

Moss Reservoir

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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Contents

Survey and Management Summary	1
Introduction	2
Reservoir Description	2
Angler Access.....	2
Management History	2
Methods	4
Results and Discussion.....	4
Fisheries Management Plan for Moss Reservoir, Texas	6
Objective-Based Sampling Plan and Schedule (2023–2027).....	7
Literature Cited.....	9
Tables and Figures	10
Water Level	10
Reservoir Characteristics	10
Boat Ramp Characteristics.....	11
Harvest Regulations	11
Stocking History.....	12
Objective-Based Sampling Plan for 2018-2019	13
Aquatic Vegetation Survey	14
Gizzard Shad	15
Bluegill	16
Longear Sunfish	17
Redear Sunfish	18
Channel Catfish	19
White Bass.....	20
Largemouth Bass	21
Spotted Bass	24
White Crappie	26
Proposed Sampling Schedule	27
APPENDIX A – Catch rates for all species from all gear types	28
APPENDIX B – Map of sampling locations.....	29
APPENDIX C – Historical catch rates.....	30

Survey and Management Summary

Fish populations in Moss Reservoir were surveyed in 2022 using electrofishing and trap netting and in 2023 using gill netting and bass-only electrofishing. 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: Moss Reservoir is a 1,140-acre impoundment on Fish Creek, a tributary of the Red River, in Cooke County. Water level declined to roughly three feet below the conservation in 2022 but experiences periodic flood conditions with substantial rain. Habitat features consisted mainly of rocky shoreline and native submerged and emergent vegetation.

Management History: Important sport fish include Channel Catfish, Largemouth Bass, and White Crappie. The management plan from the 2018 survey report included encouraging the city to offer a daily access permit, manage the spread of Yellow floating-heart, consider changing the harvest regulations on black bass, and educate the public on the threats of invasive species.

Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir yet catch rate was low. Electrofishing catch of Gizzard Shad was also low, and few Gizzard Shad were available as prey to most sport fish. Electrofishing catch of Bluegill was high, but very few Bluegill were over 5-inches long. Redear and Longear Sunfish also add to the forage base.
- **Catfishes:** Gill net catch rate of Channel Catfish increased with higher lake levels since 2015. One Flathead Catfish was also collected.
- **White Bass:** White Bass were present in the reservoir.
- **Black basses:** Largemouth Bass were abundant, but the size structure continued to be dominated by smaller bass. Spotted Bass were also abundant, with few fish over 12-inches present.
- **Crappie:** The trap net catch rate of crappie was low in 2022, possibly due to temporary low water levels in fall 2022. Crappie were collected in greater numbers using gillnets. A Black Crappie was also collected for the first time.

Management Strategies: Encourage the City of Gainesville to offer a daily or shorter-term boat access permit. Continue efforts to monitor and manage yellow floating-heart. Continue encouraging anglers to harvest Spotted Bass. Encourage anglers to report qualifying catches to the ShareLunker program and submit tournament results. Inform the public about the negative impacts of aquatic invasive species. Conduct general monitoring surveys with trap nets, gill nets, electrofishing surveys and a creel survey in 2026-2027.

Introduction

This document is a summary of fisheries data collected from Moss Reservoir in 2020-2023. 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 2020-2023 data for comparison.

Reservoir Description

Moss Reservoir is a 1,140-acre impoundment on Fish Creek, a tributary of the Red River, in Cooke County. It was constructed in 1966 by the City of Gainesville for municipal and industrial water supply and recreation. The average depth is 20.6 feet with a maximum depth of 68 feet. The lake level has remained within three feet of the conservation elevation since 2015 yet experienced a three-foot drop at the time of fall sampling in 2022, followed by flooding during spring sampling (Figure 1). Moss Reservoir has a drainage area of approximately 65 square miles, a shoreline length of 16 miles, and a shoreline development index of 3.43. Other descriptive characteristics for Moss Reservoir are in Table 1. Moss Reservoir was mesotrophic with a mean TSI chl-*a* of 49.6 (Texas Commission on Environmental Quality 2022). Habitat at time of sampling consisted of native emergent vegetation, native submerged vegetation, rocky shoreline, boat docks, and dead trees. Native aquatic plants present were southern naiad, muskgrass, cattail, coontail, and water willow. Hydrilla, a non-native aquatic plant, was first discovered in August 2003. In recent years only individual plants have been observed during surveys. Yellow floating-heart, another invasive, has increased between 2010 and 2018, and herbicide treatments provided limited control until ProcellaCOR® SC was first utilized by the Aquatic Habitat Enhancement Team in 2018. This herbicide greatly reduced the overall coverage of the plants.

Angler Access

Boat access consisted of two public boat ramps on the north and south sides of the reservoir. The two public boat ramps are in good shape and have ample lighting. Boarding docks are available at each ramp, and a small fishing pier is also available at the south ramp. The City of Gainesville charges \$35 for an annual boat access permit, with no charge for bank angling. Additional boat ramp characteristics are in Table 2. Further information about Moss Reservoir and its facilities can be obtained by visiting the Texas Parks and Wildlife Department (TPWD) web site at www.tpwd.gov/fishboat/fish/recreational/lakes/moss/.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Cummings and Bennett 2018) included:

1. Encourage the City of Gainesville to offer a daily boat access permit.

Action: Emails and a formal letter from the Denison District Office was sent to the City Council requesting development of an additional, less expensive day use pass in 2019. The city stated \$35 was an inexpensive access fee and no less expensive daily permit is currently offered.
2. Monitor Yellow floating-heart annually and evaluate ProcellaCOR® treatments.

Action: The plants have been monitored annually and distribution has been reduced to trace amounts in the main reservoir.
3. Encourage harvest of Spotted Bass, seek 16-inch maximum length limit, and conduct genetic sample to evaluate brooder stockings in 2010 and 2018.

Action: A 16-inch maximum length limit was implemented for Largemouth Bass in September 2020. Signs encouraging the harvest of Spotted Bass were placed at both public ramps. A genetic sample of 30 random Largemouth Bass was analyzed in 2022.

4. Educate the public about the negative impacts of invasive species.

Action: Signage informing the public about preventing the spread of zebra mussels was installed at each boat ramp. Discussion about invasive species awareness has taken place on social media platforms and during interaction with the public.

Harvest regulation history: Sport fishes in Moss Reservoir are currently managed with statewide regulations with an exception for Largemouth Bass (Table 3) effective on September 1, 2020. On September 1, 2021, the statewide 12-inch minimum length limit (MLL) for Channel and Blue Catfish was changed to no MLL, with no more than 10 fish 20 inches or greater in length in the combined 25 fish bag limit. This was part of a statewide effort to direct harvest towards smaller catfish and protect larger sizes.

Stocking history: Adult Florida Largemouth Bass (FLMB) were stocked in 2010 and 2018. Threadfin Shad were stocked in 2016. The complete stocking history is in Table 4.

Vegetation/habitat management history: Hydrilla was first observed in August 2003 and is currently found sparsely on the northern side of the reservoir and is not problematic. Yellow floating-heart was first observed in 2010 near the south boat ramp, then expanded by 2013. The Aquatic Habitat Enhancement (AHE) team for TPWD treated it with herbicide in 2013, 2014, and annually since 2018. Private contractors treated the plants in 2016 and 2017. Yellow floating-heart distribution has been significantly reduced since ProcettaCOR® was first used 2018.

Water transfer: Moss Reservoir is primarily used for municipal water supply, recreation, and to a lesser extent, flood control. The City of Gainesville operates one pumping station for the City's water supply. There is no water pumped into Moss Reservoir, and 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 Moss Reservoir (Cummings and Bennett 2019). Primary components of the OBS plan are listed in Table 5. Survey sites for spring electrofishing were biologist selected and survey sites for fall electrofishing, trap netting, and gill netting were randomly selected. 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 (1.0 hours at 12, 5-min stations). A daytime, spring electrofishing survey collected black bass only (1.0 hours at 12, 5-minute 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 seven randomly selected fish (range 15.0 to 16.9 inches).

Trap netting – Crappie were collected using trap nets (5 net nights at 5 stations each). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting – Channel Catfish, White Bass, and White Crappie 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). 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 and creel statistics.

Habitat – A structural habitat survey was conducted in 2022. Vegetation surveys were conducted annually to monitor yellow floating-heart and in 2022 to monitor native aquatic vegetation. Habitat was assessed with a modified digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

Water level – Source for water level data was the United States Geological Survey (USGS 2023).

Results and Discussion

Habitat: Development around Moss Lake has increased in recent years adding roughly a half-mile of new bulkhead and an additional acre of boat docks (Table 6). The majority of littoral habitat remains rocky and natural shoreline. In 2022, native aquatic vegetation coverage declined significantly due to low lake levels (Table 7). Yellow floating-heart coverage has been greatly reduced due to annual treatments with ProcellaCOR® since 2018. In recent years, trace amounts have been documented in the main lake; however, the AHE team has discovered and treated larger distributions of plants in the upper lake regions accessible only by airboat.

