

# Moss Reservoir

## 2018 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

Prepared by:

Greg Cummings, Assistant District Management Supervisor  
and  
Dan Bennett, District Management Supervisor

Inland Fisheries Division  
Denison District, Pottsboro, Texas

Carter Smith  
Executive Director

Craig Bonds  
Director, Inland Fisheries

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## Survey and Management Summary

Fish populations in Moss Reservoir were surveyed in 2018 using electrofishing and trap netting and in 2019 using gill netting and bass-only electrofishing. Historical data are presented with the 2018-2019 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

**Reservoir Description:** Moss Reservoir is a 1,140-acre impoundment on Fish Creek, a tributary of the Red River, in Cooke County. From 2016 through 2018, water level was at or below conservation level. Since fall 2018, water level has been at or above conservation level. 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 2014 survey report included recommendations to stock Threadfin Shad, consider changing the harvest regulations on black bass, encourage the harvest of Spotted Bass, promote the fishery, and educate the public on the threats of invasive species.

### Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir with low abundance. Electrofishing catch of Gizzard Shad was moderate, 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.
- **Catfishes:** Gill net catch rate of Channel Catfish was low in 2019; however, many were observed during spring electrofishing for bass. No Flathead Catfish were sampled.
- **White Bass:** White Bass were present in the reservoir in moderate abundance.
- **Black basses:** Largemouth Bass were moderately abundant, with limited legal-size fish available to anglers. Spring bass-only sampling revealed a few larger bass were available. Spotted Bass abundance was moderate, with few fish over 12-inches present.
- **White Crappie:** White Crappie were moderately abundant with legal-size fish available to anglers. Most crappie reached legal size within three years.

**Management Strategies:** Encourage the City of Gainesville to offer a daily boat access permit. Continue efforts to 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, and electrofishing surveys in 2022-2023. Vegetation surveys will be conducted annually.

## Introduction

This document is a summary of fisheries data collected from Moss Reservoir in 2018-2019. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2018-2019 data for comparison.

## Reservoir Description

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. Heavy rains during April-May 2015 caused the water levels to remain above conservation level through May 2015 (Figure 1). From 2016 through 2018, water level was at or below conservation level. Since fall 2018, water level has been at or above conservation level. 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 48.4 (Texas Commission on Environmental Quality 2018). A TSI chl-a index between 40 and 50 is considered mesotrophic. Average Secchi disk transparency was 146 cm for 2016 and the TSI (SD) > TSI (Chl-a) indicated the presence of non-algal turbidity as per Carlson's Trophic State Index (Texas Commission on Environmental Quality 2018). 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. It is currently found sparsely on the northern side of the reservoir and not problematic. Yellow floating-heart, another invasive, has increased since 2010 and spread to numerous small areas around the reservoir. Yellow floating-heart has been treated with herbicide applications in 2013, 2014, 2016, 2017, and 2018 with limited success.

## 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. Bank fishing access near each boat ramp was augmented by a fishing pier. Boarding piers/docks are available at each 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/](http://www.tpwd.gov/fishboat/fish/recreational/lakes/moss/).

## Management History

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Moczygemba and Hysmith 2015) included:

1. Stock adult Threadfin Shad to ensure their presence in the fishery.

**Action:** Threadfin Shad were stocked in 2016.

2. Reduce overabundance of sublegal black bass.

**Action:** A harvest regulation change for Largemouth Bass and Spotted Bass was discussed internally, but never made it to the public comment stage. An online angler survey showed preference for a 16-inch maximum size limit. Signs encouraging the harvest of Spotted Bass were placed at both public ramps.

3. Promote fishing at Moss Reservoir.

**Action:** Social media posts have advertised Largemouth Bass stockings and the results of the online angler survey regarding black bass regulations.

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. A comprehensive treatment plan to control yellow floating-heart was implemented in 2018, with limited success.

**Harvest regulation history:** Sport fishes in Moss Reservoir are currently managed with statewide regulations (Table 3).

**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 2018. Contractors treated the plants in 2016 and 2017. Yellow floating-heart is still present in various sections of the reservoir.

**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 (Moczygemba and Hysmith 2015). 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 2017).

**Electrofishing** – Largemouth Bass, Spotted Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.0 hours at 12, 5-min stations). Five additional stations were sampled for black bass only to meet OBS objectives (0.4 hours at 5, 5-minute 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 8 randomly-selected fish (range 13.0 to 14.9 inches).

**Trap netting** – White 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). Ages for White Crappie were determined using otoliths from 13 randomly-selected fish (range 9.0 to 10.9 inches).

**Gill netting** – Channel Catfish and White Bass 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 2014. Vegetation surveys were conducted in 2010–2019 to monitor native aquatic vegetation and yellow floating-heart. Habitat was assessed with a modified digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

**Water level** – Source for water level data was the United States Geological Survey (USGS 2019).

## Results and Discussion

**Habitat:** A habitat survey was last conducted in 2014 (Moczygemba and Hysmith 2015). Littoral zone structural habitat consisted primarily of rocky and natural shoreline with lesser amounts of bulkhead, dead trees, and native emergent vegetation. In 2018, native vegetation covered approximately 26% of the reservoir's surface area compared to 0.8% coverage by non-native vegetation (Table 6). Yellow floating-heart has been steadily expanding in coverage since 2010. In spring 2019, yellow floating-heart covered 3.4 acres (0.3 %). The reduction from 6.2 acres in April 2017 could have been due to treatment with a new herbicide (ProcellaCOR®) in 2018, but elevated, turbid water from spring rains could have been contributing factors.

**Prey species:** Electrofishing catch rates of Bluegill and Gizzard Shad were 276.0/h and 59.0/h, respectively. Both species had CPUE above the historical average in 2018 (Appendix C). Gizzard Shad IOV was poor, indicating that only 15% of Gizzard Shad were available to existing predators; this was lower than IOV estimates in previous years (Figure 2). Total CPUE of Bluegill in 2018 was higher than previous surveys, and size structure continued to be dominated by small individuals (Figure 3). Threadfin Shad continued to be present in low numbers despite the management stocking in 2016.

**Channel Catfish:** The gill net catch rate of Channel Catfish was 1.8/nn in 2019, less than previous surveys (Figure 4). No Channel Catfish over 20-inches in length were sampled in 2019, unlike the previous two surveys in 2011 and 2014.

**White Bass:** The gill net catch rate of White Bass was 3.4/nn in 2019 (Figure 5). Legal size White Bass (10-inches) were available to anglers. Body condition declined with fish size.

**Black Basses:** The electrofishing catch rate of Largemouth Bass was 98.1/h in 2018, lower than the 126.5/h in 2014. Size structure has been on the low side as PSD varied from 41 to 50 since 2010 (Figure 6). Growth of Largemouth Bass in Moss Reservoir was good in 2018; average age at legal length (14 inches) was 2.6 years (N = 8; range = 2 – 5 years). Body condition in 2018 was average as relative weight ranged between 76 and 111. Few legal-size Largemouth Bass were collected as 16 percent of stock size fish were  $\geq 14$  inches, similar to 2014 (15 percent).

