

San Augustine City Reservoir

2018 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in San Augustine City Reservoir were surveyed in 2018 using electrofishing and trap netting and in 2019 using gill netting. Historical data are presented with the 2018-2019 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 Reservoir 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 are 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 fish/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 Triploid Grass Carp presence) resulted in the eradication of hydrilla. No hydrilla has been observed since 2006. Largemouth Bass were managed with a 14- to 18-inch slot length limit from 2004 until 2018. In 2018, the regulation was changed to the statewide 14-inch minimum length limit due to ineffectiveness and to simplify regulations statewide.

Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. Electrofishing catch of sunfish was adequate (combined 296 fish/h) and primarily consisted of Redbreast Sunfish, Bluegill, and Redear Sunfish. Redbreast and Redear Sunfish have the potential to support a quality fishery, as abundance of fish ≥ 6 inches was relatively high.
- **Catfishes:** Gill netting indicated a decrease in abundance of Channel Catfish compared to the previous two survey periods. An increase in the Redbreast Sunfish population may have resulted in increased competition for preferred food items (i.e., benthic invertebrates), suppressing recruitment and survival.
- **Largemouth Bass:** Largemouth Bass abundance has been consistently low over the past three surveys, a likely result of poor littoral habitat. Size structure has remained consistent, with most fish < 15 inches in length. Largemouth Bass were in average condition.
- **Crappies:** Only White Crappie were observed during the 2018 trap net survey; however Black Crappie have been observed in previous surveys in low abundance. White Crappie abundance from the 2018 survey was significantly less compared to the previous two survey periods. The majority of the fish collected were ≥ 10 inches in length.

Management Strategies: Promote the quality sunfish populations in local media to establish a fishery. Monitor for invasive species and coordinate with the controlling authority to either control or eradicate any infestations that may occur.

Introduction

This document is a summary of fisheries data collected from San Augustine City Reservoir in 2018-2019. 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 fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2018-2019 data for comparison.

Reservoir Description

San Augustine City Reservoir 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 visibility is typically 2 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 Reservoir has one public boat ramp with adequate access (Table 2). 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 2015) included:

1. Coordinate with the controlling authority and homeowners to construct and deploy plastic fish attractors or brushpiles to increase catchability and angling opportunities.

Action: Four plastic fish attractor sites (15 structures) were established in 2017 via Conservation License Plate funds.

2. Promote the Channel Catfish and crappie fisheries in local media.

Action: Local media was contacted for the deployment of artificial PVC fish attractors with an emphasis placed on their ability to improve catchability of crappie.

Harvest regulation history: Sport fishes in San Augustine City Reservoir are currently managed under statewide regulations (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. However, the regulation was changed to the statewide 14-inch minimum length limit in 2018 because the slot limit did not improve size structure of the population, and to simplify regulations statewide.

Stocking history: Sharelunker Largemouth Bass fingerlings (4,592) were stocked in 2006 (Table 4). 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.

Vegetation/habitat management 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 fish/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 2006 and only trace amounts of native plants have persisted. In 2012, Illinois pondweed,

water stargrass, white water lily, water willow, and spatterdock were introduced (approximately 90 total plants) but no plants survived. In 2017, a total of 15 artificial fish habitat structures were placed into the reservoir across four sites.

Water transfer: San Augustine City Reservoir 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

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for San Augustine City Reservoir (TPWD unpublished). Primary components of the OBS plan are listed in Table 5. In 2018, 10 randomly selected electrofishing sites were sampled during daytime to increase sampling efficiency due to the turbid nature of the reservoir. Otherwise, all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Electrofishing – Largemouth Bass, sunfishes, and Threadfin Shad were collected by electrofishing (0.8 hour at 10, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Trap netting – Crappie were collected using trap nets (10 net nights at 10 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting – Channel Catfish were collected by gill netting (5 net nights at 5 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Habitat – A structural habitat survey was conducted in 2006. Vegetation surveys were conducted in 2015–2018 to monitor presence of hydrilla. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

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. Annual vegetation surveys were conducted 2015-2018 with only trace amounts of native vegetation observed (<3 acres).

Prey species: Threadfin Shad were present in 2018 (4.8/h (Appendix A), with abundance significantly lower than 2015 when 1,036.0/h were sampled. Redbreast Sunfish, Bluegill, and Redear Sunfish were present with a combined catch rate of 293/h (Figures 1, 2, and 3). Sunfish catches have varied significantly over the past three surveys (391/h in 2010 ; 72/h in 2014; and 293/h in 2018). Bluegill size structure continued to be dominated by small individuals. Redbreast and Redear Sunfish have the potential to support a quality fishery, as abundance of fish ≥ 6 inches was relatively high.

