

HARDY LAKE  
Scott and Jefferson Counties  
2007 Fish Management Report

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## EXECUTIVE SUMMARY

- Hardy Lake is a 741-acre impoundment located in Scott and Jefferson Counties, 6 mi east of Austin and about 3 mi north of State Road 256. Indiana Department of Natural Resources launching permits are required on boats using the lake. More information on Hardy Lake State Recreation Area can be found at <http://www.in.gov/dnr/parklake/6733.htm>.
- A creel survey was conducted at Hardy Lake from April 1 through October 31, 2007. It was estimated that 23,951 anglers fished for 102,409 h to harvest 34,593 fish (47 fish/acre) weighing 17,131 lbs (23 lbs/acre). At Hardy Lake, 53% of angler parties were fishing for largemouth bass, 19% for “anything,” 12% for bluegill, 6% crappie, 1% channel catfish, and 1% for striped bass and hybrid striped bass. Bluegill ranked first by number in the harvest, followed by crappie, redear sunfish, largemouth bass, warmouth, and channel catfish. The estimated economic value of fishing during the creel survey period was \$1,532,864.
- A general lake survey was conducted on June 25 to July 5, 2007. A total of 1,595 fish, representing 16 species and hybrid sunfish, was collected during this survey. Bluegill ranked first by number, followed by gizzard shad and largemouth bass. No stripers or wipers were collected in the fishery survey.
- In the fishery survey, bluegill (1.7 to 9.0 in TL) did not represent a balanced population due to the bluegill proportional stock density (PSD) being below the desired range for a balanced bluegill fishery. Bluegill growth is slower than 2003 and slightly below the district average; however, three 10.0-bluegill were observed in the creel and a slightly greater percentage of quality-size bluegill were harvested in the 2007 creel than in the 2003 creel.
- In the fishery survey, largemouth bass (1.4 to 16.3 in TL) represented a balanced population. The bass PSD has increased from 2003 and moved into the desired range for a balanced bass fishery. In the fishery survey, 15% of the bass were legal size (14.0 in or longer). The mean TL for age-4 bass was 14.3 in. Growth is above average for southeastern Indiana. Anglers report catching bass up to 8 lbs. A greater percentage of legal bass were released in 2007 than in 2003. Perhaps due to the improved bass fishery, a smaller percentage of anglers stated that Hardy Lake needs a largemouth bass slot limit than in 2003.
- Crappie up to 15.5-in were harvested in the creel survey. In the creel and in the fishery survey, 84% and 58% were quality size, respectively. In April and May, 59% of crappie were harvested. Crappie growth is above average for southeastern Indiana.
- Submersed aquatic vegetation was sampled on August 1 and 2, 2007. Submersed vegetation was found to a maximum depth of 15.0 ft. Eurasian watermilfoil (an exotic species) dominated the plant community. Boaters need to continue to clean their boats before leaving Hardy Lake for another body of water to prevent further spread of this exotic plant species.
- In Hardy Lake, the DFW should maintain the 14.0-in minimum size limit on largemouth bass, continue to annually stock 7,410 hybrid striped bass fingerlings, and continue to recommend stocking triploid grass carp to control the abundance of submersed vegetation. It is recommended that the biennial channel catfish stocking be reduced from 4,446 to 2,223.

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## INTRODUCTION

Hardy Lake is a 741-acre impoundment located in Scott and Jefferson Counties, 6 mi east of Austin and about 3 mi north of State Road 256. Access includes four boat ramps; the lake has no outboard restrictions. The Division of Parks and Reservoirs manages the property, so Indiana Department of Natural Resources launching permits are required on boats using the lake. Maps of the property are available from Hardy Lake State Recreation Area, 4171 East Harrod Road, Scottsburg, IN 47170.

The Division of Fish and Wildlife (DFW) manages the fish populations. The DFW stocked largemouth bass, bluegill, redear sunfish, and black crappie into Hardy Lake when construction was completed in 1970. As expected, these species have maintained their populations through natural reproduction. The DFW has stocked other fishes (e.g. channel catfish) into Hardy Lake and maintained them through supplemental stockings due to a lack of natural reproduction (Table 1). Striped bass (“stripers”) and hybrid striped bass (“wipers”) have been stocked by the DFW to utilize gizzard shad and to provide additional fishing opportunities (Table 2). Hardy Lake personnel have stocked triploid grass carp to control submersed vegetation (Table 3). Hardy Lake has a 14.0-in minimum size limit on largemouth bass.

Numerous fishery surveys and several creel surveys have been conducted to monitor fish populations and fish harvest at Hardy Lake. The creel and fishery surveys in 2007 were conducted to evaluate fish population changes since the previous surveys in 2003; all comparisons to the 2003 (and the 1999) creel and fishery surveys will reference Lehman and Kowalik (2005).

## METHODS

### Creel Survey

The angler creel survey was conducted from April 1 through October 31, 2007. The stratified random sampling design for this creel survey was based on non-uniform angler usage probabilities as described by Pollock et al. (1994). Four boat ramps and two shoreline areas were sampled based on angler use probabilities as estimated by the assistant property manager at Hardy Lake (Table 4). The fishing pier at the marina was monitored by the creel clerk while on duty at the Alpha Boat Ramp.

The creel clerk’s work assignments were based on activity probabilities as generated by a random numbers table and scheduled for bi-weekly pay periods. In a 14-d pay period, the clerk

worked 7 of 10 weekdays and 3 of 4 weekend days. Fishing activity probabilities representing the time of day (0.4 for the morning shift; 0.6 for the afternoon shift) were also used.

The fishing day was divided into two 7.5-h periods; the clerk sampled only one period each day. The morning period (A shift) ran from 7:00 AM to 2:30 PM in April, May, September, and October and ran from 7:30 AM to 3:00 PM in June, July, and August. The evening period (B shift) ran from 2:30 PM to 10:00 PM in April, May, September, and October and ran from 3:00 PM to 10:30 PM June, July, and August.

The clerk interviewed most angler parties at the end of their fishing trip; however, some shore angler parties still fishing at the end of a work shift were interviewed just before the clerk went off duty. Thus, some interviews are for incomplete fishing trips. Each interview included the start and stop time of fishing trip, number in fishing party, angler preference (based on one angler), and county of residence (based on one angler). Harvested fish were identified, counted, and measured to the nearest 0.5 in TL. The number of largemouth bass, hybrid striped bass, and striped bass caught and released was recorded. One angler from each party was asked to rate their satisfaction with their fishing experience at Hardy Lake for that day.

Expansion factors were applied to the daily observation totals for each observed category as described in Pollock (1994) to provide projections of monthly lake-wide fishing pressure and harvest, and catch-and-release. Since the 2003 data was expanded differently (e.g. weekend days and holidays were weighted stronger than weekdays in 2003), comparisons between 2003 and 2007 creel survey results may reflect those differences. Yield estimates were determined by average weights for fish by half-inch groups for Fish Management District 8. The majority of Hardy Lake crappie are black crappie, but black and white crappie will collectively be referred to as “crappie” in the creel survey. Trotline data for two parties is not included.

### Fishery Survey

A general lake survey was conducted on June 25 to July 5, 2007. Some physical and chemical characteristics of the water were measured in the deepest area of the impoundment according to standard lake survey guidelines (Shipman 2001). Submersed aquatic vegetation was sampled on August 1 and 2, 2007, using guidelines written by Pearson (2004). A GARMIN GPSmap 76 was used to record the location of the limnological data collection site, aquatic vegetation sample sites, and fish collection sites.

Fish were collected by pulsed DC electrofishing along portions of the shoreline on two nights with two dippers for a total of 1.50 h. Three trap nets were fished overnight for two nights. Four experimental-mesh gill nets were fished overnight for three nights. Each net was reset at a new location after one night.

All fish collected (except for a portion of bluegill) were measured to the nearest 0.1 in TL. The length-frequency distribution of 961 bluegill was created based on the proportion by number of each half-inch group of the bluegill subsample of 719. Average weights for fish by half-inch groups for Fish Management District 8 were used to estimate the weight of bluegill, largemouth bass, redear sunfish, black crappie, hybrid sunfish, channel catfish, yellow bullhead, white sucker, and grass pickerel within the sample. Other fishes were weighed in the field to the nearest 0.01 lb. Fish scale samples were taken from selected species for age and growth analysis.

Age-length keys were used to determine population age structure and to calculate mean total length for fish based on their length at capture. Proportional stock density (PSD) and relative stock density (RSD) were calculated using electrofishing data (Anderson and Neumann 1996). The Bluegill Fishing Potential (BGFP) index was used to assess bluegill fishing quality (Ball and Tousignant 1996). The BGFP index uses mean back calculated lengths (instead of mean length at age—which was calculated for this survey) to determine the quality of growth; therefore, the total index score was estimated. This adaptation was approved by Bob Ball, one of the authors of the original index (personal communication).

