

# Aquilla Reservoir

## 2022 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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## Survey and Management Summary

Fish populations in Aquilla Reservoir were surveyed in 2020 and 2022 using electrofishing and in 2023 with trap netting and gill netting. Historical data are presented with the 2020-2023 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:** Aquilla Reservoir is a 3,066-acre impoundment supplied by Hackberry and Aquilla Creeks within the Brazos River Basin, Hill County. Water level fluctuated greatly between August 2019 and April 2023. Mean and maximum water depths are 16 and 60 feet respectively and the reservoir is considered eutrophic. Habitat features consisted of natural shoreline and flooded timber.

**Management History:** Important sportfishes include White Crappie, White Bass, Largemouth Bass and catfishes. An 18-inch minimum length limit was placed on Largemouth Bass in 1994 to provide additional protection of brood stock, improve densities, and maximize trophy potential. The regulation was replaced with the statewide 14-inch minimum length limit in 2012 based on un-changed population indices during the period, and a 2006 creel which showed continued under-sized harvest for the species. Hydrilla was discovered in 2004 and monitored annually through 2013 but is no longer present. Efforts to mitigate the loss of important fish habitat from sedimentation and loss of reservoir volume have included native vegetation plantings and transplanting (2012 through 2017) and placement of artificial fish habitats (2016) throughout the reservoir. The statewide regulation for Blue and Channel Catfish changed on September 1, 2021; the current regulations are in this report. Recent management efforts include maintaining aquatic invasive species (AIS) signage and educating constituents about the threat of AIS, especially Zebra Mussels, whenever possible.

### Fish Community

- **Prey species:** Forage abundance was low. Gizzard Shad were observed in below-average numbers while Threadfin Shad and sunfishes were not collected.
- **Catfishes:** Blue and Channel Catfish numbers were below the historical average and body condition was good to excellent for most length classes. Flathead Catfish were not collected.
- **White Bass:** White Bass catch rates were the highest on record for the species. Most individuals were legal length although body condition was only fair.
- **Largemouth Bass:** Largemouth Bass catch rates were the lowest on record for the species and only 12 individuals were collected. Most individuals were legal length and body condition was generally good to excellent.
- **Crappies:** White Crappie abundance was low. There were good numbers of legal-length White Crappie and body condition was excellent across length classes. Black Crappie were present in low numbers.

**Management Strategies:** Continue managing sportfishes at Aquilla Reservoir with statewide regulations. Conduct a daytime electrofishing survey in fall 2024 pending reservoir conditions. Conduct angler access, vegetation and daytime electrofishing surveys in 2026 and trap netting and gill netting surveys in 2027. Continue the placement of artificial fish habitat into freshwater reefs throughout the reservoir when possible; consider constructing spawning habitat in several areas of the reservoir to improve populations of nest spawners like sunfishes. Request supplemental Blue Catfish, Channel Catfish, Lonestar Bass and Bluegill when available, and work to educate the public about AIS issues and protect the reservoir from AIS introductions.

## Introduction

This document is a summary of fisheries data collected at Aquilla Reservoir from 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

Aquilla Reservoir is a 3,066-acre reservoir located in Hill County, Texas. The reservoir was constructed in 1982 by the United States Army Corps of Engineers (USACE) to serve as a source of municipal water and for flood control. The reservoir is in the Blackland Prairie Ecological Area and land use around the reservoir is primarily agricultural. The reservoir has a conservation pool of 537.5 feet above mean sea level, a mean and maximum depth of 16 and 60 feet and is eutrophic with a mean chl-a of 57.98 (Texas Commission on Environmental Quality 2022). Habitat at time of sampling consisted of natural shoreline, with expansive stands of flooded timber. Water level has risen to 10 feet above conservation pool once and fallen to 6 feet below conservation pool once since the last report was published (July 2019; Figure 1). Water level was at conservation pool during 2020 electrofishing, 6.5 feet low during 2022 electrofishing, 5 feet low during 2023 trap netting and over 6 feet low during March 2023 gill netting. Other descriptive characteristics for Aquilla Reservoir are in Table 1.

## Angler Access

Aquilla Reservoir has three public boat ramps (Dairy Hill, Old School and Hackberry) and no private boat ramps (Table 2). The Hackberry ramp is shallow due to sedimentation issues and is seldom used for launching anything other than small watercraft. Dairy Hill and Old School ramps are available to anglers at reservoir levels above 532 feet above mean sea level. Much of Aquilla's shoreline is accessible to anglers through USACE property; however convenient shore access is limited to the public boat ramp areas.

## Management History

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Baird and Tibbs 2019) included:

1. Discontinue native vegetation plantings and deploy artificial habitat structures in complexes (i.e., freshwater reefs) throughout the reservoir. Update the TPWD website with freshwater reef locations and GPS coordinates for anglers and constituents.
 

**Action:** Native vegetation plantings and transplanting was discontinued in 2018 due to consistent failure of these efforts from fluctuating water levels and conditions. No additional freshwater reefs have been deployed into the reservoir since the last report, and no updates have been necessary to the TPWD habitat page.
2. Cooperate with the USACE to maintain appropriate AIS signage, educate the public about AIS, make a speaking point about AIS when presenting to constituent and user groups and keep track of all inter-basin water transfer routes to facilitate potential AIS responses.
 

**Action:** Invasive species signage was posted at Aquilla Reservoir during summer 2013 and has been maintained since that time. District biologists have continued to educate constituents about AIS in presentations, conversations and Facebook posts since the last report writing. Inter-basin water transfers are a permanent fixture in this report and will be updated as needed.
3. Perform a daytime electrofishing survey in fall 2020 to make up for the 2018 survey that was missed due to heavy rains and boat ramp closures.
 

**Action:** A daytime electrofishing survey was conducted during fall 2020 and data from that survey are part of this report.

**Harvest regulation history:** Sportfishes were managed with statewide regulations until 1994. From 1994 to 2012, Largemouth Bass were managed with an 18-inch minimum length limit, five fish daily bag, to provide additional protection of brood stock, improve densities, and maximize trophy potential. This regulation was removed in September 2012 and replaced with the current, Largemouth Bass statewide 14-inch minimum length limit, five fish daily bag regulation. The statewide regulation for Blue and Channel Catfish changed on September 1, 2021, and now the regulation is no minimum length limit; daily bag of 25 (in any combination – only 10 can be 20 inches or greater in length). The current regulations can be found in Table 3.

**Stocking history:** Blue Catfish, Florida Largemouth Bass and Coppernose Bluegill were stocked in the early to mid-1980s; no new stockings have occurred since 1985. The complete stocking history is in Table 4.

**Vegetation/habitat management history:** Loss of fish habitat has been attributed to sedimentation issues in the watershed and aging flooded timber in the reservoir (Tibbs and Baird 2015). In 2012, efforts were made to begin improving fish habitat by planting aquatic vegetation (pickerel weed, water willow and bulrush, reared at the Waco Wetlands aquatic vegetation nursery) at appropriate sites in the reservoir. Unfortunately, drought conditions over the next two years killed all the aquatic vegetation that was planted. Water willow and bulrush were transplanted from existing stands on the reservoir to appropriate shoreline sites in 2014 and 2017. Additionally, fish attractors (bamboo crappie condos and commercial Fishiding structures) were placed at strategic areas around the reservoir in 2016 to concentrate sportfishes for anglers. No additional structures have been deployed into the reservoir, but future management plans include artificial habitat additions when possible.

**Water transfer:** There are currently two permanent pumping stations that utilize a common intake structure and transfer water to other sites. The first is operated by the City of Cleburne and transfers untreated water to Lake Pat Cleburne to be used for municipal water supply. The other is operated by the Aquilla Water Supply Corporation, which provides water supply to a large rural area.

