Palestine Lake

Kosciusko County

Supplemental Evaluation

Date of Survey: June 2 to June 3, 2008

Date of Vegetation Survey: July 25, 2008

Biologist: Rod A. Edgell

Survey Objectives: To obtain additional data on the fishery at Palestine Lake following a summer kill in 2007.

Methods: Temperature and oxygen profiles were collected at the deepest point of each basin using a Hydrolab Quanta®. Submersed aquatic plants were sampled according to the Tier II Aquatic Vegetation Survey Protocol (IDNR 2007). A global positioning system device was used to record the location of all sampling locations.

Fish collection effort consisted of 1.0 h of pulsed D.C. night electrofishing with two dippers and four trap nets set overnight (Figure 1). Total length of fish was measured to the nearest 0.1 in and weight was measured to the nearest 0.01 lbs. Due to high catch rates of bluegills and redear sunfish in trap nets not all fish were measured but all were counted. Length frequency distributions for these two species represent only fish that were measured. Five scales per half-inch group were collected from bluegills, largemouth bass, and redear sunfish for age determination and back-calculated lengths-at-age. Length frequency distribution for reporting purposes were grouped in half-inch increments which are defined as X.0 – X.4 and X.5 – X.9. Age-length keys were also constructed to determine mean length at age. Proportional stock density (PSD) was calculated for bluegills and largemouth bass using electrofishing catch only (Anderson and Neumann 1996).

Summary: On May 2 the water temperature was 71ºF at the surface and a dissolved oxygen concentration greater than 3.0 ppm was present in the west basin down to a depth of 14 ft but only to a depth of 2 ft in the east basin. Submersed plants were recorded at a maximum depth of

15 ft, in July of 2008. Only two native species and one non-native plant species were collected. The plant community is comprised mainly of coontail (frequency = 48%) and curly-leaf pondweed (frequency = 12%). Elodea was the only other species collected.

A total of 1,906 bluegills, ranging in total length from 1.5 to 8.6 in was collected at Palestine Lake. The electrofishing and trap net catch rates were 321 fish/h and 396 fish/lift, respectively. The PSD for bluegill was 67 but the RSD-P was 2. Bluegills of quality size (6 in or greater) and preferred size (8 in or greater) comprised 64% and 1% of the sample, respectively. Based on the age length key and back calculated lengths at age the majority of bluegills reach 6 in between ages 3 - 4.

A total of 230 redear sunfish, ranging in total length from 3.6 to 11.6 in was collected at Palestine Lake. The electrofishing and trap net catch rates were 20 fish/h and 53 fish/lift, respectively. Redear of quality size (7 in or greater) and preferred size (9 in or greater) comprised 81% and 38% of the sample, respectively. Based on the age length key and back calculated lengths at age the majority of redear reach 7 in between ages 2 - 3.

A total of 43 largemouth bass was collected at Palestine Lake. The electrofishing and trap net catch rates were 43 fish/h and 0 fish/lift, respectively. Total length of largemouth bass collected ranged from 3.7 to 17.3 in. The PSD for largemouth bass during this survey was 83. Of the largemouth bass collected 49% were equal to or greater than the minimum size limit of 14 in. Based on the age length key and back calculated lengths at age the majority of largemouth bass reach 12 in between ages 3 - 4.

Palestine Lake has a long history of summer and winter fish kills caused from a lack of dissolved oxygen. Documented kills date back to at least 1977, with the last documented kill prior to last summer occurring in 1999. The lakes watershed encompasses 20,680 acres of which 81% is used for agricultural purposes (Peel 2008). Due to the lakes high nutrient load from the surrounding watershed and abundance of shallow water, algae and coontail growth is often excessive. Winter fish kills are usually dependent on the severity of the winter season. Long, cold winters with heavy snowfalls can prevent photosynthesis and often results in a lack of oxygen for fish. Large algal blooms and subsequent die offs coupled with high temperatures are often the necessary ingredients for summer fish kills as was the case in 2007.

