

BASS LAKE
Starke County
2010 Fish Management Report

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EXECUTIVE SUMMARY

- Bass Lake is the third largest natural lake in Indiana, located in southeastern Starke County. The lake is 1,345 acres with a maximum depth of 24 ft and a mean depth of 3.5 ft. A public access site is located on the southwest shore.
- A standard fisheries survey was conducted from June 17 to July 1, 2010. Fish were collected using three sampling gears. Pulsed DC, shoreline electrofishing was conducted for 2.0 h at night. Two trap nets and four standard gill nets were also fished for four nights each.
- A fall walleye evaluation was conducted on October 18 and November 3, 2010. Walleye were collected with night pulsed DC, shoreline electrofishing with two dippers. Sampling was conducted at 16 historical locations for 15 min. each (4 h total).
- From the standard survey a total of 1,242 fish representing 19 species was collected for an estimated total weight of 604.7 lbs. The five most abundant species by number were bluegill (24%), gizzard shad (15%), emerald shiners (15%), walleye (13%), and channel catfish (7%). By weight the most abundant species collected were channel catfish (35%), gizzard shad (21%), walleye (16%), quillback (8%), and white bass (7%).
- A total of 298 bluegills was collected that weighed an estimated 14.7 lbs. Bluegills ranged in TL from 1.7 to 9.1 in. Seventy-three percent of bluegills collected were less than 3.0 in.
- Gizzard shad was the second most abundant species collected by number and first by weight (125.2 lbs). Shad ranged in length from 1.3 to 17.8 in. Shad less than 2.5 in accounted for 35% of all collected shad and another 40% of shad were between 14.0 and 14.9 in.
- During the standard survey, 155 walleyes were collected that weighed an estimated 99.5 lbs. Collected walleyes ranged from 2.9 to 16.1 in, and 32% of fish collected were legal length (TL \geq 14.0 in).
- Channel catfish was the most abundant species collected by weight (38%) and fifth by number (83 fish), fish ranged in TL from 16.0 to 25.2 in. Largemouth bass were ninth in relative abundance ranged in length from 4.6 to 15.4 in and three fish collected were at least legal length (TL > 14.0 in).
- A total of 189 walleyes was collected in the fall that weighed an estimated 84.4 lbs. Walleyes ranged in length from 5.9 to 23.6 in and 14% of walleyes collected were legal length or longer. Age-0 walleyes ranged in length from 5.9 to 9.3 in and CPUE was 20.3/h.
- There were eight species of submersed aquatic vegetation collected at Bass Lake on July 21 and 22, 2010. *Chara spp.* and Eurasian watermilfoil were both found at 42% of sites. Other species identified were Illinois pondweed, southern naiad, sago pondweed, eelgrass, small pondweed, and spiny naiad.
- Bass Lake is providing good fishing opportunities for walleye and channel catfish and no changes in management need to occur at this time.

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INTRODUCTION

Bass Lake is the third largest natural lake in Indiana, located in southeastern Starke County. The lake is 1,345 acres with a maximum depth of 24 ft and a mean depth of 3.5 ft. A public access site is located on the southwest shore. A beach and campground are located on the southeast shore. The majority of Bass Lake residents use the lake for swimming, boating, and fishing (Giolitto and Olyphant 2002). The shoreline is 90% residential and 10% is wetlands. The total watershed is 3,210 acres, and 44% of the watershed is the lake itself (Theller and Engel 2011). The remainder of Bass Lake watershed is 27% forested, 12% residential, 9% grass or pasture, 4% row crop agriculture, and 2% each wetlands and commercial/industrial land use. Residents surrounding Bass Lake are most concerned with lake level and water clarity. Lake levels are maintained by inflows of approximately 47% groundwater seepage, 30% precipitation, and 23% by pumping water from a deep-water well that is maintained by the Bass Lake Conservancy District (Giolitto and Olyphant 2002). Bass Lake is a eutrophic lake that has poorer water quality than most other Indiana lakes due to high total phosphorous and organic nitrogen concentrations. Algal blooms are common with historic secchi disk readings ranging from 1 to 4 ft (Giolitto and Olyphant 2002).

Bass Lake has extensive beds of aquatic vegetation in deeper water, but much of the shallow sand flats are devoid of rooted aquatic plants. Eurasian water milfoil, an aquatic invasive species, dominates the plant community at Bass Lake particularly in the southern basin. In an attempt to limit and control milfoil, vegetation treatments were started in 1985. Since 2000, yearly treatments have targeted around 100 acres of milfoil and some spot treatments of curly leaf pondweed. In 2007, a whole lake fluridone treatment occurred resulting in small milfoil beds through 2009. In 2009, following the vegetation treatments, *Chara spp.* was the most prevalent species collected occurring at 23% of sites followed by Eurasian water milfoil and Illinois pondweed at 9% of sites each (V3 Companies, LTD.).

Since 1972, Indiana Department of Natural Resources (DNR) Division of Fish and Wildlife (DFW) has been actively improving fishing opportunities at Bass Lake. Early stocking efforts were used to bolster populations of northern pike, largemouth bass, and walleye (Table 1). Historically, natural walleye reproduction has been negligible and, thus, supplemented by annual stockings of walleye fry since 1980. To date, approximately 58.5 million walleye fry have been stocked into Bass Lake. Fall walleye evaluations were conducted in 1983 through

1992 (except 1986), 1995, 1996, and 2000. Survival of walleye fry has been excellent. However, growth was below average possibly due to the lack of an abundant prey species. In 1992, fry stocking were reduced in half in an attempt to improve growth by reducing intraspecific competition. Growth has increased slightly but may still be limited by prey or thermal tolerance.

The last standard survey of Bass Lake occurred during June 1996 (Table 2). During the survey, 723 fish were collected that represented 22 species for an estimated total weight of 326.1 lbs. The most abundant species collected by number were bluegill (28%), white crappie (27%), and channel catfish (23%). By weight the most abundant species were channel catfish (36%), quillback (20%), white crappie (13%), and common carp (10%). Overall, Bass Lake offered fair fishing opportunities for bluegill and walleye, but good opportunities for channel catfish and crappie.

There have been three creel surveys conducted on Bass Lake from April to October in 1992, 1996, and 2000. Generally, anglers have targeted walleye and crappie, but the majority of harvest is crappie. Of the total harvest estimated in the 2000 creel survey, 80% were crappie (6,702 fish) followed by channel catfish (7%; 574 fish), walleyes (5%; 409 fish), and bluegill (5%; 405 fish). Fishing effort has been variable across years from 25.8 h/acre in 1992 to 8.9 h/acre in 1996.

The goal of the 2010 fisheries survey was to evaluate the fish community at Bass Lake under work plan 300FWF10D41621. The walleye population was evaluated under work plan 300FWF10D41617.