## RESULTS

### Creel Survey

#### *Fishing Pressure and Harvest Rates*

A total of 154 d were sampled during the 214-d creel period from April 1 through October 31, 2007. During that time, the creel clerk interviewed 2,457 anglers (2,186 boat and 271 shore) from 1,301 angler parties. Angler parties consisted of one to eight anglers, and averaged two anglers per party. Ten boat anglers and two shore anglers left the lake without being interviewed. With the exception of 29 shore anglers, interview data were for completed fishing trips.

After expanding and combining boat and shore data, it was estimated that 23,951 anglers fished for 102,409 h at Hardy Lake during the survey period (Table 5). Total fishing pressure

equaled 138.2 h/acre during the survey, an increase from 108.1 h/acre in 2003. Fishing pressure was greatest in May at 21,183 h and least in September at 9,835 h (Table 5).

The creel clerk came in contact with two angler parties in May and June that were fishing with trotlines. They were recorded but not included in this survey; they had not harvested any fish at the time of the interview.

The overall harvest rate equaled 0.34 fish/h (Table 5), which is less than 2003 (0.71 fish/h) and 1999 (0.44 fish/h). In this survey, the best harvest rate was 0.69 fish/h in May. The lowest harvest rate was 0.06 fish/h in August.

### *Angler Preference*

To measure angler preference, the creel clerk asked each angler party the following question: “What were you fishing for?” Responses fit into 11 categories and were assumed to represent the party (Table 6).

At Hardy Lake, 53% of anglers were fishing for largemouth bass. Anglers from 15 bass tournaments (which involved 3 to 20 boats each) were interviewed and included in the creel survey. After largemouth, 12% of anglers were fishing for bluegill, 6% for crappie, and 1% for channel catfish. Another 7% of the anglers were fishing for various combinations of these four species. In the survey, 19% of anglers did not have a preference for any certain kind of fish, and, therefore, were fishing for “anything.” As in 2003, nearly 1% of anglers were fishing for stripers and wipers. One angler was fishing for muskie, but did not catch any; however, a bluegill angler in April caught and released a 12-lb muskie and an angler fishing for “anything” in April caught and released a 25-lb muskie.

### *Harvest by Number and Weight*

The creel clerk counted and identified 3,914 fish at Hardy Lake during the 7-month creel survey. After expansion of the data, it is estimated that 34,593 fish (47 fish/acre) weighing 17,131 lbs (23 lbs/acre) were harvested during the survey (Table 7). In 2003, it was estimated that 56,580 fish (76 fish/acre) weighing 23,923 lbs (32 lbs/acre) were harvested. As in 2003, bluegill ranked first by number, followed by crappie, redear sunfish, largemouth bass, warmouth, and channel catfish. Average lengths at harvest for the five most popular sport fish at Hardy Lake were very similar to results from the 2003 creel survey. No walleye were harvested in the creel survey; a 16.5-in walleye was harvested in 2003.

Bluegill was the most abundant fish in the harvest by number (46%) and by weight (32%) (Table 7). They ranged from 5.0 to 10.0 in TL, averaging 7.5 in. In the survey, 99% of the bluegill harvested were 6.0 in or longer (i.e. quality size) and 37% were 8.0 in or longer (i.e. preferred size). Three 10.0-in bluegill (i.e. memorable size) were observed in the harvest. Bluegill anglers harvested bluegill at a rate of 0.78 fish/h and accounted for 54% of all bluegill harvested. In May, 44% of bluegill were harvested.

Crappie ranked second by number (22%) and weight (20%) in the harvest (Table 7). They ranged from 5.5 to 15.5 in TL, averaging 9.1 in TL. In the survey, 84% of crappie harvested were 8.0 in or longer (i.e. quality size), 29% were 10.0 or longer (i.e. preferred size), and 4% were 12.0 in or longer (i.e. memorable size). Crappie anglers harvested crappie at a rate of 0.74 fish/h and accounted for 63% of all crappie harvested. In April and May, 59% of crappie were harvested. In the creel survey, only two anglers harvested a daily bag limit of 25 crappie. In April and May, five angler parties reported catching and releasing 30 to 60 crappie (along with harvesting several crappie) during each fishing trip.

Redear sunfish ranked third by number (21%) and fourth by weight (18%) in the harvest (Table 7). They ranged from 5.0 to 10.5 in TL, averaging 8.0 in. In the survey, 96% of the redear harvested were 7.0 in or longer (i.e. quality size) and 15% were 9.0 in or longer (i.e. preferred size). Redear anglers harvested redear at a rate of 0.65 fish/h, but accounted for only 6% of all redear harvested. Anglers fishing for bluegill harvested 41% of all redear. In May, 50% of redear were harvested. In the creel survey, only three anglers harvested a daily bag limit of 25 redear.

Largemouth bass was the fourth most abundant fish in the harvest by number (5%) and third by weight (19%) (Table 7). They ranged from 14.0 to 18.5 in TL, averaging 15.1 in. Bass anglers harvested bass at a rate of only 0.02 fish/h, but accounted for 72% of all bass harvested. As with bluegill, 44% of bass were harvested in May. Ten bass anglers harvested the daily bag limit of five largemouth bass (including one angler that harvested six bass). No sublegal bass were harvested in the creel survey.

Warmouth was the sixth most abundant fish in the harvest by number (5%) and by weight (5%) (Table 7). They ranged from 5.0 to 10.0 in TL, averaging 8.0 in. In the survey, 99% of the warmouth harvested were 6.0 in or longer (i.e. quality size) and 69% were 8.0 in or longer (i.e. preferred size). Anglers fishing for bluegill, redear, and panfish (in general) accounted for 71%

of all warmouth harvested. Bass anglers harvested 21% of all warmouth. In May, 73% of warmouth were harvested.

Channel catfish was the seventh most abundant fish in the harvest by number (1%) and by weight (5%) (Table 7). They ranged from 9.0 to 24.5 in TL, averaging 19.2 in. Catfish anglers harvested channel catfish at a rate of 0.05 fish/h and accounted for 22% of all channel catfish harvested.

In the survey, six stripers (8.0 to 21.0 in) and one wiper (22.0 in) were observed in the harvest. Based on these numbers, an estimated 48 and 9 were harvested, respectively (Table 7). No anglers targeting stripers and wipers harvested these fish.

### *Catch and Release Fishing*

It was estimated that anglers caught and released 50,808 largemouth bass (26% were legal bass) at a rate of 0.50 bass/h (Table 8). In 2003, it was estimated that anglers caught and released 48,892 largemouth bass (16% were legal bass) at a rate of 0.61 bass/h.

During this survey, it was estimated that anglers caught 14,797 legal largemouth bass: 1,787 (12%) were harvested and 13,010 (88%) were released. The total catch rate (harvest rate plus release rate) for legal largemouth at Hardy Lake in this creel survey was 0.14 bass/h, which is similar to 0.11 bass/h in 2003.

The total catch rate for all largemouth at Hardy Lake during this creel survey was 0.51 bass/h. This is a decrease from 0.63 bass/h in 2003, but similar to the 0.49 bass/h in 1999. Bass anglers accounted for 90% of all bass that were caught and released at a rate of 0.84 bass/h. The biggest bass caught by tournament bass anglers in the creel have been near 5 lbs. A bass angler in May reported catching and releasing an 8-lb bass.

Anglers reported that they caught and released 10 stripers (under 17.0 in) and 2 stripers and/or wipers (17.0 in and longer; one of these fish weighed 20 lbs). Based on these numbers, an estimated 83 and 15 were released, respectively (Table 8). Anglers targeting these fish accounted for 50% of the catch, while largemouth bass anglers accounted for the other 50%. In 2003, it was estimated that anglers caught and released 186 stripers and 579 wipers.

### *Angler Satisfaction*

Each angler party was asked the following question: “On a scale of 0 to 10 with 0 being *not satisfied at all* and 10 being *extremely satisfied*, how would you rate your satisfaction with

your fishing experience at Hardy Lake today?” The average satisfaction rating was 5.9, a slight increase from 5.3 in 2003. In the survey, 34% of the angler parties gave a rating of 0 to 4 (i.e. less than satisfied), 20% gave a rating of 5, and 54% gave a rating of 6 to 10 (i.e. satisfied) (Table 9). Anglers are more satisfied now than during the creel survey in 2003. In the previous survey, 34% of the parties were less than satisfied, 19% were in between, and only 46% were satisfied.

Angler parties fishing for redear sunfish (9) gave an average satisfaction rating of 6.4, while angler parties fishing for stripers and wipers (13) gave an average rating of 4.9 (Table 10). Largemouth bass angler parties (742) gave an average satisfaction rating of 6.1.

Each angler party was also asked the following question, “What would increase your satisfaction with your fishing experience at Hardy Lake?” The clerk recorded 1,301 responses, which were sorted into six categories as follows: biological (799), satisfied (308), environmental (i.e. weather) (67), other (47), facilities (41), and social (39).

The biological category contained 61% of the responses. The most common response in the survey was the desire to catch more fish (31%). Other responses were wanting to catch bigger fish (13%), to catch a fish (8%), a largemouth bass slot limit (4%), and less weeds/pads (3%). A few angler parties wanted grass carp removed/reduced, more weeds, and less weed control. Some angler parties wanted to see more largemouth bass, walleye, striper, wiper, and fish (in general) stocked in the lake. Some wanted smallmouth and spotted bass stocked. One angler wanted stripers removed. One angler wanted a smaller largemouth bass size limit and another wanted a 17.0-in size limit. In 2007, a smaller percentage of anglers stated that the lake needed a largemouth bass slot limit than in 2003.

