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STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2007 Survey Report

Big Creek Lake

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July 31, 2008

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Big Creek Lake were surveyed in 2007 using electrofishing and trap netting, and in 2008 using gill netting. Aquatic vegetation and habitat surveys were conducted on Big Creek Lake during September 2007. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Big Creek Lake is a 520-acre impoundment located in Delta County, Texas, on Big Creek, a tributary of the South Sulphur River. The reservoir was constructed by the City of Cooper for municipal water supply. Habitat consists primarily of featureless banks and the littoral area contains several species of native aquatic plants and Eurasian watermilfoil. American lotus inhabits much of the littoral area, exhibiting excessive coverage.
- **Management history:** Important sport fish include largemouth bass, white crappie, and channel catfish. The management plan from the 2003 survey report recommended stocking Florida largemouth bass at a rate of 100/acre in 2005 and 2006, and monitoring the Florida bass allele frequency using liver samples from age-0 largemouth bass collected during fall. Although Florida largemouth bass were not stocked in 2005 or 2006, fingerlings were stocked during spring 2007.
- **Fish community**
 - **Prey species:** Predominant prey species in the reservoir include gizzard shad, threadfin shad, bluegill, and redear sunfish. Electrofishing catch of gizzard shad was moderate, with the majority of gizzard shad being available as prey to most sport fish. Electrofishing catch of bluegills was low compared to previous reports. Redear sunfish are also present in the reservoir, with some individuals greater than 6 inches long. Threadfin shad provided additional forage for sport fish in the reservoir.
 - **Catfishes:** All channel catfish collected during gill netting were of harvestable size, but abundance of channel catfish was low. No blue or flathead catfish were sampled in the reservoir during the spring 2008 survey.
 - **Largemouth bass:** Numerous largemouth bass were caught during fall 2007 electrofishing. Despite the high catch rates, size structure of the population was poor, with relatively few fish of legal size. Largemouth bass were in excellent body condition, indicating prey populations were sufficient.
 - **Crappies:** Only one white crappie was sampled during the fall 2007 trap net survey, and no black crappie were collected. The fall 2003 trap net survey sampled low numbers of both species.

Management strategies: Continue to monitor the largemouth bass population using biennial electrofishing surveys to evaluate the effect of stockings of Florida strain fingerlings conducted in 2007. Continue with standard monitoring using trap netting and electrofishing in 2011 and gill netting in 2012.

INTRODUCTION

This document is a summary of fisheries data collected from Big Creek Lake June 2007 through 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

Big Creek Lake is a 520-acre impoundment constructed in 1987 on Big Creek, a tributary of the South Sulphur River. The reservoir is located in Delta County approximately 15 miles north of Sulphur Springs, Texas, and is operated and controlled by the city of Cooper. Primary water use is for municipal water supply. Habitat at time of sampling consisted of featureless banks with a littoral area comprised of native vegetation and Eurasian watermilfoil. Extremely dense stands of American lotus cover much of the reservoir's littoral area. Boat access consisted of one public boat ramp. Bank angling access was poor because of dense growths of aquatic and terrestrial vegetation along the shoreline near the public access area. Other descriptive characteristics for Big Creek Lake 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 largemouth bass population.
Action: Electrofishing surveys were conducted in 2006 and 2007 to monitor the largemouth bass population. Florida largemouth bass fingerlings were stocked during spring 2007.
2. Monitor aquatic vegetation.
Action: A vegetation survey was conducted in August 2007. Excessive amounts of American lotus were observed and may result in accessibility problems. Only small amounts of Eurasian watermilfoil were detected.
3. Improve access facilities for anglers.
Action: The City of Cooper was approached about repairing the fishing pier. Repairs were made to the pier in the spring of 2008.

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

Stocking history: Big Creek Lake was most recently stocked with FLMB in 2007. Prior to 2007, the most recent stocking occurred in 2000. FLMB were initially introduced in 1988 and stocked again in 1989, 1990 and 1998 through 2000. Blue catfish were introduced in 1988, and stocked twice more, but the population did not persist as no blue catfish have been sampled. Channel catfish were introduced in 1989 and stocked again in 1991. Channel catfish have persisted in the reservoir, but were low in abundance. The complete stocking history is in Table 3.

Vegetation/habitat history: Big Creek Lake contained only small amounts of native submerged vegetation. In 2003, aquatic vegetation coverage, estimated at 36.7%, was considered excessive. American lotus and Eurasian watermilfoil covered 21.6% and 9.9%, respectively, of the reservoir in 2003 (Storey and Myers 2004). In September 2007, the major habitat components were American lotus (89.4% of the shoreline and 32.4% of surface area), natural shoreline (90.4% of the shoreline) and native submerged vegetation (14.7% of surface area).

