

KICKAPOO LAKE
Shakamak State Park
Sullivan, Greene, and Clay Counties
2009 Fish Management Report

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EXECUTIVE SUMMARY

- Kickapoo Lake is a 253-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 spring bass supplemental survey and a general fish community survey were conducted to evaluate the bass slot size limit and the fish community as a whole.
- Fish sampling efforts produced 702 fish weighing a total of 160.88 lbs, representing 11 species. Bluegill dominated the sample by number (50.6%), followed by redear sunfish (21.1%), largemouth bass (18.2%), and warmouth (5.3%). Other species collected were black crappie, yellow bullhead, yellow perch, channel catfish, brown and black bullhead, and gizzard shad.
- The primary game species, bluegill, redear, and largemouth bass, exhibited little change since the previous survey in 2003. Kickapoo Lake currently offers excellent bluegill and redear fishing opportunities. Modeling the bass population using F.A.S.T. software indicated that total annual mortality is low for bass at 24.5%. Relative weight indices ranged from 89 to 94, indicating that the bass population may be too numerous for the food source.
- The biggest change since the previous survey in 2003 is that gizzard shad were collected during this survey. Three age-1 gizzard shad were collected.
- A supplemental fisheries evaluation will be conducted to determine the status of gizzard shad at all three lakes in Shakamak State Park.

INTRODUCTION

Kickapoo Lake is a 253-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. There is a concrete boat ramp on the lake, and anglers may also rent boats or fish from the shoreline. Electric motors are permitted while gas outboard motors are not. Camping and picnicking facilities are located nearby in the park.

Constructed in 1969, Kickapoo Lake is the newest of the three lakes in Shakamak State Park. The two older lakes, Shakamak and Lenape, are actually sub-impoundments and drain directly into Kickapoo Lake. These two lakes help to protect the water quality of Kickapoo Lake by trapping nutrients and sediment before they enter the lake. Consequently, Kickapoo is the least productive of the three lakes. Maximum depth of Kickapoo Lake is 44 ft with an average depth of 25 ft.

Fish management efforts at Kickapoo began with a fish eradication and restocking project when the lake was impounded. In 1973, a 14-in minimum size limit was imposed on largemouth bass. By 1986, Kickapoo Lake had an abundant slow growing bass population. In an effort to reduce the bass population, a 12 to 15-in protected slot size limit for largemouth bass was implemented at Kickapoo Lake. The most recent survey was conducted in 2003, and concluded that this fishery's best asset was its panfish population. The bass slot limit remained in effect and no recommendations for change in management were pursued (Stiras 2004)

METHODS

Targeted bass sampling was conducted April 4 and 17, 2009. The general survey was conducted May 19 to June 3, 2009 and the vegetation survey was conducted on July 22, 2009. The objective of the survey was to evaluate the overall status of the fishery as well as the largemouth bass population. Bass sampling effort consisted of 2.28 h of night pulsed DC electrofishing. Otoliths were removed from a sub-sample of bass for age and growth analysis. Aged bass were fitted to the non-aged fish using an age length key. Using Fisheries Analysis and System Tools (FAST) software, a catch-curve analysis for total annual mortality was modeled (Slipke and Maceina 2000). Sampling effort for the general survey consisted of 1 h of electrofishing, 8 overnight gill net sets, and 6 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 findings of the 2009 bass age and growth study and the fish community survey along with recommendations for future work. An angler creel survey was also conducted during the 2009 survey season with the results presented in a separate report.

RESULTS AND DISCUSSION

Water quality was good at Kickapoo Lake in comparison to other impoundments in the area. Dissolved oxygen levels were at least five parts per million (ppm) down to 14 ft (Appendix). The Secchi disk reading was 6 ft 6 in. Alkalinity measured at the surface was 68.4. This level of alkalinity indicates a moderately productive system.