Based on this survey it appears that the fish kill that took place in 2007 was relatively minor and was most damaging to the largemouth bass population. The electrofishing catch rate

of bass was less than half of what was reported during the 2003 survey (Benson 2003). However, the size distribution of the bass population is normal and six year classes were represented. Anglers may notice a slightly lower catch rate, but the population is likely to rebound within the next few years. The kill has had no detectable effect on any other species and the lake is currently providing very good panfish opportunities for anglers.

Recommendations:

- A Palestine Lake watershed diagnostic study was completed in 2008. The Palestine Lake Property Owners Association should seek funding to implement recommendations outlined in that report.

- While some development of Palestine Lake has taken place, a large portion of the shoreline remains relatively unchanged. Efforts by local residents and the Division of Fish and Wildlife to conserve and protect the natural shoreline at Palestine Lake should be continued.

- Due to its high productivity, fishing pressure, and vulnerability of the bass population Palestine Lake should be considered a candidate for continued research of quality largemouth bass regulations.

Literature Cited:

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-481 *in* B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Benson, A. C. 2003. Palestine Lake, Kosciusko County, 2003 Fish Management Report. Indiana Department of Natural Resources. Indianapolis, Indiana.

Indiana Department of Natural Resources. 2006. Tier II Aquatic Vegetation Survey Protocol. Indianapolis, Indiana.

Peel, S. 2008. Palestine Lake Watershed Diagnostic Study, Kosciusko County Indiana, 2008. JF New. Walkerton, Indiana.

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Date: 9/18/2008

Approved by: Edward R. Braun, Biologist

Date: 9/23/2008

Approved by: Stuart T. Shipman, Fisheries Supervisor

Date: 10/1/2008

Figure 1. Sampling gear locations at Palestine Lake, Kosciusko County, Indiana in June 2008.

Appendix
Lake Pages

LAKE SURVEY REPORT

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

Lake Name	County	Date of survey (Month, day, year)
Palestine Lake	Kosciusko	6/2/2008
Biologist's name		Date of survey (Month, day, year)
Rod Edgell		6/3/2008

LOCATION

Quadrangle Name	Range	Section
Burket	5E	1, 2, 33, 34
Township Name	Nearest Town	
31N, 32N	Palestine, IN	

ACCESSIBILITY

State owned public access site	Privately owned public access site	Other access site
Northwest Corner		

Surface acres	Maximum depth	Average depth	Acre feet	Water level	Extreme fluctuations
290	30	4	1,170	816.75 MSL	None

Location of benchmark

At public access site on northwest corner of lake.

INLETS

Name	Location	Origin
Williamson Ditch	Northwest Edge	Farmland
Sloan Ditch	South Corner	Farmland
Magee Ditch	Northeast Corner	Farmland

OUTLETS

Name	Location
Trimble Creek	Northwest Corner

Water level control

Concrete dam and mill race.

POOL	ELEVATION (Feet MSL)	ACRES
TOP OF DAM	816.75	
TOP OF FLOOD CONTROL POOL		
TOP OF CONSERVATION POOL		
TOP OF MINIMUM POOL		
STREAMBED		

Bottom type

	Bolder
x	Gravel
x	Sand
x	Muck
x	Clay
	Marl

Watershed use

Agriculture and Residential

Development of shoreline

Approximately half of the shoreline is residentially developed.

Previous surveys and investigations

Lake mapping (USGS), Fisheries surveys (IDNR) 1975, 1977, 1978, 1988, 1989, 1990, 1991, 1993, 1995, 1997, 1999, and 2003. Creel survey (IDNR) 2006.