Prey species: The catch rate of Gizzard Shad (28/h) and Threadfin Shad (64/h) was low, like prior years (Appendix C). Due to prior suspected winter kills, Threadfin Shad were stocked in 2016 and appear to have gradually increased in abundance since that time. Recent deep freezes do not appear to have resulted in total population kills, however. Larger individuals dominated the Gizzard Shad population with few available as prey (IOV = 7; Figure 2). Sunfish dominate the prey base of Moss Reservoir (Figures 3-5). The electrofishing catch rate of Bluegill was a catch of record (294.0/h; Figure 3), as was the catch rate of Redear Sunfish (45/h; Figure 5). However, size structure of Bluegill remains low (PSD = 11). Most Longear Sunfish and Redear Sunfish were also less than 5-inches and available as forage for sport fish. A few larger Redear (7 to 9-inches) were collected and may provide angling opportunities.

Channel Catfish: The gill net catch rate of Channel Catfish was 8.4/nn in 2023, suggesting an increase in abundance from previous surveys (Figure 6). Higher water levels since 2015 may have increased recruitment of Channel Catfish. Channel Catfish between 10- and 25-inches were collected; however, body condition was highly variable.

White Bass: The gill net catch rate of White Bass was 4.8/nn in 2023; similar to recent surveys (Figure 7). All fish collected were legal length (10-inches) and available to anglers. White Bass up to 15-inches were collected.

Black Basses: To encourage harvest and provide additional protection for larger fish, a 16-inch maximum length limit for Largemouth Bass went into effect on September 1, 2020. The largest bass collected in Fall 2022 was just 17-inches. However, CPUE-14 (12.0/h) was almost double that in 2018 (6.4/h; Figure 8), yet CPUE-16 (4.2/h in 2018 and 4.0/h in 2022) was similar. The electrofishing catch rate of Largemouth Bass was 198.0/h in the fall 2022 survey up from a CPUE of 98.1/h in 2018 and 126.5/h in 2014. Size structure (PSD = 37; Figure 8), was heavily influenced by an abundance of young fish in 2022, though similar to previous years. Our sampling objective of aging fish between 13- and 14.9-inches was increased to mean length at 16-inches due to the regulation change. The average age at legal length (16 inches) was 3.9 years (N = 7; range = 3 – 5 years). Body condition declined some with fish size, but most relative weights were above 85. One 9.06 lb. Largemouth Bass was submitted to the ShareLunker program in March 2020. Despite two small stockings of retired Florida brooders in 2010 and 2018, the percentage of Florida alleles in 2022 (39%) was not noticeably different than in 2014 (43%).

Spring electrofishing was conducted in 2023 to document the abundance of larger fish relative to a spring electrofishing survey in 2019 before the maximum length limit was adopted. The reservoir was experiencing flooded conditions at the time of the 2023 spring survey, and we suspected that contributed to a lower catch rate of larger bass, as only four bass over 16-inches were collected (Figure 9). Considering the novelty of the 16-inch maximum length limit, and average age of 3.9-years at 16-inches, additional time and surveys are likely required before any impacts from the regulation change can be determined.

The electrofishing catch rate and size structure of Spotted Bass in 2022 (58.0/h, PSD=22) mirrored that of 2018 (57.2/h, PSD=21). Body condition did improve for larger Spotted Bass in 2022, however (Figure 10). The spring electrofishing catch rate of Spotted Bass was much lower than the fall catch rate in both 2019 (11.0/h) and 2023 (7.0/h; Figure 11). One Smallmouth Bass was also collected in the Fall 2022 electrofishing survey (Appendix C).

White Crappie: Sampling objectives for crappie were not achieved. Trap netting catches were poor in Fall 2022 and the low lake level at the time of sampling was suspected to have contributed to our total catch of only four White Crappie (0/8/nn; Appendix C). However, the first Black Crappie ever collected from a net at Moss Reservoir was observed. Subsequently, 13 White Crappie (2.6/nn) were collected and measured in spring gill net sampling for catfish and White Bass (Figure 12). An age sample was not collected for White Crappie due to the low catch rates.

Fisheries Management Plan for Moss Reservoir, Texas

Prepared – July 2023

ISSUE 1: The City of Gainesville charges \$35 for an annual boat access permit that must be obtained from the public works building or the Moss Lake Cafe during business hours. No daily fee or pay station is available, potentially turning away anglers fishing the lake for the first time, or those who plan to access the lake only a few times a year.

MANAGEMENT STRATEGIES

1. Encourage the City of Gainesville to offer a daily boat access permit and easier purchasing options (e.g. pay station, online, etc.).

ISSUE 2: A 16-maximum length limit was adopted at Moss Reservoir in September 2020 to help improve the size structure of Largemouth Bass and encourage additional harvest of abundant smaller bass.

MANAGEMENT STRATEGIES

1. Encourage anglers to report qualifying catches to the revamped ShareLunker Program to document catches of Largemouth Bass \geq 8 lbs.
2. Conduct Fall electrofishing in 2026 and spring electrofishing in 2027 to investigate trends in size structure of the bass population.
3. Conduct a spring/summer creel survey in 2027 to estimate angler effort, catch rates, and harvest for black bass.

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. Continue to work with AHE team to request treatments of Yellow floating-heart with ProcellaCOR® herbicide as funding and staff time allows and annually assess coverage.
2. Cooperate with the controlling authority to maintain signage at access points around the reservoir.
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 Moss Reservoir include Channel Catfish, White Bass, Spotted Bass, Largemouth Bass, and crappie. Known important forage species include Gizzard and Threadfin Shad and Sunfish.

Low-density fisheries

White Bass: White Bass have low abundance and marginal directed angling effort. White Bass will be collected while achieving sampling objectives for Channel Catfish.

Smallmouth Bass: Smallmouth Bass have low abundance and only one was collected in 2022. They will be sampled along with other black basses during fall nighttime electrofishing.

Survey objectives, fisheries metrics, and sampling objectives

Channel Catfish: A creel survey in 2014-2015 indicated that directed angling effort for Channel Catfish was 17.5%, which was the fourth sought-after category after White Crappie and “anything” (Moczygemba and Hysmith 2015). Trend data on CPUE-TOTAL, size structure, and body condition has been monitored once every four years with spring gill netting since 1990. Continuation of this sampling frequency will permit us to determine any large-scale changes in the population abundance and population structure. Relative abundance has a tendency to fluctuate, as historical CPUE has ranged from 1.4 to 11.0 per net night. We estimate it will take a minimum of 15 net nights to catch 50 fish and achieve an RSE ≤ 25 with 80% confidence. Fifteen gill nets would be considered excessive in regard to directed effort for Channel Catfish on Moss Reservoir. Five, randomly selected gill nets sites will be sampled to assess presence/absence of Channel Catfish. And additional 5-net nights will be considered if we determine objectives can be achieved with additional sampling effort.

Black basses: Based on a creel survey in 2014-2015, total directed angling effort for Largemouth Bass was 41.7%, with 8.9% specifically from black bass tournaments (Moczygemba and Hysmith 2015). The popularity and reputation for quality angling for Largemouth Bass at Moss Reservoir warrant sampling time and effort. Spotted Bass, although abundant showed no directed angling effort, but will be collected along with Largemouth Bass. Trend data on CPUE-TOTAL, size structure, and body condition have been collected at four-year intervals since 1990 with fall nighttime electrofishing. Continuation of this sampling strategy will allow for determination of any large-scale changes in the Largemouth Bass population that may invite further investigation. A minimum of 12 randomly selected 5-min electrofishing sites will be sampled, but sampling will continue at random sites until 50 stock-size Largemouth Bass are collected and the RSE of CPUE-S is < 25 (the anticipated effort to meet both sampling objectives is 12-15 stations with 80% confidence). If failure to achieve either objective has occurred after one night of sampling and objectives can be attained with 6-12 additional random stations, another night of effort will be expended. Spring day-time bass-only electrofishing was conducted in 2019 and 2023 to monitor trends in spring catch rates of larger bass ≥ 16 -inches before and after the regulation change in 2020. Twelve biologist-selected 5-min electrofishing sites will be sampled in 2027.

White Crappie: A creel survey conducted in 2014-2015 indicated White Crappie comprised 18.4% of total angling effort and were the third most sought-after category after Largemouth Bass and “anything” (Moczygemba and Hysmith 2015). Despite a few surveys yielding adequate catch rates, trap nets have more often provided limited data on crappie populations at Moss Reservoir. Dual cod netting in 2014 provided a robust sample; however, the level of effort necessary for dual-cod nets is considered excessive for the low relative angler effort observed for crappie at Moss Reservoir. Instead, crappie collected while gill netting for Channel Catfish and White Bass can provide information on presence/absence in 2027, and a creel survey in 2027 will provide information on angler effort and harvest of crappie.

Sunfish and Shad: Bluegill, Redear Sunfish, Longear Sunfish, and Gizzard and Threadfin Shad are the primary forage species at Moss Reservoir. Like Largemouth Bass, trend data on CPUE-TOTAL and size structure of Bluegill and Gizzard Shad have been collected at four-year intervals since 1990 with fall electrofishing. CPUE-TOTAL was also calculated for Threadfin Shad. Continuation of four-year trend data with nighttime fall electrofishing will allow for determination of any large-scale changes in forage populations. A minimum of 12 randomly selected 5-min electrofishing sites will be sampled, but sampling will continue in conjunction with Largemouth Bass sampling. No additional effort will be expended to achieve an $RSE \leq 25$ for CPUE-S of Bluegill and Gizzard and Threadfin Shad. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both, relative to predator density. Redear Sunfish and Longear Sunfish will be collected and CPUE-T and size structure will be reported.

