

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-30-R-32

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

San Augustine City Lake

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in San Augustine City Lake were surveyed in 2006 using electrofishing and trap nets and in 2007 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** San Augustine City Lake is an impoundment of Carrizo and Caney creeks. The City of San Augustine is the reservoir's controlling authority. Primary uses are water supply and recreation. This reservoir has a surface area of 200 acres, a shoreline length of 5.5 miles, and a mean depth of 10 feet. Water level fluctuations are estimated to average 3-feet annually. Boat and bank access is adequate, with one boat ramp present.
- **Management history:** Important sport fish include largemouth bass, white and black crappie, and catfish. The management plan from the 2002 survey report included changing the 18-inch minimum length limit for largemouth bass to a 14-18 inch slot length limit. The slot length limit was implemented in 2004. Based on electrofishing results from the fall of 2006 it does not yet appear that the slot length limit has had the desired effect of producing increased numbers of quality-size largemouth bass. Growth rates of largemouth bass appeared to improve since March 2003; however body condition was less than adequate despite a plentiful forage base. Hydrilla has been problematic over the years, covering approximately 75% of the reservoir surface area in 2002. From 2002-2003, triploid grass carp were stocked at a rate of 4/vegetated acre (600 fish total) in an attempt to reduce hydrilla coverage to 10-15%. Since these stockings hydrilla coverage has steadily declined with 16% coverage observed during the summer of 2006.
- **Fish community**
 - **Prey species:** Threadfin shad were present in the reservoir. Electrofishing catch of bluegill was high, with few were over 6 inches in length. Other prey species included redbreast, longear and redear sunfish.
 - **Catfishes:** Numbers of channel catfish have declined indicating poor recruitment. Recruitment of channel catfish is likely limited by the excessive hydrilla growth that may be creating conditions favorable for increased catfish predation by largemouth bass.
 - **Largemouth bass:** Largemouth bass were relatively abundant. Size structure has remained consistent from past surveys with most fish < 15 inches in length. Largemouth bass had good growth rates and were in average condition. The current largemouth bass water body record is 13.13 lbs set in March 2006.
 - **Crappie:** Relative abundance and size structure of crappie is good. Both white and black crappies were present but white crappie were the predominant species.
- **Management strategies:** Continue to manage largemouth bass with 14-18 inch slot length limit. Continue to monitor trends of hydrilla coverage through annual aquatic vegetation surveys. Conduct electrofishing and gill net monitoring surveys in 2010 and 2011, respectively. Conduct annual aquatic vegetation surveys (2007-2010). Conduct access and structural habitat surveys in 2010.

INTRODUCTION

This document is a summary of fisheries data collected from San Augustine City Lake in 2006-2007. 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 2006-2007 data for comparison.

Reservoir Description

San Augustine City Lake is a 200-acre impoundment constructed in 1952 on Carrizo and Caney creeks (Table 1). It is located in San Augustine County approximately 5 miles east of San Augustine and is operated and controlled by the City of San Augustine. Primary water uses included municipal water supply and recreation. Secchi disc readings are typically 2-4 feet. Habitat at time of sampling consisted of rocks, some standing timber, and aquatic vegetation. Native aquatic plants present are spikerush and lotus. Hydrilla, a non-native, was first discovered in the late 1990s.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Driscoll and Parks 2003) included:

1. Stock triploid grass carp at a rate of 4 fish / vegetated acre and continue aquatic vegetation monitoring.
Action: Triploid grass carp were stocked at a rate of 4 fish / vegetated acre in 2002 and 2003. Aquatic vegetation surveys have been conducted annually from 2003 through present and hydrilla coverage was 32 acres or 16% of the surface area in summer 2006.
2. Recommend changing the largemouth bass minimum length limit from 18-inches to a 14-18 inch slot limit in order to increase harvest of undersized fish to improve the quality of the fishery. Solicit public input for the regulation change.
Action: Public input was solicited via the local newspaper and radio stations concerning changing the largemouth bass minimum length limit from 18-inches to a 14-18 inch slot limit. The angling public and the City Council of San Augustine unanimously supported the regulation change. A 14-18 inch slot limit for largemouth bass was implemented in 2004.
3. Recommend access point improvements to the City Council via discussions with the city manager.
Action: Recommendations have continued to be provided to the City of San Augustine regarding improvements to the boat ramp (i.e., road surface repairs and accommodations for the physically challenged). However, due to budget constraints no improvements have been made.
4. Contact local newspapers and publicize results of monitoring surveys and management actions in a series of news releases. Provide the city council copies of the management plan and all news releases for distribution.
Action: Provided city officials with management plans and news releases concerning San Augustine City Lake.