METHODS

Fishes were collected by electrofishing (1 hour at 12, 5-min stations), gill netting (5 net nights at 5 stations), and trap 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 and trap 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 (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

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 ($RSE = 100 \times SE \text{ of the estimate} / \text{estimate}$) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. No age and growth information is available because population samples of largemouth bass and crappie were inadequate for analysis. Largemouth bass genetic samples were not collected in 2007 because FLMB were stocked in the spring of that year.

Aquatic vegetation and habitat surveys were conducted 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.

RESULTS AND DISCUSSION

Vegetation/habitat: Shoreline habitat during fall 2007 was composed primarily of American lotus, natural shoreline, and native submerged vegetation (89.4%, 90.4% and 76.3% respectively; Table 4). Native submerged vegetation (primarily coontail) was present (14.7%), but American lotus was excessively dense, covering 32.4% of the lake's surface. Eurasian watermilfoil was still present in the lake, but only 5 acres of this invasive submerged vegetation was detected. Total aquatic vegetative cover was estimated at 52.8%.

Prey species: Electrofishing catch rates of bluegill, redear sunfish, gizzard shad and threadfin shad were 37.0/h, 50.0/h, 157.0/h, and 72.0/h respectively. Index of vulnerability (IOV) for gizzard shad was moderate, indicating that 58% of gizzard shad were available to predators (Figure 1). Total CPUE of gizzard shad was much lower than 2003 (846.0/h) but similar to the 1999 survey (175.0/h) (Figure 1). Total CPUE of bluegill in 2007 (37.0/h) was much lower than total CPUE in 2003 (229.0/h) and 1999 (291.0/h), with a relatively low abundance of small individuals (Figure 2). Redear sunfish comprised the largest component of the sunfish population in Big Creek Lake, as the electrofishing catch rate in 2007 was slightly higher than bluegill CPUE (50.0/h). Big Creek Lake has historically had a good reputation for a quality redear sunfish fishery. Many of the redear sunfish sampled in 2007 were large enough (≥ 6 inches) to provide a fishery for this species (Figure 3).

Channel catfish: The gill net catch rate of channel catfish in 2008 was 3.4/nn, compared to no fish collected in 2004 or 1999 (Figure 4). There were no fish less than stock-length (≥ 11 inches) collected in the 2008 survey, indicating possible recruitment limitations. However, all channel catfish were of harvestable size and in good body condition, indicating ample forage for the existing population.

Largemouth bass: The electrofishing catch rate of stock-length (≥ 8 inches) largemouth bass was 30.0/h in 2007, similar to the 33.0/h in 2006 and 43.0/h in 2003 (Figure 5). No electrofishing survey was conducted in 2005 due to extremely low water conditions. Body condition of stock-length fish in 2007 was excellent (W_r ranged from 95 to 112) for all size classes of fish and was better than body condition in previous surveys (Figure 5). Because FLMB were stocked in 2007, an assessment of the influence of

FLMB in the bass population could not be conducted (Table 5). During March 2007, TPWD Kills and Spills (KAST) staff received a report of a fish kill involving 200 small catfish and crappie at Big Creek Reservoir and of several largemouth bass swimming erratically at the surface. KAST staff collected six bass and subjected them to necropsy and largemouth bass virus (LMBV) analysis. Although a previous analysis of a 60 fish sample in July 2000 did not show any incidence of LMBV in the Big Creek Lake population, one of the six fish sampled in March 2008 tested positive for LMBV using both cell culture and direct-tissue PCR methods. Despite the confirmation of the presence of LMBV, the specific cause of the fish kill is unknown.

Crappies: Only one white crappie (Figure 7) and no black crappie were sampled in 2007. Previous trap net surveys in 1999 and 2003 produced good numbers of crappie, and the presence of sub-stock (≥ 5 inches) length white and black crappies did not indicate a recruitment problem at the time those surveys were conducted.

Fisheries management plan for Big Creek Lake, Texas

Prepared – July 2008

ISSUE 1: Big Creek Lake has shown the potential to produce trophy largemouth bass as evidenced by the size of the current lake record, 14.06 pounds (3/1996), and a 13.19 ShareLunker Program entry (3/2000). Florida strain largemouth bass were stocked in 2007. District staff will continue monitoring the largemouth bass population to determine the impact of the FLMB stockings and to evaluate the need for future stockings when appropriate.

MANAGEMENT STRATEGIES

1. Conduct additional electrofishing survey during fall 2009 to collect age and growth information and to monitor largemouth bass population.
2. Conduct genetic analysis on age-0 fish sampled during fall 2009 electrofishing to determine FLMB component.

