

EVALUATION OF THE FISH COMMUNITY AND ANGLER HARVEST  
AT SUMMIT LAKE

Henry County

2005 Fish Management Report

J. Rhett Wisener

Fisheries Biologist



Fisheries Section  
Indiana Department of Natural Resources  
Division of Fish and Wildlife  
I.G.C. South, Room W273  
402 W. Washington Street  
Indianapolis, Indiana 46204

2009

## EXECUTIVE SUMMARY

- In 2005, a fish community survey was conducted to assess the overall status of the fish community and to provide information useful in the monitoring of the bluegill population. Angler creel surveys were conducted during the open water and ice fishing seasons to estimate fishing pressure, angler preference, harvest, and to assess angler attitudes.
- The Petersen method of estimating population size based on a single marking and single recapture event was utilized to estimate the number of 5 in and larger bluegill.
- A total of 864 fish weighing roughly 674 lbs was collected during the community survey. Bluegill (39%) and largemouth bass (32%) were the dominant species collected.
- A total of 339 bluegill weighing 42 lbs was collected. Bluegill up to 8.8 in were collected and averaged 5.1 in.
- There were 279 largemouth caught that weighed 216 lbs. Bass ranged in length from 2.9 to 19.2 in and averaged 11.6 in.
- Other game fish collected in the survey included channel catfish, walleye, yellow perch, redear sunfish, white bass, and black crappie.
- An estimated 15,648 anglers fished for 81,302 h at Summit Lake between April 1 and October 31, 2005. Fishing pressure was highest in June and lowest in October.
- A total of 35,131 fish weighing 14,528 lbs was harvested from Summit Lake between April and October, 2005.
- Bluegill was the dominant species harvested by both number (81%) and weight (72%). The vast majority (94%) of the harvested bluegill measured at least 7 in and most (83%) were between 7 and 8.5 in.
- Harvested yellow perch ranged in length from 6 to 13 in and averaged 8.6 in.
- Harvested crappie ranged in length from 6.0 to 12.5 in and averaged 8.8 in.
- Most anglers chose to release the bass they caught. Of the 5,083 legal bass caught (those 14 in or larger), 90% of them were released.
- The 15,648 anglers that visited Summit Lake between April 1 and October 31, 2005 contributed nearly \$1,000,000 to the economy.
- Fishing pressure at Summit Lake from December 6 to 30, 2005 was estimated at 11,760 h ( $\pm 4,019$ ). During that time, anglers were estimated to have harvested 15,344 fish ( $\pm 5,936$ ).

- The estimated number of bluegill harvested in December, 2005 was 13,550 fish ( $\pm$  5,579). Most (91%) of the harvested bluegill measured at least 7 in and 83% were 7 to 8.5 in.
- There were at least 350,120 bluegill (at least 5 in) available to anglers at the beginning of April (500/ac).
- Harvest and yield estimates of 7 in and larger bluegill were 56 fish/acre and 21 lbs/acre, and 36 fish/acre and 15 lbs/acre for 8 in and larger bluegill.
- Although the number of walleye collected paled in comparison to the number of bass sampled, they appear to be aiding bass in providing predatory pressure on a number of species. Therefore, even though walleye harvest and angler preference for them were low, fingerling walleye stockings should continue at the rate of 100/acre (70,000 total). The next fall walleye evaluation is scheduled for 2010.
- Based on the creel results and population estimate, at least 60% of the 8 in and larger bluegill were harvested. This high rate of harvest coupled with whatever natural mortality is for 8 in and larger bluegill makes it clear that overall annual mortality for this group of fish is substantial.
- An overwhelming majority of anglers voiced support for a bluegill bag limit of 15 to 25 fish. Unfortunately, to make a noticeable difference in the quality of bluegill fishing, a more restrictive bag limit of 10 fish or less would likely be needed. This would likely discourage a number of anglers from fishing at Summit. Therefore, a bag limit is not being proposed.
- DFW has discussed a statewide bag limit for panfish which includes bluegill, redear sunfish, and other sunfish (crappie limits will remain separate). If this comes to fruition, it will be applied at Summit Lake.
- Anglers that are concerned that over-harvest is limiting the fishery are encouraged to practice selective harvest and not take more bluegill than they really need.
- The next fish community survey at Summit Lake should be conducted in 2010 or 2011.

## TABLE OF CONTENTS

	Page
LIST OF TABLES .....	iv
LIST OF APPENDICES.....	v
INTRODUCTION .....	1
METHODS .....	2
Fish Community Evaluation .....	2
Open Water Creel Survey .....	2
Ice Fishing Creel Survey.....	3
Bluegill Population Estimate .....	4
RESULTS .....	5
Fish Community Evaluation .....	5
Open Water Creel Survey .....	6
Angling Effort.....	6
Overall Harvest Rate.....	7
Harvest and Yield .....	7
Angler Preference .....	7
Composition of the Harvest .....	7
Bluegill.....	7
Yellow perch.....	8
Crappie.....	8
Channel catfish.....	8
Largemouth bass .....	8
Walleye .....	9
Other species.....	9
Economic Value of the Fishery.....	9
Ice Fishing Creel Survey.....	9
Bluegill Population Estimate .....	10
DISCUSSION .....	10
RECOMMENDATIONS .....	14
LITERATURE CITED .....	14

## LIST OF TABLES

Table	Page
1. Monthly and season estimates of fishing pressure, number of anglers, and overall harvest rates at Summit Lake, April 1 to October 31, 2005 .....	16
2. Summary of estimated harvest and yield for Summit Lake, April 1 to October 31, 2005.....	16
3. Monthly and seasonal angler preference (% of all anglers) by species at Summit Lake, April 1 to October 31, 2005 .....	16
4. Monthly and seasonal harvest rates in fish per hour at Summit Lake, April 1 to October 31, 2005.....	17
5. Monthly and seasonal preference harvest rates in fish per hour for the dominant species harvested at Summit Lake, April 1 to October 31, 2005.....	17
6. Monthly and seasonal catch and release for largemouth bass and walleye at Summit Lake, April 1 to October 31, 2005 .....	17
7. Monthly and seasonal preference catch rates in fish per hour for largemouth bass and walleye at Summit Lake, April 1 to October 31, 2005 .....	18
8. Species, proportion of observed harvest, and estimated number harvested from Summit Lake, December, 2005 .....	18
9. Comparison of the Summit Lake bluegill population that was available for harvest in 2005 (based on length frequency of fin clipped fish) versus bluegill that were harvested in 2005 .....	19
10. Four potential bluegill bag limits and the number of bluegill parties that would have been impacted at Summit Lake, April 1 to October 31, 2005.....	20
11. Four potential bluegill bag limits and the impact they would have had on bluegill harvest from April 1 through October 31, 2003 and 2005.....	21

LIST OF APPENDICES

Appendix	Page
1. Probabilities used in the 2005 non-random creel survey at Summit Lake .....	22
2. Actual number of parties and percent of total parties interviewed by Indiana counties represented in the creel survey at Summit Lake from April 1 to October 31, 2005 .....	23
3. Monthly estimated number of fish harvested at Summit Lake, April 1 to October 31, 2005.....	24
4. Estimated number by size and estimated weight of the dominant species harvested at Summit Lake, April 1 to October 31, 2005 .....	25
5. Actual number of parties and percent of total parties interviewed by Indiana counties represented in the creel survey at Summit Lake, December, 2005.....	29
6. Estimated number by size and estimated weight of bluegill harvested at Summit Lake, December, 2005 .....	30
7. Standard lake survey data pages, Summit Lake, 2005.....	31

## INTRODUCTION

Summit Lake is part of 2,500-acre Summit Lake State Park. The park is located approximately 4 mi north of New Castle, Indiana. In 1980, the lake was built by the Big Blue River Conservancy District. Bluegill, redear sunfish, largemouth bass, and channel catfish were initially stocked in 1981 by the Indiana Department of Natural Resources, Division of Fish and Wildlife (DFW). The public was first allowed to use the lake in 1985 and the state park opened in 1988. Anglers can access the lake via one of three boat ramps or from a variety of shoreline areas. The park also has a campground.

The water level at Summit Lake is often several feet below full pool because its watershed is relatively small. When at full pool, the lake is roughly 835 acres, however, when the water is down several feet it is closer to 700 acres. The majority of the watershed consists of vegetated park property which provides good filtration of the water entering the lake and helps sustain the lake's good water quality.

The last fish community survey at Summit was in 2002 (Keller 2003). With a good balance between the numbers of predators and prey and good numbers of quality size fish, the fishery was deemed to be doing very well. Following that survey, it was suggested that harvest might be limiting the number of 8-in and larger bluegill because bluegill growth had consistently been good at the lake, yet few larger bluegill were captured during surveys. From April through October, 2003, an angler creel survey was conducted (Wisener 2004). Bluegill was by far the dominant species harvested and over 89% measured 7 to 8 in, but only 7% were 8.5 in or longer. This, coupled with a declining trend in the number of 8.5 in and larger bluegill being caught in surveys, a fair portion of the bluegill anglers interviewed feeling they were catching fewer and smaller bluegill as the result of increased fishing pressure and harvest, and the majority of anglers supporting a bluegill bag limit, lead to the recommendation for a bluegill bag limit. The initial limit being considered following the 2003 creel survey was twenty bluegill per day.

Several surveys were conducted at Summit Lake in 2005. A fish community survey was conducted to assess the overall status of the fish community and to provide information useful in the monitoring of the bluegill population. Angler creel surveys were conducted during the open water and ice fishing seasons to estimate fishing pressure, angler preference, harvest, and to assess angler attitudes. The data gathered from these surveys will help to further determine the worthiness of a bluegill bag limit and if so, what that limit might be.

## METHODS

### FISH COMMUNITY EVALUATION

A fish community evaluation was conducted from May 17 to 19, 2005. Physical and chemical characteristics of the lake were measured according to DFW guidelines (2001). Aquatic vegetation was sampled on July 25, 2005 according to guidelines developed by Pearson (2004). However, vegetation data was amended and processed according to updated DFW guidelines (2006).