Channel Catfish: The gill net catch rate of Channel Catfish decreased to 0.8/nn in 2019, compared with 6.0/nn in 2015 and 4.2/nn in 2011 (Figure 4). An increase in the Redbreast Sunfish population may have resulted in increased competition for preferred food items (i.e., benthic invertebrates), suppressing recruitment and survival.

Largemouth Bass: Fall electrofishing catch rates of Largemouth Bass have been low compared to other Southeast Texas reservoirs (≤ 80 /h) (Figure 5). Relatively poor littoral habitat likely limits Largemouth Bass recruitment and results in poor year classes. In 2018, catch rates (80.4/h) were higher than previous years, but few fish > 14 inches were observed. Body condition from the past three surveys was adequate (average relative weight above 80) for all stock-size fish.

Crappies: White Crappie abundance decreased significantly in 2018 (4.2 fish/nn) when compared to the previous two surveys (24.6/nn in 2014 and 20.2/nn in 2010) (Figure 6). Size structure was desirable, with

the majority of fish ≥ 10 inches in length. Body condition declined in 2018 (average $W_r = 76.6$) from 2014 (average $W_r = 85.5$). Both the decline in abundance and body condition may be a result of the low forage base abundance of Threadfin Shad. Black Crappie were last observed in 2014 with only two fish sampled.

Fisheries Management Plan for San Augustine City Reservoir, Texas

Prepared – July 2019

ISSUE 1: During 2018, electrofishing catch of larger Redbreast and Redear Sunfish (≥ 6 inches in length) increased when compared to previous surveys. These populations have the potential to support a quality sunfish fishery.

MANAGEMENT STRATEGY

1. Promote the status of the quality sunfish populations in local media to increase angler awareness and establish a fishery.

ISSUE 2: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels 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 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.

Objective-Based Sampling Plan and Schedule (2019–2023)

Sport fish, forage fish, and other important fishes

Sport fishes in San Augustine City Reservoir include Largemouth Bass, crappies, and Channel Catfish. Important forage species include Bluegill and Threadfin Shad.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass had been managed with 14- to 18-inch slot length limit since 2004. However, in 2018, the regulation was changed to the statewide 14-inch minimum length limit. Since 1999, trend data on CPUE, size structure, and body condition have been collected every four years with nighttime, fall electrofishing. Population abundance has varied but size structure has been consistent. Due to the shallow and turbid nature of the reservoir, daytime fall electrofishing in 2022 will allow for determination of any large-scale changes in the Largemouth Bass population. The anticipated effort to meet desired sampling objectives ($N = 50$ stock-size fish; $RSE-S \leq 25$) is approximately 15-20 5-min stations with 80% confidence. However, there is only enough shoreline area to sample 12 stations.

Catfishes: Since 1998, gill netting has been conducted every four years. During the last three sampling years, data has indicated variable Channel Catfish recruitment and abundance. Continuation of this sampling frequency should provide adequate population-level insight relative to large-scale changes that would dictate further investigation. Due to the small size of the reservoir (200 surface acres), a total of 5 randomly selected gill netting sites will be sampled in 2023.

Crappies: Since 1994, trap netting has been conducted every four years, and catch rates have averaged 15-20/nn. A maximum of 10 randomly selected trap netting sites will be sampled in 2022 in an attempt to achieve desired sampling objectives ($N = 50$ stock-size crappie; $RSE-S \leq 25$).

Prey species: Bluegill and Threadfin Shad are the primary forage at San Augustine City Reservoir. Fall electrofishing every four years (per Largemouth Bass sampling) will be used to monitor forage populations. Largemouth Bass body condition (fish ≥ 8 " TL) will be used to provide additional information on forage abundance and vulnerability.

Literature Cited

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- 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.
- Guy, C. S., R. M. Neumann, 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.

Tables and Figures

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

Characteristic	Description
Year constructed	1952
Controlling authority	City of San Augustine
County	San Augustine
Reservoir type	Tributary – Carrizo and Caney creeks
Shoreline Development Index	2.2
Conductivity	140 μ S/cm

Table 1. Boat ramp characteristics for San Augustine City Reservoir, Texas, November, 2018. Reservoir elevation at time of survey was 311 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 2. Harvest regulations for San Augustine City Reservoir, 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-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 3. Stocking history of San Augustine City Reservoir, 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
Threadfin Shad	1979	1,200	ADL
	2000	3,300	ADL
	2000	2,300	ADL
	Total	6,800	
Triploid Grass Carp	2002	320	AFGL
	2003	280	AFGL
	Total	600	

Table 4. Objective-based sampling plan components for San Augustine City Reservoir, Texas 2018–2019.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass ^a	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	10 fish/inch group (max)
Bluegill ^b	Abundance	CPUE–Total	
	Size structure	PSD, length frequency	
Threadfin Shad ^b	Abundance	CPUE–Total	
<i>Trap netting^a</i>			
Crappie	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N = 50$
	Condition	W_r	10 fish/inch group (max)
<i>Gill netting^a</i>			
Channel Catfish	Abundance	CPUE–stock	
	Size structure	PSD, length frequency	
	Condition	W_r	10 fish/inch group (max)

^a Due to the small size of the reservoir (200 surface acres), no more than 12 electrofishing, 10 trap netting, and 5 gill netting sites will be sampled.

