

# Graham Reservoir

## 2021 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

Contents .....	i
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 Graham Reservoir, Texas.....	8
Objective-Based Sampling Plan and Schedule (2022–2026).....	9
Literature Cited.....	10
Tables and Figures .....	11
Water Level .....	11
Reservoir Characteristics .....	11
Boat Ramp Characteristics.....	12
Harvest Regulations .....	12
Stocking History.....	13
Objective Based Sampling .....	14
Structural Habitat Survey.....	14
Aquatic Vegetation Survey .....	15
Gizzard Shad .....	16
Bluegill .....	17
Redear Sunfish .....	18
Blue Catfish .....	19
Channel Catfish .....	21
White Bass.....	23
Palmetto and Sunshine Bass .....	25
Largemouth Bass .....	28
White Crappie.....	32
Crappie .....	34
Proposed Sampling Schedule .....	35
APPENDIX A – Catch rates for all species from all gear types .....	36
APPENDIX B – Map of sampling locations.....	37
APPENDIX C – Reporting of creel ZIP code data .....	38

APPENDIX D – Historical catch rates of targeted species by gear type for Graham Reservoir, Texas..... 39

## Survey and Management Summary

Fish populations in Graham Reservoir were surveyed in 2021 using electrofishing, trap netting and in 2022 using gill netting. Anglers were surveyed from Dec 1, 2021, through May 31, 2022, with a creel survey that will continue until the end of November. Historical data are presented with the 2019-2022 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

**Reservoir Description:** Graham Reservoir is a 2,396-acre impoundment located on Salt Creek in the Brazos River Basin approximately two miles northwest of Graham. The water elevation has been within three feet of full pool since 2015 when a record drought was ended by heavy precipitation resulting in the reservoir elevation rising 15 feet. Graham Reservoir has moderate to high productivity. Habitat features consisted of natural shoreline, standing timber, and rocks. Much of the reservoir is ringed by emergent aquatic vegetation. There are four public boat ramps and adequate bank-fishing access.

**Management History:** Important sport fish include White Bass, Sunshine and Palmetto Bass, Largemouth Bass, White and Black Crappie, and Blue, Channel, and Flathead Catfish. The management plan from the 2017 survey report included stocking Sunshine and Palmetto Bass at 7 fish/acre every year for each hybrid cross as part of an approved research project. September 1, 2021, the Blue and Channel Catfish regulation changed to a 25 fish aggregate bag limit, no minimum length-limit, and only 10 catfish 20-inches or greater in length being harvested.

### Fish Community

- **Prey species:** Threadfin Shad were abundant in the reservoir. Electrofishing catch rate of Gizzard Shad was slightly above the historical average, but many Gizzard Shad were too large for most predators to consume. Electrofishing catch rate of Bluegill was the highest in the past twenty years and well above the historical average. Bluegill up to eight-inches and Redear Sunfish up to ten-inches were captured.
- **Catfishes:** The Blue and Channel Catfish catch rates were the highest documented with many small, young fish in the populations. Body conditions were considered good for both species. Flathead Catfish were present in the reservoir. A partially completed year-long creel survey found anglers targeting Blue Catfish was significantly higher than in previous creel surveys.
- **Temperate basses:** White Bass, Sunshine Bass, and Palmetto Bass were present in the reservoir. White Bass abundance was up over the previous surveys and was well above the historical average. Hybrid Striped Bass relative abundance was the highest it's been in the last twenty-five years.
- **Largemouth Bass:** Largemouth Bass were abundant, with catch rates up from the previous six surveys and above the historical average. Plenty of legal-length bass were available to anglers. Largemouth Bass had average growth (age at 14 inches long was 2.5 years) and exhibited good body conditions. Largemouth Bass was the most targeted species in Graham Reservoir.
- **Crappie:** White and Black Crappie combined were moderately abundant with plenty of legal-length fish available to anglers. White Crappie catch rate was the highest it has ever been. Black Crappie are not nearly as abundant as White Crappie. Body condition was considered excellent. Anglers targeting crappie were down compared to previous surveys.

**Management Strategies:** Continue stocking Palmetto/Sunshine Bass at 15 fish/acre. Monitor the hybrid Striped Bass population with an additional 2024 gill net survey. Monitor the Largemouth Bass population with an additional electrofishing survey in 2023. Inform the public about the negative impacts of aquatic invasive species. Conduct general monitoring surveys with trap nets, gill nets, and electrofishing surveys in 2025-2026. Access and vegetation surveys will be conducted in 2025.

