

PERFORMANCE REPORT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2014 Fisheries Management Survey Report

San Augustine City Lake

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in San Augustine City Lake were surveyed in 2014 using electrofishing and trap netting and in 2015 using gill netting. Historical data are presented with the 2014-2015 data for comparison. 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 controlling authority, and 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 average three 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 Channel Catfish. Historically, hydrilla has been problematic. In 2002, coverage was 75% of the reservoir surface area, and Largemouth Bass growth and body condition were poor. During 2002 and 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%. In 2004, harvest regulations for Largemouth Bass were changed to a 14-18-inch slot length limit due to high recruitment and poor growth related to excessive hydrilla. In 2005, hydrilla coverage was reduced to a manageable level (50 acres), but drought conditions throughout 2006 (coupled with Triploid Grass Carp presence) resulted in the eradication of hydrilla. Although all Triploid Grass Carp likely escaped during a historic flood event in 2008, no hydrilla has been observed since 2007.
- **Fish community**
 - **Prey species:** Threadfin Shad were abundant in the reservoir. Electrofishing catch of sunfish was poor and primarily consisted of Redbreast Sunfish, Bluegill, and Redear Sunfish; few fish were over 6 inches in length.
 - **Catfishes:** Gill netting indicated an increase in abundance of Channel Catfish over the last three survey periods, which was likely related to the eradication of hydrilla. Lack of vegetative cover reduced Largemouth Bass abundance, which lowered predation on Channel Catfish, and increased nutrients available for preferred food items (i.e., benthic invertebrates).
 - **Largemouth Bass:** Largemouth Bass abundance has declined over the past three surveys, a likely result of declining and poor littoral habitat. Size structure has remained consistent, with most fish < 15 inches in length. Largemouth Bass were in average condition.
 - **Crappies:** White and Black Crappie were present. Since 2010, White Crappie abundance has been high and stable. The majority of the fish collected were > 10 inches in length.
- **Management Strategies:** Due to lack of habitat and failed attempts to establish native vegetation, coordinate with the controlling authority to fund and deploy fish attractors in the reservoir to increase angling opportunity. Promote the increase of White Crappie and Channel Catfish populations in local media.

INTRODUCTION

This document is a summary of fisheries data collected from San Augustine City Lake in 2014-2015. 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 2014-2015 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 trace amounts of aquatic vegetation. Native aquatic plants present are spikerush and American lotus. Hydrilla was first documented in the late 1990s, quickly became problematic by 2002, but has not been observed since 2006.

Angler Access

San Augustine City Lake has one public boat ramp (Table 2). In 2012, the ramp was not usable due to low water levels. However, in 2013, the City of San Augustine extended the ramp and resurfaced the parking area. Shoreline access is limited to the public boat ramp area.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Ashe and Driscoll 2011) included:

1. Continue to monitor aquatic vegetation annually. If hydrilla coverage were to expand beyond acceptable levels, meet with city officials and angling public to develop an integrated aquatic vegetation management plan.
Action: Aquatic vegetation surveys have been conducted annually. Since 2006, no hydrilla has been observed.
2. Discuss introductions of water willow or other Triploid Grass Carp resistant aquatic plant species with the City of San Augustine.
Action: Five species of native plants were introduced in 2012 (approximately 90 total plants).
3. Recommend access point improvements to the City Council via discussions with the city manager.
Action: The City of San Augustine has made improvements to the public boat ramp and parking area.
4. Continue to monitor Largemouth Bass size structure and growth to assess the success of the slot limit by fall electrofishing.
Action: A fall electrofishing survey was conducted in 2014 and growth was examined.

Harvest regulation history: Sport fishes in San Augustine City Lake are currently managed under statewide regulations with the exception of Largemouth Bass (Table 3). From 1990 to 2003, Largemouth Bass were managed with an 18-inch minimum length limit. As hydrilla expanded to 75% coverage in 2002, recruitment rates were high but growth and body condition were poor. As a result, a 14- to 18-inch slot length limit was implemented in 2004.

Stocking history: Sharelunker Largemouth Bass fingerlings (4,592) were stocked in 2006. Triploid Grass Carp were stocked in 2002 and 2003. Florida Largemouth Bass were stocked in 1979, 1980, and

again in 1992. Threadfin Shad were introduced in 1979 and 2000 (Table 4).

