

San Augustine City Lake

2022 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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July 31, 2023



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Survey and Management Summary

Fish populations in San Augustine City Lake were surveyed in 2022 using electrofishing and trap netting and in 2023 using gill netting. Historical data are presented with the 2022-2023 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 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. Four artificial fish attractor sites were established in 2017. 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 of the slot length limit to increase abundance of \geq 14-inch fish and to simplify regulations statewide.

Fish Community

- **Prey species:** Threadfin Shad were the primary prey species in the reservoir and electrofishing catch rate was high (4,324.0 fish/h). Electrofishing catch of sunfish was low (combined 147.0 fish/h) and primarily consisted of Redbreast Sunfish and Redear Sunfish. Few sunfish were available as prey, as most fish observed were \geq 5 inches in length.
- **Catfishes:** Gill netting indicated an increase in abundance of Channel Catfish in 2023 compared to the previous survey in 2019. A Blue Catfish was observed for the first time in this waterbody and likely resulted from an illegal introduction.
- **Largemouth Bass:** Largemouth Bass abundance increased compared to the two previous surveys, likely a result of a robust 2021 year class. Size structure has remained consistent, with most fish < 15 inches in length. Largemouth Bass were in adequate condition.
- **Crappies:** Only White Crappie were observed during the 2022 trap net survey. However, Black Crappie have been observed in previous surveys at low abundance. White Crappie abundance has declined significantly since the 2014 survey.

Management Strategies: Inspect artificial habitat structures in 2026 and repair or refurbish if needed. Coordinate with the City of San Augustine to control or eradicate any invasive aquatic vegetation infestations that may occur.

Introduction

This document is a summary of fisheries data collected from San Augustine City Lake from 2022-2023. 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 2022-2023 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 visibility is typically 2 feet. Habitat at time of sampling consisted of rocks, some standing timber, and trace amounts of aquatic vegetation (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 and access is adequate (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 2019) included:

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

Action: An interview was conducted with the local newspaper promoting the potential of a sunfish fishery.

Harvest regulation history: Sport fishes in San Augustine City Lake 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. In 2021, statewide harvest regulations for Channel and Blue Catfish were changed to a no minimum length limit, 25-fish daily bag limit (no more than 10 fish 20 inches or larger may be retained).

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 stocked again in 2000. The complete stocking history can be found in Table 4.

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, 15 artificial fish structures were placed into the reservoir across four sites.

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. No known interbasin transfer is known to exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for San Augustine City Lake (Ashe and Driscoll 2019). Primary components of the OBS plan are listed in Table 5. In 2018 and 2022, 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 2022).

Electrofishing – Largemouth Bass, sunfishes, and Threadfin Shad were collected by daytime electrofishing (1.0 hour at 12, 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 statistics.

Habitat – A structural habitat survey was conducted in 2006. A vegetation survey was conducted in 2022. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

Results and Discussion

Habitat: Littoral zone habitat was poor and consisted of overhanging brush and trace amounts of emergent aquatic vegetation. Poor habitat conditions have persisted over the last 15 years. An aquatic vegetation survey was conducted in 2022 and only trace amounts of plants were observed (spikerush and American lotus). Several species of aquatic vegetation have been introduced but none have successfully established or survived. In 2017 artificial structures were deployed across four sites using a total of 15 structures. If funds become available in the future it is TPWD's intent to refresh the existing artificial structure sites and establish an additional two sites.

Prey species: Threadfin Shad were the primary prey species in the reservoir. In 2022, the electrofishing catch rate was high (4,324.0/h; Appendix A) when compared to 2018 (4.8/h). Redbreast Sunfish, Bluegill, and Redear Sunfish were present, but the combined catch rate of 142.0/h was relatively low compared to the prior survey (Figures 1, 2, and 3). Few sunfish were available as prey, as most fish observed were \geq 5 inches in length. Sunfish catch rates have varied significantly over the past three surveys (72.0/h in 2014; 244.0/h in 2018; and 142.0/h in 2022). Although the sunfish fishery has been promoted in the past, it is believed that with a catch rate of only 142.0 fish/h that this would not constitute a quality fishery at present.

Channel Catfish: The gill net catch rate of Channel Catfish was 4.0/nn in 2023, which was higher than 2019 (0.8/nn) but similar to 2015 (6.0/nn) (Figure 4). Channel Catfish abundance is variable but has remained consistently low over the past three surveys. In 2023, fish exhibited good body condition, as most W_r values were > 90 .