Despite low fall electrofishing catch rates of legal-size Largemouth Bass, tournament data provided by a local bass club in 2016 confirmed angler catches of fish  $> 8$  pounds. In addition, a daytime bass-only electrofishing survey was conducted in spring 2019 to determine if larger bass were present in Moss Reservoir. While fewer Largemouth Bass were sampled (53.0/h), the size structure was better (PSD = 70, Figure 7), as is typical with spring electrofishing. A higher proportion of legal-size Largemouth Bass were collected with 43 percent of stock size fish  $\geq 14$  inches. Four bass were  $\geq 20$  inches in length. The electrofishing catch rate of Spotted Bass declined to 11.0/h in spring 2019 (Figure 9).

The electrofishing catch rate of Spotted Bass was 57.2/h in fall 2018, lower than the 101.5/h in 2014. Size structure improved since the last survey as PSD was 21 in 2018, compared to 11 in 2014 (Figure 8). Body condition was average for smaller size classes and poor for size classes  $\geq 10$  inches. Spotted Bass have rarely exceeded 14 inches in Moss Reservoir, and the majority sampled were below 12 inches.

Previous reports suggest an overabundance of black bass  $\leq 12$  inches in length in Moss Reservoir (Moczygemba and Hysmith 2011; 2015). Alteration of harvest regulations was considered to reduce the number of smaller bass. In 2016, an online angler survey targeting bass anglers on Moss Reservoir inquired about harvest regulation preferences for black bass. Thirty-nine anglers responded with a mix of tournament (N=15) and non-tournament (N=24) anglers. Most anglers first-choice was for a 16-inch maximum length limit with either a 5- or 10-fish bag limit. A majority said they would harvest bass  $< 14$  inches if allowed. Summarized results of the survey are in Appendix D. To date, a proposal for an alternative harvest regulation for black bass has not reached the public comment stage.

**White Crappie:** The trap net catch rate of White Crappie was 12.1/nn in 2018, higher than in 2010 (7.2/nn) and well above the historical average (3.5/nn, Appendix C). Legal length (10 inches) crappie were available to anglers, and size structure was good with a PSD of 90 (Figure 10). Mean relative weight was below 90 for most size classes in 2018, similar to values observed in 2010. Average age at legal length for White Crappie was 2.8 years (N = 13, range = 2 – 3 years). The catch rate and precision of 10 net nights in 2018 (single-cod) were similar to the 10 net series in 2014 (dual-cod). This showed that increased effort alone with single-cod trap nets was sufficient to achieve our OBS objectives for White Crappie.

# Fisheries Management Plan for Moss Reservoir, Texas

Prepared – July 2019

**ISSUE 1:** The City of Gainesville charges \$35 for an annual boat access permit. No daily fee is available, potentially limiting anglers from accessing the lake. This would include 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.

**ISSUE 2:** Yellow floating-heart has been expanding in coverage since 2010. The plant is particularly problematic to homeowners who have shallow water surrounding their boat docks and yards. Control has proven to be difficult with traditional herbicides.

## MANAGEMENT STRATEGY

1. Continue to work with AHE team to request and evaluate treatments of yellow floating-heart with ProcellaCOR® herbicide.
2. Conduct vegetation surveys after treatment and annually to assess aquatic vegetation coverage.

**ISSUE 3:** Data suggests that there is an overabundance of black bass  $\leq 12$  inches in Moss Reservoir. Electrofishing data typically under-represent the abundance of Largemouth Bass greater than 20 inches, while anglers report catches above this size.

## MANAGEMENT STRATEGIES

1. Encourage anglers to report qualifying catches to the revamped ShareLunker program, in order to document catches of Largemouth Bass  $\geq 20$  inches.
2. Continue collecting angler-volunteered data, especially tournament results.
3. Continue to encourage harvest of Spotted Bass and seek a 16-inch maximum length limit for Largemouth Bass with a five-fish combined limit for black bass.
4. Stock FLMB brooders when available and conduct genetic sample in 2022 to determine success of FLMB broodfish stockings in 2010 and 2018.

**ISSUE 4:** Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.



## MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to maintain signage at access points around the reservoir.
2. Educate the public about invasive species through the use of media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups.
4. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

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

### Sport fish, forage fish, and other important fishes

Sport fishes in Moss Reservoir include Channel Catfish, White Bass, Spotted Bass, Largemouth Bass, and White Crappie. Known important forage species include Gizzard and Threadfin Shad and Bluegill.

### 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 2018. 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”. 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  $\leq 25$  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.

**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. 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.

**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”. Trend data on CPUE-TOTAL, size structure, age and growth, and body condition have been collected at four-year intervals with fall trap netting. Continuation of this strategy will allow for determination of any

large-scale changes in the White Crappie population. A minimum of 5 randomly selected single-cod trap nets will be sampled for one net-night each with sampling objectives of 50 stock-size White Crappies and 13 between 10 and 11 inches for aging. An additional five random sites will be sampled if required, with a maximum of 10 net-nights sampled.

**Sunfish and Shad:** Bluegill and Gizzard and Threadfin Shad are the primary forage 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.

The proposed sampling schedule for important sport fish and forage is located in Table 7.

## 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.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and Gizzard Shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- 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.
- Moczygemba, J.H. and B.T. Hysmith. 2011. Statewide freshwater fisheries monitoring and management program survey report for Moss Reservoir, 2010. Texas Parks and Wildlife Department, Federal Aid Report F-221-M-1, Austin.
- Moczygemba, J.H. and B.T. Hysmith. 2015. Statewide freshwater fisheries monitoring and management program survey report for Moss Reservoir, 2014. Texas Parks and Wildlife Department, Federal Aid Report F-221-M-5, Austin.
- Texas Commission on Environmental Quality. 2018. Trophic classification of Texas reservoirs. Draft 2016 Texas Integrated Report for Clean Water Act Sections 305(b) and 303 (d), Austin. 15 pp.
- United States Geological Society (USGS). 2019. National water information system: Web interface. Available: <http://waterdata.usgs.gov/tx/nwis> (May 2019).