^b No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill and Threadfin Shad if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Redbreast Sunfish

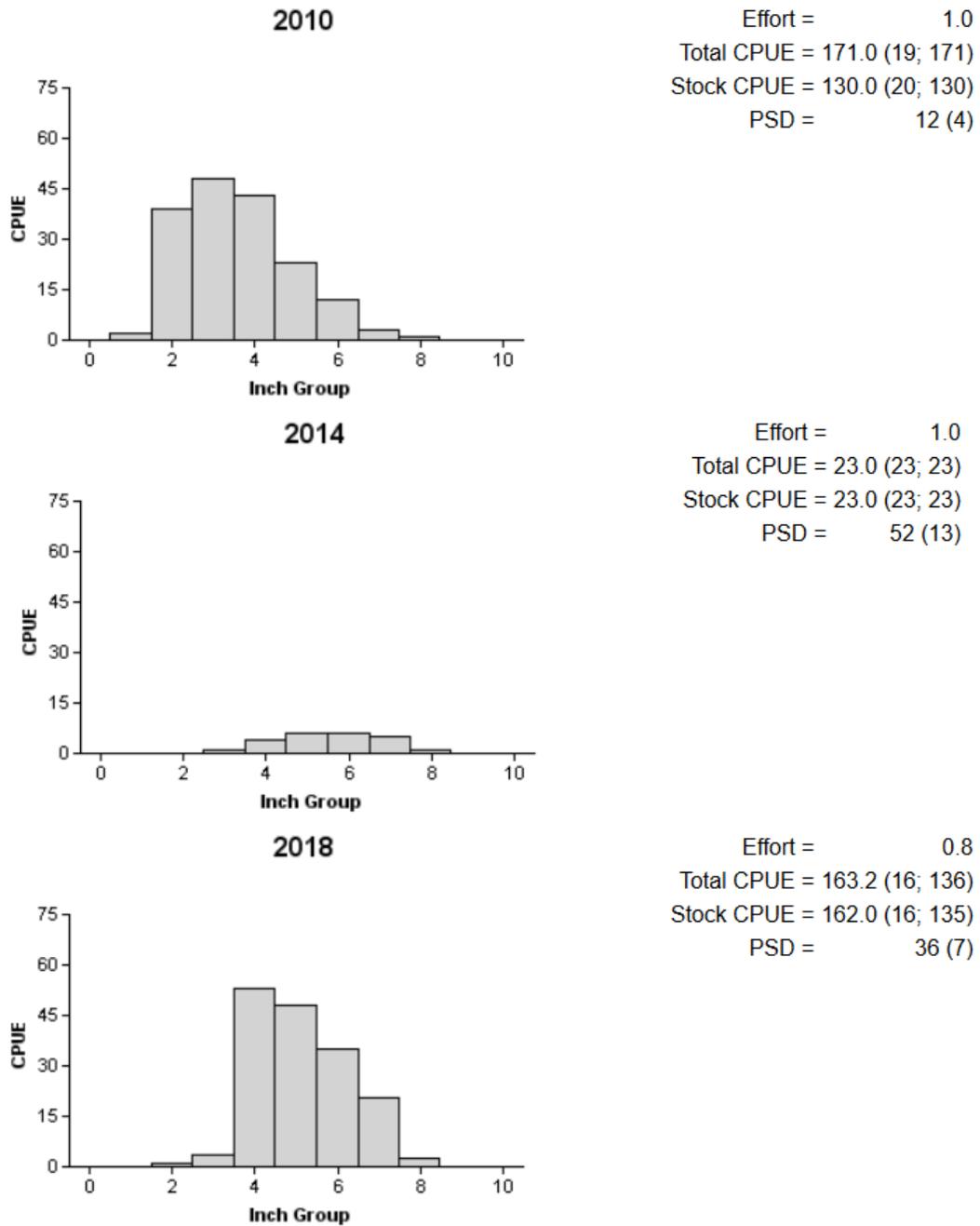


Figure 1. Number of Redbreast Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Reservoir, Texas, 2010, 2014, and 2018.