METHODS

A standard fisheries survey was conducted from June 17 to July 1, 2010. Physical and chemical characteristics were collected in the deepest area of the lake according to the Division of Fish and Wildlife (DFW) sampling guidelines (Shipman et al. 2001). Aquatic vegetation was sampled on July 21 and 22, 2010 according to the DFW Tier II Aquatic Vegetation Survey Protocol (IDNR 2007).

Fish were collected using three sampling gears. Pulsed DC, shoreline electrofishing was conducted for 2.0 h at night with two dippers. Two trap nets and four standard gill nets were also fished for four nights each. All fish collected were measured to the nearest 0.1 in total

length (TL) and a length-weight regression was used to estimate fish weight. Five scale samples were taken per half-inch group (X.0-X.4 for inch group and X.5-X.9 for half-inch group) from all sportfish for age and growth analysis. For largemouth bass, five scale (fish < 12.0 in TL) or fin ray (fish ≥ 12.0 in TL) samples were taken per half-inch group for age and growth analysis. Catch per unit effort (CPUE) was calculated for the dominant fish collected as catch divided by effort for each sampling gear. Proportional stock density (PSD) was calculated for largemouth bass and bluegill captured via electrofishing (Anderson and Neumann 1996).

A fall walleye evaluation was conducted on October 18 and November 3, 2010. Walleye were collected with night pulsed DC, shoreline electrofishing with two dippers. Sampling was conducted at 16 historical locations for 15 min. each (4 h total). All walleye were measured to the nearest 0.1 in TL and a length-weight regression was used to estimate fish weight. Five scale samples were taken per half-inch group (X.0-X.4 for inch group and X.5-X.9 for half-inch group) for age and growth analysis.

RESULTS

Standard Fisheries Survey

A total of 1,242 fish representing 19 species was collected for an estimated total weight of 604.7 lbs. The five most abundant species by number were bluegill (24%), gizzard shad (15%), emerald shiners (15%), walleye (13%), and channel catfish (7%). By weight the most abundant species collected were channel catfish (35%), gizzard shad (21%), walleye (16%), quillback (8%), and white bass (7%).

A total of 298 bluegills was collected that weighed an estimated 14.7 lbs. The majority of bluegills were collected in trap nets (CPUE = 29.8/lift), followed by electrofishing (CPUE = 28.5/h), and gill net CPUE was 0.2/lift. Bluegills ranged in TL from 1.7 to 9.1 in. Seventy-three percent of bluegills collected were less than 3.0 in. Bluegill PSD was 18 and RSD was 9. Ages 1 to 9 were identified, and 80% of fish collected were age-1 that averaged 2.4 in. Age-2 and -3 bluegill averaged 4.6 and 5.9 in, respectively.

Gizzard shad was the second most abundant species (190 fish) collected by number and second by weight (125.2 lbs). Most shad were collected with electrofishing at a rate of 53.0/h, followed by gill nets (CPUE = 4.1/lift) and trap nets (CPUE = 2.3/lift). Shad ranged in length from 1.3 to 17.8 in. Shad less than 2.5 in accounted for 35% of all collected shad and another 40% of shad were between 14.0 and 14.9 in.

There were 155 walleyes collected that weighed an estimated 99.5 lbs. Walleye CPUE was 15.0/h for electrofishing and 7.8/lift for gill nets. No walleyes were captured in trap nets. Collected walleyes ranged from 2.9 to 16.1 in and 32% of fish collected were legal length (TL \geq 14.0 in). Walleye ages ranged from 0 to 3 and 63% of walleyes aged were age-2. Walleyes averaged 10.6 in at age-1, 13.5 in at age-2, and 15.2 in at age-3 at time of capture.

Channel catfish was the most abundant species collected by weight (38%) and ranked fifth by number (83 fish). Catfish ranged in TL from 16.0 to 25.2 in. Catfish were not aged.

Seventy-three white bass were collected that weighed an estimated 42.3 lbs. White bass ranged in length from 1.8 to 13.8 in and 41% of fish collected were larger than 12.0 in. Ages ranged from 0 to 4. White bass averaged 8.9, 12.4, 13.2 and 13.8 in for ages 1-4, respectively.

A total of 72 yellow perch were collected, and they weighed an estimated 3.5 lbs. Most were collected with electrofishing at a rate of 32.0/h. Gill net and trap net CPUE were 0.4/lift and 0.1/lift, respectively. Perch ranged in length from 1.8 to 8.4 in and 33% of fish were smaller than 2.5 in. Perch ages ranged from 0 to 2. Average length of age-1 fish was 4.9 in, and age-2 was 7.2 in.

There were 33 largemouth bass collected (9th in relative abundance) with an estimated total weight of 23.1 lbs. All bass were collected with electrofishing at a rate of 16.5/h. Bass ranged from 4.6 to 15.4 in and three fish collected were legal length or longer (TL \geq 14.0 in). Bass ranged in age from 1 to 4. Length at capture for ages 1 to 4 was 4.8, 9.6, 11.6, and 13.7 in, respectively.

Other game fish collected include 16 black crappies that ranged in length from 4.2 to 11.4 in. Fifty percent of the black crappies collected were between 9.5 and 11.5 in TL and ages were 1 and 4 to 7. There were five smallmouth bass collected that weighed an estimated 3.3 lbs and ranged in length from 7.8 to 12.9 in. Two white crappies were collected and their lengths were 6.1 and 6.4 in.

A variety of non-game species were collected. Emerald shiner was the third most abundant species collected by number (183 fish). Quillback was the fourth most abundant species by weight (46.7 lbs) even though only 14 fish were collected. Quillback ranged in length from 17.1 to 21.2 in. A 29.0 in spotted gar was also collected.

Fall Walleye Evaluation

Walleyes were collected with electrofishing on October 18 and November 3, 2010 when surface water temperature was 59.8°F and 46.4°F, respectively. A total of 189 walleye was collected that weighed an estimated 84.4 lbs. On October 18, 105 walleyes were collected and 84 fish on November 3 were collected. Overall, electrofishing CPUE for all walleyes was 47.3/h and age-0 CPUE was 20.3/h. Walleyes ranged in length from 5.9 to 23.6 in and 14% of walleyes collected were legal length or longer. Walleye ages ranged from 0 to 5. Mean length at capture was 7.9, 12.0, 13.7, and 15.5 in for ages 0 to 3, respectively. Age-0 walleyes ranged in length from 5.9 to 9.3 in.