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night Hours		Total Hours
			1		1
TRAP NETS	Number of Traps		Number of Lifts		Total Lifts
	4		1		4
GILL NETS	Number of Nets		Number of Lifts		Total Lifts
					0
ROTENONE	Gallons	ppm	Acre-feet Treated	SHORELINE SEINING	Number of 100 ft Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS							
Color	Turbidity (Secchi Disk)				Air Temperature	75	F
Brown	2	Feet	6	Inches	Water temperature	71.8	F
Water Chemistri GPS Coordinates	N	41.17192984	W	-85.94101318			

WATER QUALLITY PARAMETERS															
DEPTH (Feet)	Degrees (F)	D.O.	SpC	pH	TDS	D.O.%	Turb.	DEPTH	Degrees (F)	D.O.	SpC	pH	TDS	D.O.%	Turb.
SURFACE	71.8	5.7	0.4	7.4	0.2	67.8		52							
2	70.1	5.0	0.4	7.2	0.3	58.3		54							
4	66.2	4.0	0.4	7.1	0.3	44.3		56							
6	63.9	4.7	0.4	7.1	0.3	50.5		58							
8	63.0	3.5	0.4	7.1	0.3	37.5		60							
10	62.2	3.3	0.4	7.1	0.3	35.2		62							
12	61.4	3.2	0.4	7.1	0.3	34.0		64							
14	60.1	3.2	0.4	7.2	0.3	33.1		66							
16	58.0	2.2	0.5	7.1	0.3	22.2		68							
18	55.9	0.7	0.5	7.0	0.3	7.3		70							
20	53.9	0.0	0.5	6.9	0.3	0.0		72							
22	51.0	0.0	0.5	6.9	0.3	0.0		74							
24	48.8	0.0	0.5	6.8	0.3	0.0		76							
26	47.8	0.0	0.5	6.8	0.4	0.0		78							
28								80							
30								82							
32								84							
34								86							
36								88							
38								90							
40								92							
42								94							
44								96							
46								98							
48								100							
50															

COMMENTS
West Basin

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night Hours		Total Hours 0
TRAP NETS	Number of Traps		Number of Lifts		Total Lifts 0
GILL NETS	Number of Nets		Number of Lifts		Total Lifts 0
ROTENONE	Gallons	ppm	Acre-feet Treated	SHORELINE SEINING	Number of 100 ft Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS							
Color	Turbidity (Secchi Disk)				Air Temperature		F
Brown	1	Feet	6	Inches	Water temperature	71.3	F
Water Chemistri GPS Coordinates	N	41.17794871	W	-85.9346778			

WATER QUALLITY PARAMETERS															
DEPTH (Feet)	Degrees (F)	D.O.	SpC	pH	TDS	D.O.%	Turb.	DEPTH	Degrees (F)	D.O.	SpC	pH	TDS	D.O.%	Turb.
SURFACE	71.3	6.5	0.4	7.3	0.3	76.6		52							
2	69.6	4.1	0.4	7.1	0.3	47.7		54							
4	67.2	1.3	0.4	6.8	0.3	14.5		56							
6	64.5	1.9	0.5	6.9	0.3	20.1		58							
8	61.9	0.9	0.5	6.9	0.3	10.0		60							
10	59.1	0.2	0.6	6.8	0.3	2.1		62							
12	57.9	0.1	0.5	6.8	0.3	1.3		64							
14	55.6	0.1	0.5	6.8	0.3	0.8		66							
16	52.5	0.1	0.6	0.7	0.4	0.7		68							
18	50.5	0.0	0.6	6.5	0.4	0.4		70							
20								72							
22								74							
24								76							
26								78							
28								80							
30								82							
32								84							
34								86							
36								88							
38								90							
40								92							
42								94							
44								96							
46								98							
48								100							
50															

COMMENTS
East Basin

Occurrence and Abundance of Submersed Aquatic Plants - Overall

Lake: Palestine Lake	Secchi(ft): NA	SE Mean species / site: 0.09
Date: 7/25/2008	Littoral sites with plants: 32	Mean natives / site: 0.52
Littoral Depth (ft): 15.0	Number of species: 3	SE Mean natives / site: 0.07
Littoral Sites: 60	Maximum species / site: 3	Species diversity: 0.38
Total Sites: 60	Mean species / site: 0.63	Native diversity: 0.12

	Frequency of	Score Frequency				
Species	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	48.3	51.7	40.0	3.3	5.0	15.0
Curly-leaf pondweed	11.7	88.3	11.7	0.0	0.0	2.3
Elodea	3.3	96.7	3.3	0.0	0.0	0.7
Filamentous Algae	100.0					

Other species noted:

Occurrence and Abundance of Submersed Aquatic Plants - 0 to 5 ft.