**Reservoir capacity:** Aquilla was impounded in 1983. Original plans calculated the reservoir's capacity at conservation pool (537.5 feet above mean sea level) to be 52,400 acre-feet. Recent reservoir capacity comparisons conducted by the Texas Water Development Board (TWDB) found the 2008 capacity to be 44,566 acre-feet. Further TWDB research indicated 84 to 218 acre-feet of reservoir volume is lost annually due to erosion and sedimentation from its watershed. See Tibbs and Baird (2015) for additional information.

## Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Aquilla Reservoir (Baird and Tibbs 2019). 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, except that electrofishing was conducted during day-time hours and trap netting was conducted during spring (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

**Electrofishing** – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by day-time electrofishing (0.75 hour at 8, 5-min stations) in fall 2020 and (0.8 hour at 9, 5-min stations) in fall 2022. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

**Trap netting** – White Crappie were collected by trap netting (10 net nights at 10 stations). The 2023 survey is the first spring-time trap netting survey completed on Aquilla Reservoir. Catch per unit effort (CPUE) for trap netting was recorded as the number of fish caught per net night (fish/nn).

**Gill netting** – Catfishes and White Bass were collected by gill netting (8 net nights at 8 stations). Catch per unit effort (CPUE) for gill netting was recorded as the number of fish caught per net night (fish/nn).

**Genetics** – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2022). Micro-satellite DNA analysis was used to determine genetic composition of individual fish since 2005. Electrophoresis analysis was used prior to 2005. Fin clips were taken for all Largemouth Bass collected (N = 12).

**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 last conducted by Tibbs and Baird (2011) and a vegetation survey was conducted, by random point method, in late summer 2022 (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:** The last structural habitat survey estimated 48.1 miles (98.9%) of natural shoreline, trace amounts of rock and bulk headed shorelines and 245 acres of standing timber (Tibbs and Baird 2011). Littoral zone habitat in summer 2022 was all natural shoreline (100% or 36 of 36 randomly selected shoreline points). Structural habitat was dominated by flooded timber and submerged vegetation was nonexistent.

**Prey species:** Gizzard Shad, Threadfin Shad, Bluegill and Longear Sunfish were collected with daytime electrofishing at rates of 672.0 fish/h, 930.0 fish/h, 7.5 fish/h and 12.0 fish/h respectively in 2020; Gizzard Shad were the only forage species collected in 2022 (251.0 fish/h; Figures 2, 3 and 4; Appendices A and B). The OBS goals for Gizzard Shad, Bluegill and Longear Sunfish, general monitoring to collect abundance (CPUE – Total; RSE  $\leq$  25) and size structure (PSD and length-frequency; N  $\geq$  50 stock) data, were achieved for Gizzard Shad completely in 2020 and partially in 2022 (Figure 2). No OBS goals were achieved for Bluegill or Longear Sunfish in 2020 or 2022 (Figures 3 and 4). The IOV for Gizzard Shad was good in both surveys and 80 to 91% of individuals were available to existing predators, similar to the IOV estimate from 2014 (Figure 2). Bluegill and Longear Sunfish catch rates were well below average in 2020 and the lowest on record (0.0 fish/h) in 2022 (Figures 3 and 4; Appendix B). No other forage species were observed.

**Catfishes:** Blue and Channel Catfish were collected at rates of 4.9 fish/nn and 1.8 fish/nn respectively in 2023 (Figures 5 and 6; Appendices A and B). Both catch rates were similar to historical averages (Appendix B). The OBS goals for these species, general monitoring to collect abundance (CPUE – Total; RSE  $\leq$  25) and size structure (PSD and length-frequency; N  $\geq$  50 stock) data, were not achieved since only 43 combined individuals were collected and RSE values were well above 25 (Figures 5 and 6). The Blue Catfish population was skewed toward stock to quality-length individuals with good to excellent body condition. The Channel Catfish population was appropriately balanced with highly variable body condition. Few individuals reached the preferred length categories (30-inches for Blues and 24-inches for Channels; Figures 5 and 6).

**White Bass:** White Bass were collected at a rate of 11.9 fish/nn in 2023 and this catch rate was nearly twice the historical average (Figure 7; Appendices A and B). The OBS goal for White Bass abundance (CPUE – Total; RSE  $\leq$  25) was not achieved (RSE = 42), but the goal for size structure (PSD and length-frequency; N  $\geq$  50 stock) was (N = 95 stock length individuals; Figure 7). The population was skewed toward larger individuals with many in the preferred (12-inch) to memorable (15-inch) length category. Body condition was excellent for the nine and ten-inch length classes, but poor for the remaining length classes (Figure 7).

**Largemouth Bass:** Largemouth Bass were collected with day-time electrofishing at a rate of 37.5 fish/h in 2020 and 16.0 fish/h in 2022 - the lowest catch rate on record (Figure 8; Appendices A and B). The

OBS goals for this species, general monitoring to collect abundance (CPUE – Total;  $RSE \leq 25$ ) and size structure (PSD and length-frequency;  $N \geq 50$  stock) data, were not achieved since only 11 stock-length individuals were collected with an RSE value of 38 (Figure 8). Individuals commonly make it to preferred length (15-inches) but not memorable length (20-inches; Figure 8). Body condition was good to excellent with few exceptions. Florida Largemouth Bass influence increased from 50% to 66% from the 2014 analysis (Tibbs and Baird 2015). The poor sampling conditions in 2022 (i.e., water level at 6' below conservation pool) is partly to blame for low catch rates of Largemouth Bass however, sedimentation and the loss of quality habitat are the main issues affecting the population (Tibbs and Baird 2015).

**Crappie:** White Crappie were collected with spring trap netting at a rate of 9.3 fish/nn in 2023, which is below the historical average (Figure 9; Appendices A and B). The OBS goal for White Crappie abundance (CPUE – Stock;  $RSE \leq 25$ ) fell short ( $RSE = 35$ ) while that for size structure (PSD and length-frequency;  $N \geq 50$  stock) was achieved ( $N = 93$  stock length individuals; Figure 9). The population was skewed toward larger individuals with many in the preferred (10-inch) to memorable (12-inch) length category. Body condition was excellent (Figure 9). Black Crappie were present in low numbers (Appendices A and B).

# Fisheries Management Plan for Aquilla Reservoir, Texas

Prepared – July 2023

**ISSUE 1:** A 2008 TWDB study found that Aquilla Reservoir could be losing as much as 218 acre-feet of volume each year through erosion and sedimentation. This relatively rapid loss of fisheries habitat is the single most important issue facing the fishery as a whole. Low water levels can inflate these issues, damaging populations even further. Although watershed-level work is unreasonable given high costs, other steps could help improve the fishery and angler satisfaction in the short-term.

## MANAGEMENT STRATEGIES

1. Request supplemental Blue Catfish, Channel Catfish, Lone Star Bass and Bluegill when available to mitigate these catastrophic losses.
2. Consider constructing spawning beds or habitat in several areas of the reservoir to improve populations of nest spawners like sunfishes.
3. Deploy structure (freshwater reefs) in appropriate areas throughout the lower end of the reservoir to provide much-needed habitat for forage and sportfishes.
4. Perform an additional electrofishing survey in fall 2024 to monitor Largemouth Bass and forage species.

**ISSUE 2:** Many AIS 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 AIS 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 USACE to maintain appropriate signage at access points around the reservoir.
2. Provide technical support and informational materials to interested constituents describing the agencies' "Clean, Drain, Dry" initiative.
3. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.
4. Make a speaking point about AIS when presenting to constituent and user groups.



## Objective-Based Sampling Plan and Schedule (2023–2027)

### Important sport and forage fishes

Important sportfishes include White Crappie, White Bass, Largemouth Bass and Blue and Channel Catfish. Important forage fishes include Gizzard Shad, Threadfin Shad, Bluegill and Longear Sunfish.

### Sportfishes with low-density populations

Flathead Catfish and Black Crappie occur in low abundance and are generally caught incidentally to targeted species. We will continue collecting and reporting data for these species as needed.