A diverse community of aquatic plants was observed during the vegetation survey. A total of nine submersed plants were collected or observed. There were six species of emergent plants observed. By frequency of occurrence, coontail was most abundant, followed by Eurasian watermilfoil, vallisneria, American elodea, slender naiad and small pondweed. Other plants collected or observed were brittle naiad, water stargrass, American pondweed, giant duckweed, white water lily, arrow arum, bladderwort, water willow, pickerel weed and button bush. Chara and pithophora algae were also collected.

A total of 736 fish weighing a total of 163.35 lbs and representing 12 species was collected. Bluegill dominated the sample by number (48.2%), followed by redear sunfish (20.1%), largemouth bass (17.4%), warmouth (5.0%), and longear sunfish (4.6%). Other species collected were black crappie, yellow bullhead, yellow perch, channel catfish, brown and black bullhead and gizzard shad. Combined, these species totaled less than 5% of the total catch. This is also the first time gizzard shad appeared in the lake. Largemouth bass were the most abundant by weight (38.7%), followed by redear sunfish (22.3%), bluegill (19.9%), channel catfish (6.8%), and warmouth (4.0%). The remaining species comprised less than 7.6% of the sample by weight.

The bluegill sample consisted of 355 fish ranging from 1.1 to 9.2 in. The bluegill PSD was 26 and the RSD8 was 9, compared to a PSD of 19 and a RSD8 of 9 in 2003. Age 1 to 3 bluegill grew slightly faster compared to the last survey in 2003. Growth for older fish was

similar to the previous survey. Bluegill are reaching preferred size (6 in) by age 4, and quality size (8 in) by age 6.

Weights of bluegill were compared to standard weights to determine Relative Weight (Wr). Bluegill were separated by stock indices and Wr averaged to determine condition of bluegill by stock indices. The relative weights in 2009 were considered high for all three categories with stock size (3 in) to quality (6 in) fish at 125.1 and quality to preferred (8 in) at 106.1. 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 redear sample consisted of 148 fish ranging from 3.1 to 9.8 in. The redear PSD was 43 and the RSD9 was 4. Redear grew similar to the last survey up to age 3 and slightly slower beyond age 3. Fish are reaching preferred size (7 in) as early as age 5. The relative weights in 2009 were considered high for two categories. Stock size (4 in) to quality (7 in) fish was 127.2 and quality to preferred (10 in) was 111.8.

Spring largemouth bass sampling occurred April 15 and 17, 2009 with a total of 260 bass collected with a length range of 3.4 to 21.9 in. The general survey occurred just over a month later with a total of 128 bass collected with a length range of 3.8 to 21.0 in. The total catch for the two surveys was 383 bass. The PSD for bass was 24. The RSD15 was 3 and RSD20 was 1. The PSD and RSD15 indices when combined with bluegill indices was below the range (40 to 70) of what is considered a balanced bass/panfish population. However, this is still within the range for panfish management (20 to 40). Of the 383 bass collected, 16% were within the 12 to 15 in protected slot limit, which is almost double from the previous survey, while bass greater than 15 in accounted for 4% of the sample. In 2003, less than 1% of the bass collected were 15 in and greater. Bass grew good up to age 4. As bass reach the protected slot limit, it appears growth slows, taking a bass 6 to 7 years to reach 15 in. This growth pattern is similar to the previous survey.

Total annual mortality was low at an estimated 24.5 %. Creel results indicate 869 bass were harvested or 6.4% of the total harvest during the 2009 season (King 2010). The relative weights in 2009 were between “underweight” and “in balance for food supply” for all three categories with stock size (8 in) to quality fish (12 in) at 89.9, quality to preferred (15 in) at 90.8,

and preferred to memorable (20 in) at 94.0. This is also an indicator that the bass population, although high, is also maintaining a healthy panfish population.

Warmouth comprised 5% of the catch. There were 37 fish collected with a length range of 3.0 to 7.8 in. Almost half of the warmouth catch was 6 in and greater. Anglers rarely target warmouth but they will often show up in the harvest.