ISSUE 2: Shoreline access is limited near the boat launch and the ramp is in need of repairs. Although the City of Cooper repaired the fishing pier in 2008, the boat ramp and launch area at Big Creek Lake are still in need of improvement. The end of the functional boat ramp has eroded and under low water conditions trailers can easily be backed off the end of the ramp. American lotus and cattails are encroaching on the boat ramp and severely limit bank fishing access around the launch area.

MANAGEMENT STRATEGY

1. To improve access facilities for anglers, work with the City of Cooper to assist them in securing funding through TPWD for making improvements to the boat ramp area.
2. Recommend herbicide spot treatments to control American lotus and cattails in the vicinity of the boat ramp.

ISSUE 3: There is a need to inform anglers of the fisheries that exist in the reservoir. Fisheries regulations that govern Big Creek's fisheries resources need to be prominently displayed and clearly communicated to anglers.

MANAGEMENT STRATEGIES

1. Prepare regulation posters detailing the fisheries regulations at Big Creek Lake and post this information at the boat ramp and local businesses.
2. When opportunities arise, promote the fisheries resources of Big Creek Lake through local media and other outlets.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional electrofishing 2009, and mandatory monitoring, including a summer vegetation and habitat survey, fall electrofishing and spring gill netting in 2011-2012 (Table 6). The additional electrofishing survey in 2009 is necessary to age and growth information on the largemouth bass population. Gill net surveys are only necessary every four years to monitor channel catfish recruitment and abundance.

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.
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Table 1. Characteristics of Big Creek Lake, Texas.

Characteristic	Description
Year constructed	1987
Controlling authority	City of Cooper
Surface area	520 acres
Counties	Delta
Reservoir type	Tributary
Mean depth	12.0 ft.
Maximum depth	31.0 ft.
Shoreline Development Index (SDI)	3.52
Conductivity	160 $\mu\text{mho} / \text{cm}$
Secchi disc range	1 – 2 ft.
Watershed area	11.7 mi^2

Table 2. Harvest regulations for Big Creek Lake.

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 Big Creek Lake, Texas. Size categories are: FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

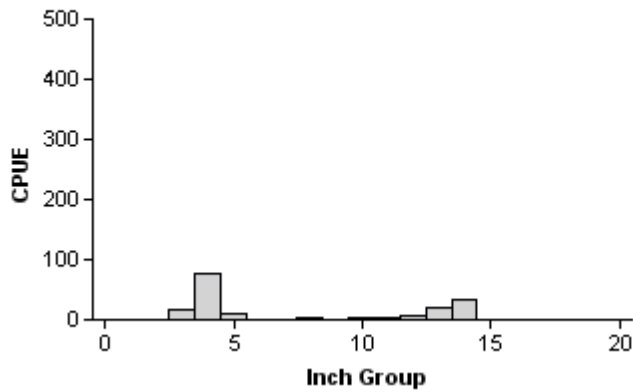
Species	Year	Number	Size
Gizzard shad	1988	60	ADL
	Total	60	
Threadfin shad	1991	1,200	ADL
	Total	1,200	
Blue catfish	1988	26,000	FGL
	1990	5,269	AFGL
	1991	26,135	FGL
	Total	57,404	
Channel catfish	1989	13,000	FGL
	1991	13,000	FGL
	Total	26,000	
Coppernose bluegill	1988	150,626	
	Total	150,626	
Florida largemouth bass	1988	54,057	FGL
	1988	625	AFGL
	1989	10,988	FGL
	1990	38,578	FGL
	1990	2,108	AFGL
	1998	52,894	FGL
	1999	51,960	FGL
	2000	4,500	FGL
	2007	123,860	FGL
	Total	339,570	
White crappie	1988	26,000	FGL
	Total	26,000	

Table 4. Survey of littoral zone and physical habitat types, Big Creek Lake, 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. Surface area (acres) and percent of reservoir surface area were determined for each type of aquatic vegetation found.

Shoreline habitat component / Aquatic vegetation species	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Natural shoreline	7.4	90.4		
Rip rap	0.5	5.5		
Standing timber	2.4	29.1		
American lotus	7.3	89.4	131.0	32.4
Eurasian watermilfoil	0.4	5.2	1.7	0.4
Native emergent	3.6	43.7	21.3	5.3
Native submerged	6.2	76.3	59.2	14.7
Total			213.2	52.8