Submersed Aquatic Vegetation Survey

There were eight species of submersed aquatic vegetation collected at Bass Lake. *Chara* sp. and Eurasian water milfoil were both found at 42% of sites. Other species identified were: Illinois pondweed, southern naiad, sago pondweed, eelgrass, small pondweed, and spiny naiad. Vegetation was collected down to 9.0 ft and secchi disk reading was 2.5 ft. Mean rake score was 1.1. Additional emergent species identified were: arrowhead, bulrush, cattail, common reed, purple loosestrife, spatterdock, water shield, and white water lily.

DISCUSSION

The Bass Lake fishery has undergone some significant changes since the first fisheries survey in 1972. In the 1970's the fishery was dominated by channel catfish, white crappie, gizzard shad, and white bass. Recently the fishery has been dominated by bluegill, gizzard shad and walleye. The greatest change to the fishery was the decline in both white and black crappie. Crappie were an important sport fish in Bass Lake in the 1990's accounting for 61%, 23%, and 80% of harvest in the 1992, 1996, and 2000 creel surveys (Robertson and Page 1992; Riedel et al. 1997; Brindza 2001). This decline could be due to many factors including the erratic nature of crappie recruitment, high harvest, lack of spawning habitat, or the increase in gizzard shad populations. Future surveys at Bass Lake should more closely examine the crappie population and determine if management actions are needed. Another change to the overall relative abundance was the collection of emerald shiners. Emerald shiners were the third most abundant species by number in this survey and have never been this abundant.

The bluegill population has remained consistent between the 1996 and 2010 surveys representing the most abundant species in Bass Lake. Overall, relative species abundance was 24.0% in 2010 and 27.9% in 1996, above the low abundances in the 1970's and 1991 surveys. The majority of the bluegills (73%) collected in this survey were less than 3.0 in, demonstrating good natural recruitment and a prey source for the predator species. Bluegill PSD was 18 which is slightly below the target range from 20 to 60, but RSD of 9 is within the target range from 5 to 20 (Anderson and Neumann 1996). Although, only 7% of bluegill collected were considered harvestable ($TL \geq 6.0$ in), fish up to 9.1 in were collected.

Gizzard shad abundance has increased from a historically low abundance in the 1996 survey. The 15.3% relative shad abundance is similar to the 15.7% and 14.8% composition in the 1972 and 1974 surveys, respectively. Similar to bluegill, most (35%) of the shad collected were small ($TL \leq 2.0$ in) thus providing prey species for the lake predators.

Walleye abundance in Bass Lake has increased since earlier standard surveys. Gill net CPUE was 7.8/lift in the summer 2010 survey as compared to 0.9/lift in 1996. Walleye size structure has improved likely due to the implementation of a 14.0 inch minimum size limit in August 1996. During the standard survey in 1996 (prior to the minimum length limit), only 24 walleyes were collected and of those 12.5% were larger than 14.0 in. In this survey, we collected 155 walleye of those 32% were 14.0 in or longer. We collected 189 walleyes during the fall target survey at a rate of 47.3/h. Age-0 walleye CPUE was 20.3/h which is slightly below the long term Bass Lake average of 25.4/h (Figure 1). However, this age-0 CPUE is well above the successful stocking criteria of 7.0/h (Shipman 1991).

By conducting the summer and fall survey we are able to compare growth and length frequencies (Figure 2). Age-0 walleye averaged 3.2 in during the summer standard survey and 7.9 in during the fall (Table 3). Age-1 walleyes grew 1.4 in between the surveys. Growth of age-2 and -3 fish was negligible between the summer and fall surveys. Given the poor summer growth there may be a limitation to adult walleye growth. This does not appear to be related to limited prey availability as prey species were quite abundant in the survey collection. Walleye growth during the summer is likely limited by thermal tolerances. Bass Lake is a shallow lake (mean depth 3.5 ft) that had sufficient dissolved oxygen concentration in 2010 down to 20 ft. However, water temperatures measured during the late June survey were already above 80°F. The optimal temperature for adult walleye growth is 71.6°F (Hokanson 1977). Subadult fish are

not as restricted in their thermal tolerances for growth. Despite the poor summer conditions, annual growth rates of Bass Lake walleye are similar to other area walleye lakes largely due to good prey availability and cooler water from fall to spring. Overall, walleye at Bass Lake should continue to be stocked with fry at similar numbers (1000 fry/ac) and maintain the current statewide 14.0 minimum length limit. Stocking rates or size of walleyes should not change since these fish are growing well by reaching legal size between ages-2 and -3, easy and relatively inexpensive to stock.

The channel catfish population in Bass Lake has been self-sustaining and provides anglers another species to target. The 2010 survey collected the fewest catfish (83 fish) and lowest relative abundance by number compared with other surveys despite the most gill netting effort. However, relative abundance by weight is similar across years indicating fewer, but larger catfish. Previous surveys showed catfish populations dominated by more, but smaller individuals. Catfish collected in 2010 were all above 16.0 in. Catfish were not assigned ages, but the absence of smaller fish may indicate a recruitment problem. The next standard survey will dictate if further catfish management or stocking will need to occur, but currently channel catfish are providing excellent angling opportunities for larger fish.

White bass, yellow perch, and large- and smallmouth bass provide some angling opportunities at Bass Lake. Forty-one percent of the white bass collected were larger than 12.0 in. Yellow perch relative abundance was the higher than historical catch rates due to the capture of 24 age-0 fish. It is ironic that Bass Lake has a relatively low abundance of bass; however, largemouth bass abundance has increased over recent years, and five smallmouth bass were collected. Smallmouth bass have not been previously collected in standard surveys; although, a few smallmouth bass were caught and released in the 1992 creel survey. The increase in bass abundance is likely due to implementation the statewide 14-inch minimum size limit in 1998.

Overall, the fishery at Bass Lake is providing good fishing opportunities for a variety of species. Bass Lake should be resurveyed within the next five years to determine if there needs to be further channel catfish management and if the crappie population has rebounded. Nuisance aquatic vegetation management, specifically for Eurasian water milfoil, should continue to promote a more diverse aquatic plant community, increased abundance of native species, and reduce recreational impairment.

RECOMMENDATIONS

- Continue to stock walleye fry at a rate of 1000/acre.
- Resurvey Bass Lake within five years to examine changes in species abundance.

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Table 1. Species stocked into Bass Lake, Starke County, Indiana.