### Survey objectives, fisheries metrics, and sampling objectives

**Fall Electrofishing:** This survey will be used to evaluate Largemouth Bass and primary forage species (Gizzard Shad, Threadfin Shad, Bluegill and Longear Sunfish). Largemouth Bass catch rates for fall 2020 and fall 2022 (37.5 and 16.0 fish/h respectively) were among the lowest on record for Aquilla. Catch rates for all sunfish species were also near historical lows. Since catch rates are well below those desired for general monitoring, the goal of the 2024 and 2026 surveys will be exploratory sampling only. Twelve random five-minute daytime electrofishing stations will be sampled during late fall 2024 and again in 2026. Fin clips will be taken for genetics on all Largemouth Bass collected during the 2026 survey, up to 30 fish total. Index of vulnerability (IOV) will also be calculated for Gizzard Shad to assess the relative proportion of individuals in the population suitable as prey for sportfishes. No additional sampling effort will be conducted.

**Spring Trap Netting:** This survey will be used to evaluate White Crappie, which is the dominant crappie species in Aquilla Reservoir. White Crappie were last sampled with spring trap netting in 2023 (9.3 fish/nn;  $N \geq \text{Stock} = 93$ ). The goal of the 2027 survey will be general monitoring (using CPUE, size structure and relative weight as metrics) to characterize the White Crappie population and make comparisons with historical and future data. Catch per unit effort target precision will be an  $RSE \leq 25$ . Target sample size will be an  $N \geq 50$  stock-sized fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence. Ten random trap netting stations will be sampled during early spring 2027. If catch rates indicate collecting our size structure target is reasonable, sampling will continue at random trap netting stations until that target is reached.

**Spring Gill Netting:** This survey will be used to evaluate Blue Catfish, Channel Catfish and White Bass, which are all important sport fishes in Aquilla Reservoir. Blues, Channels and White Bass were last sampled with eight net nights (nn) of gill netting in 2023: (4.9 fish/nn;  $N \geq \text{Stock} = 30$ ), (1.8 fish/nn;  $N \geq \text{Stock} = 13$ ) and (11.9 fish/nn;  $N \geq \text{Stock} = 95$ ) respectively. Catch rates from earlier gill netting surveys (i.e., 2011; 5 nn, 2015; 5 nn and 2019; 8 nn) were, similar for Blue Catfish, higher for Channel Catfish and lower for White Bass. Increasing the number of net nights from 5 to 8 only enabled us to reach target catch rate and RSE values for White Bass on one occasion; those for Blue and Channel Catfish fell short. So, the goal of the 2027 survey will be exploratory sampling only. Five random gill netting stations will be sampled during spring 2027. No additional sampling effort will be conducted.

## Literature Cited

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## Tables and Figures

### Aquilla Lk Abv Aquilla, TX - 08093350

August 1, 2018 - April 1, 2023

Lake or reservoir water surface elevation above NGVD 1929, ft <sup>1</sup>

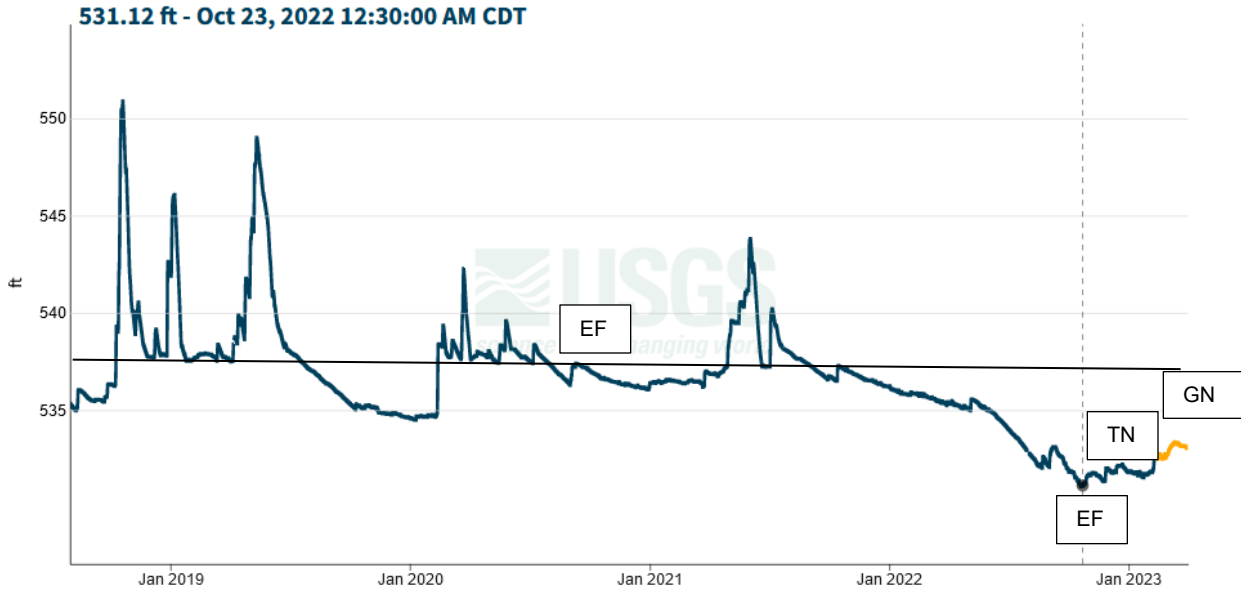


Figure 1. Daily water level elevations in feet above mean sea level (MSL) recorded for Aquilla Reservoir, Texas, August 1, 2019, through April 1, 2023. The figure is from the United States Geological Survey (USGS) website. NGVD 1929 refers to the National Geodetic Vertical Datum of 1929. The dashed line represents the lowest water elevation during the period, the horizontal line indicates Conservation pool (537.5), the thick dark line represents daily water level elevations, and the thick lighter line represents provisional data. Sampling times for electrofishing (EF), trap netting (TN) and gill netting (GN) are noted.

Table 1. Characteristics of Aquilla Reservoir, Texas.

Characteristic	Description
Year constructed	1982
Controlling authority	United States Army Corps of Engineers
County	Hill
Reservoir type	Tributary

Table 2. Boat ramp characteristics for Aquilla Reservoir, Texas, 2022. Reservoir elevation at time of survey was 533.10 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity	Condition
Old School	31.9112; -97.22403	Y	40	Single lane; good
Dairy Hill	31.92604; -97.18749	Y	28	Single lane; good
Hackberry	31.93972; -97.17953	Y	10	Single lane; poor

Table 3. Harvest regulations for Aquilla Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel, Blue, 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, Spotted, their hybrids and subspecies <sup>a</sup>	5 (any combination)	14-inch minimum
Crappie: White, Black, their hybrids and subspecies	25 (any combination)	10-inch minimum

<sup>a</sup> Daily bag for Largemouth Bass and Spotted Bass = 5 fish in any combination. There is no minimum length limit for Spotted Bass.

Table 4. Stocking history for Aquilla, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given.

Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1983	<u>33,261</u>	UNK	0.0
	Total	33,261		
Coppernose Bluegill	1984	<u>165,000</u>	AFGL	2.0
	Total	165,000		
Florida Largemouth Bass	1982	31,900	FGL	2.0
	1983	164,000	FRY	1.0
	1984	164,753	FGL	2.0
	1985	<u>72,559</u>	FRY	1.0
	Total	433,212		

Table 5. Objective-based sampling plan components for Aquilla Reservoir, Texas 2020–2023.

