

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-30-R-33

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2007 Survey Report

Lake Hawkins

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Hawkins were surveyed in 2007 using electrofishing and in 2008 using gill netting and electrofishing. Aquatic vegetation and habitat surveys were conducted on Lake Hawkins during August 2007. Due to a hydrilla problem beginning in 2005, additional vegetation surveys were conducted on a quarterly basis from fall 2005 through spring 2008. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Lake Hawkins is a 634-acre impoundment located in Wood County, Texas, on Little Sandy Creek, a tributary of the Sabine River. The reservoir was constructed by Wood County for flood control and recreation. Habitat consists primarily of native submerged and floating aquatic vegetation. Hydrilla and Eurasian watermilfoil are also present in the reservoir. Standing timber is present in large quantities in the northern portion of the lake. The shoreline is historically comprised of native emergent and floating vegetation, along with boat docks.
- **Management history:** Largemouth bass is the most important sport fish. The management plan from the 2003 survey report recommended monitoring the Florida largemouth bass allele frequency using liver samples from age-0 largemouth bass collected during fall electrofishing. Florida largemouth bass were stocked most recently in 1990. The monitoring of invasive aquatic species in Lake Hawkins is a priority because the diversity of aquatic species in the lake is a unique situation.
- **Fish community**
 - **Prey species:** Historically, clupeids have been low in abundance in Lake Hawkins. The predominant prey species in the reservoir include bluegill, redear sunfish, and other less abundant sunfish species. Electrofishing catch of gizzard shad was very low, with only large individuals collected. A small number of threadfin shad were also collected. Electrofishing catch of bluegills was low, and few bluegills were over 6 inches. Redear sunfish are also present in the reservoir in moderate abundance, with many ≥ 6 inches.
 - **Catfishes:** No catfish were sampled in the reservoir during the spring 2007 gill net survey. Although channel catfish were stocked as recently as 1992, this species remained rare in Lake Hawkins.
 - **Largemouth bass:** Few largemouth bass were caught during electrofishing in fall 2006, due to extremely dense hydrilla growth that limited the effectiveness of this sampling gear. Following significant hydrilla reduction in 2007, electrofishing catch rates of largemouth bass increased five-fold compared to 2006. Despite the improved catch rates in 2007, size structure of the population was poor, with few individuals of legal-size (≥ 14 inches).
 - **Crappies:** Black crappie have historically occurred in low abundance. No fall trap net survey was conducted during 2007.

Management strategies: Conduct additional vegetation surveys on a quarterly basis to monitor the hydrilla infestation and make management recommendations based on survey findings. Continue with standard monitoring using electrofishing and gill netting surveys in 2011-2012.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Hawkins from June 2007 to May 2008. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2007 and 2008 data for comparison.

Reservoir Description

Lake Hawkins is a 634-acre impoundment constructed in 1962 on Little Sandy Creek, a tributary of the Sabine River. The reservoir is located in Wood County approximately 18 miles north of Tyler, Texas, and is operated and controlled by Wood County. Primary water uses included flood control and recreation. Habitat at time of sampling consisted of natural shoreline with extensive cover provided by native emergent and floating aquatic vegetation. Boat docks and hydrilla also provided useable habitat for fish. Boat access consisted of four public boat ramps. Bank fishing access was excellent and could be found at all public boat ramps, the RV park, and along much of the shoreline throughout the lake. Other descriptive characteristics for Lake Hawkins are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Storey and Myers 2004) included:

1. Monitor the invasive aquatic plant, Eurasian watermilfoil.
Action: A standard vegetation survey was conducted in 2007. Less than 0.1 acre of Eurasian watermilfoil was observed.
2. Monitor the largemouth bass population and enhance population genetics through the stocking of FLMB, if justifiable.
Action: Lake Hawkins was sampled using electrofishing in fall 2005 and 2007. A sample of age-0 fish was collected in fall 2007 and subjected to genetic analysis. Analysis showed 63% FLMB alleles.
3. Improve angler access facilities
Action: Wood County has constructed a new boat ramp with a loading dock and a parking area on CR 3497 since the last report was prepared in 2004.

Harvest regulation history: Sport fishes in Lake Hawkins are currently managed with statewide regulations (Table 2).

Stocking history: Florida largemouth bass (FLMB) were initially introduced in 1975 (55,000 fingerlings) and stocked again in 1990. Blue catfish were introduced in 1982, but the population did not persist as no blue catfish have been sampled during the past two decades. Channel catfish were introduced in 1967 and three more times thereafter, but are rarely sampled. Smallmouth bass were stocked five times between 1987 and 1991, but have not been encountered in population sampling nor by anglers. Triploid grass carp were stocked by Wood County in 2006 as a management tool to help control hydrilla in Lake Hawkins. The complete stocking history is in Table 3.