## Introduction

This document is a summary of fisheries data collected from Graham Reservoir from 2019-2022. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2019-2022 data for comparison.

## Reservoir Description

Graham Reservoir is a 2,396-acre impoundment consisting of two distinct parts often referred to as Graham-Eddleman. The Eddleman dam was completed in 1929 impounding Flint Creek. In 1958, the Graham dam was constructed on Salt Creek. The two reservoirs were connected via a canal after June 1959, creating Graham Reservoir. It is in Young County approximately two miles northwest of the City of Graham and is operated and controlled by the City of Graham. The reservoir provides municipal and industrial water supply for the City of Graham and water for a steam-electric generating plant, which is on standby status and used only during peak demands. The reservoir is also used for flood control and recreation. Land use around the reservoir includes both residential and agricultural. Graham Reservoir has a watershed of 221 mi<sup>2</sup> and is located within the Brazos River basin. Mean depth is 18.5 feet and a maximum depth of 49.1 feet (Sullivan et al. 2003). Habitat at time of sampling consisted mainly of standing timber, emergent vegetation, natural structure, and rocky structure. The water elevation was near full pool since 2015 (Figure 1). Other descriptive characteristics for Graham Reservoir are in Table 1.

## Angler Access

Boat access consisted of four public boat ramps (Table 2). Bank fishing access was available around the boat ramps, bridges, and two city park areas. A user-pay crappie house (\$5/day) was available on the Eddleman side of the reservoir.

## Management History

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Lang and Mauk 2018) included:

1. Include Graham Reservoir in an approved research project evaluating Palmetto and Sunshine Bass stockings and performance including growth, catchability, and population structure of the two crosses in 2021.
 

**Action:** Data collection did not occur until 2022 since stockings did not occur as scheduled. A year-long creel survey was begun November 2021 to collect data on all species but specifically hybrid Striped Bass.
2. Monitor the Largemouth Bass population in 2019 and 2021 through electrofishing surveys. Work with and educate anglers and tournament groups on fish care to reduce angling mortality.
 

**Action:** Largemouth Bass were monitored using electrofishing in 2019 and 2021. Tried to educate anglers, especially tournament anglers by offering to give presentations to their organizations but offer was declined.
3. Ensure proper signage placed at reservoir ramps to inform public of invasive species and how to stop spread. Make speaking point about invasive species in media and presentations. Be aware of any possible water transfers that might lead to introduction of unwanted species.
 

**Action:** Made sure signage was placed at boat ramps and made it a speaking point when interacting with public and media. Monitored possible water transfers from and to the reservoir.

**Harvest regulation history:** Sport fish in Graham Reservoir have always been managed with statewide regulations (Table 3). The statewide combined Channel and Blue Catfish regulation changed September 1, 2021, from a 25 fish bag limit with a 12-inch minimum length limit to a 25 fish bag limit (in any combination, only 10 fish 20-inch or greater in length), no length limit.

**Stocking history:** Graham Reservoir was stocked in 2017, 2018, and 2019 with Palmetto and Sunshine Bass as part of a research project. In 2020 (fry), 2021 (fingerling), and 2022 (fry and fingerling) only Sunshine Bass were stocked. No other species have been stocked since 2017. The complete stocking history is in Table 4.

**Vegetation/habitat management history:** Graham Reservoir has no significant vegetation or habitat management history. In 2019, spider blocks were placed into the reservoir as part of a Boy Scouts of America Eagle Badge project.

**Water transfer:** Graham Reservoir is primarily used for municipal water supply, as a cooling water source for a local power plant, recreation, and to a lesser extent, flood control for the City of Graham. In the past, water was sold to the cities of Newcastle and Bryson for their municipal use. Small amounts of untreated water are also used by Graham waterfront property owners for irrigation purposes. No water is directly transferred to other reservoirs unless the lake elevation exceeds full pool. In that situation, the excess water flows down Salt Creek to the Brazos River then onto Possum Kingdom Reservoir.

## Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Graham Reservoir (Lang and Mauk 2018). 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, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1 hour at 12, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths from 13 randomly selected fish (range 13.0 to 14.9 inches).

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

**Gill netting** – Blue Catfish, Channel Catfish, White Bass, and Palmetto/Sunshine Bass were collected by gill netting (10 net nights at 10 stations). 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 2017). Micro-satellite DNA analysis was used to determine genetic composition of individual fish since 2005. Electrophoresis analysis was used prior to 2005.

**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). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). 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.