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
	Condition	$W_r$	10 fish/inch group (max)
	Genetics	% FLMB	$N = 30$ , any age
Bluegill <sup>a</sup>	Abundance	CPUE–Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$
Longear Sunfish <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>			
Crappie	Abundance	CPUE–Total	RSE $\leq 25$
	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>			
Blue Catfish	Abundance	CPUE–Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N = 50$
	Condition	$W_r$	10 fish/inch group (max)
Channel Catfish	Abundance	CPUE–Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N = 50$
	Condition	$W_r$	10 fish/inch group (max)
White Bass	Abundance	CPUE–Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N = 50$
	Condition	$W_r$	10 fish/inch group (max)

<sup>a</sup> No additional effort will be expended to achieve an RSE  $\leq 25$  for CPUE of Bluegill, Longear 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.

## Gizzard Shad

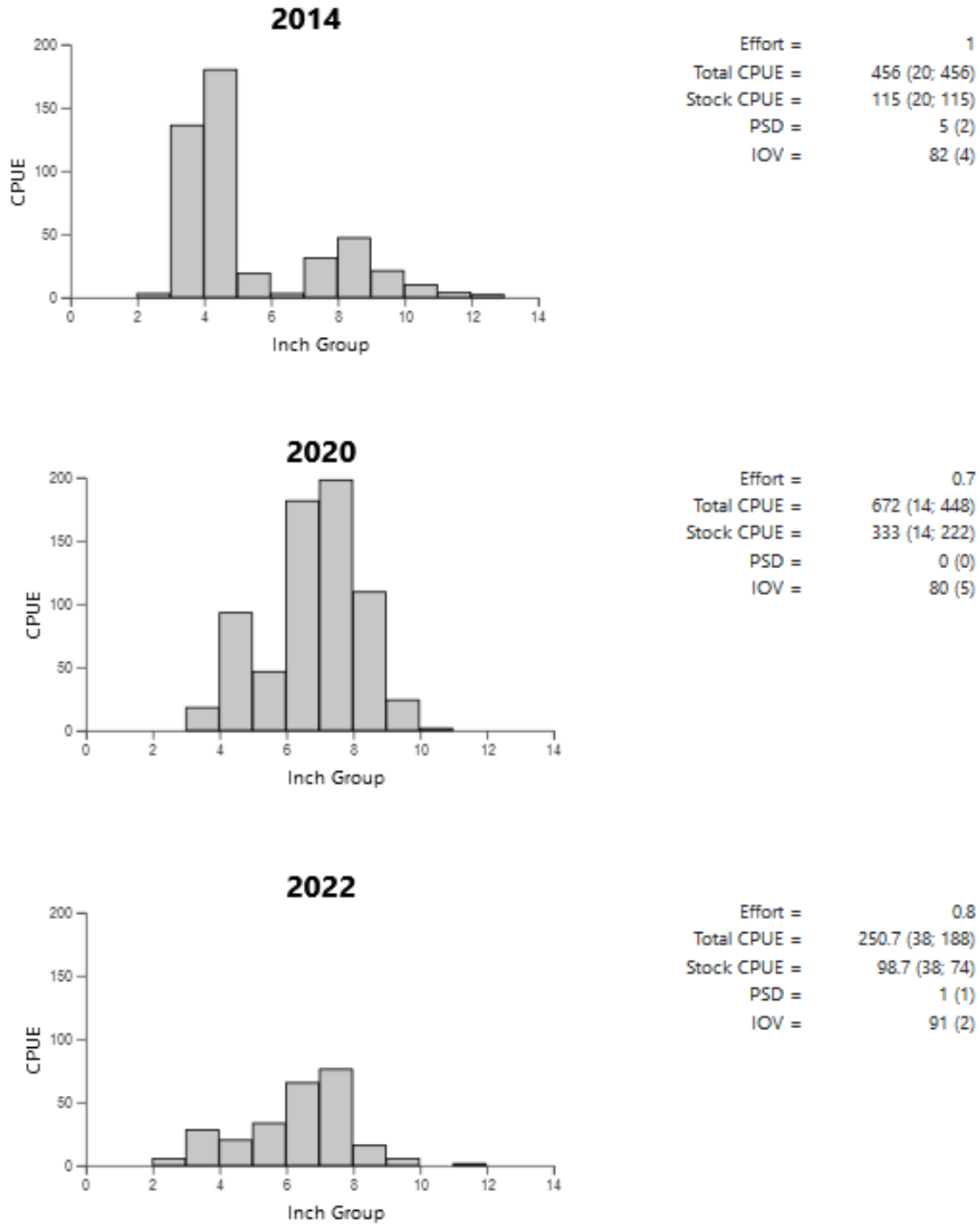


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Aquilla Reservoir, Texas, 2014 (nighttime), 2020 (daytime), and 2022 (daytime).

## Bluegill

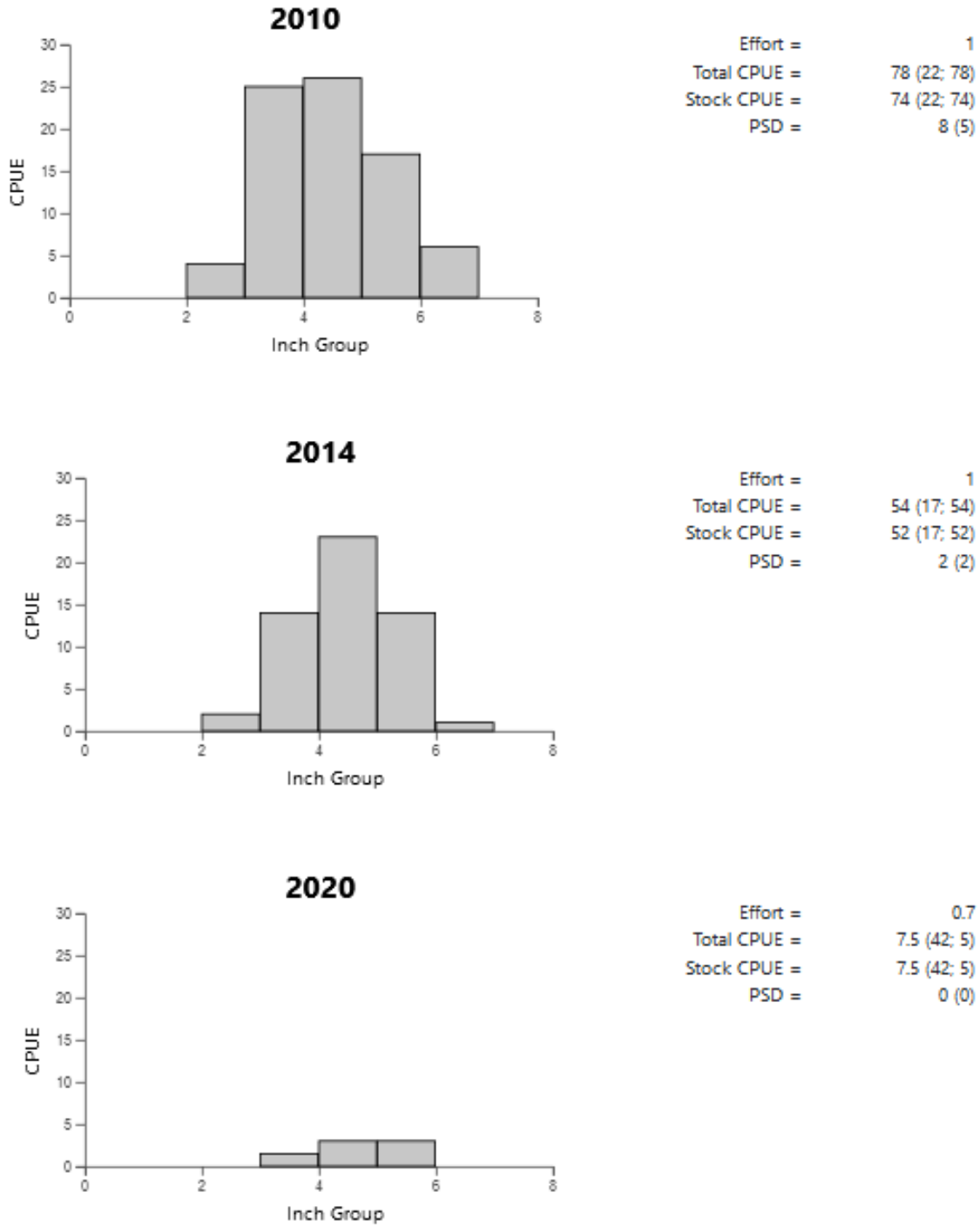


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Aquilla Reservoir, Texas, 2010 (nighttime), 2014 (nighttime) and 2020 (daytime). No Bluegill were collected during 2022 (daytime) electrofishing.

