SHAKAMAK LAKE

Shakamak State Park

Sullivan and Clay Counties

2009 Fish Management Report

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EXECUTIVE SUMMARY

- Shakamak Lake is a 52-acre impoundment located in Shakamak State Park near Jasonville, Indiana. It is one of three lakes in the park that offer fishing as a primary attraction. In 2009, a general fish community survey was conducted to assess the fish community as a whole. The general survey also included a tier II aquatic vegetation survey.

- Fish sampling effort produced 234 fish weighing a total of 132.71 lbs, representing 9 species. Largemouth bass were the most abundant species collected by number (37.6%) followed by bluegill (32.1%), redear (15.8%), yellow bullhead (5.6%), and channel catfish (4.3%). Other species collected were warmouth, black crappie, gizzard shad and bowfin.

- The primary game species; bluegill, redear, and largemouth bass, exhibited little change since the previous survey in 1997. Shakamak Lake offers excellent bluegill and redear fishing opportunities. Relative weight indices for largemouth bass ranged from 80 to 86, indicating that the bass population may be too numerous for the food source.

- In 2009, gizzard shad were collected for the first time at Kickapoo and Shakamak Lakes. A supplemental fisheries survey will be conducted in June of 2010 to determine if gizzard shad were able to successfully spawn in 2009 and 2010.

- A decision to remove the protected slot-size limit will be made when there is evidence of successful gizzard shad spawns or the presence of multiple year classes of gizzard shad at any of the Shakamak State Park Lakes.

INTRODUCTION

Shakamak Lake is a 52-acre impoundment located in Shakamak State Park near Jasonville, Indiana. Shakamak Lake is one of three lakes at the park where fishing is a primary attraction. Constructed in 1930, Shakamak Lake has been open to public fishing since its impoundment.

Beginning in 1973, Indiana imposed a 14-in minimum size limit on largemouth bass at all lakes and impoundments on lands owned by the state. Under the 14-in size limit, largemouth bass began to stockpile and by 1986 all three lakes at the park were being managed with a 12 to 15-in protected slot size limit. Currently, the slot size limit remains in effect and 1,400 channel catfish are stocked on odd numbered years. The most recent survey in 1997 was an evaluation of the slot size limit (Schoenung 1998). Recommendations in 1997 were to maintain the quality panfish fishery and maintain the slot size limit for bass. The objective of this survey was to evaluate the overall status of the fishery.

METHODS

A general survey was conducted on May 27, June 10 and 11, 2009. The vegetation survey was conducted on July 22 to 23, 2009. Sampling effort for the general survey consisted of 0.92 h of electrofishing, three overnight gill net sets, and four overnight trap net sets. All species were counted and measured to the nearest 0.1 in. Fish were weighed to the nearest 0.01 lb. Scale samples were taken from game species for age and growth analysis. Proportional stock density (PSD) and relative stock density (RSD) indices were used to assess the population (Anderson and Neumann 1996). Relative weights (Wr) were calculated for indices of fish condition (Murphy and Willis 1996). This report presents the results of the survey along with recommendations for future work.

RESULTS

Of the three lakes at the park, Shakamak Lake is the most eutrophic. Dissolved oxygen levels were at least five parts per million (ppm) down to 6 ft (Appendix). The Secchi disk reading was 7 ft. Alkalinity measured at the surface was 68.4. Conductivity was 180ms and pH was 7.9

There were four species of submersed plants collected or observed. There were five species of emergent and floating plants observed. By frequency of occurrence, coontail was most abundant followed by leafy pondweed, water stargrass, and brittle naiad. Other plants collected or observed were giant duckweed, watermeal, and water willow. Pithophora and bluegreen algae were also observed.

Fish sampling effort produced 234 fish weighing a total of 132.71 lbs, representing 9 species. Largemouth bass were the most abundance species collected by number (37.6%) followed by bluegill (32.1%), redear (15.8%), yellow bullhead (5.6%), and channel catfish (4.3%). Other species collected were warmouth, black crappie, gizzard shad, and bowfin. Combined, these species totaled less than 5% of the total catch. Largemouth bass were the most abundant by weight (43.6%), followed by channel catfish (16.4%), bluegill (15.5%), and redear (9.6%). These primary game species made up over 85% of the catch by weight.