**Creel survey** – A roving creel survey was conducted from 2021 through 2022. The creel period was December 1, 2021, continuing through November 30, 2022. For this report, only the first six-months of the creel is reported. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

**Habitat** – A structural habitat survey was conducted in 2017 with no observed major changes occurring since then. Vegetation surveys were conducted in 2009, 2013, 2017, and 2021 to monitor presence of aquatic vegetation. Habitat was assessed with the 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 2022).

## Results and Discussion

**Habitat:** A structural habitat survey was last conducted in 2017 (Table 6). At the time 58% of the shoreline was natural and 30% was rocky with over 22% of the reservoir consisting of standing timber. A 2021 vegetation survey determined native vegetation covered 1.2% of the reservoir's surface area with the majority being classified as emergent vegetation (Table 7). In 2019, a Boy Scout of America earned his Eagle Scout badge by placing spider blocks into the reservoir to increase habitat. Wichita Falls management personnel helped in deployment of the spider blocks using our boat, electronics, and suggesting where the structures would be most beneficial.

**Creel:** Directed fishing effort by anglers was highest for Largemouth Bass (46.4% total; 25.6% anglers and 20.8% tournament anglers), followed by anglers fishing for anything (18.0%) and White and Black Crappie (17.8%; Table 8). Of note are the 5.4% anglers targeting Blue Catfish, a species first documented in the reservoir 20 years ago but just now becoming very abundant (Figure 5). Total fishing effort for all species increased since the last creel survey which was during a severe drought but slightly below the creel survey completed in 2008-09 (Table 9). Direct expenditures at Graham Reservoir were significantly increased from the previous two creel surveys (\$320,680; Table 9). Anglers were mostly from the City of Graham though tournament anglers traveled good distances to fish and spent money on their trips (Appendix C).

**Prey species:** Electrofishing catch rates of Gizzard Shad and Bluegill were 292.0/h and 299.0/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad was 41, indicating that only 41% of Gizzard Shad were available to existing predators; this was lower than IOV estimates in 2019 but much better than in 2017 (Figure 2). Total CPUE of Gizzard Shad was considerably lower than the 2019 survey (510.0/h) but comparable to 2017 (332.0/h; Figure 2) and the historical average of 268.7/h. Total CPUE of Bluegill in 2021 was higher than the surveys completed in 2019 and 2017, and total lengths ranged from 1 to 8 inches (Figure 3). Redear Sunfish are present and abundant having a catch rate of 43.0/h. There has been a steady improvement in abundance since 2017. Lengths ranged from 3 to 10 inches (Figure 4). Threadfin Shad are also present and abundant having a catch rate of 249.0/h in 2021 (Appendix A).

**Catfishes:** Blue Catfish abundance has exploded with a gill net catch rate of 34.7/nn, the highest catch rate recorded and over three times the historical average of 10.2/nn (Appendix D). Lengths ranged from 4 to 30 inches (Figure 5). Body condition as measured by  $W_r$  generally increased with length, indicating a usage of bigger prey with increasing length. Most of the increase in abundance was in the presence of smaller catfish, specifically 8-inch Blue Catfish which accounted for 32% of all Blue Catfish sampled. The last twenty years has seen the establishment of the Blue Catfish population which has never been stocked by TPWD. The gill net catch rate of Channel Catfish was 4.1/nn in 2022 which is the highest catch rate for this species at Graham. Channel Catfish ranged in length from 7 to 20 inches (Figure 7). Relative weights were considered good for the population. Flathead Catfish are present in the reservoir as evidenced by one being caught in gill nets and a new rod-and-reel waterbody record. In the previous report, catfishes were considered a low-density group of fish and they were not part of the objective based sampling plan. Directed fishing effort, catch per hour, and total harvest for Blue Catfish showed an increasing Blue Catfish fishery (Table 10). Channel Catfish directed fishing effort was non-existent, being replaced by Blue Catfish anglers (Table 8). Catfish anglers at Graham Reservoir were more catch-and-release anglers, as opposed to harvest-oriented as 69.7% and 65.7% of legal-length Blue and Channel Catfish, respectively were released.

**White Bass:** The gill net catch rate of White Bass was 6.1/nn in 2022, a great improvement over the previous two surveys in 2018 and 2016 (Figure 9). Lengths ranged from 6 to 15 inches and exhibited good body condition. There were no objective based sampling goals set for this year's gill nets, they were just recorded during our hybrid Striped Bass collection. Directed fishing effort, catch per hour, and total harvest for White Bass was 547.6 h, 5.2 fish/h, and 2,203 fish, respectively (Table 12). Directed fishing effort has declined over the past three creel surveys. Catch rate has increased over those three creel surveys and total harvest has remained nearly the same over the creel periods. White Bass were more of a catch-and-release fish as approximately 74.0% of the legal-length fish were released in the current creel survey. This is a great change from the previous two creel surveys when only 33.8% and 35.7% were released. Observed harvest showed good angler compliance, and harvested fish ranged in length from 10 to 16 inches (Figure 10).

