

HARDY LAKE LARGEMOUTH BASS, HYBRID STRIPED BASS, STRIPED BASS AND
AQUATIC VEGETATION SURVEYS

Scott and Jefferson Counties
2015 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/2958.htm>.
- A Largemouth Bass survey was conducted on May 11, 2015. A total of 70 Largemouth Bass were collected after 1.06 h of electrofishing, at a rate of 66.0/h.
- Overall Largemouth Bass PSD has improved slightly compared to previous years, but still falls within the range of a balanced fishery. Relative weights of Largemouth Bass fall within the target range for populations managed to maintain higher densities of bass for control of panfish recruitment.
- Growth of Largemouth Bass was faster than other Gizzard Shad impoundments.
- A Hybrid Striped Bass and Striped Bass survey was conducted on June 24 through 25, 2015 using 6 experimental Striped Bass gill nets. A total of 22 Striped Bass were collected at a rate of 1.8/lift and 65 Hybrid Striped Bass were collected at a rate of 5.4/overnight lift.
- Continued annual stocking of 7,480 Hybrid Striped Bass and 1,000 Striped Bass is recommended.
- An aquatic vegetation survey was conducted on August 11, 2015 following Tier II sampling guidelines. No submersed aquatic vegetation was found. An aquatic vegetation survey is recommended at Hardy Lake in 2016.

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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. Lake access includes four boat ramps and there are no outboard restrictions. The Division of Parks and Reservoirs manages the property, therefore, 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, located at 4171 East Harrod Road, Scottsburg, IN 47170.

The Division of Fish and Wildlife (DFW) is responsible for managing the fish populations. The DFW stocked Largemouth Bass, Bluegill, Redear Sunfish, and Black Crappie into Hardy Lake when construction was completed in 1970. These species have maintained their populations through natural reproduction. 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). Striped Bass were initially stocked in 2001 with subsequent annual stockings in 2005 through 2008. A minimum of 7,410 were requested annually. In 2009, the Striped Bass stocking was changed to Hybrid Striped Bass due to better survival. Hybrids were first stocked in 2002 and annual stockings have occurred since 2009. Stocking numbers have ranged from 5,855 to 22,232 fingerlings. The DFW stocked a total of 7,700 Triploid Grass Carp to control submersed vegetation over the span of 1996 through 2007.

Numerous fish management, angler creel, and aquatic vegetation surveys have been conducted over the years. The latest creel survey (2010) documented high effort and harvest rates for panfish and low effort and harvest of Largemouth Bass. The bass angler's satisfaction rating was the lowest of all preference groups, with a score of 6.7 out of 10 (Carnahan 2011). For these reasons, this supplemental Largemouth Bass survey was conducted to evaluate the bass population. In addition, a Striped Bass and Hybrid Striped Bass survey was conducted to monitor their growth, and an aquatic vegetation survey was conducted to determine plant abundance. Submersed plants have not been found in the lake since 2008, due to the Triploid Grass Carp stockings. No future Grass Carp stockings are recommended.

METHODS

Largemouth Bass survey

A Largemouth Bass survey was conducted on May 11, 2015. Fish were collected by pulsed DC electrofishing with two dippers for a total of 1.06 h. All Largemouth Bass collected were measured to the nearest 0.1 in TL and weighed to the nearest 0.01 lb. Scale samples from 5 bass per 0.5 in length group were taken for age and growth analysis.

Hybrid Striped Bass and Striped Bass survey

A Hybrid Striped Bass and Striped Bass survey was conducted on June 24 and 25, 2015. Some physical and chemical characteristics of the water were measured on June 24 in the deepest area of the impoundment according to standard lake survey guidelines (Shipman 2001). Six experimental Striped Bass gill nets were set for 2 nights for a total of 12 lifts. Multifilament nets were 300 ft long, 10 ft deep, and bar mesh sizes ranged from 1.5 to 3.0 in. One of the six nets was moved over the two sampling days and all nets were checked and ran daily. Nets were suspended approximately 5 ft from the surface using five evenly spaced floats in 20 to 30 ft of water. All fish were measured to the nearest 0.1 in TL and weighed to the nearest 0.01 lb. Otoliths were taken from every fish on the first day of net lifts for age determination, and scales were used for age determination on both days of sampling.