Many angler parties (24%) stated that they were “satisfied” with their fishing experience or did not offer anything that would increase their satisfaction.

Weather-related comments were more common in 2007 (5%) than in 2003 (2%), most likely due to the hot, dry summer and early-fall of 2007. Angler parties said that better weather would make their fishing experience more satisfying. Comments from September and October about the lake’s water level and adding more water into the lake were included in this category.

The “other” category had 4% of the angler parties, which included angler parties that did not comment. Comments included putting more money back into lake and finding a place to get live bait.

The facilities category contained 3% of the responses, which included cutting/marking stumps, providing more places to fish along the shoreline, fixing ramps and docks, cleaning bathrooms, replacing cleaning boards, adding more lights, and cutting grass. Other comments in this category were making the lake bigger and raising the water level. These comments have been passed on to the manager at Hardy Lake.

The social category contained another 3% of the responses, which included reducing/limiting speed of boats, size of boats, number of boats, size of boat motors, and bass tournament pressure. Other comments were enforcing the idle zone, banning jet skis, and reducing fees.

### *Angler Origin*

The creel clerk interviewed angler parties from 47 counties in Indiana and from other states, including Kentucky and Ohio (Table 11). If the party consisted of anglers from more than one county, the location of the angler interviewed was used to represent the party. Of the 1,301 angler parties interviewed during this survey, 22% were from Scott County, where the lake is primarily located. Approximately 54% came from the five counties of Clark, Jackson, Jefferson, Jennings, and Washington immediately adjacent to Scott County. Approximately 21% came from 41 other counties in Indiana and nearly 3% came from outside the state.

### *Economic Value of the Hardy Lake Fishery*

In 2006, the U.S. Fish and Wildlife Service determined that the value of one angler's fishing trip in Indiana was \$64 (U.S. Department of the Interior, et al. 2007). This figure includes expenditures for food, lodging, transportation, equipment, license fees, and related fishing expenditures. Based on the estimated number of anglers, there were 23,951 fishing trips to Hardy Lake during the 7-month period covered by this creel survey. At \$64 per trip, the estimated economic value of fishing during the creel survey period was \$1,532,864. Fishing at Hardy Lake is very important to the local and state economy.

### Fishery Survey

At the time of the fishery survey, the Secchi disk reading was 7.3 ft. Hardy Lake was thermally stratified into warm and cold layers. Dissolved oxygen concentrations were not adequate for fish survival below 12.0 ft.

Submersed vegetation was found to a maximum depth of 15.0 ft. Eurasian watermilfoil (an exotic species) dominated the plant community, was collected at 59% of the sites, and was dense where collected. Coontail was also found frequently throughout the lake.

A total of 1,595 fish, representing 16 species and hybrid sunfish, was collected during this survey. Total weight of the fish sample was approximately 456 lbs. Bluegill ranked first by number, followed by gizzard shad and largemouth bass. Gizzard shad ranked first by weight, followed by five grass carp (30.5 to 42.0 in TL, weighing 114 lbs) and then largemouth bass and bluegill. No stripers or wipers were collected in the fishery survey.

A total of 961 bluegill (1.7 to 9.0 in TL) was sampled that weighed 43 lbs. Relative abundance was 60% by number and 9% by weight. The electrofishing catch rate was 402.0/h, decreasing from 437.3/h in 2003. Bluegill did not represent a balanced population; the bluegill PSD was 3, a decrease from 10 in 2003. In the subsample, 6% of bluegill were 6.0 in or longer (i.e. quality size), a decrease from 11% in 2003. The bluegill RSD-8 was 0 in this survey; however, five bluegill 8.0 in and longer (i.e. preferred size) were collected by gill net.

The mean TL for age-4 bluegill was 6.0 in, indicating bluegill reached quality size during their fifth summer, which is slightly below average for southeastern Indiana. Bluegill growth was slower than in 2003. Assuming *fair* growth, the BGFP index was 8 (i.e. marginal), which is a decline from 16 (i.e. fair) in 2003.

A total of 230 gizzard shad (2.0 to 14.3 in TL) was sampled that weighed 122 lbs. Relative abundance was 14% by number and 27% by weight. The electrofishing catch rate was 72.7/h, decreasing from 132.7/h in 2003. Gizzard shad were not aged.

A total of 106 largemouth bass (1.4 to 16.3 in TL) was sampled that weighed 74 lbs. Relative abundance was 7% by number and 16% by weight. The electrofishing catch rate was 62.0/h, decreasing from 98.0/h in 2003. Largemouth did represent a balanced population; the bass PSD was 49, an increase from 32 in 2003. The bass RSD-15 was 3 in this survey. In this sample, 15% of bass were 14.0 in or longer (i.e. legal size), an increase from 6% in 2003.

The mean TL for age-4 bass was 14.3 in, indicating bass reached legal size by their fifth summer. The average bass in southeastern Indiana reaches 14.0 in during age 5, late in its sixth year of growth. Bass growth was faster than 2003 and above the district average.

A total of 75 redear sunfish (3.0 to 9.4 in TL) was sampled that weighed 23 lbs. Relative abundance was 5% by number and weight. The electrofishing catch rate was 14.7/h, decreasing from 42.0/h in 2003. The redear RSD-7 was 62 and the RSD-9 was 10. In this sample, 68% of

redeer were 7.0 in or longer (i.e. quality size), an increase from 32% in 2003. The mean TL for age-4 redear was 7.6 in, indicating redear reached quality size before their fifth summer. Redear growth was similar to 2003 and was average for southeastern Indiana.

A total of 70 warmouth (2.3 to 8.7 in TL) was sampled that weighed 14 lbs. Relative abundance was 4% by number and 3% by weight. The electrofishing catch rate was 24.0/h, decreasing from 33.3/h in 2003. The warmouth RSD-6 was 41 and the RSD-8 was 3. In this sample, 54% of warmouth were 6.0 in or longer (i.e. quality size), a decrease from 58% in 2003.

A total of 31 black crappie (3.7 to 9.2 in TL) was sampled that weighed 7 lbs. Relative abundance was 2% by number and by weight. As in 2003, the electrofishing catch rate was 0.7/h (one fish). In this sample, 58% of black crappie were 8.0 in or longer (i.e. quality size), an increase from 47% in 2003. The mean TL for age-2 black crappie was 8.4 in, indicating black crappie reached quality size before their third summer. This growth is above average for southeastern Indiana. According to Hoffman (2006), Hardy Lake crappie reach 12.0 in TL in 4.2 years and crappie growth is faster than southern Indiana district averages up to age 3.

A total of 25 yellow bullhead (5.5 to 12.0 in TL) was sampled that weighed 11 lbs. All bullhead were caught by gill net. In the sample, 76% of bullhead were 9.0 in or longer (i.e. quality size).

A total of 21 naturally occurring hybrid sunfish (4.5 to 9.8 in TL) was sampled that weighed 8 lbs. In this sample, 76% of hybrid sunfish were 6.0 in or longer.

A total of 17 flathead catfish (6.2 to 21.5 in TL) was sampled that weighed 15 lbs. All flathead were caught along the dam by electrofishing; the total electrofishing catch rate was 11.3/h. In this sample, one flathead longer than 20.0 in (i.e. quality size) was collected. Only one flathead (18.6 in TL) was collected in 2003.

A total of 9 channel catfish (14.2 to 22.0 in TL) was sampled that weighed 16 lbs. All but one channel catfish were caught by gill net. Four (44%) channel catfish were 16.0 in or longer (i.e. quality size). Only four channel catfish (15.3 to 23.2 in TL) were collected in 2003.

## DISCUSSION

From April 1 through October 31, 2007, it was estimated that 23,951 anglers fished for 102,409 h at Hardy Lake to harvest 34,593 fish (47 fish/acre) weighing 17,131 lbs (23 lbs/acre). The total catch rate equaled 0.84 fish/h. Total fishing pressure equaled 138.2 h/acre during the survey. Fishing pressure was greater than 2003, but less fish were harvested. The most common

response to what would increase satisfaction of the fishing experience was catching more fish. Fishing pressure and harvest rate were greatest in May; more largemouth bass, bluegill, redear sunfish, and warmouth were harvested in May than the other six months. Fishing pressure was least in September, when the lake was at its lowest for 2007 due to lack of rain.

The average satisfaction rating was 5.9, a slight increase from 5.3 in 2003. While the majority of the anglers in the creel were from Scott County and the five adjacent counties, the creel represented anglers from 41 other counties in Indiana and from Kentucky and Ohio. At \$64 per trip, the estimated economic value of fishing during the creel survey period was \$1,532,864.

Gizzard shad were first documented in Hardy Lake in 1987 when six were collected. Since that time, their numbers have expanded so that in every fishery survey since 1998, shad have ranked second by number and first by weight in relative abundance. The presence of shad can lower the predation by largemouth bass on small bluegill, which is needed to keep the bluegill population under control. Gizzard shad also directly compete with bluegill and young bass for zooplankton, which can lead to a decline in fishing.