There were 10 black crappie collected with a length range of 3.0 to 8.8 in. Black crappie collections from past surveys have always represented less than 5% of the catch for general surveys. However, in the 2009 creel survey, crappie harvest ranked 3rd or 8% of the total harvest.

Yellow, brown, and black bullheads were collected. There were 9 yellow bullhead collected ranging in length from 7.3 to 11.6 in. Two brown bullhead and one black bullhead were also collected. Their combined length range was 10.6 to 12.3 in.

Three channel catfish were collected ranging in length from 18.8 to 24.5 in. Channel catfish are stocked on odd numbered years at Shakamak and Lenape Lakes. During high water, these fish have access to Kickapoo Lake.

For the first time since its impoundment, gizzard shad were collected at Kickapoo and Shakamak Lakes. Three 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 overflow drainage from impoundments outside the park may be the source. There were also comments from anglers from the 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. If shad successfully reproduce, it is unlikely that the bass population at Kickapoo Lake will be able to control these nuisance fish before they become unmanageable. As the shad become established and compete for food with all fish, the overall bass numbers will decline due to lack of recruitment. The low bass numbers will no longer provide adequate predation for panfish and the result will be reduced quality of the 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 14 in size limit.

RECOMMENDATIONS

- 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.

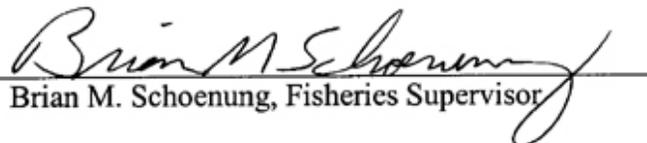
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Submitted By: David S. Kittaka, Fisheries Biologist

Date: February 18, 2010

Approved by:


Brian M. Schoenung, Fisheries Supervisor

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	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
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Lake Name Kickapoo Lake	County Sullivan and Greene	Date of survey (Month, day, year) 5/19/09, 6/1/09-6/3/09
Biologist's name David Kittaka, Debbie King		Date of approval (Month, day, year) 4/20/2010

LOCATION		
Quadrangle Name Jasonville	Range 7W, 8W	Section 36, 31, 1, 6
Township Name 8N, 9N	Nearest Town Jasonville	

ACCESSIBILITY					
State owned public access site Concrete boat ramp		Privately owned public access site		Other access site	
Surface acres 253*	Maximum depth 44 ft.	Average depth 24.5	Acre feet 6198.5*	Water level 550 MSL	Extreme fluctuations 2 ft.
Location of benchmark					

INLETS		
Name Shakamak Lake Outlet	Location North shore	Origin
Lenape Lake Outlet	East shore	

OUTLETS																
Name Big Branch Creek	Location T8N, R8W, S1															
Water level control Earthen dam with concrete drop box and 24 inch gate valve																
POOL	ELEVATION (Feet MSL)	ACRES														
TOP OF DAM																
TOP OF FLOOD CONTROL POOL																
TOP OF CONSERVATION POOL																
TOP OF MINIMUM POOL																
STREAMBED																
<table border="0"> <tr> <td></td> <td>Bottom type</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Boulder</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Gravel</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Sand</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Muck</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Clay</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Marl</td> </tr> </table>				Bottom type	<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
	Bottom type															
<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															
Watershed use Shakamak State Park, mixed hardwood and grasses.																
Development of shoreline One concrete boat ramp and boat rental pier.																
Previous surveys and investigations Fisheries surveys 1972, 1976, 1979, 1984, 1989, 1996, and 2003. Voluntary creel survey 1999.																
*GIS map of lake acreage in 2010 changed from 291 to 253 surface acres.																
*Recalculated acre-feet based on new surface acres totals.																