## Longear Sunfish

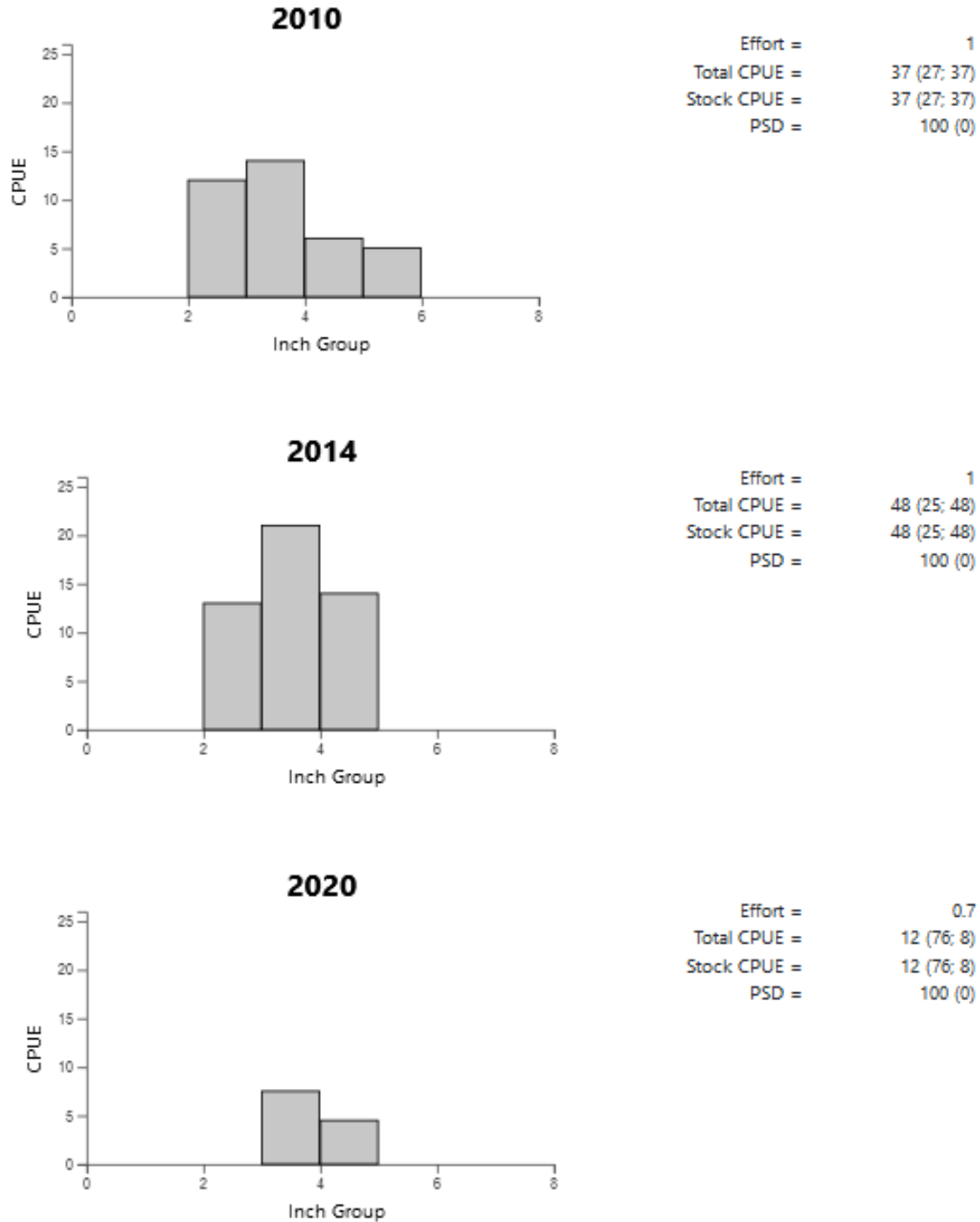


Figure 4. Number of Longear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Aquilla Reservoir, Texas, 2010 (nighttime), 2014 (nighttime) and 2020 (daytime). No Longear Sunfish were collected during 2022 (daytime) electrofishing.



## Blue Catfish

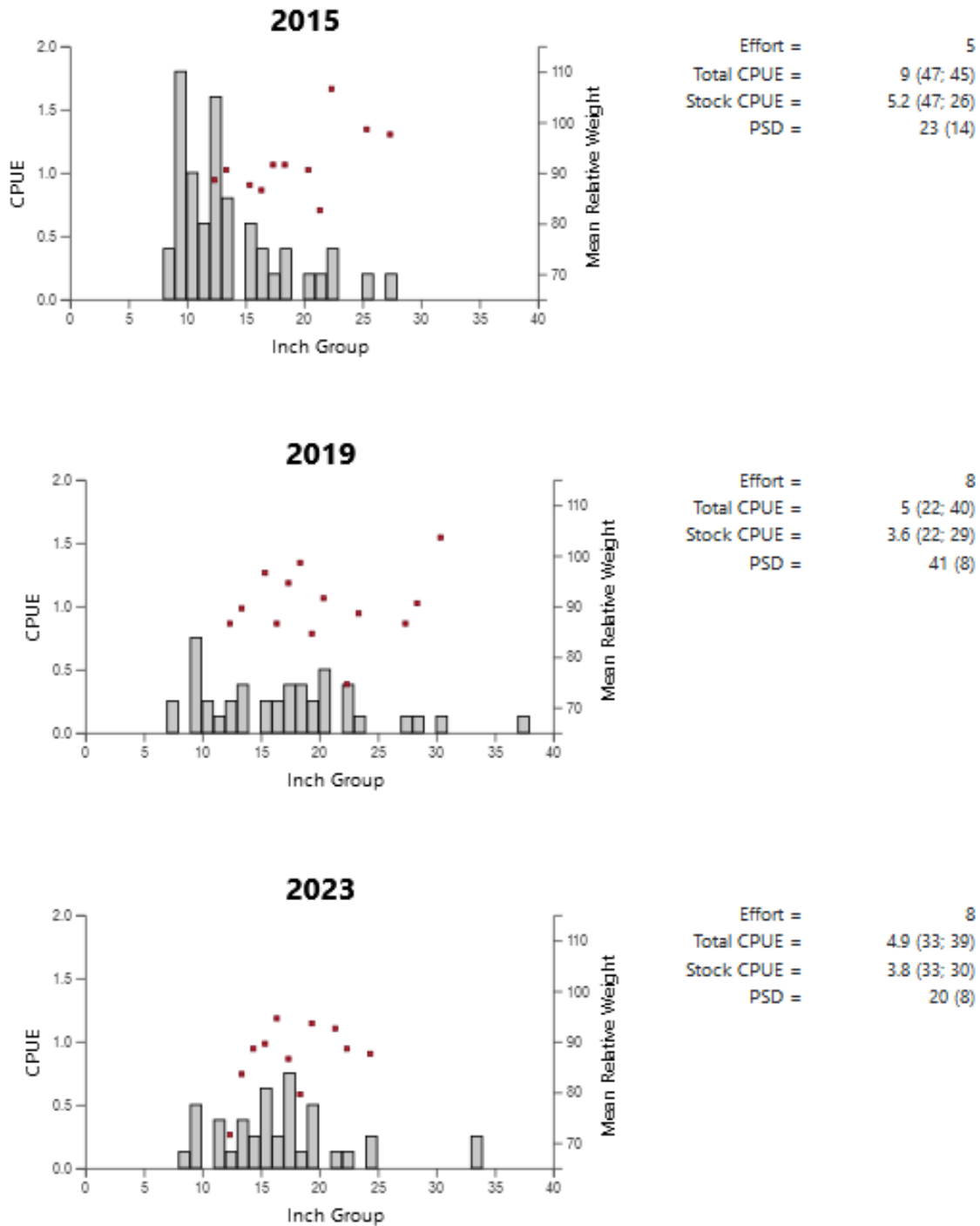


Figure 5. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Aquilla Reservoir, Texas, 2015, 2019, and 2023. The minimum length limit for Blue Catfish was 12-inches during 2015 and 2019; currently there is none.