Fish were collected via 1.5 h (6, 15-min stations) of DC electrofishing at night with two dippers, twelve gill net lifts, and six trap net lifts. Collected fish were measured to the nearest 0.1 in TL. Scales were taken from sport fish for age and growth analysis. Weights were estimated for all species using central Indiana averages or length-weight regression. Proportional stock density was figured for bluegill and largemouth bass (Anderson and Neumann 1996). The Bluegill Fishing Potential Index (BGFP) was also used to describe the bluegill fishery (Ball and Tousignant 1996).

### OPEN WATER CREEL SURVEY

A personal contact creel survey was conducted at Summit Lake from April 1 to October 31, 2005. A total of 151 days was sampled during the period. The survey was conducted using a non-uniform probability design. Sampling areas included the east boat ramp, west boat ramp, and campground ramp. Probabilities were determined via car counts conducted during the 2003 fishing season and are listed in Appendix 1. Sampling was divided into 7.5 h periods: morning (6:30 am to 2:00 pm) and evening (2:00 pm to 9:30 pm). These periods were sampled based on probabilities generated from previous creel surveys (0.25 for morning periods and 0.75 for evenings). The probabilities used for fishing activity were 0.051 for weekends and 0.025 for weekdays.

A single angler analyst was employed for the creel survey. The angler analyst interviewed anglers upon completion of their fishing trips. Information recorded for each fishing party included: trip length, number of anglers in the party, fishing preference, and county or state of residence. At times, multiple anglers were leaving the lake at the same time, so not all of them could be interviewed. The number of anglers that had completed their day of fishing but were not interviewed was listed. Harvested fish were identified, counted, and measured to the

nearest 0.5 in TL. All bluegill were inspected for a fin clip, and if present, they were recorded accordingly.

Anglers were asked to recall the numbers of legal and sub-legal largemouth bass and walleye released. In addition, anglers were asked a series of management questions, including: were they participating in a largemouth bass tournament, how many times a year they fish at Summit Lake, were they aware of the walleye stockings, and would they support a bluegill bag limit of 15 to 25 fish at Summit.

Fishing pressure and fish harvest were estimated by month. Weights of harvested fish were estimated using both central Indiana averages and length-weight regression. Summit Lake was considered to be 700 acres for purposes of calculations based on lake size.

#### ICE FISHING CREEL SURVEY

A personal contact creel survey was conducted at Summit Lake from December 15 to 30, 2005. A total of 10 days was sampled during the period. Data was expanded to estimate effort, catch rates, and harvest during the ice fishing season which lasted from December 6 to 30, 2005 (Dan Robinson, assistant property manager at Summit Lake, personal communication, 2006).

Sampling was divided into 5.5 h periods: morning (8:30 am to 2:00 pm) and evening (2:00 pm to 7:30 pm). Equal probabilities were assumed for morning and evening periods (0.5). There was no differentiation between weekends and weekdays because of the short season. Angler counts were conducted twice during each shift (8:45 am and 11:00 am, or 2:15 pm and 4:30 pm). To conduct counts, the angler analyst drove a route that consisted of six stops. From the six vantage points the majority of the lake could be seen. Counts were considered to be instantaneous because no interviews were conducted during the counts and on average a count was completed in 33 min. The number of anglers and ice shanties observed at each stop were recorded. To determine the overall number of anglers observed per count, interviewed anglers were asked if they had fished in a shanty and if so, how many in their party were in that shanty. That information was used to derive the average number of anglers fishing per shanty which was used in calculating the overall number of anglers fishing per count.

When counts were not being conducted, the angler analyst interviewed anglers. Information recorded for each fishing party included: whether the party had completed their trip or not, trip length, number of anglers in the party, fishing preference, and county or state of

residence. Harvested fish were identified, counted, and measured to the nearest 0.5 in TL. All bluegill were inspected for a fin clip, and if present, they were recorded accordingly.

Anglers were asked to recall the numbers of legal and sub-legal largemouth bass and walleye released. In addition, they were asked if they would support a bluegill bag limit of 15 to 25 fish at Summit Lake.

Complete and incomplete trip information was used in calculations of catch rates with exception of parties that had fished for less than 0.5 hr. Weights of harvested fish were estimated using both central Indiana averages and length-weight regression. Summit Lake was considered to be 700 acres for purposes of calculations based on lake size.

#### BLUEGILL POPULATION ESTIMATE

The Petersen method of estimating population size based on a single marking and single recapture event was utilized to estimate the number of 5 in and larger bluegill. This size of fish was of interest because it was the group of fish that would potentially be harvested. The formula for calculating the population estimate was:

$$N = [(n1 + 1)(n2 + 1) / (m2 + 1)] - 1$$

**n1** = the number of fish marked during the first sampling event

**n2** = the total number of fish caught during the second sampling event

**m2** = the number of marked fish caught during the second sampling event

The first sampling event was viewed as the time period between May 3 and June 1, 2005. During that time, several days were spent conducting targeted sampling for bluegill in addition to the fish community survey that was conducted. Total sampling effort of the targeted sampling and community survey was 6.88 h of DC electrofishing (day and night), 56 trap net lifts, and 12 gill net lifts. There were 1,155, 5 to 9 in bluegill caught, marked with a left pectoral fin clip, and released. This was the value used for “n1” in the equation.

Once bluegill marking began, the angler analyst was instructed to look for marked fish being harvested. No marked fish were observed in the harvest until sometime in June. Therefore, the expanded harvest of bluegill from June 1 to October 31 was viewed as the second sampling occasion or recapture event and this was the value used for “n2”. The expanded number of marked fish harvested during that time represented the recaptures or “m2”.

## RESULTS

### FISH COMMUNITY EVALUATION

The surface temperature of the lake on May 17 was 64°F. Although DO could not be measured because the meter malfunctioned, the temperature profile did not indicate a thermocline. Conductivity was 270 $\mu$ S and the Secchi disk reading was 9.0 ft.

Eurasian watermilfoil, coontail, and American pondweed were found at over a third of the sites sampled during the vegetation survey. Overall, 11 species of submersed vegetation, cattails, and filamentous algae were found. Submersed vegetation was present down to 14 ft.

A total of 864 fish weighing roughly 674 lbs was collected. Twelve species comprised the sample. Bluegill (39%) and largemouth bass (32%) were the only species to account for more than 5% of the sample by number. By weight, largemouth bass (32%) and carp (31%) were the predominant species collected.

Bluegill was the most abundant species collected by number (39%) and sixth by weight (6%). A total of 339 bluegill weighing 42 lbs was collected. Bluegill CPUE was 180.7/h and 8.8/trap net lift. As in 2002, bluegill up to 8.8 in were collected and averaged 5.1 in. Approximately 42% of the bluegill were 6.0 in or larger compared to 40% in 2002, 18% in 2000, and 12% in 1998. Bluegill PSD was higher in 2005 than in recent surveys, 48 versus 33 in 2002, 15 in 2000, and 11 in 1998. The proportion of 5 in and larger bluegill that measured at least 8.5 in was 2.8% compared to just 0.3% in 2002. Age-2 (37%) and age-4 (34%) bluegill accounted for the majority of the collection. Age-4 bluegill averaged 7.1 in. The BGFP score was 22, and as in 2000 and 2002 this equated to a “good” rating.

As in 2002, largemouth bass ranked second in abundance by number (32%) and first by weight (32%). There were 279 largemouth caught that weighed 216 lbs. Largemouth bass CPUE was 180.7/h. Bass ranged in length from 2.9 to 19.2 in and averaged 11.6 in. Just 8% of the bass measured at least 14 in compared to 19% in 2002. The majority (86%) of the largemouth were ages 3 or 4 and nearly 70% of those measured 10 to 12 in. Only one age 1 and few age 2 (7%) bass were collected. Bass PSD was 40 and similar to 2002 (38).

Thirty-nine channel catfish weighing 47 lbs were collected. Channels up to 27.2 in were found. However, 90% of the channel catfish were 8.5 to 16.5 in. In 2002, just six channels were collected and they were 19.5 in or larger.

There were 39 walleye weighing 47 lbs collected. Walleye CPUE was 2.7/h and 2.9/gill

net lift which compared favorably to 2002 catch rates of 3.3/h and 0.5/gill net lift. Walleye up to 23.0 in and at least age 5 were found. Age-1 (33%) and age-2 (41%) walleye accounted for the bulk of those caught. Nearly 44% of walleye were at least 14 in.

Continuing to decline in abundance, yellow perch accounted for just 5% of all fish collected versus 13% in 2002, 31% in 2000, and 59% in 1998. The CPUE of perch (16.7/h) was half what it was in 2002 (33.3/h). A total of 39 perch weighing 6 lbs was sampled. The largest perch collected was 10.6 in. As in 2002, 31% of the perch were 8 in or larger.

Thirty-six carp were collected that weighed 207 lbs. Although sixth in abundance by number (4%), carp ranked second by weight (31%). The largest carp sampled was almost 30 in and weighed approximately 12 lbs.

There were 29 redear sunfish weighing 10 lbs sampled. Redear abundance (3%) was relatively low as it was in 2002 (2%). Only two of the redear were less than 6 in while 13 (45%) measured 8 to 9.9 in. All the redear collected were age 2 or older.

White bass accounted for 3% of the sample by number and 4% by weight. Twenty-three white bass weighing 29 lbs were collected. White bass have been found in the lake since 1998, however, this was the first time that more than five were collected. White bass ranged in length from 7.6 to 15.9 in. All but two white bass were at least 14 in and age 4 or older.

Other species collected were white sucker, black crappie, brown bullhead, and golden shiner. With 22 fish weighing 59 lbs, white sucker was the most prevalent of this group.

## OPEN WATER CREEL SURVEY

### Angling Effort

Anglers fished for an estimated 81,302 h or nearly 116 h/acre at Summit Lake between April 1 and October 31, 2005 (Table 1). This was similar to the 2003 estimate of fishing pressure which was 88,058 h (126 h/acre). An estimated 15,648 anglers (22/acre) fished at Summit during that time, down from 20,300 anglers in 2003. Fishing pressure was highest in June (14,023 h), May (13,449 h), and April (13,378 h). As in 2003, fishing pressure was lowest in October (7,769 h).

