

Lone Star 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 Lone Star Lake were surveyed in 2022 using electrofishing. Historical data are presented with the 2022 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: Lone Star Lake is a 1,516-acre impoundment located on Ellison Creek in the Cypress River Basin in Morris County. Structural habitat is sparse, but is comprised of brush, riprap, creek channels, and boat docks. Hydrilla was discovered in the reservoir in 2006 and has needed occasional herbicide treatment by homeowner groups. A fish consumption advisory was issued due to PCB contamination in 2005 and remains in effect.

Management History: Important sport fish include Largemouth Bass. White Bass, White Crappie, Black Crappie, and Channel Catfish are present in this reservoir, but have low historical abundance and limited directed angling effort. All sport fish have historically been managed with statewide harvest regulations. Florida Largemouth Bass have been stocked in this reservoir to improve the quality of the Largemouth Bass fishery. Palmetto Bass stocking was discontinued in 2005 due to the fish consumption advisory. Hydrilla was discovered in the reservoir in 2006 and herbicide treatments were conducted in 2006 and 2007. Environmental conditions caused a reduction in native vegetation in 2010, but vegetation coverage returned to previous levels in subsequent years. Hydrilla was treated with herbicide in 2016 and 2022 by homeowners whose reservoir access was impeded by heavy growth. Giant salvinia was discovered in 2020 and has been managed by Texas Parks and Wildlife's Aquatic Habitat Enhancement team.

Fish Community

- **Prey species:** Gizzard Shad, Threadfin Shad, and several species of sunfish were present, indicating good forage diversity. Bluegill were the most abundant sunfish species. Redear Sunfish catch rates have declined since previous surveys. The sunfish population generally displayed a small size structure with few large (>8 inches) sunfish for anglers but abundant smaller fish for predators.
- **Largemouth Bass:** Largemouth Bass were abundant with many fish over 14 inches observed. Largemouth Bass growth has been consistently fast in recent surveys, with good body condition indicating an excellent forage base. Many Largemouth Bass under 10 inches were observed during the 2022 survey, which should result in an increased number of larger fish in the population over the next several years. Spotted Bass were present but comprised a small part of the black bass community.

Management Strategies: Conduct electrofishing surveys in fall 2024 and 2026 to monitor the Largemouth Bass and prey populations. Annual vegetation surveys will be conducted to monitor hydrilla, alligatorweed, giant salvinia and any other invasive species.

Introduction

This document is a summary of fisheries data collected from Lone Star Lake in 2022. 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 data for comparison.

Reservoir Description

Lone Star Lake is a 1,516-acre impoundment constructed in 1943 on Ellison Creek in the Cypress River Basin. It is in the city of Lone Star, in Morris County. The controlling authority is U. S. Steel Tubular Products, Inc. Primary water uses are industrial water supply and public recreation. It has a watershed of approximately 37 square miles, a shoreline length of 18.6 miles, and a shoreline development index of 2.6. The lake water level was briefly lowered approximately 4 feet from conservation pool in 2019 for dam repairs. Annual water level fluctuation is typically around 1-2 ft (Figure 1). Water elevation data is not available after October of 2020. Structural habitat is sparse but is comprised of inundated timber, brush, riprap, creek channels, and boat docks. Hydrilla coverage has increased since 2014. A fish consumption advisory has been in effect since 2005 due to PCB contamination. Other descriptive characteristics for Lone Star Lake are recorded in Table 1.

Angler Access

Lone Star Lake has two public boat ramps. Shoreline access for bank fishing is limited to the public boat ramp areas. Additional boat ramp characteristics are recorded in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Bister and Stadig 2019) included:

1. Continue to manage and monitor the Largemouth Bass population with additional electrofishing, and Florida Largemouth Bass stocking.

Action: Electrofishing was conducted in 2020 and 2022. Florida Largemouth Bass were stocked in 2020.
2. Conduct annual aquatic vegetation surveys and recommend treatment if necessary.

Action: Aquatic invasive vegetation has been monitored annually. Technical guidance has been provided to homeowners regarding herbicide treatment of hydrilla. Alligatorweed flea beetles were released during spring 2022. Giant salvinia has been managed by Texas Parks and Wildlife's Aquatic Habitat Enhancement team.
3. Maintain signage related to fish consumption advisory.

Action: Signs related to the PCB fish consumption advisory have been maintained and concerned citizens have been referred to the Texas Department of State Health Services (TDSHS).
4. Inform public about invasive aquatic species.

Action: A public meeting was held with lake residents to discuss invasive aquatic plants; especially water hyacinth.

Harvest regulation history: Fish populations in Lone State Lake have been managed under statewide harvest regulations. The statewide harvest regulation for Channel Catfish and Blue Catfish was changed from a 12-inch minimum length limit and combined daily bag limit of 25 fish in 2021 to no minimum length

limit with 25 fish daily bag limit (in any combination), of which no more than 10 fish can be over 20 inches in length. Current regulations are found in Table 3.

Stocking history: Lone Star Lake was previously stocked with Palmetto Bass; however, it was discontinued following the fish consumption advisory from TSDHS in 2005. Florida Largemouth Bass stocking has been conducted to establish and maintain a quality fishery. The complete stocking history is recorded in Table 4.

Vegetation/habitat management history: Hydrilla was discovered in the reservoir in 2006, and herbicide treatments were conducted in 2006 and 2007 by the controlling authority. Lakefront property owners hired a contractor to conduct herbicide treatment of hydrilla in 2016. In 2014 and 2022, Alligatorweed flea beetles were obtained from U. S. Army Corps of Engineers in Florida and released in the upper end of the reservoir to provide biological control of plants during the growing season.