**Palmetto and Sunshine Bass:** The gill net catch rate of hybrid Striped Bass was 4.2/nn in 2022, an increase over the previous two surveys in 2018 and 2016 (Figure 11). The 2022 catch rate was the highest since 1997 and well above the historical average of 2.5/nn (Appendix D). Lengths ranged from 11 to 24 inches and  $W_r$  ranged from 87 to 98. The sampling objective for a relative abundance estimate with a RSE of  $\leq 15$  and capturing 50 stock-length fish for meaningful PSD and length frequency estimates



was not met. It would have taken too many nets and resulted in too much by-catch to be practical. Instead, to capture more fish than the 42 hybrid Striped Bass caught with experimental gill nets in our standardized gill net survey, we switched to 150 foot hobbled 3-inch and 4-inch gill nets that eliminated much of the by-catch and increased our number of captured hybrid Striped Bass for the special project. Age and growth is reported for the fish captured during the standardized gill net survey (Figure 13). All fish for the special project will be aged but at the time the report was written, collection by angling was on-going. Fish achieved legal length (18-inches) sometime between 2 to 3 years, though aging all collected fish will help determine age-at-length more closely (Figure 13). Preliminarily, growth potential appears limited since age 4 through 9-year-old fish are nearly the same length. Further aging of the remaining sampled fish will help clarify the populations growth potential as well as differentiating growth between Palmetto and Sunshine Bass. Directed effort for Palmetto and Sunshine Bass combined, increased over the previous creel surveys (Table 13) with 2.4% of the anglers targeting hybrids Striped Bass (Table 8). Anglers targeting hybrid Striped Bass during the creel survey did not catch any, but there were hybrid Striped Bass caught as evidenced by the estimated harvest of 100 fish for all anglers. Catch-and-release was practiced for the hybrids with 78.4% of legal-length fish being released (Table 13).

**Largemouth Bass:** The electrofishing total catch rate of Largemouth Bass was 146.0/h in 2021, higher than 90.0/h in 2019 and 82.0/h in 2017 (Figure 14). The total catch rate was well above the historical average of 111.2/h (Appendix D). Lengths ranged from 3 to 21 inches with  $W_r$ 's ranging from 89 to 100 (except a 77 outlier; Figure 14). Catch rate of legal length (14-inches) Largemouth Bass was 28.0/h which indicates good availability of harvestable length bass for anglers (Figure 14). Growth of Largemouth Bass was considered good; average age at 14 inches was 2.5 years (N=13; range = 2–4 years). Genetic analysis determined that the percentage of Florida alleles in the population was 58, the highest seen at the reservoir (Table 15). Ten percent of the sampled bass were pure Florida strain (Table 15), the highest we have seen at the reservoir. The objective based sampling plan calling for trend monitoring of size structure was met. Of the total anglers surveyed this period, 25.6% were targeting Largemouth Bass and another 20.8% were actively tournament fishing at time of interview. Directed fishing effort, catch per hour, and total harvest for Largemouth Bass was 14,779.4 h, 1.3 fish/h, and 434.5 fish, respectively, for the current creel survey (Table 14). The reservoir has become a popular Largemouth Bass fishery as shown by these estimates. During the creel survey, we documented many bass over four pounds caught and released (Table 14), and we documented a 10.3-pound bass caught during a tournament. Probably the best bass angling has been at the reservoir. These are all the highest estimated results we have found in the three completed creel surveys. It should be noted that only 16.4% of the legal-length Largemouth Bass caught by non-tournament anglers were released (Table 14). This is a high percentage of harvested legal-length bass by non-tournament anglers. The harvested bass ranged in length from 16 to 20 inches (Figure 15). The results of the 2008-2009 creel survey showed that the ratio of tournament angler caught to non-tournament angler harvested bass exceeded a 3:1 ratio which Allen et al. (2004) identified as the threshold at which Largemouth Bass size structure could decline because of tournament mortality affecting legal length and above bass. At that time, poor handling practices were observed for some tournaments. While the complete creel survey still has six-months to go before completion, the ratio once again could be surpassed, though poor handling has not been observed. The reservoir has a long history of a cyclic Largemouth Bass population, possibly caused by excessive tournament angling.