Largemouth Bass: Fall electrofishing catch rates of Largemouth Bass have increased considerably over the last three survey periods (39.0, 80.4, and 101.1/h in 2014, 2018, and 2022, respectively) (Figure 5). This increase in population abundance was unexpected given the consistent and relatively poor littoral habitat conditions. Low sample abundance in 2014 could be attributed to sampling at night in turbid water conditions, while the increase in abundance observed beginning in 2018 could be due to improved sampling conditions in the daytime. However, few fish > 14 inches were observed. Body condition from the past three surveys was moderate (average $W_r > 80$) for most stock-size fish. This fishery is marginal compared to other East Texas reservoirs within the district. Although there is currently a dearth of aquatic vegetation that could account for some of the quality issues it should be noted that when there was excessive vegetation in the early 2000's that quality did not improve under that scenario either.

Crappies: In 2014, the trap net catch rate for White Crappie was relatively high (24.6/nn) (Figure 6). Since then, the population has declined. Catch rates were relatively low in 2018 (4.2/nn) and 2022 (3.9/nn). Body condition has also steadily declined over the past three surveys (average W_r values were 85.5, 76.6, and 72.5 in 2014, 2018, and 2022, respectively). Size structure was desirable, with the majority of fish ≥ 10 inches in length. Black Crappie were last observed in 2014, with only two fish sampled. The decline in the crappie fishery has been somewhat surprising given the abundance of threadfin shad. Given the size of the reservoir (200 acres) there may be interspecific competition with the increasing Largemouth Bass population.

Fisheries Management Plan for San Augustine City Lake, Texas

Prepared – July 2023

ISSUE 1: Habitat is limited with only trace amounts of aquatic vegetation present. In 2017, 15 artificial fish attractors were placed into the reservoir across four sites to improve angler catch rates.

MANAGEMENT STRATEGY

1. In 2026, examine condition and arrangement of artificial fish attractors via side-scan sonar and refurbish if needed.
2. When funding is available, construct two additional artificial fish attractor sites (4 structures per site).

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 (2023–2027)

Sport fish, forage fish, and other important fishes

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

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. From 1999 to 2014, trend data on CPUE, size structure, and body condition were collected every four years with nighttime, fall electrofishing. Population abundance has varied but size structure has been consistent. Beginning in 2018, daytime fall electrofishing was conducted due to the shallow and turbid nature of the reservoir. Continuation of daytime fall electrofishing in 2026 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 effectively sample 12 stations so effort will remain at this level for the 2026 survey.

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 2027.

Crappies: From 1998 through 2022, trap netting has been conducted every four years, and catch rates have averaged 9.5/n. A maximum of 10 randomly selected trap netting sites will be sampled in 2022 to achieve desired sampling objectives ($N = 50$ stock-size crappie; $RSE-S \leq 25$). No additional sites will be selected if objectives are not met.

Prey species: Threadfin Shad and sunfishes are the primary forage at San Augustine City Lake. 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

- 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. 2019. 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-221-M-3, Austin.
- 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 Lake, 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 2. Boat ramp characteristics for San Augustine City Lake, Texas, August 2022. 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 3. Harvest regulations for San Augustine City Lake, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (only 10 \geq 20 inches)	None
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 4. Stocking history of San Augustine City Lake, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adult.

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 ^a	2006	4,592	FGL
Threadfin Shad	1979	1,200	ADL
	2000	5,600	ADL
	Total	6,800	
Triploid Grass Carp	2002	320	AFGL
	2003	280	AFGL
	Total	600	

^a ShareLunker Largemouth Bass are 1st generation offspring from angler-donated Largemouth Bass \geq 13 pounds from the Toyota ShareLunker program.

Table 5. Objective-based sampling plan components for San Augustine City Lake, Texas, 2022-2023.