Water transfer: No interbasin transfers are known to exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lone Star Lake (TPWD unpublished). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

Electrofishing – Largemouth Bass, Spotted Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1 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. Ages for Largemouth Bass were determined using otoliths from 14 randomly-selected fish (range 13.0 to 13.9 inches).

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). Index of Vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 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.

Habitat – A structural habitat survey was conducted in 2010. Annual vegetation surveys were conducted in 2019–2022 to monitor invasive species, and native aquatic plant abundance was assessed in 2022. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

Water level – Source for water level data was from U. S. Steel Tubular Products, Inc.

Results and Discussion

Habitat: A structural habitat survey was last conducted in 2010 (Bister 2011). Littoral zone structural habitat consisted primarily of natural shoreline (Table 6). There haven't been any perceived changes to structural habitat since the last survey. Hydrilla (374.8 acres) and native floating-leaved vegetation (101.8 acres) were the most abundant vegetation (Table 7). Hydrilla coverage has expanded since 2018, which accounted for 27% of reservoir acreage. This coverage was beneficial to support the quality Largemouth Bass fishery. Homeowners using private contractors treated approximately 17.5 acres of hydrilla in 2022. TPWD currently treats hydrilla around the two public boat ramps and public swimming area when access is restricted. Alligatorweed continues to persist in the upper end of the reservoir (Table 7). Giant Salvinia

was discovered in October 2020 and accounted for approximately 8 acres in 2022. Herbicide treatment of giant salvinia has been conducted by TPWD AHE to maintain plant coverage at a manageable level and to minimize its spread throughout the reservoir. Herbicide treatments that targeted hydrilla have also been conducted by AHE to open boater access at public boat ramps. Water hyacinth was found and temporarily eradicated in 2016 and 2017. Approximately 3 acres of water hyacinth was treated with herbicide in 2021 and no water hyacinth was documented in the 2022 survey.

Prey species: Gizzard Shad, Threadfin Shad, and several species of sunfish were present, indicating good forage diversity. Index of Vulnerability (IOV) for Gizzard Shad was low, with 30% of fish being available to predators. Gizzard Shad catch rate was higher in 2022 (165.0/h) than 2018 (76.0/h) and 2020 (52.0/h) (Figure 2). Redbreast Sunfish catch rate in 2022 (14.0/h) was lower than 2018 (64.0/h) and 2020 (43.0/h) (Figure 3). Bluegill catch rate was 367.0/h in 2022, which was lower than 2018 (428.0/h) and 2020 (400.0/h) (Figure 4). Redear Sunfish catch rate was similar in 2022 (31.0/h) and 2018 (39.0/h) (Figure 5). Additional sunfish species are listed in Appendix A. The sunfish population generally displayed a small size structure with few large (> 8 inches) sunfish for anglers but abundant smaller fish for predators. Steadily declining catch rates of sunfish over the past surveys was likely due to a decrease in capture efficiency from increasing hydrilla coverage.

Black Basses: Spotted Bass were present but comprised a small part of the black bass community. The electrofishing catch rate of stock-length (≥ 8 inches) Largemouth Bass was 190.0/h in 2022, which was higher than 95.0/h in 2020 and 127.0/h in 2018 (Figure 6). The catch rate of legal-sized individuals (CPUE-14) increased from 31.0/h in 2018 and 43.0/h in 2020 to 52.0/h in 2022, indicating a healthy and progressively improving size structure of Largemouth Bass (Figure 6). Largemouth Bass growth has been fast. In 2022, mean age at 14 inches (13.0 – 14.5 inches) was 2.3 years (N = 14; range = 1 – 5 years), similar to 2.2 years in 2020 (13.0 – 14.6 inches; N = 14; range 1 – 3 years) and 2.1 years in 2018 (13.0 – 14.8 inches; N = 13, range 1 – 4 years). Body condition was satisfactory, and similar to past surveys, with most inch groups having a mean $W_r > 90$. This indicated adequate prey availability for Largemouth Bass.

Fisheries Management Plan for Lone Star Lake, Texas

Prepared – July 2023

ISSUE 1: The Largemouth Bass population in Lone Star Lake consists of quality-sized fish and has the ability to produce larger fish. Previous creel and electrofishing surveys have documented fish greater than 20 inches in the reservoir. The current lake record is 11.45 pounds set in 2017. Continued introduction of Florida Largemouth Bass genetics is necessary to maintain the quality of this fishery by enhancing growth potential.

MANAGEMENT STRATEGY

1. Stock Lone Star Bass fingerlings, which are 2nd generation offspring of pure Florida strain ShareLunker Largemouth Bass that have proven to be able to grow to ≥ 13 pounds, at a rate of 1,000/km shoreline every other year.
2. Conduct electrofishing surveys in 2024 and 2026 to monitor Largemouth Bass and prey fish populations.

ISSUE 2: Hydrilla had expanded to over 350 acres in Lone Star Lake in recent years. Hydrilla was and has been treated with herbicides by homeowners in 2016 and 2022. Hydrilla should be monitored to identify potential access problems in the future. Alligatorweed is present and has been managed with alligatorweed flea beetles. Water hyacinth was discovered during the survey period but was eliminated with manual removal and herbicide treatment. Giant Salvinia is present and has been managed by Texas Parks and Wildlife Department through herbicide treatment. Annual surveys are necessary to monitor the invasive aquatic vegetation.

MANAGEMENT STRATEGIES

1. Conduct annual invasive aquatic plant surveys to monitor abundance and provide technical guidance to the controlling authority and shoreline property owners.
2. Continue to coordinate with TPWD's Aquatic Habitat Enhancement team to treat water hyacinth and giant salvinia with herbicide treatments to discourage further expansion.