## Channel Catfish

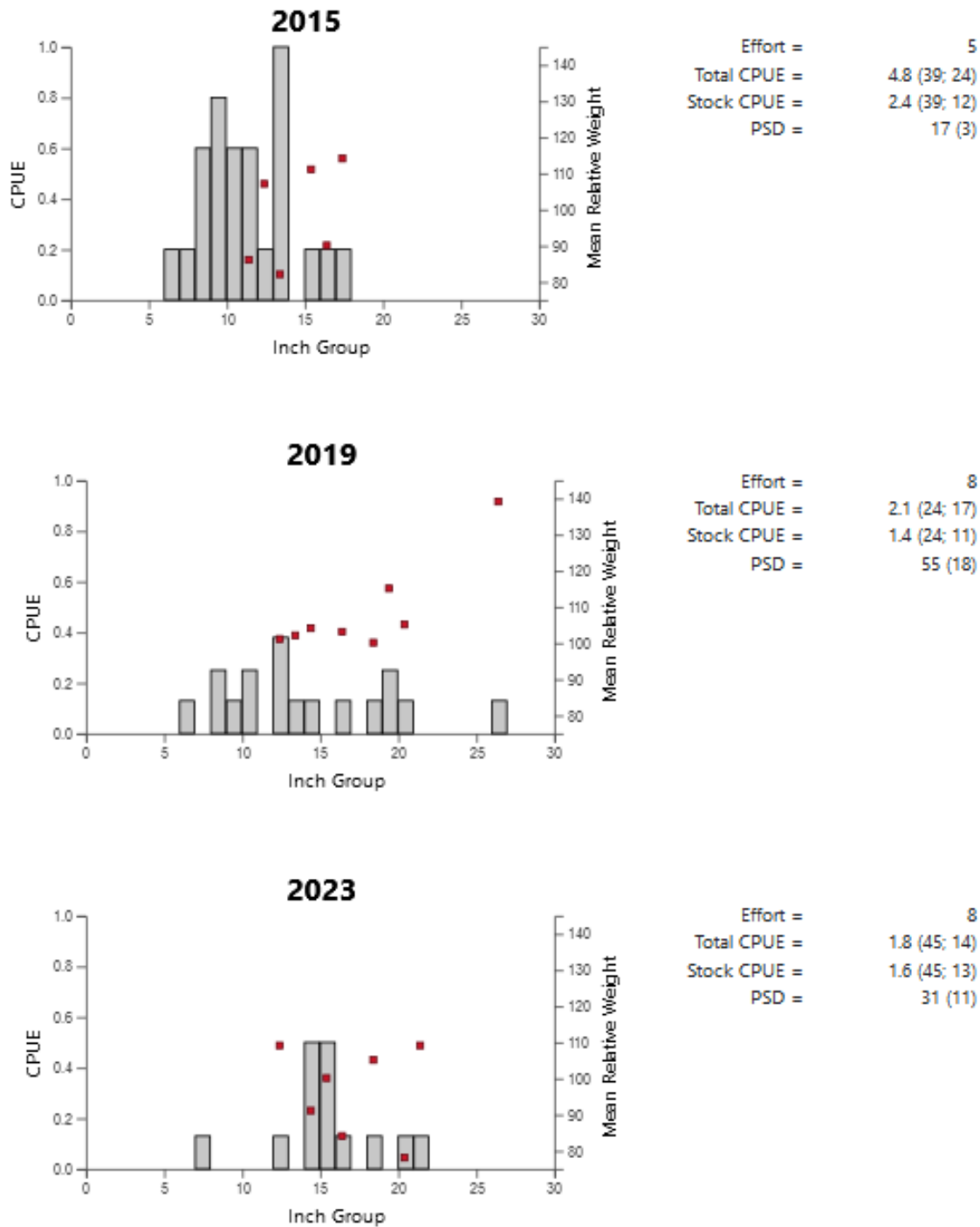


Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Aquilla Reservoir, Texas, 2015, 2019, and 2023. The minimum length limit for Channel Catfish was 12-inches during 2015 and 2019; currently there is none.

## White Bass

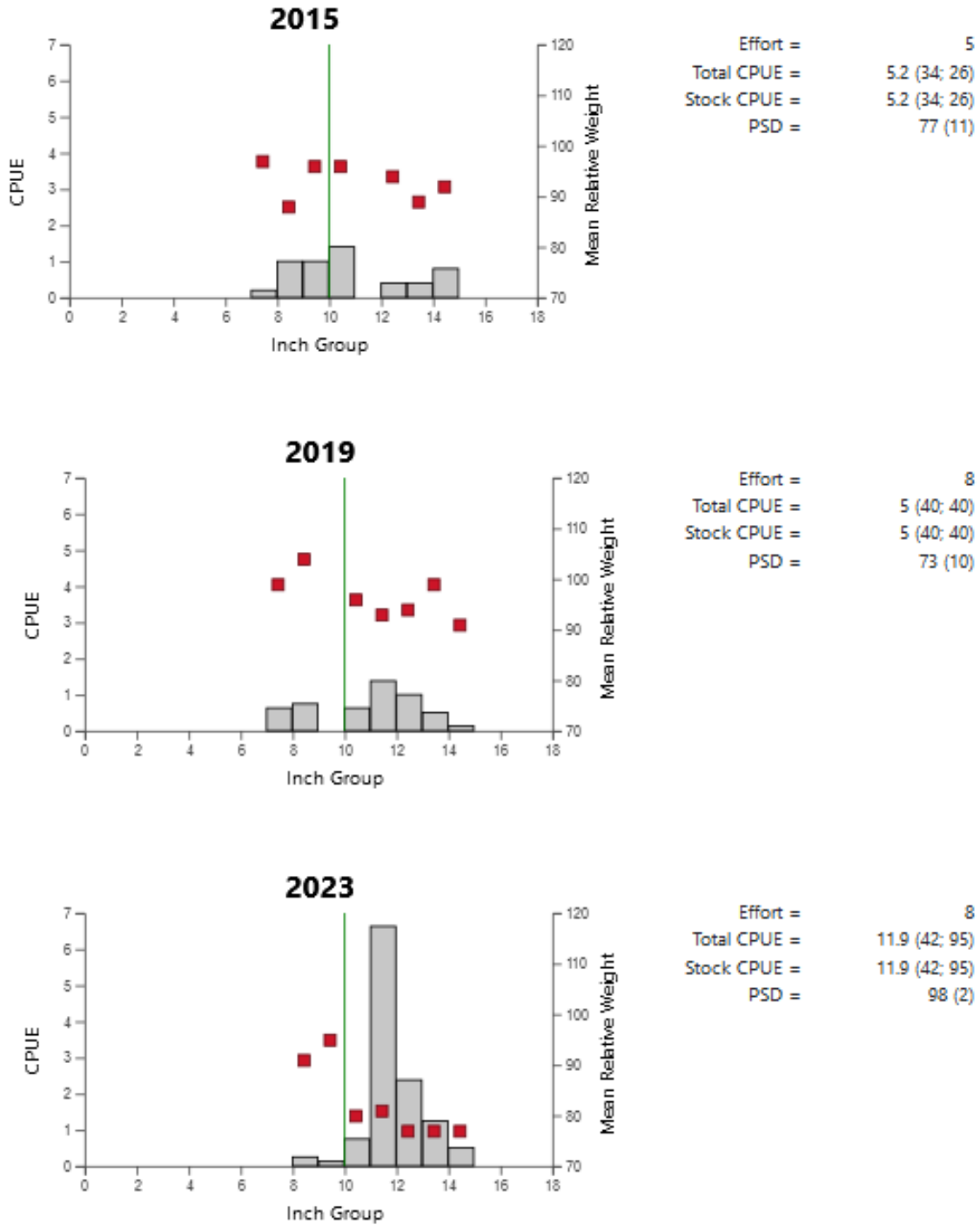


Figure 7. Number of White Bass caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Aquilla Reservoir, Texas, 2015, 2019, and 2023. Vertical line represents the minimum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