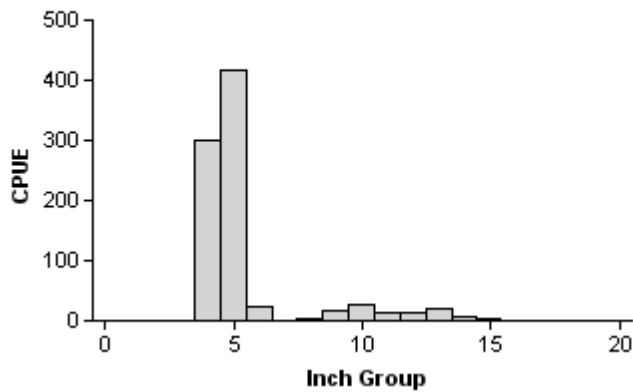
Gizzard Shad

1999



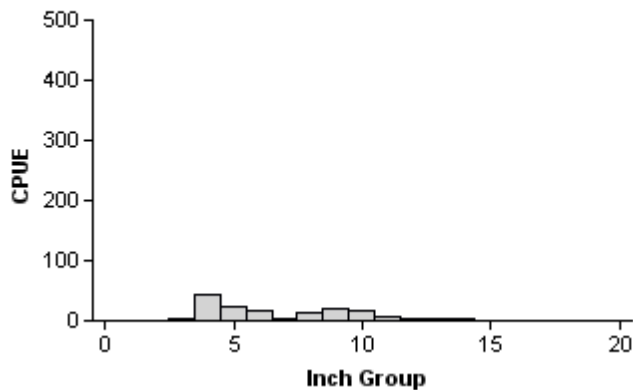
Effort = 1.0
 Total CPUE = 175.0 (15; 175)
 Stock CPUE = 71.0 (22; 71)
 PSD = 89 (4.4)
 IOV = 59.43 (6.9)

2003



Effort = 1.0
 Total CPUE = 846.0 (27; 846)
 Stock CPUE = 108.0 (15; 108)
 PSD = 56 (8.1)
 IOV = 87.35 (2.9)

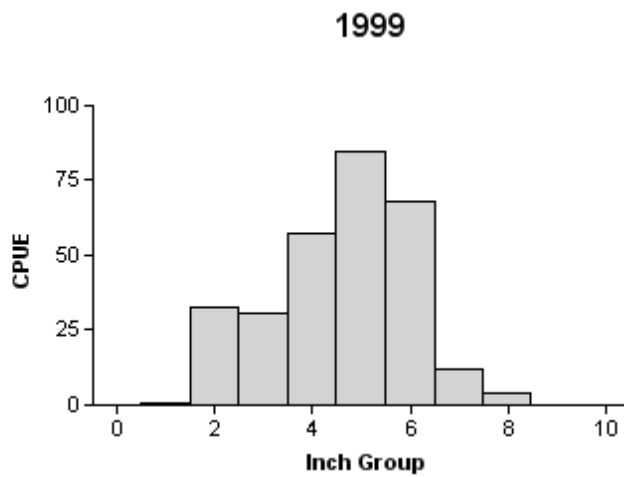
2007



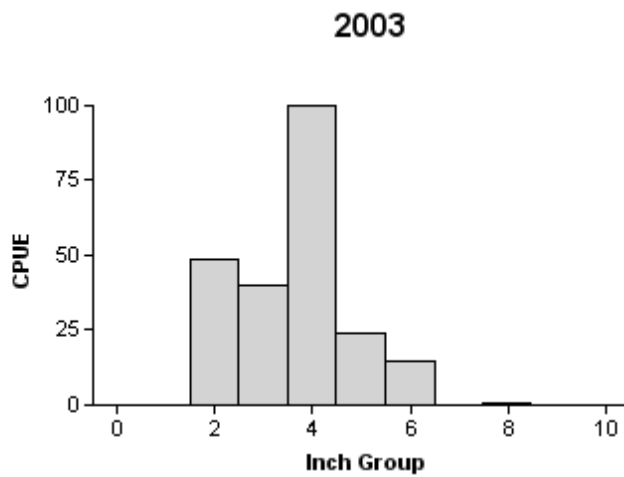
Effort = 1.0
 Total CPUE = 157.0 (19; 157)
 Stock CPUE = 70.0 (25; 70)
 PSD = 20 (5.4)
 IOV = 57.96 (8.9)

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, Big Creek Lake, Texas, 1999, 2003, and 2007.

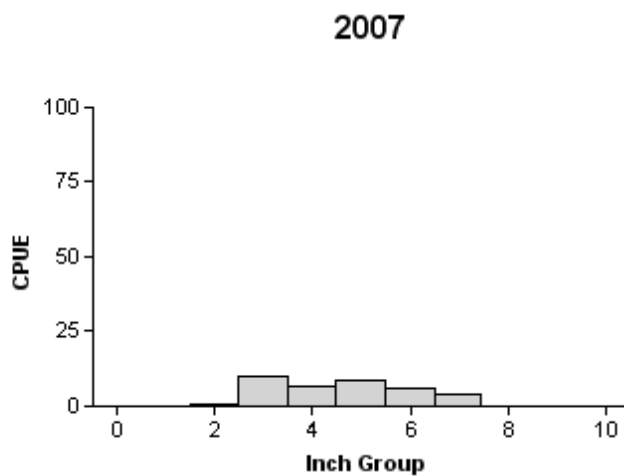
Bluegill



Effort = 1.0
 Total CPUE = 291.0 (16; 291)
 Stock CPUE = 257.0 (17; 257)
 PSD = 33 (5.2)