Vegetation survey

On August 11, 2015 submersed aquatic vegetation was sampled using Tier II guidelines developed by the Indiana Department of Natural Resources (2006). In this survey, 38 selectively chosen sites were sampled in high traffic areas including boat ramps, the dam area, and the beach. Visual inspection of the entire lake shoreline was also completed for this survey.

RESULTS

Largemouth Bass survey

A total of 70 Largemouth Bass was sampled, ranging in length from 5.0 to 21.6 in and the largest weighed 6 lbs. The Largemouth Bass electrofishing catch rate was 66/h. Previous catch rates were 132/h (2010) and 98/h (2003). In 2015, the PSD, PSD-14, and PSD-18 were 54, 6,

and 2, while the same indices in 2010 were 41, 12, and 1 respectively. The PSD falls into the range of a balanced fishery (40 to 70).

Scales from 63 bass were subsampled for age estimation. Ages 1 through 4 were represented in the sample, with 5 fish or greater in each age class. Largemouth Bass grew fast compared to other Gizzard Shad lakes in the district where scales were the age estimation structure (Figure). Largemouth Bass growth was above average for all ages, falling in the 75th percentile or greater. An age-4 bass averaged 13.7 inches in 2015 compared to 13.2 inches in 2010.

Mean relative weights (Wr) were calculated by size group. Bass size groups were classified as stock (2:8 in), quality (2:12 in), and preferred (2: 15 in) sizes (Anderson and Neumann 1996). The Wr for each size group was 90 (stock), 87 (quality), and 90 (preferred).

Hybrid Striped Bass and Striped Bass survey

At the time of this survey, the thermocline was at 10 ft and the water temperature was 77°F.

A total of 65 Hybrid Striped Bass were sampled. The Hybrid Striped Bass ranged in length from 15.0 to 25.5 in and the largest weighed 6 lbs. The Hybrid Striped Bass gill net catch rate increased to 5.4/overnight lift compared to the 2013 catch rate of 4.5/overnight lift. Hybrid Striped Bass from all stockings except 2014 (age 1) and 2010 (age 5), were represented in our sample, indicating good survival. The 2014 year class was not susceptible to the gear. The 2013 (age 2) cohort had the highest catch, followed by age 4, age 3, age 5, and age 6. Length ranges by cohort are in the attached age-length key. Hybrid Striped Bass grew faster than what was found in the most recent survey (2013) at Hardy (Carnahan 2014). Age-2, age-3 and age-4 fish averaged 16.6, 19.0, and 20.8 in, respectively. In 2013, length at ages 2 through 4 were 14.4, 18.0, and 24.5 in, respectively.

A total of 22 Striped Bass were sampled. The Striped Bass ranged in length from 26.0 to 35.5 in and the largest weighed 16 lbs. The Striped Bass gill net catch rate was 1.8/overnight lift while the previous catch rate from 2013 was 0.4/overnight lift. Only Striped Bass from the last two stocking years (2007 (age 8) and 2008 (age 7)) were represented in the sample.

Vegetation survey

Minimal vegetation was present in Hardy Lake at all water depths during the 2015 survey. No submersed aquatic vegetation was found at any of the sites, and only American waterwillow (*Justicia Americana*), phragmites (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), and buttonbush (*Cephalanthus occidentalis*) were observed along the shoreline. Similarly, no submersed aquatic vegetation has been found at any of the sites since 2011. During 2010, coontail (*Ceratophyllum demersum*), Eurasian watermilfoil (*Myriophyllum spicatum*), southern naiad (*Najas guadalupensis*), and waterthread pondweed (*Potamogeton diversifolius*) were observed in trace amounts.