Harvest regulation history: Sport fishes in San Augustine City Lake are currently managed with statewide regulations with the exception of largemouth bass (Table 2). From 1990 to 2003, largemouth bass were managed with an 18-inch minimum length limit. A 14- to 18-inch slot length limit was implemented in 2004 to improve largemouth bass size structure, growth, and size of bass caught by anglers.

Stocking history: Sharelunker largemouth bass fingerlings (4,592) were stocked in 2006. Triploid grass carp have not been stocked since 2003. Florida largemouth bass were stocked in 1979, 1980, and again in 1992. Threadfin shad were introduced in 1979 and stocked again in 2000 and were still present in the reservoir (Table 3).

Vegetation/habitat history: San Augustine City Lake aquatic vegetation coverage has declined significantly since 2003. The controlling authority stocked triploid grass carp in 2002 and 2003 to reduce hydrilla that had become problematic. The reservoir had nearly 75% hydrilla coverage prior to the triploid grass carp stockings. An aquatic vegetation survey conducted in 2006 indicated that hydrilla coverage had declined to 16% (Table 4). Native vegetation is limited to less than 3 acres (spikerush and American lotus). There is residential shoreline development. The majority of the land surrounding the reservoir is used for agriculture and timber production.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), trap netting (4 nets nights at 4 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 per net night (fish/nn). All survey sites were randomly selected and the electrofishing, trap net, and gill net surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

Experimental trap net procedures were employed in fall 2006. Trap nets were set in groups consisting of one tandem net, one standard net, and one offshore net (4 groups at 4 stations). Tandem trap nets were constructed of two standard trap nets with leaders completely overlapping and attached together along the float lines and weighted lines (throats of each net facing each other). Tandem and offshore trap nets were both set offshore and perpendicular to the shore. Standard trap nets were set following Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Catch per unit effort (CPUE) for experimental trap nets was recorded as the number of fish per net night (fish/nn). Trap net survey procedures were dictated by a special crappie sampling committee that was formed to improve crappie sampling procedures. Consequently, the results of the 2006 survey are not directly comparable to results of previous surveys done on San Augustine City Lake, but are reported in the results and discussion of this document.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of overhanging brush, emergent aquatic vegetation and hydrilla (Table 4).

Prey species: Electrofishing catch rates of threadfin shad were 53.0/h in 2006, which is considerably higher than observed in 2003 (9.0/h) and 1999 (11.0/h). Bluegill and redear sunfish were the predominant prey species with electrofishing catch rates of 437.0/h and 115.0/h, respectively in 2006 (Figures 1 and 2). Total CPUE of both bluegill and redear in 2006 was higher from what was observed from surveys in 1999 and 2003, and size structure continued to be dominated by small individuals.

Channel catfish: The gill net catch rate of channel catfish remained low (0.4/nn) in 2007 compared to 1.2/nn in 2003 and 5.8 /nn in 1998 (Figure 3). Hydrilla had become problematic by 2002 with coverage

exceeding 75% of the reservoir. Excessive hydrilla coverage may suppress catfish growth and abundance. Also, trophic dynamics of the reservoir likely changed with increased aquatic vegetation growth, possibly leading to reductions in preferred food items (namely benthic invertebrates) for channel catfish. Similar relationships between hydrilla coverage and channel catfish catch rates have been observed at Nacogdoches Reservoir (Driscoll and Parks 2001) and Martin Creek Reservoir (Ashe and Driscoll 2006). Hydrilla coverage has declined over the past two years without a discernable increase in channel catfish recruitment.

Largemouth bass: The electrofishing catch rate of largemouth bass in the fall of 2006 (132.0/h) was greater than catch rates observed in 1999 (78.0/h) and 1998 (94.5/h) (Figure 4). The length-frequency distribution was similar among years with the majority of fish < 15 inches in length (PSD range = 41 – 68).

Mean lengths-at-age had been lower than ecological region averages suggesting slower than average growth rates (Driscoll and Parks 2003). Growth of largemouth bass has improved since 2003; average age at 14 inches (13.5 to 14.5 inches) was 2.3 years (N = 13; range = 2 to 3 years). Excessive hydrilla coverage in 2001 – 2003 likely reduced largemouth bass foraging efficiency. Given the good growth rate of largemouth bass in 2006, recruitment into the 14-18 inch slot size range and above (>18 inches) should improve in future years.