**Crappie:** The trap net total catch rate of White Crappie was 15.0/nn in 2021, higher than in 2017 (11.8/nn) and 2013 (7.8/nn) rates. The 2021 CPUE was the highest documented and well above the historical average of 9.1/nn (Appendix D). The PSD was 96, slightly higher than the PSD in 2017 (88) and 2013 (82; Figure 16). Mean relative weight ranged from 97-117 indicating plenty of available prey for all lengths of White Crappie. This is an improvement from 2017 survey (range 83-103) and 2013 (range 58-114) when  $W_r$  decreased with length (Figure 17). Black Crappie are present in the reservoir but in low abundance. The 2021 catch rate (1.0/nn) was similar to 2013 (0.8/nn) but higher than 2017 (0.2/nn; Figure 18). Body condition was considered average but is based on a small sample size. Survey objectives for crappie were met examining size structure. Directed effort for crappie was 5,658.0/h,

considerably lower than the previous two creel surveys (Table 16). The percentage of anglers targeting crappie (17.8%) was also considerably down compared to the two previous creel surveys (35.6% and 52.4%; Table 8). It is unknown why the decrease in effort for crappie is occurring, especially when the crappie population is so good. Catch rate (2.1/h) and total harvest (7,059.9) are also down from previous creel surveys (Table 16). Size of harvested Crappie in in the current creel survey ranged from 9 to 15 inches in total length (Figure 19).

# Fisheries Management Plan for Graham Reservoir, Texas

Prepared – July 2022

**ISSUE 1:** Palmetto Bass have been a part of the fishery at Graham Reservoir since 1979. Sunshine Bass were first introduced in 2017, and Graham Reservoir is one of five sites involved in a study comparing growth, recruitment, and relative catchability between Sunshine and Palmetto Bass when stocked as fingerlings. Annual stocking of Palmetto or Sunshine Bass is required to sustain the population and maintain a fishery.

## MANAGEMENT STRATEGIES

1. Complete the Sunshine and Palmetto Bass growth, recruitment, and relative catchability study in 2022 which includes a creel survey, scale collection for genetics, angling, and aging of the collected fish.
2. Stock hybrid Striped Bass annually at 15 fish/acre.
3. Complete an additional gill net survey in 2024 to monitor the hybrid population.

**ISSUE 2:** Largemouth Bass have historically supported an important fishery at the reservoir with many anglers and tournaments targeting this species. In the past, it has been noted that tournament angling could possibly be altering size structure through tournament mortality. Therefore, it is important to monitor this species every two years.

## MANAGEMENT STRATEGIES

1. Complete an additional electrofishing survey in 2023.
2. Monitor tournaments and stress proper handling when possible if poor handling is noted.

**ISSUE 3:** Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state

## MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. 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 (2022–2026)

Sport fish, forage fish, and other important fishes

Sport fishes in Graham Reservoir have historically included White Bass, Palmetto and Sunshine Bass, Largemouth Bass, and White and Black Crappie. Blue and Channel Catfish in the past were considered low-density fisheries based on relative abundance and the number of anglers identifying themselves as targeting these species in past creel surveys. The current creel survey and the just completed gill net survey indicates that they should be considered important fishes in this report. Gizzard Shad and Bluegill are important prey species.

Low-density fisheries

Flathead Catfish historically have been low-density fishery.

Survey objectives, fisheries metrics, and sampling objectives

For all species, complete the year-long creel survey we are currently in the middle of. Report the creel results in the 2025 Fisheries Management Report.

Largemouth Bass have historically been a very sought-after species in the reservoir. The 2021 electrofishing survey documented a very healthy population. To monitor this population, an additional electrofishing survey (12 5-minute sites) will be completed in 2023 along with the report year survey of 2025. Survey objectives will be to examine abundance, size structure, and fish condition for monitoring trend data. Abundance sampling objective will be to achieve a RSE of stock-length Largemouth bass of  $\leq 25$ . Examining size structure will be achieved by capturing 50 Largemouth Bass  $\geq$  stock-length to examine PSD and length frequency. Body condition will be achieved by measuring and weighing all bass. Data on Gizzard Shad, Threadfin Shad, *Lepomis spp.* will be collected along with Largemouth Bass data, but no additional sampling will occur for these species.