The proposed sampling schedule for important sport fish and forage is in Table 9.

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Tables and Figures

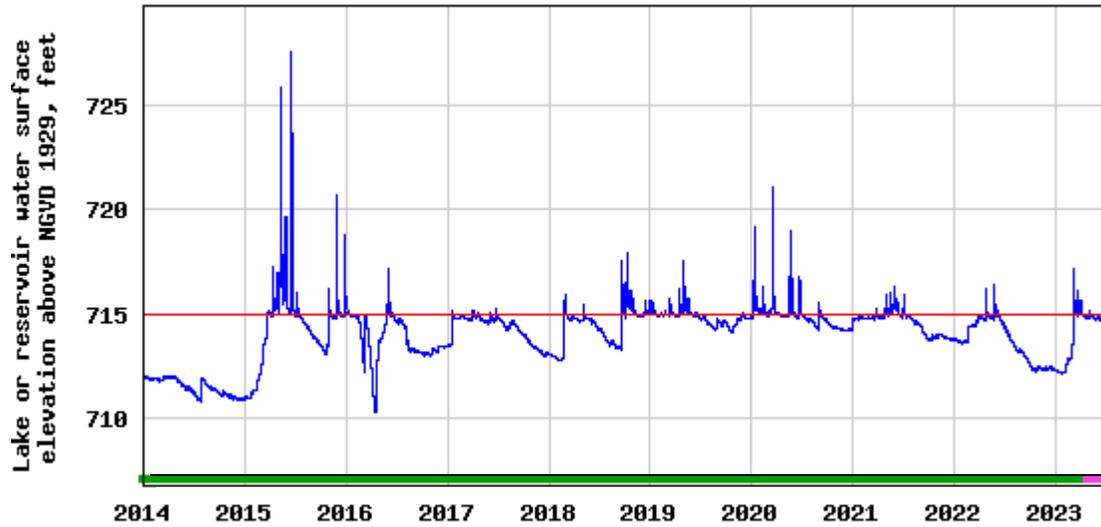


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Moss Reservoir, Texas, 2015-2023. Red line indicates conservation elevation.

Table 1. Characteristics of Moss Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	City of Gainesville
County	Cooke
Reservoir type	Tributary
Shoreline Development Index	3.43
Conductivity	264 $\mu\text{S/cm}$

Table 2. Boat ramp characteristics for Moss Reservoir, Texas, August 2022. Reservoir elevation at time of survey was 712 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
North Ramp	33.77352 -97.22267	Y	30	709.5	Good. Extension is feasible
South Ramp	33.75696 -97.21550	Y	15	710.0	Good. Extension is feasible

Table 3. Harvest regulations for Moss Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination); no more than 10/day \geq 20- inches	no minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5 ^a	16-inch maximum
Bass: Spotted	5 ^a	None
Bass, Smallmouth	5 ^a	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

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

Table 4. Stocking history of Moss Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults; FRY = fry; UNK = unknown.

Species	Year	Number	Life Stage
Channel Catfish	2008	118,276	FGL
	Total	118,276	
Florida Largemouth Bass	1981	38,500	FGL
	1982	58,064	FGL
	2010	97	ADL
	2018	58	ADL
	Total	96,719	
Largemouth Bass	1967	10,000	UNK
	1971	260,000	UNK
	Total	270,000	
Smallmouth Bass	1985	13	ADL
	1986	22,080	FGL
	1987	22,300	FRY
	1988	56,304	FRY
	Total	100,697	
Threadfin Shad	1984	1,170	AFGL
	1985	6,500	AFGL
	2016	1,600	AFGL
	Total	9,270	
Walleye	1977	341,100	FRY
	1978	339,500	FRY
	1979	339,910	FRY
	Total	1,020,510	

Table 5. Objective-based sampling plan components for Moss Reservoir, Texas 2019–2023.

Gear/target species	Survey objective	Metrics	Sampling objective	
<i>Electrofishing</i>				
Bass	Largemouth	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 ^a	Abundance	CPUE–Total	RSE ≤ 25
		Size structure	PSD, length frequency	$N \geq 50$
	Gizzard Shad ^a	Abundance	CPUE–Total	RSE ≤ 25
		Size structure	PSD, length frequency	$N \geq 50$
		Prey availability	IOV	$N \geq 50$
	<i>Trap netting</i>			
	White Crappie	Size structure	PSD, length frequency	$N = 50$
		Age-and-growth	Age at 10 inches	$N = 13, 9.0 - 10.9$ inches
<i>Gill netting</i>				
Channel Catfish	Abundance	CPUE–stock	Practical effort	
	Size structure	PSD, length frequency	Practical effort	

^a No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill, Redear Sunfish, Longear Sunfish and Gizzard 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.

Table 6. Survey of structural habitat types, Moss Reservoir, Texas, 2022. Shoreline habitat type units are in miles and piers and docks and standing timber are acres.

Habitat Type	Estimate	% of total
Bulkhead	2.5 miles	15.7
Piers and docks	4.0 acres	0.35
Natural	3.3 miles	21.0
Rocky	10.2 miles	64.2
Standing timber	71.0 acres	6.2

Table 7. Survey of aquatic vegetation, Moss Reservoir, Texas, 2018, 2019, 2020, 2021 and 2022. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2018	2019	2020	2021	2022
Native submersed ^a	270.4 (23.7)				44.1 (3.9)
Native floating-leaved ^b	15.0 (1.3)				1.0 (1.3)
Native emergent ^c	7.0 (0.6)				trace
Non-native					
Yellow floating-heart (Tier II)*	9.0 (0.8)	3.4 (0.3)**	2.0 (<1)	2.0 (<1)	2.0 (<1)**
Hydrilla (Tier III)*	trace				trace

^a chara, coontail

^b American pondweed

^c water willow

* Tier II is Maintenance and Tier III is Watch status.

** Survey was conducted in spring.

Gizzard Shad

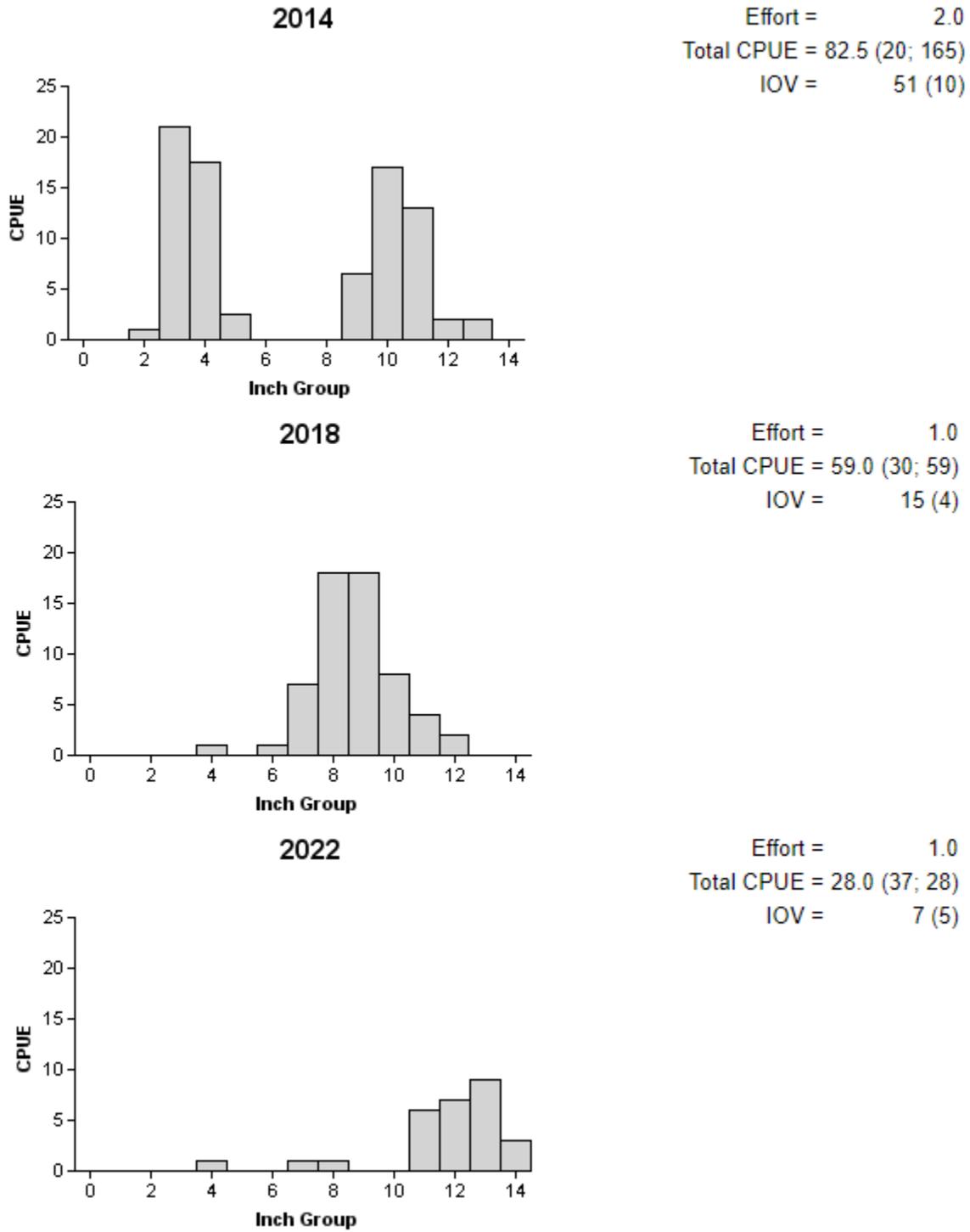
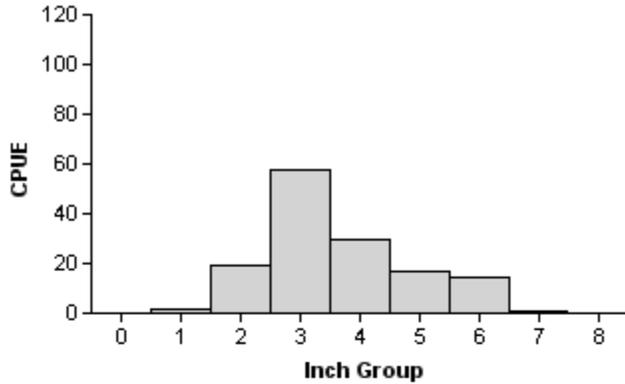