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

Redbreast Sunfish

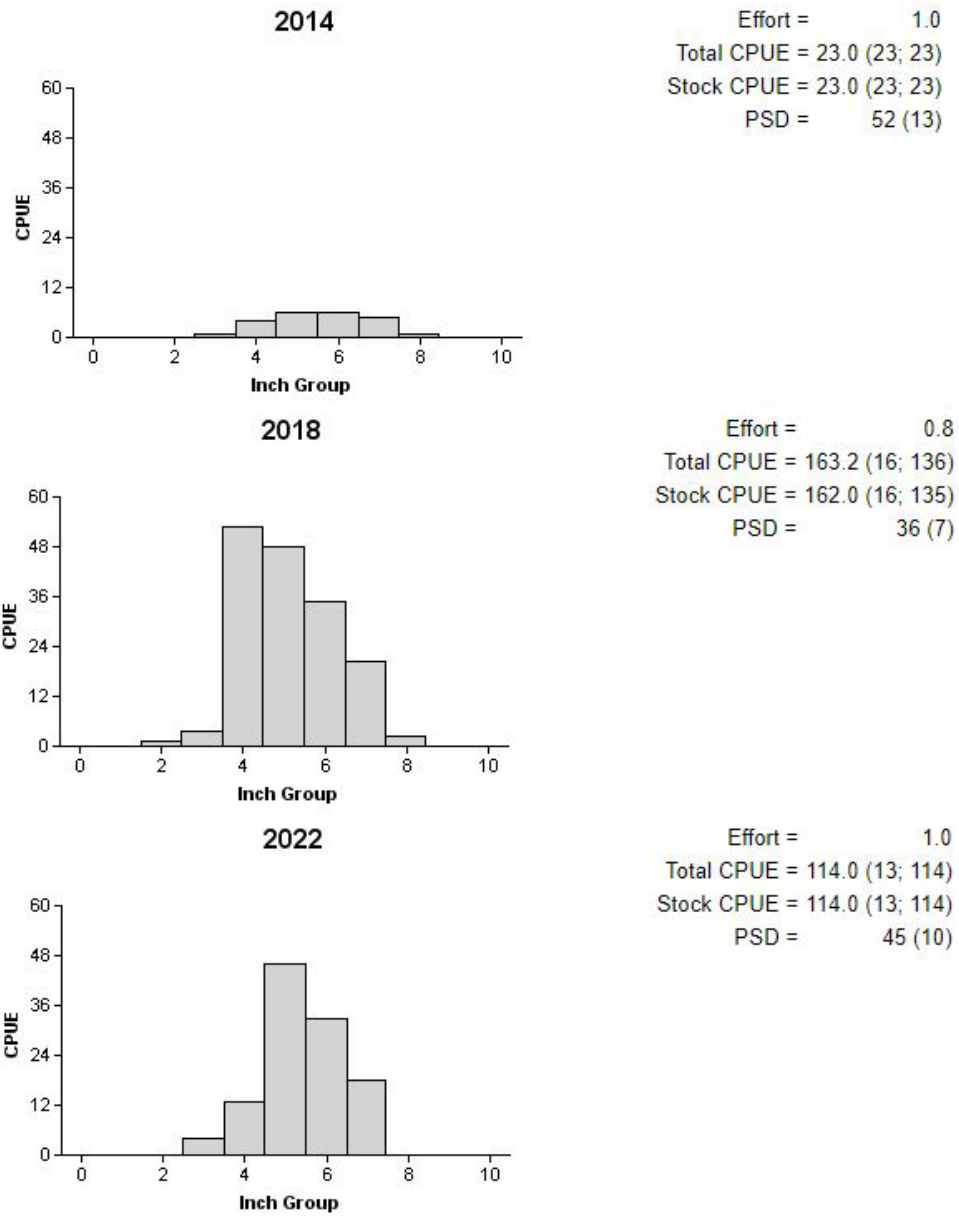


Figure 1. Number of Redbreast Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 2014 (daytime), 2018 (nighttime), and 2022 (nighttime).