DISCUSSION

Overall proportional size distribution indices (PSD) for Largemouth Bass have improved for PSD, were lower for PSD-14 and about the same for PSD-18 (Carnahan 2011). The low PSD-14 value is directly correlated with the small sample size offish 14 in and larger. The Largemouth Bass population was undersampled during this survey and should be sampled again during 2017. Results indicate that bass growth was faster than previous surveys, densities were low, and relative weights improved since recent surveys. During the 2010 management survey (Carnahan 2011), bass growth was slow, densities were high, and relative weights were low. Low PSD-14 values in 2010 were indicative of a stockpiled Largemouth Bass population at 14 in (Carnahan 2011). A more comprehensive Largemouth Bass survey in 2018 is needed to obtain a larger sample size along with a Bluegill and Redear Sunfish survey in 2018 to better understand the management strategy that needs to be used.

A total of 7,480 Hybrid Striped Bass and 1,000 Striped Bass should continue to be stocked annually as they have high survival rates as indicated by the representation of fish in each age class. Both species are attaining large sizes, which are providing exciting angling opportunities.

A lake-wide absence of aquatic vegetation is due to the overabundance of Triploid Grass Carp. Stockings of Triploid Grass Carp were discontinued in 2009, as there was no longer a need for aquatic vegetation control in Hardy Lake. Aquatic vegetation should continue to be monitored annually as it will reestablish as the Triploid Grass Carp population dies off.

RECOMMENDATIONS

- Conduct a Largemouth Bass survey in 2018.
- Conduct a Bluegill and Redear Sunfish survey in 2018.
- Continue stocking 7,480 Hybrid Striped Bass and 1,000 Striped Bass annually.
- Continue monitoring aquatic vegetation abundance with annual surveys.

LITERATURE CITED

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Submitted by: Rebecca A. Munter, District 6 Fisheries Biologist
Date: December 16, 2015

Approved by: J £,
Daniel P. Carnahan, South Region Fisheries Supervisor
Date: March 23, 2017

Table. Stocking records for Hybrid Striped Bass and Striped Bass by DFW at Hardy Lake.

<u>Species</u>	Number	Year
Striped Bass	7,410	2001
Hybrid Striped Bass	7,410	2002
Striped Bass	7,410	2005
Striped Bass	14,820	2006
Striped Bass	7,410	2007
Striped Bass	4,427	2008
Hybrid Striped Bass	9,674	2009
Hybrid Striped Bass	14,960	2010
Hybrid Striped Bass	22,232	2011
Hybrid Striped Bass	14,960	2012
Hybrid Striped Bass	14,960	2013
Hybrid Striped Bass	7,480	2014
Hybrid Striped Bass	7,480	2015