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2014, 2018, and 2022.

Bluegill

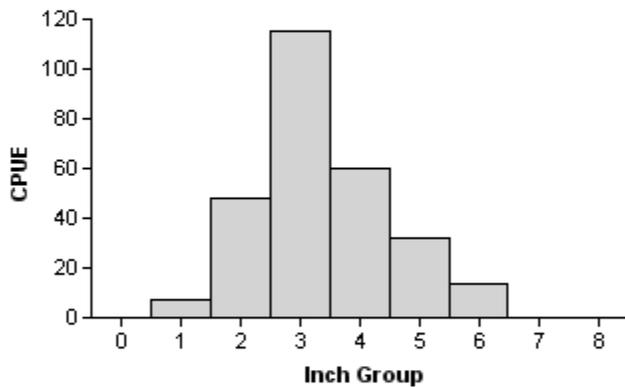
2014

Effort = 2.0
 Total CPUE = 140.0 (13; 280)
 PSD = 13 (3)



2018

Effort = 1.0
 Total CPUE = 276.0 (21; 276)
 PSD = 6 (2)



2022

Effort = 1.0
 Total CPUE = 294.0 (14; 294)
 PSD = 11 (3)

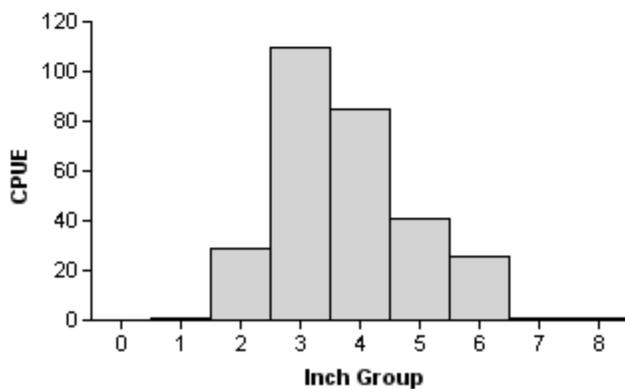


Figure 3. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure (PSD) are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2014, 2018, and 2022.

Longear Sunfish

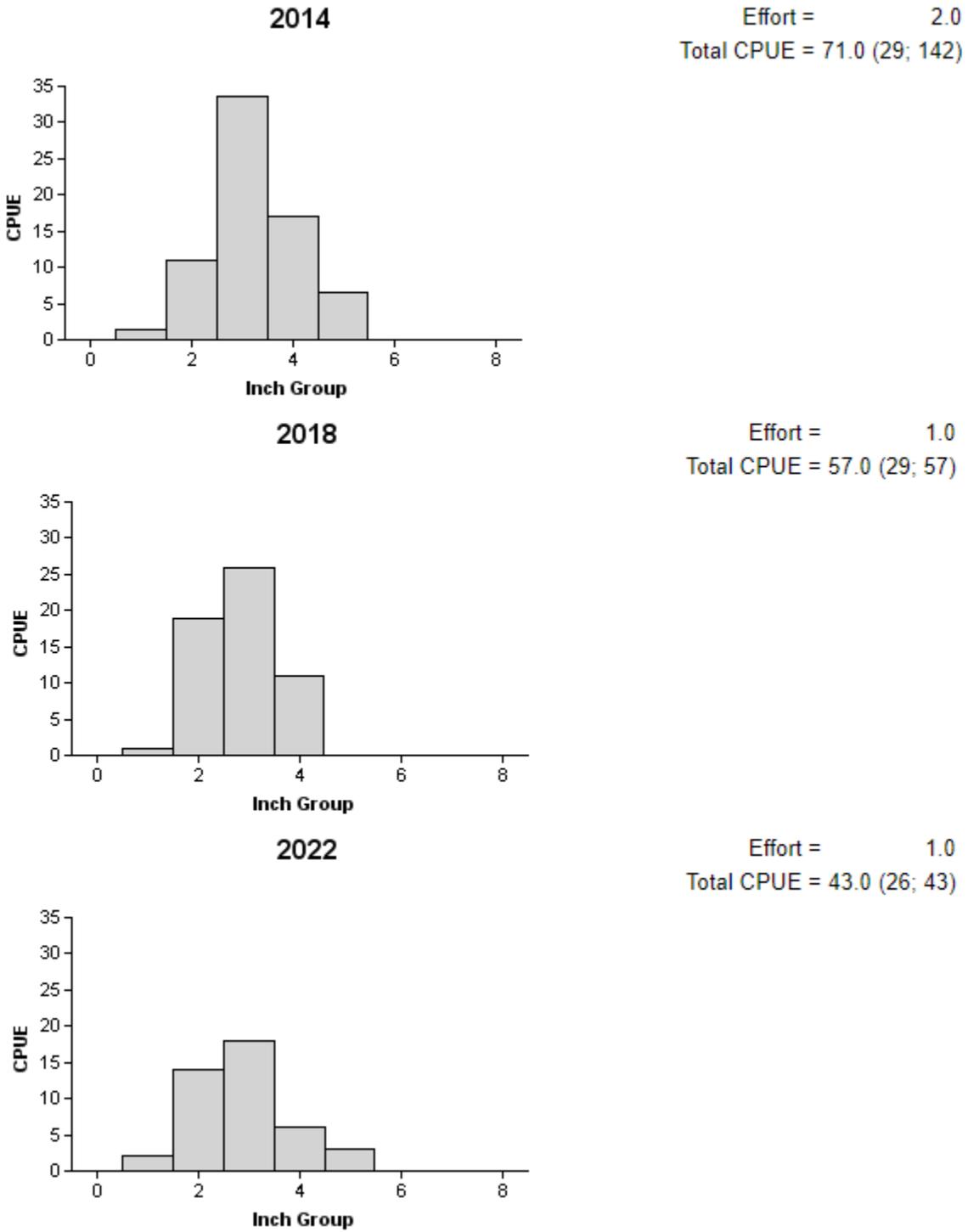
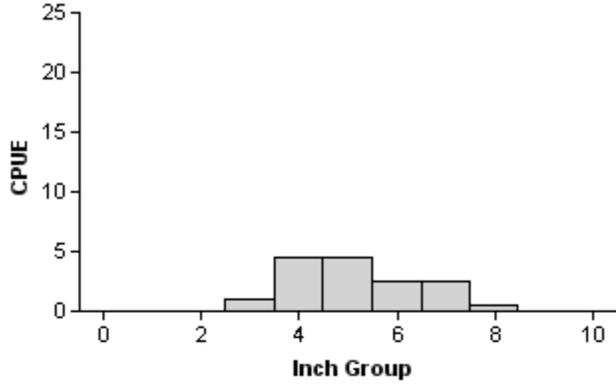


Figure 4. Number of Longear Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE) for fall electrofishing surveys, Moss Reservoir, Texas, 2014, 2018, and 2022.

Redear Sunfish

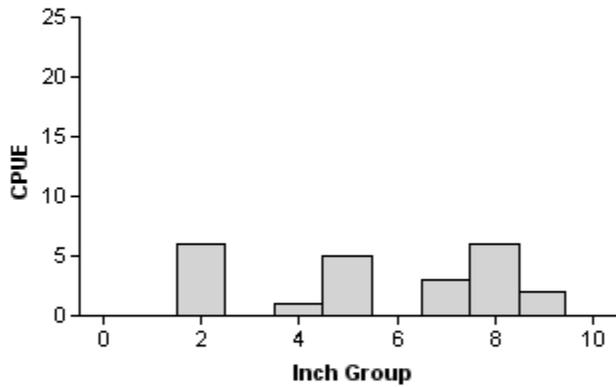
2014

Effort = 2.0
Total CPUE = 16.0 (21; 32)



2018

Effort = 1.0
Total CPUE = 23.0 (30; 23)



2022

Effort = 1.0
Total CPUE = 45.0 (23; 45)

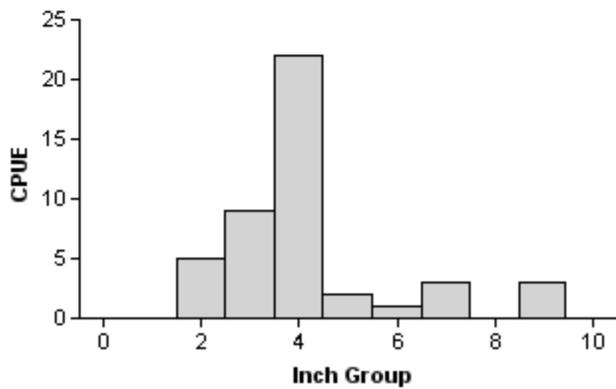


Figure 5. Number of Redear Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE) for fall electrofishing surveys, Moss Reservoir, Texas, 2014, 2018, and 2022.