Lake: Palestine Lake	Secchi(ft): NA	SE Mean species / site: 0.14
Date: 7/25/2008	Littoral sites with plants: 19	Mean natives / site: 0.60
Littoral Depth (ft): 15.0	Number of species: 3	SE Mean natives / site: 0.11
Littoral Sites: 30	Maximum species / site: 3	Species diversity: 0.51
Total Sites: 30	Mean species / site: 0.83	Native diversity: 0.20

	Frequency of	Score Frequency				
Species	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	53.3	46.7	36.7	6.7	10.0	21.3
Curly-leaf pondweed	23.3	76.7	23.3	0.0	0.0	4.7
Elodea	6.7	93.3	6.7	0.0	0.0	1.3
Filamentous Algae	100.0					

Other species noted:

Occurrence and Abundance of Submersed Aquatic Plants - 5 to 10 ft.

Lake: Palestine Lake	Secchi(ft): NA	SE Mean species / site: 0.11
Date: 7/25/2008	Littoral sites with plants: 9	Mean natives / site: 0.45
Littoral Depth (ft): 15.0	Number of species: 1	SE Mean natives / site: 0.11
Littoral Sites: 20	Maximum species / site: 1	Species diversity: 0.00
Total Sites: 20	Mean species / site: 0.45	Native diversity: 0.00

	Frequency of	Score Frequency				
Species	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	45.0	55.0	45.0	0.0	0.0	9.0
Curly-leaf pondweed	0.0	100.0	0.0	0.0	0.0	0.0
Elodea	0.0	100.0	0.0	0.0	0.0	0.0
Filamentous Algae	100.0					

Other species noted:

Occurrence and Abundance of Submersed Aquatic Plants - 10 to 15 ft.

Lake: Palestine Lake	Secchi(ft): NA	SE Mean species / site: 0.16
Date: 7/25/2008	Littoral sites with plants: 4	Mean natives / site: 0.40
Littoral Depth (ft): 15.0	Number of species: 1	SE Mean natives / site: 0.16
Littoral Sites: 10	Maximum species / site: 1	Species diversity: 0.00
Total Sites: 10	Mean species / site: 0.40	Native diversity: 0.00

	Frequency of	Score Frequency				
Species	**Occurrence**	**0**	**1**	**3**	**5**	**Dominance**
Coontail	40.0	60.0	40.0	0.0	0.0	8.0
Curly-leaf pondweed	0.0	100.0	0.0	0.0	0.0	0.0
Elodea	0.0	100.0	0.0	0.0	0.0	0.0
Filamentous Algae	100.0					

Other species noted:

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT						
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches) minimum	LENGTH RANGE (inches) maximum	WEIGHT (pounds)	PERCENT
Bluegill	1,906	70.3	1.5	8.6	62.80	19.6
Gizzard shad	382	14.1	9.2	15.7	51.52	16.1
Redear sunfish	230	8.5	3.6	11.6	81.32	25.4
Yellow bullhead	62	2.3	6.1	13.4	47.76	14.9
Warmouth	56	2.1	3.1	8.9	14.91	4.7
Largemouth bass	43	1.6	3.7	17.3	50.98	15.9
Black crappie	10	0.4	7.7	9.3	2.91	0.9
Pumpkinseed	8	0.3	4.8	7.4	1.25	0.4
Yellow perch	5	0.2	5.0	11.2	1.57	0.5
White sucker	2	0.1	10.4	14.6	1.78	0.6
Golden shiner	2	0.1	4.2	4.3	0.04	0.0
Hybrid sunfish	2	0.1	6.0	9.0	0.80	0.3
Black bullhead	1	0.0	6.8	6.8	0.16	0.1
Common carp	1	0.0	15.2	15.2	1.99	0.6
Total (Species)	2710	100			319.78	100

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

Abundance of fish collected during general surveys at Palestine Lake from 1980 through 2008.