## Tables and Figures

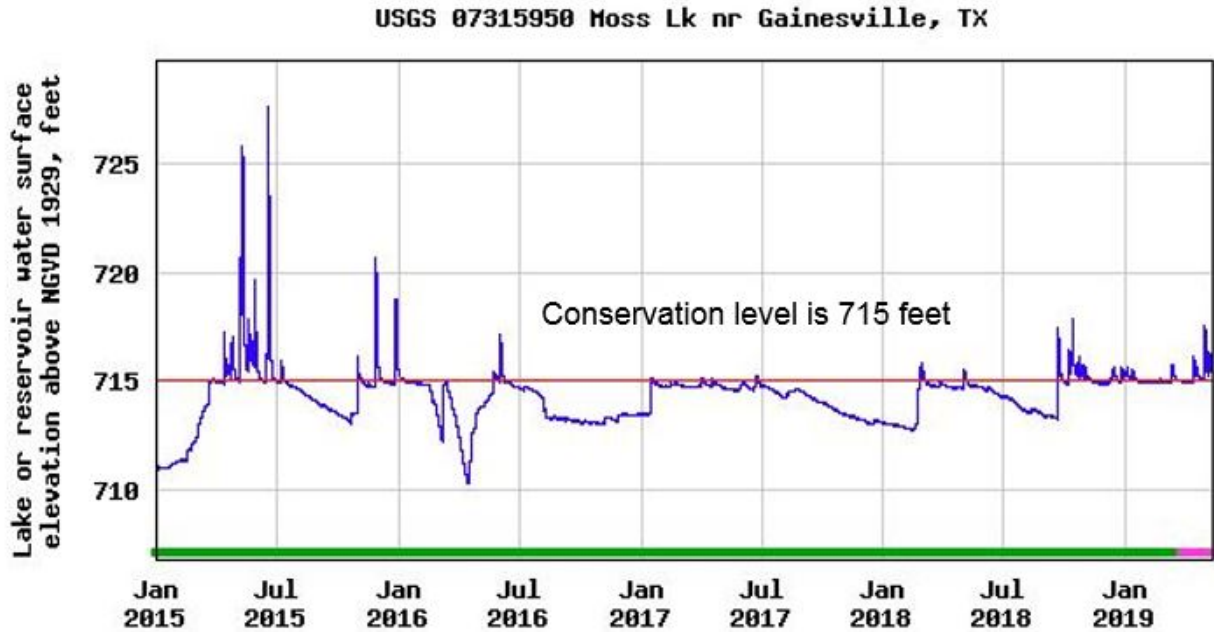


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Moss Reservoir, Texas.

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	255 $\mu\text{S}/\text{cm}$

Table 2. Boat ramp characteristics for Moss Reservoir, Texas, August, 2014. Reservoir elevation at time of survey was 711.12 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)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5 <sup>a</sup>	14-inch minimum
Bass: Spotted	5 <sup>a</sup>	None
Bass, Smallmouth	5 <sup>a</sup>	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

<sup>a</sup> 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.

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Life Stage</b>
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 2018–2019.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE–Stock	RSE-Stock $\leq 25$
	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 <sup>a</sup>	Abundance	CPUE–Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad <sup>a</sup>	Abundance	CPUE–Total	RSE $\leq 25$
	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

<sup>a</sup> No additional effort will be expended to achieve an RSE  $\leq 25$  for CPUE of Bluegill 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 aquatic vegetation, Moss Reservoir, Texas, 2014, 2016, 2017, 2018 and 2019. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2014	2016	2017	2018	2019
Native submersed <sup>a</sup>	72.5 (6.3)			270.4 (23.7)	
Native floating-leaved <sup>b</sup>				15.0 (1.3)	
Native emergent <sup>c</sup>	<1.0 (0.1)			7.0 (0.6)	
Non-native					
Yellow floating-heart (Tier II)*	2.2 (0.2)	2.6 (0.2)	6.2 (0.5)**	9.0 (0.8)	3.4 (0.3)**
Hydrilla (Tier III)*	<0.1 (<0.1)			trace	

<sup>a</sup> chara, coontail

<sup>b</sup> American pondweed

<sup>c</sup> water willow

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

\*\* Survey was conducted in spring.



## Gizzard Shad

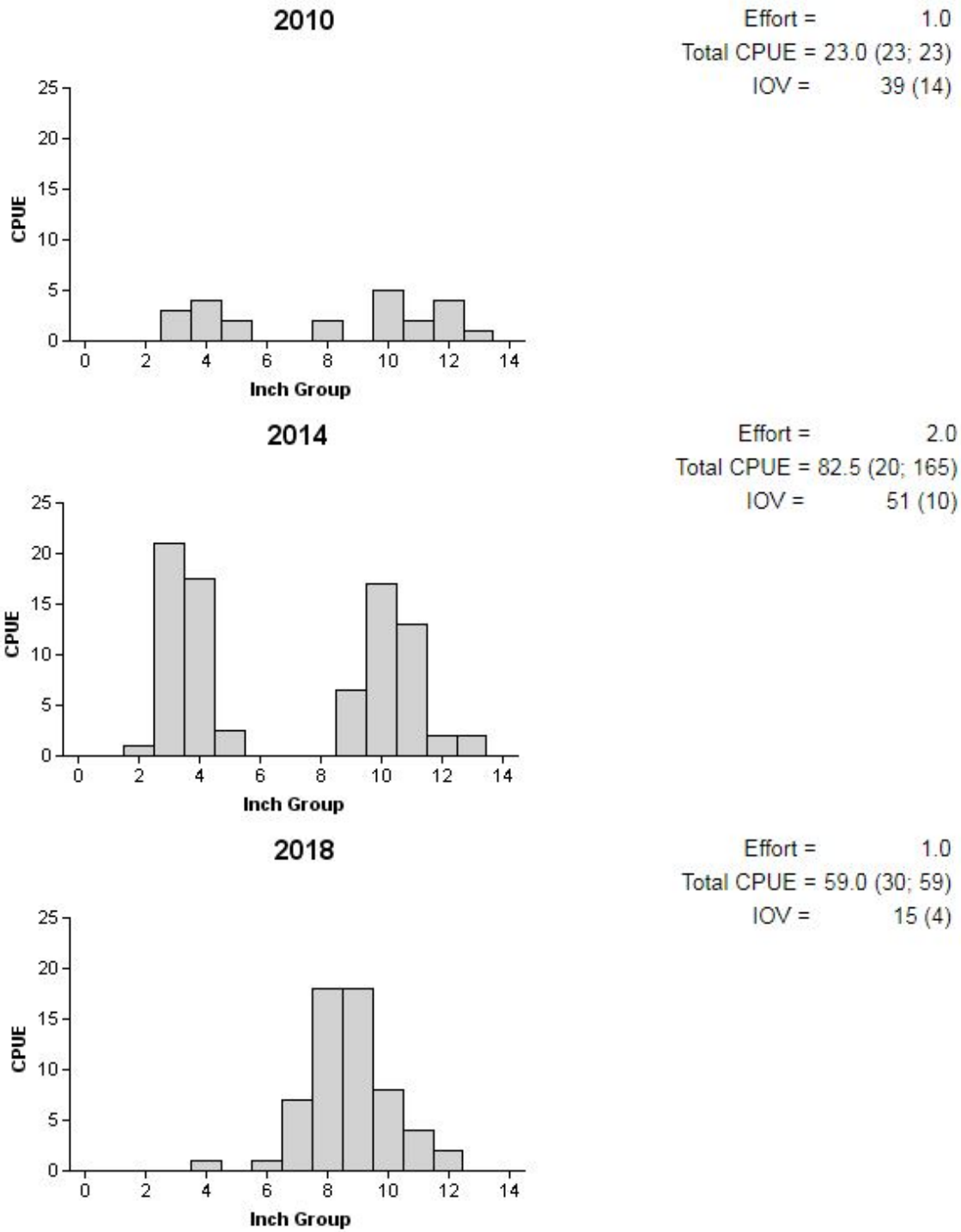


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2010, 2014, and 2018.