Bluegill

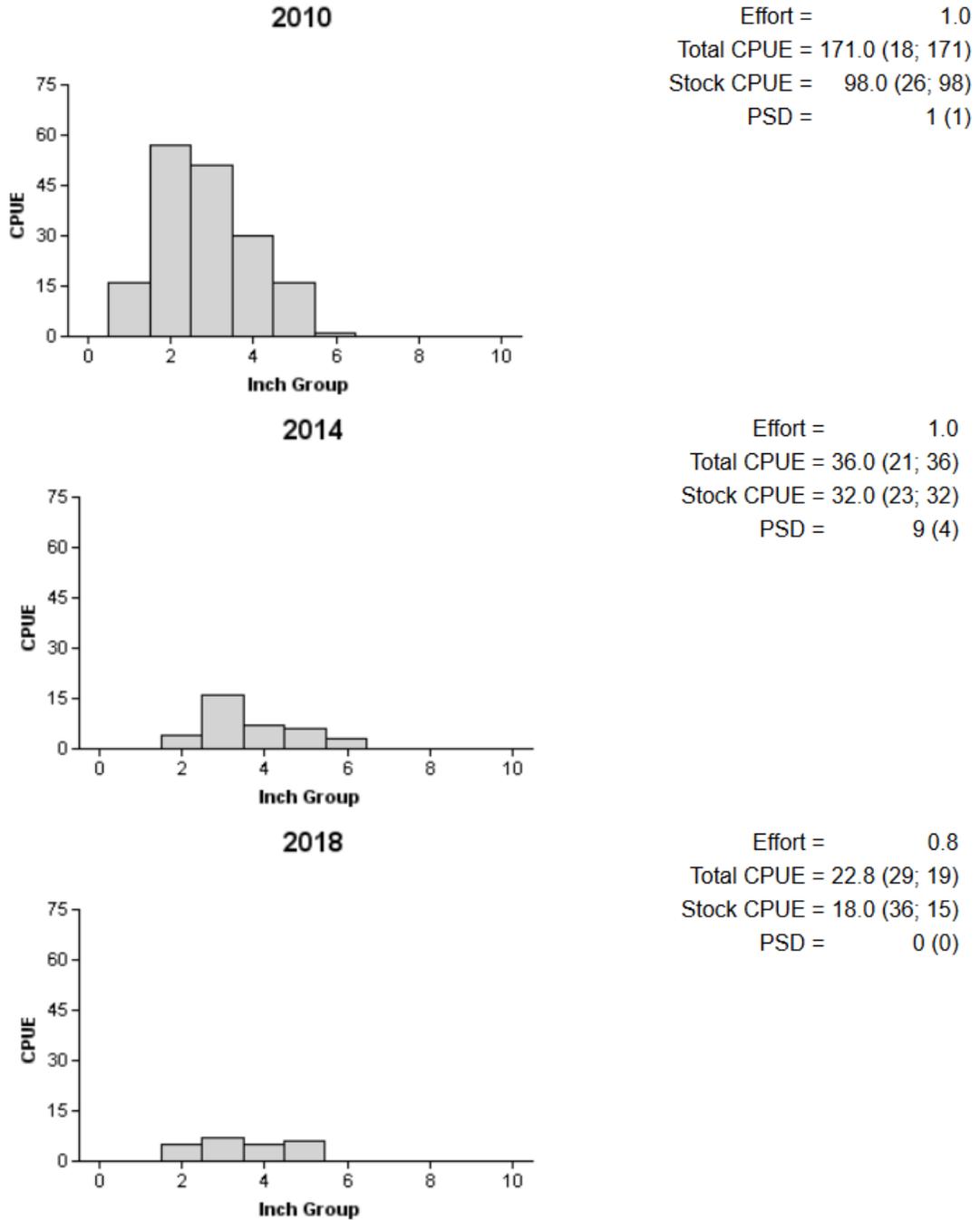


Figure 2. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Reservoir, Texas, 2010, 2014, and 2018.