Channel Catfish

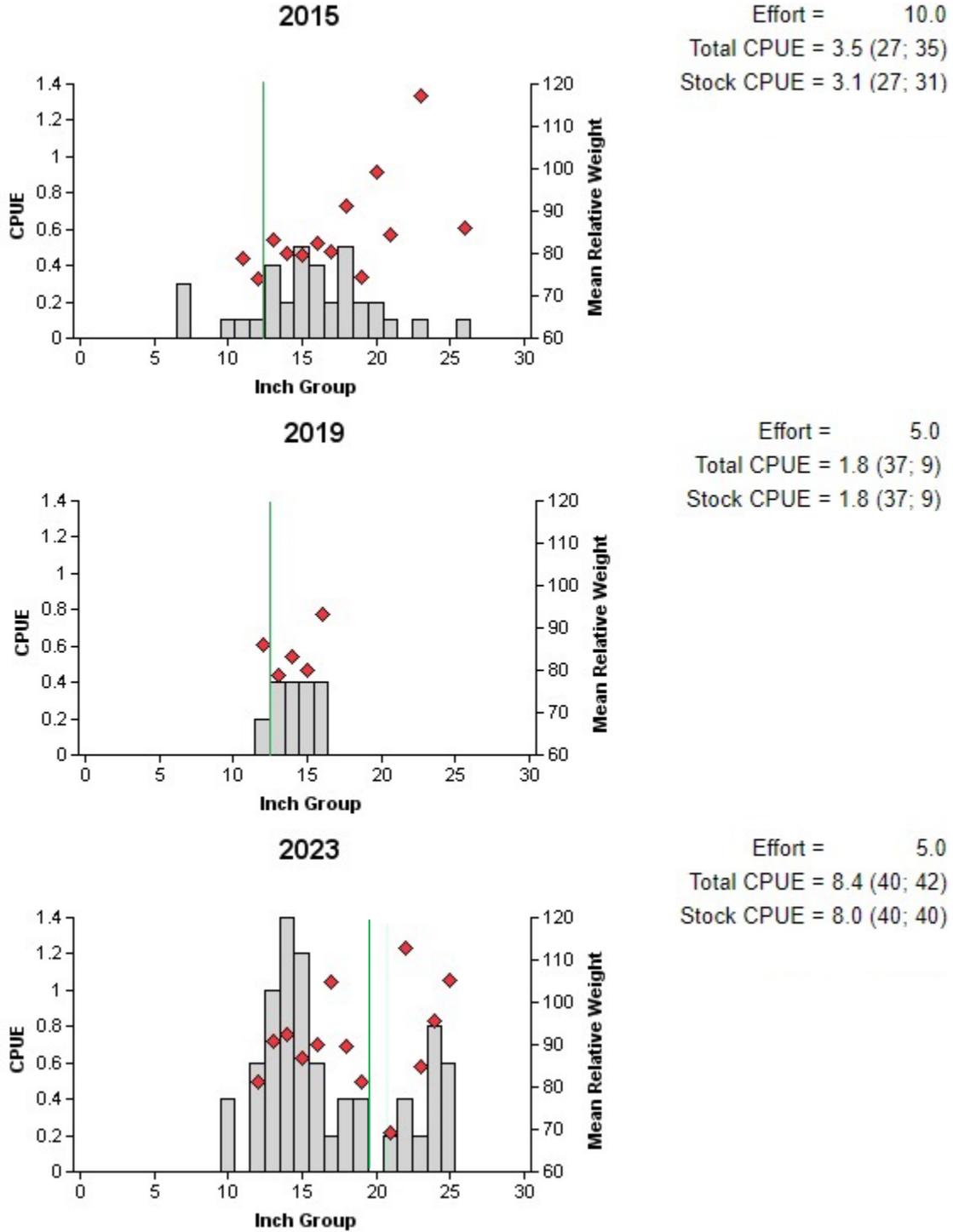


Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE in parentheses) for spring gill net surveys, Moss Reservoir, Texas, 2015, 2019, and 2023. Vertical line indicates minimum length limit in 2015 and 2019, and the demarcation of the graduated bag limit in 2023.

White Bass

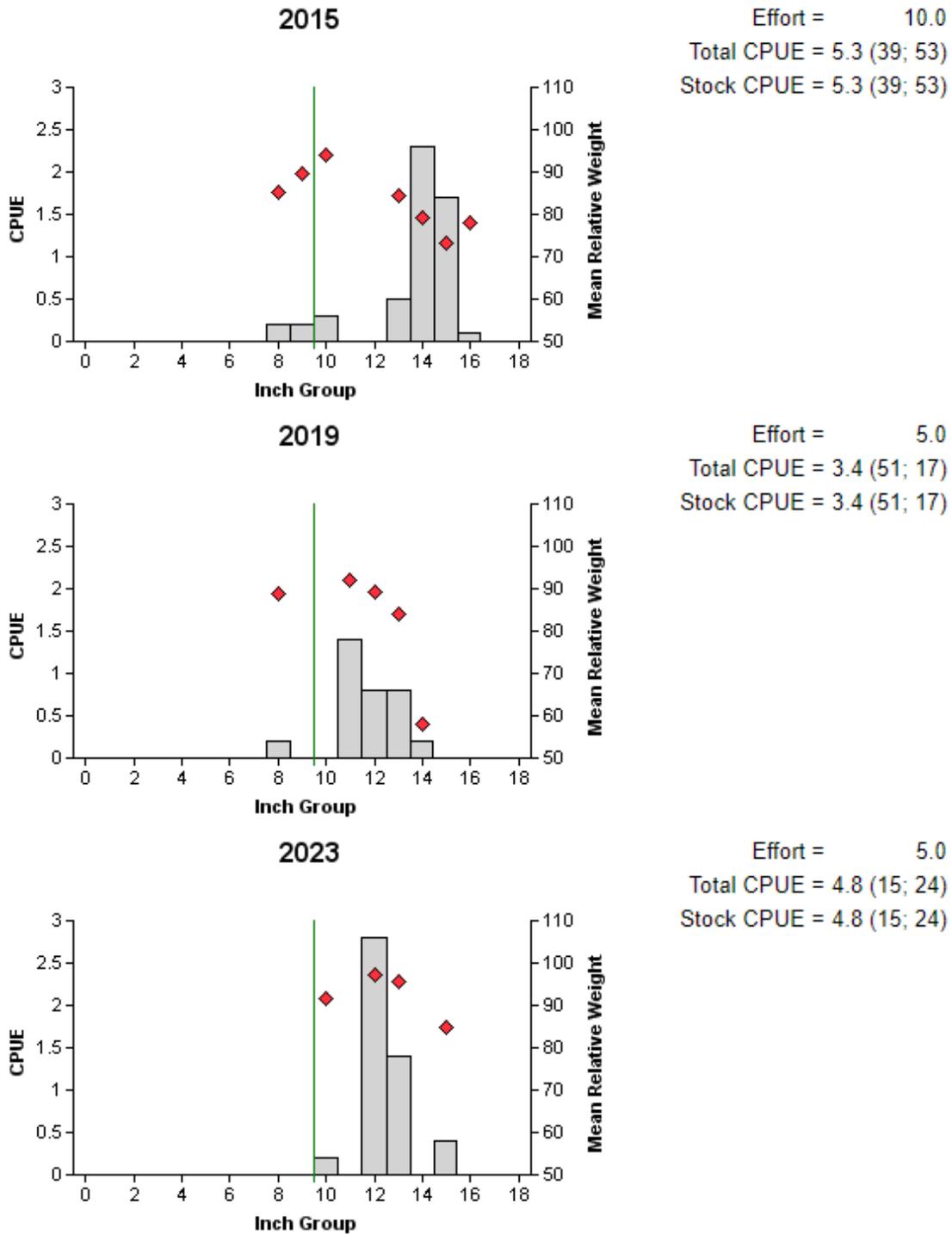


Figure 7. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Moss Reservoir, Texas, 2015, 2019, and 2023. Vertical line indicates minimum length limit.