SAMPLING EFFORT KICKAPOO LAKE, 2009					
ELECTROFISHING	Day hours		Night hours		Total hours
	N/A		1		1
TRAP NETS	Number of traps		Number of Lifts		Total effort
	3		2		6
GILL NETS	Number of nets		Number of Lifts		Total effort
	4		2		8
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS					
Color			Turbidity		
green			6 Feet 6 Inches (SECCHI DISK)		
Alkalinity (ppm)*			pH		
Surface: 68.4 Bottom:			Surface: 8.6 Bottom:		
Conductivity:			Air temperature:		
micromhos			°F		
Water chemistry GPS coordinates:					
N 39.162765			W -87.248416		

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	77.4	12.15	36	49.8	0.05	72		
2	77.0	11.90	38	49.1	0.04	74		
4	76.1	12.25	40	48.6	0.04	76		
6	74.7	12.72	42	48.2	0.03	78		
8	72.3	13.80	44			80		
10	69.4	12.95	46			82		
12	67.3	10.90	48			84		
14	65.7	5.80	50			86		
16	63.9	2.60	52			88		
18	62.4	2.00	54			90		
20	61.7	1.70	56			92		
22	60.8	1.70	58			94		
24	59.5	2.25	60			96		
26	58.3	1.85	62			98		
28	55.8	1.50	64			100		
30	52.7	0.15	66					
32	50.9	0.05	68					
34	50.4	0.05	70					

COMMENTS								

*ppm-parts per million

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF 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	6	1.7	0.01	1	19.0				
1.5	28	7.9	0.01	1	19.5				
2.0	50	14.1	0.01	1,2	20.0				
2.5	34	9.6	0.01	2	20.5				
3.0	29	8.2	0.02	2	21.0				
3.5	29	8.2	0.04	2,3	21.5				
4.0	46	13.0	0.05	3	22.0				
4.5	30	8.5	0.08	3	22.5				
5.0	27	7.6	0.11	3,4	23.0				
5.5	17	4.8	0.14	3,4,5	23.5				
6.0	11	3.1	0.18	3,5	24.0				
6.5	13	3.7	0.23	4,5,6,	24.5				
7.0	9	2.5	0.32	3,4,6,7	25.0				
7.5	6	1.7	0.35	5	25.5				
8.0	11	3.1	0.44	6,7,8	26.0				
8.5	7	2.0	0.52	7,8,	TOTAL	355			
9.0	2	0.6	0.64	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	323 /hr	GILL NET CATCH	1 /lift	TRAP NET CATCH	5 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF 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	1	0.7	0.02	2	21.0				
3.5	2	1.4	0.03	2	21.5				
4.0	5	3.4	0.06	2	22.0				
4.5	9	6.1	0.06	2	22.5				
5.0	5	3.4	0.10	2,3,4	23.0				
5.5	13	8.8	0.15	3	23.5				
6.0	21	14.2	0.18	3,4	24.0				
6.5	24	16.2	0.24	4,5	24.5				
7.0	29	19.6	0.28	5,6,7	25.0				
7.5	22	14.9	0.33	5,6,7	25.5				
8.0	6	4.1	0.39	6,7	26.0				
8.5	6	4.1	0.45	7,8	TOTAL	148			
9.0	3	2.0	0.64	6,7,8,					
9.5	2	1.4	0.58	7					
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	71 /hr	GILL NET CATCH	0 /lift	TRAP NET CATCH	13 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF All 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					19.0	1	0.3	4.00	9
1.5					19.5				
2.0					20.0	2	0.5	4.61	10,12
2.5					20.5				
3.0	1	0.3	0.02	1	21.0	1	0.3	4.95	10
3.5	6	1.6	0.03	1	21.5	1	0.3	6.25	14
4.0	11	2.9	0.03	1	22.0				
4.5	28	7.3	0.04	1	22.5				
5.0	18	4.7	0.05	1	23.0				
5.5	9	2.3	0.07	1	23.5				
6.0	4	1.0	0.09	1	24.0				
6.5	1	0.3	0.10	2	24.5				
7.0	3	0.8	0.19	2	25.0				
7.5	9	2.3	0.20	2	25.5				
8.0	41	10.7	0.22	1,2	26.0				
8.5	52	13.6	0.27	2	TOTAL	383			
9.0	33	8.6	0.32	2,3					
9.5	21	5.5	0.40	3					
10.0	12	3.1	0.45	2,3,4					
10.5	19	5.0	0.52	3,4,5					
11.0	25	6.5	0.61	3,4,5					
11.5	20	5.2	0.72	5,7					
12.0	20	5.2	0.86	4,5					
12.5	16	4.2	0.91	4,5,6,7					
13.0	10	2.6	1.01	5,6					
13.5	9	2.3	1.09	5,6					
14.0	5	1.3	1.39	5,6,7					
14.5	1	0.3	1.40	7					
15.0	1	0.3	1.55	7					
15.5	1	0.3	1.63	6					
16.0									
16.5	1	0.3	2.54	9					
17.0	1	0.3	2.75	7					
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	115 /hr	GILL NET CATCH	1 /lift	TRAP NET CATCH	0 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF Warmouth, 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	6	16.2	0.03	not aged	21.0				
3.5	3	8.1	0.04	not aged	21.5				
4.0				not aged	22.0				
4.5	2	5.4	0.10	not aged	22.5				
5.0	2	5.4	0.11	not aged	23.0				
5.5	6	16.2	0.15	not aged	23.5				
6.0	4	10.8	0.19	not aged	24.0				
6.5	7	18.9	0.27	not aged	24.5				
7.0	5	13.5	0.30	not aged	25.0				
7.5	2	5.4	0.40	not aged	25.5				
8.0					26.0				
8.5					TOTAL	37			
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	34 /hr	GILL NET CATCH	0 /lift	TRAP NET CATCH	0 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF Longear 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	2	5.9	0.03	Not aged	20.5				
3.0	8	23.5	0.04		21.0				
3.5	2	5.9	0.04		21.5				
4.0	7	20.6	0.05		22.0				
4.5	7	20.6	0.08		22.5				
5.0	6	17.6	0.12		23.0				
5.5					23.5				
6.0	2	5.9	0.22		24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	34			
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	34 /hr	GILL NET CATCH	0 /lift	TRAP NET CATCH	0 /lift
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BLUEGILL AGE-LENGTH KEY 2009