White and Black Crappie are present, but White Crappie is the most abundant in the reservoir. Data will be collected for both species but only White Crappie will have survey objectives for monitoring trend data. Relative abundance and size structure will be examined with CPUE-S RSE of  $\leq 25$  and with over 50 stock-length White Crappie being sampled. Body condition will be achieved by measuring and weighing all collected crappie. Historically, these goals have been achieved by setting five trap net sites. To try to ensure that objectives are met, seven trap net sites will be completed in 2025.

Catfishes in the previous report were considered a low-density population, so no objective based sampling plan was created for their populations. Blue Catfish are becoming quite popular with anglers according to the current creel survey (Table 8), and the population is expanding numerically (Figure 5). Catfish will be monitored in 2024 and 2026 when collecting hybrid Striped Bass. Ten gill nets seem to be able to achieve an RSE for CPUE of stock-length Blue Catfish for an abundance estimate and captures  $\geq 50$  stock-length fish for size structure estimates and body condition for monitoring trend data. Channel Catfish and Flathead Catfish will have data collected but no survey objectives are being set for these species.

Sunshine and Palmetto Bass will also be collected with the catfishes in 10 gill nets in 2024 and 2026. Since a special project examining these hybrid Striped Bass crosses will have recently been completed by the time of these gill net surveys, no extra sampling will be completed, just monitoring of trend data such as CPUE, size structure, and body condition but with no sampling objectives since historically not enough hybrid Striped Bass are captured to meet sampling objectives. White Bass trend data (relative abundance, size structure, and body condition) will be collected from gill nets like the hybrid crosses, and like the crosses, White Bass historically have never been captured in sufficient numbers to meet most of the sampling objectives associated with the trend data to justify additional sampling.

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## Tables and Figures

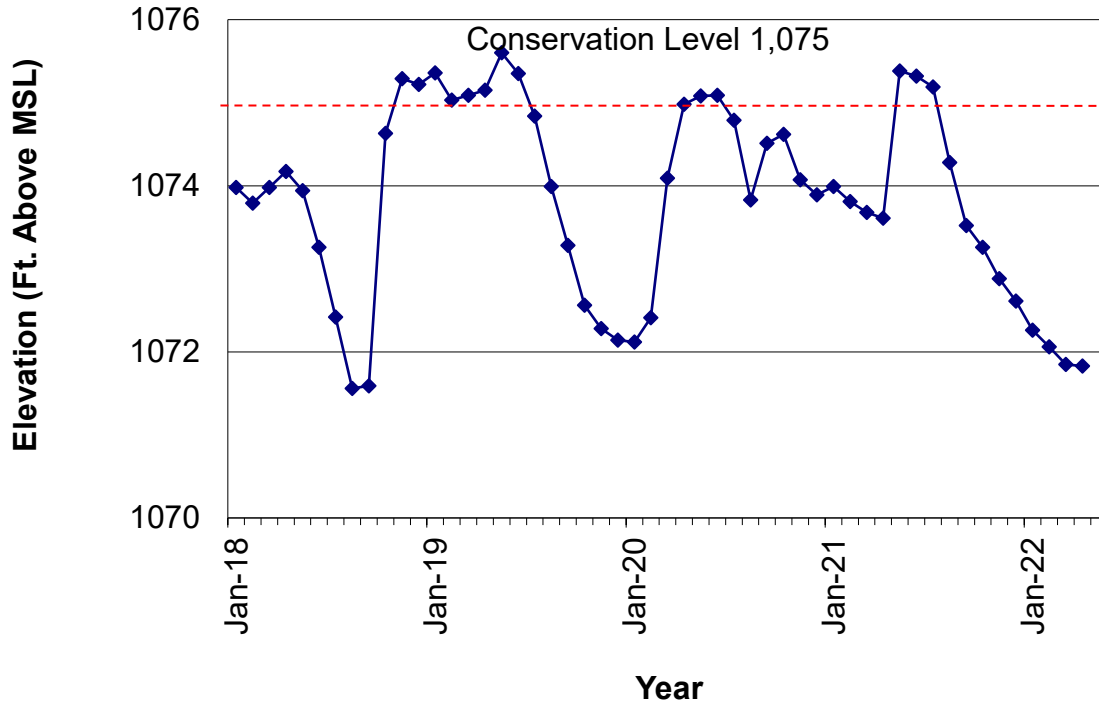


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Graham Reservoir, Texas. Red, dotted line represents full pool (1,075 msl).

Table 1. Characteristics of Graham Reservoir, Texas.