Vegetation/habitat history: Historically, hydrilla has been problematic. In 2002, coverage was 75% of the reservoir surface area. During 2002 and 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%. In 2005, hydrilla coverage was reduced to a manageable level (50 acres), but drought conditions throughout 2006 (coupled with the presence of Triploid Grass Carp) resulted in the eradication of hydrilla. Although all Triploid Grass Carp likely escaped during a historic flood event in 2008, no hydrilla has been observed since 2007 and only trace amounts of native plants have persisted. Annual habitat surveys have been conducted with only trace amounts of native vegetation having been observed since 2007.

Water transfer: San Augustine City Lake is used for municipal water supply and recreation. There is a permanent pumping station on the reservoir that supplies 100% of the municipal water supply to the City of San Augustine. Additionally, water is transferred to Bland Lake Water Supply and San Augustine Water Supply for municipal uses throughout San Augustine County.

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), trap netting (5 nets nights at 5 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 trap nets and 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 2014).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and condition indices [relative weight (W_r)] 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. Average age of 14-inch (13.5 – 14.5 inches) Largemouth Bass collected in 2014 was determined from otoliths (N=7). Water level data is not available.

A structural habitat survey was conducted in 2006. Vegetation surveys were conducted in 2011 – 2014 to monitor potential expansion of hydrilla.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat was poor and consisted of overhanging brush and trace amounts of emergent aquatic vegetation (Ashe and Driscoll 2007). Poor habitat conditions have persisted over the last 5 years. In 2012, Illinois pondweed, water stargrass, white water lily, water-willow, and spatterdock were introduced (approximately 90 total plants) but no plants survived. Annual vegetation surveys were conducted 2011-2014 with only trace amounts of native vegetation observed (<3 acres).

Prey species: Threadfin Shad were abundant, (1,036.0/h), during the 2014 electrofishing survey (Appendix A). Redbreast Sunfish, Bluegill, and Redear Sunfish were present but catch rates were low. Sunfish catches have declined significantly noticeably over the past three surveys due to a lack of littoral habitat (Figures 1, 2, and 3). Size structure continued to be dominated by small individuals.

Channel Catfish: The gill net catch rate of Channel Catfish increased to 6.0/nn in 2015, compared with 4.2/nn in 2011 and 0.4/nn in 2007 (Figure 4). Excessive hydrilla coverage from 2000 to 2004 likely suppressed catfish abundance. The lack of vegetative cover during the last eight years reduced Largemouth Bass abundance, which likely lowered predation on Channel Catfish. In addition, declining vegetation increased nutrients available to benthic invertebrates, preferred food items of Channel Catfish.

Largemouth Bass: Catch rates of Largemouth Bass have declined markedly, from 132.0/h in 2006, to 69.0/h in 2010, and ultimately to 39.0/h in 2014 (Figure 5). This decline in catch is a likely result of poor and declining littoral habitat. The length-frequency distribution was similar among years with the majority of fish being < 15 inches in length (PSD range = 35 – 47). Growth was adequate, as average age at 14 inches (13.5 to 14.5 inches) was 2.7 years (N = 7; range = 2 to 3 years). Average body condition (Wr) also generally declined from 2006 to 2014.

Crappies: White Crappie abundance has remained high and consistent over the past two surveys, as catch rates were 24.6/nn in 2014 and 20.2/nn in 2010 (Figure 6). Size structure was desirable, as the majority of fish were ≥ 10 inches in length. Average age of white crappie at 10 inches (9.5 to 10.5 inches) was 2.1 years (N=21; range = 2 to 3 years) (Ashe and Driscoll 2011). Body condition improved from 2010 to 2014, indicating adequate forage. Black Crappie were also present but abundance was low with 0.4 fish/nn in 2014.

Fisheries management plan for San Augustine City Lake, Texas

Prepared – June 2015

ISSUE 1: Sunfish and Largemouth Bass catch rates are low, likely resulting from poor littoral habitat at the time of sampling. Introduction of native plants was attempted with no success.

MANAGEMENT STRATEGY

1. Coordinate with the controlling authority and homeowners to construct and deploy plastic fish attractors (if funds are available) or brushpiles to increase catchability and angling opportunities.

ISSUE 2: Since 2006, White Crappie numbers have increased significantly, and an abundant population is present. Channel Catfish abundance has also improved, and the majority of fish collected in 2015 were ≥ 12 inches in length.

MANAGEMENT STRATEGY

1. Promote both fisheries in local media.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes mandatory monitoring in 2018-2019 (Table 5).

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. 2007. Statewide freshwater fisheries monitoring and management program, San Augustine City Lake, Texas Parks and Wildlife Department, Federal Aid in Sport Fish Restoration, Performance Report, Project F-30-R-32, Austin
- Ashe, D., and T. Driscoll. 2011. Statewide freshwater fisheries monitoring and management program survey report for San Augustine City Lake, 2010. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-36, Austin.
- Guy, C.S., R.M. Neuman, D.W. Willis, and R.O. Anderson. 2007. Proportional size distribution (PSD): A further refinement of population size structure index terminology. Fisheries 32(7):348.