## Largemouth Bass

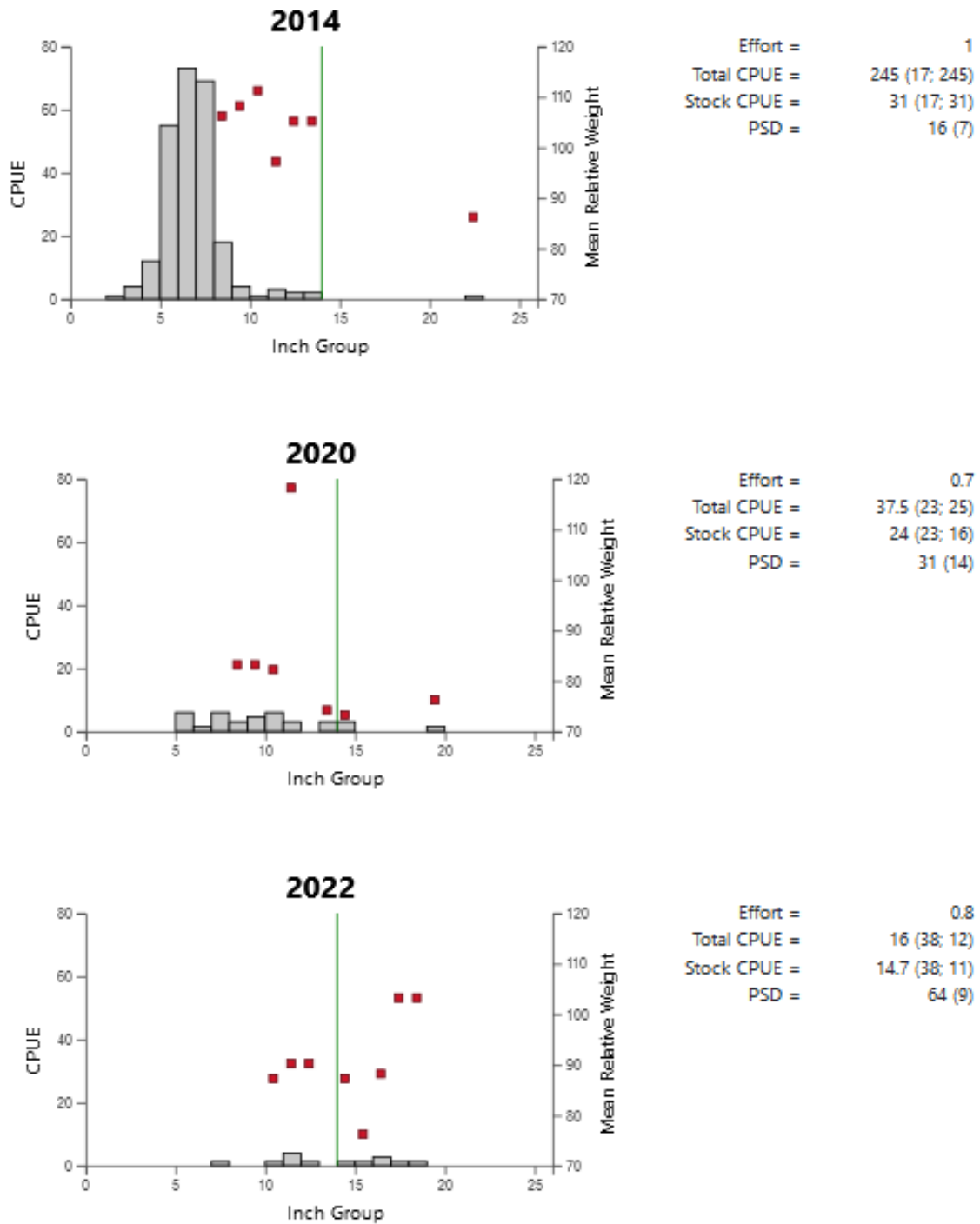


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Aquilla Reservoir, Texas, 2014 (nighttime), 2020 (daytime), and 2022 (daytime). Vertical line represents the minimum length limit.

## White Crappie

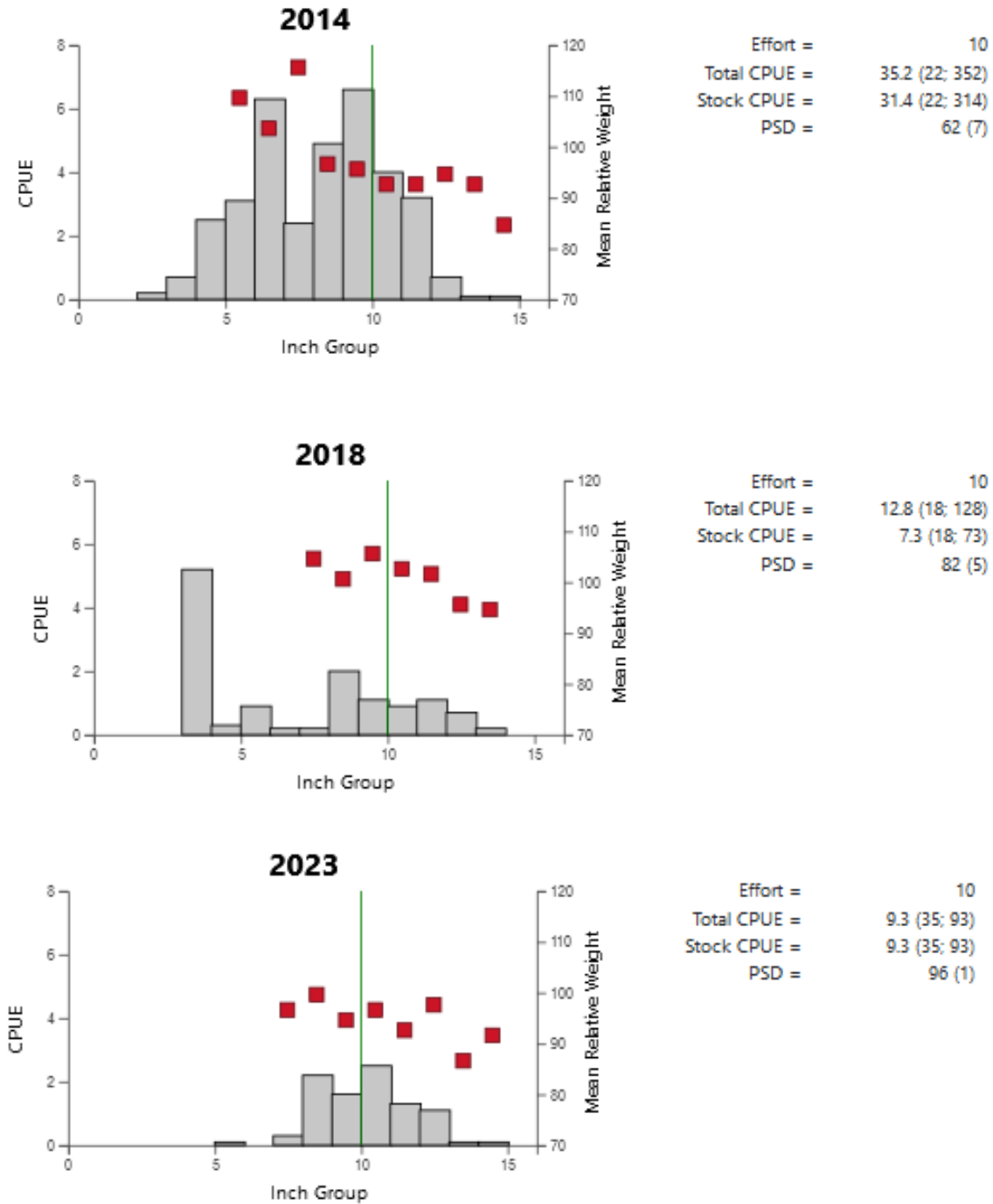


Figure 9. Number of White Crappie caught per hour (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring trap netting surveys, Aquilla Reservoir, Texas, 2014 (winter), 2018 (winter), and 2023 (spring). Vertical line represents the minimum length limit.