Bluegill ranked first by number in the creel harvest and the fishery survey. Although the bluegill PSD declined since 2003 (remaining below the desired range for a balanced population) and a smaller portion of quality-size bluegill were collected in the fishery survey, a slightly greater percentage of quality-size bluegill were harvested in the creel. The 2007 BGFP index declined to the marginal category from the fair category in 2003. According to the index, this negative effect was due to a *poor* PSD and no RSD-8. Bluegill 8.0 in or longer were caught by gill net in the fishery survey and a greater percentage of preferred-size bluegill were harvested in the 2007 creel than in 2003.

Bluegill growth is slower than 2003 and slightly below the district average; however, three 10.0-in bluegill were observed in the creel. Bluegill *marginal* growth could be the result of the presence of shad and the abundance and density of Eurasian watermilfoil and coontail. No complaints were received concerning the bluegill fishery and the average satisfaction rating of bluegill anglers was near the overall average. Bluegill remain the second most targeted species by anglers, following largemouth bass.

Largemouth bass remains the most targeted species at Hardy Lake. By number, bass ranked fourth in the harvest and third in the fishery survey. The PSD has increased from 2003 into the desired range for a balanced population and a greater percentage of legal-size bass were

collected in the 2007 fishery survey than in 2003. Bass growth was faster than 2003 and above the district average.

Although the total bass catch rate in the 2007 creel survey (0.51 bass/h) decreased from 2003 (0.63 bass/h), a greater percentage of released bass were legal size. Bass anglers caught and released 90% of the bass and harvested 72% of the bass. The average satisfaction rating of bass anglers was above the overall average. Perhaps due to the improved bass population in Hardy Lake, a smaller percentage of anglers stated that the lake needs a largemouth bass slot limit than in 2003. **There is no evidence that bass are stockpiled under the 14.0-in size limit.** The DFW should maintain the 14.0-in minimum size limit to prevent overharvest of largemouth bass, the primary source of predation on small panfish and gizzard shad in Hardy Lake.

Crappie was the third most targeted species in the creel survey. Crappie ranked second by number in the harvest, which included a 15.5-in trophy-size crappie. In the creel and in the fishery survey, 84% and 58% were quality size, respectively. Crappie anglers harvested crappie at a rate of 0.74 fish/h and accounted for 63% of all crappie harvested. In April and May, 59% of crappie were harvested and five angler parties during those months reported catching and releasing 30 to 60 crappie (along with harvesting several crappie) during each fishing trip. Crappie growth is above average for southeastern Indiana.

Stripers and wipers were targeted by only a few angler parties in the creel survey, whom gave an average satisfaction rating of 4.9 (the only average rating below 5 for any preference category). These anglers did not harvest any stripers or wipers, but accounted for half the stripers and wipers caught and released. Bass anglers accounted for the other 50%. It was estimated that 83 stripers (under 17.0 in) and 15 stripers and wipers (17.0 in and longer) were released. In 2003, it was estimated that anglers caught and released 186 stripers and 579 wipers.

In 2007, anglers reported catching stripers up to 42.5 in. No stripers or wipers were collected in the fishery survey. Some anglers wanted more stripers and wipers stocked in the lake, while one angler wanted stripers removed. From 2001 through 2007, 37,050 striper fingerlings and 7,410 wiper fingerlings were stocked at Hardy Lake. Wipers, which are thought to be more suitable for Hardy Lake conditions than stripers, should continue to be stocked to control gizzard shad and to provide additional fishing opportunities.

Channel catfish were targeted by a small percentage of the total number of anglers. Although the channel catfish harvest rate was low, catfish anglers gave an average satisfaction

rating of 5.4 (slightly below the overall average). Prior to this survey, 76,770 channels had been stocked into Hardy Lake.

It was estimated that 263 channel catfish up to 24.5 in were harvested. This represents only a 12% annual return on the supplemental stockings of channel catfish made every 2 years at Hardy Lake. It is recommended that the number of channel catfish being stocked be reduced from 4,446 to 2,223 every 2 years.

Other catfish at Hardy Lake, not stocked by the IDNR, are bullheads and flathead catfish. In the creel survey, it was estimated that 17 bullhead up to 12.0 in were harvested. In the fishery survey, 25 yellow bullhead were collected and 76% of bullhead were quality size. In the fishery survey, 16 flathead catfish up to 21.5 in were collected. Popular catfishing sites for shoreline anglers are the dam and the overlook area.

Eurasian watermilfoil (an exotic species) and coontail are the dominant submersed plants in Hardy Lake. Excess vegetation interferes with fishing and fisheries management. A reduction in vegetation should improve bass predation on bluegill, benefiting both species. The DFW will continue to treat the submersed vegetation near Alpha, Sunnyside, and Wooster ramps as well as near the beach and handicap-accessible fishing pier. It is recommended that Hardy Lake continue to maintain the “Stop Aquatic Hitchhikers!” signs at each ramp and annually stock triploid grass carp to help control submersed vegetation.

Grass carp also provide some exciting fishing opportunities. The Indiana record for grass carp-of-the-year was a 39-in fish caught from Hardy Lake in October. An even larger grass carp (42-in) had been caught and released in May 2007.

## RECOMMENDATIONS

- Contrary to the opinion of some anglers, the bass population in Hardy Lake is not stockpiled under the current 14.0-in minimum size limit; thus, a slot-limit is not needed at this time. The DFW should maintain the 14.0-in minimum size limit on largemouth bass at Hardy Lake.
- The DFW should continue to stock hybrid striped bass fingerlings at 10/acre to utilize gizzard shad and to provide additional fishing opportunities. Maintaining this open-water predator in Hardy Lake requires annual supplemental stockings. Survival and growth of these fish will be evaluated by DFW according to current work plan guidelines. These stockings and evaluations should be advertised.
- The DFW should stock 2,223 (8/acre) channel catfish fingerlings every 2 years as long as it is felt channel catfish should be managed in this manner. Fingerlings should average at least 8-in long to reduce mortality from bass predation.

- The DFW and Hardy Lake personnel should continue to use triploid grass carp, herbicides, and Hardy Lake's floating mowing machine to reduce aquatic vegetation to levels more acceptable in fish management. It is also recommended that Hardy Lake personnel continue to maintain the "Stop Aquatic Hitchhikers!" signs at each boat ramp.

#### ACKNOWLEDGEMENTS

Special thanks to our creel clerk Thomas R. "Bud" McLemore for 7 months of dedication and data collection. He was very dependable and had a great attitude from start to finish. We also greatly appreciate the assistance of Hardy Lake personnel. Thanks also to the anglers who cooperated with our creel clerk. Participation in a creel survey by all anglers, whether they catch fish or not, is essential for an accurate evaluation of fishing pressure, fish harvest, and management programs.

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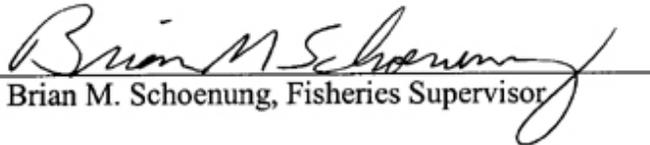
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Submitted by: Clinton R. Kowalik, Assistant Fisheries Biologist  
Date: April 3, 2008

Approved by: Larry L. Lehman, Fisheries Biologist

Approved by:   
Brian M. Schoenung, Fisheries Supervisor

Date: August 12, 2008

Table 1. Supplemental fish stocking record by DFW at Hardy Lake.

Species	Number	Total Length Range (in)	Stocking Date Range
Walleye	10,302,350	Fry	1970 through 1983
Northern pike	1,898	7 to 20	1976 through 1983
Tiger muskie	16,945	8 to 14	1985 through 1996
Muskie	14,775	7 to 13	1997 through 1999
Channel catfish	76,770	3 to 14	1970 through 2006

Table 2. Stocking record for striped bass and hybrid striped bass by DFW at Hardy Lake.

Species	Number	Mean Total Length (in)	Stocking Date
Striped bass	7,410	1.20	May 31, 2001
Hybrid striped bass	7,410	1.66	June 19, 2002
Striped bass	7,410	1.85	June 29, 2005
Striped bass	14,820	0.90	June 28, 2006
Striped bass	<u>7,410</u>	1.00	June 28, 2007
Totals	44,460		

Table 3. Triploid grass carp stocking record by Division of State Parks and Reservoirs for Hardy Lake.

Year stocked	Number	Total Length Range (in)	Mean Total Length (in)
1996	1,150	8 to 11	-
2000	600	8 to 12	10
2001	700	8 to 12	-
2002	1,030	8 to 12	-
2004	1,000	---	10
2005	1,000	---	10
2006	1,000	8 to 12	-
2007	<u>1,000</u>	8 to 11	-
Total	7,482		

Table 4. Weight of sample sites and sample periods for creel survey at Hardy Lake, 2007.