Year	Species	Number	Mean length
1974	Largemouth bass	2,800	3.6
1979	Northern pike	1,803	8.8
1980	Walleye	4,010,025	Fry
1982	Walleye	2,017,000	Fry
1983	Northern pike	750	9.8
1986	Walleye	3,776,450	Fry
1987	Bluegill	7,645	
1987	Fathead minnow	39,953	
1988	Walleye	4,035,000	Fry
1989	Walleye	4,088,175	Fry
1990	Walleye	4,070,200	Fry
1991	Walleye	4,036,125	Fry
1992	Walleye	4,031,425	Fry
1993	Walleye	2,017,500	Fry
1994	Walleye	2,018,650	Fry
1995	Walleye	2,023,350	Fry
1996	Walleye	2,024,525	Fry
1997	Walleye	2,018,650	Fry
1998	Walleye	2,017,500	Fry
1999	Walleye	2,075,050	Fry
2000	Walleye	1,854,150	Fry
2002	Walleye	1,598,000	Fry
2003	Walleye	1,345,375	Fry
2004	Walleye	1,351,250	Fry
2005	Walleye	1,345,001	Fry
2006	Walleye	1,345,000	Fry
2007	Walleye	1,363,000	Fry
2008	Walleye	1,345,000	Fry
2009	Walleye	1,345,140	Fry
2010	Walleye	1,345,375	Fry

Table 2. Species relative abundance by percent number and weight (lbs.) with sampling effort for fisheries surveys from 1972 to 2010 at Bass Lake, Starke County, Indiana.

Species	2010		1996		1991		1979		1974	1972
	Num. (%)	Wt. (%)	Num. (%)	Wt. (%)	Num. (%)	Wt. (%)	Num. (%)	Wt. (%)	Num. (%)	Num. (%)
Bluegill	24.0	2.4	27.9	5.2	1.3	0.3	0.2	0.1	0.3	0.2
Gizzard shad	15.3	20.7	1.2	3.0	6.6	11.5	4.7	10.1	14.8	15.7
Emerald shiner	14.7	0.2	-	-	-	-	5.5	*	-	1.9
Walleye	12.5	16.4	3.6	4.1	4.0	1.6	1.5	4.2	2.6	3.2
Channel catfish	6.7	34.5	23.2	35.7	49.3	19.6	33.6	45.6	45.3	44.8
White bass	5.9	7.0	0.6	0.4	5.8	2.1	8.8	5.2	17.9	7.4
Yellow perch	5.8	0.6	2.4	0.7	1.1	0.1	1.7	0.2	1.1	1.9
Bluntnose minnow	4.3	*	1.2	0.0	0.8	*	-	-	-	1.3
Largemouth bass	2.7	3.8	0.6	0.6	0.5	0.2	-	-	0.5	0.2
Spotfin shiner	1.9	*	-	-	-	-	-	-	-	-
Black crappie	1.3	0.9	-	-	-	-	8.3	2.8	4.8	-
Sand shiner	1.3	*	-	-	-	-	-	-	-	-
Spotted gar	1.2	2.0	4.3	5.4	1.3	3.3	0.2	0.4	0.5	-
Quillback	1.1	7.7	2.9	20.2	13.0	51.6	4.0	15.2	6.8	15.6
Smallmouth bass	0.4	0.5	-	-	-	-	-	-	-	-
Pumpkinseed	0.4	0.1	0.6	0.1	0.3	*	-	-	-	-
Common carp	0.2	2.7	1.0	10.9	1.9	6.3	0.8	6.3	2.0	6.6
White crappie	0.2	*	27.7	13.1	11.7	2.9	30.9	9.9	0.9	1.1
White sucker	0.1	0.3	-	-	-	-	-	-	1.5	-
Common shiner	-	-	1.0	*	1.6	0.1	-	-	-	-
Silver shiner	-	-	0.8	*	0.8	*	-	-	-	-
Green sunfish	-	-	0.6	0.1	-	-	-	-	-	-
Golden shiner	-	-	0.3	*	-	-	-	-	1.1	-
Iron-colored shiner	-	-	0.3	*	-	-	-	-	-	-
Yellow bullhead	-	-	0.1	0.1	-	-	-	-	-	-
Black bullhead	-	-	0.1	0.3	-	-	-	-	-	-
Hybrid sunfish	-	-	0.1	*	-	-	-	-	-	-
Redfin shiner	-	-	0.1	*	-	-	-	-	-	-
Brown bullhead	-	-	-	-	0.3	0.1	-	-	-	-
Steelcolor shiner	-	-	-	-	0.3	*	-	-	-	-
Warmouth	-	-	-	-	-	-	-	-	0.2	-
Brook silverside	-	-	-	-	-	-	-	-	-	0.4
Totals	1242	604.9 lbs.	723	326.1 lbs.	377	222.0 lbs.	602	307.6 lbs.	660	527

* Represents less than 0.1% of total

Gear	Sampling Effort					
	2010	1996	1991	1979	1974	1972
Electrofishing (h)	2 (DC)	1 (DC)	2 (DC)	3 (AC)	2 (AC)	2 (AC)
Trap net (lifts)	8	4	12	4	-	-
Gill net (lifts)	16	4	12	4	4	4

Table 3. Total number of walleye collected, mean total length (TL; in) and standard error (SE) by age class for fish collected during the summer standard survey (night electrofishing and gill nets) and fall walleye targeted sampling with night electrofishing at Bass Lake, Starke County, Indiana during 2010.

Age	<u>Summer</u>			<u>Fall</u>		
	Number	Mean TL	SE	Number	Mean TL	SE
0	11	3.2	0.08	81	7.9	0.09
1	24	10.6	0.17	54	12.0	0.09
2	98	13.5	0.08	43	13.7	0.11
3	21	15.2	0.12	7	15.5	0.46
4				1	15.8	
5				3	20.1	1.83