Anglers from 41 Indiana counties fished at Summit Lake from April through October, 2005 (Appendix 2). Henry (36%), Madison (16%), and Delaware (16%) counties provided the bulk of the anglers. Out-of-state anglers represented 3% of the total.

The majority (95%) of the anglers interviewed had fished at Summit Lake before. Many anglers (73%) indicated they fish at Summit eleven or more days per year which was higher than reported in 2003 (54%). Of those fishing more than 10 days a year, 76% said they spend at least 21 days annually at Summit Lake and 39% are there more than 50 days each year. An overwhelming majority (91%) of anglers supported a bluegill bag limit of 15 to 25 fish. Approximately 93% of the anglers were aware of the walleye stockings.

### Overall Harvest Rate

The overall harvest rate between April 1 and October 31, 2005 was 0.432 fish/h (Table 1) compared to 0.573/h in 2003. The highest harvest rate was in August (1.007 fish/h) followed by September (0.505) and April (0.442). The lowest harvest rates were in May and June, 0.207 and 0.195 fish/h, respectively.

### Harvest and Yield

A total of 35,131 fish weighing 14,528 lbs was harvested from Summit Lake between April and October, 2005 (Table 2). Overall harvest and yield estimates were 50 fish/acre and 21 lbs/acre, respectively, compared to 72 fish/acre and 28 lbs/acre in 2003. Harvest was much greater in August (12,397 fish) than any other month (Appendix 3).

### Angler Preference

Largemouth bass was the most sought after species by anglers at Summit from April through October, 2005 (Table 3). Anglers exclusively fishing for bass represented 43% of the interviewed anglers. In May and June, over half of the anglers targeted bass. A quarter of the anglers strictly fished for bluegill and their presence was greatest in August when they accounted for 61% of anglers. Preference for walleye was lower in 2005 (0.3%) than in 2003 (2.5%).

### Composition of the Harvest

#### Bluegill

As in 2003, bluegill was once again the dominant species harvested by both number (81%) and weight (72%). An estimated 28,550 bluegill weighing 10,433 lbs were harvested between April 1 and October 31, 2005. Harvested bluegill averaged 7.9 in, which was similar to

the 2003 average of 7.7 in. The vast majority (94%) of the bluegill harvested measured at least 7 in and most (83%) were between 7 and 8.5 in (Appendix 4). Bluegill were harvested at the rate of 0.351 fish/h (Table 4) and the highest bluegill harvest rate occurred in August (0.956/h). The preference harvest rate for bluegill was 1.008/h (Table 5) compared to 1.183/h in 2003. Preference harvest rates were highest in April (1.524), August (1.474), and July (1.111).

#### Yellow perch

There were 2,528 yellow perch weighing 787 lbs harvested. The relative abundance of perch harvested by number (7%) and weight (5%) was nearly half that observed in 2003, 14% and 9%, respectively. Harvested perch ranged in length from 6 to 13 in and averaged 8.6 in which was an increase from 8.1 in in 2003. Approximately 20% of the perch harvested measured at least 10 in. The overall harvest rate of perch was 0.031 fish/h while the preference harvest rate was 0.520 fish/h, a slight decrease from 0.700/h in 2003.

#### Crappie

Crappie made up considerably less of the harvest by number (7%) and weight (6%) than they did in 2003, 13% and 12%, respectively. The 2,433 crappie harvested weighed 902 lbs. Harvested crappie ranged in length from 6.0 to 12.5 in and averaged 8.8 in. The preference harvest rate of crappie was 0.401 fish/h compared to 0.593/h in 2003.

#### Channel catfish

There were 575 channel catfish weighing 907 lbs harvested versus just 200 catfish that were harvested in 2003. While the average channel harvested measured just 13.8 in, the largest observed harvested was 29.5 in and weighed over 12 lbs. Most of the catfish harvest occurred in August (43%).

#### Largemouth bass

A total of 489 largemouth bass weighing 1,080 lbs was harvested. Harvested bass measured 14.0 to 22.0 in and averaged 15.8 in. Most anglers chose to release the bass they caught. Of the 5,083 legal bass caught (those 14 in or larger), 90% of them were released (Table 6). Overall, 25,306 bass were caught and released. The preference catch rate of bass was lower in 2005 (0.607 fish/h) than in 2003 (0.859). The preference catch rate of legal size bass was 0.123 fish/h (Table 7).

Anglers participating in bass tournaments accounted for 11% of all bass anglers at Summit Lake between April and October, 2005. The average trip length for tournament and

non-tournament bass anglers was nearly equal, 5.3 h and 5.0 h, respectively. The catch rate of legal size bass for tournament (0.093 fish/h) and non-tournament bass anglers (0.127) was similar.

### Walleye

One hundred and six walleye weighing 222 lbs were harvested. Walleye accounted for less than 1% of the harvest by number and 2% by weight. Harvested walleye averaged 17.1 in, an increase from 16.1 in in 2003. In addition to those harvested, 658 walleye were caught and released and 88 of those measured at least 14 in. The preference catch rate for walleye declined from 0.208 fish/h in 2003 to 0.092/h in 2005.

### Other species

Other species harvested included redear sunfish, bullheads, and miscellaneous sunfish. Collectively, these species accounted for 1% of the harvest by number and by weight.

### Economic Value of the Fishery

The U.S. Fish and Wildlife Service conducted a national survey of fishing, hunting, and wildlife-associated recreation in 2006 (U.S. Department of the Interior). From this survey, an estimate of how much money an angler spends per day to fish in Indiana was calculated. Taking into account all money spent on bait, tackle, food, lodging, licenses, transportation, etc., the average cost of an angler day in Indiana in 2006 was roughly \$62.60. Based on this estimate, the 15,648 anglers that visited Summit Lake between April 1 and October 31, 2005 contributed nearly \$1,000,000 to the economy.

### ICE FISHING CREEL SURVEY

Fishing pressure at Summit Lake from December 6 to 30, 2005 was estimated at 11,760 h ( $\pm 4,019$ ). During that time, anglers were estimated to have harvested 15,344 fish ( $\pm 5,936$ ) (Table 8). The mean angler harvest rate was 1.4 fish/h. Anglers from at least 22 counties and out-of-state visited Summit during the 2005 ice fishing season (Appendix 5). All but four of the 149 parties interviewed indicated bluegill was one of the species they were targeting. Most anglers (86%) supported a bluegill bag limit of 15 to 25 fish.

Bluegill accounted for 88% of the observed harvest (Table 8). The estimated number of bluegill harvested in December, 2005 was 13,550 fish ( $\pm 5,579$ ) that weighed 4,753 lbs. The

mean angler harvest rate of bluegill was 1.3 fish/h. Bluegill up to 10 in were observed harvested and on average they measured 7.8 in (Appendix 6). As was seen during the open water creel survey, most (91%) of the bluegill harvested measured at least 7 in and 83% were 7 to 8.5 in.

Other fish observed harvested were yellow perch, redear sunfish, crappie, largemouth bass, and walleye. However, because there were so few of these species observed, there is little confidence in the individual estimates of the numbers of these species harvested.

## BLUEGILL POPULATION ESTIMATE

There were 22,947 bluegill harvested between June 1 and October 31, 2005. During that time, 76 of the 1,155 marked bluegill were estimated to have been harvested. Based on these numbers  $\{N = [(1,155+1)(22,947+1)/(76+1)] - 1\}$  the population estimate of 5 in and larger bluegill was 344,517 ( $\pm 77,820$ ). Add to that the 5,603 bluegill harvested in April and May and there were at least 350,120 bluegill (at least 5 in) available to anglers at the beginning of April (500/acre). Based on length frequency of marked bluegill and estimated average weights, there were 75,676 lbs of harvestable size bluegill (108 lbs/acre) available as of April 1 (Table 9). Breaking these numbers down further, density estimates of 7 in and larger bluegill were 224 fish/acre and 68 lbs/acre and estimates for 8 in and larger bluegill were 58 fish/acre and 23 lbs/acre.

The cumulative harvest of bluegill from April through October and the ice fishing season was 42,100 fish (60/acre) that weighed 15,186 lbs (22/acre). Therefore, roughly 12% of the 5 in and larger bluegill were harvested and 20% of the biomass was removed. However, 93% of harvested fish measured at least 7 in while only 45% of the fin clipped bluegill were 7 in or longer. Harvest and yield estimates of 7 in and larger bluegill were 56 fish/acre and 21 lbs/acre, and 36 fish/acre and 15 lbs/acre for 8 in and larger bluegill. Therefore, a quarter of the 7 in and larger bluegill (31% by weight) and 62% of the 8 in and larger bluegill (65% by weight) were harvested in 2005.

## DISCUSSION

Summit Lake continues to provide a quality sport fishery. Bluegill and largemouth bass remain the most abundant species in the lake and PSD's of each indicate fairly balanced populations. Many of the bluegill (42%) were 6 in or longer and PSD was higher than in recent

years as a result of the abundant age-4 year class that averaged 7.1 in. A relatively small percentage of bass measured at least 14 in (8%). However, the 2001 and 2002 year classes of bass were within a year or two of attaining legal size. With anglers releasing around 90% of the legal largemouth they catch, these two year classes should provide for some excellent bass fishing action for several years.

Besides bluegill and bass, other sport fish that were fairly well represented in the survey included: channel catfish, walleye, perch, redear sunfish, and white bass. As the result of stockings in 2003 (7,000 fish) and 2004 (5,070 fish), catfish were more prevalent in 2005 than 2002. Anglers took advantage of this, as catfish was one of the few species to see an increase in the number of fish harvested in 2005 versus 2003. Channel cats were given another boost in 2006 when 5,000 surplus fish were stocked.