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
Shoreline Development Index (SDI)	2.2
Conductivity	140 umhos/cm

Table 2. Boat ramp characteristics for San Augustine City Lake, Texas, May, 2015. Reservoir elevation at time of survey was 310 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
City Ramp	31.51510 94.10130	Y	6-8	306	Adequate condition, no access issues

Table 3. Harvest regulations for San Augustine City Lake, Texas.

Species	Bag Limit	Length Limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, Largemouth	5	14 to 18-inch slot
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

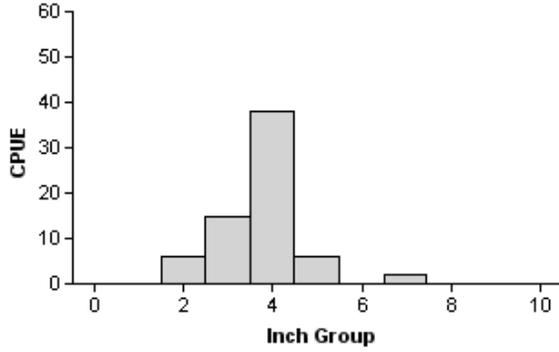
Table 4. Stocking history of San Augustine City Lake, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults.

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
	Total	4,592	
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	

Redbreast Sunfish

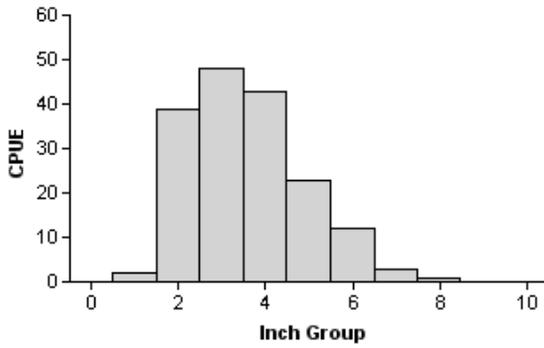
2006

Effort = 1.0
 Total CPUE = 67.0 (40; 67)
 PSD = 3 (2.4)



2010

Effort = 1.0
 Total CPUE = 171.0 (19; 171)
 PSD = 12 (4.4)



2014

Effort = 1.0
 Total CPUE = 23.0 (23; 23)
 PSD = 52 (13.1)

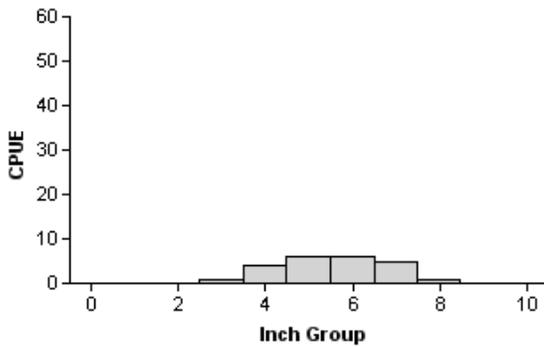
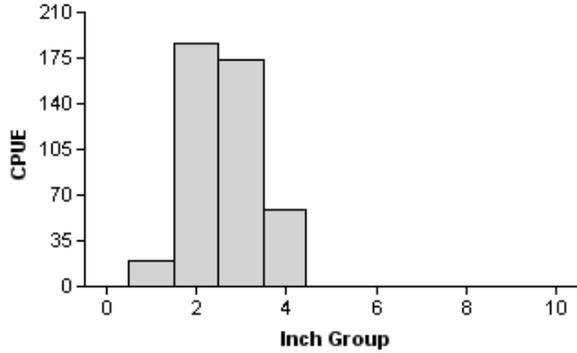


Figure 1. Number of Redbreast Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 2006, 2010, and 2014.