A total of 88 bass was collected with a length range of 1.0 to 20.5 in. The PSD for bass was 34, RSD15 was 6, and RSD20 was 1. When compared to bluegill indices, the PSD and RSD were slightly below the range of what is considered a balanced bass/panfish population (40 to 70). Of the 88 bass collected, 27% were within the 12 to 15-in protected slot limit, and bass greater than 15 in accounted for 6%. This is similar to the other lakes in the park under the same regulation. Growth for bass appears to be good up to age 4 and compared to the 1997 survey, the growth to age 4 is similar. As bass reach the protected slot limit, growth slows, taking a bass at least 7 years to reach 15 in. This growth pattern is similar to the other lakes in the park. Weights of largemouth bass were compared to standard weights to determine Relative Weight (Wr). Bass were separated by stock indices and Wr averaged to determine condition of bass by stock indices. The relative weights for bass were considered low for all three categories with stock size (8 in) to quality fish (12 in) at 86.7, quality to preferred (15 in) at 80.6, and preferred to memorable (20 in) at 88.3. Fish with a relative weight close to 100 are in balance with their food supply, whereas fish with values below 85 are underweight and may be too abundant for their food supply (Flickinger et al 1999). Fish with a relative weight above 105 are more plump than necessary, reflecting an overabundant food supply.

The bluegill sample consisted of 75 fish ranging in length from 1.4 to 8.8 in. The bluegill PSD was 76 and the RSD8 was 26. Growth for age 1 to 4 is very good. Bluegill are reaching preferred size (6 in) by age 3, and reach quality size (8 in) as early as age 4.

The relative weights in 2009 were considered high for all three categories with stock size (3 in) to quality (6 in) fish at 150.5 and quality to preferred (8 in) at 116.1.

The redear sample consisted of 37 fish ranging in length from 3.8 to 9.0 in. The redear PSD was 81 and the RSD9 was 4. Growth for redear is also very good. Fish are reaching preferred size (7 in) as early as age 3.

There were 13 yellow bullhead collected with a length range of 8.6 to 11.9 in. The total weight was 7.96 lbs.

There were 10 channel catfish collected with a length range of 13.6 to 20.5 in. The total weight of the channel catfish was 21.74 lbs. Based on length frequency, there were two to three year classes of channel catfish, indicating the stocked channel catfish are surviving. In 2007, there were 1,400 channel catfish stocked. It is recommended that the Division of Fish and Wildlife continue stocking channel catfish at a rate 25/acre on odd numbered years.

There were 3 gizzard shad collected with a length range of 11.5 to 12.5 in. All were age 1 fish. This is the first time shad have been collected at this lake.

Two black crappie at 10.0 in and 10.9 in were collected. Spring crappie fishing is popular at Shakamak Lake. Black crappie numbers were most likely underestimated. Low crappie catches are not uncommon during standard surveys.

DISCUSSION

Shakamak Lake is the oldest lake in the park. This system is highly eutrophic and annual vegetation control is necessary to maintain lake access from the cabins and boat ramp. Like the other lakes in the park, panfishing is the best attribute of this lake. High bass densities keep panfish numbers in check. Size structure for bass is almost identical to the previous survey in 1997.

For the first time since impoundment, gizzard shad were collected at Kickapoo and Shakamak Lakes. Only age-1 gizzard shad were collected at each lake. The source of these fish is unknown. In 2008, there was record flooding in the watershed. It is possible that the shad source may be from overflow drainage from impoundments outside the park. There were also comments from anglers during the Kickapoo Lake creel survey stating “the bass are too small and need shad to grow better”. Gizzard shad infestations are known to negatively affect game fish populations in a just a few years. As the shad become established and compete for food with

all fish, the overall bass numbers will decline because of lack of recruitment. The low bass numbers will no longer provide adequate predation for panfish and the result will be a numerous but reduced quality panfish population. Continued monitoring of this fishery through supplemental fisheries investigations in June will be required to determine if shad are successfully spawning. Because Shakamak Lake drains to Kickapoo Lake, evidence of a successful shad spawn at Shakamak Lake will determine the management actions at Kickapoo Lake as well. This will most likely include the removal of the parks 12 to 15 in slot size limit and reinstating the 14in size limit.