Species	1980	1987	1999	2003	2008
Bluegill	139	138	1209	509	1906
Gizzard shad		909	508	74	382
Redear sunfish			78	5	230
Yellow bullhead	162	5		2	62
Warmouth	12	3	149	11	56
Largemouth bass	12	17	102	109	43
Crappie	486	656	143	106	10
Pumpkinseed	262	20	256	7	8
Yellow perch	127	89		6	5
Hybrid Sunfish	1		10	1	2
White sucker	16	2	2	5	2
Golden shiner	817	4	216	73	2
Black bullhead	249	14	70	18	1
Common carp	395	248	1		1
Bowfin	3	2			
Redfin pickerel	14	1	3		
Lake chubsucker	76				
Brown bullhead	132	41		2	
Green sunfish		1	2	1	
Northern pike			6		
Channel catfish				1	
Total	2903	2150	2755	930	2710
Electrofishing Effort (h)	1.0	1.5	1.0	1.0	1.0
# of Gill Net Lifts	3	3	3	3	0
# of Trap Net Lifts	6	3	5	3	4

					TN	GN	EF
Lake:	Palestine Lake			Total #	1585	0	321
Date:	6/2/2008	to	6/3/2008	Effort	4	0	1
Species:	Bluegill			CPUE	396	NA	321
Total number:	1906						
Total weight:	62.80						
Length range:	1.5	to	8.6				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	3	27	0	293	320	-
Quality	6	27	0	195	222	67
Preferred	8	0	0	5	5	2
Memorable	10	0	0	0	0	
Trophy	12	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5	4	0.00	18.0			34.5		
2.0	9	0.00	18.5			35.0		
2.5	15	0.01	19.0			35.5		
3.0	11	0.02	19.5			36.0		
3.5	23	0.03	20.0			36.5		
4.0	24	0.05	20.5			37.0		
4.5	10	0.07	21.0			37.5		
5.0	13	0.10	21.5			38.0		
5.5	17	0.13	22.0			38.5		
6.0	43	0.17	22.5			39.0		
6.5	55	0.22	23.0			39.5		
7.0	76	0.27	23.5			40.0		
7.5	43	0.33	24.0			40.5		
8.0	4	0.41	24.5			41.0		
8.5	1	0.43	25.0			41.5		
9.0			25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

					TN	GN	EF
Lake:	Palestine Lake			Total #	210	0	20
Date:	6/2/2008	to	6/3/2008	Effort	4	0	1
Species:	Redear sunfish			CPUE	53	NA	20
Total number:	230						
Total weight:	81.32						
Length range:	3.6	to	11.6				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	4	115	0	17	132	-
Quality	7	105	0	4	109	24
Preferred	9	51	0	0	51	
Memorable	11	15	0	0	15	
Trophy	13	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0			18.5			35.0		
2.5			19.0			35.5		
3.0			19.5			36.0		
3.5	3	0.04	20.0			36.5		
4.0	1	0.06	20.5			37.0		
4.5	1	0.06	21.0			37.5		
5.0	2	0.11	21.5			38.0		
5.5	2	0.16	22.0			38.5		
6.0	6	0.22	22.5			39.0		
6.5	11	0.27	23.0			39.5		
7.0	19	0.33	23.5			40.0		
7.5	25	0.39	24.0			40.5		
8.0	12	0.50	24.5			41.0		
8.5	2	0.56	25.0			41.5		
9.0	3	0.64	25.5			42.0		
9.5	5	0.79	26.0			42.5		
10.0	8	0.99	26.5			43.0		
10.5	20	1.03	27.0			43.5		
11.0	13	1.25	27.5			44.0		
11.5	2	1.25	28.0			44.5		
12.0			28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