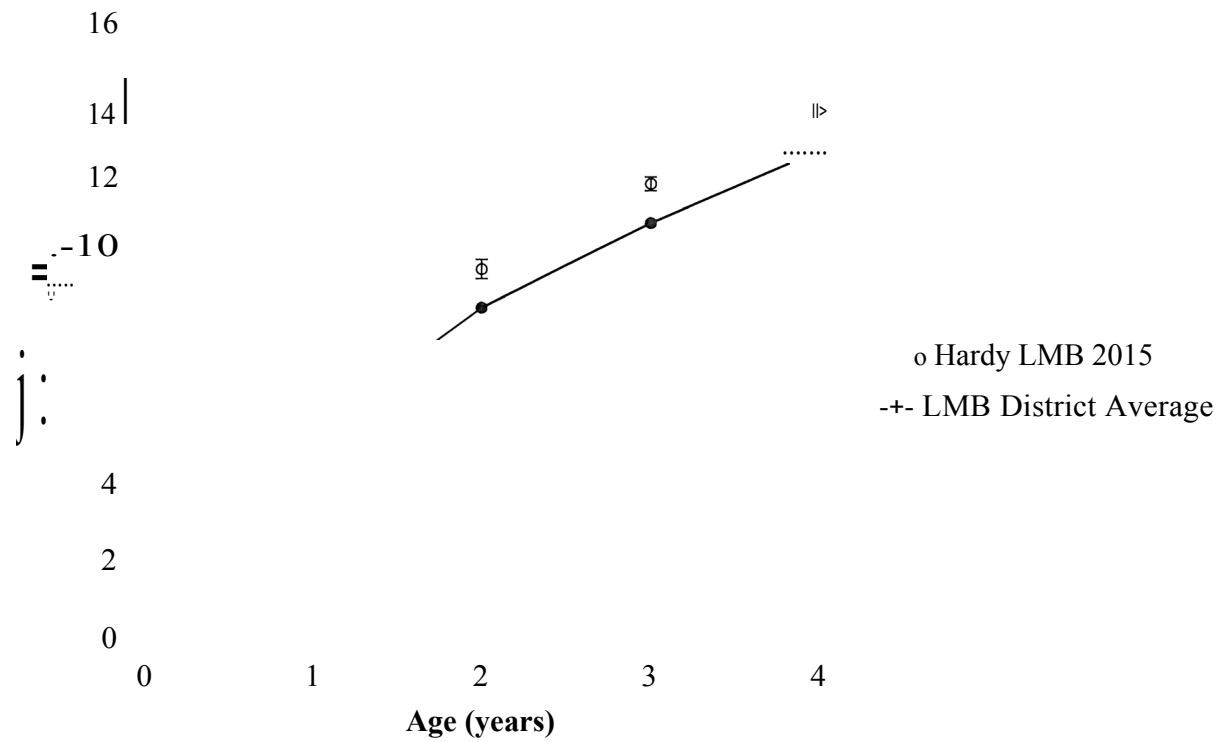


Figure. Mean length-at-age (with standard error) of Largemouth Bass sampled in Hardy Lake on May 11, 2015 compared to the district average for Largemouth Bass from lakes with Gizzard Shad. Scales were the age estimation structure.

APPENDIX

Largemouth Bass survey

Hybrid Striped Bass and Striped Bass survey

Vegetation Survey

LAKE SURVEY REPORT

Type of Survey	Oinilial Survey	[g] Re-Survey
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Hardy Lake	Scott	May, June, August and Oct. 2015
Biologist's name	Rebecca A Munter	Date of approval (Month, day, year)
		March 23, 2017

LOCATION		
Quadrangle Name	Range	Section
<u>Deputy</u> , Ind. 1968 P	7E,8E	13, 14, 18, 19, 24, 25, 30
Township Name	Nearest Town	
4N	<u>Deputy</u>	

ACCESSIBILITY						
State owned public access site			Privately owned public access site		Other access site	
Four concrete boat ramgs						
Surface acres	Maximum depth	Average depth	Acre feet	Water level	Extreme fluctuations	
741	38 ft	16 ft	11,856	600	598.5-601.5 ft MSL	
Location of benchmark						

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

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

Watershed use
Watershed covers 12 square mi (50% agricultural, 37% forest, 8% residential, 5% pasture/old field).

Development of shoreline
State-owned cam12_ground, Qeach, marina, overlook area, two fishing piers, and four boat ramps.

A private campground and approximately 24 homes are located along and near the northern and eastern shoreline.

Previous surveys and investigations
 Fishery surveys: 1971-1975, 1978, 1987, 1990, 1995, 1998-2000, 2003, and 2007. Walleye study: 1983, 1984.

Angler creel surveys: 1975, 1977, 1978, 1981, 1999, 2003, 2007, and 2010. Submersed vegetation surveys: 2004-201

Striped Bass/Hybrid Striped Bass surveys: 2005, 2007, 2009, 2010, and 2013.

Largemouth Bass survey: 2010.