LITERATURE CITED

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Date: February 18, 2010

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Date: April 20, 2010

APPENDIX

Lake sampling page
Sampling effort and water chemistry
Fish species and relative abundance
Individual fish length frequencies and weights
Growth summaries for game fish
Location of fish sampling by gear type
Summary of aquatic vegetation survey

LAKE SURVEY REPORT

Type of Survey: [ ] Initial Survey [X] Re-Survey

Lake Name	County	Date of survey (Month, day, year)
Shakamak Lake	Clay and Sullivan	5/27/09, 6/7/09-6/10/09
Biologist's name		**Date of approval (Month, day, year)**
David Kittaka, Debbie King		4/20/2010

LOCATION

Quadrangle Name	Range	Section
Jasonville	8W	31, 36
Township Name	**Nearest Town**	
9N	Jasonville	

ACCESSIBILITY

State owned public access site	Privately owned public access site	Other access site
Concrete boat ramp		

Surface acres	Maximum depth	Average depth	Acre feet	Water level	Extreme fluctuations
*52	26 ft.	10.8 ft.	562	550 MSL	None

Location of benchmark: None

INLETS

Name	Location	Origin
Surface runoff		

OUTLETS

Name	Location
Kickapoo Lake	South

Water level control: Earthen dam with concrete spillway and removable board

POOL	ELEVATION (Feet MSL)	ACRES
TOP OF DAM		
TOP OF FLOOD CONTROL POOL		
TOP OF CONSERVATION POOL		
TOP OF MINIMUM POOL		
STREAMBED		

Bottom type

- [ ] Boulder
- [ ] Gravel
- [x] Sand
- [x] Muck
- [x] Clay
- [ ] Marl

Watershed use: The watershed consists of 980 acres of mixed hardwoods, grasses, and some cultivated land.

Development of shoreline: Boat ramp, boat rental concession, and several rental cabins.

Previous surveys and investigations: Fisheries surveys 1963, 1967, 1968, 1972, 1976, 1979, 1985, 1989 and 1997. Feasibility study 1988.

Bass sampling 1990 and 1993.

*Recalculated acreage measurement using GIS.

SAMPLING EFFORT For Shakamak Lake, 2009					
ELECTROFISHING	Day hours		Night hours 0.92		Total hours 0.92
TRAP NETS	Number of traps 4		Number of Lifts 1		Total effort 4
GILL NETS	Number of nets 3		Number of Lifts 1		Total effort 3
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS	
Color: Brown	Turbidity: 7 Feet 0 Inches (SECCHI DISK)
Alkalinity (ppm)*: Surface: 68.4 Bottom:	pH: Surface: 7.9 Bottom:
Conductivity: 180 m, .08 TDS micromhos	Air temperature: °F
Water chemistry GPS coordinates: N 39.17609 W 87.24516	

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	79.2	10.10	36			72		
2	76.6	10.60	38			74		
4	75.4	4.35	40			76		
6	69.8	1.80	42			78		
8	66.0	0.80	44			80		
10	61.0	0.26	46			82		
12	55.6	0.15	48			84		
14	51.1	0.10	50			86		
16	49.6	0.10	52			88		
18	48.6	0.10	54			90		
20	47.7	0.10	56			92		
22	46.9	0.10	58			94		
24			60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			70					

COMMENTS
Electrofishing was conducted over two nights because of bad weather.

*ppm-parts per million

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT, Shakamak Lake, 2009					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Largemouth bass	88	37.6	1.1 - 20.5	57.91	43.6
Bluegill	75	32.1	1.4 - 8.8	20.55	15.5
Redear	37	15.8	3.8 - 9.0	12.72	9.6
Yellow bullhead	13	5.6	8.6 - 11.9	7.96	6.0
Channel catfish	10	4.3	13.6 - 20.5	21.74	16.4
Warmouth	4	1.7	6.1 - 7.7	1.17	0.9
Gizzard shad	3	1.3	11.5 - 12.5	2.70	2.0
Black crappie	2	0.9	10.0 - 10.9	1.37	1.0
Bowfin	2	0.9	21.1 - 22.1	6.59	5.0
	234	100.0		132.71	100.0

*Common names of fishes recognized by the American Fisheries Society.