Length group (in)	Total #	Sub-sample	Age							
			1	2	3	4	5	6	7	8
1.0	6	4	6							
1.5	28	4	28							
2.0	50	5	20	30						
2.5	34	5		34						
3.0	29	5		29						
3.5	29	5		6	23					
4.0	46	5			46					
4.5	30	5			30					
5.0	27	5			5	22				
5.5	17	5			3	7	7			
6.0	11	5			4		7			
6.5	13	5				5	5	3		
7.0	9	5			2	4		2	2	
7.5	6	5					6			
8.0	11	6						2	7	2
8.5	7	5							6	1
9.0	2	2							2	
Total	355	81	54	99	114	37	25	6	17	3

LARGEMOUTH BASS AGE-LENGTH KEY 2009

Length group (in)	Total #	Sub-sample	Age														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	
3.0	1	1	1														
3.5	6	4	6														
4.0	11	5	11														
4.5	28	6	28														
5.0	18	5	18														
5.5	9	5	9														
6.0	4	2	4														
6.5	1	1		1													
7.0	3	2		3													
7.5	9	5		9													
8.0	41	8	5	36													
8.5	52	7		52													
9.0	33	5		20	13												
9.5	21	4			21												
10.0	12	4		3	3	6											
10.5	19	6			6	6	6										
11.0	25	4			6	13	6										
11.5	20	3					13		7								
12.0	20	6				10	10										
12.5	16	5				3	6	3	3								
13.0	10	5					6	4									
13.5	9	6					5	5									
14.0	5	4					3	1	1								
14.5	1	1							1								
15.0	1	1							1								
15.5	1	1						1									
16.0																	
16.5	1	1											1				
17.0	1	1							1								
17.5																	
18.0																	
18.5																	
19.0	1	1											1				
19.5																	
20.0	2	2												1		1	
20.5																	
21.0	1	1												1			
21.5	1	1															1
Total	383	113	82	124	50	38	55	14	14	0	2	2	0	1	0	0	1