Redear Sunfish

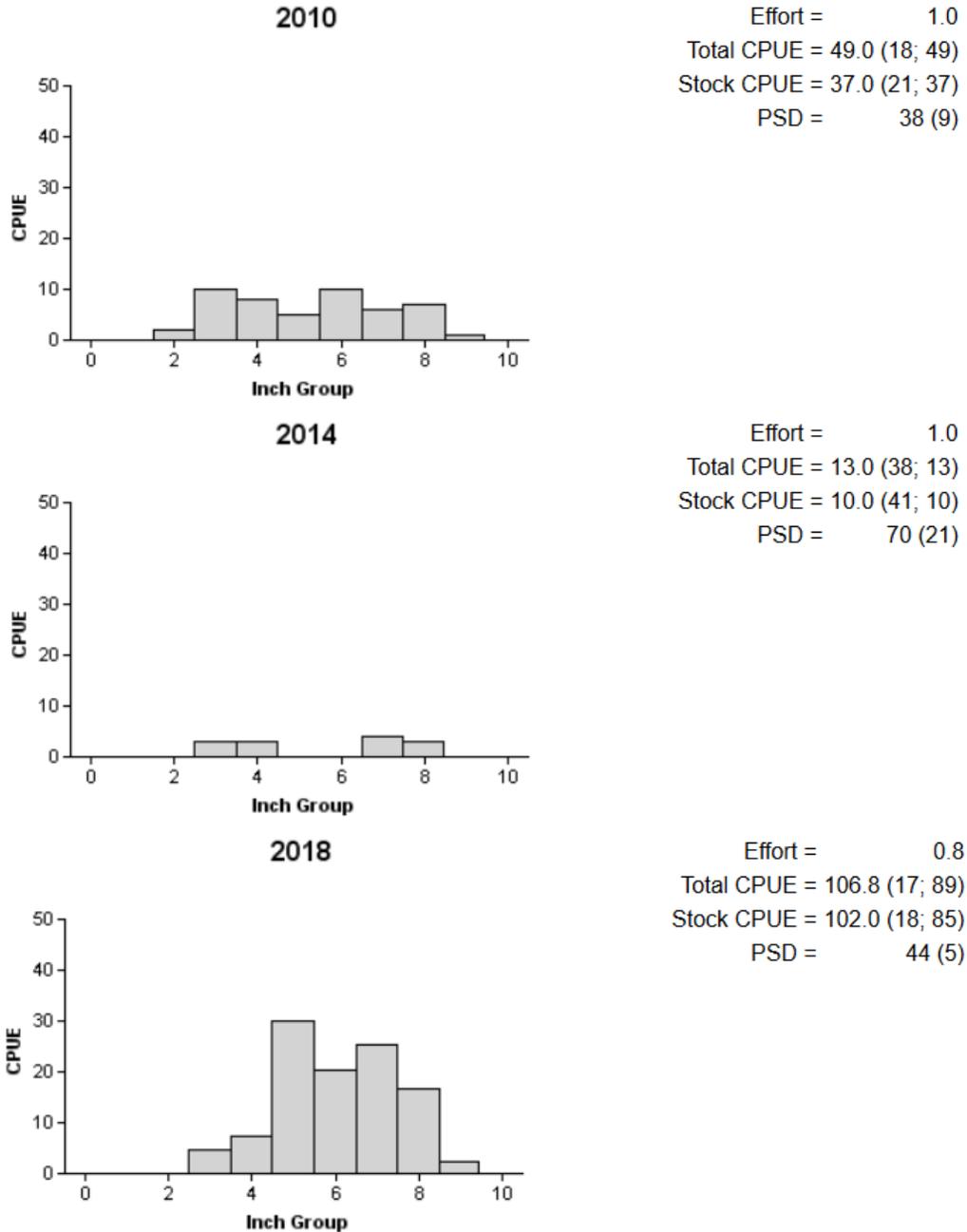


Figure 3. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Reservoir, Texas, 2010, 2014, and 2018.