Crappies: White and black crappie were present in the reservoir, with white crappie being the dominant species. The standard trap net catch rate of white crappie in the fall of 2006 (5.0/nn) was greater than the catch rate observed in 2002 (0.4/nn), but similar to 1998 (6.8/nn) (Figure 5). Low catch rates observed in 2002 is likely due to excessive hydrilla coverage that may have reduced catch efficiency. Hydrilla coverage has declined significantly since 2002, therefore catch efficiency has increased. Catch rates for black crappie are low with 1.0/nn and 0.2/nn observed in 2006 and 1998 respectively (Figure 6). Experimental trap net procedures in 2006 yielded catch rates of 7.3/nn and 1.1/nn of white and black crappie respectively (see methods above).

Fisheries management plan for San Augustine City Lake, Texas

Prepared – June 2007

ISSUE 1: Hydrilla in San Augustine City Lake was first documented by TPWD in 1998. Since then, hydrilla has proven to be problematic with coverage reaching 75% of the surface area by 2002. Triploid grass carp were stocked at a rate of 4/vegetated acre in 2002 and 2003. San Augustine city officials stated that hydrilla enhanced water quality and desired to maintain the plant at 10-15% coverage. Hydrilla coverage observed in 2006 was 16%, which is near the management goal agreed upon by city officials and the angling public in August 2000.

MANAGEMENT STRATEGY

1. Continue to monitor aquatic vegetation annually (2007-2010). If hydrilla coverage expands beyond an acceptable coverage (40% or levels prompting public complaint) within the next 4 years, meet with city officials and angling public to develop an integrated aquatic vegetation management plan.

ISSUE 2: Giant salvinia a non-native floating plant that can become problematic has been found within several water bodies within the management district. There is potential that giant salvinia may be introduced to San Augustine City Lake.

MANAGEMENT STRATEGY

1. During aquatic vegetation surveys continue to remain vigilant to identify any presence of giant salvinia with plans to initiate an eradication or control response if any plants are found. Maintain signs educating the public of giant salvinia identification and reminding the public to conduct boat trailer inspections before launching.

ISSUE 3: In 1998, recommendations were provided to the City of San Augustine regarding improvements to the boat ramp (i.e. road surface repairs and accommodations for physically challenged anglers). However, due to budgetary constraints limited improvements have been made to the boat ramp.

MANAGEMENT STRATEGY

1. Continue to recommend improvements at the access point.

ISSUE 4: From 1990 to 2003, largemouth bass were managed with an 18-inch minimum length limit. A 14- to 18-inch slot length limit was implemented in 2004 to improve largemouth bass size structure, growth, and size of bass caught by anglers. Limited recruitment of largemouth bass into the slot limit has been observed.

MANAGEMENT STRATEGY

1. Continue to monitor largemouth bass size structure and growth to assess the success of the implemented slot limit by fall electrofishing (2010).

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual aquatic vegetation surveys and mandatory monitoring in 2010-2011 (Table 5). Annual aquatic vegetation surveys are required to monitor hydrilla coverage.

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.
- Ashe, D., and T. Driscoll. 2006. Statewide freshwater fisheries monitoring and management program survey report for Martin Creek Reservoir, 2005. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-31, Austin.
- Driscoll, T., and J. Parks. 2003. Statewide freshwater fisheries monitoring and management program survey report for San Augustine City Lake, 2002. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-28, Austin.
- Driscoll, T., and J. Parks. 2001. Statewide freshwater fisheries monitoring and management program survey report for Nacogdoches Reservoir, 2000. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-26, Austin.

Table 1. Characteristics of San Augustine City Lake, Texas.

Characteristic	Description
Year Constructed	1952
Controlling authority	City of San Augustine
County	San Augustine
Reservoir type	Mainstream
Mean Depth	10 feet
Size	200 acres
Secchi Disc	2-4 feet
Conductivity	140 umhos/cm

Table 2. Harvest regulations for San Augustine City 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 – 18
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

Table 3. Stocking history of San Augustine City Lake, Texas. Size Categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, ADL = adults.