Effort = 1.0
 Total CPUE = 229.0 (17; 229)
 Stock CPUE = 180.0 (16; 180)
 PSD = 9 (2.9)



Effort = 1.0
 Total CPUE = 37.0 (46; 37)
 Stock CPUE = 36.0 (48; 36)
 PSD = 28 (8.8)

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, Big Creek Lake, Texas, 1999, 2003, and 2007.

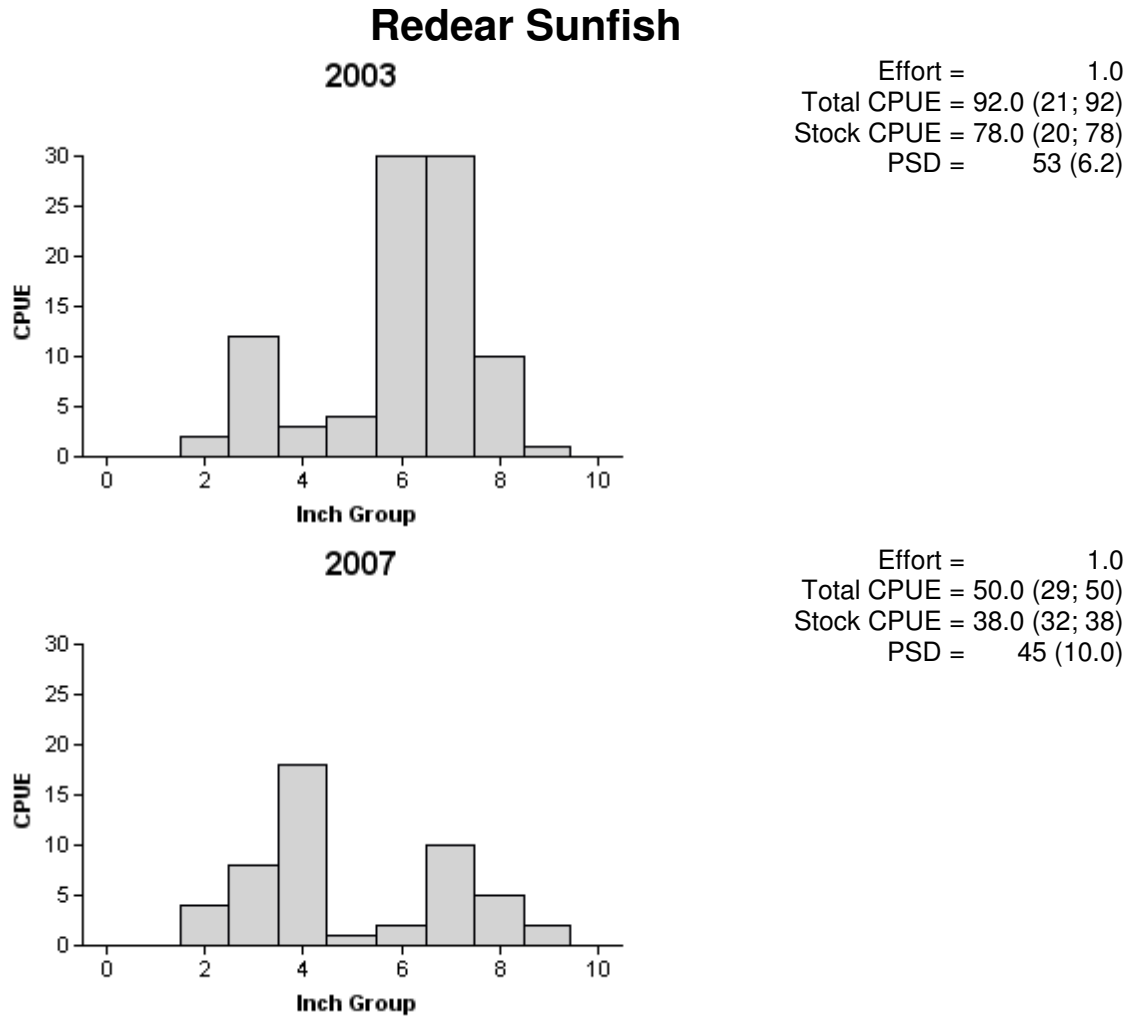


Figure 3. Number of redear sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Big Creek Lake, Texas, 2003 and 2007. No redear sunfish were captured in the fall 1999 survey.