Bluegill

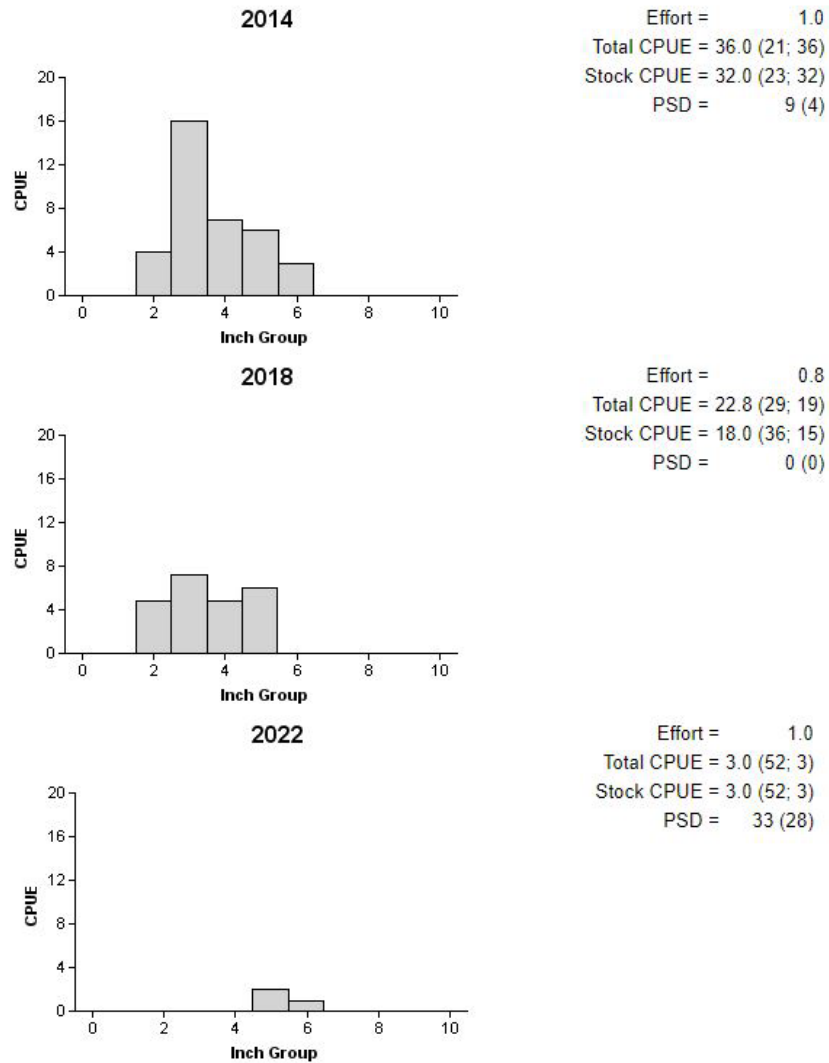


Figure 2. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 2014 (daytime), 2018 (nighttime), and 2022 (nighttime).