Bluegill

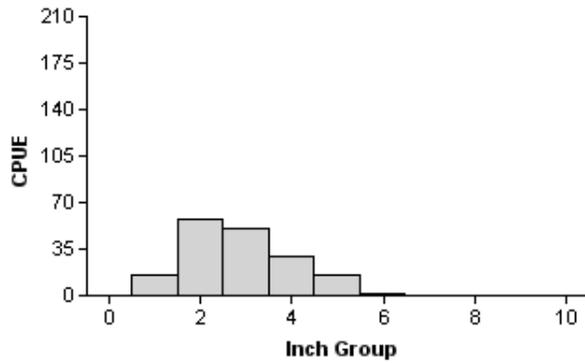
2006

Effort = 1.0
 Total CPUE = 437.0 (18; 437)
 PSD = 0 (65.8)



2010

Effort = 1.0
 Total CPUE = 171.0 (18; 171)
 PSD = 1 (1)



2014

Effort = 1.0
 Total CPUE = 36.0 (21; 36)
 PSD = 9 (4.1)

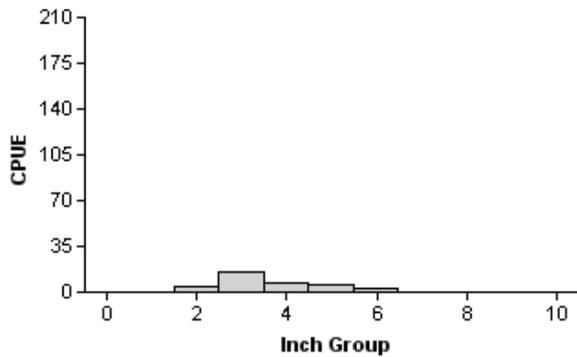
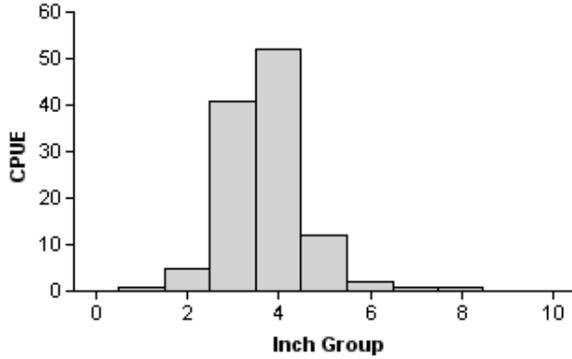


Figure 2. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 2006, 2010, and 2014.

Redear Sunfish

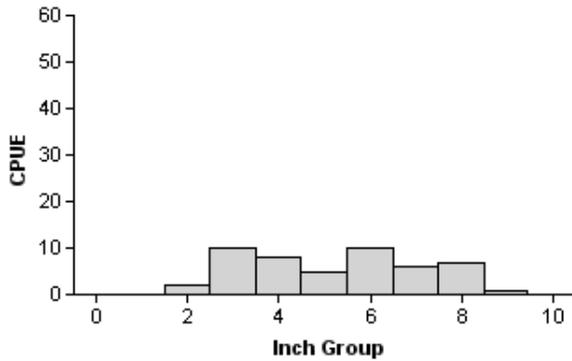
2006

Effort = 1.0
 Total CPUE = 115.0 (20; 115)
 PSD = 3 (1.4)



2010

Effort = 1.0
 Total CPUE = 49.0 (18; 49)
 PSD = 38 (9.1)



2014

Effort = 1.0
 Total CPUE = 13.0 (38; 13)
 PSD = 70 (21.3)

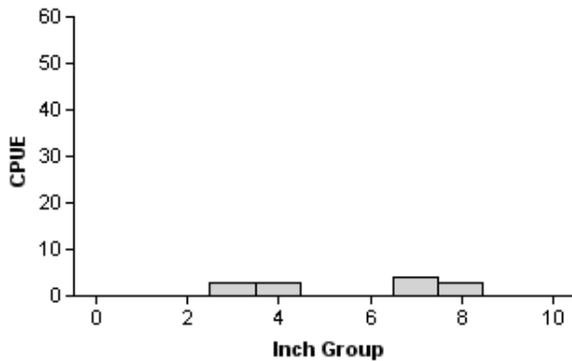


Figure 3. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 2006, 2010, and 2014.