Although the number of walleye collected paled in comparison to the number of bass sampled, they appear to be aiding bass in providing predatory pressure on a number of species at Summit Lake. Even fewer perch were collected in 2005 than in 2002, but nearly a third were at least 8 in and growth seems to have improved as age-3 perch (7.7 in) were nearly as big as perch at age-5 collected in 2002 (8.0 in). More white bass were found in 2005 than in 2002, but most of these were older fish (93% age 4 or older and 14 in or larger) indicating that bass and walleye may be keeping their numbers in check. The presence of quality size panfish such as redear to nearly 10 in and bluegill upwards of 9 in would not be possible without significant predation on them. These predator populations also serve to keep other fish such as carp and white suckers from reaching nuisance levels. Therefore, even though walleye harvest and angler preference for them were lower in 2005 than in 2003, walleye stockings should continue. The recommended annual stocking is 70,000 walleye fingerlings (100/acre). Walleye stockings will continue to periodically be evaluated, as will the fishery, and if necessary walleye stocking recommendations will be modified. The next fall walleye evaluation is scheduled for 2010.

With the variety and quality of fish available at Summit Lake it is no surprise that the lake continues to receive quite a bit of fishing pressure. While fewer anglers were estimated to have visited Summit between April and October of 2005 than in 2003, the number of hours they fished was similar. Most of those hours were spent targeting bass (43%) or seeking bluegill or bluegill and some other species (34%).

The overall number of fish harvested was approximately 30% lower in 2005 than in

2003. This was primarily the result of the declines in the harvest of bluegill (20% fewer), perch (65%), and crappie (62%). Although fewer of those species were harvested, anglers targeting these species were still fairly successful as the average size of those kept was slightly better and preference harvest rates were not much lower than they were in 2003.

The primary purpose of the surveys in 2005 was to justify the recommendation from 2003 for a bluegill bag limit, and if warranted, to better determine what that limit should be. The bag limit was proposed for a number of reasons. First, there had been a steady decline in the number of 8.5 in and larger bluegill found in surveys from 1990 to 2003. Second, harvest appeared to be significant enough to be limiting the number of bigger bluegill as 93% of harvested bluegill in 2003 measured 8 in or less. Third and finally, a fair portion of bluegill anglers felt that in recent years they had been catching fewer and smaller bluegill as the result of increased fishing pressure and harvest, which was supported by the fact that 74% of interviewed anglers in 2003 supported a bag limit.

Survey results in 2005 did not identify the need for a bag limit as clearly as results from the 2003 angler survey and 2002 community survey. In 2005, 2.8% of the 5 in and larger bluegill were at least 8.5 in. This was a considerable improvement from 2002 (0.3%) and similar to the level observed in 1998 (2.4%). Also, 8.5 in and 9.0 in and larger bluegill accounted for much more of the harvest in 2005 than in 2003, 31% at least 8.5 in and 11% at least 9 in in 2005 versus 7% and 1%, respectively, in 2003.

However, it was apparent that a substantial number of 8 in and larger bluegill were harvested in 2005. Based on the creel results and population estimate, over 60% of the 8 in and larger fish were harvested and this does not include any harvest that occurred in the four months not surveyed. Had the ice fishing season lasted for two months or more which is common (Dan Robinson, personal communication), it is conceivable that harvest would have been significantly greater. Even though the ice fishing season lasted less than a month, nearly a third of the cumulative bluegill harvest occurred during that time. This high rate of harvest coupled with whatever natural mortality is for 8 in and larger bluegill makes it clear that overall annual mortality for this group of fish is substantial.

To maintain the quality bluegill fishing requires consistent recruitment and good growth. Bluegill growth remains good as evidenced by the fact age-4 fish averaged 7.1 in. However, recruitment can and is variable as evidenced by the lack of age-3 bluegill compared to age-4

bluegill. Without limiting harvest enough to protect a substantial number of quality size fish from being harvested annually, fishing success is likely to vary from year to year depending on year class strength. For example, once most of the age-4 year class of bluegill is removed from the population via angling and natural mortality and is replaced by the age-3 year class, there will likely be fewer quality bluegill caught than in the year when the age-4 class dominated anglers' creels. It is situations like this where if there was a restrictive enough bag limit to ensure that a sizeable number of the quality size fish were protected each year, angling success may be more consistent from year to year even when there is variable recruitment.

While an overwhelming majority of anglers voiced support for a bluegill bag limit, this was for a limit that ranged from 15 to 25 fish. Unfortunately, to make a noticeable difference in the quality of bluegill fishing, a more restrictive bag limit than 15 would likely be needed. According to a study done on multiple lakes in Minnesota, a significant reduction in harvest is needed for the regulation to be effective (Jacobson 2005). For their project, Minnesota implemented a 10 fish bag limit which on average reduced harvest by 39%. Had there been a bag limit of 15 bluegill at Summit Lake in 2005, this would have affected about 11% of the open water anglers (Table 10) and only reduced harvest by 12% from April through October (Table 11). Roughly 16% of the ice fishing parties interviewed that had completed their fishing trip would have been impacted by a 15 fish limit. Had the limit been 25 fish, which seemed to be the preferred proposal, harvest would have only been reduced by about 4% during the open water creel and would have only affected 3% of the open water anglers and 8% of those ice fishing.

To annually reduce harvest by at least 20% would require a bag limit of 10 fish or less. This would have reduced the open water harvest by nearly 24% in 2005 and 32% in 2003. Many anglers would have also been impacted in 2005 by a 10 fish limit: 20% of the open water anglers and at least 28% of the ice fishing parties. Due to how restrictive a limit it would take to reduce harvest to the levels suggested by Jacobson (2005) and the impact it would have on anglers, a bag limit is not being proposed at this time. Implementing such a restrictive bag limit might cause quite a few anglers not to fish the lake, especially those anglers that do not live close by. If that were to happen and angling pressure were considerably less, enough harvest may not occur to sustain the good bluegill growth. Although a bag limit is not being proposed, DFW has discussed a statewide bag limit for panfish which includes bluegill, redear sunfish, and other sunfish (crappie limits will remain separate). Preliminary discussions have been about a 25 fish

limit. If this comes to fruition, it will be applied at Summit Lake.

Summit Lake will continue to be surveyed periodically and the bluegill fishery will be monitored during community surveys. If drastic changes are found in the bluegill fishery, then the idea of implementing a bag limit may be revisited. In the meantime, anglers that are concerned that over-harvest is limiting the fishery are encouraged to practice selective harvest and not to take more bluegill than they really need. The next community survey at Summit Lake should be conducted in 2010 or 2011.

### RECOMMENDATIONS

- A bluegill bag limit is not recommended at this time. Should a statewide limit be adopted, it will also be enacted at Summit Lake.
- The next community survey at Summit Lake should be conducted in 2010 or 2011.
- The next fall walleye evaluation should be conducted in 2010.
- Fingerling walleye should continue to be stocked annually at the rate of 100/acre (70,000 total).

### LITERATURE CITED

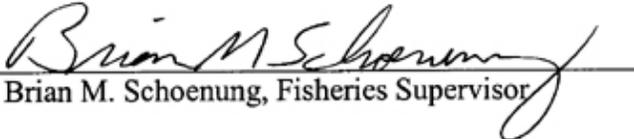
- Anderson, R.O. and R.M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-481 in B.R. Murphey and D.W. Willis, editors. Fisheries Techniques, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- Ball, R.L. and J.N. Tousignant. 1996. The Development of an Objective Rating System to Assess Bluegill Fishing in Lakes and Ponds, Research Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, Indiana. 18pp.
- Indiana Division of Fish and Wildlife. 2001. Manual of fisheries survey methods. Indiana Department of Natural Resources. Indianapolis, Indiana. 67pp.
- Indiana Division of Fish and Wildlife. 2006. Tier II aquatic vegetation survey protocol. Indiana Department of Natural Resources. Indianapolis, Indiana. 23pp.
- Jacobson, P.C. 2005. Experimental analysis of a reduced daily bluegill limit in Minnesota. North American Journal of Fisheries Management 25:203-210.
- Pearson, J. 2004. A proposed sampling method to assess occurrence, abundance, and distribution of submersed aquatic plants in Indiana lakes. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, Indiana. 37pp.

Keller, D.C. 2003. Summit Lake, 2002 Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, Indiana. 23pp.

U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Wisener, J.R. 2004. Evaluation of angler harvest and walleye stockings at Summit Lake, 2003 Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, Indiana. 18pp.

Submitted by: J. Rhett Wisener, Fisheries Biologist  
Date: December 3, 2009

Approved by:   
Brian M. Schoenung, Fisheries Supervisor

Date: December 30, 2009

Table 1. Monthly and season estimates of fishing pressure, number of anglers, and overall harvest rates at Summit Lake, April 1 to October 31, 2005.

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>TOTAL</u>
Fishing Pressure (hrs)	13,378	13,449	14,023	10,999	12,312	9,372	7,769	81,302
Fishing Pressure (hrs/ac)	19.11	19.21	20.03	15.71	17.59	13.39	11.10	116.15
No. of Anglers	2,642	2,429	2,835	2,086	2,200	1,864	1,592	15,648
No. of Anglers / Acre	3.77	3.47	4.05	2.98	3.14	2.66	2.27	22.35
No. of Fish Harvested	5,909	2,783	2,739	4,604	12,397	4,730	1,969	35,131
Harvest Rate (fish/hr)	0.442	0.207	0.195	0.419	1.007	0.505	0.253	0.432

Table 2. Summary of estimated harvest and yield for Summit Lake, April 1 to October 31, 2005.

	<u>Harvest</u>		<u>Yield</u>	
	<u>Number</u>	<u>Percent</u>	<u>Pounds</u>	<u>Percent</u>
Bluegill	28,550	81.3%	10,433.26	71.8%
Yellow perch	2,528	7.2%	787.47	5.4%
Crappie	2,433	6.9%	902.33	6.2%
Channel catfish	575	1.6%	906.56	6.2%
Largemouth bass	489	1.4%	1,079.91	7.4%
Redear sunfish	359	1.0%	150.06	1.0%
Walleye	106	0.3%	221.85	1.5%
Bullhead	67	0.2%	37.19	0.3%
Miscellaneous sunfish	24	0.1%	9.12	0.1%
<b>TOTAL</b>	<b>35,131</b>		<b>14,527.76</b>	

Table 3. Monthly and seasonal angler preference (% of all anglers) by species at Summit Lake, April 1 to October 31, 2005.