Sample Site	Site Sample Weight	Time of Day	Period Sample Weight
Alpha Ramp	0.40	A shift	0.40
Wooster Ramp	0.20	B shift	0.60
Sunnyside Ramp	0.15		
Carmel Ramp	0.15		
Dam shoreline	0.07		
Overlook	0.03		

Table 5. Estimated number of anglers, fishing pressure, number of fish harvested, and harvest rates by month during the 2007 creel survey at Hardy Lake. Boat and shore data are combined.

Month	Number of		Number of Fish	Harvest Rate
	Anglers	Fishing Pressure	Harvested	(fish/h)
April	2,385	13,564	4,782	0.35
May	4,883	21,183	14,649	0.69
June	5,278	20,908	4,717	0.23
July	4,333	14,814	3,112	0.21
August	2,439	10,927	708	0.06
September	2,060	9,835	2,088	0.21
October	<u>2,573</u>	<u>11,177</u>	<u>4,538</u>	0.41
Totals	23,951	*102,409	34,593	0.34

\*Total fishing pressure = 102,409 h per 741 acres = 138.2 h/acre.

Table 6. Preference categories of anglers fishing at Hardy Lake from April 1 through October 31, 2007.

Preference Category	Number of Anglers	Percent of Anglers
Largemouth bass	1,307	53.2
Anything	454	18.5
Bluegill	293	11.9
Crappie	155	6.3
Largemouth bass and panfish	79	3.2
Panfish	64	2.6
Channel catfish	34	1.4
Channel catfish and panfish	26	1.1
Striped bass or hybrid striped bass	23	0.9
Redear sunfish	21	0.9
Muskie	<u>1</u>	<u>&lt; 0.1</u>
Totals	2,457	100.0

Table 7. Estimated number and weight of fishes harvested at Hardy Lake from April 1 through October 31, 2007. TL range and mean TL are also listed.

Species	Number	%	Weight (lbs)	%	TL Range (in)	Mean TL (in)
Bluegill	15,732	45.5	5,419.68	31.6	5.0-10.0	7.5
Crappie	7,659	22.1	3,373.93	19.7	5.5-15.5	9.1
Redear sunfish	7,363	21.3	3,151.36	18.4	5.0-10.5	8.0
Largemouth bass	1,787	5.2	3,283.00	19.2	14.0-18.5	15.1
Warmouth	1,651	4.8	797.68	4.7	5.0-10.0	8.0
Channel catfish	263	0.8	777.06	4.5	9.0-24.5	19.2
Gizzard shad	57	0.2	7.00	< 0.1	6.0-7.5	7.0
Striped bass	48	0.1	82.00	0.5	8.0-21.0	15.3
Bullhead	17	< 0.1	13.69	0.1	11.5-12.0	11.8
Hybrid striped bass	9	< 0.1	37.71	0.2	22.0	22.0
Common carp	<u>7</u>	<u>&lt; 0.1</u>	<u>188.16</u>	<u>1.1</u>	40.0	40.0
Totals	34,593	100.0	17,131.27	100.0		

Table 8. Estimated number of and catch rates for largemouth bass, striped bass, and hybrid striped bass caught and released by anglers at Hardy Lake from April 1 through October 31, 2007.

Species	Number	Catch and Release Rate (fish/h)
Largemouth bass (< 14.0 in)	37,797	0.37
Largemouth bass ( $\geq$ 14.0 in)	<u>13,010</u>	0.18
Total largemouth bass	50,808	0.50
Striped bass (< 17.0 in)	83	< 0.01
Striped bass and hybrid striped bass ( $\geq$ 17.0 in)	<u>15</u>	< 0.01
Total striped bass and hybrid striped bass	98	< 0.01

Table 9. Satisfaction ratings by angler parties at Hardy Lake from April 1 through October 31, 2007.

Satisfaction Rating	Number of Parties	Percent of Parties
0 "Not satisfied at all"	88	6.8
1	26	2.0
2	71	5.5
3	65	5.0
4	88	6.8
5	263	20.2
6	120	9.2
7	164	12.6
8	177	13.6
9	58	4.5
10 "Extremely satisfied"	<u>181</u>	<u>13.9</u>
Totals	1,301	100.0

Table 10. Satisfaction ratings by angler parties for each preference category at Hardy Lake from April 1 through October 31, 2007.

Preference category	Mean Satisfaction Rating	Number of Parties
Redear sunfish	6.4	9
Largemouth bass	6.1	742
Crappie	6.0	88
Largemouth bass and panfish	6.0	38
Panfish	6.0	29
Bluegill	5.6	145
Channel catfish	5.5	17
Anything	5.4	207
Channel catfish and panfish	5.3	12
Muskie	5.0	1
Striped bass or hybrid striped bass	<u>4.9</u>	<u>13</u>
	5.9	1,301

Table 11. Origin of angler parties in creel survey at Hardy Lake from April 1 through October 31, 2007.

Indiana County (or State)	Number of Parties	%	Indiana County (or State)	Number of Parties	%
Scott	290	22.3	Starke	2	0.2
Clark	259	19.9	Whitley	2	0.2
Jackson	167	12.8	Allen	1	0.1
Jefferson	146	11.2	Boone	1	0.1
Jennings	99	7.6	Brown	1	0.1
Bartholomew	63	4.8	Carroll	1	0.1
Floyd	46	3.5	Clinton	1	0.1
Johnson	37	2.8	Daviess	1	0.1
Washington	31	2.4	Franklin	1	0.1
Marion	27	2.1	Greene	1	0.1
Decatur	15	1.2	Harrison	1	0.1
Hancock	9	0.7	Huntington	1	0.1
Henry	8	0.6	Knox	1	0.1
Shelby	8	0.6	Lake	1	0.1
Dearborn	7	0.5	Lawrence	1	0.1
Morgan	5	0.4	Montgomery	1	0.1
Ripley	5	0.4	Owen	1	0.1
Hendricks	4	0.3	Porter	1	0.1
Switzerland	3	0.2	St. Joseph	1	0.1
Delaware	2	0.2	Steuben	1	0.1
Grant	2	0.2	Tippecanoe	1	0.1
Madison	2	0.2	Kentucky	15	1.2
Monroe	2	0.2	Other states*	13	1.0
Rush	2	0.2	Ohio	<u>8</u>	<u>0.6</u>
				1,301	100.0

\*A state other than Indiana, Kentucky, or Ohio

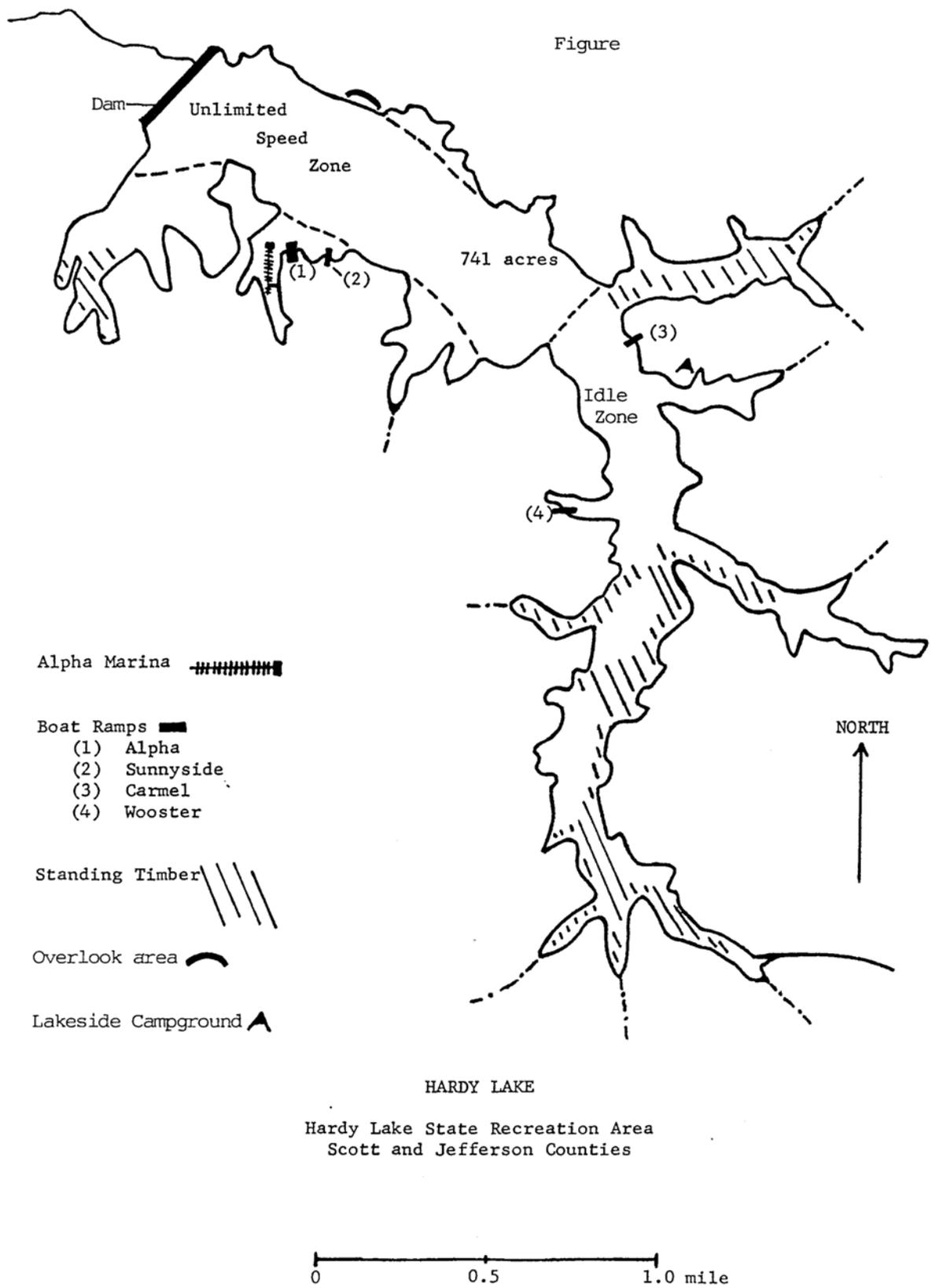


Figure 1. Map of Hardy Lake.