Channel Catfish

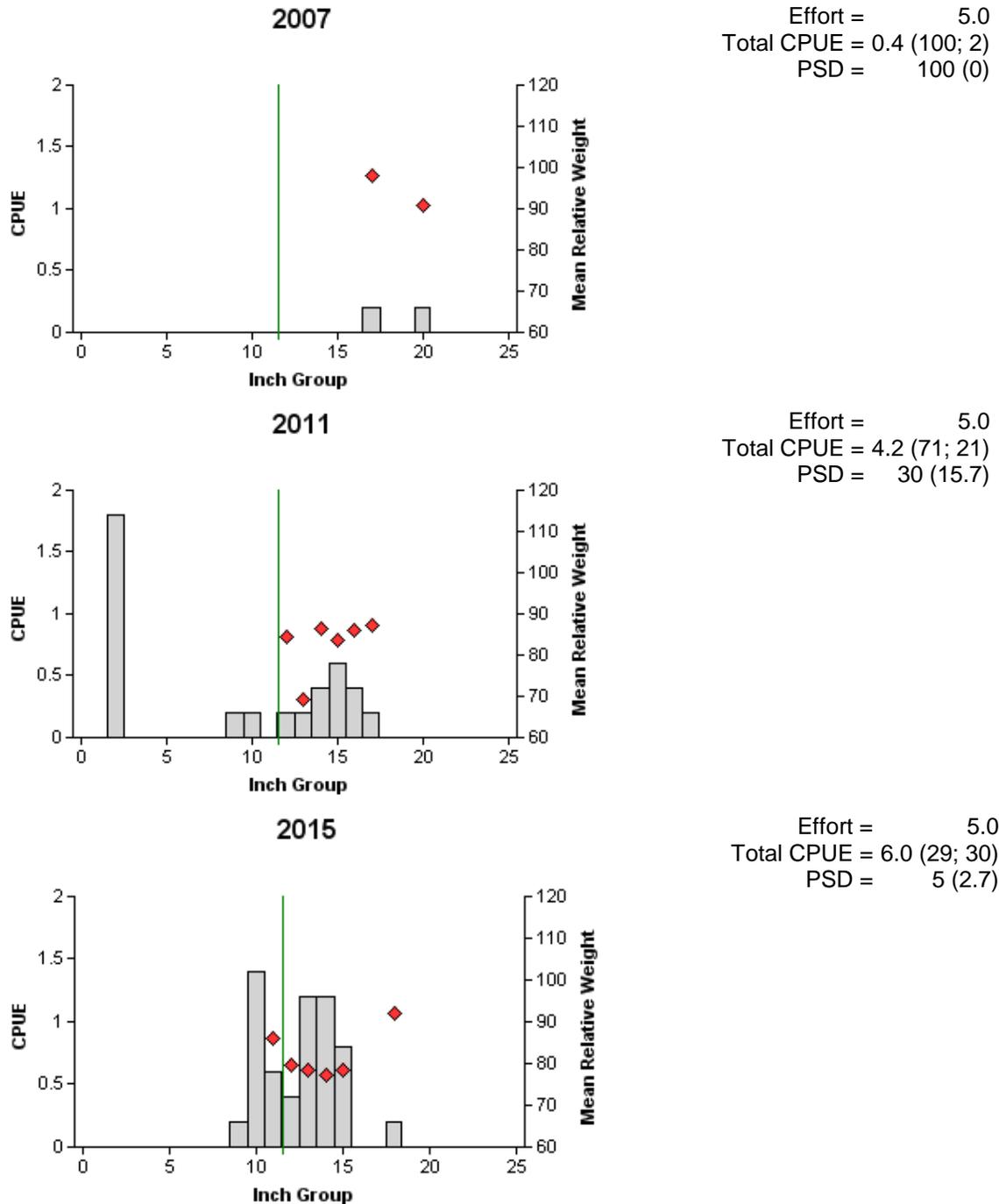


Figure 4. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, San Augustine City Lake, Texas, 2007, 2011, and 2015. Vertical lines indicate minimum length limit at time of survey.