Channel Catfish

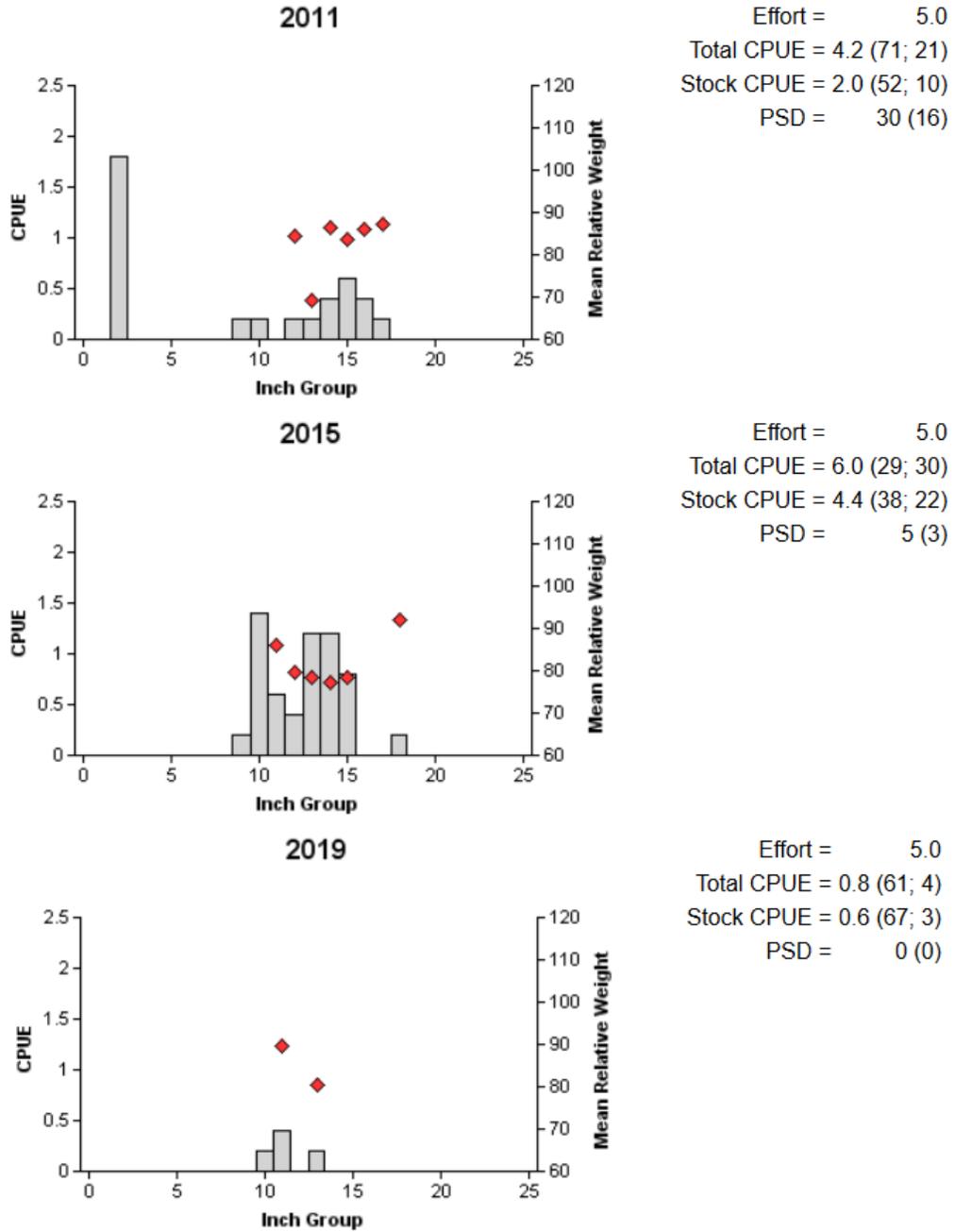


Figure 4. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, San Augustine City Reservoir, Texas, 2011, 2015, and 2019.