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>TOTAL</u>
Largemouth bass	45.6%	53.6%	50.9%	44.5%	30.2%	38.8%	32.8%	43.4%
Bluegill	6.6%	6.5%	9.3%	26.3%	61.0%	45.5%	37.8%	25.1%
Anything	18.1%	16.4%	20.2%	19.4%	3.3%	10.0%	17.8%	15.3%
Bluegill / Crappie	14.4%	13.7%	12.1%	2.9%	---	---	0.6%	7.2%
Crappie	7.5%	6.0%	1.1%	1.1%	1.5%	0.4%	3.0%	3.1%
Bluegill / Yellow perch	1.2%	0.2%	3.5%	3.6%	1.0%	0.8%	---	1.6%
Yellow perch	1.5%	---	---	0.8%	1.2%	2.0%	6.6%	1.4%
Largemouth / Other	2.5%	0.6%	2.1%	0.1%	0.4%	0.4%	0.6%	1.1%
Yellow perch / Crappie	1.9%	1.8%	---	---	---	---	---	0.6%
Walleye	0.2%	0.2%	0.4%	0.9%	0.8%	---	---	0.3%
Catfish	---	---	---	---	0.6%	1.0%	0.9%	0.3%
Largemouth / Walleye	---	1.0%	0.2%	0.4%	---	0.1%	---	0.3%
Walleye / Other	0.1%	---	0.3%	---	---	0.9%	---	0.2%
Other	0.4%	---	---	---	---	---	---	0.1%

Table 4. Monthly and seasonal harvest rates in fish per hour at Summit Lake, April 1 to October 31, 2005.

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>TOTAL</u>
Bluegill	0.307	0.111	0.145	0.347	0.956	0.460	0.129	0.351
Yellow perch	0.041	0.028	0.017	0.036	0.020	0.019	0.071	0.031
Crappie	0.084	0.051	0.005	0.008	0.003	0.013	0.041	0.030
Channel catfish	---	---	0.006	0.008	0.020	0.011	0.007	0.007
Largemouth bass	0.006	0.012	0.009	0.006	0.002	0.001	0.002	0.006
Redear sunfish	< 0.001	0.003	0.010	0.009	0.002	0.001	0.004	0.004
Walleye	0.002	0.001	0.002	0.001	0.002	---	< 0.001	0.001
Bullhead	< 0.001	< 0.001	---	0.004	0.001	---	0.001	0.001
Miscellaneous sunfish	0.001	---	0.001	---	---	---	---	< 0.001

Table 5. Monthly and seasonal preference harvest rates in fish per hour for the dominant species harvested at Summit Lake, April 1 to October 31, 2005.

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>TOTAL</u>
Bluegill	1.524	0.333	0.647	1.111	1.474	0.872	0.312	1.008
Yellow perch	0.583	---	---	0.314	0.386	0.613	0.549	0.520
Crappie	0.252	0.817	0.000	0.000	0.123	4.994	0.702	0.401

Table 6. Monthly and seasonal catch and release for largemouth bass and walleye at Summit Lake, April 1 to October 31, 2005.

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>TOTAL</u>
Largemouth < 14in released	1,826	6,075	4,269	3,327	1,561	2,082	1,572	20,712
Release Rate (fish/hr)	0.136	0.452	0.304	0.302	0.127	0.222	0.202	0.255
Largemouth >= 14in released	848	907	920	464	558	564	333	4,594
Release Rate (fish/hr)	0.063	0.067	0.066	0.042	0.045	0.060	0.043	0.057
Walleye < 14in released	6	249	153	89	19	7	47	570
Release Rate (fish/hr)	0.000	0.019	0.011	0.008	0.002	0.001	0.006	0.007
Walleye >= 14in released	16	17	50	5	0	0	0	88
Release Rate (fish/hr)	0.001	0.001	0.004	< 0.001	---	---	---	0.001

Table 7. Monthly and seasonal preference catch rates in fish per hour for largemouth bass and walleye at Summit Lake, April 1 to October 31, 2005.

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>TOTAL</u>
Largemouth bass (all sizes)	0.373	0.755	0.588	0.665	0.601	0.680	0.526	0.607
Largemouth bass (>=14 in)	0.138	0.124	0.119	0.074	0.161	0.153	0.106	0.123
Walleye	0.000	0.234	0.073	0.000	0.193	---	---	0.092

Table 8. Species, proportion of observed harvest, and estimated number harvested from Summit Lake, December, 2005.

<u>Species</u>	<u>Proportion of observed harvest</u>	<u># harvested</u>	<u>SE</u>	<u>95% CI</u>
Bluegill	0.883107089	13,550	2789.52	5579.04
Yellow perch	0.042986425	660	615.44	1230.89
Redear sunfish	0.042232278	648	610.02	1220.04
Crappie	0.027903469	428	495.85	991.70
Largemouth bass	0.002262443	35	141.19	282.39
Walleye	0.001508296	23	115.28	230.57

Table 9. Comparison of the Summit Lake bluegill population that was available for harvest in 2005 (based on length frequency of fin clipped fish) versus bluegill that were harvested in 2005.

Length (in)	ave. weight (lbs)	Bluegill Available for Harvest					Harvested Bluegill				
		LF of marked blg	total # of blg available	# of blg available/acre	total lbs of blg available	lbs of blg available/acre	LF of harvested blg	total # of blg harvested	# of blg harvest/acre	total lbs of blg harvested	lbs of blg harvest/acre
5.0	0.09	14.1%	49,411	71	4,501	6	0.3%	146	***	13	***
5.5	0.12	8.7%	30,617	44	3,689	5	0.4%	154	***	19	***
6.0	0.16	12.4%	43,348	62	6,745	10	1.8%	776	1	121	***
6.5	0.20	19.9%	69,721	100	13,728	20	4.1%	1,732	2	341	***
7.0	0.24	18.6%	65,174	93	15,955	23	12.8%	5,383	8	1,318	2
7.5	0.30	14.6%	51,230	73	15,359	22	20.5%	8,644	12	2,592	4
8.0	0.36	8.1%	28,191	40	10,219	15	28.9%	12,182	17	4,416	6
8.5	0.43	3.2%	11,216	16	4,859	7	20.5%	8,645	12	3,745	5
9.0	0.51	0.3%	1,213	2	621	1	5.9%	2,471	4	1,266	2
9.5	0.60						2.5%	1,036	1	622	1
10.0	0.70						1.2%	512	1	357	1
10.5	0.81						0.5%	216	***	174	***
11.0	0.92						0.3%	108	***	100	***
11.5	1.05						0.2%	76	***	80	***
12.0	1.19						0.0%	19	***	23	***
TOTAL			350,120	500	75,676	108		42,100	60	15,186	22

\*\*\* less than 1 bluegill or 1 lb harvested per acre

Table 10. Four potential bluegill bag limits and the number of bluegill parties that would have been impacted at Summit Lake, April 1 to October 31, 2005.

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>TOTAL</u>
Bluegill parties	342	292	374	395	764	546	378	3,091
No. bluegill parties harvesting 25 blg per person	23	5	0	8	48	5	0	89
Bluegill parties affected by 25 fish bag limit	1 in 15	1 in 58	0	1 in 49	1 in 16	1 in 109	0	1 in 35
No. bluegill parties harvesting 20 blg per person	38	5	9	15	84	24	0	175
Bluegill parties affected by 20 fish bag limit	1 in 9	1 in 58	1 in 42	1 in 26	1 in 9	1 in 23	0	1 in 18
No. bluegill parties harvesting 15 blg per person	60	14	14	43	144	66	8	349
Bluegill parties affected by 15 fish bag limit	1 in 6	1 in 21	1 in 27	1 in 9	1 in 5	1 in 8	1 in 47	1 in 9
No. bluegill parties harvesting 10 blg per person	105	21	29	77	294	126	8	660
Bluegill parties affected by 10 fish bag limit	1 in 3	1 in 14	1 in 13	1 in 5	1 in 3	1 in 4	1 in 47	1 in 5

Table 11. Four potential bluegill bag limits and the impact they would have had on bluegill harvest from April 1 through October 31, 2003 and 2005.

<u>2005</u>									
	<u>No Limit</u>	<u>25 blg</u>	<u>% change</u>	<u>20 blg</u>	<u>% change</u>	<u>15 blg</u>	<u>% change</u>	<u>10 blg</u>	<u>% change</u>
April	4,108	3,892	5.3%	3,709	9.7%	3,371	17.9%	2,819	31.4%
May	1,495	1,486	0.6%	1,462	2.2%	1,391	7.0%	1,288	13.8%
June	2,040	2,040	0.0%	2,021	0.9%	1,970	3.4%	1,804	11.6%
July	3,819	3,414	10.6%	3,357	12.1%	3,197	16.3%	2,797	26.8%
Aug	11,776	11,373	3.4%	11,053	6.1%	10,280	12.7%	8,700	26.1%
Sept	4,310	4,285	0.6%	4,245	1.5%	4,060	5.8%	3,543	17.8%
Oct	1,002	1,002	0.0%	1,002	0.0%	968	3.4%	884	11.8%
Total	28,550	27,492	3.7%	26,849	6.0%	25,237	11.6%	21,835	23.5%

<u>2003</u>									
	<u>No Limit</u>	<u>25 blg</u>	<u>% change</u>	<u>20 blg</u>	<u>% change</u>	<u>15 blg</u>	<u>% change</u>	<u>10 blg</u>	<u>% change</u>
April	857	857	0.0%	857	0.0%	857	0.0%	851	0.7%
May	1,910	1,910	0.0%	1,888	1.2%	1,858	2.7%	1,733	9.3%
June	14,606	13,373	8.4%	12,668	13.3%	11,423	21.8%	9,160	37.3%
July	2,019	1,904	5.7%	1,843	8.7%	1,782	11.7%	1,692	16.2%
Aug	5,638	5,563	1.3%	5,071	10.1%	4,341	23.0%	3,485	38.2%
Sept	8,029	7,012	12.7%	6,565	18.2%	5,877	26.8%	5,037	37.3%
Oct	2,293	2,261	1.4%	2,236	2.5%	2,211	3.6%	2,084	9.1%
Total	35,352	32,880	7.0%	31,128	11.9%	28,349	19.8%	24,042	32.0%

Appendix 1. Probabilities used in the 2005 non-random creel survey at Summit Lake.