Vegetation/habitat history: Lake Hawkins has historically had a rich diversity of native aquatic plants. In 2003, 312 acres of aquatic vegetation representing 44.6% of the reservoir's surface area was observed (Storey and Myers 2004).

METHODS

Fishes were collected by electrofishing in fall 2007 and spring 2008 (1 hour at 12, 5-min stations), and gill netting (5 net nights at 5 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill nets, as the number of fish caught per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (Texas Parks and Wildlife Department (TPWD), Inland Fisheries Division, unpublished manual revised 2005). Aquatic vegetation and littoral habitat surveys were performed according to the Fishery Assessment Procedures TPWD, Inland Fisheries Division, unpublished manual revised 2005). Shoreline distances and areas of vegetation were estimated using ArcView GIS software.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and relative weight (W_r) were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error ($RSE = 100 \times SE$ of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Ages were determined for largemouth bass using otoliths from 8 specimens with lengths ranging from 13 to 15 inches. A sample of 30 age-0 largemouth bass were collected by electrofishing in fall 2007 and subjected to genetic analysis using DNA microsatellite analysis in accordance with Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

RESULTS AND DISCUSSION

Vegetation/habitat: In summer 2005, District staff received reports from area residents about an infestation of hydrilla in Lake Hawkins. A survey conducted in September 2005 found 160 acres of hydrilla mixed with native aquatic plants and Eurasian watermilfoil confined to the lower end of the lake. In February 2006, a public hearing was held in Hawkins between representatives from Wood County, TPWD, and the local homeowner's group to discuss management options. District staff committed to conduct hydrilla surveys on a quarterly basis. A proposal was presented to stock triploid grass carp, and following a public hearing in April 2006, 1,000 fish were stocked in May 2006. Hydrilla acreage reached a peak in December 2006 at 479 acres and plants were distributed throughout the reservoir. Wood County purchased Sonar herbicide in spring 2007, and TPWD Aquatic Habitat Enhancement staff applied the chemical in April 2007. The applied management controls, in addition to heavy rainfall experienced in summer 2007 combined to reduce the acreage of hydrilla in Lake Hawkins (Appendix C). A comprehensive vegetation survey conducted in September 2007 showed an aquatic plant community dominated by hydrilla (142.0 acres), native submerged (48.3 acres), and native floating species (20.5 acres) which accounted for 33.9% of the reservoir surface area (Table 4). A habitat survey conducted at the same time revealed a shoreline dominated by natural shoreline bordered by native aquatic species (emergent, floating, and submerged) and hydrilla. Boat docks were encountered on 17% of the shoreline (Table 4).

Prey species: Electrofishing catch rates of bluegill, redear sunfish and gizzard shad were 159.0/h, 60.0/h, and 2.0/h, respectively. Total CPUE of gizzard shad was low, with fish too large to make any meaningful contribution to the prey base (Figure 1). A small number of threadfin shad was also collected. Total CPUE of bluegill in 2007 was lower than previous years but the majority of fish collected were of suitable size for predators (Figure 2). Redear sunfish CPUE was lower than bluegill CPUE. Redear sunfish provide an additional prey species and offer recreational opportunities (Figure 3). The abundance of aquatic vegetation and high water clarity in Lake Hawkins provides an ideal opportunity for sunfish to dominate the prey base.

Channel catfish: No channel catfish were collected in 2008. Historically low catches of catfish likely result from extensive aquatic vegetation, high water clarity, and consequent predation by largemouth bass.

Largemouth bass: The electrofishing catch rate of largemouth bass was 64/h in 2007, higher than in 2005 (47/h) or 2006 (13/h) (Figure 4). The extremely low catch rate in 2006 was the result of a dense infestation of hydrilla that made sampling and recovery of fish difficult. Over 43% of the fish collected in 2007 were at or above stock size (8 inches), and of these fish approximately 18% were of legal size. The population has historically been dominated by fish less than 10 inches in length. Body condition in fall 2007 was good (W_r ranged from 80 to 100) for all size classes of fish, indicating an ample supply of prey species. Electrofishing conducted in spring 2008 also showed fish with good relative weights and moderate abundance (Figure 5). Growth of largemouth bass in Lake Hawkins was slow; fish grew to legal-length (14 inches) between three and four years of age. Genetic assessment of a sample of age-0 fish collected during fall 2007 indicated a FLMB allele frequency of 63.4%. No pure FLMB were collected (Table 5).

Crappies: No trap net sampling was conducted in 2007. The trap net catches have historically been low which indicates a low-density population, an inefficient sampling method or both.