SAMPLING EFFORT- Largemouth Bass Survey					
ELECTROFISHING	Day hours		Night hours		Total hours
					1.06
TRAP NETS	Number of traps		Number of Lifts		Total effort
GILL NETS	Number of nets		Number of Lifts		Total effort
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORFI INF SEINING	Number of 100 Foot Seine Hauls

PHYSICAL					
Color			Turbidity		
			Feet	Inches (SECCHI DISK)	
Alkalinity (ppm)*			pH		
Surface:		Bottom:	Surface:		Bottom:
Conductivity:			Air temperature:		
micromhos			OF		
Water chemistry GPS coordinates:					
			N	W	

DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	no data collected		36			72		
2			38			74		
4			40			76		
6			42			78		
8			44			80		
10			46			82		
12			48			84		
14			50			86		
16			52			88		
18			54			90		
20			56			92		
22			58			94		
24			60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			70					

COMMENTS
 Four stations were completed out of 8 stations that were planned for the evening. Station 5 had 200 seconds of effort and was incomplete due to motor troubles. Total electrofishing effort is recorded as 1.06, which includes the few LMB caught during the 200 seconds at station 5.

*ppm-parts per million

S. Jlm.

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	1.4	6.00	not aged
4.0					22.0				
4.5					22.5				
5.0	2	2.9	0.07	1	23.0				
5.5					23.5				
6.0	2	2.9	0.12	1	24.0				
6.5	1	1.4	0.10	1	24.5				
7.0	1	1.4	0.20	2	25.0				
7.5	1	1.4	0.15	2	25.5				
8.0	2	2.9	0.25	2	26.0				
8.5	1	1.4	0.30	2	TOTAL	70			
9.0	3	4.3	0.33	2					
9.5	3	4.3	0.40	2,3					
10.0	6	8.6	0.47	2,3					
10.5	5	7.1	0.53	2,3					
11.0	4	5.7	0.59	2,3					
11.5	6	8.6	0.72	3					
12.0	10	14.3	0.78	3					
12.5	5	7.1	0.88	3,4					
13.0	6	8.6	1.05	3,4					
13.5	5	7.1	1.27	3,4					
14.0	4	5.7	1.26	4					
14.5	1	1.4	1.25	4					
15.0	1	1.4	1.65	4					
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	66.0/h	GILL NET CATCH	TRAP NET CATCH
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Length group (in)	Total number	Sub-sample	AGE			
			1	2	3	4
5.0	2	2	2			
5.5	0	0				
6.0	2	2	2			
6.5	1	1	1			
7.0	1	1		1		
7.5	1	1		1		
8.0	2	2		2		
8.5	1	1		1		
9.0	3	3		3		
9.5	3	3		2	1	
10.0	6	6		5	1	
10.5	5	5		4	1	
11.0	4	4		1	3	
11.5	6	5			6	
12.0	10	6			10	
12.5	5	5			3	2
13.0	6	5			1	5
13.5	5	5			1	4
14.0	4	4				4
14.5	1	1				1
15.0	1	1				1
15.5	0	0				
16.0	0	0				
16.5	0	0				
17.0	0	0				
17.5	0	0				
18.0	0	0				
18.5	0	0				
19.0	0	0				
19.5	0	0				
20.0	0	0				
20.5	0	0				
21.0	0	0				
21.5	1	0				
Totals	70	63	5	20	27	17

AGE-LENGTH KEY SUMMARY						
Age	Number	Mean TL	Var	SE	Lower 95%CI	Upper 95%CI
1	5	5.8	0.61	0.27	5.2	6.3
2	20	9.6	1.12	0.25	9.1	10.1
3	27	11.8	0.84	0.18	11.5	12.2
4	17	13.7	0.65	0.16	13.4	14.0

*Scales were the age estimation structure used for Largemouth Bass.

SAMPLING SITE: J - Flipped Bass and Hybrid Striped Bass Survey

ELECTROFISHING	Day hours		Night hours	Total hours
	TRAP NETS		Number of traps	Number of Lifts
STB GILL NETS	Number of nets		Number of Lifts	Total effort
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING
		6	2	12
				Number of 100 Foot Seine Hauls

CHARACTERISTICS

Color	Turbidity		
	4 Feet	0 Inches (SECCHI DISK)	
Alkalinity (ppm)*	pH		
Surface:	Bottom:	Surface:	Bottom:
Conductivity:	Air temperature:		
micromhos	82 OF		
Water chemistry GPS coordinates:			
N 38.79076		W 85.70940	