# LAKE SURVEY REPORT

Type of Survey <input type="checkbox"/> Initial Survey <input checked="" type="checkbox"/> Re-Survey
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Lake Name Hardy Lake	County Scott & Jefferson	Date of survey (Month, day, year) June 25 to July 5, 2007
Biologist's name Larry L. Lehman		Date of Approval (Month, day, year) August 12, 2008

LOCATION		
Quadrangle Name Deputy, Ind. 1968 Photorevised 1988	Range 7E, 8E	Sections 13, 14, 18, 19, 24, 25, 30
Township 4N	Nearest Town Deputy	

ACCESSIBILITY					
State owned public access site Four concrete boat ramps		Privately owned public access site		Other access site	
Surface acres 741	Maximum depth (ft) 38	Average depth (ft) 16	Volume (acre feet) 12,000*	Water level (feet MSL) 600	Extreme fluctuations 598.5-601.5 feet MSL
Location of benchmark 1.5 miles west of dam at intersection of County Roads 650 North and 200 East					

INLETS		
Name Quick Creek	Location Southeast corner of lake	Origin Watershed runoff
Numerous unnamed, intermittent inlets also drain into Hardy Lake		

OUTLETS			
Name Quick Creek	Location West end of lake at principal spillway		
Water level control Principal spillway is a concrete tower with drawdown tubes present. Grass emergency spillway is at south end of dam.			
POOL	ELEVATION (feet MSL)	ACRES	Bottom type
TOP OF DAM	613.5	1,200	<input type="checkbox"/> Boulder
EMERGENCY SPILLWAY	603.5	870	<input checked="" type="checkbox"/> Gravel
NORMAL POOL	600.0	741	<input type="checkbox"/> Sand
TOP OF MINIMUM POOL	570.0	90	<input type="checkbox"/> Muck
STREAMBED			<input checked="" type="checkbox"/> Clay
			<input type="checkbox"/> Marl

Watershed use Watershed covers approximately 12 square miles (50% agricultural, 36% forest, 8% residential, 5% pasture/old field).**
Development of shoreline State-owned campgrounds, beach, marina, overlook area, two fishing piers (one is handicapped accessible), and four boat ramps are present on the shoreline. A private campground (Lakeside Campground) and approximately two-dozen homes are located along and near the northern and eastern shoreline.
Previous surveys and investigations Fishery surveys 1971, 1972, 1973, 1974, 1975, 1978. Walleye study 1983, 1984. Fishery surveys in 1987, 1990. Fishery surveys in 1995, 1998, 1999, 2000. Creel surveys in 1975, 1977, 1978, 1981, and 1999. Fishery and creel survey 2003. Submersed vegetation surveys 2004, 2005, 2006. Fall striper survey 2005.
* (Anonymous 1967)    ** (EnviroScience, Inc. 2000)

SAMPLING EFFORT AT HARDY LAKE					
ELECTROFISHING	Day hours		Night hours		Total hours
	0		1.50		<b>1.50</b>
TRAP NETS	Number of traps		Number of Lifts		Total effort
	3		2 lifts per net		<b>6 Lifts</b>
GILL NETS	Number of nets		Number of Lifts		Total effort
	4		3 lifts per net		<b>12 Lifts</b>
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls
	0				0

PHYSICAL AND CHEMICAL CHARACTERISTICS					
Color			Turbidity		
Grayish-green			7 Feet 4 Inches (SECCHI DISK)		
Alkalinity (ppm)*			pH		
Surface: 86		Bottom: 103		Surface: 7.8 Bottom: 7.3	
Conductivity:			Air temperature:		
185 micromhos/cm			91 °F		
Water chemistry GPS coordinates:					
N 38.79106348			W -85.70789846		

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	82.4	7.84	36	50.0	0.63	72		
2	82.2	7.83	38	49.8	0.63	74		
4	81.5	7.87	40	49.8	0.63	76		
6	81.0	7.84	42			78		
8	80.4	7.81	44			80		
10	79.2	7.35	46			82		
12	78.4	6.55	48			84		
14	74.7	1.81	50			86		
16	69.4	0.70	52			88		
18	63.3	0.67	54			90		
20	59.4	0.66	56			92		
22	56.3	0.65	58			94		
24	54.3	0.65	60			96		
26	52.9	0.65	62			98		
28	52.0	0.64	64			100		
30	51.4	0.63	66		thermocline			
32	51.1	0.63	68					
34	50.5	0.63	70					

COMMENTS
**Electrofisher settings (7/2/07): 530 volts DC, output mode = 60 pps, and pulse width = 4 ms (3-5 amps)
**Electrofisher settings (7/5/07): 530 volts DC, output mode = 60 pps, and pulse width = 4 ms (3-4.5 amps)

\*ppm-parts per million

### Occurrence and Abundance of Submersed Aquatic Plants in Hardy Lake

Lake: Hardy Lake	Secchi (ft): 6.7	SE Mean Species / Site: 0.08
Date: 08/01/07 - 08/02/07	Littoral Sites w/Plants: 54	Mean Natives / Site: 0.23
Littoral Depth (ft): 15.0	Number of Species: 4	SE Mean Natives / Site: 0.05
Littoral Sites: 81	Max. Species / Site: 3	Species Diversity: 0.42
Total Sites: 90	Mean Species / Site: 0.82	Native Diversity: 0.18

Species	Frequency of	Score Frequency				Dominance
	Occurrence	0	1	3	5	
Eurasian watermilfoil*	58.9	41.1	31.1	14.4	13.3	28.2
Coontail	21.1	78.9	13.3	2.2	5.6	9.6
Brittle naiad	1.1	98.9	1.1	0.0	0.0	0.2
Nitella	1.1	98.9	1.1	0.0	0.0	0.2
Filamentous algae	13.3					

Other species noted:

SUBMERSED: American pondweed

ROOTED FLOATING: American lotus, Water shield

EMERGENT: American water willow, Arrowhead (Sagittaria sp.) Broadleaf cattail, Bulrush sp., Buttonbush, Creeping water primrose, Purple loosestrife\*, Spikerush (Eleocharis sp.), Squarestem spikerush

\*Exotic plant

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Bluegill	961	60.3	1.7-9.0	42.73	9.4
Gizzard shad	230	14.4	2.0-14.3	121.68	26.7
Largemouth bass	106	6.6	1.4-16.3	74.21	16.3
Redear sunfish	75	4.7	3.0-9.4	23.12	5.1
Warmouth	70	4.4	2.3-8.7	13.53	3.0
Black crappie	31	1.9	3.7-9.2	7.02	1.5
Yellow bullhead	25	1.6	5.5-12.0	10.99	2.4
Hybrid sunfish	21	1.3	4.5-9.8	7.84	1.7
Spotfin shiner	21	1.3	2.1-4.0	0.27	0.1
Golden shiner	19	1.2	6.6-9.0	4.64	1.0
Flathead catfish	17	1.1	6.2-21.5	15.37	3.4
Channel catfish	9	0.6	14.2-22.0	15.62	3.4
Grass carp	5	0.3	30.5-42.0	113.70	24.9
Bowfin	2	0.1	13.6-21.2	4.54	1.0
White sucker	1	0.1	12.8	0.90	0.2
Grass pickerel	1	0.1	3.8	0.01	0.0
Bluntnose minnow	1	0.1	2.5	0.01	0.0
Species collected in 2003 but not this survey:					
Striped bass					
Hybrid striped bass					
Black bullhead					
Brown bullhead					
Walleye					
Totals (16 species & 1 hybrid)	1,595	100.0		456.18	100.0

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

**SIZE STRUCTURE SUMMARY FOR BLUEGILL**

<b>Lake:</b>	Hardy Lake				<b>TN</b>	<b>GN</b>	<b>EF</b>
<b>Date:</b>	6/25/2007	to	7/5/2007	Total # fish	339	19	603
<b>Species:</b>	Bluegill			Effort	6	12	1.50
<b>Total number:</b>	961			CPUE	56.5	1.6	402.0
<b>Total weight (lbs):</b>	42.73						
<b>Length range (in):</b>	1.7	to	9.0				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	3	263	19	469	751	-
Quality	6	16	18	13	47	3 = PSD = 13/469(100)
Preferred	8	0	5	0	5	
Memorable	10	0	0	0	0	
Trophy	12	0	0	0	0	