Redear Sunfish

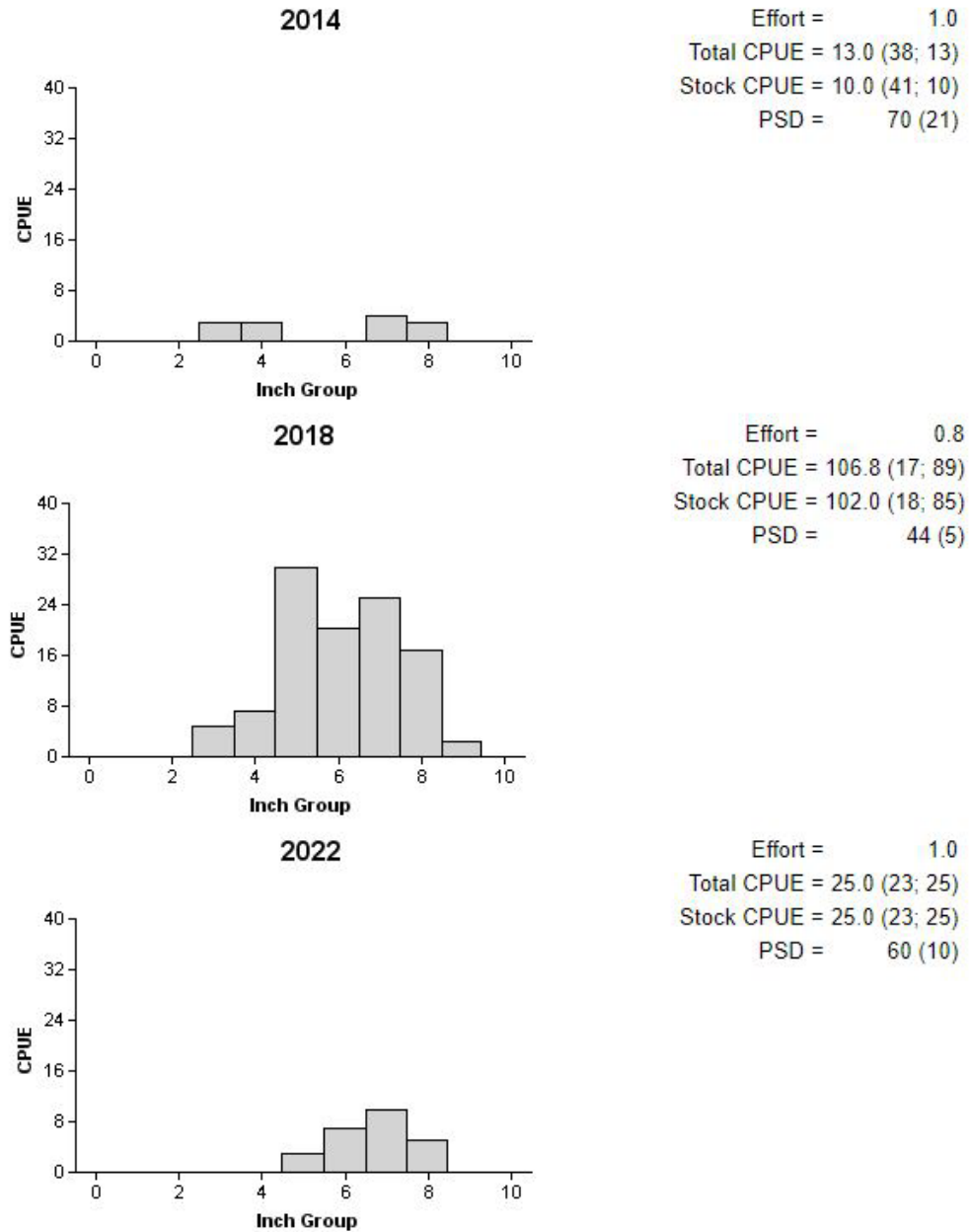


Figure 3. Number of Redear Sunfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 2014 (daytime), 2018 (nighttime), and 2022 (nighttime).

Channel Catfish

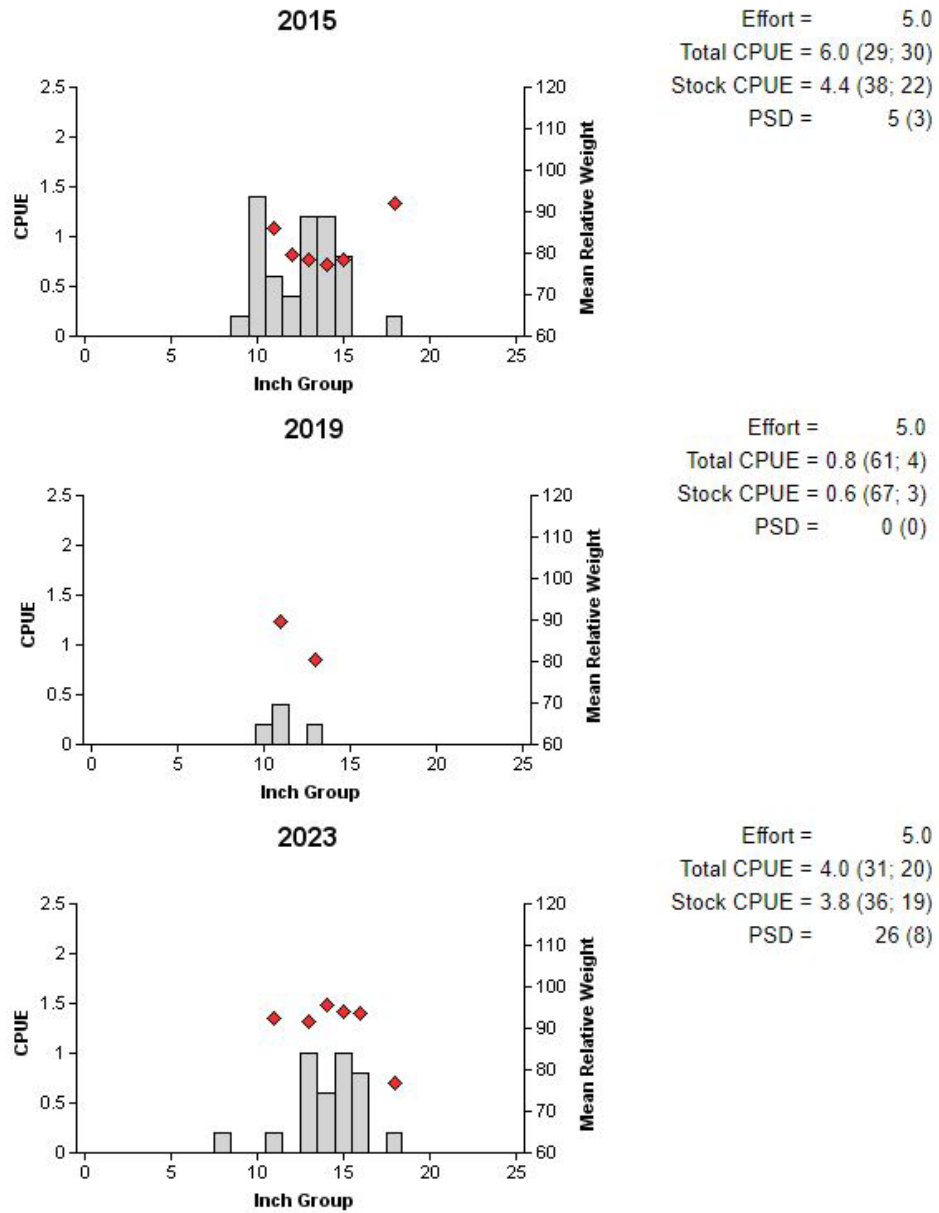


Figure 4. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, San Augustine City Lake, Texas, 2015, 2019, and 2023.