TEMPERATURE, DEPTH, AND D.O. DATA

DEPTH (FEET)	DEGREES ("F)	D.O. (ppm)	DEPTH (FEET)	DEGREES ("F)	D.O. (ppm)	DEPTH (FEET)	DEGREES ("F)	D.O. (ppm)
SURFACE	81.9	8.85	36			72		
2	81.9	8.93	38			74		
4	81.9	9.01	40			76		
6	81.7	9.00	42			78		
8	79.7	8.04	44			80		
10	76.5	5.31	46			82		
12	73.9	2.20	48			84		
14	72.5	1.20	50			86		
16	69.4	0.51	52			88		
18	66.9	0.35	54			90		
20	63.0	0.26	56			92		
22	59.2	0.21	58			94		
24	57.9	0.16	60			96		
26	57.4	0.14	62			98		
28	56.7	0.14	64			100		
30	54.5	0.13	66					
32			68					
34			70					

COMMENTS

Net 3 also heif :w :Q in by anglers, only half of the net fished the entire 2nd night. N3 moved to N7 (GPS).
 Water was warm and nets were set to cover the entire region above the thermocline.

*ppm-parts per million

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	5	7.7	2.76	3
1.5					19.5	3	4.6	3.33	4
2.0					20.0	1	1.5	3.00	4
2.5					20.5	4	6.2	3.50	4,5
3.0					21.0	4	6.2	4.00	4
3.5					21.5	2	3.1	4.00	4
4.0					22.0	1	1.5	3.50	notaged
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0	1	1.5	3.65	notaged
6.5					24.5				
7.0					25.0				
7.5					25.5	1	1.5	6.00	6
8.0					26.0				
8.5					TOTAL	65			
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	2	3.1	1.35	notaged					
15.5	3	4.6	1.72	2					
16.0	12	18.5	1.80	2					
16.5	14	21.5	1.95	2					
17.0	7	10.8	1.99	2					
17.5	1	1.5	2.25	notaged					
18.0									
18.5	4	6.2	2.58	3					

ELECTROFISHING CATCH		GILL NET CATCH	5.4 /lift	TRAP NET CATCH	
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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					25.5				
8.0					26.0	1	4.5	8.00	not aged
8.5					26.5				
9.0					27.0				
9.5					27.5				
10.0					28.0				
10.5					28.5				
11.0					29.0	1	4.5	10.30	7
11.5					29.5				
12.0					30.0	4	18.2	12.38	7
12.5					30.5	2	9.1	12.50	7
13.0					31.0	3	13.6	11.60	not aged
13.5					31.5	4	18.2	13.38	7
14.0					32.0	2	9.1	14.85	7
14.5					32.5	3	13.6	14.83	7
15.0					33.0	1	4.5	15.50	7
15.5					33.5				
16.0					34.0				
16.5					34.5				
17.0					35.0				
17.5					35.5	1	4.5	16.00	8
18.0					TOTAL	22			
18.5									

ELECTROFISHING CATCH		GILL NET CATCH	1.8 /lift	TRAP NET CATCH	
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1%

Length	Total	Sub-	AGE					
group (in)	number	sample	1	2	3	4	5	6
15	2	0						
15.5	3	1(2)		1				
16.0	12	6(2)		6				
16.5	14	10(2)		10				
17.0	7	2(2)		2				
17.5	1	0						
18.0								
18.5	4	3(3)			3			
19.0	5	4(3)			4			
19.5	3	1(4)				1		
20.0	1	1(4)				1		
20.5	4	2(4),1(5)				2	1	
21.0	4	4(4)				4		
21.5	2	1(4)				1		
22.0	1	0						
22.5								
23.0								
23.5								
24.0	1	0						
24.5								
25.0								
25.5	1	1(6)						1
Totals	65	37	0	19	7	9	1	1

AGE-LENGTH KEY SUMMARY						
Age	Number	Mean TL	Var	SE	Lower 95%CI	Upper 95%CI
1	0					
2	19	16.6	0.34	0.08	16.4	16.7
3	7	19.0	0.29	0.11	18.7	19.2
4	9	20.8	0.63	0.21	20.4	21.3
5	1	20.9				
6	1	25.5				

* Otoliths were used to estimate all ages.