Largemouth Bass

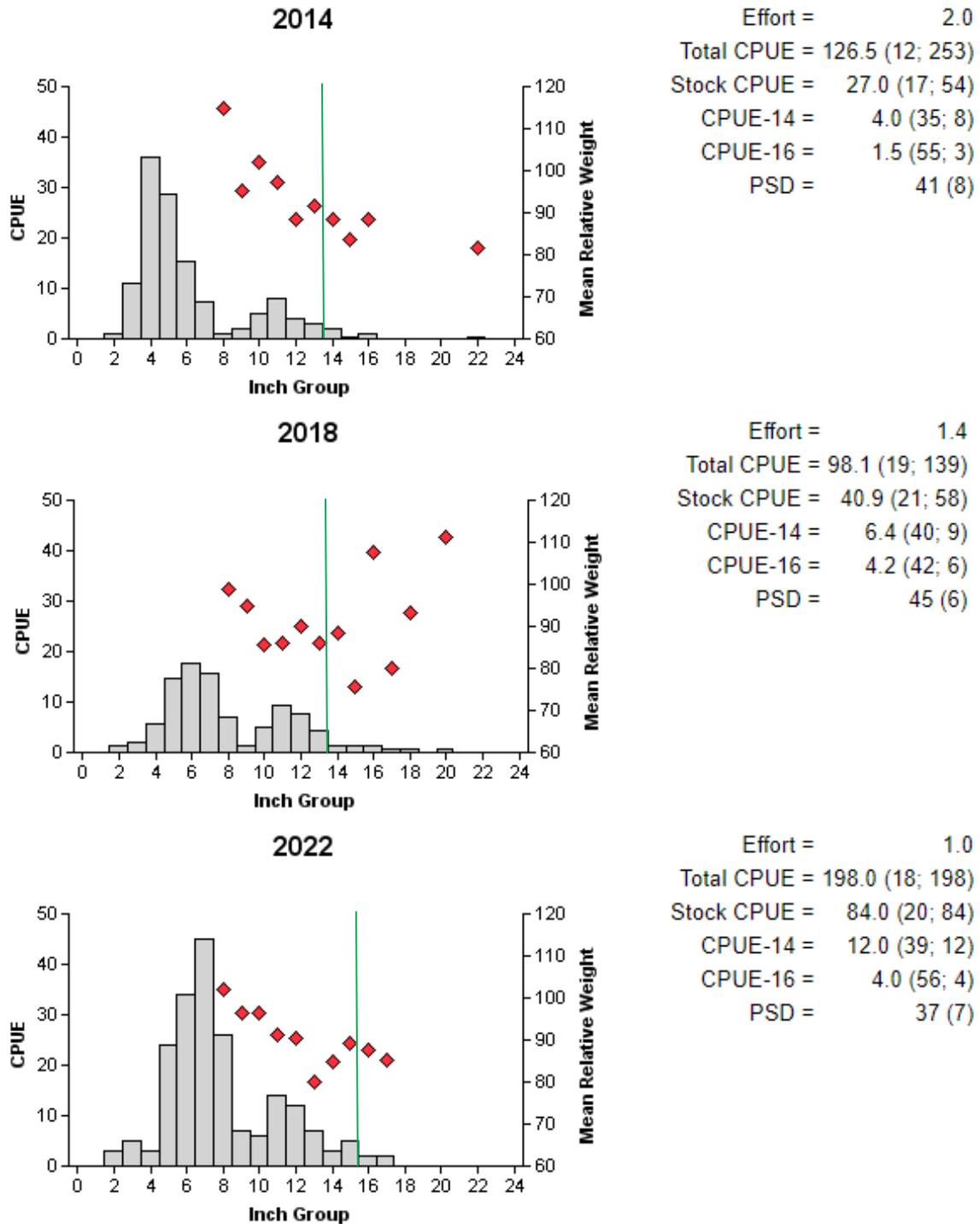


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2014, 2018, and 2022. Vertical line indicates minimum length limit in 2014 and 2018, and maximum length limit in 2022.

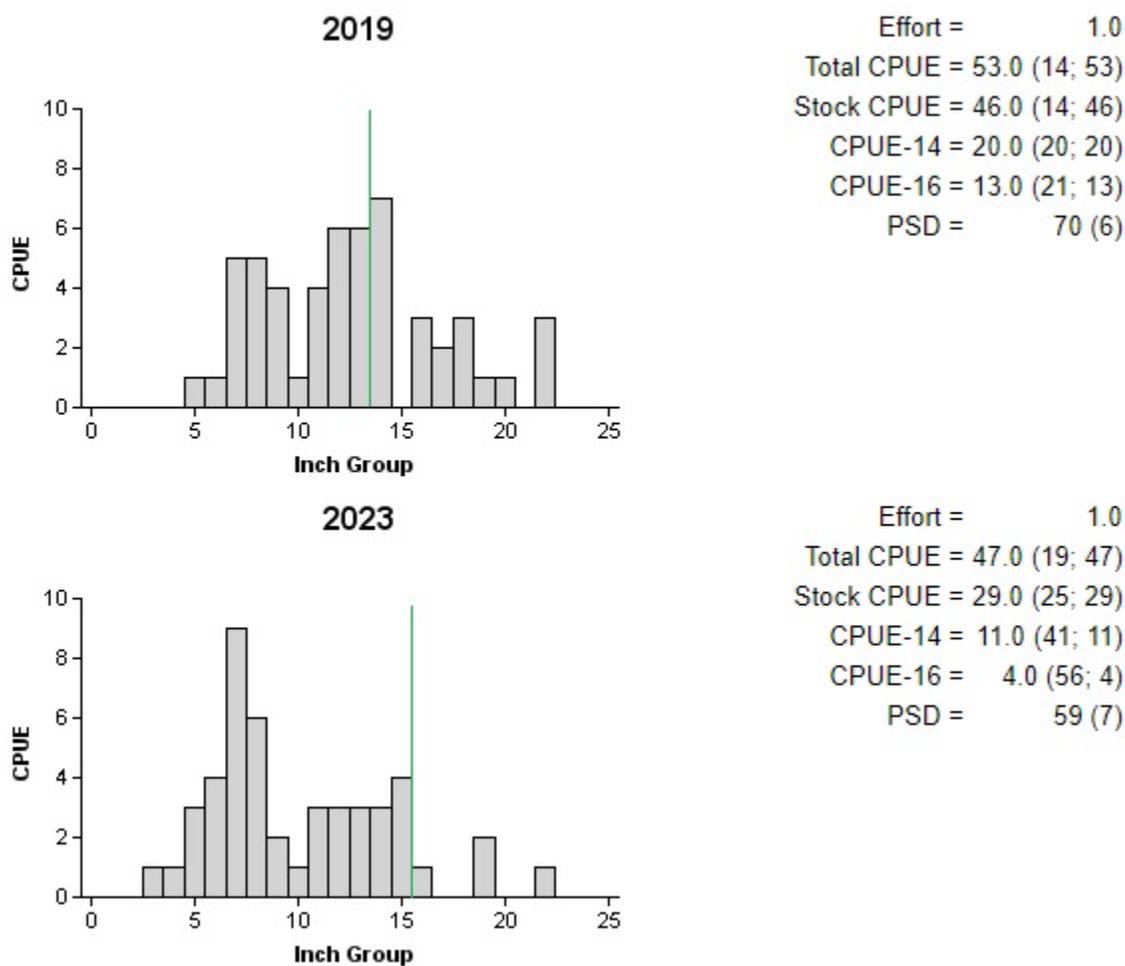


Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for daytime spring electrofishing surveys, Moss Reservoir, Texas, 2019 and 2023. Vertical line indicates minimum length limit in 2019 and maximum length limit in 2023.

Table 8. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Moss Reservoir, Texas. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB. Genetic composition was determined with micro-satellite DNA analysis.

Year	Sample size	Number of fish				% FLMB alleles	%FLMB
		FLMB	F1	Fx	NLMB		
1989	33	1	na	31 ^a	1	63.6	3.0
2002	26	0	na	19 ^a	7	34.9	0.0
2006	30	1	na	28 ^a	1	46.0	3.0
2014	30	0	na	30 ^a	0	43.0	0.0
2022	30	0	1	28	1	39.0	0.0

^a Determination of hybrid status not conducted.