Largemouth Bass

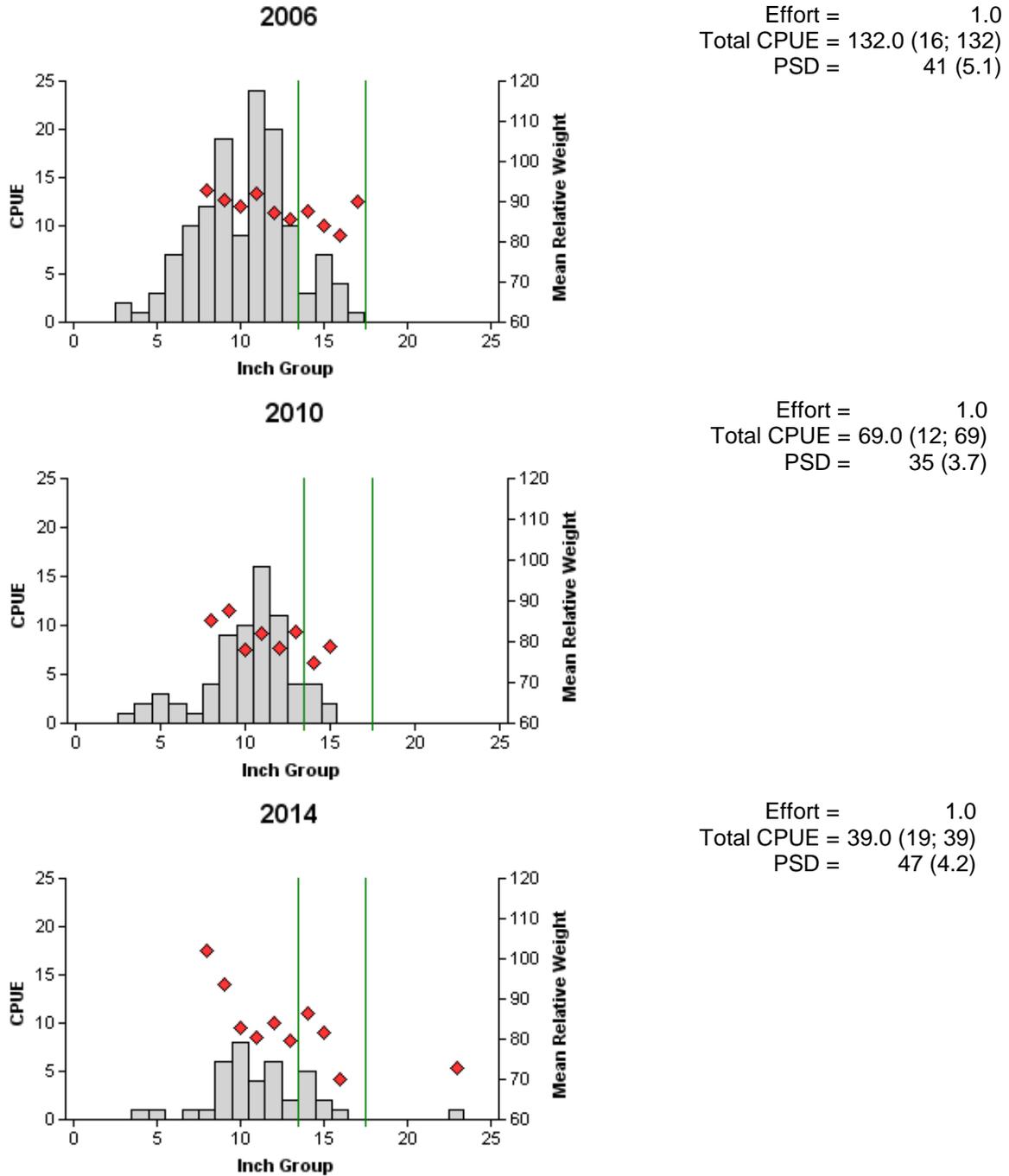


Figure 5. Number of Largemouth Bass caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 2006, 2010, and 2014. Vertical lines indicate the lower and upper bounds of the protected slot length limit at time of survey.