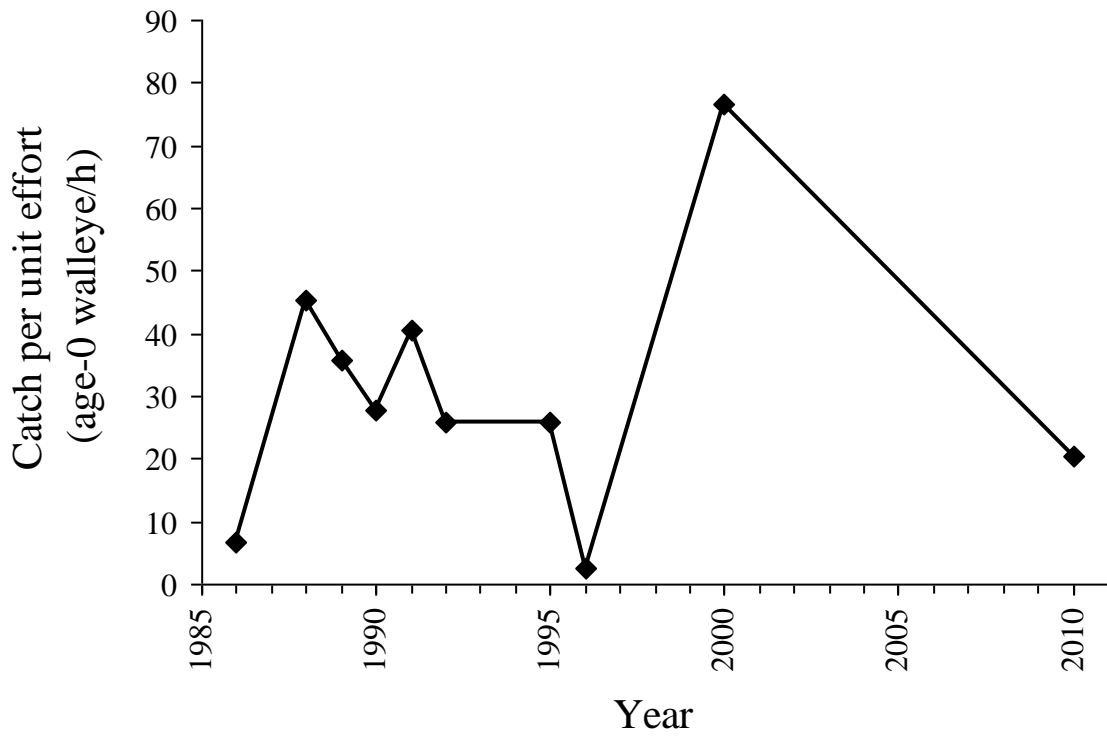


Figure 1. Fall (September to November) age-0 walleye catch per unit effort (fish/h) collected with night pulsed DC, shoreline electrofishing from 1986 to 2010 from Bass Lake, Starke County, Indiana.

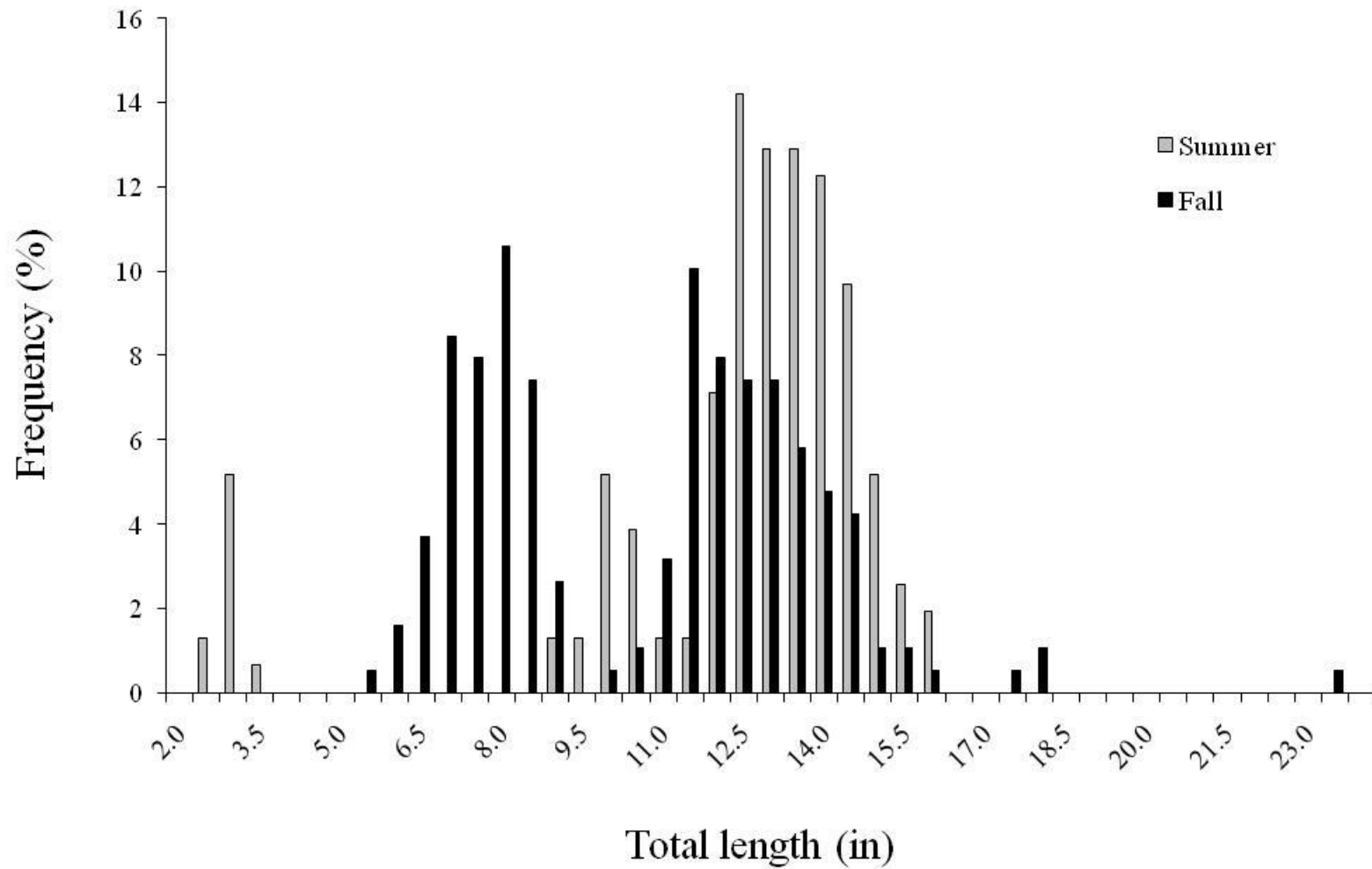


Figure 2. Length frequency of walleye collected during summer standard survey sampling (night electrofishing and gill nets) and fall walleye targeted sampling with night electrofishing at Bass Lake, Starke County, Indiana during 2010.

APPENDIX

LAKE SURVEY REPORT

Type of Survey	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
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Lake Name Bass Lake	County Starke	Date of survey (Month, day, year) 6/17-7/1/2010
Biologist's name Jeremy Price		Date of approval (Month, day, year)

LOCATION		
Quadrangle Name Bass Lake	Range 1W, 2W	Section 12, 13, 14, 17, 18, 23, 24
Township Name 32N	Nearest Town Knox	

ACCESSIBILITY					
State owned public access site SW Corner		Privately owned public access site One Marina		Other access site	
Surface acres 1,345	Maximum depth (ft) 28	Average depth (ft) 3.5	Acre feet 4,626	Water level 704.3 MSL	Extreme fluctuations 5 ft.
Location of benchmark					