Spotted Bass

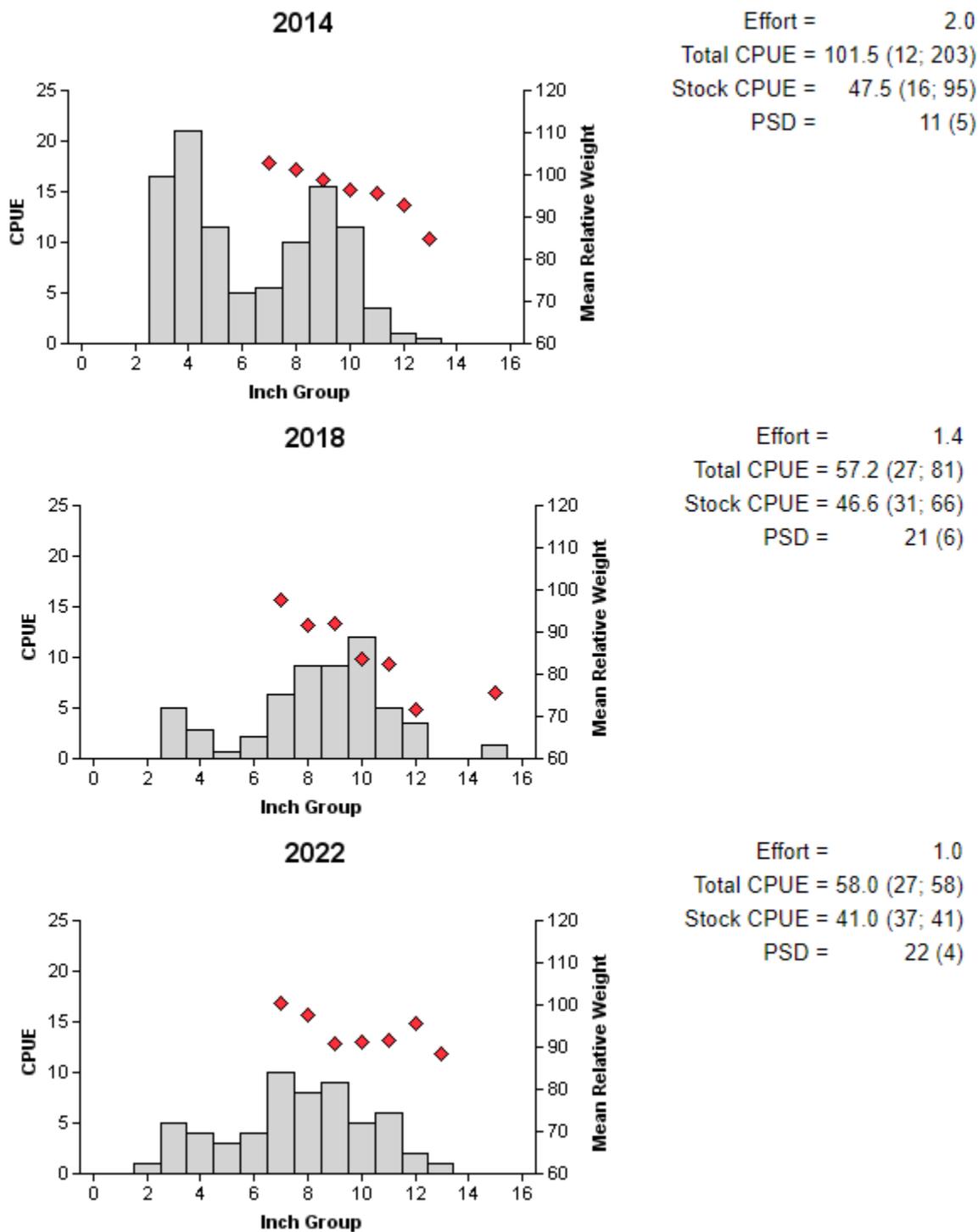


Figure 10. Number of Spotted Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2014, 2018, and 2022.

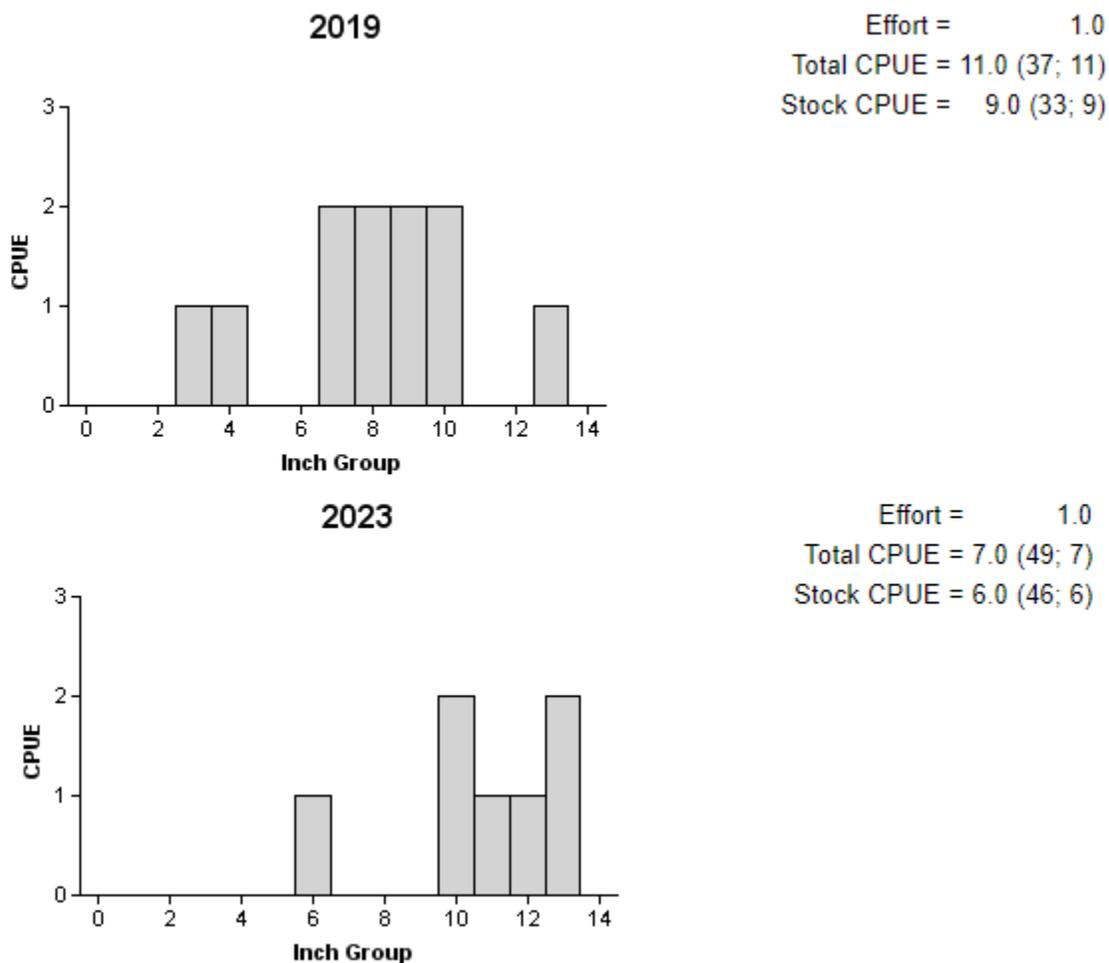


Figure 11. Number of Spotted Bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE are in parentheses) for daytime spring electrofishing surveys, Moss Reservoir, Texas, 2019 and 2023.

White Crappie

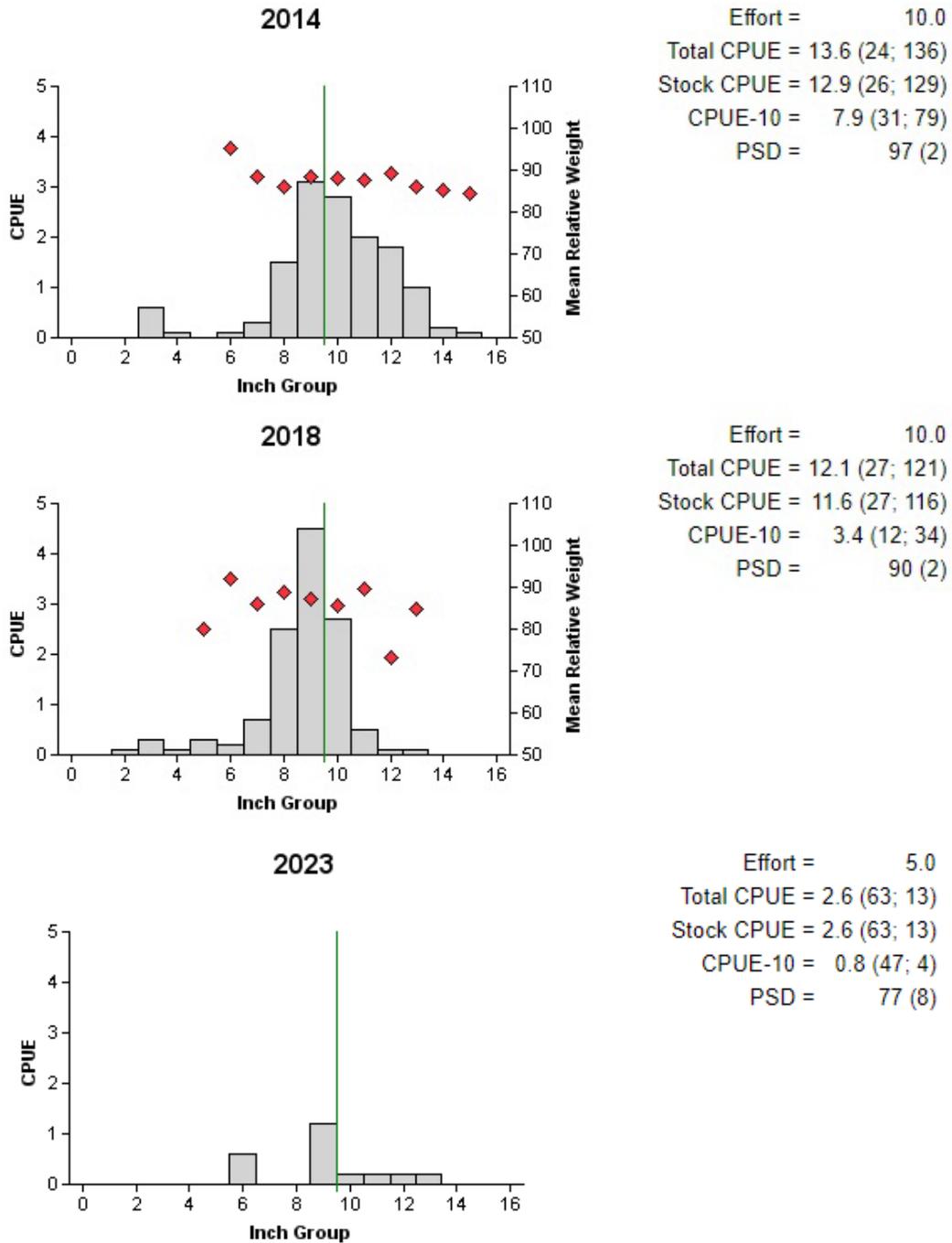


Figure 12. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Moss Reservoir, Texas, 2014 and 2018, and gillnetting in spring 2023. The 2014 survey utilized dual-cod trap nets and CPUE was recorded as number of White Crappie caught per net series (3 nights). Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 9. Proposed sampling schedule for Moss 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.