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 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 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 Lone Star Lake include Largemouth Bass, Channel Catfish, White Crappie, and Black Crappie. Known important forage species include Redbreast Sunfish, Bluegill, Redear Sunfish, Gizzard Shad, and Threadfin Shad.

Low-Density or Underutilized Fisheries:

White Bass are present in this reservoir, but abundance is low due to lack of suitable spawning habitat. White and Black Crappie have been present in the past; however, few fish have been collected during trap netting surveys. Only two crappies were collected during the 2006 survey, and no crappie were collected during the 2010 survey. Spotted Bass are present but have been low in abundance in previous surveys. Channel Catfish are present and have historically had moderate abundance. However, during the spring 2016 creel survey, directed effort toward catfish accounted for less than 1% of the total effort.

Survey objectives, fisheries metrics, and sampling objectives:

Black Bass: The last creel survey on Lone Star Lake (March 2016 through May 2016) estimated 91% of directed angling effort was for black bass. Largemouth Bass are managed with a 14-inch minimum length limit. Trend data on relative abundance and size structure have been collected biennially during fall nighttime electrofishing with 1 hour of effort at 12, 5-minute stations. Continuation of biennial trend data in this reservoir with fall nighttime electrofishing will allow for determination of any large-scale changes in the Largemouth Bass population that may spur further investigation.

Survey objectives for Largemouth Bass will include size structure (PSD and length frequency), relative abundance (CPUE-total and CPUE-stock), condition (mean W_r using lengths and weights from up to 10 fish per inch group). Largemouth Bass growth (mean age at 14 inches using a sample size of 13 fish between 13.0 and 14.9 inches) will also be evaluated.

A minimum of 12 randomly selected 5-min electrofishing sites will be sampled in 2024 and 2026. Past sampling has achieved an RSE of CPUE-stock <25 with 12 randomly selected stations, so we are confident we will achieve this level of precision with the minimum sampling effort. However, an additional three random stations will be determined in the event extra sampling is necessary to meet sampling objectives ($N \geq 50$ stock, $RSE\text{-Stock} \leq 25$). A maximum of 15 stations will be sampled.

Prey Species: Trend data on relative abundance and size structure of sunfish, Gizzard Shad and Threadfin Shad have been collected biennially. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in sunfish and shad relative abundance and size structure. No additional effort will be expended beyond the effort necessary to achieve Largemouth Bass objectives. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density. Relative weight of Largemouth Bass ≥ 8 inches total length will be determined from their length/weight data with maximum of 10 fish per inch class.

Habitat: Hydrilla and giant salvinia are present and annual surveys are required to monitor their coverage as well as the presence of any other invasive species. Annual invasive aquatic vegetation surveys will be conducted to monitor coverage of hydrilla or other invasive species. A survey of native aquatic vegetation and structural shoreline habitat will be conducted in 2026.

Literature Cited

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Tables and Figures

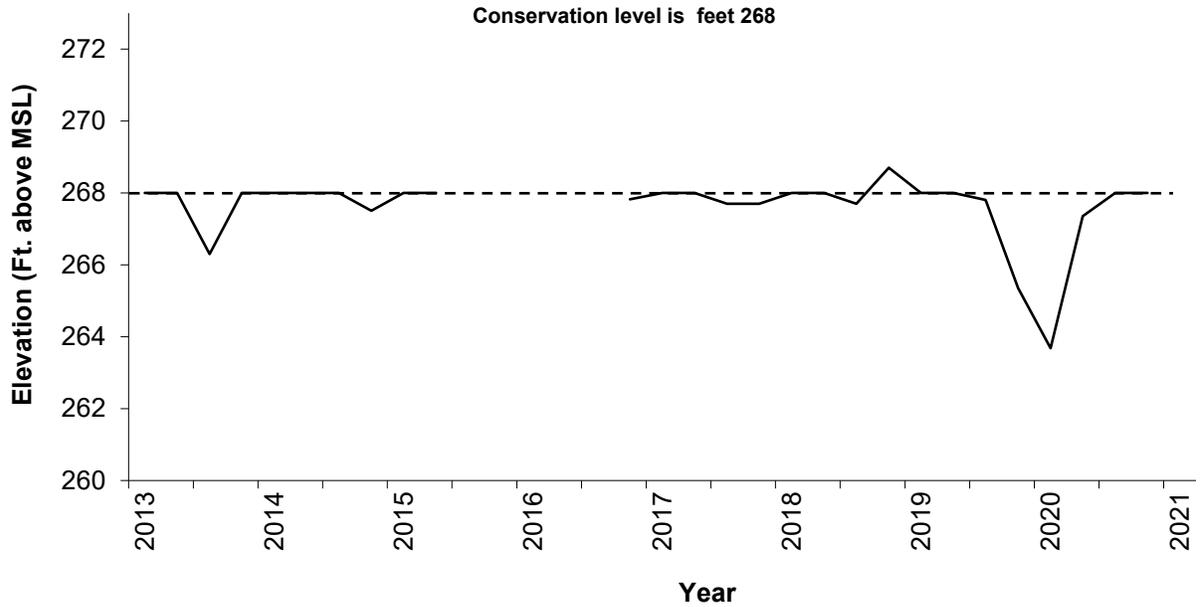


Figure 1. Water level elevations in feet above mean sea level (MSL) recorded for Lone Star Lake, Texas. Average monthly level was calculated from Monday elevation readings. Water level above conservation pool elevation (268 feet) was recorded as 268 feet. Water level data source was U.S. Steel Tubular Products, Inc. Data unavailable after April 2019.

Table 1. Characteristics of Lone Star Lake, Texas.