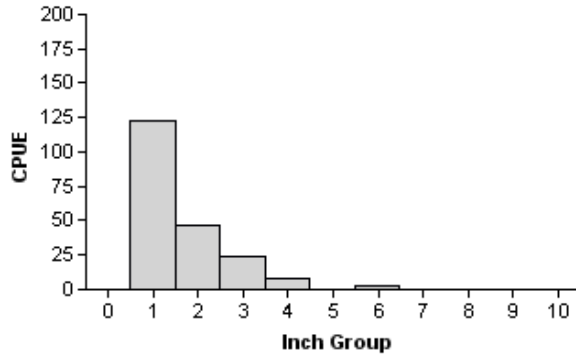
Species	Year	Number	Size
Florida largemouth bass	1979	10,000	FGL
	1980	10,000	FGL
	1992	20,000	FGL
	Total	40,000	
Sharelunker largemouth bass	2006	4,592	FGL
Threadfin shad	1979	1,200	AFGL
	2000	3,300	ADL
	2000	2,300	AFGL
	Total	6,800	
Triploid grass carp	2002	320	AFGL
	2003	280	AFGL
	Total	600	

Table 4. Survey of littoral zone and physical habitat types, San Augustine City Lake, Texas, 2006. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Overhanging Brush	2.7	49.1		
Riprap	0.3	5.5		
Eroded Bank	0.2	3.6		
Non vegetated Shoreline	0.1	1.8		
Spikerush (native emergent)	1.3	23.6	2	< 1.0
Lotus (native emergent)	0.2	3.6	0.8	< 1.0
Nondescript	0.7	12.8		
Hydrilla			32	16.0

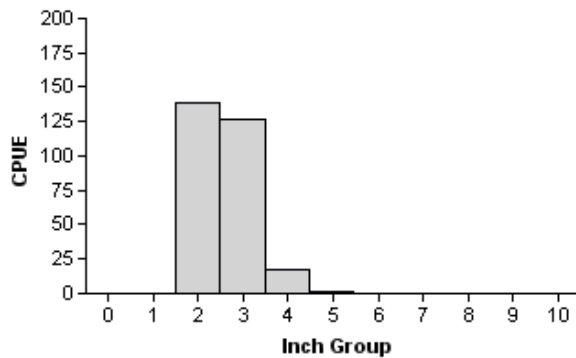
Bluegill

1998



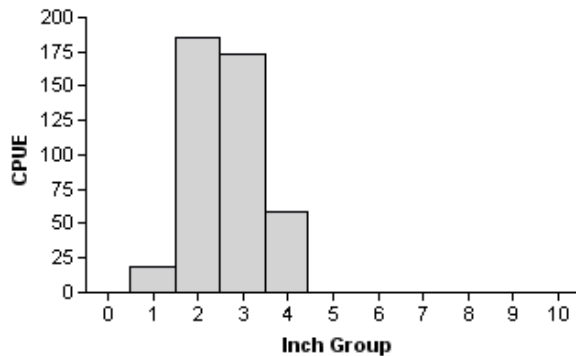
Effort = 0.7
 Total CPUE = 204.0 (37; 136)
 Stock CPUE = 34.5 (20; 23)
 PSD = 9 (6.4)

1999



Effort = 1.0
 Total CPUE = 284.0 (21; 284)
 Stock CPUE = 146.0 (17; 146)
 PSD = 0 (71.0)

2006

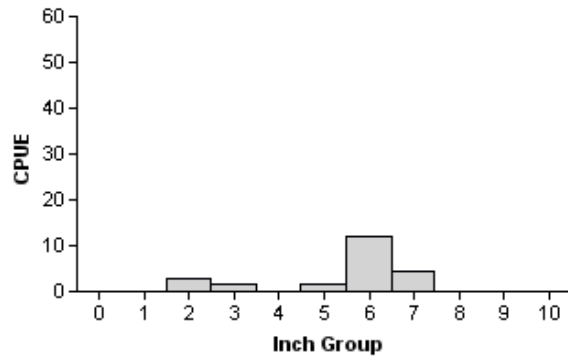


Effort = 1.0
 Total CPUE = 437.0 (18; 437)
 Stock CPUE = 232.0 (20; 232)
 PSD = 0 (65.8)

Figure 1. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 1998, 1999, and 2006.