Characteristic	Description
Year constructed	1929
Controlling authority	City of Graham
County	Young
Reservoir type	Tributary
Shoreline Development Index	3.25
Conductivity	566 $\mu\text{S/cm}$

Table 2. Boat ramp characteristics for Graham Reservoir, Texas, August 2021. Reservoir elevation at time of survey was 1,074.6 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Eddleman	33.13597 -98.60117	Y	>100	1,064	Good
Lake Graham	33.13244 -98.62733	Y	20	1,062	Good
Eastside Lake	33.16667 -98.62158	Y	5	1,070	Good
White Rose	33.16667 -98.63117	Y	40	1.065	Good

Table 3. Harvest regulations for Graham Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids, and subspecies	25 (in any combination-only 10 can be 20 inches or greater in length)	No limit*
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Palmetto and Sunshine	5	18-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black crappie, their hybrids, and subspecies	25 (in any combination)	10-inch minimum

\*Regulation changed September 1, 2021, from 12-inch minimum length and 25 fish bag limit.

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

Year	Number	Size	Year	Number	Size
	<u>Channel Catfish</u>			<u>Largemouth Bass</u>	
1970	50,000	AFGL	1966	303,000	FRY
	<u>Sunshine Bass</u>		1967	60,000	UNK
2017	13,328	FGL	1969	10,000	UNK
2018	17,527	FGL	1970	50,000	UNK
2019	9,842	FGL	<u>1971</u>	<u>4,000</u>	UNK
2020	148,500	FRY	Species Total	427,000	
2021	45,363	FGL		<u>Florida Largemouth Bass</u>	
2022	37,531	FGL			
<u>2022</u>	<u>180,596</u>	FRY			
Species Total	452,687		1979	50,022	FRY
	<u>Palmetto Bass</u>		1992	151,869	FRY
1979	100,000	UNK	1994	150,217	FGL
1981	100,000	UNK	1997	151,247	FGL
1983	148,500	UNK	2015	43,906	FGL
1985	60,600	FGL	<u>2016</u>	<u>65,007</u>	FGL
1986	59,900	FRY	Species Total	612,268	
1987	59,900	FRY			
1988	60,868	FRY			
1989	69,426	FGL			
1991	56,235	FGL			
1992	25,415	FGL			
1994	46,350	FGL			
1995	52,277	FGL			
1996	45,334	FGL			
1997	30,974	FGL			
1998	30,536	FGL			
1999	22,655	FGL			
2002	15,050	FGL			
2004	16,816	FGL			
2005	12,867	FGL			
2006	12,000	FGL			
2007	24,001	FGL			
2008	17,272	FGL			
2011	18,343	FGL			
2013	24,228	FGL			
2015	9,151	FGL			
2016	33,943	FGL			
2017	15,135	FGL			
2018	25,501	FGL			
<u>2019</u>	<u>9,694</u>	FGL			
Species Total	1,202,971				



Table 5. Objective-based sampling plan components for Graham Reservoir, Texas 2021–2022.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Size structure	PSD, length frequency	$N \geq 50$ stock
<i>Trap netting</i>			
Crappie	Size structure	PSD, length frequency	$N = \geq 50$
<i>Gill netting</i>			
Hybrid Striped Bass	Abundance	CPUE–stock	RSE-Stock $\leq 15$
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age and Growth	Age structure of population	$\geq 200$ stock

Table 6. Survey of structural habitat types, Graham Reservoir, Texas, 2017. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Bulkhead	0.4 miles	1.1
Rocky shore with boat docks	4.0 miles	10.5
Natural	22.0 miles	57.9
Rocky	11.6 miles	30.5
Standing timber	534.0 acres	22.3

Table 7. Survey of aquatic vegetation, Graham Reservoir, Texas, 2009, 2013, 2017, and 2021. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2009	2013	2017	2021
Native floating-leaved	58.6 (2.4)		5.3 (0.2)	0.4 (<0.1)
Native emergent	59.3 (2.5)		27.0 (1.1)	28.9 (1.2)

Table 8. Percent directed angler effort by species for Graham Reservoir, Texas, 2008-09, 2013-14, and 2021-2022. Survey periods were from 1 November through 31 May for all surveys.

Species	2008/2009	2013/2014	2021/2022
Blue Catfish			5.4
Channel Catfish	2.1	1.9	
Catfish <i>spp.</i>	4.8	9.8	6.4
White Bass	6.4	6.5	1.7
Palmetto and Sunshine Bass	0.9		2.4
Temperate Bass	1.4		0.8
Redear Sunfish	1.5		
Sunfish <i>spp.</i>			1.2
Largemouth Bass	11.3	5.7	25.6
Tournament	17.1	3.3	20.8
Crappie <i>spp.</i>	35.6	52.4	17.8
Anything	18.9	20.4	18.0

Table 9. Total fishing effort (h) for all species and total directed expenditures at Graham Reservoir, Texas, 2008-09, 2013-14, and 2021-22. Survey periods were from 1 Nov through 31 May. Relative standard error is in parentheses.