Fisheries management plan for Lake Hawkins, Texas

Prepared – July 2008

ISSUE 1: Hydrilla coverage in Lake Hawkins has decreased from a peak of 479 acres in December 2006 but continues to pose a threat to the reservoir.

MANAGEMENT STRATEGIES

1. Conduct quarterly hydrilla surveys as appropriate.
2. Conduct comprehensive vegetation and habitat surveys every 4 years.
3. Make management recommendations to the controlling authority (Wood County) regarding additional grass carp stockings or herbicide applications if acreage of hydrilla shows evidence of increase.
4. Provide progress reports on the status of hydrilla to the Wood County Commissioner and the Association of Lake Hawkins Property Owners.

ISSUE 2 The largemouth bass population in Lake Hawkins received two stockings of Florida largemouth bass (1975 and 1990). The population is characterized by good body condition and is dominated by fish under the minimum length limit. In 2007, the population contained 63% FLMB alleles, an increase compared to 2003 and 1999.

MANAGEMENT STRATEGIES

1. Monitor largemouth bass abundance, condition, and population size structure, by conducting electrofishing surveys every other year beginning in 2009.
2. Continue to monitor Florida largemouth bass allele frequency through collection of fin samples from age-0 largemouth bass every four years. Recommend stocking of Florida largemouth bass if level of FLMB alleles decreases below 20%.

ISSUE 3 The catfish and crappie populations in Lake Hawkins have traditionally been low in abundance and their relative contribution to the fishery has been minimal. To provide additional fishing opportunities for anglers, underutilized fisheries in the reservoir should be promoted.

MANAGEMENT STRATEGIES

1. Because of the extensive bank angling access on Lake Hawkins, shore anglers can easily target sunfishes. When possible, promote the sunfish fishery through press releases, public outreach activities, and angler encounters.
2. Anecdotal observations suggest an abundant population of chain pickerel in the lake. There is potential for this species to be utilized by anglers as a sport fish. Efforts will be made to promote this fishery similar to sunfishes.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional electrofishing in 2009, and mandatory monitoring in 2011-2012 (Table 6). Gill net surveys will be conducted every four years to monitor channel catfish recruitment, condition, and relative abundance. Quarterly hydrilla surveys will continue in the near future but when the population stabilizes, sampling frequency will be reduced.

LITERATURE CITED

- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- Storey, K., and R. Myers. 2004. Statewide freshwater fisheries monitoring and management program survey report for Lake Hawkins, 2003. Texas Parks and Wildlife Department, Federal Aid in Sport Fish Restoration, Performance Report, Project F-30-R-29, Job A, 21 pages.

Table 1. Characteristics of Lake Hawkins, Texas.

Characteristic	Description
Year constructed	1962
Controlling authority	Wood County
Surface area	634 acres
Counties	Wood
Reservoir type	Tributary
Mean depth	15.0 ft.
Maximum depth	30.0 ft.
Shoreline development index (SDI)	5.8
Conductivity	130 μ mho / cm
Secchi disc range	8 – 12 ft.

Table 2. Harvest regulations for Lake Hawkins.

Species	Bag limit	Minimum-Maximum length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No limit
Catfish: flathead	5	18 - No limit
Bass: largemouth	5	14 - No limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No limit

Table 3. Stocking history of Lake Hawkins, Texas. Size categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

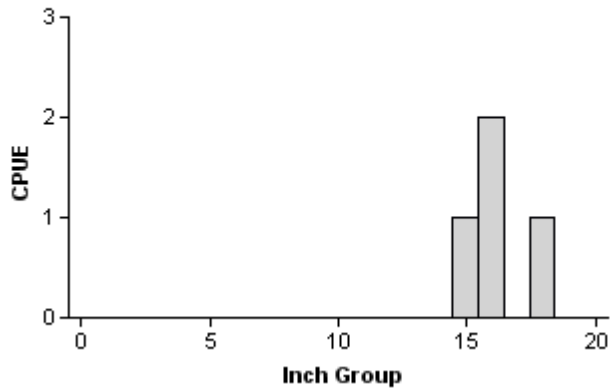
Species	Year	Number	Size
Threadfin shad	1991	500	ADL
	Total	500	
Triploid grass carp	2006	1,000	ADL
	Total	1,000	
Blue catfish	1982	56,154	FGL
	Total	56,154	
Channel catfish	1967	4,000	AFGL
	1981	54,500	FGL
	1982	55,000	FGL
	1992	8,028	AFGL
	Total	121,531	
Smallmouth bass	1987	21,500	FGL
	1988	157,300	FRY
	1989	1,550	FGL
	1989	38,476	FGL
	1991	3,740	FGL
	Total	222,566	
Florida largemouth bass	1975	55,000	FGL
	1990	80,546	FGL
	Total	135,546	