INLETS		
Name None	Location	Origin

OUTLETS			
Name Cedar Lake Ditch		Location SW Corner	
Water level control Steel Piling Dam			
POOL	ELEVATION (Feet MSL)	ACRES	Bottom type <input checked="" type="checkbox"/> Bolder <input checked="" type="checkbox"/> Gravel <input checked="" type="checkbox"/> Sand <input checked="" type="checkbox"/> Muck <input checked="" type="checkbox"/> Clay <input type="checkbox"/> Marl
TOP OF DAM			
TOP OF FLOOD CONTROL POOL			
TOP OF CONSERVATION POOL			
TOP OF MINIMUM POOL			
STREAMBED			
Watershed use 70% Residential, 20% Undeveloped Marsh or Forest, 10% Farmland			
Development of shoreline 90% Residential, 10 % Wetland			
Previous surveys and investigations Contour Map 1923			
Fishery Surveys: 1935-1936; 1972, 1974, 1979; 1991; 1996. Creel Survey: 1991; 2000			
Walleye Surveys: 1980-1991; 1995; 1996			

Occurrence and Abundance of Submersed Aquatic Plants - Overall

Lake: Bass	Secchi (ft): 2.5	Mean species/site: 1.19
County: Starke	Sites with plants: 60	SE Mean species/site: 0.14
Date: 7/21-22/20	Sites with native plants: 44	Mean native species/site: 0.77
Littoral Depth (ft): 9.0	Number of species: 8	SE Mean natives/site: 0.11
Littoral Sites: 86	Number of native species: 7	Species diversity: 0.72
Total Sites: 100	Maximum species/site: 6	Native species diversity: 0.64

All Depths	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Chara	42.0	58.0	37.0	4.0	1.0	10.8
Eurasian water milfoil	42.0	58.0	32.0	1.0	9.0	16.0
Illinois Pondweed	16.0	84.0	12.0	3.0	1.0	5.2
Southern Naiad	11.0	89.0	11.0	0	0	2.2
Sago Pondweed	4.0	96.0	4.0	0	0	0.8
Eelgrass	2.0	98.0	2.0	0	0	0.4
Spiny Naiad	1.0	99.0	1.0	0	0	0.2
Small Pondweed	1.0	99.0	1.0	0	0	0.2

Filamentous Algae 0

Other species observed: Arrowhead, bullrush, cattail, common reed, purple loosestrife, spatterdock, water shield, and white water lily

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
			2		2
TRAP NETS	Number of traps		Number of Lifts		Total effort
	2		4		8
GILL NETS	Number of nets		Number of Lifts		Total effort
	4		4		16
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS					
Color			Turbidity		
Green			2 Feet		6 Inches (SECCHI DISK)
Alkalinity (ppm)*			pH		
Surface: 40		Bottom: 40	Surface: 10		Bottom: 10
Conductivity: 319		microsiemens	TDS: 1497		Air temperature: 80 °F
Water chemistry GPS coordinates:			N 41.23580		W 86.57577

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	82.7	10.0	36			72		
2	82.7	9.3	38			74		
4	82.7	9.5	40			76		
6	82.7	9.3	42			78		
8	82.7	9.1	44			80		
10	82.7	9.0	46			82		
12	82.7	9.0	48			84		
14	82.1	8.0	50			86		
16	82.1	7.9	52			88		
18	81.6	7.3	54			90		
20	80.7	5.3	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

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	**WEIGHT (pounds)	PERCENT
Bluegill	298	24.0	1.7 - 9.1	14.65	2.4
Gizzard Shad	190	15.3	1.3 - 17.8	125.24	20.7
Emerald Shiner	183	14.7	2.0 - 3.9	0.93	0.2
Walleye	155	12.5	2.9 - 16.1	99.47	16.4
Channel Catfish	83	6.7	16.0 - 25.2	208.47	34.5
White Bass	73	5.9	1.8 - 13.8	42.27	7.0
Yellow Perch	72	5.8	1.8 - 8.4	3.48	0.6
Bluntnose Minnow	54	4.3	1.6 - 2.8	0.21	<0.1
Largemouth Bass	33	2.7	4.6 - 15.4	23.13	3.8
Spotfin Shiner	24	1.9	1.8 - 3.3	0.15	<0.1
Black Crappie	16	1.3	4.2 - 11.4	5.19	0.9
Sand Shiner	16	1.3	1.8 - 2.6	0.14	0.0
Spotted Gar	15	1.2	17.6 - 29.0	11.95	2.0
Quillback	14	1.1	17.1 - 21.2	46.68	7.7
Pumpkinseed	5	0.4	5.4 - 5.8	0.71	0.1
Smallmouth Bass	5	0.4	7.8 - 12.9	3.27	0.5
Common Carp	3	0.2	22.4 - 24.6	16.46	2.7
White Crappie	2	0.2	6.1 - 6.4	0.18	<0.1
White Sucker	1	0.1	18.1	2.11	0.3
Total (19) Species	1242			604.69	

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

**Weight estimated from length-weight regression.

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					19.0				
1.5	12	4.0	0.01	1	19.5				
2.0	158	53.0	0.01	1	20.0				
2.5	47	15.8	0.02	1	20.5				
3.0	17	5.7	0.03	1	21.0				
3.5	8	2.7	0.05	1, 2	21.5				
4.0	7	2.3	0.07	2	22.0				
4.5	14	4.7	0.09	2	22.5				
5.0	9	3.0	0.12	2, 3	23.0				
5.5	6	2.0	0.15	3	23.5				
6.0	3	1.0	0.19	3	24.0				
6.5	2	0.7	0.23	3	24.5				
7.0	1	0.3	0.28	4	25.0				
7.5	4	1.3	0.34	5, 6	25.5				
8.0	3	1.0	0.40	6	26.0				
8.5	6	2.0	0.47	7, 8	TOTAL	298			
9.0	1	0.3	0.54	9					
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	28.5 /h	GILL NET CATCH	0.2 /lift	TRAP NET CATCH	29.8 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF GIZZARD SHAD

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	0.5	0.00		19.0				
1.5	48	25.3	0.00		19.5				
2.0	18	9.5	0.01		20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	190			
9.0									
9.5									
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0	1	0.5	0.76						
13.5	13	6.8	0.84						
14.0	41	21.6	0.93						
14.5	36	18.9	1.02						
15.0	22	11.6	1.12						
15.5	6	3.2	1.23						
16.0									
16.5	2	1.1	1.45						
17.0	1	0.5	1.58						
17.5	1	0.5	1.71						
18.0									
18.5									

ELECTROFISHING CATCH	53.0 /h	GILL NET CATCH	4.1 /lift	TRAP NET CATCH	2.3 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF WALLEYE (STANDARD)