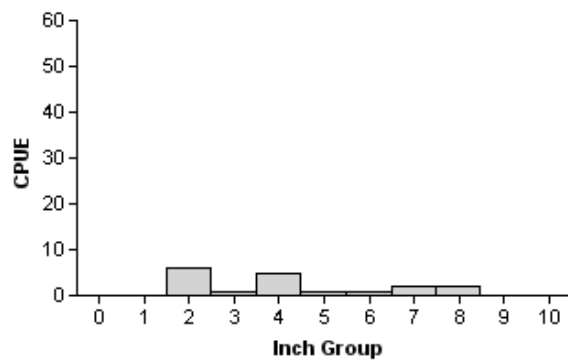
Redear Sunfish

1998



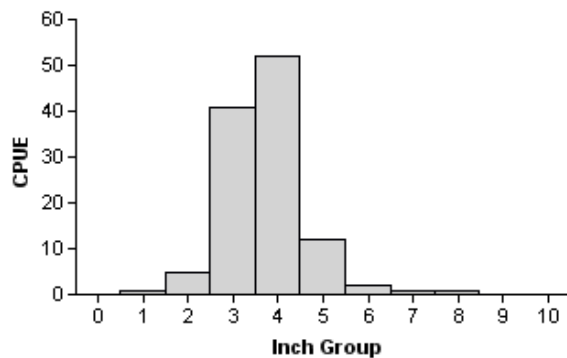
Effort = 0.7
 Total CPUE = 22.5 (28; 15)
 Stock CPUE = 18.0 (36; 12)
 PSD = 25 (19.2)

1999



Effort = 1.0
 Total CPUE = 18.0 (25; 18)
 Stock CPUE = 11.0 (28; 11)
 PSD = 36 (19.3)

2006

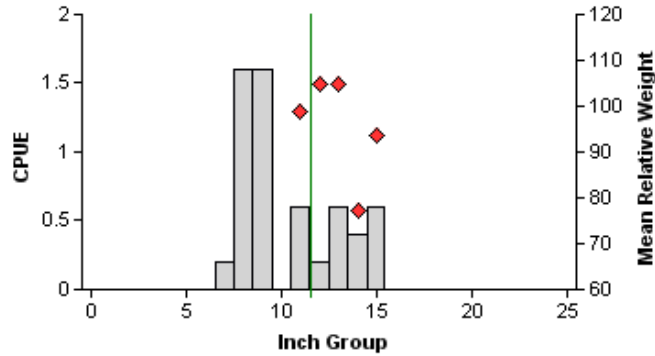


Effort = 1.0
 Total CPUE = 115.0 (20; 115)
 Stock CPUE = 68.0 (26; 68)
 PSD = 3 (1.4)

Figure 2. Number of redear sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 1998, 1999, and 2006.

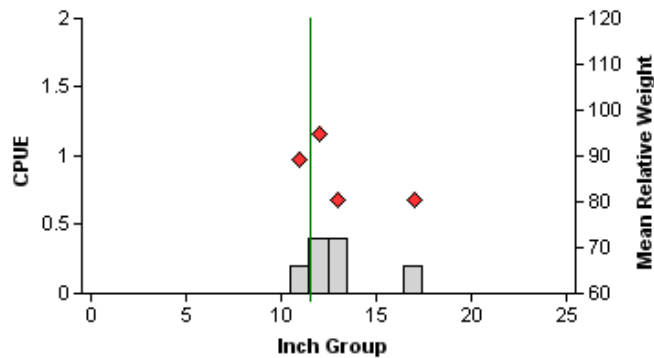
Channel Catfish

1998



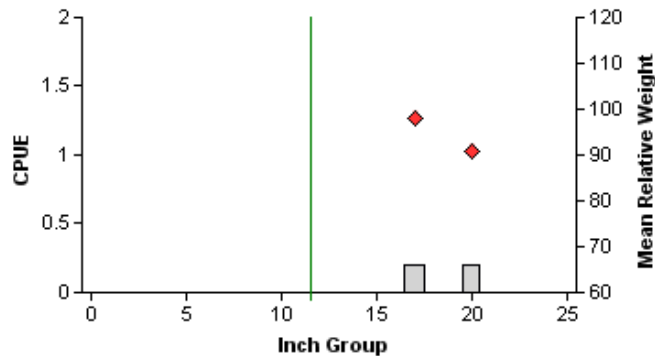
Effort = 5.0
 Total CPUE = 5.8 (42; 29)
 Stock CPUE = 2.4 (49; 12)
 PSD = 0 (158.4)
 RSD-12 = 75 (17.4)

2003



Effort = 5.0
 Total CPUE = 1.2 (41; 6)
 Stock CPUE = 1.2 (41; 6)
 PSD = 17 (15.2)
 RSD-12 = 83 (15.2)

2007

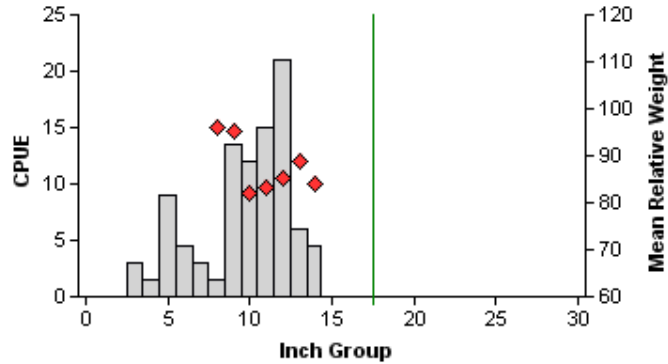


Effort = 5.0
 Total CPUE = 0.4 (100; 2)
 Stock CPUE = 0.4 (100; 2)
 PSD = 100 (0)
 RSD-12 = 100 (0)

Figure 3. Number of channel catfish caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, San Augustine City Lake, Texas, 1998, 2003, and 2007. Vertical lines indicates minimum length limit.