## Bluegill

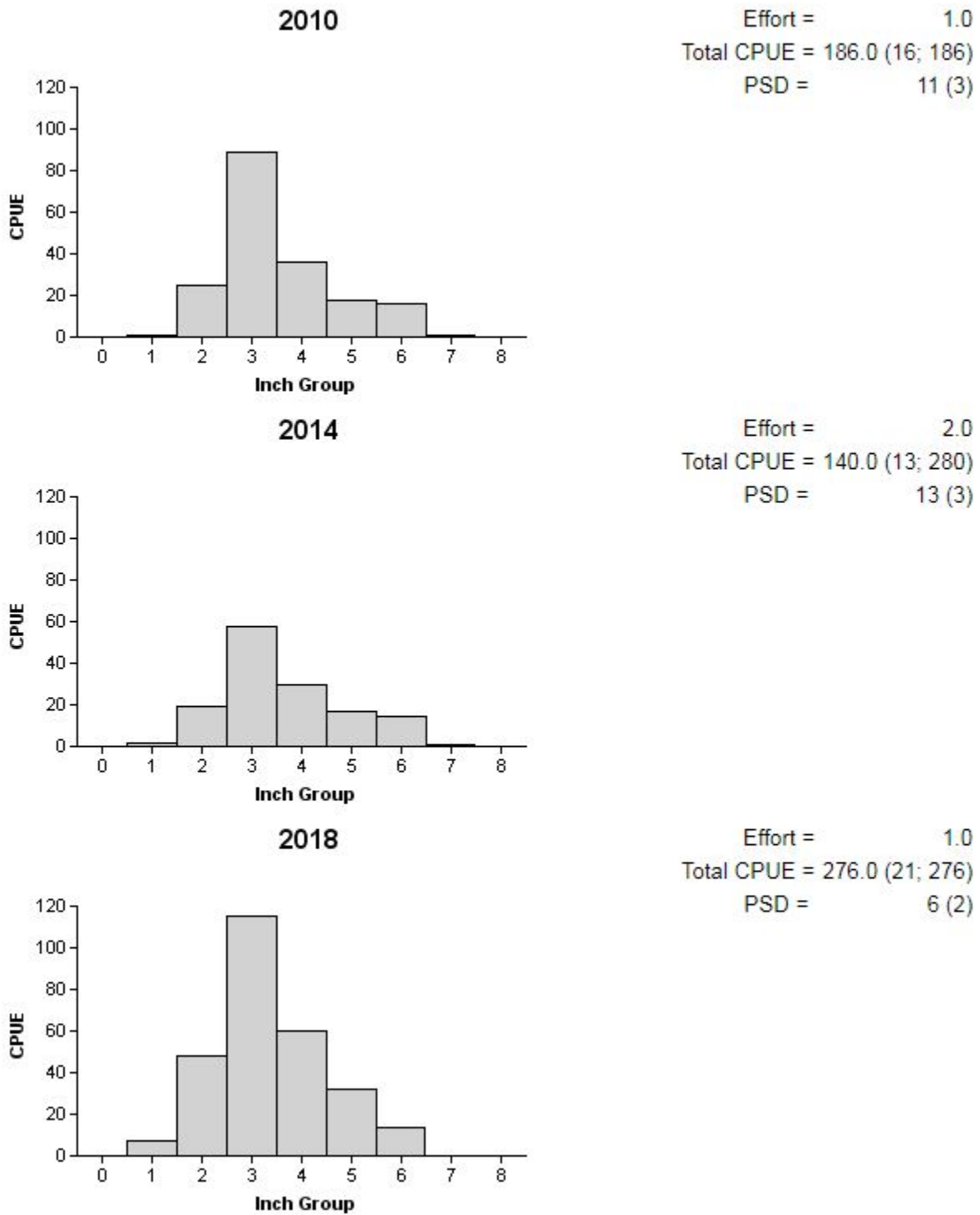


Figure 3. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2010, 2014, and 2018.

## Channel Catfish

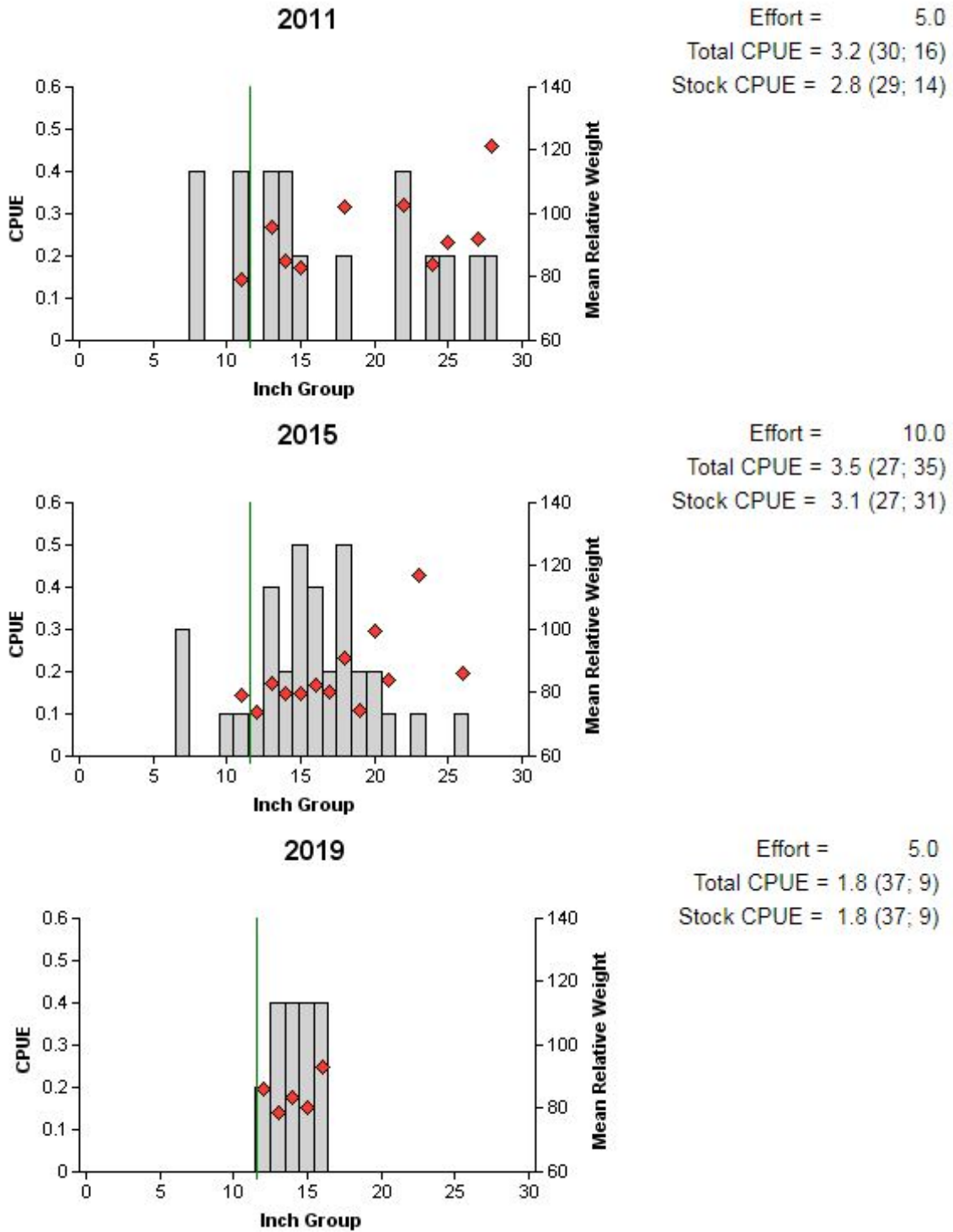


Figure 4. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE in parentheses) for spring gill net surveys, Moss Reservoir, Texas, 2011, 2015, and 2019. Vertical line indicates minimum length limit.