---

Sampling Site Probability		Probability
Location		
	East Ramp	0.605
	West Ramp	0.320
	Campground Ramp	0.075
Time of Day Probability		Probability
Period		
	6:30 am to 2:00 pm	0.25
	2:00 pm to 9:30 pm	0.75
Day of Week Probability		Probability
	Weekend	0.051
	Weekday	0.025

---

Appendix 2. Actual number of parties and percent of total parties interviewed by Indiana counties represented in the creel survey at Summit Lake from April 1 to October 31, 2005.

---

<u>County</u>	<u>Number of Parties</u>	<u>Percent</u>
Henry	456	35.7%
Madison	205	16.1%
Delaware	200	15.7%
Marion	91	7.1%
Hancock	58	4.5%
Wayne	58	4.5%
Out-of-State	39	3.1%
Randolph	35	2.7%
Grant	30	2.3%
Hamilton	26	2.0%
Huntington	13	1.0%
Dekalb	7	0.5%
Wells	7	0.5%
Blackford	6	0.5%
Jay	5	0.4%
Rush	5	0.4%
Tipton	5	0.4%
Franklin	4	0.3%
Jennings	4	0.3%
Elkhart	3	0.2%
Fayette	3	0.2%
Hendricks	3	0.2%
Howard	3	0.2%
Scott	3	0.2%
Allen	2	0.2%
Fulton	2	0.2%
Johnson	2	0.2%
Morgan	2	0.2%
14 Counties with 1 party		
<b>TOTAL</b>	<b>1,277</b>	

---

Appendix 3. Monthly estimated number of fish harvested at Summit Lake, April 1 to October 31, 2005.

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>TOTAL</u>
Bluegill	4,108	1,495	2,040	3,819	11,776	4,310	1,002	28,550
Yellow perch	548	377	234	399	242	180	548	2,528
Crappie	1,121	689	68	84	35	118	318	2,433
Channel catfish	0	0	85	83	249	105	53	575
Largemouth bass	83	166	123	66	30	7	14	489
Redear sunfish	6	37	147	102	29	10	28	359
Walleye	24	16	34	10	20	0	2	106
Bullhead	3	3	0	41	16	0	4	67
Miscellaneous sunfish	16	0	8	0	0	0	0	24
<b>TOTAL</b>	<b>5,909</b>	<b>2,783</b>	<b>2,739</b>	<b>4,604</b>	<b>12,397</b>	<b>4,730</b>	<b>1,969</b>	<b>35,131</b>

Appendix 4. Estimated number by size and estimated weight of the dominant species harvested at Summit Lake, April 1 to October 31, 2005.

---

**Crappie**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
6.0	14	0.6%	0.11	1.50
6.5	41	1.7%	0.14	5.82
7.0	159	6.5%	0.18	27.93
7.5	325	13.4%	0.22	71.31
8.0	359	14.8%	0.26	94.62
8.5	359	14.8%	0.32	113.35
9.0	353	14.5%	0.38	134.79
9.5	304	12.5%	0.46	140.09
10.0	235	9.7%	0.53	123.38
10.5	194	8.0%	0.60	116.51
11.0	48	2.0%	0.71	34.35
11.5	21	0.9%	0.85	17.56
12.0	14	0.6%	0.97	13.46
12.5	7	0.3%	1.11	7.67
<b>TOTAL</b>	<b>2,433</b>			<b>902.33</b>

**Bluegill**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
5.0	25	0.1%	0.09	2.31
5.5	57	0.2%	0.12	6.88
6.0	438	1.5%	0.16	68.10
6.5	1116	3.9%	0.20	219.81
7.0	3692	12.9%	0.24	903.72
7.5	6108	21.4%	0.30	1,831.28
8.0	8233	28.8%	0.36	2,984.56
8.5	5626	19.7%	0.43	2,437.30
9.0	1662	5.8%	0.51	851.54
9.5	698	2.4%	0.60	419.13
10.0	476	1.7%	0.70	332.25
10.5	216	0.8%	0.81	173.85
11.0	108	0.4%	0.92	99.66
11.5	76	0.3%	1.05	80.17
12.0	19	0.1%	1.19	22.71
<b>TOTAL</b>	<b>28,550</b>			<b>10,433.26</b>

**Yellow perch**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
6.0	37	1.5%	0.08	3.14
6.5	102	4.0%	0.11	11.44
7.0	283	11.2%	0.14	40.47
7.5	406	16.1%	0.18	74.38
8.0	385	15.2%	0.22	83.75
8.5	321	12.7%	0.27	86.58
9.0	278	11.0%	0.33	91.71
9.5	214	8.5%	0.40	86.23
10.0	171	6.8%	0.48	82.28
10.5	96	3.8%	0.55	53.32
11.0	123	4.9%	0.65	79.90
11.5	48	1.9%	0.72	34.77
12.0	43	1.7%	0.87	37.28
12.5	11	0.4%	0.93	9.91
13.0	11	0.4%	1.15	12.29
TOTAL	2,528			787.47

**Largemouth bass**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
14.0	130	26.7%	1.38	180.40
14.5	91	18.7%	1.56	142.77
15.0	46	9.3%	1.74	79.43
15.5	46	9.3%	1.92	87.58
16.0	39	8.0%	2.15	84.27
16.5	20	4.0%	2.36	46.09
17.0	20	4.0%	2.62	51.34
17.5	13	2.7%	2.84	37.07
18.0	7	1.3%	3.18	20.74
18.5	13	2.7%	3.54	46.18
19.0	7	1.3%	3.82	24.89
20.0	52	10.7%	4.57	238.29
22.0	7	1.3%	6.27	40.86
TOTAL	489			1,079.91

**Channel catfish**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
8.0	16	2.8%	0.15	2.36
8.5	16	2.8%	0.17	2.73
9.0	32	5.6%	0.20	6.51
9.5	40	7.0%	0.23	9.48
10.0	57	9.9%	0.28	15.65
10.5	49	8.5%	0.33	16.01
11.0	49	8.5%	0.38	18.37
11.5	65	11.3%	0.43	27.94
12.0	40	7.0%	0.49	19.85
12.5	16	2.8%	0.56	9.13
13.0	24	4.2%	0.67	16.20
13.5	8	1.4%	0.73	5.94
15.0	8	1.4%	1.03	8.38
15.5	8	1.4%	1.17	9.51
16.0	16	2.8%	1.33	21.62
16.5	8	1.4%	1.51	12.20
17.0	8	1.4%	1.66	13.46
18.0	8	1.4%	2.02	16.35
19.0	8	1.4%	2.46	19.96
20.0	8	1.4%	2.95	23.90
21.0	24	4.2%	3.43	83.44
23.0	24	4.2%	4.74	115.22
23.5	16	2.8%	5.23	84.67
26.5	8	1.4%	7.83	63.40
28.5	8	1.4%	10.91	88.32
29.0	8	1.4%	11.97	96.94
29.5	8	1.4%	12.23	99.01
TOTAL	583			906.56

**Miscellaneous sunfish**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
8.0	24	100.0%	0.38	9.12

**Redear sunfish**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
6.5	35	9.8%	0.20	7.03
7.0	65	18.0%	0.25	16.36
7.5	65	18.0%	0.31	20.26
8.0	53	14.8%	0.38	20.07
8.5	41	11.5%	0.46	18.79
9.0	41	11.5%	0.56	23.16
9.5	29	8.2%	0.67	19.65
10.0	18	4.9%	0.78	13.76
10.5	12	3.3%	0.93	10.98
<b>TOTAL</b>	<b>359</b>			<b>150.06</b>

**Walleye**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
14.0	17	15.8%	0.90	15.00
14.5	22	21.1%	1.00	22.30
15.0	6	5.3%	1.13	6.31
15.5	6	5.3%	1.25	6.98
16.0	6	5.3%	1.34	7.46
16.5	6	5.3%	1.47	8.20
17.0	6	5.3%	1.66	9.26
17.5	17	15.8%	1.83	30.63
20.0	6	5.3%	2.87	15.99
23.0	6	5.3%	4.54	25.31
24.0	6	5.3%	5.74	32.02
26.0	6	5.3%	7.60	42.40
<b>TOTAL</b>	<b>106</b>			<b>221.85</b>

**Bullhead**

<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
8.5	10	14.3%	0.26	2.46
9.0	16	23.8%	0.32	5.16
9.5	10	14.3%	0.37	3.49
10.0	3	4.8%	0.47	1.48
11.0	10	14.3%	0.65	6.22
11.5	6	9.5%	0.81	5.15
12.0	6	9.5%	0.87	5.55
12.5	3	4.8%	1.00	3.17
13.5	3	4.8%	1.41	4.50
<b>TOTAL</b>	<b>67</b>			<b>37.19</b>

---

Appendix 5. Actual number of parties and percent of total parties interviewed by Indiana counties represented in the creel survey at Summit Lake, December, 2005.

---

<u>County</u>	<u>Number of Parties</u>	<u>Percent</u>
Henry	50	33.6%
Delaware	27	18.1%
Madison	15	10.1%
Grant	14	9.4%
Marion	9	6.0%
Wayne	7	4.7%
Allen	3	2.0%
Huntington	3	2.0%
Adams	2	1.3%
Cass	2	1.3%
Elkhart	2	1.3%
Morgan	2	1.3%
Noble	2	1.3%
Out-of-State	2	1.3%
Blackford	1	0.7%
Boone	1	0.7%
Hamilton	1	0.7%
Hendricks	1	0.7%
Howard	1	0.7%
Johnson	1	0.7%
Randolph	1	0.7%
Wells	1	0.7%
Whitley	1	0.7%
TOTAL	149	

---

Appendix 6. Estimated number by size and estimated weight of bluegill harvested at Summit Lake, December, 2005.