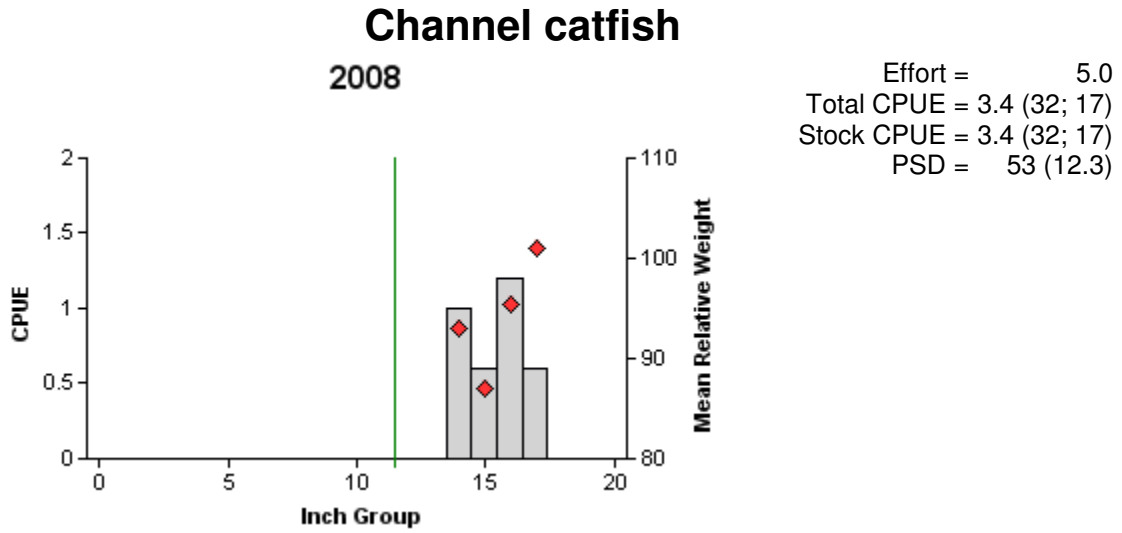


Figure 4. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Big Creek Lake, Texas, 2008. Vertical lines indicate minimum length limit at time of survey. No channel catfish were captured in the spring 2004 survey.