## White Bass

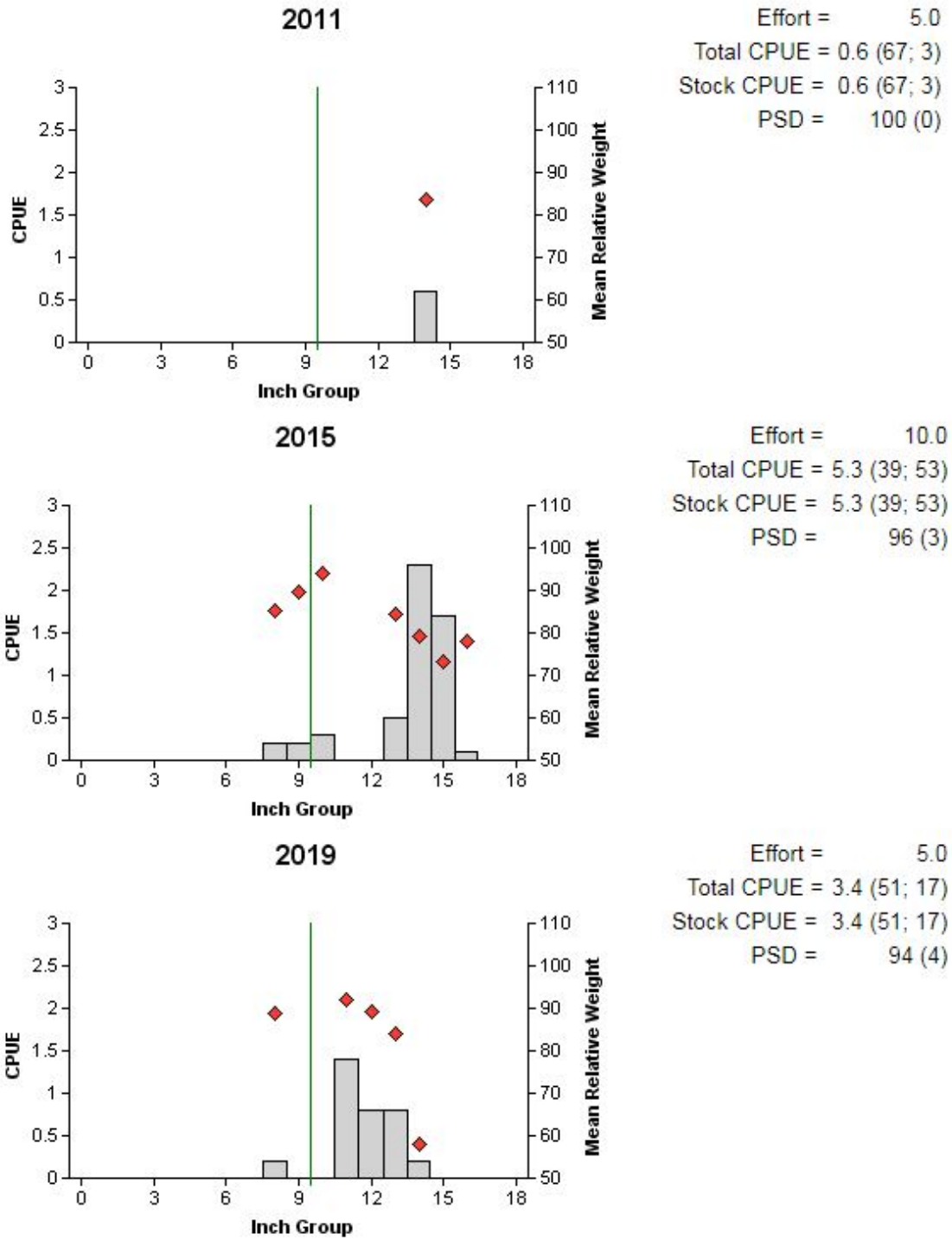


Figure 5. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Moss Reservoir, Texas, 2011, 2015, and 2019. Vertical line indicates minimum length limit.

## Largemouth Bass

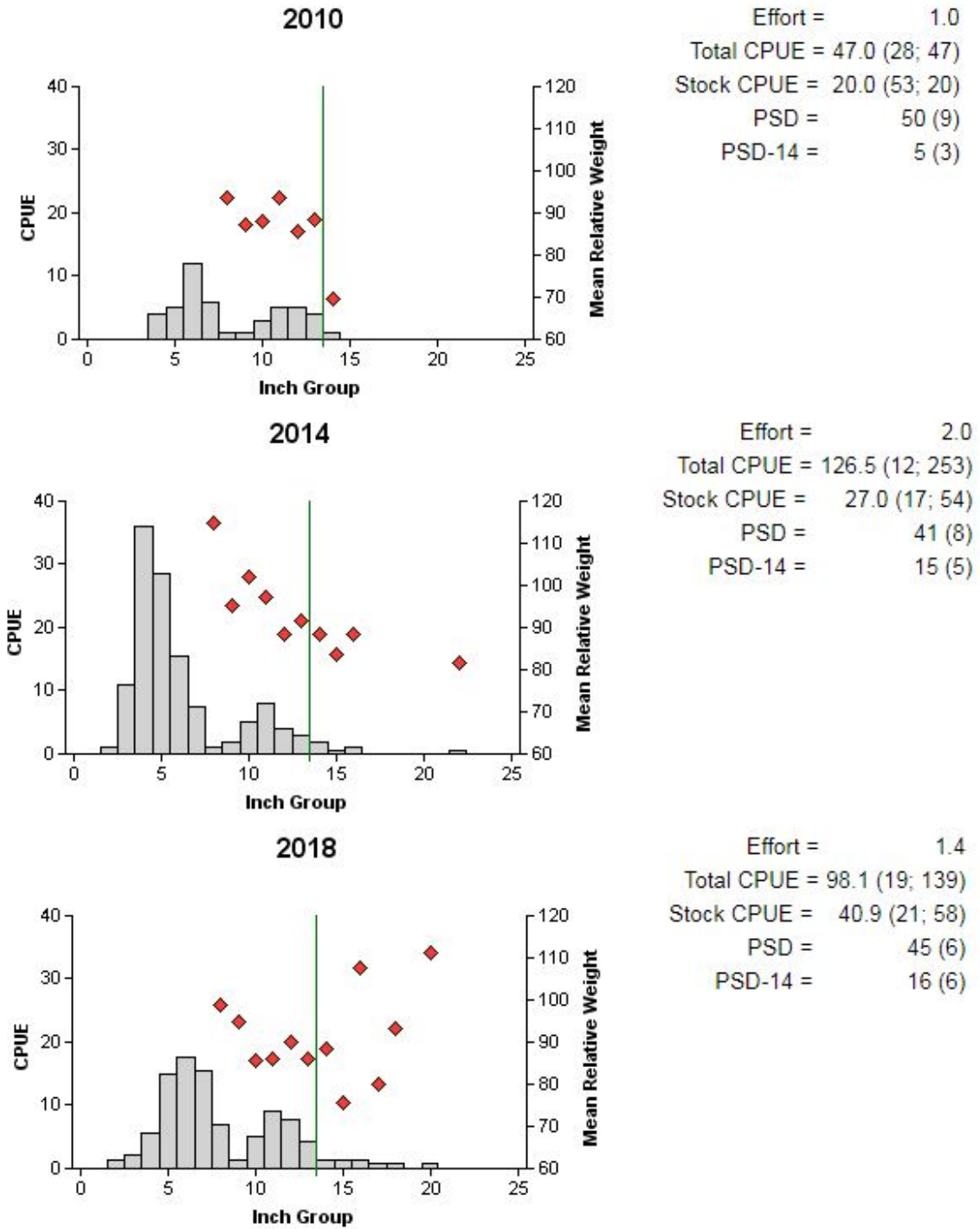


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2010, 2014, and 2018. Vertical line indicates minimum length limit.