Table 4. Survey of littoral zone and physical habitat types, Lake Hawkins, Texas, September 2007. A linear shoreline distance (miles) was recorded for each habitat type found. The sum of shoreline distances exceeds the lake perimeter because of overlap of habitat types.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Boat docks	3.0	17.2		
Standing timber	0.9	5.1		
Overhanging brush	0.2	1.1		
Rock shore	0.2	1.1		
Sandy shore	0.1	0.8		
Native emergent (<i>pondweed, maidencane, waterwillow, pickerelweed, waterprimrose, cattail, watershield, arrowhead</i>)	5.1	29.1	4.1	0.6
Native floating (<i>American lotus, spatterdock, water lily</i>)	8.5	48.1	20.5	3.2
Native submerged (<i>fanwort, coontail, muskgrass</i>)	4.1	23.3	48.3	7.6
Eurasian watermilfoil	0.1	0.8	0.1	<0.0
Hydrilla	9.3	52.7	142.0	22.4
Total			215.0	33.9

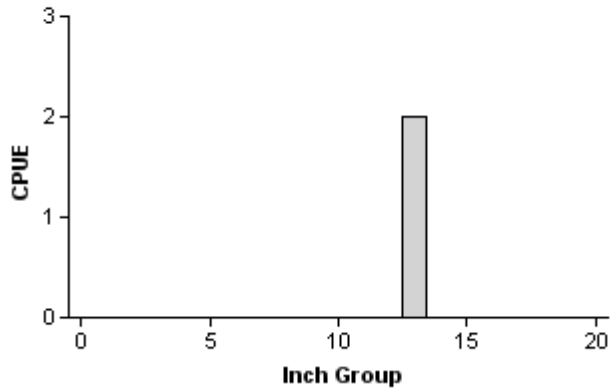
Gizzard shad

2003



Effort = 1.0
 Total CPUE = 4.0 (56; 4)
 Stock CPUE = 4.0 (56; 4)
 PSD = 100 (0)
 IOV = 0.0 (0)

2007



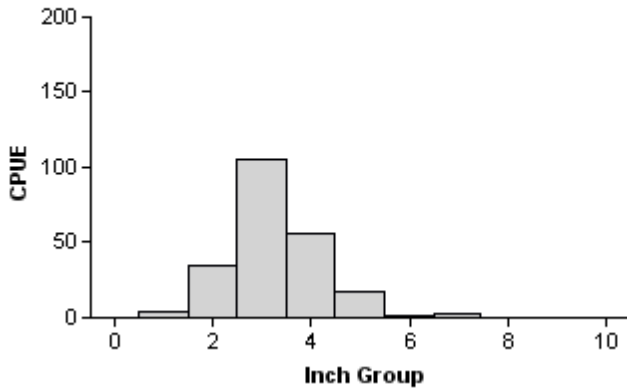
Effort = 1.0
 Total CPUE = 2.0 (67; 2)
 Stock CPUE = 2.0 (67; 2)
 PSD = 100 (0.0)
 IOV = 0.0 (0.0)

Figure 1. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2003 and 2007. No gizzard shad were collected in 1999.

Bluegill

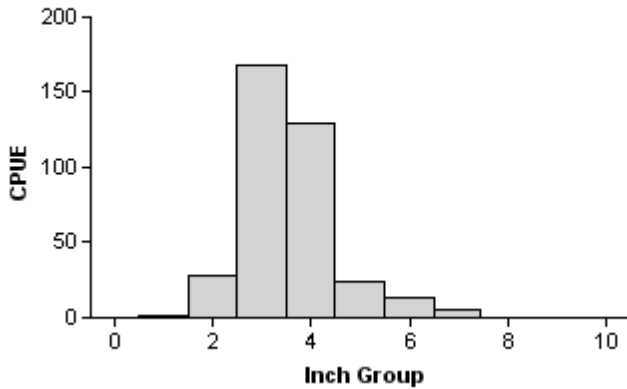
1999

Effort = 1.0
 Total CPUE = 223.0 (24; 223)
 Stock CPUE = 184.0 (25; 184)
 PSD = 3 (1.6)



2003

Effort = 1.0
 Total CPUE = 369.0 (19; 369)
 Stock CPUE = 340.0 (20; 340)
 PSD = 5 (1.3)



2007

Effort = 1.0
 Total CPUE = 159.0 (20; 159)
 Stock CPUE = 136.0 (19; 136)
 PSD = 21 (4)

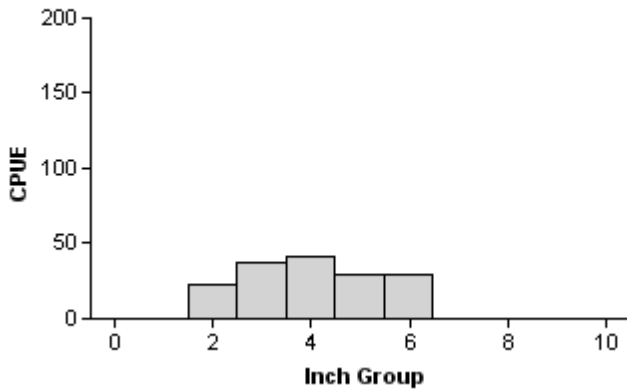


Figure 2. Number of bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 1999, 2003, and 2007.