REDEAR SUNFISH AGE-LENGTH KEY 2009

Length group (in)	Total # number	Sub- sample	Age								
			1	2	3	4	5	6	7	8	
3.0	1	1		1							
3.5	2	2		2							
4.0	5	5		5							
4.5	9	5		9							
5.0	5	5		1	3	1					
5.5	13	4			13						
6.0	21	5			13	8					
6.5	24	5				19	5				
7.0	29	5					12	12	6		
7.5	22	6					7	11	4		
8.0	6	5						1	5		
8.5	6	5							4	2	
9.0	3	3							1	1	1
9.5	2	2								2	
Total	148	58	0	18	29	29	24	25	21	3	

Lake: Kickapoo Lake
 Date: 5/19/2009 to 6/3/2009
 Species: Bluegill

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	54	1.9	0.11	0.04	1.8	2.0
2	99	2.8	0.21	0.05	2.7	2.9
3	114	4.5	0.47	0.06	4.4	4.6
4	37	5.7	0.52	0.12	5.5	6.0
5	25	6.6	0.58	0.15	6.3	6.9
6	6	7.3	0.47	0.27	6.8	7.9
7	17	8.4	0.30	0.13	8.2	8.7
8	3	8.5	0.09	0.17	8.1	8.8

Lake: Kickapoo Lake
 Date: 5/19/2009 to 6/3/2009
 Species: Redear sunfish

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1						
2	18	4.4	0.24	0.12	4.2	4.7
3	29	5.9	0.11	0.06	5.8	6.0
4	29	6.6	0.12	0.06	6.4	6.7
5	24	7.3	0.13	0.07	7.2	7.5
6	25	7.6	0.21	0.09	7.4	7.8
7	21	8.2	0.65	0.18	7.8	8.5
8	3	8.9	0.07	0.15	8.6	9.2

Lake: Kickapoo Lake
 Date: 4/7/2009 to 6/3/2009
 Species: Largemouth bass

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	82	5.1	1.06	0.11	4.9	5.3
2	124	8.6	0.31	0.05	8.5	8.7
3	50	10.0	0.45	0.10	9.8	10.2
4	38	11.4	0.65	0.13	11.1	11.7
5	55	12.2	0.95	0.13	12.0	12.5
6	14	13.6	0.62	0.21	13.1	14.0
7	14	13.0	2.95	0.46	12.1	14.0
8						
9	2	18.0	3.13	1.25	15.5	20.5
10	2	20.8	0.50	0.50	19.8	21.8
11						
12	1	20.3	N/A	N/A	N/A	N/A
13						
14	1	21.8	N/A	N/A	N/A	N/A