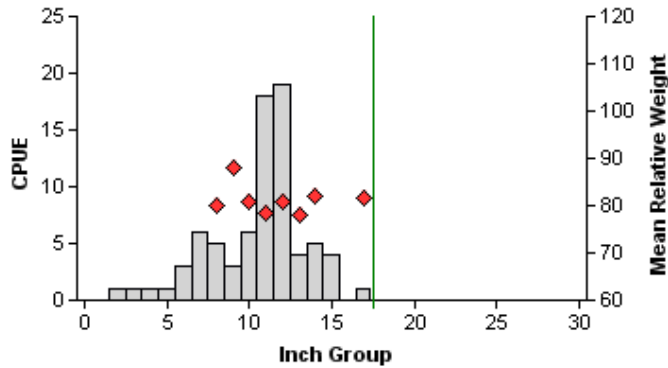
Largemouth Bass

1998



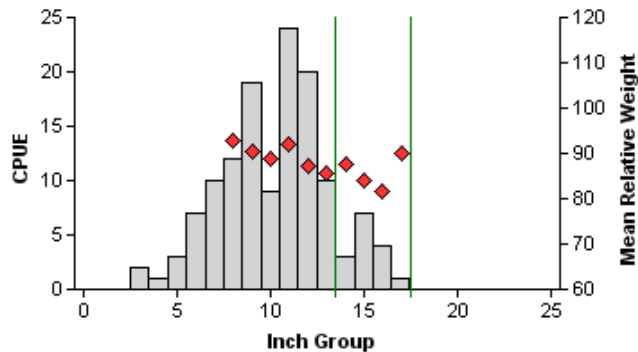
Effort = 0.7
 Total CPUE = 94.5 (26; 63)
 Stock CPUE = 73.5 (26; 49)
 PSD = 43 (6.1)
 RSD-14 = 6 (1.5)
 RSD-18 = 0 (0)

1999



Effort = 1.0
 Total CPUE = 78.0 (11; 78)
 Stock CPUE = 65.0 (14; 65)
 PSD = 51 (5.5)
 RSD-14 = 15 (5.9)
 RSD-18 = 0 (0)

2006

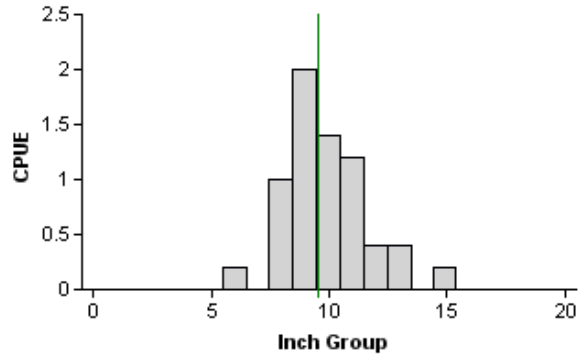


Effort = 1.0
 Total CPUE = 132.0 (16; 132)
 Stock CPUE = 109.0 (14; 109)
 PSD = 41 (5.1)
 RSD-14 = 14 (1.7)
 RSD-18 = 0 (0)

Figure 4. Number of largemouth bass caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 1998, 1999, and 2006. Vertical lines represent the minimum length limit for 1998 and 1999, and a slot limit for 2006.