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	1.3	0.00	Not Aged	20.5				
3.0	8	5.2	0.00	Not Aged	21.0				
3.5	1	0.6	0.01	Not Aged	21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	155			
9.0	2	1.3	0.19	1					
9.5	2	1.3	0.22	1					
10.0	8	5.2	0.27	1					
10.5	6	3.9	0.31	1					
11.0	2	1.3	0.37	1					
11.5	2	1.3	0.43	1, 2					
12.0	11	7.1	0.49	1, 2					
12.5	22	14.2	0.57	2					
13.0	20	12.9	0.65	2					
13.5	20	12.9	0.74	2					
14.0	19	12.3	0.84	2					
14.5	15	9.7	0.94	2, 3					
15.0	8	5.2	1.06	2, 3					
15.5	4	2.6	1.19	3					
16.0	3	1.9	1.32	3					
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	15.0 /h	GILL NET CATCH	7.8 /lift	TRAP NET CATCH	0 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF CHANNEL CATFISH									
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	10	12.0	2.41	
1.5					19.5	12	14.5	2.61	
2.0					20.0	6	7.2	2.81	
2.5					20.5	8	9.6	3.02	
3.0					21.0	2	2.4	3.24	
3.5					21.5	3	3.6	3.48	
4.0					22.0	4	4.8	3.72	
4.5					22.5				
5.0					23.0	1	1.2	4.25	
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0	1	1.2	5.44	
7.5					25.5				
8.0					26.0				
8.5					TOTAL	83			
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	2	2.4	1.45						
16.5	2	2.4	1.59						
17.0	7	8.4	1.74						
17.5	7	8.4	1.89						
18.0	6	7.2	2.06						
18.5	12	14.5	2.23						

ELECTROFISHING CATCH	1.0 /h	GILL NET CATCH	5.1 /lift	TRAP NET CATCH	0 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF WHITE 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	2	2.7	0.00	Not Aged	19.5				
2.0	5	6.8	0.00	Not Aged	20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5	1	1.4	0.20	1	25.5				
8.0	5	6.8	0.24	1	26.0				
8.5	13	17.8	0.29	1	TOTAL	73			
9.0	14	19.2	0.35	1					
9.5									
10.0									
10.5	1	1.4	0.56	2					
11.0	1	1.4	0.65	2					
11.5	1	1.4	0.74	2					
12.0	5	6.8	0.85	2					
12.5	13	17.8	0.96	2, 3					
13.0	9	12.3	1.09	2, 3					
13.5	3	4.1	1.22	3, 4					
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	22.5 /h	GILL NET CATCH	1.3 /lift	TRAP NET CATCH	0.9 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF YELLOW PERCH

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	4	5.6	0.00	Not Aged	19.5				
2.0	20	27.8	0.01	Not Aged	20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0	12	16.7	0.04	1	22.0				
4.5	16	22.2	0.05	1	22.5				
5.0	5	6.9	0.07	1	23.0				
5.5	6	8.3	0.08	1	23.5				
6.0	4	5.6	0.11	1, 2	24.0				
6.5	2	2.8	0.13	2	24.5				
7.0	1	1.4	0.16	2	25.0				
7.5	1	1.4	0.20	2	25.5				
8.0	1	1.4	0.23	2	26.0				
8.5					TOTAL	72			
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	32.0 /h	GILL NET CATCH	0.4 /lift	TRAP NET CATCH	0.1 /lift
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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				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5	1	3.0	0.06	1	22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5	1	3.0	0.17	2	24.5				
7.0	2	6.1	0.20	2	25.0				
7.5	3	9.1	0.25	2, 3	25.5				
8.0	2	6.1	0.30	2	26.0				
8.5	2	6.1	0.36	3	TOTAL	33			
9.0	2	6.1	0.42	2					
9.5									
10.0	1	3.0	0.57	2					
10.5									
11.0									
11.5									
12.0	5	15.2	0.95	2, 3, 4					
12.5	7	21.2	1.07	2, 3, 4					
13.0	4	12.1	1.20	3, 4					
13.5									
14.0	1	3.0	1.49	4					
14.5	1	3.0	1.65	4					
15.0	1	3.0	1.81	4					
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	16.5 /h	GILL NET CATCH	0 /lift	TRAP NET CATCH	0 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLACK CRAPPIE

TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0	2	12.5	0.04	1	22.0				
4.5	3	18.8	0.05	1	22.5				
5.0	2	12.5	0.07	1	23.0				
5.5	1	6.3	0.09	1	23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	16			
9.0									
9.5	1	6.3	0.45	4					
10.0	2	12.5	0.52	4					
10.5	2	12.5	0.60	4, 5					
11.0	3	18.8	0.68	5, 6, 7					
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	1.5 /h	GILL NET CATCH	0.8 /lift	TRAP NET CATCH	0 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF WALLEYE (FALL)									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5	1	0.5	0.04	0	23.5	1	0.5	4.95	5
6.0	3	1.6	0.05	0	24.0				
6.5	7	3.7	0.06	0	24.5				
7.0	16	8.5	0.08	0	25.0				
7.5	15	7.9	0.10	0	25.5				
8.0	20	10.6	0.12	0	26.0				
8.5	14	7.4	0.15	0	TOTAL	189			
9.0	5	2.6	0.19	0					
9.5									
10.0	1	0.5	0.27	1					
10.5	2	1.1	0.31	1					
11.0	6	3.2	0.37	1					
11.5	19	10.1	0.43	1					
12.0	15	7.9	0.49	1					
12.5	14	7.4	0.57	1, 2					
13.0	14	7.4	0.65	1, 2					
13.5	11	5.8	0.74	2					
14.0	9	4.8	0.84	2, 3					
14.5	8	4.2	0.94	2, 3					
15.0	2	1.1	1.06	2, 3					
15.5	2	1.1	1.19	3, 4					
16.0	1	0.5	1.32	3					
16.5									
17.0									
17.5	1	0.5	1.80	3					
18.0	2	1.1	1.98	5					
18.5									

ELECTROFISHING CATCH	47.3 /h								
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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
1.0													
1.5	12	5	12										
2.0	158	5	158										
2.5	47	5	47										
3.0	17	5	17										
3.5	8	5	3	5									
4.0	7	4		7									
4.5	14	6		14									
5.0	9	6		6	3								
5.5	6	4			6								
6.0	3	3			3								
6.5	2	2			2								
7.0	1	1				1							
7.5	4	4					1	3					
8.0	3	3						3					
8.5	6	4							3	3			
9.0	1	1									1		
9.5													
Total	298	63	237	32	14	1	1	6	3	3	1		
Mean TL			2.4	4.6	5.9	7.3	7.8	8.0	8.8	8.8	9.3		
SE			0.02	0.09	0.13			0.11	0	0			

AGE-LENGTH KEY FOR WALLEYE (STANDARD)													
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE										
			1	2	3	4	5	6	7	8	9	10	11
1.0													
1.5													
2.0													
2.5	2	0											
3.0	8	0											
3.5	1	0											
4.0													
4.5													
5.0													
5.5													
6.0													
6.5													
7.0													
7.5													
8.0													
8.5													
9.0	2	2	2										
9.5	2	2	2										
10.0	8	5	8										
10.5	6	5	6										
11.0	2	2	2										
11.5	2	2	1	1									
12.0	11	4	3	8									
12.5	22	5		22									
13.0	20	5		20									
13.5	20	4		20									
14.0	19	5		19									
14.5	15	5		3	12								
15.0	8	5		5	3								
15.5	4	4			3								
16.0	3	3			3								
16.5													
17.0													
17.5													
18.0													
Total	155	58	24	98	21								
Mean TL			10.6	13.5	15.2								
SE			0.17	0.08	0.12								