Largemouth Bass

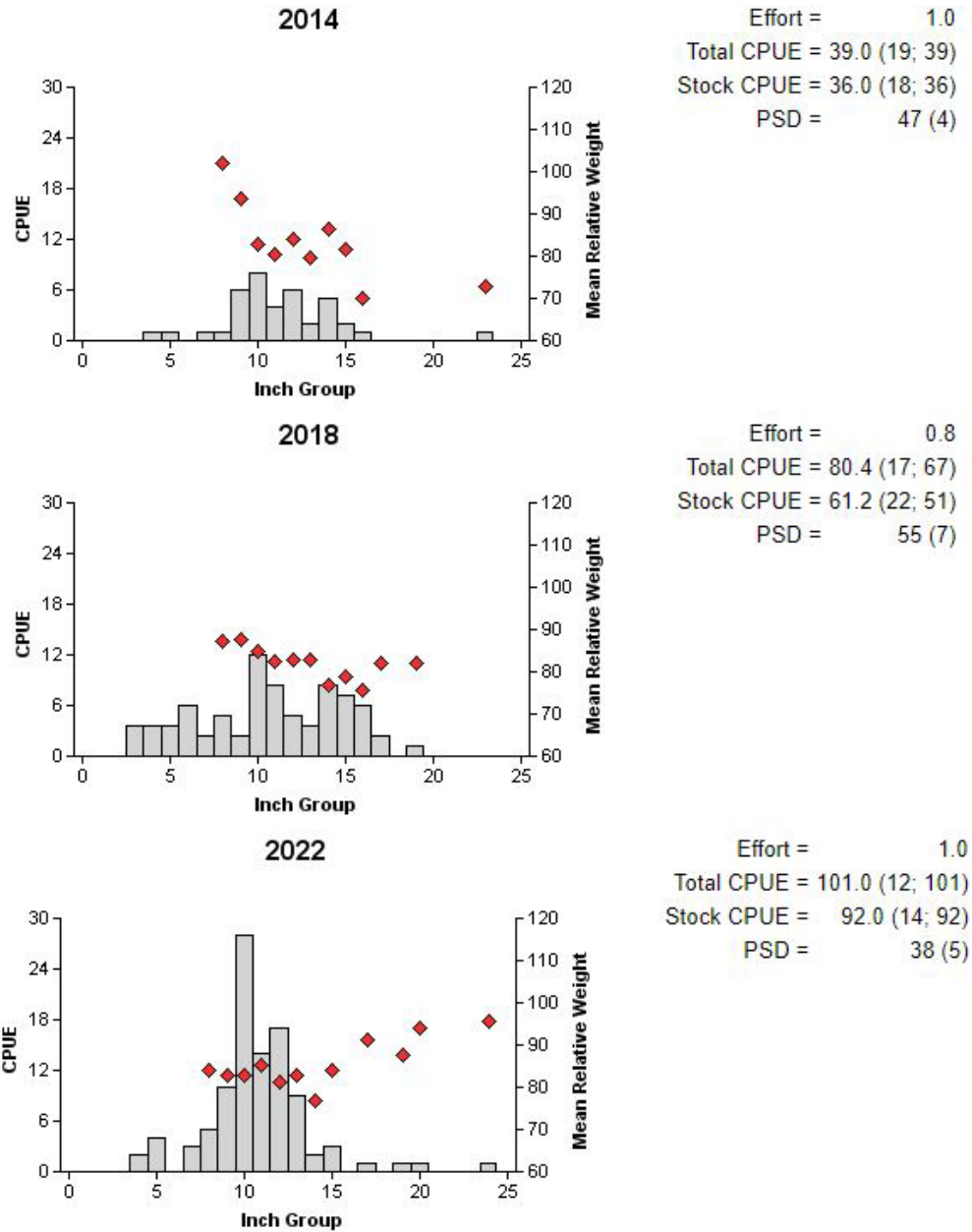


Figure 5. Number of Largemouth Bass caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, San Augustine City Lake, Texas, 2014 (daytime), 2018 (nighttime), and 2022 (nighttime).