<b>Bluegill</b>				
<u>Size</u>	<u>Number</u>	<u>Percentage</u>	<u>Estimated Ave. weight</u>	<u>Total weight</u>
5.0	121	0.9%	0.09	11.02
5.5	97	0.7%	0.12	11.69
6.0	338	2.5%	0.16	52.59
6.5	616	4.5%	0.20	121.29
7.0	1691	12.5%	0.24	413.96
7.5	2536	18.7%	0.30	760.29
8.0	3949	29.1%	0.36	1,431.51
8.5	3019	22.3%	0.43	1,307.83
9.0	809	6.0%	0.51	414.53
9.5	338	2.5%	0.60	203.04
10.0	36	0.3%	0.70	25.14
<b>TOTAL</b>	<b>13,550</b>			<b>4,752.90</b>

# LAKE SURVEY REPORT

Type of Survey	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
----------------	---	---

Lake Name Summit Lake	County Henry	Date of survey (Month, day, year) 5/17-19/2005
Biologist's name J. Rhett Wisener		Date of approval (Month, day, year) 12/30/2009

LOCATION		
Quadrangle Name Mount Pleasant	Range 11 E	Section 4,5,6,7,8,18
Township Name 18N	Nearest Town New Castle	

ACCESSIBILITY					
State owned public access site Summit Lake State Park		Privately owned public access site None		Other access site	
Surface acres 700+	Maximum depth 47 ft	Average depth	Acre feet	Water level	Extreme fluctuations
Location of benchmark					

INLETS		
Name Big Blue River	Location East end	Origin T18N,R11E,S20,NE1/4,NE1/4

OUTLETS	
Name Big Blue River	Location West end

Water level control																
<b>POOL</b>	<b>ELEVATION (Feet MSL)</b>	<b>ACRES</b>														
TOP OF DAM																
TOP OF FLOOD CONTROL POOL																
TOP OF CONSERVATION POOL	1069.8	835														
TOP OF MINIMUM POOL																
STREAMBED																
<table border="0"> <tr> <td></td> <td><b>Bottom type</b></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>				<b>Bottom type</b>	<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
	<b>Bottom type</b>															
<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  
Most of the watershed lies within the state park. Outside the state park, the watershed is agricultural.

Development of shoreline  
Three boat ramps, swimming beach, picnic and camping areas all operated by Summit Lake State Park.

Previous surveys and investigations  
Pre-impoundment eradication 1980. Spot-check: 1981, 1982. STD surveys: 1986, 1990, 1996, 1998, 2000, 2002.

Largemouth bass population estimate 1998. Fall walleye evaluation: 1999, 2000, 2001, 2004.

Creel survey 2003.

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
			1.5		1.5
TRAP NETS	Number of traps		Number of Lifts		Total effort
	6		1		6 lifts
GILL NETS	Number of nets		Number of Lifts		Total effort
	12		1		12 lifts
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS			
Color		Turbidity	
green		9 Feet 0 Inches (SECCHI DISK)	
Alkalinity (ppm)*		pH	
Surface: 51.3 Bottom: 51.3		Surface: 9.5 Bottom: 9	
Conductivity:		Air temperature:	
270 microsiemens		°F	
Water chemistry GPS coordinates:			
N		W	

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	63.7		36	52.3		72		
2	63.5		38	52.2		74		
4	63.3		40	52.0		76		
6	63.3		42	51.8		78		
8	61.3		44	51.4		80		
10	61.2		46	51.3		82		
12	60.8		48			84		
14	60.6		50			86		
16	60.4		52			88		
18	60.3		54			90		
20	59.2		56			92		
22	57.6		58			94		
24	56.1		60			96		
26	54.9		62			98		
28	54.0		64			100		
30	53.4		66					
32	52.9		68					
34	52.5		70					

COMMENTS
Dissolved oxygen not measured due to meter malfunction.

\*ppm-parts per million

## Occurrence and Abundance of Submersed Aquatic Plants - Overall

Lake: Summit Lake	Secchi (ft): 7	SE Mean Species / Site: 0.15
Date: 7/25/2005	Littoral Sites w/Plants: 85	Mean Natives / Site: 1.49
Littoral Depth (ft): 14.0	Number of Species: 11	SE Mean Natives / Site: 0.12
Littoral Sites: 93	Max. Species / Site: 6	Species Diversity: 0.85
Total Sites: 100	Mean Species / Site: 2.14	Native Diversity: 0.82

Species	Frequency of	Score Frequency				Dominance
	Occurrence	0	1	3	5	
Eurasian watermilfoil	50	50	33	7	10	20.8
Coontail	42	58	18	14	10	22
American pondweed	36	64	13	18	5	18.4
Sago pondweed	19	81	14	3	2	6.6
Chara	17	83	14	2	1	5
Curlyleaf pondweed	15	85	12	2	1	4.6
Brittle naiad	14	86	12	2	0	3.6
Elodea	10	90	7	2	1	3.6
Southern naiad	8	92	7	1	0	2
Leafy pondweed	2	98	2	0	0	0.4
Water stargrass	1	99	0	1	0	0.6

Other species noted:           cattails and filamentous algae



NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLUEGILL										
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	
1.0	1	0.3	0.01	not aged	19.0					
1.5	8	2.4	0.01	1	19.5					
2.0	7	2.1	0.01	1,2	20.0					
2.5	36	10.6	0.01	1,2	20.5					
3.0	50	14.7	0.02	2	21.0					
3.5	20	5.9	0.03	2	21.5					
4.0	25	7.4	0.04	2	22.0					
4.5	14	4.1	0.06	2,3	22.5					
5.0	13	3.8	0.08	3	23.0					
5.5	21	6.2	0.11	3,4	23.5					
6.0	22	6.5	0.15	3,4	24.0					
6.5	47	13.9	0.20	3,4,5	24.5					
7.0	35	10.3	0.25	4	25.0					
7.5	26	7.7	0.31	4	25.5					
8.0	9	2.7	0.38	4,5	26.0					
8.5	5	1.5	0.47	5	TOTAL	339				
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		180.7/hr		GILL NET CATCH		1.3/lift		TRAP NET CATCH		8.8/lift

**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	0.4	3.82	not aged
1.5					19.5				
2.0					20.0				
2.5	1	0.4	0.01	not aged	20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0	1	0.4	0.05	1	23.0				
5.5					23.5				
6.0	1	0.4	0.09	2	24.0				
6.5	1	0.4	0.12	2	24.5				
7.0	2	0.7	0.15	2	25.0				
7.5	2	0.7	0.19	2	25.5				
8.0	10	3.6	0.23	2	26.0				
8.5	2	0.7	0.28	2	TOTAL	279			
9.0	3	1.1	0.33	2,3					
9.5	14	5.0	0.40	3					
10.0	21	7.5	0.46	3					
10.5	31	11.1	0.54	3,4					
11.0	32	11.5	0.63	3,4					
11.5	48	17.2	0.72	3,4					
12.0	35	12.5	0.82	3,4					
12.5	20	7.2	0.95	3,4					
13.0	15	5.4	1.08	4,5					
13.5	18	6.5	1.20	4					
14.0	9	3.2	1.38	4,5					
14.5	5	1.8	1.56	4,5					
15.0	3	1.1	1.74	4,5,6					
15.5	1	0.4	1.92	not aged					
16.0									
16.5	1	0.4	2.36	not aged					
17.0	2	0.7	2.62	not aged					
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	180.7/hr	GILL NET CATCH	0.7/lift	TRAP NET CATCH	0/lift
----------------------	----------	----------------	----------	----------------	--------

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				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5	1	2.6	3.71	
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5	1	2.6	5.74	
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5	1	2.6	0.17	not aged	26.5	1	2.6	7.45	
9.0	5	12.8	0.20		27.0	1	2.6	7.93	
9.5	2	5.1	0.24		TOTAL	39			
10.0	2	5.1	0.29						
10.5	3	7.7	0.34						
11.0	2	5.1	0.40						
11.5	2	5.1	0.46						
12.0									
12.5									
13.0	3	7.7	0.69						
13.5	3	7.7	0.79						
14.0	3	7.7	0.89						
14.5	2	5.1	1.00						
15.0	4	10.3	1.12						
15.5	2	5.1	1.24						
16.0									
16.5	1	2.6	1.53						
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		1.3/hr		GILL NET CATCH	3.0/lift		TRAP NET CATCH		0.2/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF WALLEYE										
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	2.6	2.37	4	
1.5					19.5					
2.0					20.0	2	5.1	2.87	4	
2.5					20.5					
3.0					21.0					
3.5					21.5	1	2.6	3.60	5	
4.0					22.0	1	2.6	3.70	5	
4.5					22.5	1	2.6	4.12	not aged	
5.0					23.0	1	2.6	4.54	not aged	
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	1	2.6	0.18	1	TOTAL	39				
9.0										
9.5	5	12.8	0.27	1						
10.0	6	15.4	0.31	1						
10.5	1	2.6	0.37	1						
11.0										
11.5										
12.0	1	2.6	0.54	2						
12.5	2	5.1	0.62	2						
13.0	5	12.8	0.72	2						
13.5	1	2.6	0.80	2						
14.0	4	10.3	0.90	2						
14.5	1	2.6	1.00	2						
15.0										
15.5	2	5.1	1.25	2						
16.0										
16.5	1	2.6	1.47	3						
17.0										
17.5										
18.0										
18.5	2	5.1	2.17	3,4						
ELECTROFISHING CATCH		2.7/hr		GILL NET CATCH		2.9/lift		TRAP NET CATCH		0/lift