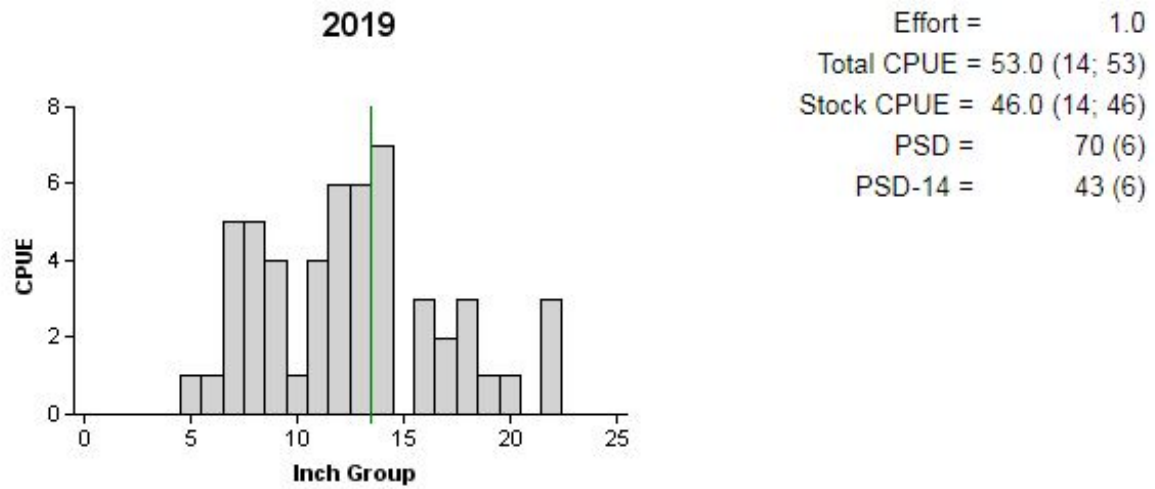


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for daytime spring electrofishing surveys, Moss Reservoir, Texas, 2019. Vertical line indicates minimum length limit.

## Spotted Bass

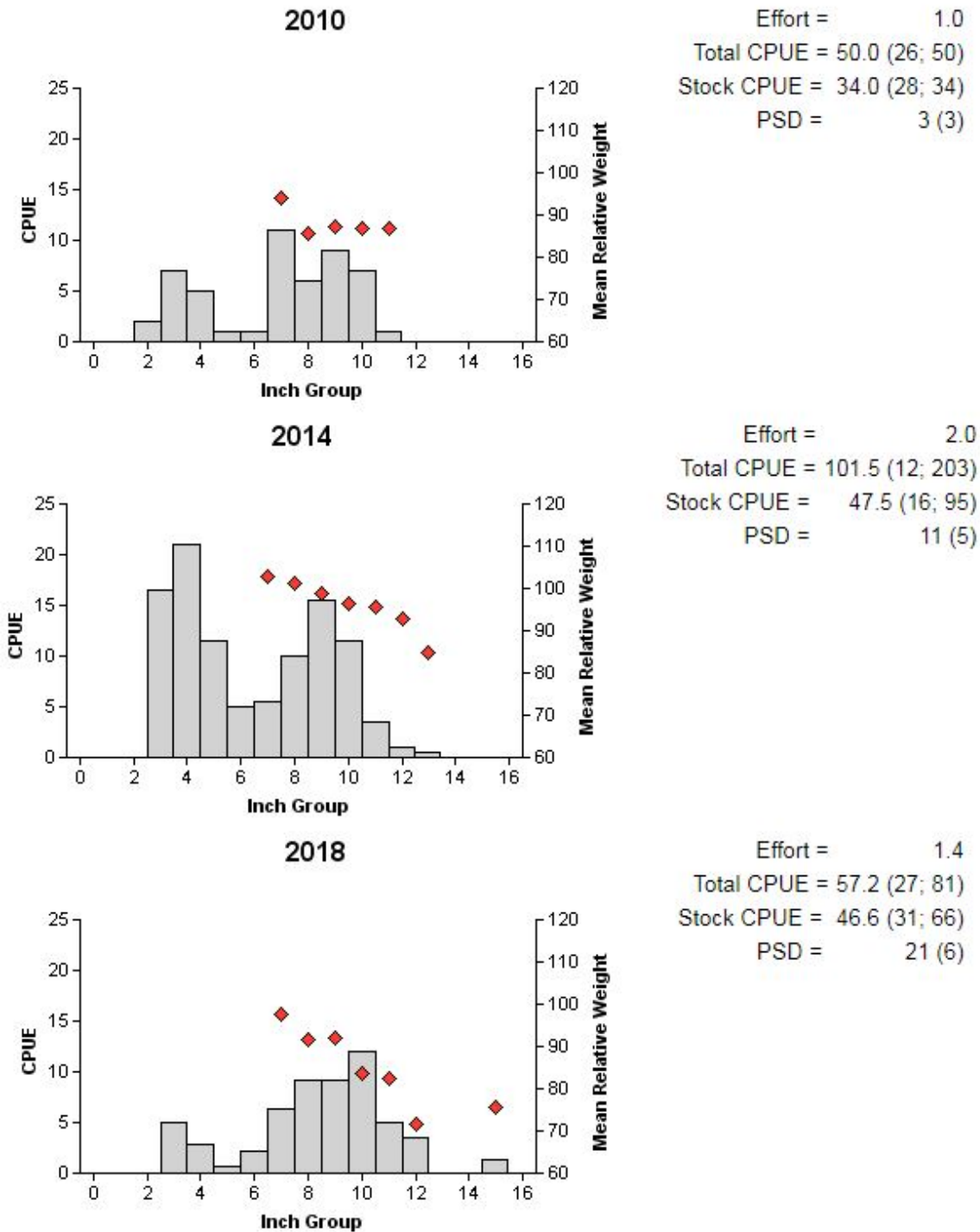


Figure 8. Number of Spotted Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 2010, 2014, and 2018.