White Crappie

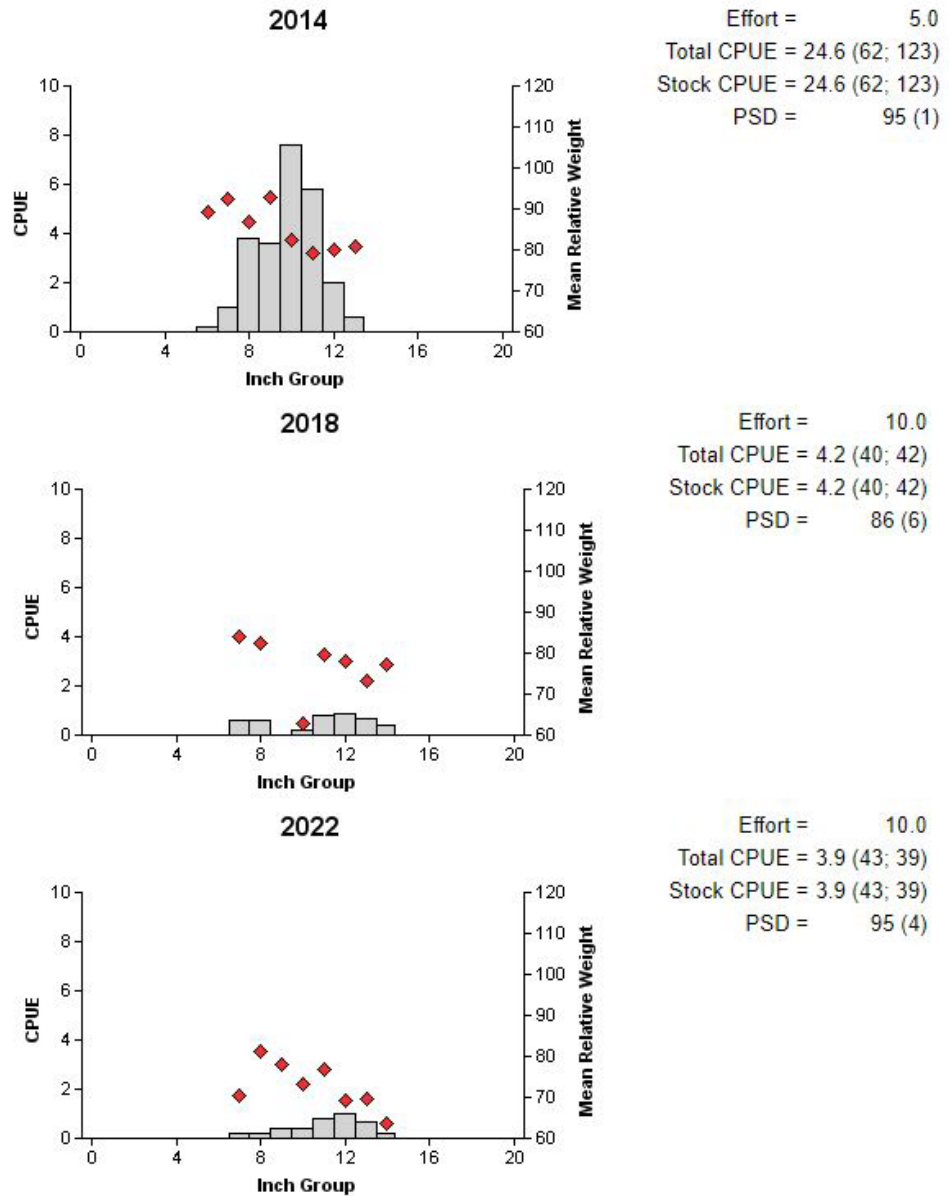


Figure 6. Number of White Crappie caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, San Augustine City Lake, Texas, 2014, 2018, and 2022.

Proposed Sampling Schedule

Table 1. 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.