GPS LOCATION OF SAMPLING EQUIPMENT, Kickapoo Lake, 2009

GILL NETS					TRAP NETS					ELECTROFISHING								
1	N	39.1617233	W	-87.250845	1	N	39.162774	W	-87.251161	1*	N	39.1632373	W	-87.243241				
	N	39.1614595	W	-87.249815	2	N	39.1625785	W	-87.235672	N	39.1636843	W	-87.240516					
2	N	39.1652741	W	-87.240911	3	N	39.1697837	W	-87.250806	2*	N	39.1625818	W	-87.236772				
	N	39.1645398	W	-87.241354	4	N	39.1698318	W	-87.244931	N	39.164446	W	-87.239675					
3	N	39.169304	W	-87.252746	5	N	39.1737539	W	-87.240515	3*	N	39.1646551	W	-87.242399				
	N	39.1690752	W	-87.251737	6	N	39.1719947	W	-87.247403	N	39.1662133	W	-87.24447					
4	N	39.1680174	W	-87.239492	7	N		W		4*	N	39.1721391	W	-87.244922				
	N	39.1688724	W	-87.239761	8	N		W		N	39.1731204	W	-87.241985					
5	N	39.1703399	W	-87.242982	9	N		W		5*	N	39.1697272	W	-87.247119				
	N	39.1697408	W	-87.243411	10	N		W		N		W						
6	N	39.1735515	W	-87.239748	11	N		W		6*	N	39.1688714	W	-87.251477				
	N	39.1736491	W	-87.238904	12	N		W		N		W						
7	N	39.1755412	W	-87.244498	13	N		W		7*	N	39.1632073	W	-87.249505				
	N	39.1755962	W	-87.245342	14	N		W										
8	N	39.1692068	W	-87.248728	15	N		W		8	N	39.1616708	W	-87.250361				
	N	39.1685192	W	-87.248734	16	N		W		N		W						
9	N		W		17	N		W		9	N	39.1655001	W	-87.240711				
	N		W		18	N		W		N	39.1647958	W	-87.24185					
10	N		W		19	N		W		10	N	39.1717458	W	-87.244512				
	N		W		20	N		W		N		W						
11	N		W							11	N	39.1710261	W	-87.247547				
	N		W							N		W						
12	N		W							12	N		W		N		W	
	N		W							N		W						
13	N		W							13	N		W		N		W	
	N		W							N		W						
14	N		W							14	N		W		N		W	
	N		W							N		W						
15	N		W							15	N		W		N		W	
	N		W							N		W						
16	N		W							16	N		W		N		W	
	N		W							N		W						
17	N		W							17	N		W		N		W	
	N		W							N		W						
18	N		W							18	N		W		N		W	
	N		W							N		W						
19	N		W							19	N		W		N		W	
	N		W							N		W						
20	N		W							20	N		W		N		W	
	N		W							N		W						