## Proposed Sampling Schedule

Table 6. Proposed sampling schedule for Aquilla Reservoir, Texas. Survey period is June through May. Electrofishing surveys are conducted in the fall, while trap netting and gill netting surveys are conducted in the spring.

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

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Aquilla Reservoir, Texas, 2022-2023. Sampling effort was 8 net nights for gill netting, 10 net nights for trap netting, and 0.75 hour for daytime electrofishing.

Species	2023 Gill Netting		2023 Trap Netting		2022 Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					188	250.7 (38)
Channel Catfish	14	1.8 (45)				
Blue Catfish	39	4.9 (33)				
White Bass	95	11.9 (42)				
Largemouth Bass					12	16.0 (38)
White Crappie	107	13.4 (36)	93	9.3 (35)		
Black Crappie	21	2.6 (60)				

## APPENDIX B – Historical catch rates for targeted species

Catch rates (CPUE) of targeted species collected with electrofishing, trap netting and gill netting surveys on Aquilla Reservoir, Texas, 2002 to present. Electrofishing stations were sampled with a 5.0 Smith-Root GPP (Gas Powered Pulsator) until 2010 and a 7.5 Smith-Root GPP thereafter. No electrofishing was conducted in fall 2018. Species averages are in bold. Asterisk denotes a species collected by a non-standard gear. Dashes represent no data available. The 2023 trap netting survey was conducted in early spring instead of winter. Electrofishing surveys were conducted during daytime in 2020 and 2022.

### Electrofishing

	2002	2006	2010	2014	2018	2020	2022	Average
Gizzard Shad	77.0	554.0	272.0	456.0	---	672.0	251.0	380.0
Threadfin Shad	94.0	91.0	49.0	881.0	---	930.0	0.0	341.0
Bluegill	110.0	107.0	78.0	54.0	---	7.5	0.0	59.0
Longear	55.0	33.0	37.0	48.0	---	12.0	0.0	31.0
Warmouth	2.0	8.0	3.0	2.0	---	0.0	0.0	3.0
Green	70.0	6.0	3.0	2.0	---	1.5	0.0	14.0
Largemouth Bass	200.0	95.0	68.0	245.0	---	37.5	16.0	110.0

### Trap netting

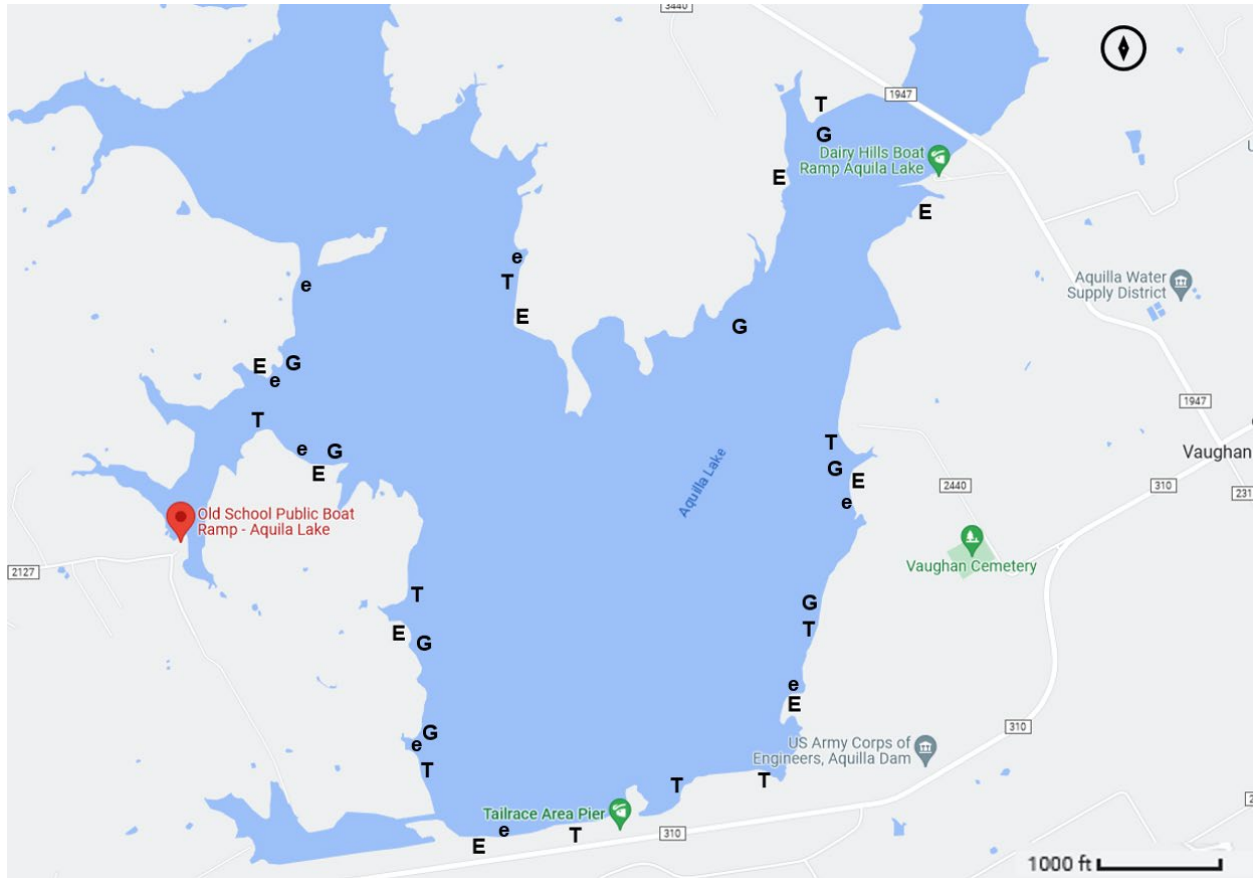
	2002	2006	2010	2014	2018	2023	Average
White Crappie	8.4	3.6	14.2	35.2	12.8	9.3	14.0

### Gill netting

	2003	2007	2011	2015	2019	2023	Average
Blue Catfish	7.4	2.6	8.0	9.0	5.0	4.9	6.0
Channel Catfish	1.4	1.2	5.0	4.8	2.1	1.8	3.0
White Bass	2.8	6.6	3.4	5.2	5.0	11.9	6.0
White Crappie*	---	---	21.2	---	4.1	13.4	13.0
Black Crappie*	---	---	---	---	---	2.6	3.0



## APPENDIX C – Map of sampling locations



Location of sampling sites, Aquilla Reservoir, Texas, 2020-2023. Trap netting, gill netting, 2020 electrofishing stations and 2022 electrofishing stations are indicated by T, G, e and E, respectively. Water level was within six feet of full pool at the time of the surveys.



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