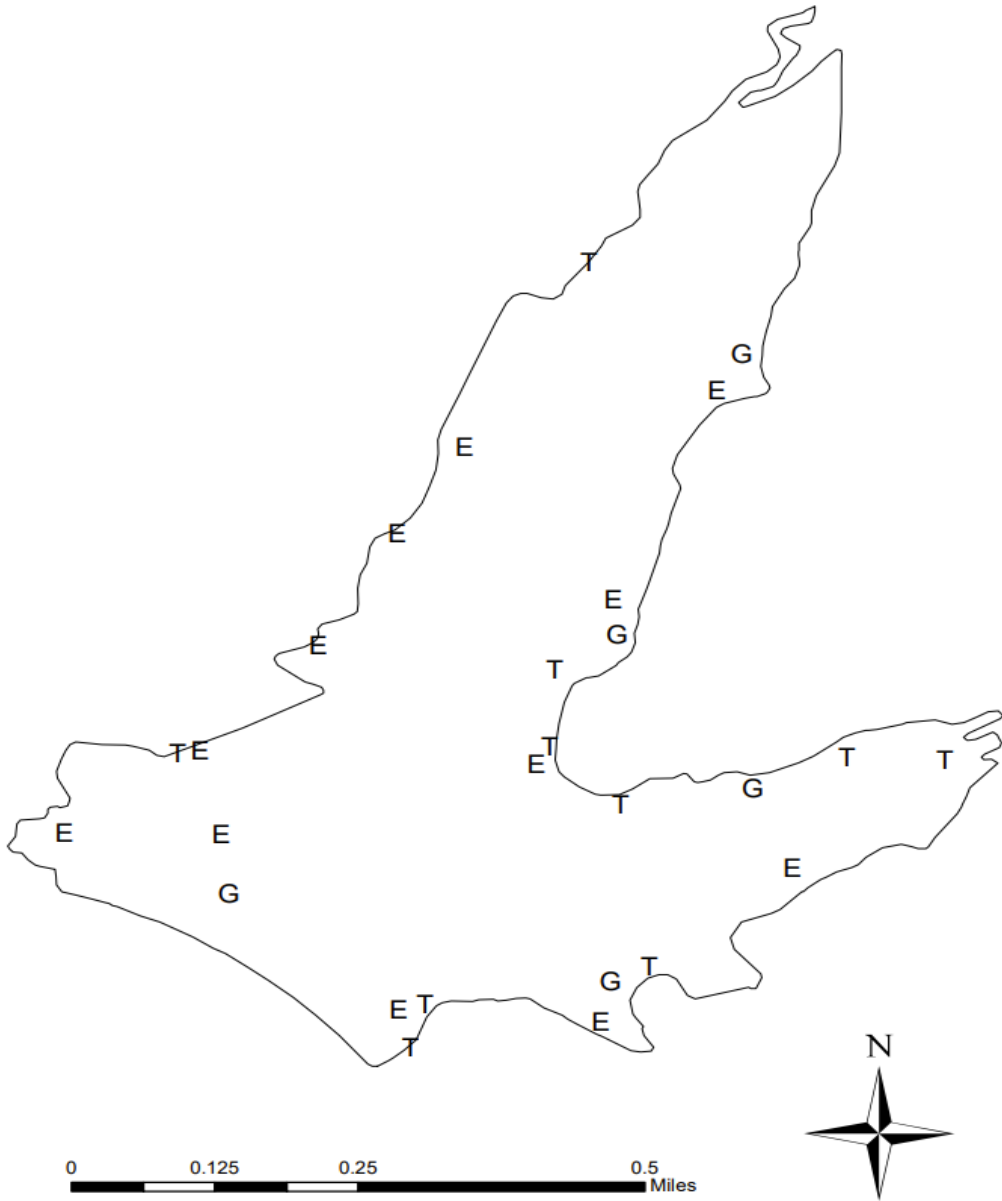
	Survey year			
	2023-2024	2024-2025	2025-2026	2026-2027
Angler Access				X
Vegetation				X
Structural habitat survey				X
Electrofishing – Fall				X
Trap netting				X
Gill netting				X
Report				X

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from San Augustine City Lake, Texas, 2022-2023. Sampling effort was 5 net nights for gill netting, 10 net nights for trap netting, and 1 hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Spotted Sucker	7	1.4 (43)	1	0.1 (100)		
Threadfin Shad					4,324	4,324.0 (28)
Blue Catfish	1	0.2 (100)				
Channel Catfish	20	4.0 (31)				
Redbreast Sunfish					114	114.0 (13)
Green Sunfish					5	5.0 (46)
Warmouth			3	0.3 (71)		
Bluegill	3	0.6 (100)	7	0.7 (43)	3	3.0 (52)
Redear Sunfish			3	0.3 (100)	25	25.0 (23)
Largemouth Bass	8	1.6 (32)	1	0.1 (100)	101	101.0 (12)
White Crappie	11	2.2 (30)	39	3.9 (43)		

APPENDIX B – Map of sampling locations



Location of sampling sites, San Augustine City Lake, Texas, 2022-2023. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was near full pool at time of sampling.



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