White Crappie

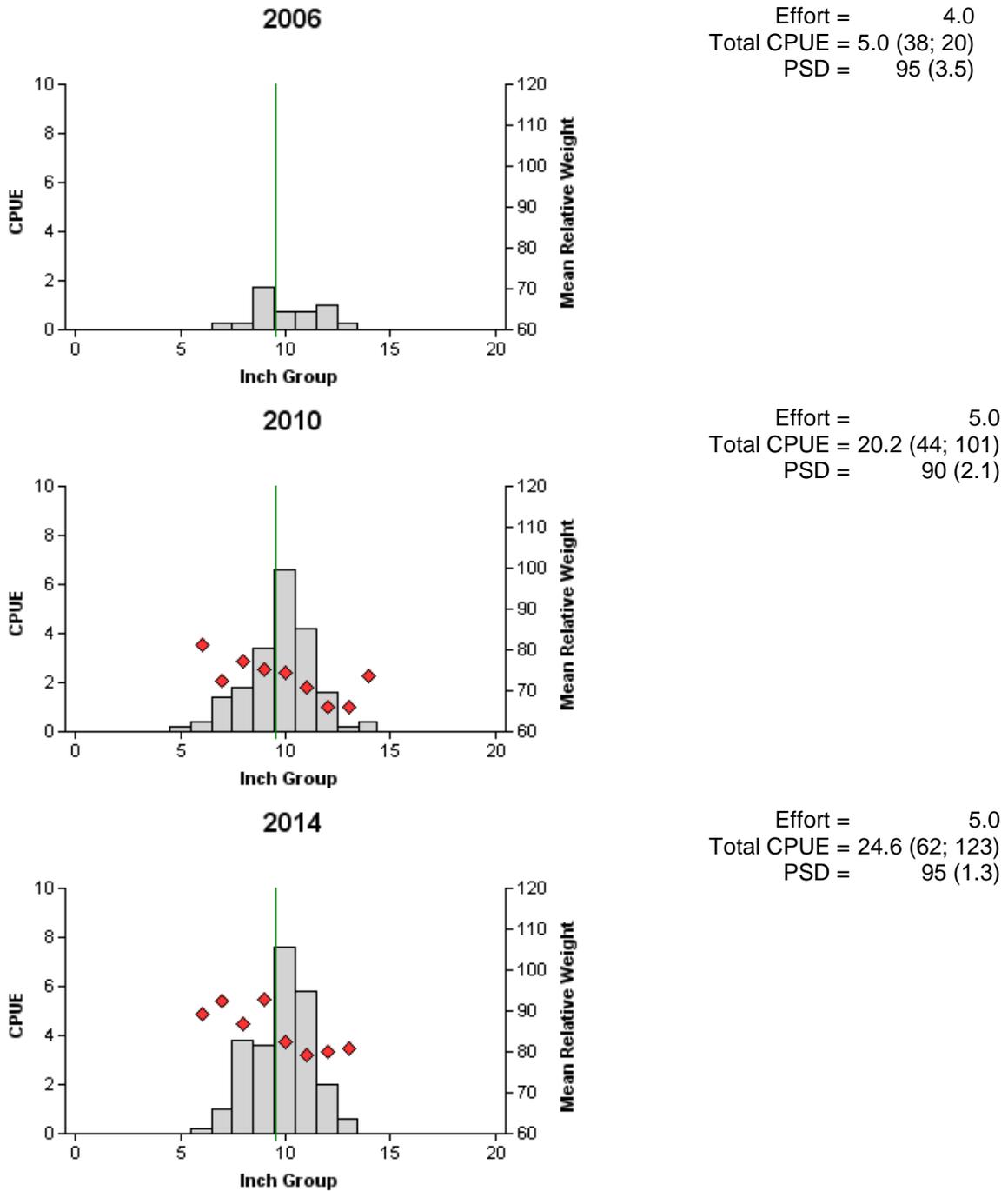


Figure 6. Number of White Crappie caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, San Augustine City Lake, Texas, 2006, 2010, and 2014. Vertical lines indicate minimum length limit at time of survey.