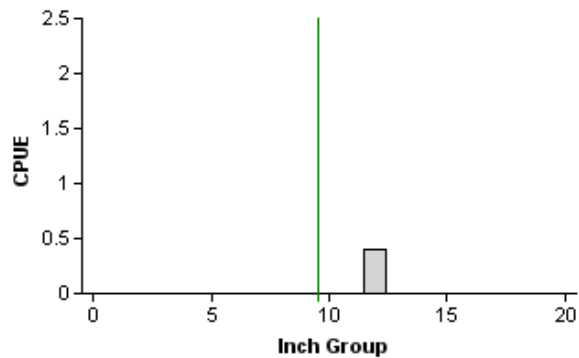
White Crappie

1998



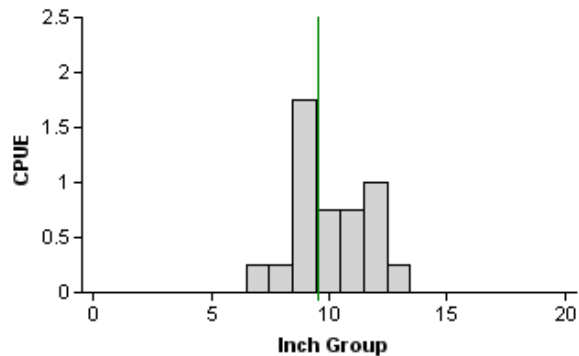
Effort = 5.0
 Total CPUE = 6.8 (60; 34)
 Stock CPUE = 6.8 (60; 34)
 PSD = 97 (3)
 RSD-10 = 53 (4.2)

2002



Effort = 5.0
 Total CPUE = 0.4 (100; 2)
 Stock CPUE = 0.4 (100; 2)
 PSD = 100 (0.0)
 RSD-10 = 100 (0)

2006



Effort = 4.0
 Total CPUE = 5.0 (38; 20)
 Stock CPUE = 5.0 (38; 20)
 PSD = 95 (3.5)
 RSD-10 = 55 (12.1)

Figure 5. Number of white crappie caught per net night (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for standard fall trap net surveys, San Augustine City Lake, Texas, 1998, 2002, and 2006. Vertical lines indicates minimum length limit.

Black Crappie

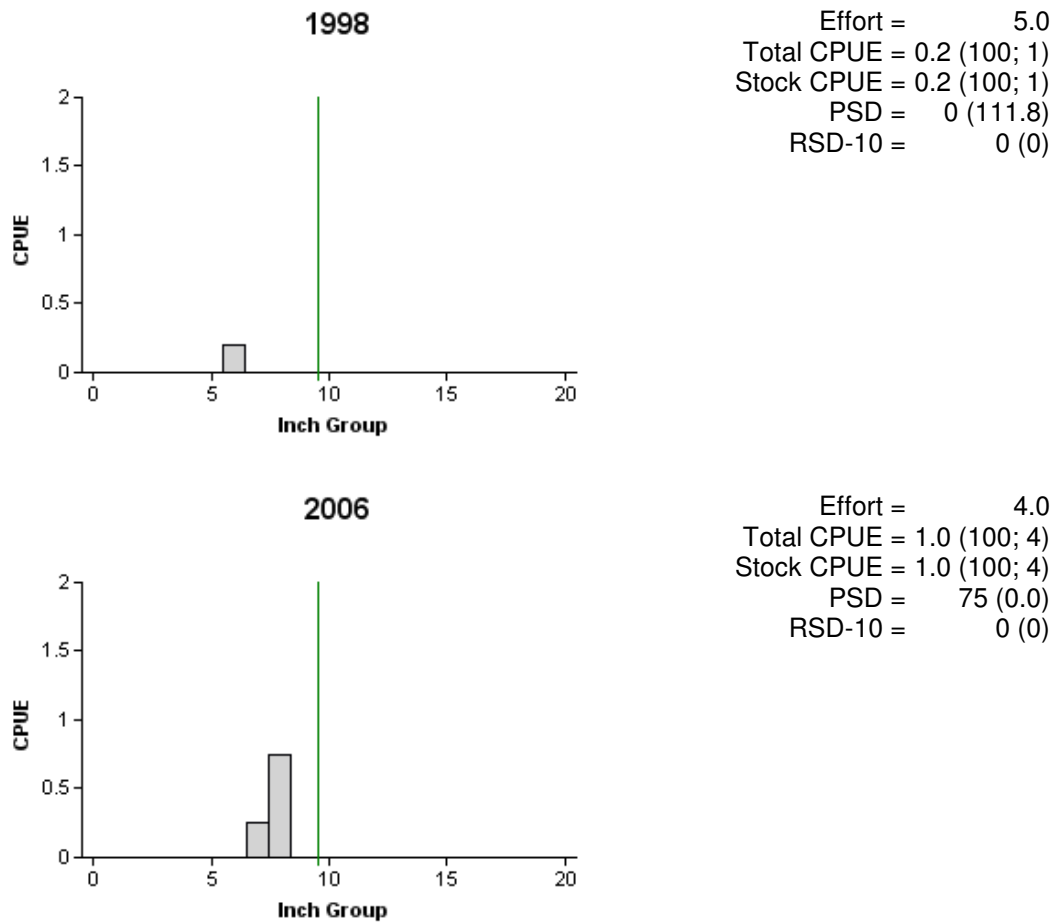


Figure 6. Number of black crappie caught per net night (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for standard fall trap net surveys, San Augustine City Lake, Texas, 1998 and 2006. A trap net survey was conducted in the fall of 2002 with no black crappie caught. Vertical lines indicates minimum length limit.