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF SHAKAMAK LAKE Largemouth bass, 2009									
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	2	2.3	0.01	YOY	19.0				
1.5					19.5	1	1.1	4.08	8
2.0					20.0	1	1.1	3.73	8
2.5					20.5	1	1.1	4.35	8
3.0					21.0				
3.5					21.5				
4.0	3	3.4	0.03	1	22.0				
4.5	3	3.4	0.04	1	22.5				
5.0	3	3.4	0.05	1	23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5	1	1.1	0.18	1	25.5				
8.0	5	5.7	0.23	2,3	26.0				
8.5	4	4.5	0.28	2,3	TOTAL	88			
9.0	8	9.1	0.31	2,4					
9.5	6	6.8	0.39	2,3					
10.0	6	6.8	0.33	2,3					
10.5	9	10.2	0.53	3,4					
11.0	6	6.8	0.60	3,4					
11.5	5	5.7	0.69	4,5					
12.0	6	6.8	0.81	4,5,6					
12.5	4	4.5	0.88	4,5					
13.0	5	5.7	0.96	5,6					
13.5	2	2.3	0.98	4					
14.0	4	4.5	1.17	4,5					
14.5	1	1.1	1.17	6					
15.0	1	1.1	1.65	7					
15.5	1	1.1	1.75	7					
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	89 /hr	GILL NET CATCH	1 /lift	TRAP NET CATCH	1 /lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF SHAKAMAK LAKE Bluegill 2009									
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	1.3	0.01	1	19.0				
1.5	2	2.7	0.01	1	19.5				
2.0	3	4.0	0.01	1	20.0				
2.5	4	5.3	0.02	1,2	20.5				
3.0	1	1.3	0.04	3	21.0				
3.5	2	2.7	0.05	2	21.5				
4.0	2	2.7	0.05	2	22.0				
4.5	5	6.7	0.08	2,3	22.5				
5.0	2	2.7	0.10	3	23.0				
5.5	3	4.0	0.16	3	23.5				
6.0	4	5.3	0.20	3	24.0				
6.5	6	8.0	0.25	3,4	24.5				
7.0	5	6.7	0.35	4	25.0				
7.5	18	24.0	0.39	4,5	25.5				
8.0	11	14.7	0.44	4,5,6	26.0				
8.5	6	8.0	0.52	4,5,6,7	TOTAL	75			
9.0									
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	75 /hr	GILL NET CATCH	0 /lift	TRAP NET CATCH	1 /lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF SHAKAMAK LAKE Redear sunfish, 2009									
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	2.7	0.04	3	21.5				
4.0					22.0				
4.5					22.5				
5.0	1	2.7	0.15	3	23.0				
5.5	2	5.4	0.16	3	23.5				
6.0	1	2.7	0.21	3	24.0				
6.5	2	5.4	0.24	4	24.5				
7.0	8	21.6	0.30	4,5,6	25.0				
7.5	6	16.2	0.36	3,5,6,8	25.5				
8.0	7	18.9	0.38	5,6,7	26.0				
8.5	8	21.6	0.47	7,8	TOTAL	37			
9.0	1	2.7	0.50	7					
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	30 /hr	GILL NET CATCH	1 /lift	TRAP NET CATCH	2 /lift

LARGEMOUTH BASS AGE-LENGTH KEY 2009

Length	Total #	Sub-	Age							
group (in)	number	sample	1	2	3	4	5	6	7	8
1.0	2									
4.0	3	3	3							
4.5	3	3	3							
5.0	3	3	3							
7.5	1	1	1							
8.0	5	5		3	2					
8.5	4	4		3	1					
9.0	8	5		6		2				
9.5	6	5		4	2					
10.0	6	4		3	3					
10.5	9	5			4	5				
11.0	6	6			4	2				
11.5	5	4				3	3			
12.0	6	6				1	4	1		
12.5	4	4				1	3			
13.0	5	5					4	1		
13.5	2	2				1			1	
14.0	4	4				1	2		1	
14.5	1	1						1		
15.0	1	1							1	
15.5	1	1							1	
19.5	1	1								1
20.0	1	1								1
20.5	1	1								1
Total	88	75	10	19	16	16	16	3	4	3