AGE-LENGTH KEY FOR WHITE 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												
2.0	5	0												
2.5														
3.0														
3.5														
4.0														
4.5														
5.0														
5.5														
6.0														
6.5														
7.0														
7.5	1	1	1											
8.0	5	5	5											
8.5	13	5	13											
9.0	14	5	14											
9.5														
10.0														
10.5	1	1		1										
11.0	1	1		1										
11.5	1	1		1										
12.0	5	4		5										
12.5	13	6		9	4									
13.0	9	5		2	7									
13.5	3	3			2	1								
14.0														
14.5														
15.0														
15.5														
16.0														
16.5														
17.0														
17.5														
18.0														
Total	73	37	33	18	14	1								
Mean TL			8.9	12.4	13.2	13.8								
SE			0.07	0.15	0.09									

AGE-LENGTH KEY FOR YELLOW PERCH													
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE										
			1	2	3	4	5	6	7	8	9	10	11
1.0													
1.5	4	0											
2.0	20	0											
2.5													
3.0													
3.5													
4.0	12	5	12										
4.5	16	5	16										
5.0	5	5	5										
5.5	6	5	6										
6.0	4	4	3	1									
6.5	2	2		2									
7.0	1	1		1									
7.5	1	1		1									
8.0	1	1		1									
8.5													
9.0													
9.5													
Total	72	29	42	6									
Mean TL			4.9	7.2									
SE			0.10	0.30									

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														
4.0														
4.5	1	1	1											
5.0														
5.5														
6.0														
6.5	1	1		1										
7.0	2	2		2										
7.5	3	3		2	1									
8.0	2	2		2										
8.5	2	2			2									
9.0	2	2		1										
9.5														
10.0	1	1		1										
10.5														
11.0														
11.5														
12.0	5	5		2	2	1								
12.5	7	5		3	3	1								
13.0	4	4			3	1								
13.5														
14.0	1	1				1								
14.5	1	1				1								
15.0	1	1				1								
15.5														
16.0														
16.5														
17.0														
17.5														
Total	33	31	1	14	11	6								
Mean TL			4.8	9.6	11.6	13.7								
SE				0.64	0.64	0.46								

AGE-LENGTH KEY FOR BLACK CRAPPIE														
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														
4.0	2	2	2											
4.5	3	3	3											
5.0	2	2	2											
5.5	1	1	1											
6.0														
6.5														
7.0														
7.5														
8.0														
8.5														
9.0														
9.5	1	1				1								
10.0	2	1				2								
10.5	2	2				1	1							
11.0	3	3					1	1	1					
11.5														
Total	16	15	8			4	2	1	1					
Mean TL			4.9			10.3	11.0	11.3	11.3					
SE			0.18			0.20	0.25							

AGE-LENGTH KEY FOR WALLEYE (FALL)													
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE										
			0	1	2	3	4	5	6	7	8	9	10
1.0													
1.5													
2.0													
2.5													
3.0													
3.5													
4.0													
4.5													
5.0													
5.5	1	1	1										
6.0	3	1	3										
6.5	7	3	7										
7.0	16	4	16										
7.5	15	4	15										
8.0	20	3	20										
8.5	14	4	14										
9.0	5	5	5										
9.5													
10.0	1	1		1									
10.5	2	2		2									
11.0	6	5		6									
11.5	19	5		19									
12.0	15	5		15									
12.5	14	5		6	8								
13.0	14	5		6	8								
13.5	11	4			11								
14.0	9	6			8	2							
14.5	8	5			6	2							
15.0	2	2			1	1							
15.5	2	2				1	1						
16.0	1	1				1							
16.5													
17.0													
17.5	1	1				1							
18.0	2	1						2					
18.5													
19.0													
19.5													
20.0													
20.5													
21.0													
21.5													
22.0													
22.5													
23.0													
23.5	1	1						1					
24.0													
Total	189	76	81	54	43	7	1	3					
Mean TL			7.87	12.0	13.7	15.5	15.8	20.1					
SE			0.09	0.09	0.11	0.46		1.83					

GILL NETS				TRAP NETS				ELECTROFISHING			
1	N	41.21266	W 86.60019	1	N	41.22023	W 86.61063	1	N	41.23391	W 86.58567
	N	41.21330	W 86.59999	2	N	41.21793	W 86.61164		N	41.22883	W 86.58696
2	N	41.21247	W 86.59635	3	N	41.24152	W 86.57770	2	N	41.22494	W 86.59165
	N	41.21248	W 86.59719	4	N	41.23551	W 86.58560		N	41.22113	W 86.59163
3	N	41.21352	W 86.59174	5	N	41.22785	W 86.58860	3	N	41.22363	W 86.60388
	N	41.21331	W 86.59253	6	N	41.21962	W 86.58227		N	41.21197	W 86.61185
4	N	41.21629	W 86.59045	7	N	41.21933	W 86.58511	4	N	41.23836	W 86.58425
	N	41.21562	W 86.59082	8	N	41.23189	W 86.57422		N	41.24089	W 86.57859
5	N	41.23283	W 86.57407					5	N	41.23393	W 86.57167
	N	41.23279	W 86.57489						N	41.23093	W 86.57614
6	N	41.23036	W 86.57684					6	N	41.22032	W 86.58191
	N	41.23001	W 86.57749						N	41.21628	W 86.58789
7	N	41.22358	W 86.58357					7	N	41.21628	W 86.58789
	N	41.22415	W 86.58316						N	41.21156	W 86.59108
8	N	41.22168	W 86.58480					8	N	41.20963	W 86.60272
	N	41.22216	W 86.58417						N	41.21111	W 86.61009
9	N	41.21989	W 86.58582								
	N	41.22011	W 86.58494								
10	N	41.21904	W 86.59062								
	N	41.21963	W 86.59017								
11	N	41.23662	W 86.57601								
	N	41.23708	W 86.57537								
12	N	41.23344	W 86.57315								
	N	41.23391	W 86.57286								
13	N	41.22736	W 86.58711								
	N	41.22678	W 86.58742								
14	N	41.22612	W 86.58432								
	N	41.22559	W 86.58465								
15	N	41.21326	W 86.59315								
	N	41.21311	W 86.59403								
16	N	41.21275	W 86.59626								
	N	41.21272	W 86.59702								