**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					19.5				
2.0					20.0				
2.5					20.5				
3.0	7	17.9	0.02	1	21.0				
3.5	7	17.9	0.02	1,2	21.5				
4.0	2	5.1	0.02	1	22.0				
4.5					22.5				
5.0	1	2.6	0.05	2	23.0				
5.5	2	5.1	0.07	2	23.5				
6.0	2	5.1	0.08	2	24.0				
6.5	3	7.7	0.11	2,3	24.5				
7.0	2	5.1	0.14	3	25.0				
7.5	1	2.6	0.18	3	25.5				
8.0	1	2.6	0.22	3	26.0				
8.5	2	5.1	0.27	3	TOTAL	39			
9.0	4	10.3	0.33	not aged					
9.5	3	7.7	0.40	not aged					
10.0	1	2.6	0.48	not aged					
10.5	1	2.6	0.55	not aged					
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	16.7/hr	GILL NET CATCH	1.0/lift	TRAP NET CATCH	0.3/lift
----------------------	---------	----------------	----------	----------------	----------

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF COMMON CARP									
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	2	5.6	3.23	
1.5					19.5				
2.0					20.0	2	5.6	3.75	
2.5					20.5	1	2.8	4.03	
3.0					21.0	3	8.3	4.32	
3.5					21.5	1	2.8	4.63	
4.0					22.0	5	13.9	4.95	
4.5					22.5	4	11.1	5.28	
5.0					23.0	2	5.6	5.63	
5.5					23.5				
6.0					24.0	2	5.6	6.37	
6.5					24.5	1	2.8	6.76	
7.0					25.0	2	5.6	7.17	
7.5					25.5				
8.0					26.0	1	2.8	8.03	
8.5					26.5	1	2.8	8.49	
9.0					27.0				
9.5					27.5	1	2.8	9.45	
10.0					28.0				
10.5					28.5	1	2.8	10.49	
11.0					29.0	2	5.6	11.03	
11.5					29.5	1	2.8	11.59	
12.0					TOTAL	36			
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0	1	2.8	1.96	not aged					
16.5	1	2.8	2.15						
17.0									
17.5									
18.0									
18.5	2	5.6	2.99						
ELECTROFISHING CATCH	15.3/hr			GILL NET CATCH	0.4/lift		TRAP NET CATCH	1.3/lift	

**NUMBER, PERCENTAGE, WEIGHT, AND AGE OF REDEAR SUNFISH**

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	1	3.4	0.08	2	23.0				
5.5	1	3.4	0.11	2	23.5				
6.0	4	13.8	0.15	2,3	24.0				
6.5	4	13.8	0.20	2	24.5				
7.0	2	6.9	0.25	2	25.0				
7.5	4	13.8	0.31	2,3	25.5				
8.0	2	6.9	0.38	3,4	26.0				
8.5	5	17.2	0.46	3	TOTAL	29			
9.0	5	17.2	0.56	3					
9.5	1	3.4	0.67	4					
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	17.3/hr	GILL NET CATCH	0/lift	TRAP NET CATCH	0.5/lift
----------------------	---------	----------------	--------	----------------	----------

**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					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					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5	1	4.3	0.19	1	25.5				
8.0					26.0				
8.5					TOTAL	23			
9.0									
9.5									
10.0									
10.5									
11.0	1	4.3	0.57	2					
11.5									
12.0									
12.5									
13.0									
13.5									
14.0	4	17.4	1.14	4					
14.5	7	30.4	1.32	4					
15.0	6	26.1	1.41	5					
15.5	4	17.4	1.58	not aged					
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	8.7/hr	GILL NET CATCH	0.8/lift	TRAP NET CATCH	0/lift
----------------------	--------	----------------	----------	----------------	--------

Bluegill Age-length Key															
Length group (in)	Total #	Sub-sample	Age												
			1	2	3	4	5	6	7	8	9	10	11	12	13
1.0	1	0													
1.5	8	1	8												
2.0	7	4	5	2											
2.5	36	5	14	22											
3.0	50	5		50											
3.5	20	5		20											
4.0	25	5		25											
4.5	14	5		8	6										
5.0	13	5			13										
5.5	21	5			17	4									
6.0	22	5			9	13									
6.5	47	5			9	28	9								
7.0	35	4				35									
7.5	26	5				26									
8.0	9	5				7	2								
8.5	5	2					5								
<b>Total</b>	<b>339</b>	<b>66</b>	<b>28</b>	<b>127</b>	<b>54</b>	<b>114</b>	<b>16</b>								

Yellow perch Age-length Key															
Length group (in)	Total #	Sub-sample	Age												
			1	2	3	4	5	6	7	8	9	10	11	12	13
3.0	7	4	7												
3.5	7	3	5	2											
4.0	2	2	2												
4.5															
5.0	1	1		1											
5.5	2	1		2											
6.0	2	2		2											
6.5	3	3		1	2										
7.0	2	2			2										
7.5	1	1			1										
8.0	1	1			1										
8.5	2	1			2										
9.0	4	0													
9.5	3	0													
10.0	1	0													
10.5	1	0													
<b>Total</b>	<b>39</b>	<b>21</b>	<b>14</b>	<b>8</b>	<b>8</b>										

Largemouth bass Age-length Key

Length group (in)	Total #	Sub-sample	Age													
			1	2	3	4	5	6	7	8	9	10	11	12	13	
2.5	1	0														
3.0																
3.5																
4.0																
4.5																
5.0	1	1	1													
5.5																
6.0	1	1		1												
6.5	1	1		1												
7.0	2	2		2												
7.5	2	2		2												
8.0	10	3		10												
8.5	2	1		2												
9.0	3	2		2	2											
9.5	14	4			14											
10.0	21	5			21											
10.5	31	5			19	12										
11.0	32	5			26	6										
11.5	48	5			19	29										
12.0	35	5			14	21										
12.5	20	5			12	8										
13.0	15	3				10	5									
13.5	18	4				18										
14.0	9	4				5	5									
14.5	5	3				3	2									
15.0	3	3				1	1	1								
15.5	1	0														
16.0																
16.5	1	0														
17.0	2	0														
17.5																
18.0																
18.5																
19.0	1	0														
Total	279	64	1	20	126	113	12	1								

Walleye Age-length Key															
Length group (in)	Total # number	Sub-sample	Age												
			1	2	3	4	5	6	7	8	9	10	11	12	13
8.5	1	1	1												
9.0															
9.5	5	4	5												
10.0	6	5	6												
10.5	1	1	1												
11.0															
11.5															
12.0	1	1		1											
12.5	2	2		2											
13.0	5	5		5											
13.5	1	1		1											
14.0	4	4		4											
14.5	1	1		1											
15.0															
15.5	2	2		2											
16.0															
16.5	1	1				1									
17.0															
17.5															
18.0															
18.5	2	2				1	1								
19.0	1	1					1								
19.5															
20.0	2	2					2								
20.5															
21.0															
21.5	1	1						1							
22.0	1	1						1							
22.5	1	0													
23.0	1	0													
<b>Total</b>	<b>39</b>	<b>35</b>	<b>13</b>	<b>16</b>	<b>2</b>	<b>4</b>	<b>2</b>								

Redear sunfish Age-length Key															
Length group (in)	Total # number	Sub-sample	Age												
			1	2	3	4	5	6	7	8	9	10	11	12	13
5.0	1	1		1											
5.5	1	1		1											
6.0	4	3		3	1										
6.5	4	3		4											
7.0	2	2		2											
7.5	4	3		1	3										
8.0	2	2			1	1									
8.5	5	2			5										
9.0	5	4			5										
9.5	1	1					1								
<b>Total</b>	<b>29</b>	<b>22</b>	<b>0</b>	<b>12</b>	<b>15</b>	<b>2</b>									

White bass Age-length Key

Length group (in)	Total #	Sub-sample	Age												
			1	2	3	4	5	6	7	8	9	10	11	12	13
7.5	1	1	1												
8.0															
8.5															
9.0															
9.5															
10.0															
10.5															
11.0	1	1		1											
11.5															
12.0															
12.5															
13.0															
13.5															
14.0	4	4				4									
14.5	7	3				7									
15.0	6	4						6							
15.5	4	0													
<b>Total</b>	<b>23</b>	<b>13</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>11</b>	<b>6</b>								

Black crappie Age-length Key

Length group (in)	Total #	Sub-sample	Age												
			1	2	3	4	5	6	7	8	9	10	11	12	13
2.5	1	1	1												
3.0															
3.5															
4.0															
4.5															
5.0															
5.5															
6.0															
6.5															
7.0	3	3		2	1										
7.5	1	1		1											
8.0	1	1			1										
8.5	1	1			1										
9.0	2	2			2										
9.5	1	0													
<b>Total</b>	<b>10</b>	<b>9</b>	<b>1</b>	<b>3</b>	<b>5</b>										

Mean length at Capture

**Bluegill**

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	28	2.4	0.20	0.08	2.2	2.5
2	127	3.5	0.37	0.05	3.4	3.6
3	54	5.8	0.39	0.09	5.6	6.0
4	114	7.1	0.37	0.06	7.0	7.2
5	16	7.5	0.93	0.24	7.1	8.0

**Largemouth bass**

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	1	5.3				
2	20	8.0	0.54	0.17	7.7	8.4
3	126	11.1	0.86	0.08	11.0	11.3
4	113	12.4	1.22	0.10	12.2	12.7
5	12	14.0	0.50	0.20	13.6	14.4
6	1	15.3				

**Walleye**

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	13	10.0	0.23	0.13	9.7	10.2
2	16	13.8	1.03	0.25	13.3	14.3
3	2	17.8	2.00	1.00	15.8	19.8
4	4	19.6	0.56	0.38	18.9	20.4
5	2	22.0	0.13	0.25	21.5	22.5

**Yellow perch**

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	14	3.6	0.14	0.10	3.4	3.8
2	8	5.4	1.35	0.40	4.6	6.2
3	8	7.7	0.67	0.29	7.1	8.3

**Redear sunfish**

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
2	12	6.6	0.51	0.21	6.2	7.0
3	15	8.5	0.82	0.23	8.0	9.0
4	2	9.0	1.13	0.75	7.5	10.5

**White bass**

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	1	7.8				
2	1	11.3				
4	11	14.6	0.06	0.08	14.4	14.7
5	6	15.3	0.00	0.00	15.3	15.3