Largemouth bass

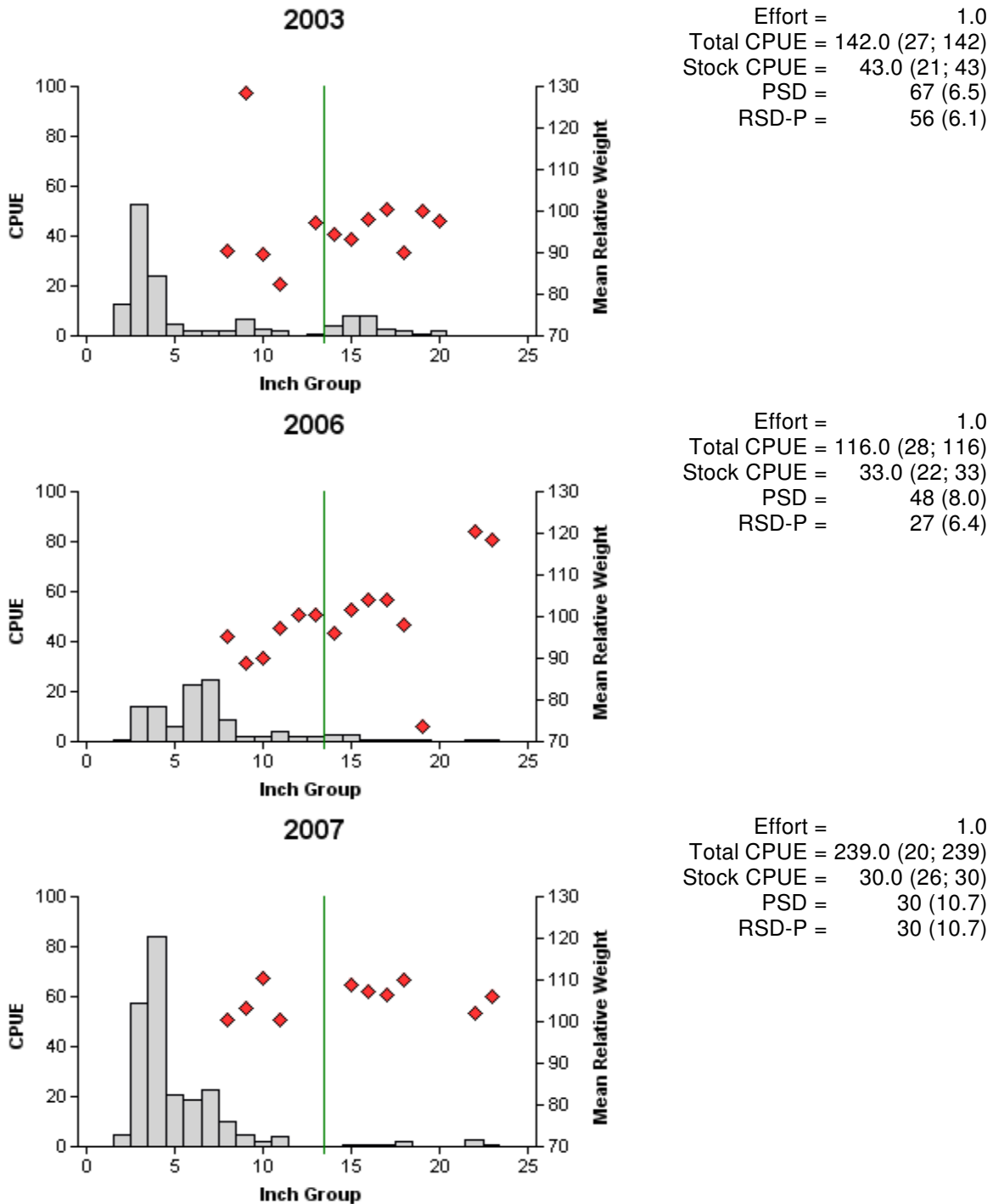


Figure 5. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Big Creek Lake, Texas, 2003, 2006, and 2007. The 2006 survey was bass-only. Vertical lines indicate minimum length limit at time of survey.