Characteristic	Description
Year constructed	1943
Controlling authority	U.S. Steel Tubular Products, Inc.
County	Morris
Reservoir type	Tributary
Shoreline Development Index (SDI)	2.6
Conductivity	113 $\mu\text{S/cm}$

Table 2. Boat ramp characteristics for Lone Star Lake, Texas, August 2022. Reservoir elevation at time of survey was 267 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Lone Star City Park	32.94678 -94.71485	Y	10	263	Excellent, no access issues
FM 997 County Ramp	32.96302 -94.72221	Y	10	263	Excellent, no access issues

Table 3. Harvest regulations for Lone Star 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, White	25	10-inch minimum
Bass, Largemouth	5 ^a	14-inch minimum
Bass: Spotted and Guadalupe	5 ^a	None
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

^a Daily bag for Largemouth Bass and Spotted Bass = 5 fish in any combination.

Table 4. Stocking history of Lone Star Lake, Texas. FGL = fingerling; FRY = fry; UNK = unknown.

Species	Year	Number	Size
Palmetto Bass	1983	16,500	UNK
	1997	15,253	FGL
	1999	7,636	FGL
	2002	15,264	FGL
	2004	14,300	FGL
	2005	14,328	FGL
	Total	83,281	
Florida Largemouth Bass	1990	153,238	FRY
	1995	75,013	FGL
	2008	151,608	FGL
	2009	152,108	FGL
	2015	155,063	FGL
	2018	163,430	FGL
	2020	31,503	FGL
	Total	881,963	

Table 5. Objective-based sampling plan components for Lone Star Lake, Texas 2022–2023.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age-and-growth	Age at 14 inches	$N = 13, 13.0 - 14.9$ inches
	Condition	W_r	10 fish/inch group (max)
Bluegill	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
	Prey availability	IOV	

Table 6. Survey of structural habitat types, Lake Lone Star, Texas, 2010 (Bister 2011). Shoreline habitat type units are in miles.

Habitat type	Estimate	% of total
Bulkhead	2.6 miles	14.0
Natural	11.2 miles	60.2
Natural with boat docks	2.8 miles	15.1
Rocky	1.5 miles	8.1
Rocky with boat docks	0.5 miles	2.7

Table 7. Survey of aquatic vegetation, Lone Star Lake, Texas, 2018–2022. Surface area (acres) is listed with percent of total reservoir surface area in parentheses. Native vegetation was not surveyed 2019–2021.

Vegetation	2018	2019	2020	2021	2022
Native submersed	133 (8.8)				54.4 (3.6)
Native floating-leaved	63 (4.2)				101.8 (6.7)
Native emergent	2 (0.1)				39.1 (2.6)
Non-native					
Giant Salvinia (Tier 1)				< 1 (0.1)	7.9 (0.5)
Alligatorweed (Tier II)	6 (0.4)	1 (< 0.1)	2 (0.1)	8 (0.5)	5.5 (0.3)
Hydrilla (Tier II)	158 (10.4)	22 (1.5)		21 (1.4)	374.8 (24.7)

*Tier I is immediate response, Tier II is maintenance status, and Tier III is watch status