Subsample: PSD = 8/282(100) = 3  
 Subsample: % ≥ 6.0 in = 42/719(100) = 6

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5	5	< 0.01	18.0			34.5		
2.0	88	0.01	18.5			35.0		
2.5	117	0.02	19.0			35.5		
3.0	256	0.02	19.5			36.0		
3.5	220	0.03	20.0			36.5		
4.0	116	0.05	20.5			37.0		
4.5	54	0.06	21.0			37.5		
5.0	36	0.10	21.5			38.0		
5.5	22	0.13	22.0			38.5		
6.0	14	0.18	22.5			39.0		
6.5	12	0.21	23.0			39.5		
7.0	10	0.27	23.5			40.0		
7.5	6	0.35	24.0			40.5		
8.0	2	0.38	24.5			41.0		
8.5	2	0.51	25.0			41.5		
9.0	1	0.56	25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

**AGE-LENGTH KEY FOR HARDY LAKE BLUEGILL**

Length group (in)	Total number	Sub-sample	Age					
			1	2	3	4	5	6
1.0								
1.5	5	2	5					
2.0	88	5	88					
2.5	117	5	47	70				
3.0	256	5		256				
3.5	220	5		220				
4.0	116	5		70	46			
4.5	54	5		32	22			
5.0	36	7			31	5		
5.5	22	6			7	15		
6.0	14	5				8	6	
6.5	12	5				7	5	
7.0	10	4					5	5
7.5	6	6					1	4
8.0	2	1						2
8.5	2	2						
9.0	1	1						
Total	961	69	140	648	106	35	16	11

**GROWTH SUMMARY FOR BLUEGILL AT DATE OF CAPTURE**

**Lake:** Hardy Lake  
**Date:** 6/25/07 to 7/5/07  
**Species:** Bluegill

Age	Number	Mean TL	Var	SE	Lo95%CI	Up95%CI
1	140	2.4	0.07	0.02	2.4	2.4
2	648	3.5	0.24	0.02	3.5	3.6
3	106	4.7	0.25	0.05	4.6	4.8
4	35	6.0	0.24	0.08	5.8	6.2
5	16	6.8	0.24	0.12	6.6	7.0
6	11	7.6	0.15	0.12	7.4	7.9
7	3	8.4	0.33	0.33	7.8	9.1
8	1	9.3				

**SIZE STRUCTURE SUMMARY FOR GIZZARD SHAD**

<b>Lake:</b>	Hardy Lake			<b>TN</b>	<b>GN</b>	<b>EF</b>	
<b>Date:</b>	6/25/2007	to	7/5/2007	Total # fish	6	115	109
<b>Species:</b>	Gizzard shad			Effort	6	12	1.50
<b>Total number:</b>	230			CPUE	1.0	9.6	72.7
<b>Total weight (lbs):</b>	121.68						
<b>Length range (in):</b>	2.0	to	14.3				

<b>Group</b>	<b>TL (in)</b>	<b>TN</b>	<b>GN</b>	<b>EF</b>	<b>TOTAL</b>	<b>RSD</b>
Stock	7	5	115	106	226	-
Quality	11	3	76	92	171	87
Preferred						
Memorable						
Trophy						

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0	1	< 0.01	18.5			35.0		
2.5	2	< 0.01	19.0			35.5		
3.0			19.5			36.0		
3.5			20.0			36.5		
4.0			20.5			37.0		
4.5			21.0			37.5		
5.0			21.5			38.0		
5.5			22.0			38.5		
6.0			22.5			39.0		
6.5	1	0.10	23.0			39.5		
7.0	9	0.12	23.5			40.0		
7.5	14	0.15	24.0			40.5		
8.0	1	0.22	24.5			41.0		
8.5			25.0			41.5		
9.0			25.5			42.0		
9.5			26.0			42.5		
10.0	8	0.35	26.5			43.0		
10.5	23	0.42	27.0			43.5		
11.0	20	0.49	27.5			44.0		
11.5	23	0.49	28.0			44.5		
12.0	45	0.57	28.5			45.0		
12.5	43	0.64	29.0			45.5		
13.0	30	0.74	29.5			46.0		
13.5	7	0.92	30.0			46.5		
14.0	3	0.95	30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

**SIZE STRUCTURE SUMMARY FOR LARGEMOUTH BASS**

<b>Lake:</b>	Hardy Lake			<b>TN</b>	<b>GN</b>	<b>EF</b>	
<b>Date:</b>	6/25/2007	to	7/5/2007	Total # fish	0	13	93
<b>Species:</b>	Largemouth bass			Effort	6	12	1.50
<b>Total number:</b>	106			CPUE	0.0	1.1	62.0
<b>Total weight (lbs):</b>	74.21						
<b>Length range (in):</b>	1.4	to	16.3				

<b>Group</b>	<b>TL (in)</b>	<b>TN</b>	<b>GN</b>	<b>EF</b>	<b>TOTAL</b>	<b>RSD</b>	
Stock	8	0	13	65	78	-	
Quality	12	0	8	32	40	49	= PSD = 32/65(100)
Preferred	15	0	0	2	2	3	= RSD <sub>15</sub> = 2/65(100)
Memorable	20	0	0	0	0		
Trophy	25	0	0	0	0		

% ≥ 14.0 in = 16/106(100) = 15

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0	1	< 0.01	17.5			34.0		
1.5	5	< 0.01	18.0			34.5		
2.0	6	< 0.01	18.5			35.0		
2.5	2	0.01	19.0			35.5		
3.0			19.5			36.0		
3.5			20.0			36.5		
4.0			20.5			37.0		
4.5			21.0			37.5		
5.0	1	0.07	21.5			38.0		
5.5	2	0.07	22.0			38.5		
6.0			22.5			39.0		
6.5	5	0.14	23.0			39.5		
7.0	2	0.18	23.5			40.0		
7.5	4	0.20	24.0			40.5		
8.0	1	0.24	24.5			41.0		
8.5	1	0.28	25.0			41.5		
9.0	7	0.37	25.5			42.0		
9.5	7	0.44	26.0			42.5		
10.0	10	0.53	26.5			43.0		
10.5	2	0.57	27.0			43.5		
11.0	5	0.68	27.5			44.0		
11.5	5	0.76	28.0			44.5		
12.0	5	0.92	28.5			45.0		
12.5	8	1.02	29.0			45.5		
13.0	8	1.17	29.5			46.0		
13.5	3	1.34	30.0			46.5		
14.0	7	1.48	30.5			47.0		
14.5	7	1.65	31.0			47.5		
15.0			31.5			48.0		
15.5	1	2.06	32.0			48.5		
16.0	1	2.29	32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

**AGE-LENGTH KEY FOR HARDY LAKE LARGEMOUTH BASS**

Length group (in)	Total number	Sub-sample	Age					
			1	2	3	4	5	6
1.0	1							
1.5	5							
2.0	6							
2.5	2							
3.0								
3.5								
4.0								
4.5								
5.0	1	1	1					
5.5	2	2	2					
6.0								
6.5	5	4	5					
7.0	2	2	2					
7.5	4	4	4					
8.0	1	1	1					
8.5	1	1		1				
9.0	7	6		7				
9.5	7	4		7				
10.0	10	6		10				
10.5	2	2		2				
11.0	5	5		4	1			
11.5	5	4			5			
12.0	5	4			5			
12.5	8	4			8			
13.0	8	6			8			
13.5	3	3			2	1		
14.0	7	5				7		
14.5	7	5				3	4	
15.0								
15.5	1	1					1	
16.0	1	1						1
Total	106	71	15	31	29	11	5	1

**GROWTH SUMMARY FOR LARGEMOUTH BASS AT DATE OF CAPTURE**

**Lake:** Hardy Lake  
**Date:** 6/25/07 to 7/5/07  
**Species:** Largemouth bass

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	15	7.0	0.74	0.22	6.5	7.4
2	31	10.0	0.46	0.12	9.8	10.3
3	29	12.6	0.44	0.12	12.4	12.9
4	11	14.3	0.09	0.09	14.2	14.5
5	5	14.9	0.19	0.19	14.6	15.3
6	1	16.3				
7						

**SIZE STRUCTURE SUMMARY FOR REDEAR SUNFISH**

<b>Lake:</b>	Hardy Lake			<b>TN</b>	<b>GN</b>	<b>EF</b>	
<b>Date:</b>	6/25/2007	to	7/5/2007	Total # fish	46	7	22
<b>Species:</b>	Redear sunfish			Effort	6	12	1.50
<b>Total number:</b>	75			CPUE	7.7	0.6	14.7
<b>Total weight (lbs):</b>	23.12						
<b>Length range (in):</b>	3.0	to	9.4				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	4	44	7	21	72	-
Quality	7	31	7	13	51	62 = RSD <sub>7</sub> = 13/21(100)
Preferred	9	2	1	2	5	10 = RSD <sub>9</sub> = 2/21(100)
Memorable	11	0	0	0	0	
Trophy	13	0	0	0	0	