Redear sunfish

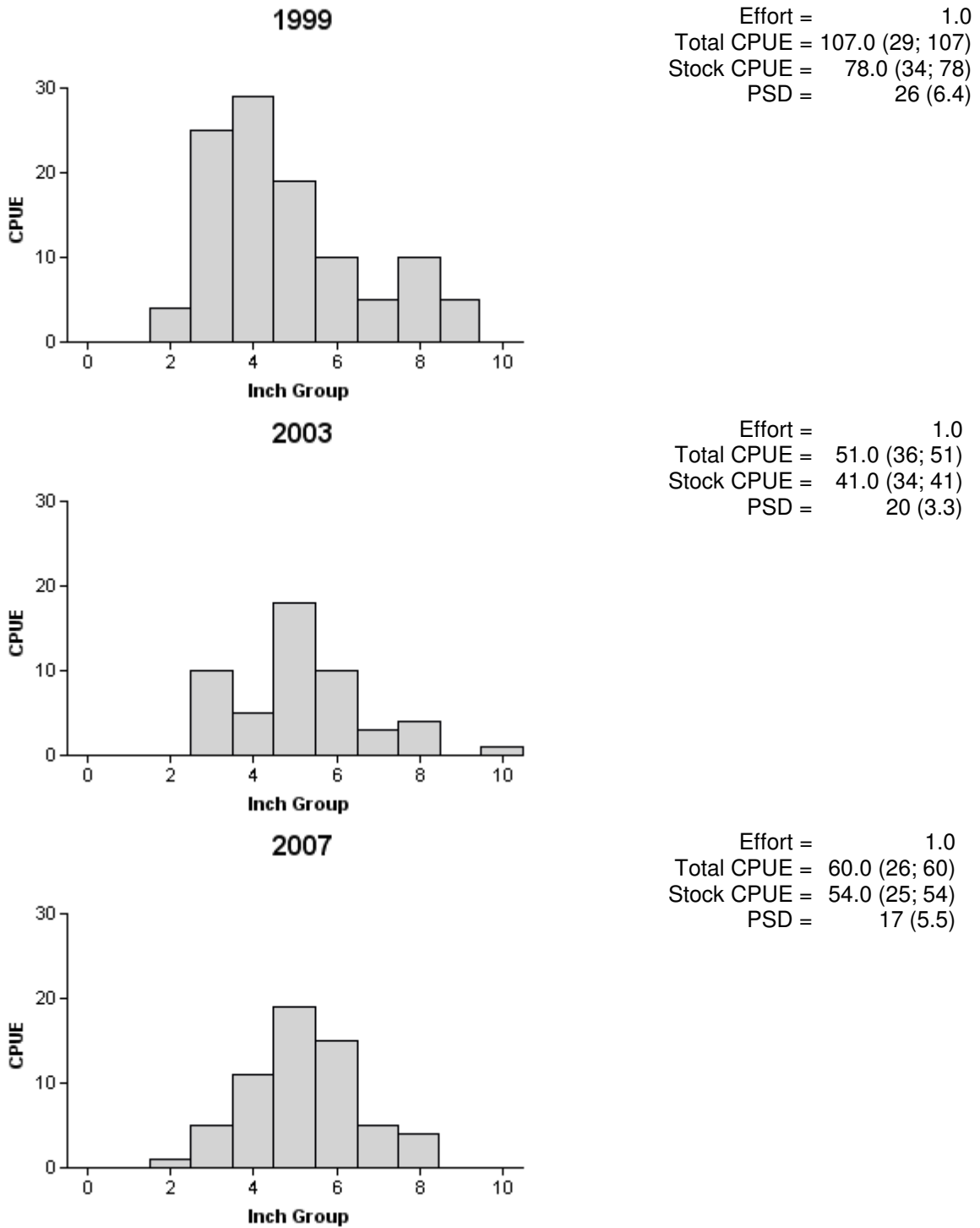


Figure 3. Number of redear sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 1999, 2003, and 2007.