					TN	GN	EF
Lake:	Palestine Lake			Total #	0	0	43
Date:	6/2/2008	to	6/3/2008	Effort	4	0	1
Species:	Largemouth bass			CPUE	0	NA	43
Total number:	43						
Total weight:	50.98						
Length range:	3.7	to	17.3				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	8	0	0	35	35	-
Quality	12	0	0	29	29	83
Preferred	15	0	0	14	14	40
Memorable	20	0	0	0	0	
Trophy	25	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0			18.5			35.0		
2.5			19.0			35.5		
3.0			19.5			36.0		
3.5	1	0.02	20.0			36.5		
4.0			20.5			37.0		
4.5	1	0.03	21.0			37.5		
5.0	1	0.06	21.5			38.0		
5.5	2	0.07	22.0			38.5		
6.0			22.5			39.0		
6.5	1	0.13	23.0			39.5		
7.0	1	0.20	23.5			40.0		
7.5	1	0.17	24.0			40.5		
8.0	3	0.22	24.5			41.0		
8.5	2	0.37	25.0			41.5		
9.0			25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5	1	0.70	27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0	2	0.84	28.5			45.0		
12.5	2	0.98	29.0			45.5		
13.0	1	1.20	29.5			46.0		
13.5	3	1.29	30.0			46.5		
14.0	3	1.26	30.5			47.0		
14.5	4	1.52	31.0			47.5		
15.0	4	1.75	31.5			48.0		
15.5	2	1.79	32.0			48.5		
16.0	4	2.18	32.5			49.0		
16.5	2	2.39	33.0			49.5		
17.0	2	2.75	33.5			50.0		

Back-calculated lengths-at-age for bluegills captured at Palestine Lake, Kosciusko County, Indiana in June 2008.

		Age				
Year Class	# Aged	I	II	III	IV	V
2001	15	1.8				
	SD	0.4				
2000	20	1.9	3.5			
	SD	0.4	0.7			
1999	7	1.7	3.2	4.9		
	SD	0.3	0.5	0.4		
1998	13	1.6	3.1	4.8	6.0	
	SD	0.3	0.5	0.6	0.5	
1997	9	1.5	3.2	4.9	6.4	7.2
	SD	0.2	0.6	1.0	1.0	1.0
Mean*		1.7	3.3	4.9	6.2	7.2
SD		0.3	0.6	0.7	0.8	1.0

*Does not include age groups with less than three samples.

Age-length key for bluegills captured at Palestine Lake, Kosciusko County, Indiana in June 2008.

Length	# in	# (age) in	Age				
Group	sample	subsample	1	2	3	4	5
1.5	4	4(1)	4				
2.0	9	4(1)	9				
2.5	15	5(1)	15				
3.0	11	2(1), 3(2)	4	7			
3.5	23	4(2)		23			
4.0	24	5(2)		24			
4.5	10	5(2)		10			
5.0	13	3(2), 2(3)		8	5		
5.5	17	3(3), 2(4)			10	7	
6.0	43	2(3), 2(4), 1(5)			17	17	9
6.5	55	5(4)				55	
7.0	76	4(4), 1(5)				61	15
7.5	43	4(5)					43
8.0	4	3(5)					4
8.5	1						
Mean TL			2.6	4.2	5.9	6.9	7.5
SE			0.08	0.07	0.07	0.04	0.06

Back-calculated lengths-at-age for redear sunfish captured at Palestine Lake, Kosciusko County, Indiana in June 2008.