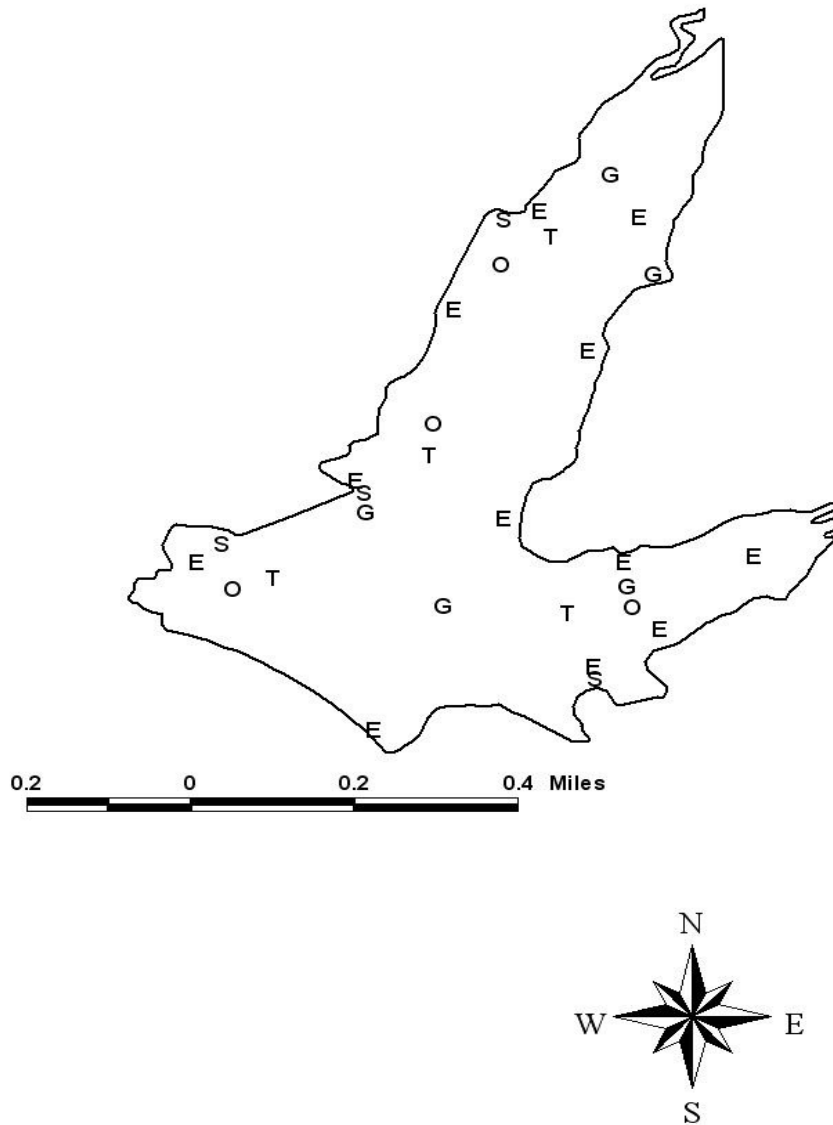
Table 5. Proposed sampling schedule for San Augustine City Lake, Texas. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall. Standard survey denoted by S.

Survey Year	Electrofishing	Gill Net	Access Point Survey	Vegetation Survey	Report
Fall 2007-Spring 2008				A	
Fall 2008-Spring 2009				A	
Fall 2009-Spring 2010				A	
Fall 2010-Spring 2011	S	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from San Augustine City Lake, Texas, 2006-2007.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	1	0.2				
Threadfin shad					53	53.0
Channel catfish	2	0.4				
Redbreast sunfish					67	67.0
Green sunfish					7	7.0
Warmouth					4	4.0
Bluegill					437	437.0
Longear sunfish					11	11.0
Redear sunfish					115	115.0
Largemouth bass	9	1.8			132	132.0
White crappie	8	1.6	116	7.3		
Black crappie			17	1.1		

APPENDIX B

Location of sampling sites, San Augustine City Lake, Texas, 2006-2007. Gill net and fall electrofishing stations are indicated by G and E respectively. Standard, offshore, and tandem trap net sites are represented by S, O, and T respectively.