Largemouth bass

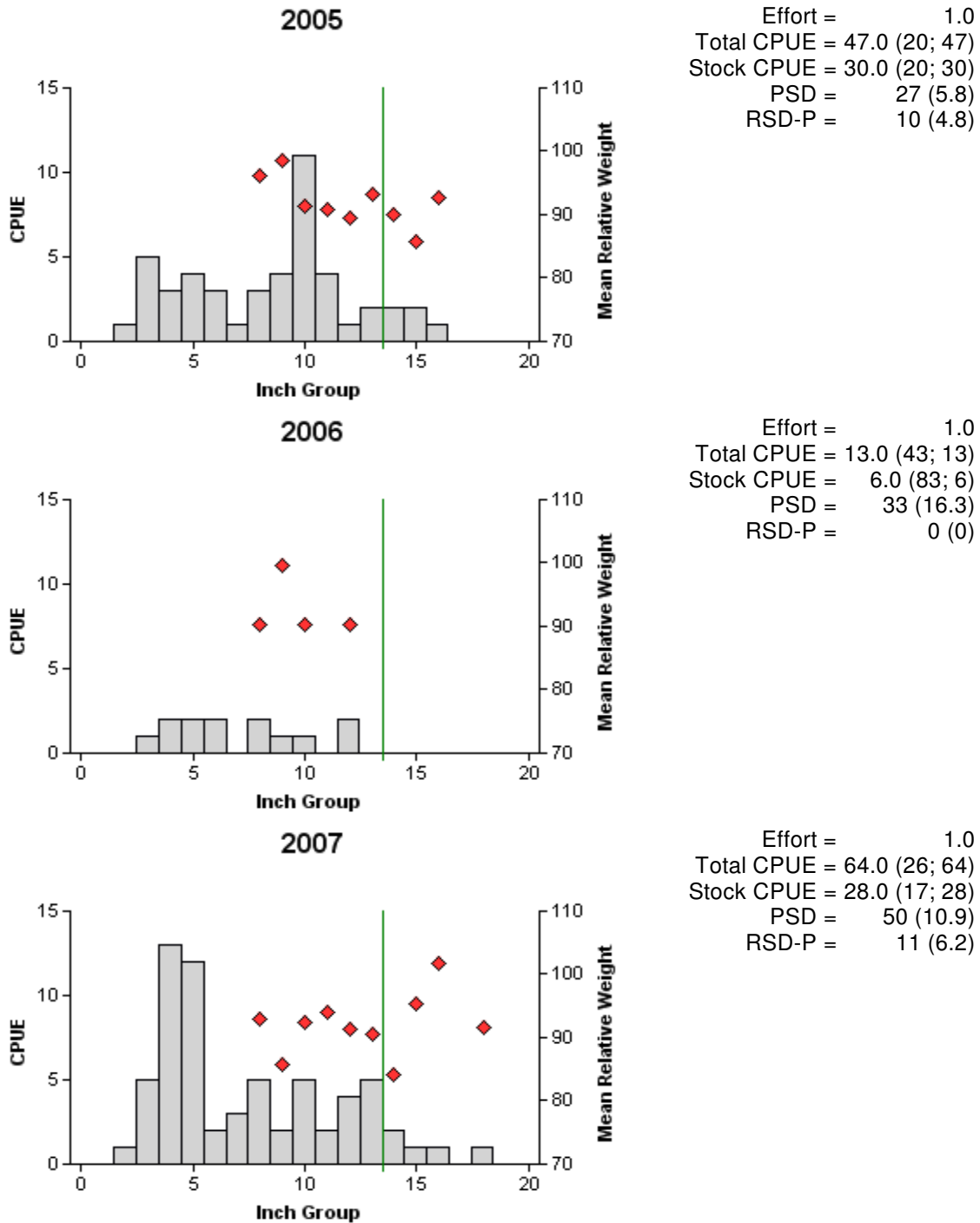


Figure 4. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Hawkins, Texas, 2005, 2006, and 2007. The 2005 and 2006 surveys were bass-only. Vertical lines indicate minimum length limit at time of survey.