Largemouth Bass

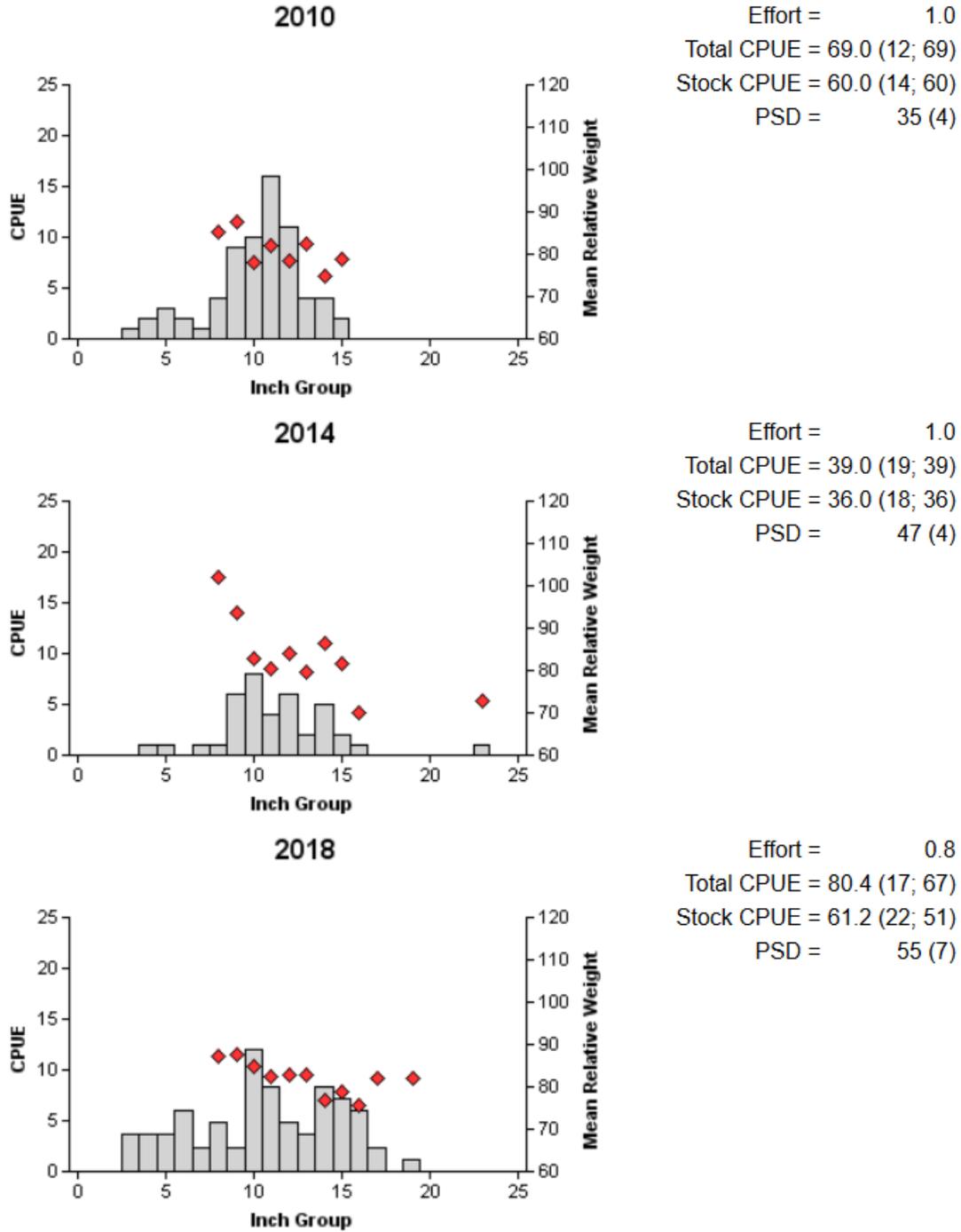


Figure 5. Number of Largemouth Bass caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Reservoir, Texas, 2010, 2014, and 2018.

White Crappie

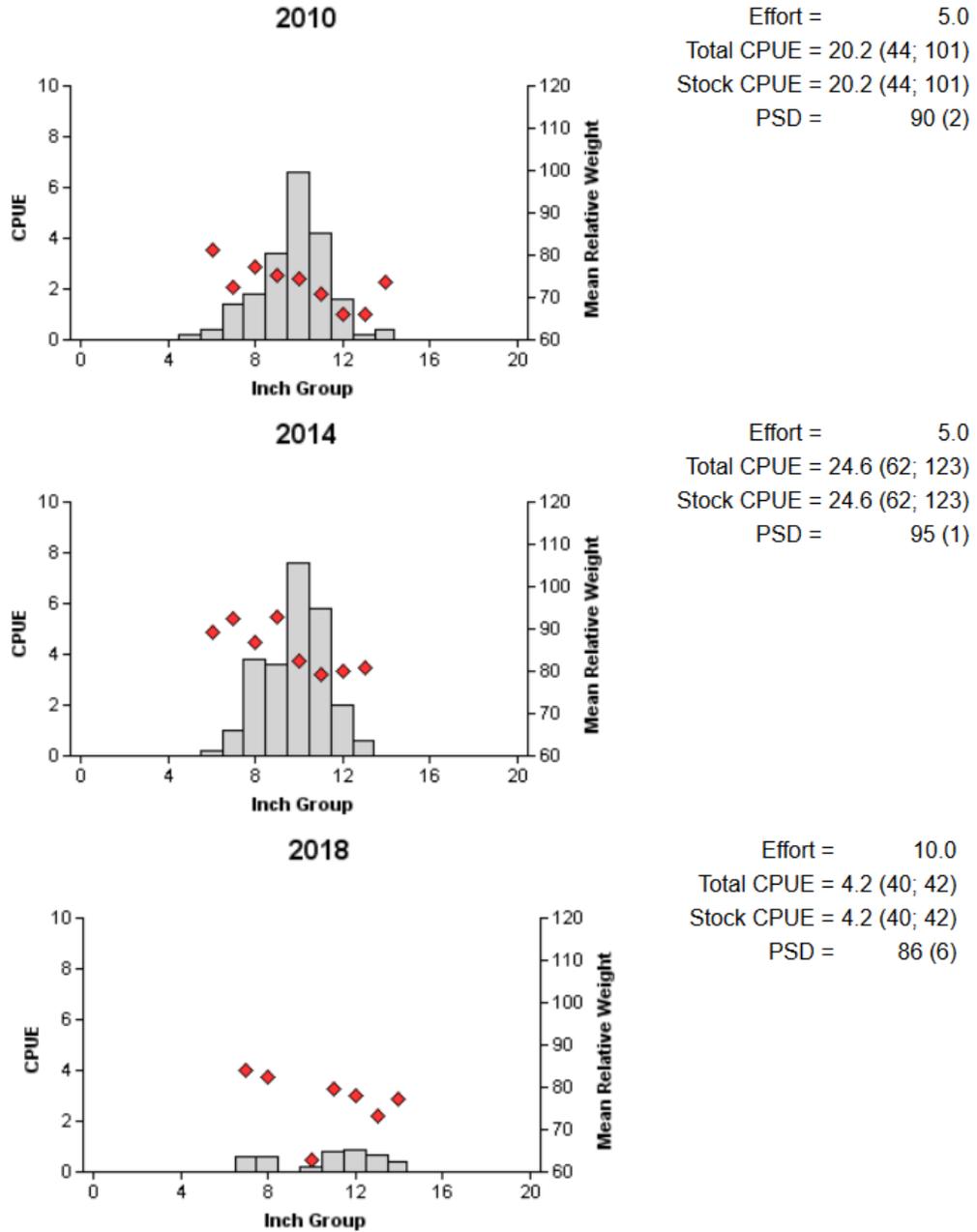


Figure 6. Number of White Crappie caught per net night (CPUE, bars), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, San Augustine City Reservoir, Texas, 2010, 2014, and 2018.