Length group (in)	Total number	Sub-sample	AGE	
			7	8
26.0	1	0		
26.5				
27.0				
27.5				
28.0				
28.5				
29.0	1	1(7)	1	
29.5				
30.0	4	2(7)	2	
30.5	2	1(7)	1	
31.0	3	0		
31.5	4	2(7)	2	
32.0	2	2(7)	2	
32.5	3	1(7)	1	
33.0	1	1(7)	1	
33.5				
34.0				
34.5				
35.0				
35.5	1	1(8)		1
Totals	22	11	10	1

AGE-LENGTH KEY SUMMARY						
Age	Number	Mean TL	Var	SE	Lower 95%CI	Upper 95%CI
7	10	31.4	1.26	0.40	30.6	32.2
8	1	35.7				

* Otoliths were used to estimate all ages.

-R-fll iJ.Eb

GILL NETS				TRAP NETS				ELECTROFISHING						
1	N	38.78982	W	-85.70784	1	N		W		1	N	38.77135	W	-85.68766
	N	38.78957	W	-85.70652	2	N		W			N	38.77291	W	-85.68934
2	N	38.79045	W	-85.70810	3	N		W		2	N	38.76929	W	-85.67751
	N	38.79006	W	-85.70698	4	N		W			N	38.76775	W	-85.67574
3	N	38.78996	W	-85.71084	5	N		W		3	N	38.77774	W	-85.68514
	N	38.79077	W	-85.71007	6	N		W			N	38.77752	W	-85.68268
4	N	38.78816	W	-85.71106	7	N		W		4	N	38.78417	W	-85.47944
	N	38.78782	W	-85.70985	8	N		W			N	38.78352	W	-85.68424
5	N	38.78923	W	-85.70203	9	N		W		5	N	38.78584	W	-85.69439
	N	38.78880	W	-85.70091	10	N		W			N	38.78556	W	-85.69389
6	N	38.78602	W	-85.69830	11	N		W		6	N		W	
	N	38.78971	W	-85.69665	12	N		W			N		W	
7	N	38.78586	W	-85.69665	13	N		W		7	N		W	
	N	38.78516	W	-85.69587	14	N		W			N		W	
8	N		W		15	N		W		8	N		W	
	N		W		16	N		W			N		W	
9	N		W		17	N		W		9	N		W	
	N		W		18	N		W			N		W	
10	N		W		19	N		W		10	N		W	
11	N		W		20	N		W			N		W	
11	N		W							11	N		W	
12	N		W								N		W	
	N		W								N		W	
13	N		W							12	N		W	
	N		W								N		W	
14	N		W							13	N		W	
	N		W								N		W	
15	N		W							14	N		W	
	N		W								N		W	
16	N		W							15	N		W	
	N		W								N		W	
17	N		W							16	N		W	
	N		W								N		W	
18	N		W							17	N		W	
	N		W								N		W	
19	N		W							18	N		W	
	N		W								N		W	
20	N		W							19	N		W	
	N		W								N		W	
											N		W	
											N		W	
											N		W	

20

N

W

Occurrence and Abundance of Submersed Aquatic Plants

Lake: Hardy	Secchi (ft): 2.5	SE Mean Species / Site: 0.00
Date: 8/11/2015	Littoral Sites w/Plants: 0	Mean Natives / Site: 0.00
Littoral Depth (ft): 1.5	Number of Species: 0	SE Mean Natives / Site: 0.00
Littoral Sites: 4	Max. Species / Site: 0	Species Diversity: 0.00
Total Sites: 38	Mean Species / Site: 0.00	Native Diversity: 0.00

Species noted: Phragmites
Purple loosestrife
American waterwillow
Buttonbush