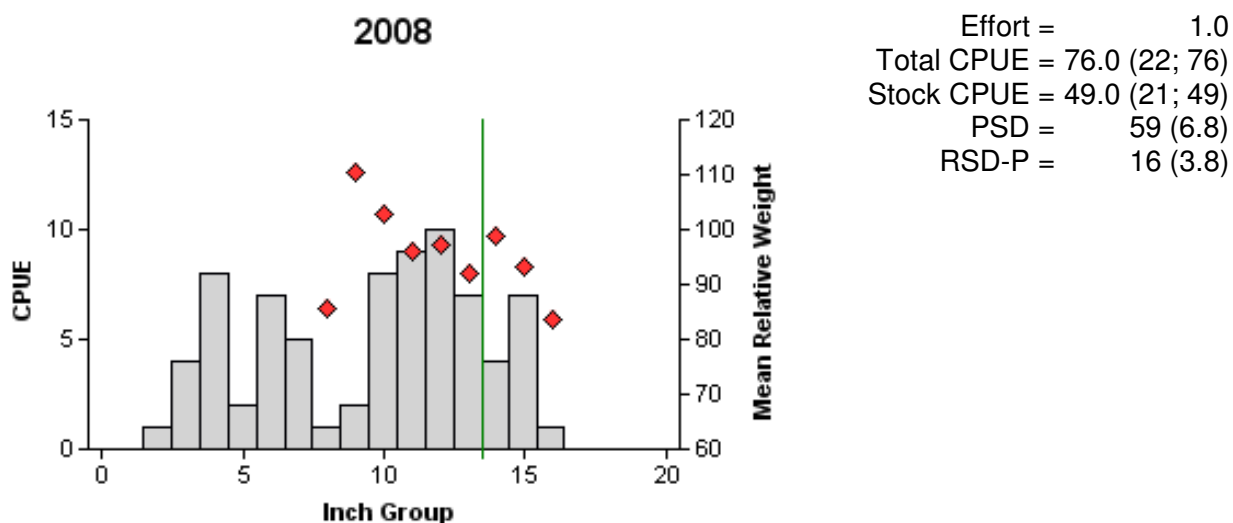


Figure 5. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing survey, Lake Hawkins, Texas, 2008. Vertical lines indicate minimum length limit at time of survey.

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Lake Hawkins, Texas, 1993, 1996, 1999, 2003, and 2007. Data from 1993 through 2003 is derived from starch-gel electrophoresis, and 2007 data is from microsatellite DNA. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

Year	Sample size	Genotype				NLMB	% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	Combined hybrids			
1993	30	1	10	15	25	4	45.8	3.3
1996	25	2	7	15	22	1	45.0	8.0
1999	30	1	9	18	27	2	36.7	3.3
2003	30	4	7	17	24	2	50.0	13.3
2007	30	0	^a	^a	30	0	63.4	0.0

^aAnalysis no longer separates F1 from Fx hybrids

Table 6. Proposed sampling schedule for Lake Hawkins, Texas. Gill netting surveys are conducted in the spring, while electrofishing is conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

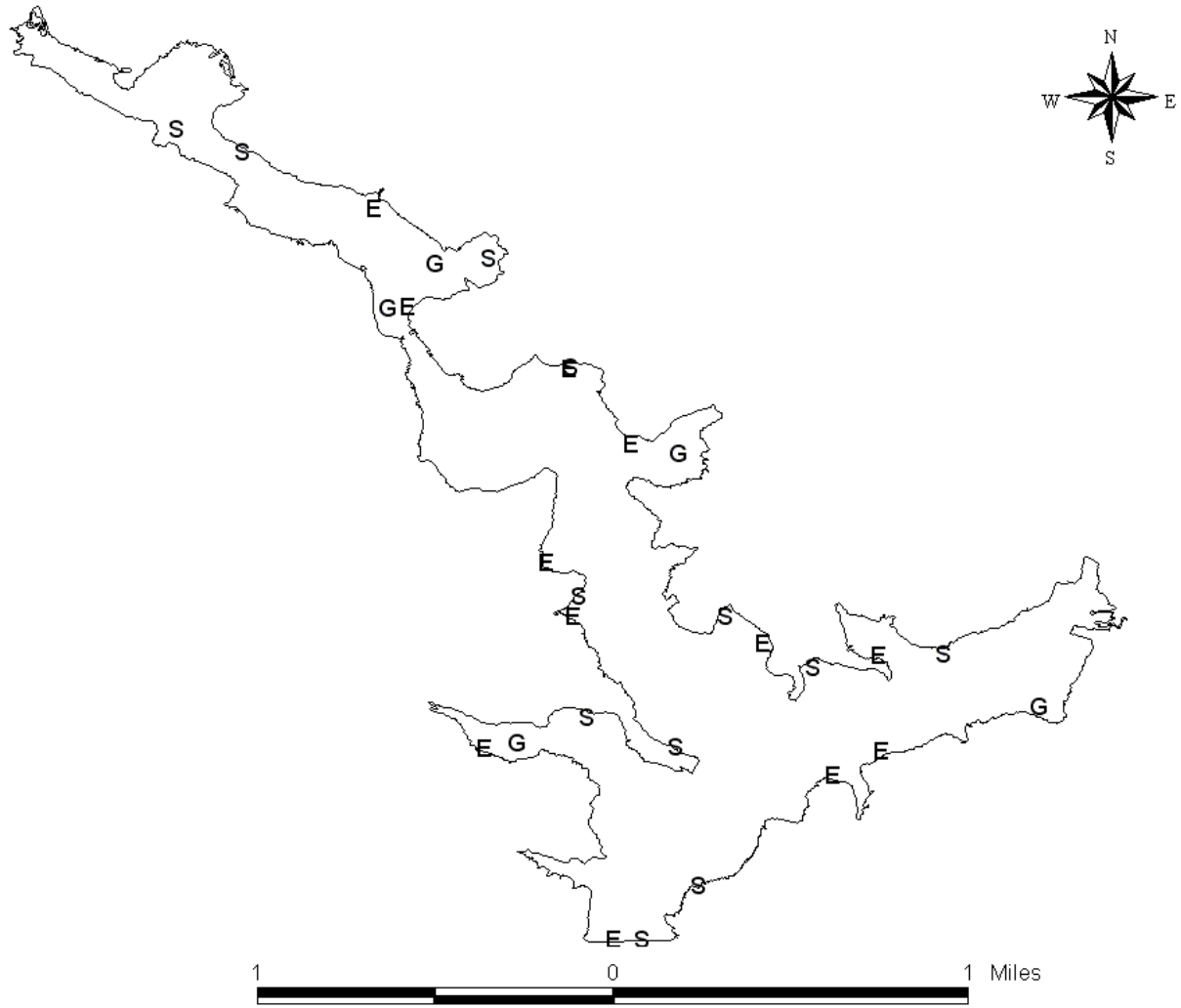
Survey Year	Electrofishing	Gill net	Vegetation/ Habitat	Report
Summer 2008-Spring 2009			A	
Summer 2009-Spring 2010	A		A	
Summer 2010-Spring 2011			A	
Summer 2011-Spring 2012	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected by fall and spring electrofishing from Lake Hawkins, Texas, 2007-2008. The spring survey was bass-only.