Black Crappie

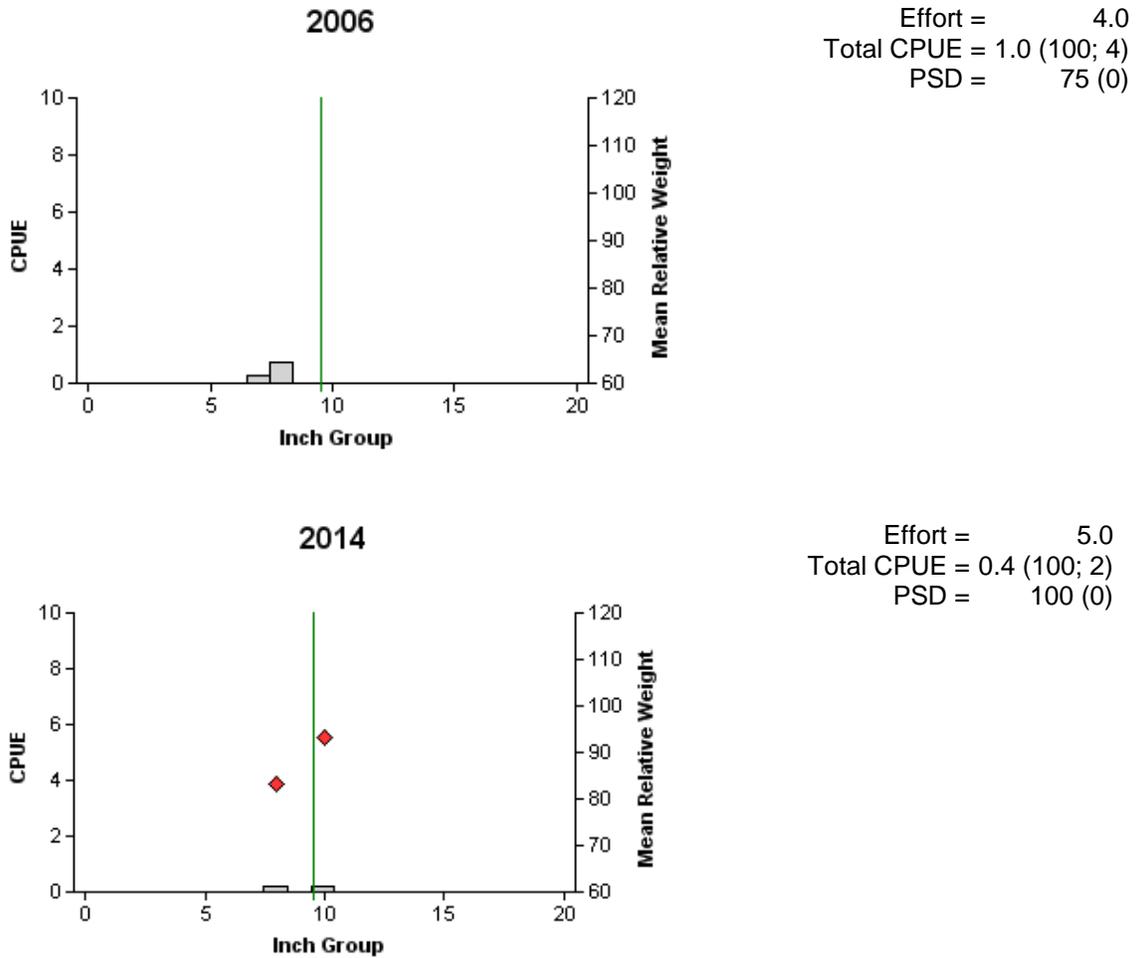


Figure 7. Number of Black Crappie caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, San Augustine City Lake, Texas, 2006 and 2014. No fish were collected in 2010. Vertical lines indicate minimum length limit at time of survey.

Table 5. Proposed sampling schedule for San Augustine City Lake, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S.

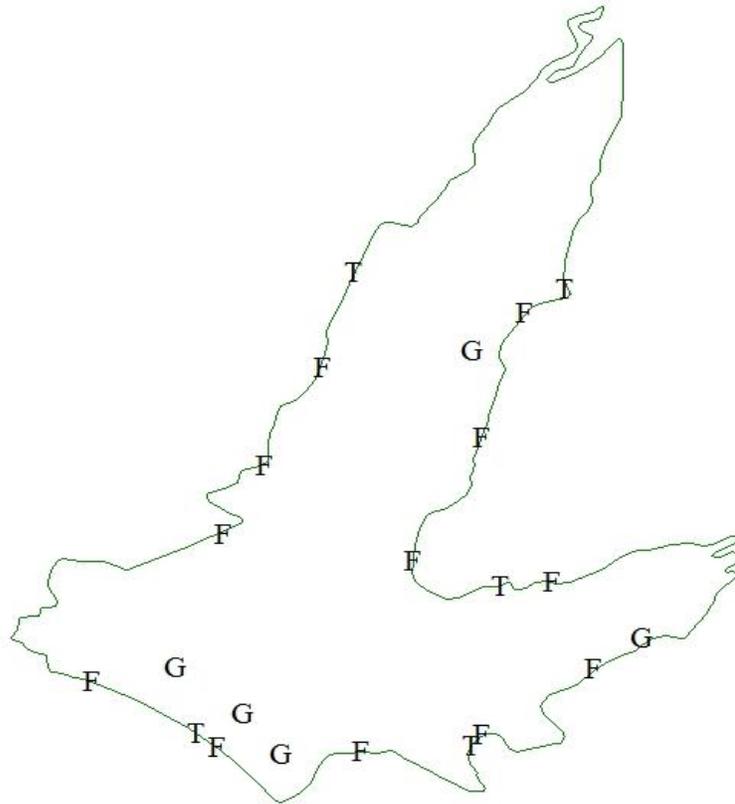
Survey year	Electrofishing	Trap net	Gill net	Habitat			Report
				Structural	Vegetation	Access	
2015-2016							
2016-2017							
2017-2018							
2018-2019	S	S	S		S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from San Augustine City Lake, Texas, 2014-2015. Sampling effort was 5 net nights for gill netting, 5 net nights for trap netting, and 1 hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Threadfin Shad					1,036	1,036.0
Channel Catfish	30	6.0				
Redbreast Sunfish					23	23.0
Green Sunfish					14	3.0
Warmouth					16	2.0
Bluegill					171	36.0
Longear Sunfish					12	120.0
Redear Sunfish					49	13.0
Redspotted Sunfish					3	3.0
Largemouth Bass					69	39.0
White Crappie	20	4.0	123	24.6		
Black Crappie			2	0.4		

APPENDIX B



Location of sampling sites, San Augustine City Lake, Texas, 2014-2015. Gill net, fall electrofishing, and trap net stations are indicated by G, F, and T respectively. Water level was near conservation pool at time of sampling.