		Age					
Year Class	# Aged	I	II	III	IV	V	VI
2007	1	2.9					
	SD	0.0					
2006	31	2.2	5.8				
	SD	0.4	1.4				
2005	13	2.8	6.2	8.5			
	SD	0.6	0.8	1.0			
2004	10	2.8	7.0	8.3	10.0		
	SD	0.5	0.8	1.2	0.6		
2003	3	2.8	6.6	8.5	10.0	10.9	
	SD	0.3	0.7	1.0	0.6	0.4	
2002	3	2.4	5.9	7.0	8.7	10.0	10.9
	SD	0.0	0.5	0.2	1.0	0.8	0.5
Mean*		2.6	6.3	8.1	9.6	10.4	10.9
SD		0.4	0.8	0.8	0.7	0.6	0.5

*Does not include age groups with less than three samples.

Age-length key for redear sunfish captured at Palestine Lake, Kosciusko County, Indiana in June 2008.

Length Group	# in sample	# (age) in subsample	Age					
			1	2	3	4	5	6
3.5	3	1(1), 2(2)	1	2				
4.0	1	1(2)		1				
4.5	1	1(2)		1				
5.0	2	2(2)		2				
5.5	2	2(2)		2				
6.0	6	5(2)		6				
6.5	11	5(2)		11				
7.0	19	4(2), 1(3)		15	4			
7.5	25	4(2), 1(3)		20	5			
8.0	12	4(2), 1(3)		10	2			
8.5	2	1(2), 1(3)		1	1			
9.0	3	3(3)			3			
9.5	5	5(3)			5			
10.0	8	1(3), 4(4)			2	6		
10.5	20	3(4), 1(5), 1(6)				12	4	4
11.0	13	3(4), 2(5)				8	5	
11.5	2	2(6)						2
Mean TL			3.8	7.1	8.6	10.8	11.0	11.1
SE				0.12	0.23	0.07	0.09	0.21

Back-calculated lengths-at-age for largemouth bass captured at Palestine Lake, Kosciusko County, Indiana in June 2008.

		Age					
Year Class	# Aged	I	II	III	IV	V	VI
2001	5	4.6					
	SD	0.8					
2000	7	3.2	7.2				
	SD	0.6	1.1				
1999	4	3.9	8.0	11.5			
	SD	0.3	1.3	1.0			
1998	8	3.8	8.2	12.0	13.7		
	SD	0.5	1.8	1.4	1.3		
1997	12	3.4	7.5	11.1	13.5	14.8	
	SD	0.6	1.3	1.5	1.2	1.0	
1996	4	4.8	8.3	11.0	13.5	14.9	16.0
	SD	1.0	1.6	1.6	1.4	0.8	1.0
Mean*		4.0	7.9	11.4	13.6	14.8	16.0
SD		0.6	1.4	1.4	1.3	0.9	1.0

*Does not include age groups with less than three samples.

Age-length key for largemouth bass captured at Palestine Lake, Kosciusko County, Indiana in June 2008.

Length Group	# in sample	# (age) in subsample	Age					
			1	2	3	4	5	6
3.5	1	1(1)	1					
4.0								
4.5	1	1(1)	1					
5.0	1	1(2)		1				
5.5	2	2(1)	2					
6.0								
6.5	1	1(1)	1					
7.0	1	1(2)		1				
7.5	1							
8.0	3	3(2)		3				
8.5	2	2(2)		2				
9.0								
9.5								
10.0								
10.5	1	1(3)			1			
11.0								
11.5								
12.0	2	2(3)			2			
12.5	2	1(3), 1(4)			1	1		
13.0	1	1(4)				1		
13.5	3	2(4), 1(5)				2	1	
14.0	3	1(4), 1(5)				1	1	
14.5	4	1(4), 3(5)				1	3	
15.0	4	3(5), 1(6)					3	1
15.5	2	1(4), 1(5)				1	1	
16.0	4	1(4), 3(5)				1	3	
16.5	2	2(6)						2
17.0	2	1(6)						2
Mean TL			5.4	7.8	12.0	14.3	15.2	16.7
SE			0.51	0.47	0.43	0.40	0.23	0.37