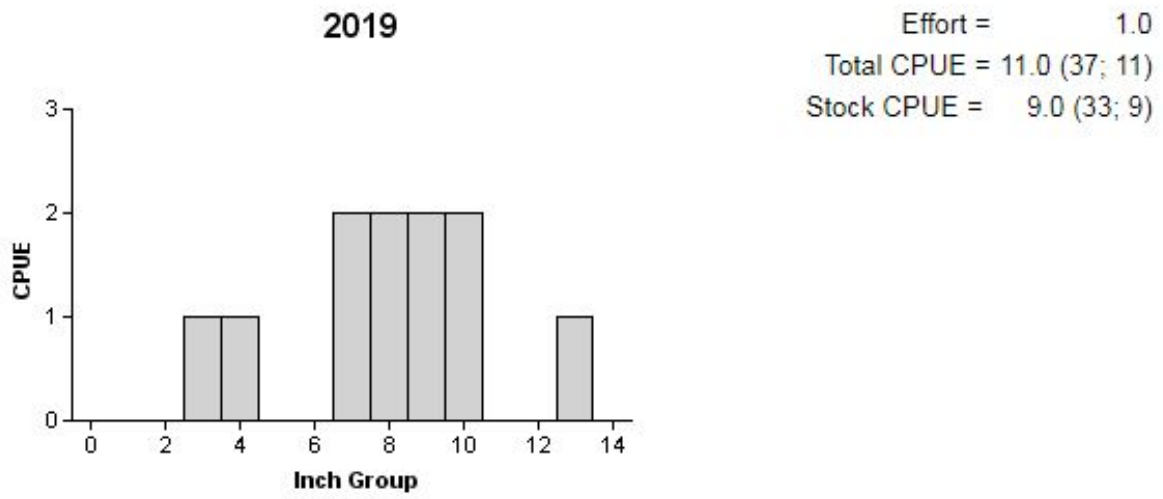


Figure 9. Number of Spotted Bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE are in parentheses) for daytime spring electrofishing surveys, Moss Reservoir, Texas, 2019.



## White Crappie

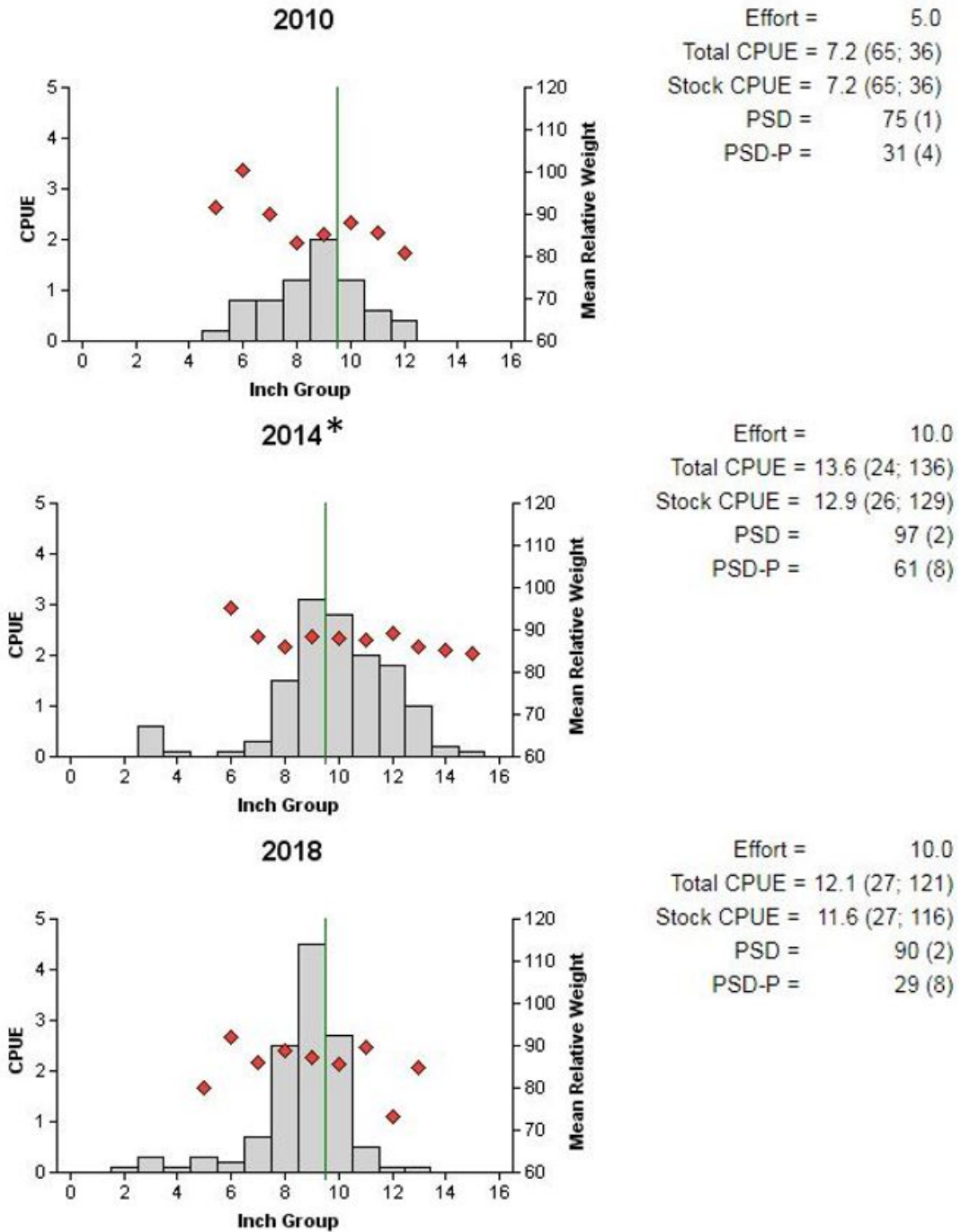


Figure 10. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Moss Reservoir, Texas, 2010, 2014, and 2018. The 2014 survey utilized dual-cod 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 7. 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. Standard survey denoted by S and additional survey denoted by A.