*Spring bass sampling

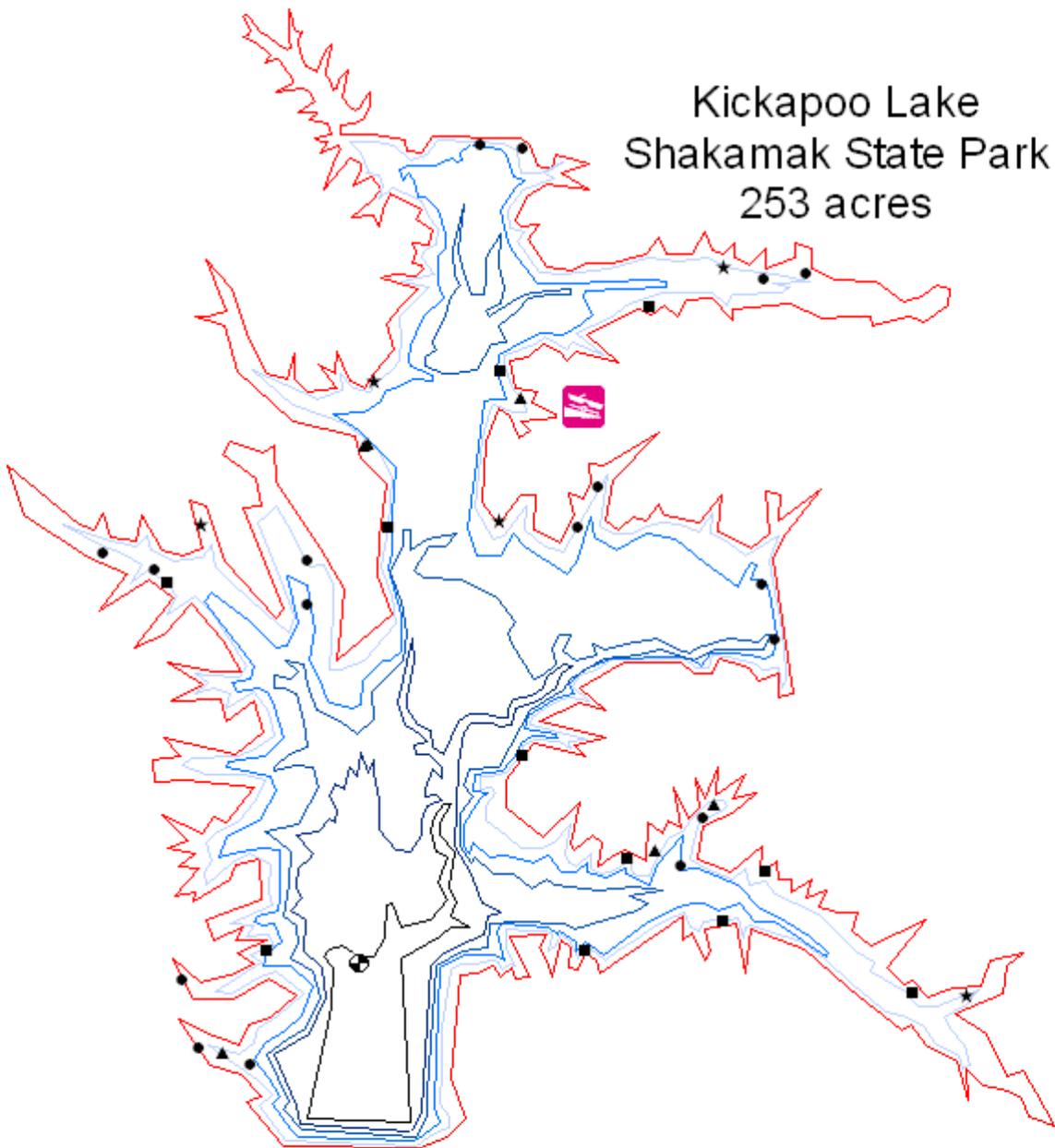
Occurrence and Abundance of Submersed Aquatic Plants - Overall

Lake:	Kickapoo Lake	Secchi (ft):	6.5	SE Mean Species / Site:	0.28
Date:	7/22/2009	Littoral Sites w/Plant:	50	Mean Natives / Site:	1.98
Littoral Depth (ft):	16.5	Number of Species:	10	SE Mean Natives / Site:	0.24
Littoral Sites:	53	Max. Species / Site:	8	Species Diversity:	0.83
Total Sites:	60	Mean Species / Site:	2.47	Native Diversity:	0.79

Species	Frequency of Occurrence	Score Frequency				Dominance
		0	1	3	5	
Coontail	75.0	25.0	25.0	16.7	33.3	48.3
American elodea	21.7	78.3	15	3.3	3.3	8.3
Brittle naiad	13.3	86.7	8.3	3.3	1.7	5.3
Slender naiad	21.7	78.3	10.0	11.7	0	9.0
Eel grass	30	70.0	25.0	5.0	0	8.0
Stargrass	8.3	91.7	8.3	0.0	0	1.7
Small pondweed	18.3	81.7	15.0	3.3	0	5.0
American pondweed	3.3	96.7	3.3	0.0	0	0.7
Chara	6.7	93.3	3.3	3.3	0	2.7
Eurasian watermilfoil	48.3	51.7	16.7	20.0	11.7	27.0
Filamentous Algae	1.7					

Other species noted: Giant duckweed, white water lily, arrow arum, bladderwort, water willow, pickerel weed and button bush

Kickapoo Lake
Shakamak State Park
253 acres



2009 sampling locations

- ▲ Electrofishing
- Largemouth bass electrofishing
- Gillnet
- ★ Trapnet
- ⊙ Secchi

Depth contours (ft)

- 10
- 20
- 30
- 35
- 40

0 487.5 975 1,950 Feet