White crappie

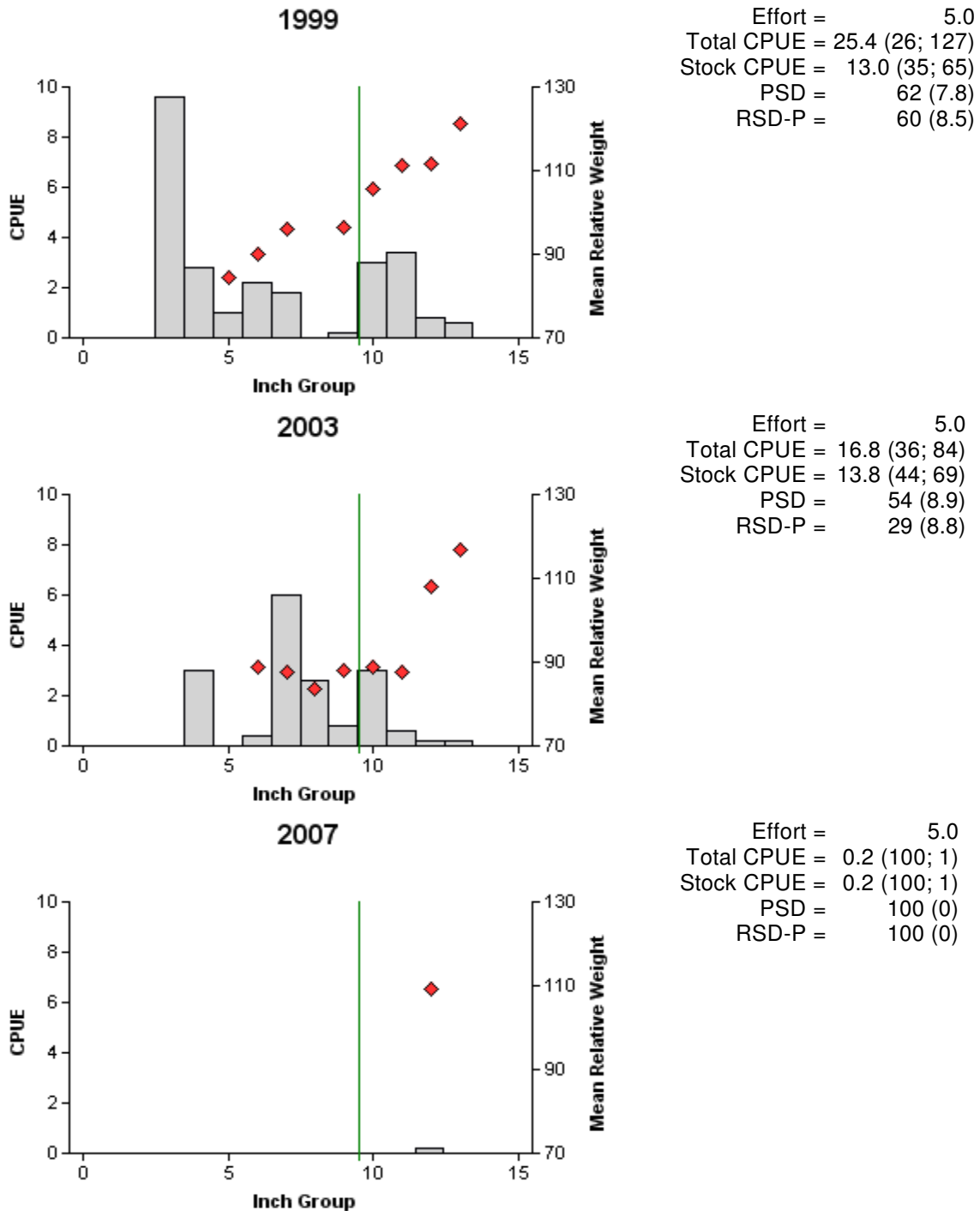


Figure 6. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Big Creek Lake, Texas, 1999, 2003 and 2007. Vertical lines indicate minimum length limit at time of survey.

Table 5. Proposed sampling schedule for Big Creek Lake, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

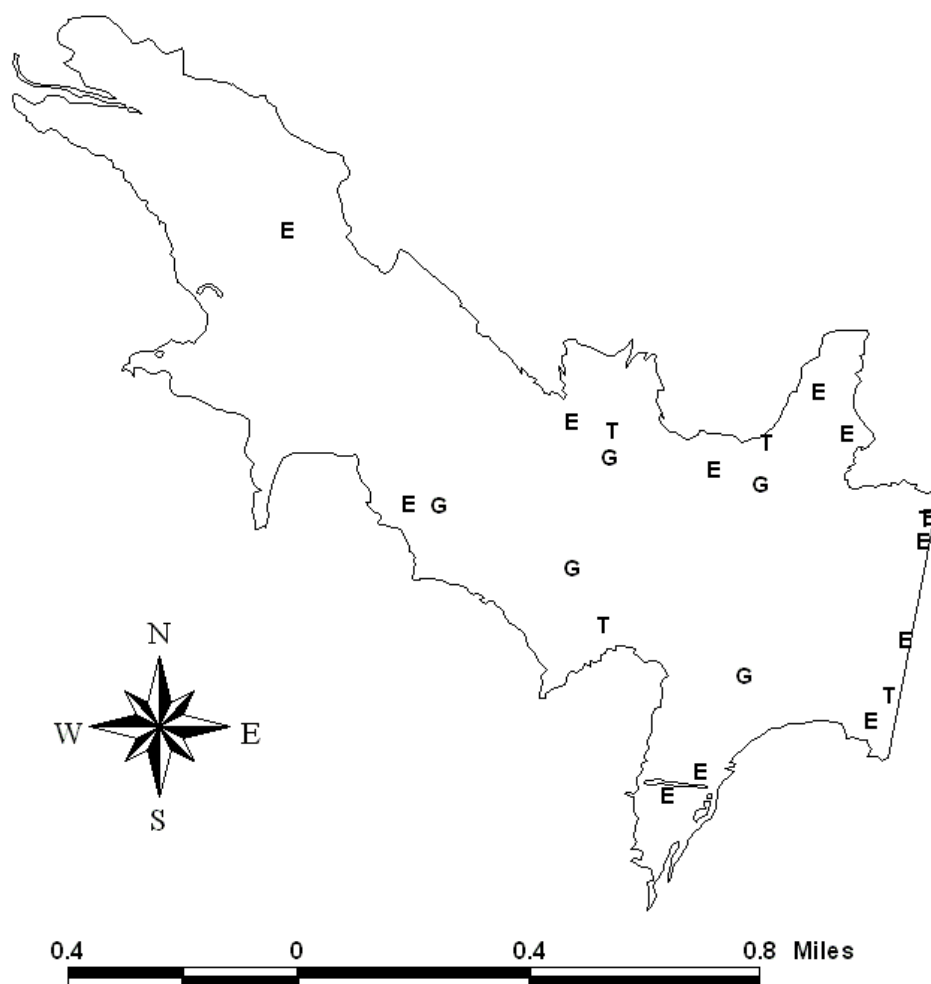
Survey Year	Electrofishing	Gill netting	Vegetation/ Habitat	Report
Fall 2009-Spring 2010	A			
Fall 2011-Spring 2012	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Big Creek Lake, Texas, 2007-2008.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					157	157.0
Threadfin shad					72	72.0
Channel catfish	17	3.4				
Green sunfish					20	20.0
Bluegill					37	37.0
Longear sunfish					55	55.0
Redear sunfish					50	50.0
Largemouth bass					239	239.0
White crappie			1	0.2		

APPENDIX B



Location of gill net (G), trap net (T), and electrofishing sites (E), Big Creek Lake, Texas, 2007-2008.