Gizzard Shad

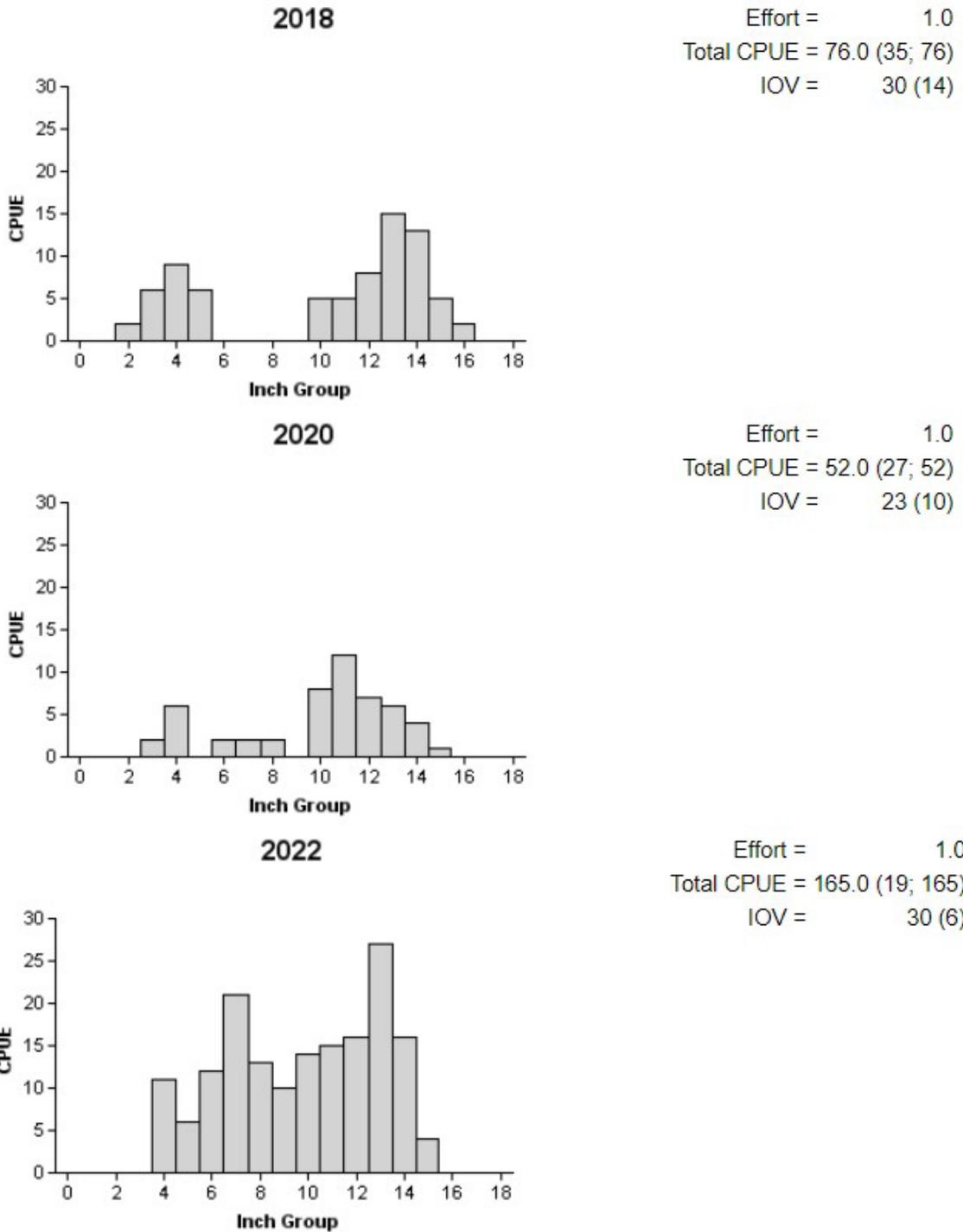


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lone Star Lake, Texas, 2018, 2020, and 2022.

Redbreast Sunfish

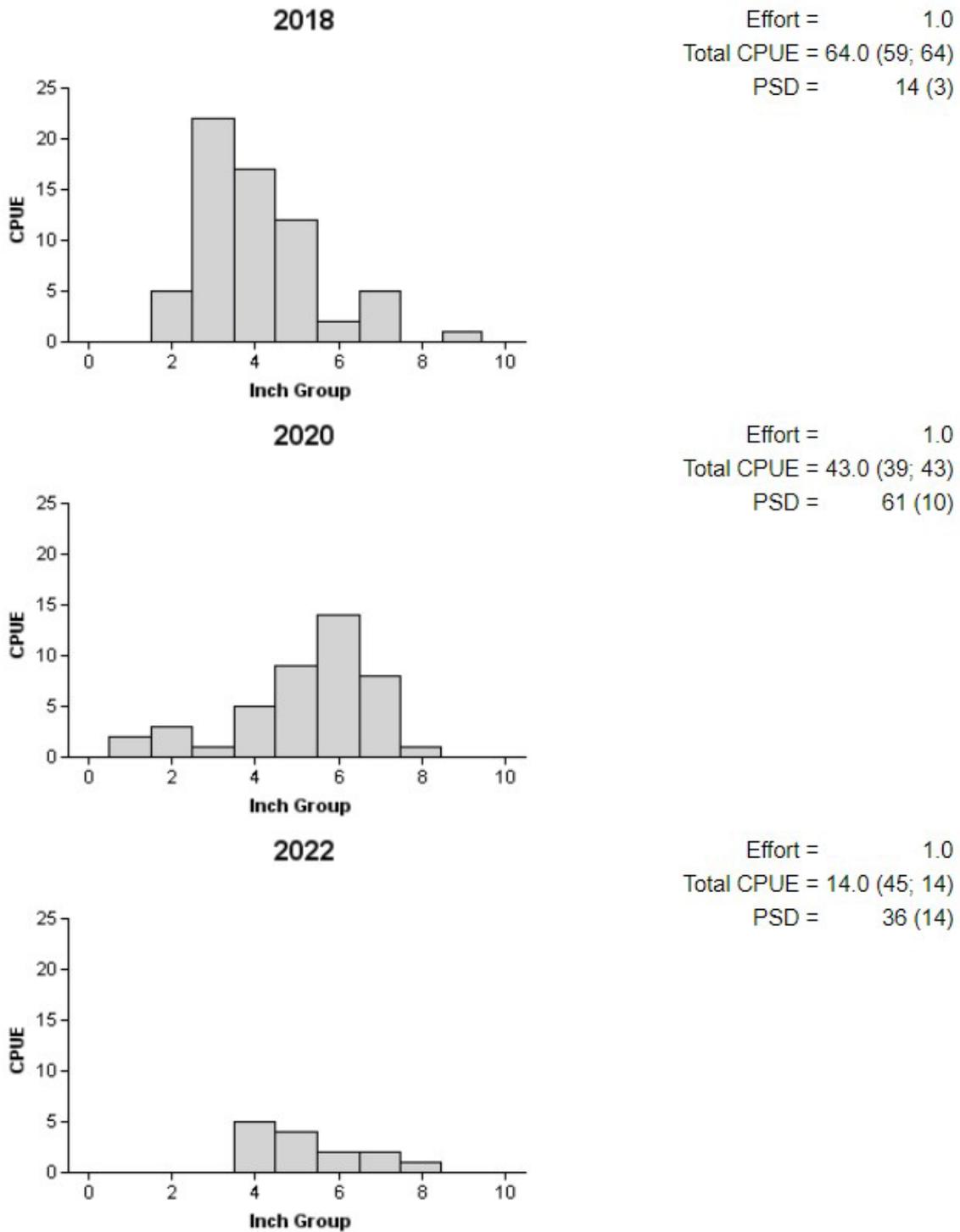


Figure 3. Number of Redbreast Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lone Star Lake, Texas, 2018, 2020, and 2022.