Proposed Sampling Schedule

Table 6. Proposed sampling schedule for San Augustine City Reservoir, 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 and additional survey denoted by A.

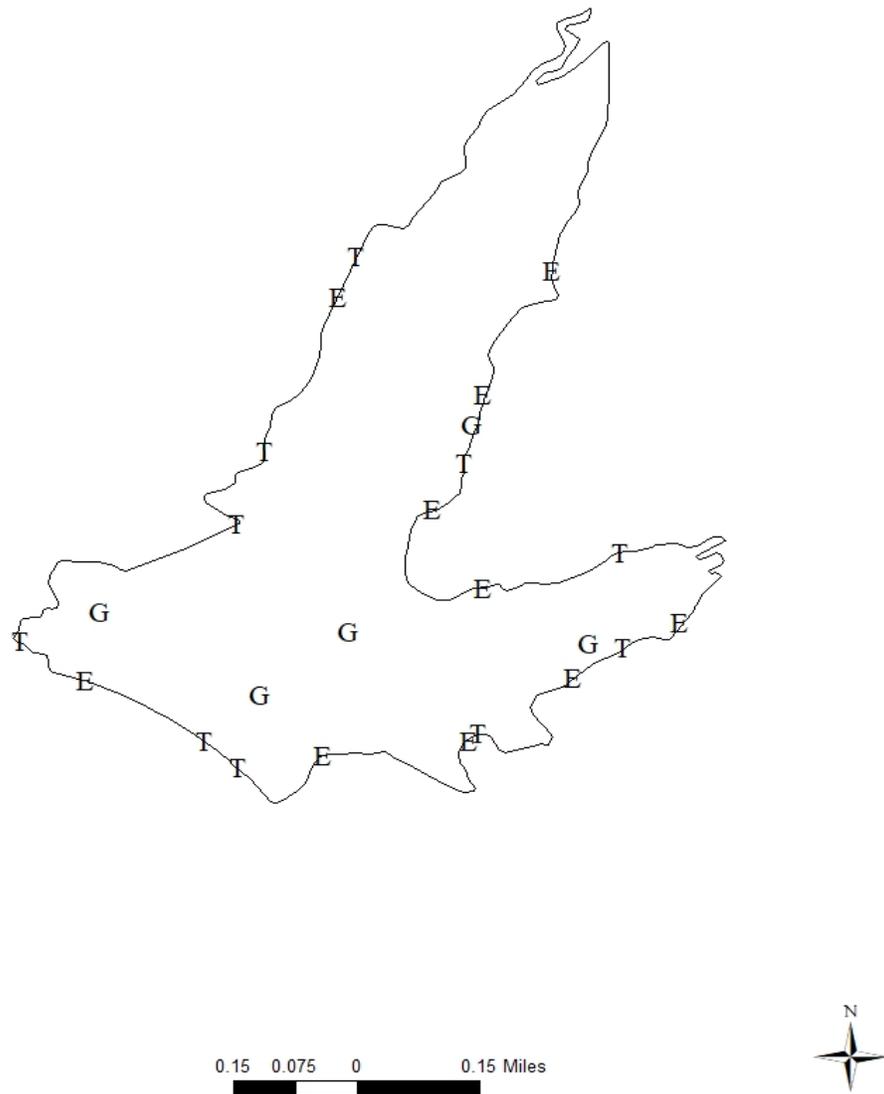
	Survey year			
	2019-2020	2020-2021	2021-2022	2022-2023
Angler Access				S
Vegetation				S
Electrofishing				S
Trap netting				S
Gill netting				S
Report				S

APPENDIX A – Catch rates for all species from all gear types

Number (N) and catch rate (CPUE) (RSE in parentheses) of all species collected from all gear types from San Augustine City Reservoir, Texas, 2018-2019. Sampling effort was 5 net nights for gill netting, 10 net nights for trap netting, and 0.8 hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Threadfin Shad					4	4.8 (100)
Channel Catfish	4	0.8 (61)				
Redbreast Sunfish					136	163.2 (16)
Green Sunfish					2	2.4 (100)
Warmouth					1	1.2 (100)
Bluegill					19	22.8 (29)
Redear Sunfish					89	106.8 (17)
Largemouth Bass					67	80.4 (17)
White Crappie	5	1.0 (45)	42	4.2 (40)		

APPENDIX B – Map of sampling locations



Location of sampling sites, San Augustine City Reservoir, Texas, 2018-2019. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was near conservation pool at time of sampling.



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