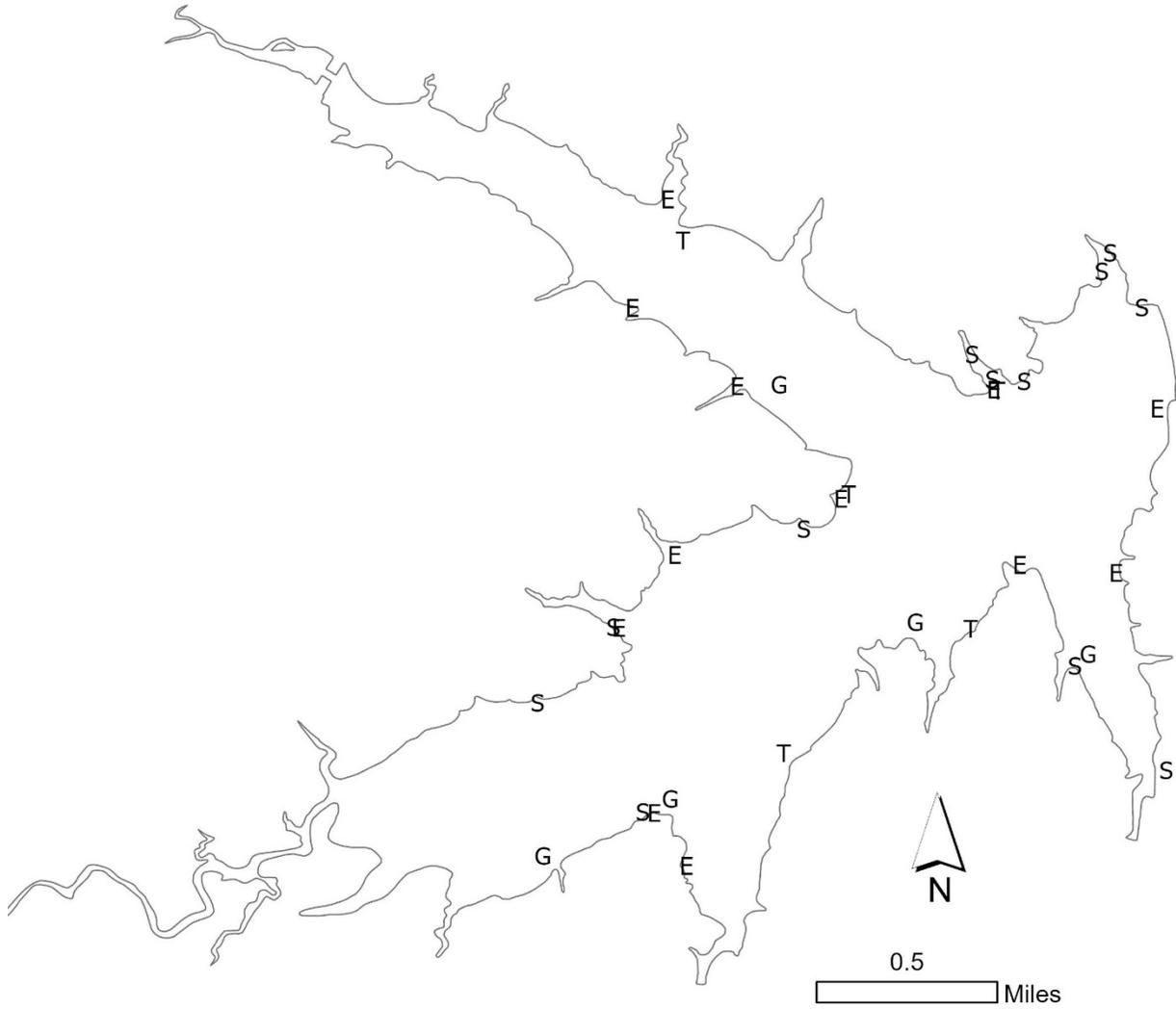
	Survey year			
	2023-2024	2024-2025	2025-2026	2026-2027
Angler Access				X
Vegetation	X	X	X	X
Fall Electrofishing				X
Spring Electrofishing				X
Gill netting				X
Creel survey				X
Report				X

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 Moss Reservoir, Texas, 2022-2023. Sampling effort was 5 net nights for gill netting, 5 net nights for trap netting, 1 hour for fall electrofishing, and 1 hour for spring electrofishing.

Species	Gill Netting		Trap Netting		Fall Electrofishing		Spring Electrofishing	
	N	CPUE	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					28	28.0 (37)		
Threadfin Shad					64	64.0 (78)		
Channel Catfish	42	8.4 (40)						
Flathead Catfish	1	0.2 (100)						
White Bass	24	4.8 (15)						
Green Sunfish					5	5.0 (55)		
Warmouth					9	9.0 (37)		
Bluegill					294	294.0 (14)		
Longear Sunfish					43	43.0 (26)		
Redear Sunfish					45	45.0 (23)		
Largemouth Bass					198	198.0 (18)	47	47.0 (19)
Spotted Bass					58	58.0 (27)	7	7.0 (49)
Smallmouth Bass					1	1.0 (100)		
White Crappie	13	2.6 (63)	4	0.8 (47)				
Black Crappie			1	0.2 (100)				

APPENDIX B – Map of sampling locations



Location of sampling sites, Moss Reservoir, Texas, 2022-2023. Trap net, gill net, fall electrofishing, and spring electrofishing stations are indicated by T, G, F and S, respectively. Water level was 3 feet low during fall sampling and above full pool during spring sampling.

APPENDIX C – Historical catch rates

Historical catch rates of targeted species by gear type for Moss Reservoir, Texas, 1987 - 2022.

Gear	Species	Year										Avg.
		1987 ^a	1990 ^a	1994 ^a	1997	2002	2006	2010	2014	2018	2022	
Gill Netting* (fish/net night)	Channel Catfish	9.6	11.0	6.6	3.8	4.6	1.4	3.2	3.5	1.8	8.4	5.4
	White Bass	0.6	1.8	3.6	2.0	3.8	1.8	0.6	5.3	3.4	4.8	2.8
	White Crappie	0.8	2.4								2.6	1.9
Fall Electrofishing (fish/hour)	Gizzard Shad	20.0	43.0	20.0	36.0	8.0	28.0	23.0	82.5	59.0	28.0	34.8
	Threadfin Shad	0.0	273.0	32.0	0.6	7.0	173.0	3.0	0.0	5.0	64.0	55.8
	Green Sunfish	38.0	81.0	32.0	19.3	18.0	6.0	8.0	3.5	22.0	5.0	23.3
	Warmouth	6.7	18.0	24.7	7.3	23.0	10.0	15.0	8.0	10.0	9.0	13.2
	Bluegill	229.3	289.0	304.7	187.3	262.0	187.0	186.0	140.0	276.0	294.0	235.5
	Longear Sunfish	73.3	94.0	28.0	18.7	53.0	31.0	46.0	71.0	57.0	43.0	51.5
	Redear Sunfish	4.7	28.0	29.3	19.3	18.0	18.0	22.0	16.0	23.0	45.0	22.3
	Smallmouth Bass	0.0	5.0	0.0	0.0	0.0	2.0	0.0	0.0	1.0	1.0	0.9
	Spotted Bass	40.7	73.0	40.7	34.7	69.0	48.0	50.0	101.5	57.2	58.0	57.3
	Largemouth Bass	51.3	117.0	108.7	94.0	55.0	126.0	47.0	126.5	98.1	198.0	102.2
Spring Electrofishing** (fish/hour)	Spotted Bass									11.0	7.0	9.0
	Largemouth Bass									53.0	47.0	50.0
Trap Netting (single cod; fish/net night)	White Crappie	0.7	0.8	1.8	0.4	0.5	4.6	7.2		12.1	0.8	3.2
	Black Crappie										0.2	1.0
Trap Netting (dual cod; fish/net series)	White Crappie								13.6			13.6

* Gill netting was conducted in the spring of the following year from 2002 forward.

** Spring electrofishing sites were subjectively selected and conducted in the spring of the following year.

^a All sampling stations for all gear types were subjectively selected.



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