Bluegill

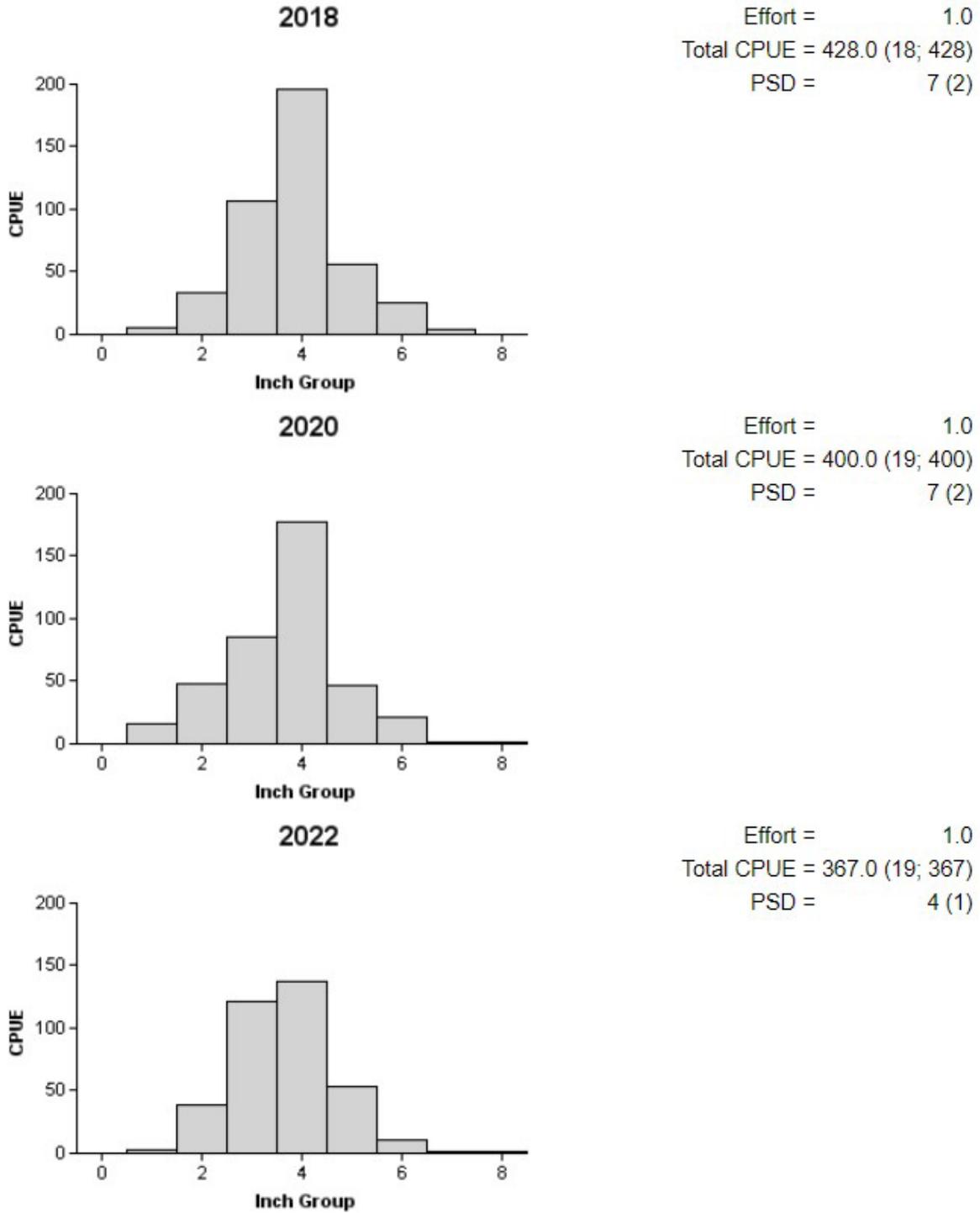


Figure 4. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lone Star Lake, Texas, 2018, 2020, and 2022.