% ≥ 7.0 in = 51/75(100) = 68

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0			18.5			35.0		
2.5			19.0			35.5		
3.0	2	0.03	19.5			36.0		
3.5	1	0.04	20.0			36.5		
4.0	1	0.06	20.5			37.0		
4.5	4	0.07	21.0			37.5		
5.0	3	0.11	21.5			38.0		
5.5	4	0.14	22.0			38.5		
6.0	6	0.19	22.5			39.0		
6.5	3	0.20	23.0			39.5		
7.0	11	0.31	23.5			40.0		
7.5	17	0.35	24.0			40.5		
8.0	14	0.41	24.5			41.0		
8.5	4	0.48	25.0			41.5		
9.0	5	0.60	25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

**AGE-LENGTH KEY FOR HARDY LAKE REDEAR SUNFISH**

Length group (in)	Total number	Sub-sample	Age					
			1	2	3	4	5	6
1.0								
1.5								
2.0								
2.5								
3.0	2	2	2					
3.5	1	1		1				
4.0	1	1		1				
4.5	4	4		4				
5.0	3	3		3				
5.5	4	3		4				
6.0	6	5		2	4			
6.5	3	3			3			
7.0	11	4			3	8		
7.5	17	6				11	6	
8.0	14	6				2	12	
8.5	4	2					4	
9.0	5	5					1	4
Total	75	45	2	15	9	22	22	4

**GROWTH SUMMARY FOR REDEAR SUNFISH AT DATE OF CAPTURE**

**Lake:** Hardy Lake  
**Date:** 6/25/07 to 7/5/07  
**Species:** Redear sunfish

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	2	3.3	0.00	0.00	3.3	3.3
2	15	5.2	0.53	0.19	4.9	5.6
3	9	6.7	0.19	0.14	6.4	7.0
4	22	7.6	0.11	0.07	7.5	7.8
5	22	8.3	0.16	0.08	8.1	8.4
6	4	9.3	0.00	0.00	9.3	9.3
7						
8						

**SIZE STRUCTURE SUMMARY FOR WARMOUTH**

<b>Lake:</b>	Hardy Lake				<b>TN</b>	<b>GN</b>	<b>EF</b>
<b>Date:</b>	6/25/2007	to	7/5/2007	Total # fish	10	24	36
<b>Species:</b>	Warmouth			Effort	6	12	1.50
<b>Total number:</b>	70			CPUE	1.7	2.0	24.0
<b>Total weight (lbs):</b>	13.53						
<b>Length range (in):</b>	2.3	to	8.7				

<b>Group</b>	<b>TL (in)</b>	<b>TN</b>	<b>GN</b>	<b>EF</b>	<b>TOTAL</b>	<b>RSD</b>	
Stock	3	10	24	34	68	-	
Quality	6	5	19	14	38	41	= RSD <sub>6</sub> = 14/34(100)
Preferred	8	1	5	1	7	3	= RSD <sub>8</sub> = 1/34(100)
Memorable	10	0	0	0	0		
Trophy	12	0	0	0	0		

% ≥ 6.0 in = 38/70(100) = 54

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0	2	0.01	18.5			35.0		
2.5			19.0			35.5		
3.0	1	0.03	19.5			36.0		
3.5	6	0.04	20.0			36.5		
4.0	4	0.06	20.5			37.0		
4.5	3	0.08	21.0			37.5		
5.0	7	0.11	21.5			38.0		
5.5	9	0.14	22.0			38.5		
6.0	11	0.19	22.5			39.0		
6.5	11	0.23	23.0			39.5		
7.0	5	0.30	23.5			40.0		
7.5	4	0.38	24.0			40.5		
8.0	5	0.44	24.5			41.0		
8.5	2	0.46	25.0			41.5		
9.0			25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

**SIZE STRUCTURE SUMMARY FOR BLACK CRAPPIE**

<b>Lake:</b>	Hardy Lake			<b>TN</b>	<b>GN</b>	<b>EF</b>	
<b>Date:</b>	6/25/2007	to	7/5/2007	Total # fish	9	21	1
<b>Species:</b>	Black crappie			Effort	6	12	1.50
<b>Total number:</b>	31			CPUE	1.5	1.8	0.7
<b>Total weight (lbs):</b>	7.02						
<b>Length range (in):</b>	3.7	to	9.2				

<b>Group</b>	<b>TL (in)</b>	<b>TN</b>	<b>GN</b>	<b>EF</b>	<b>TOTAL</b>	<b>RSD</b>
Stock	5	6	21	0	27	-
Quality	8	2	16	0	18	
Preferred	10	0	0	0	0	
Memorable	12	0	0	0	0	
Trophy	15	0	0	0	0	

**% ≥ 8.0 in = 18/31(100) = 58**

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0			18.5			35.0		
2.5			19.0			35.5		
3.0			19.5			36.0		
3.5	1	0.02	20.0			36.5		
4.0	1	0.03	20.5			37.0		
4.5	2	0.04	21.0			37.5		
5.0	1	0.08	21.5			38.0		
5.5			22.0			38.5		
6.0			22.5			39.0		
6.5	2	0.14	23.0			39.5		
7.0			23.5			40.0		
7.5	6	0.23	24.0			40.5		
8.0	9	0.25	24.5			41.0		
8.5	6	0.32	25.0			41.5		
9.0	3	0.35	25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

**AGE-LENGTH KEY FOR HARDY LAKE BLACK CRAPPIE**

Length group (in)	Total number	Sub-sample	Age						
			1	2	3	4	5	6	7
1.0									
1.5									
2.0									
2.5									
3.0									
3.5	1	1	1						
4.0	1	1	1						
4.5	2	1	2						
5.0	1	1	1						
5.5									
6.0									
6.5	2	1	2						
7.0									
7.5	6	6		6					
8.0	9	5		9					
8.5	6	5		6					
9.0	3	3		3					
Total	31	24	7	24	0	0	0	0	0

**GROWTH SUMMARY FOR SPECIES AT DATE OF CAPTURE BLACK CRAPPIE**

**Lake:** Hardy Lake  
**Date:** 6/25/07 to 7/5/07  
**Species:** Black crappie

Age	Number	Mean TL	Var	SE	Lo 95%CI	Up 95%CI
1	7	5.2	1.37	0.44	4.3	6.1
2	24	8.4	0.24	0.10	8.2	8.6
3						
4						
5						
6						
7						

**GPS LOCATION OF SAMPLING EQUIPMENT AT HARDY LAKE**

GILL NETS			TRAP NETS			ELECTROFISHING		
1	N 38.78968	W -85.71134	1	N 38.78567	W -85.71434	1	N 38.79221	W -85.70899
	N 38.79024	W -85.71073	2	N 38.78449	W -85.70955		N 38.78907	W -85.71199
2	N 38.78391	W -85.70823	3	N 38.79102	W -85.70345	2	N 38.78533	W -85.71119
	N 38.78459	W -85.70840	4	N 38.78859	W -85.69662		N 38.78391	W -85.70830
3	N 38.78276	W -85.70695	5	N 38.78609	W -85.69117	3	N 38.78014	W -85.69079
	N 38.78344	W -85.70662	6	N 38.78348	W -85.69780		N 38.77718	W -85.68941
4	N 38.78292	W -85.71128	7	N	W	4	N 38.77242	W -85.68410
	N (No data)	W (No data)	8	N	W		N 38.77533	W -85.68408
5	N 38.77984	W -85.69054	9	N	W	5	N 38.78353	W -85.69767
	N 38.77926	W -85.69020	10	N	W		N 38.78071	W -85.69873
6	N 38.78353	W -85.69977	11	N	W	6	N 38.78828	W -85.69578
	N 38.78410	W -85.69881	12	N	W		N 38.78987	W -85.69930
7	N 38.78210	W -85.68644	13	N	W	7	N	W
	N 38.78235	W -85.68562	14	N	W		N	W
8	N 38.77917	W -85.69567	15	N	W	8	N	W
	N 38.77967	W -85.69519	16	N	W		N	W
9	N 38.77720	W -85.68542	17	N	W	9	N	W
	N 38.77665	W -85.68481	18	N	W		N	W
10	N 38.76803	W -85.68453	19	N	W	10	N	W
	N 38.76743	W -85.68502	20	N	W		N	W
11	N 38.76848	W -85.67746				11	N	W
	N 38.76883	W -85.67828					N	W
12	N 38.76798	W -85.68858				12	N	W
	N 38.76824	W -85.68781					N	W
13	N	W				13	N	W
	N	W					N	W
14	N	W				14	N	W
	N	W					N	W
15	N	W				15	N	W
	N	W					N	W
16	N	W				16	N	W
	N	W					N	W
17	N	W				17	N	W
	N	W					N	W
18	N	W				18	N	W
	N	W					N	W
19	N	W				19	N	W
	N	W					N	W
20	N	W				20	N	W
	N	W					N	W