BLUEGILL AGE-LENGTH KEY 2009

Length group (in)	Total # number	Sub-sample	Age						
			1	2	3	4	5	6	7
1.0	1	1	1						
1.5	2	2	2						
2.0	3	2	3						
2.5	4	4	3	1					
3.0	1	1			1				
3.5	2	2		2					
4.0	2	2		2					
4.5	5	5		3	2				
5.0	2	2			2				
5.5	3	3			3				
6.0	4	4			4				
6.5	6	5			5	1			
7.0	5	5				5			
7.5	18	6				15	3		
8.0	11	5				2	2	7	
8.5	6	6				1	1	3	1
Total	75	55	9	8	17	24	6	10	1

REDEAR SUNFISH AGE-LENGTH KEY 2009

Length group (in)	Total # number	Sub-sample	Age							
			1	2	3	4	5	6	7	8
3.5	1	1			1					
5.0	1	1			1					
5.5	2	2			2					
6.0	1	1			1					
6.5	2	2				2				
7.0	8	5				5	2	2		
7.5	6	6			1		2	2		1
8.0	7	6					2	2	2	
8.5	8	5							6	2
9.0	1	1							1	
Total	37	30	0	0	6	7	6	6	10	3

Lake: Shakamak
Date: 5/27/2009 to 6/10/2009
Species: Largemouth Bass

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	10	5.1	1.07	0.33	4.4	5.7
2	19	9.3	0.42	0.15	9.0	9.6
3	16	10.2	1.05	0.26	9.7	10.7
4	16	11.5	1.80	0.34	10.8	12.1
5	16	12.8	0.62	0.20	12.4	13.2
6	3	13.4	1.58	0.73	12.0	14.9
7	4	14.8	0.83	0.46	13.8	15.7
8	3	20.3	0.25	0.29	19.7	20.8

Lake: Shakamak
Date: 5/27/2009 to 6/10/2009
Species: Bluegill

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	8	2.3	0.17	0.15	2.0	2.6
2	8	4.1	0.48	0.25	3.6	4.6
3	17	5.8	0.91	0.23	5.4	6.3
4	24	7.7	0.17	0.08	7.5	7.8
5	6	8.1	0.16	0.16	7.8	8.4
6	10	8.4	0.06	0.08	8.2	8.6
7	1	8.8	0.00	0.00	0.00	0.00

Lake: Shakamak
Date: 5/27/2009 to 6/10/2009
Species: Redear Sunfish

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1						
2						
3	6	5.8	1.70	0.53	4.7	6.8
4	7	7.1	0.06	0.09	6.9	7.3
5	6	7.8	0.19	0.18	7.4	8.2
6	6	7.8	0.19	0.18	7.4	8.2
7	10	8.7	0.09	0.10	8.5	8.9
8	3	8.4	0.38	0.38	7.6	9.1