Redear Sunfish

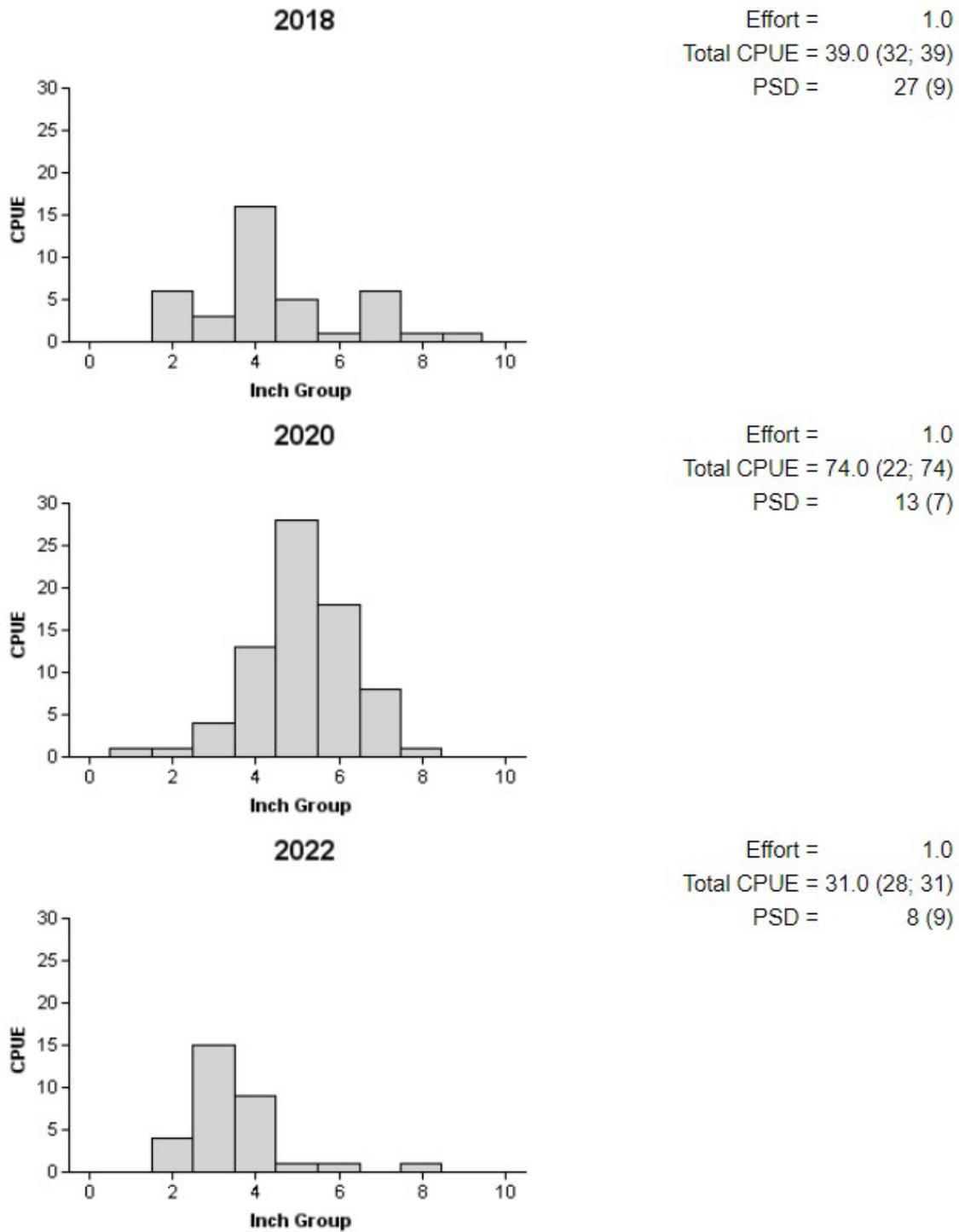


Figure 5. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lone Star Lake, Texas, 2018, 2020, and 2022.

Largemouth Bass

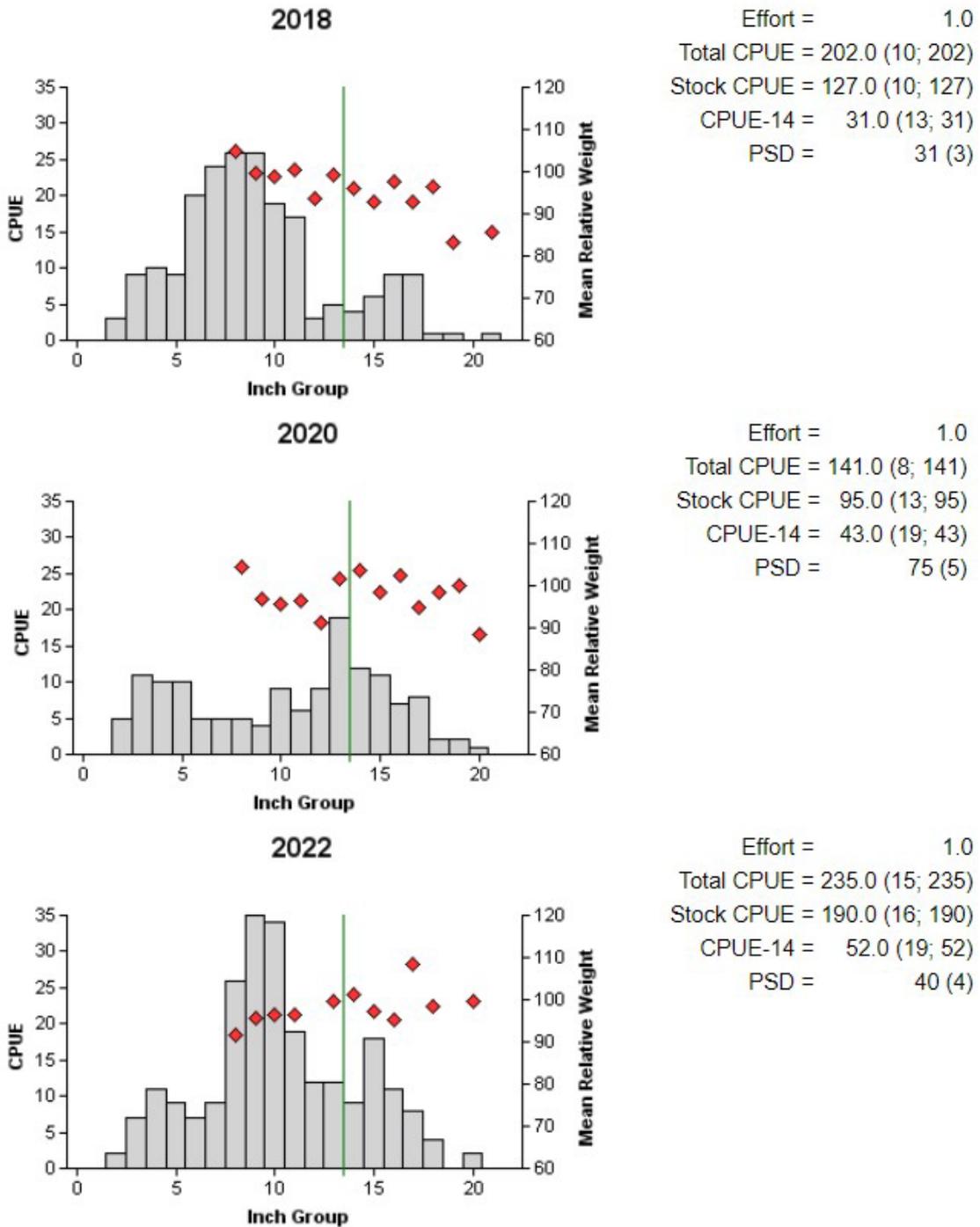


Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lone Star Lake, Texas, 2018, 2020, and 2022. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 8. Proposed sampling schedule for Lone Star Lake, Texas. Survey period is June through May. Electrofishing surveys are conducted in the fall.