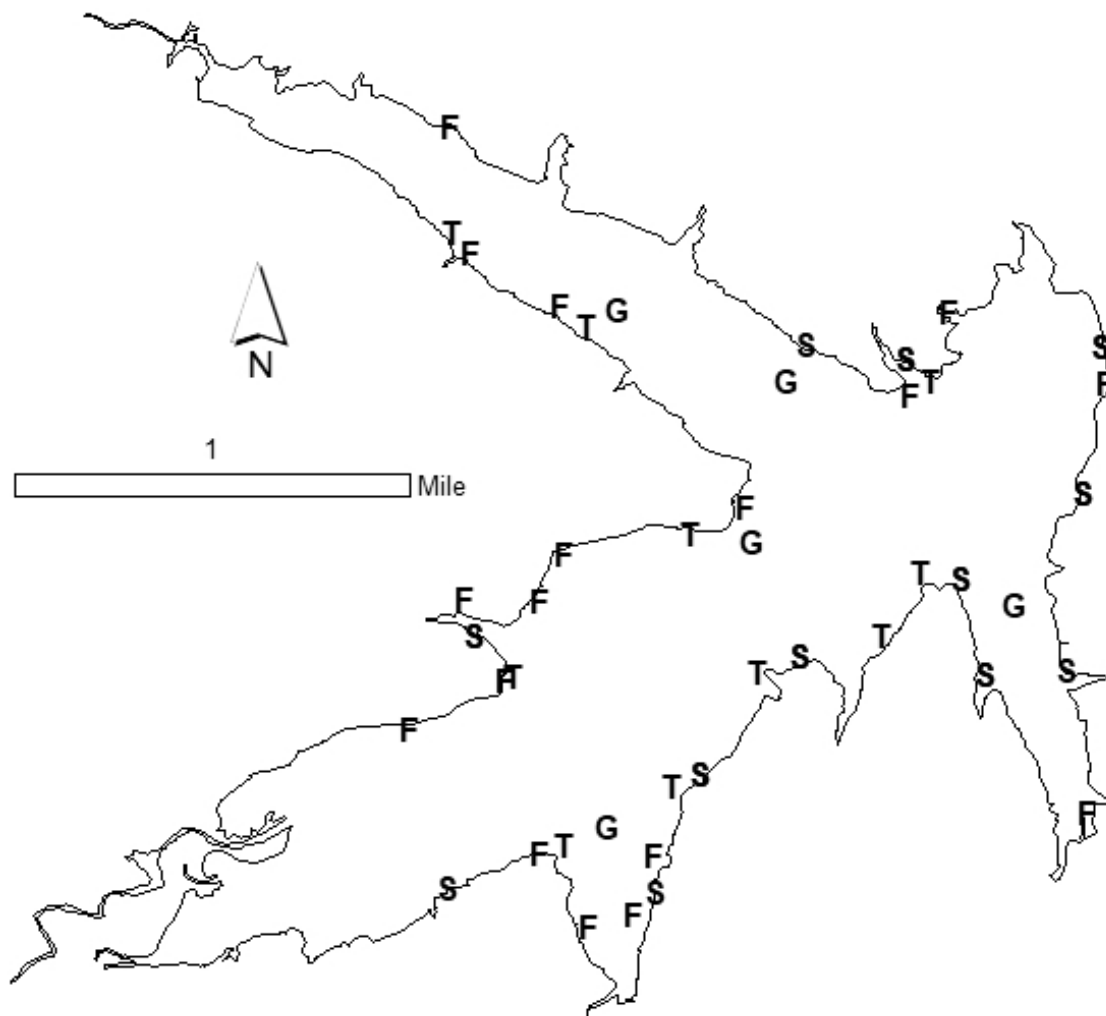
	Survey year			
	2019-2020	2020-2021	2021-2022	2022-2023
Angler Access				S
Structural Habitat				
Vegetation	A	A	A	S
Electrofishing				S
Trap netting				S
Gill netting				S
Creel survey				
Report				S

## 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, 2018-2019. Sampling effort was 5 net nights for gill netting, 10 net nights for trap netting, 1.4 hours 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					59	59.0 (30)		
Threadfin Shad					5	5.0 (81)		
Channel Catfish	9	1.8 (37)						
White Bass	17	3.4 (51)						
Green Sunfish					22	22.0 (37)		
Warmouth					10	10.0 (32)		
Orangespotted Sunfish					1	1.0 (100)		
Bluegill					276	276.0 (21)		
Longear Sunfish					57	57.0 (29)		
Redear Sunfish					23	23.0 (30)		
Largemouth Bass					64	64.0 (17)	53	53.0 (14)
Spotted Bass					53	53.0 (40)	11	11.0 (37)
Smallmouth Bass					1	1.0 (100)		
White Crappie			121	12.1 (27)				
Black Crappie			2	0.2 (67)				

## APPENDIX B – Map of sampling locations



Location of sampling sites, Moss Reservoir, Texas, 2018-2019. Trap net, gill net, fall electrofishing, and spring electrofishing stations are indicated by T, G, F and S, respectively. Water level was near full pool at time of sampling.

## APPENDIX C – Historical catch rates

Historical catch rates of targeted species by gear type for Moss Reservoir, Texas, 1987- 2018.

Gear	Species	Year									
		1987 <sub>a</sub>	1990 <sub>a</sub>	1994 <sub>a</sub>	1997	2002	2006	2010	2014	2018	Avg.
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	5.1
	White Bass	0.6	1.8	3.6	2.0	3.8	1.8	0.6	5.3	3.4	2.5
Fall Electrofishing (fish/hour)	Gizzard Shad	20.0	43.0	20.0	36.0	8.0	28.0	23.0	82.5	59.0	35.5
	Threadfin Shad	0.0	273.0	32.0	0.6	7.0	173.0	3.0	0.0	5.0	54.8
	Green Sunfish	38.0	81.0	32.0	19.3	18.0	6.0	8.0	3.5	22.0	25.3
	Warmouth	6.7	18.0	24.7	7.3	23.0	10.0	15.0	8.0	10.0	13.6
	Bluegill	229.3	289.0	304.7	187.3	262.0	187.0	186.0	140.0	276.0	229.0
	Longear Sunfish	73.3	94.0	28.0	18.7	53.0	31.0	46.0	71.0	57.0	52.4
	Redear Sunfish	4.7	28.0	29.3	19.3	18.0	18.0	22.0	16.0	23.0	19.8
	Smallmouth Bass	0.0	5.0	0.0	0.0	0.0	2.0	0.0	0.0	1.0	0.9
	Spotted Bass	40.7	73.0	40.7	34.7	69.0	48.0	50.0	101.5	57.2	57.2
Largemouth Bass	51.3	117.0	108.7	94.0	55.0	126.0	47.0	126.5	98.1	91.5	
Spring Electrofishing** (fish/hour)	Spotted Bass									11.0	11.0
	Largemouth Bass									53.0	53.0
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	3.5
										13.6	13.6
Trap Netting (dual cod; fish/net series)	White Crappie										

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

\*\* Spring electrofishing was conducted in the spring of the following year.

<sub>a</sub> All sampling stations for all gear types were subjectively selected.

## APPENDIX D – Online angler opinion survey results

Select statistics from an online angler opinion survey for Moss Reservoir, Texas, 2016.

Proportion of responses to survey item: “Under which of the following combined, daily bag limits for black bass (Largemouth, Alabama, Spotted, Smallmouth) would you be most likely to keep and eat bass?”  
Number in parenthesis indicates the total number of respondents in each category.

Selection	Non-tournament (24)	Tournament (15)	All Anglers (39)
I would not keep bass regardless of the daily bag.	33.3	50.0	39.5
5 fish daily bag limit	25.0	21.4	23.7
8 fish daily bag limit	20.8	14.3	18.4
10 fish daily bag limit	20.8	14.3	18.4

Proportion of responses to survey item: “Please rank the following regulations for black bass according to your most preferred choice.”

All Anglers (39)			
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>
Keep the current regulation	26	11	26
daily bag 5, 2 $\geq$ 18 inches	9	6	9
daily bag 10, 2 $\geq$ 18 inches	6	14	14
daily bag 10; no MLL	17	6	0
16-inch max, daily bag 5, ShareLunker $\geq$ 13lbs	23	17	6
16-inch max, daily bag 10, ShareLunker $\geq$ 13lbs	20	17	6

Tournament Anglers (15)			
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>
keep the current regulation	31	15	23
daily bag 5, 2 $\geq$ 18 inches	8	15	15
daily bag 10, 2 $\geq$ 18 inches	0	0	15
daily bag 10; no MLL	0	15	8
16-inch max, daily bag 5, ShareLunker $\geq$ 13lbs	54	8	8
16-inch max, daily bag 10, ShareLunker $\geq$ 13lbs	8	31	8



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