GPS LOCATION OF SAMPLING EQUIPMENT SHAKAMAK LAKE, 2009

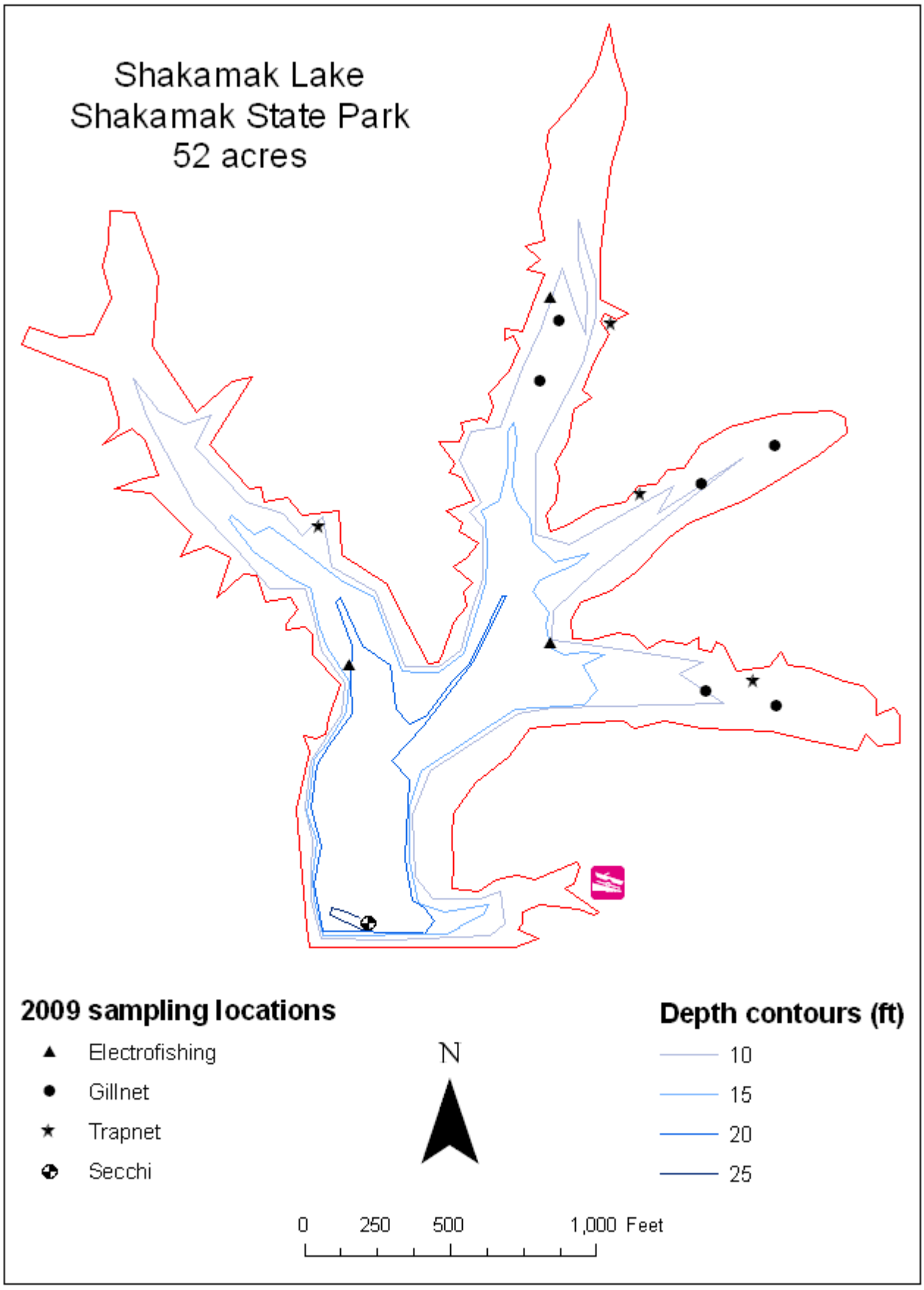
GILL NETS					TRAP NETS					ELECTROFISHING				
1	N	39.1781819	W	-87.240408	1	N	39.1784108	W	-87.24068	1	N	39.1787666	W	-87.243151
	N	39.1783145	W	-87.24127	2	N	39.1801607	W	-87.242048		N		W	
2	N	39.1806185	W	-87.240447	3	N	39.1817683	W	-87.242416	2	N	39.1820157	W	-87.243155
	N	39.1802599	W	-87.241326	4	N	39.1798557	W	-87.245938		N		W	
3	N	39.1817903	W	-87.243059	5	N		W		3	N	39.1785565	W	-87.245586
	N	39.1812284	W	-87.243285	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 - Overall

Lake:	Shakamak Lake	**Secchi (ft):**	4.5	**SE Mean Species / Site:**	0.09
Date:	7/22/2009	**Littoral Sites w/Plants:**	18	**Mean Natives / Site:**	0.48
Littoral Depth (ft):	15.0	**Number of Species:**	2	**SE Mean Natives / Site:**	0.09
Littoral Sites:	32	**Max. Species / Site:**	2	**Species Diversity:**	0.10
Total Sites:	40	**Mean Species / Site:**	0.48	**Native Diversity:**	0.10

	Frequency of	Score Frequency				
Species	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	45	55	7.5	7.5	30	36
Leafy pondweed	2.5	97.5	2.5	0	0	0.5
Filamentous algae	10					

Other species noted: Giant duckweed, watermeal, waterwillow, lotus, creeping waterprimrose, stargrass, brittle naiad, and bluegreen algae.


Shakamak Lake
Shakamak State Park
52 acres
2009 sampling locations
Electrofishing
Gillnet
Trapnet
Secchi
N
Depth contours (ft)
10
15
20
25
0
250
500
1,000 Feet