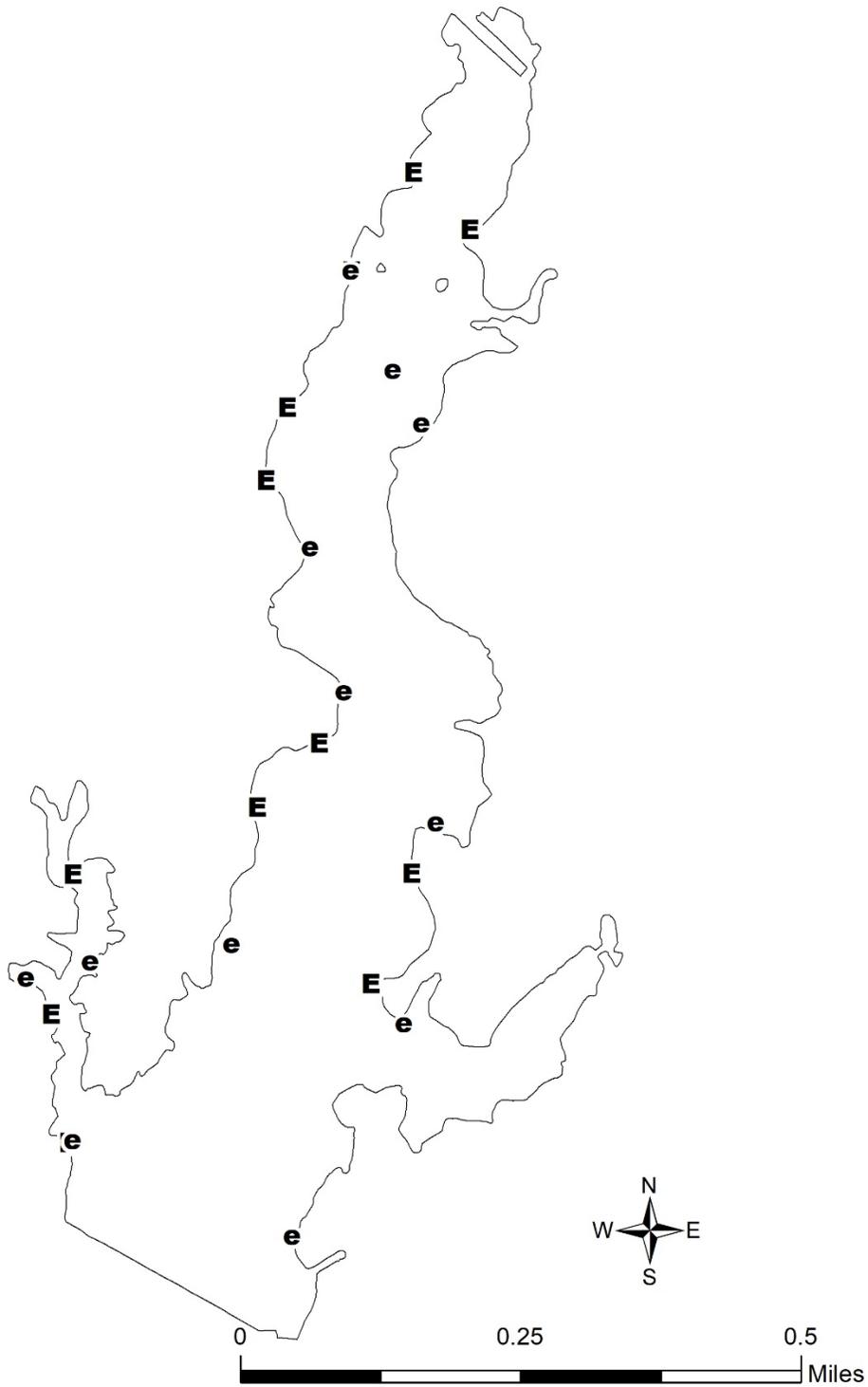
	Survey year			
	2023-2024	2024-2025	2025-2026	2026-2027
Angler Access				X
Structural Habitat				X
Vegetation	X	X	X	X
Electrofishing – Fall		X		X
Report				X

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 Lone Star Lake, Texas, 2018-2022. Sampling effort was 1 hour for electrofishing each year.

Species	Electrofishing					
	2018		2020		2022	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad	76	76.0 (35)	52	52.0 (27)	165	165.0 (19)
Threadfin Shad	125	125.0 (25)	60	60.0 (37)	163	163.0 (50)
Redbreast Sunfish	64	64.0 (59)	43	43.0 (39)	14	14.0 (45)
Warmouth	7	7.0 (33)	7	7.0 (39)	3	3.0 (72)
Orangespotted Sunfish	4	4.0 (100)			19	19.0 (42)
Bluegill	428	428.0 (18)	400	400.0 (19)	367	367.0 (19)
Dollar Sunfish	58	58.0 (52)				
Longear Sunfish	45	45.0 (86)	69	69.0 (55)	4	4.0 (67)
Redear Sunfish	39	39.0 (32)	74	74.0 (22)	31	31.0 (28)
Redspotted Sunfish	3	3.0 (72)			6	6.0 (58)
Bantam Sunfish	5	5.0 (100)				
Spotted Bass	10	10.0 (100)	5	5.0 (55)	4	4.0 (56)
Largemouth Bass	202	202.0 (10)	141	141.0 (8)	235	235.0 (15)

APPENDIX B – Map of sampling locations



Location of sampling sites, Lone Star Lake, Texas, 2020 and 2022. Electrofishing stations from 2020 are indicated by “E”, stations from 2022 are indicated by “e”. Water level was near full pool at time of sampling



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