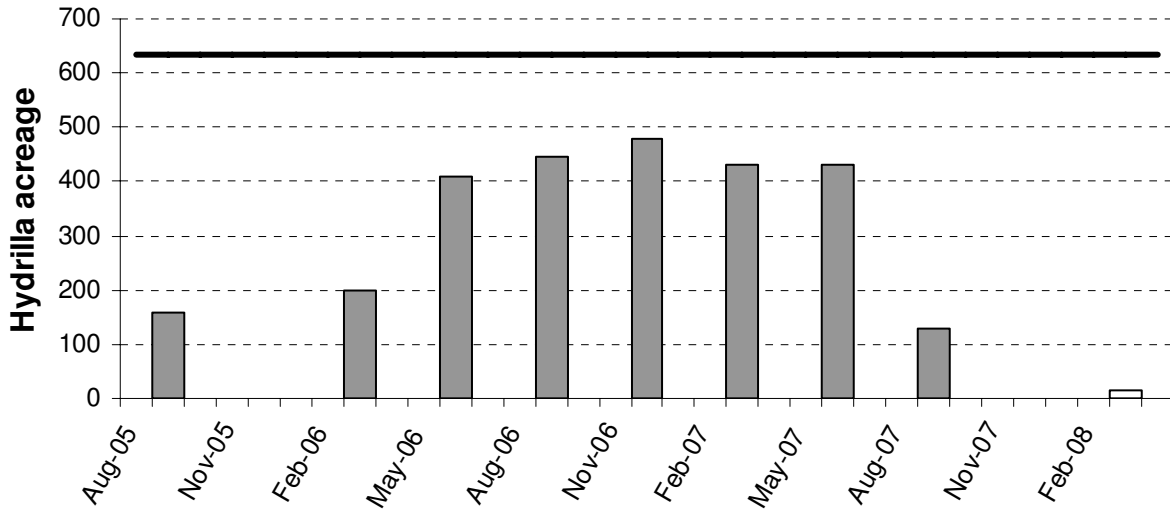
Species	Fall 2007		Spring 2008	
	N	CPUE	N	CPUE
Gizzard shad	2	2.0		
Threadfin shad	5	5.0		
Redbreast sunfish	23	23.0		
Warmouth	7	7.0		
Bluegill	159	159.0		
Longear sunfish	2	2.0		
Redear sunfish	60	60.0		
Largemouth bass	64	64.0	76	76.0

APPENDIX B



Location of electrofishing (E), gill net (G), and spring electrofishing (S) sites, Lake Hawkins, Texas, 2007-2008.

APPENDIX C



Acreage estimates of hydrilla in Lake Hawkins, September 2005 through March 2008. Solid horizontal line represents reservoir area (634 acres)