Creel statistic	2008/2009	2013/2014	2021/2022
Total fishing effort	37,300.1 (18)	18,155.9 (26)	31,851.9 (17)
Total directed expenditures	\$201,964 (36)	\$79,973 (38)	\$320,680 (34)

### Gizzard Shad

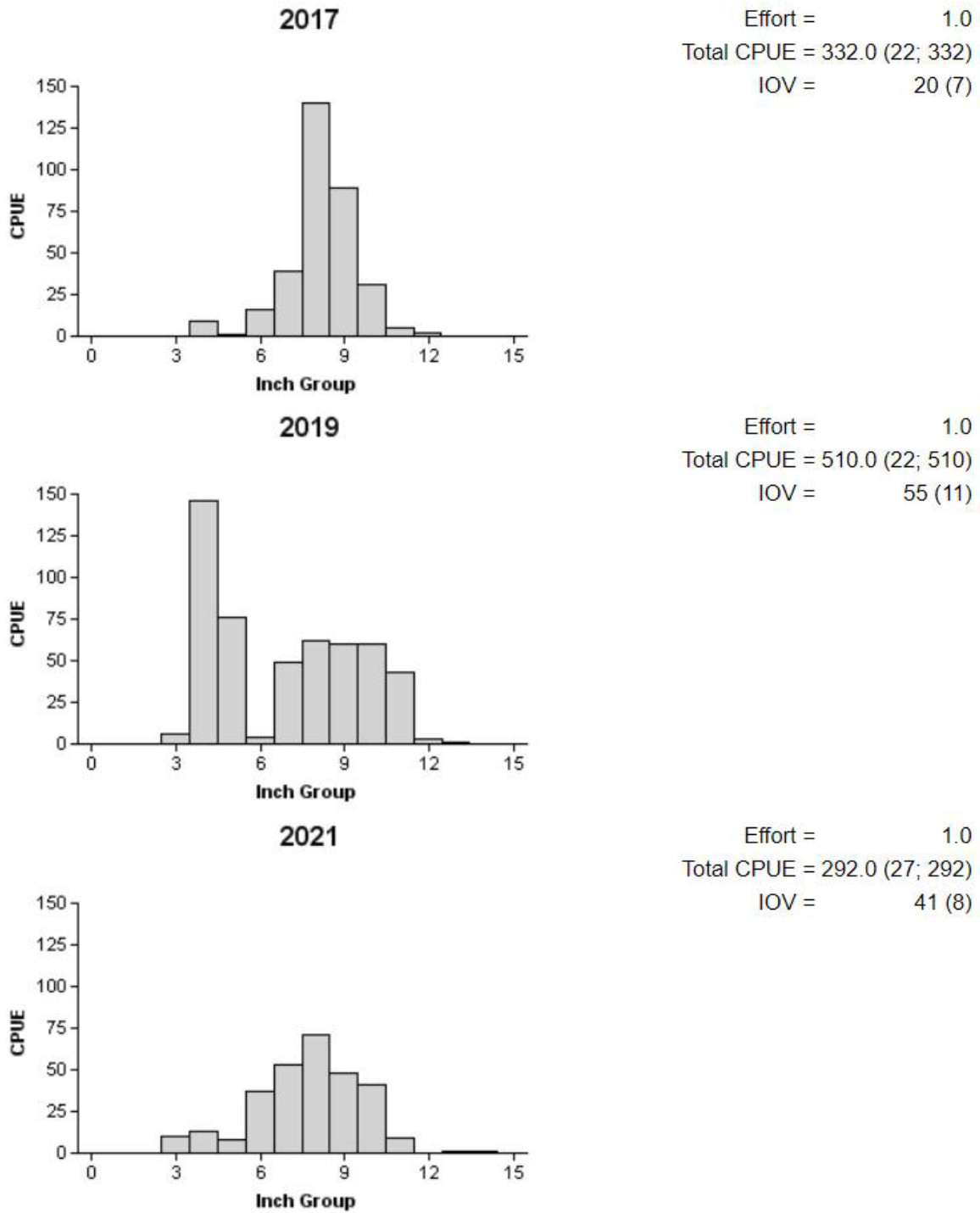


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2017, 2019, and 2021.

## Bluegill

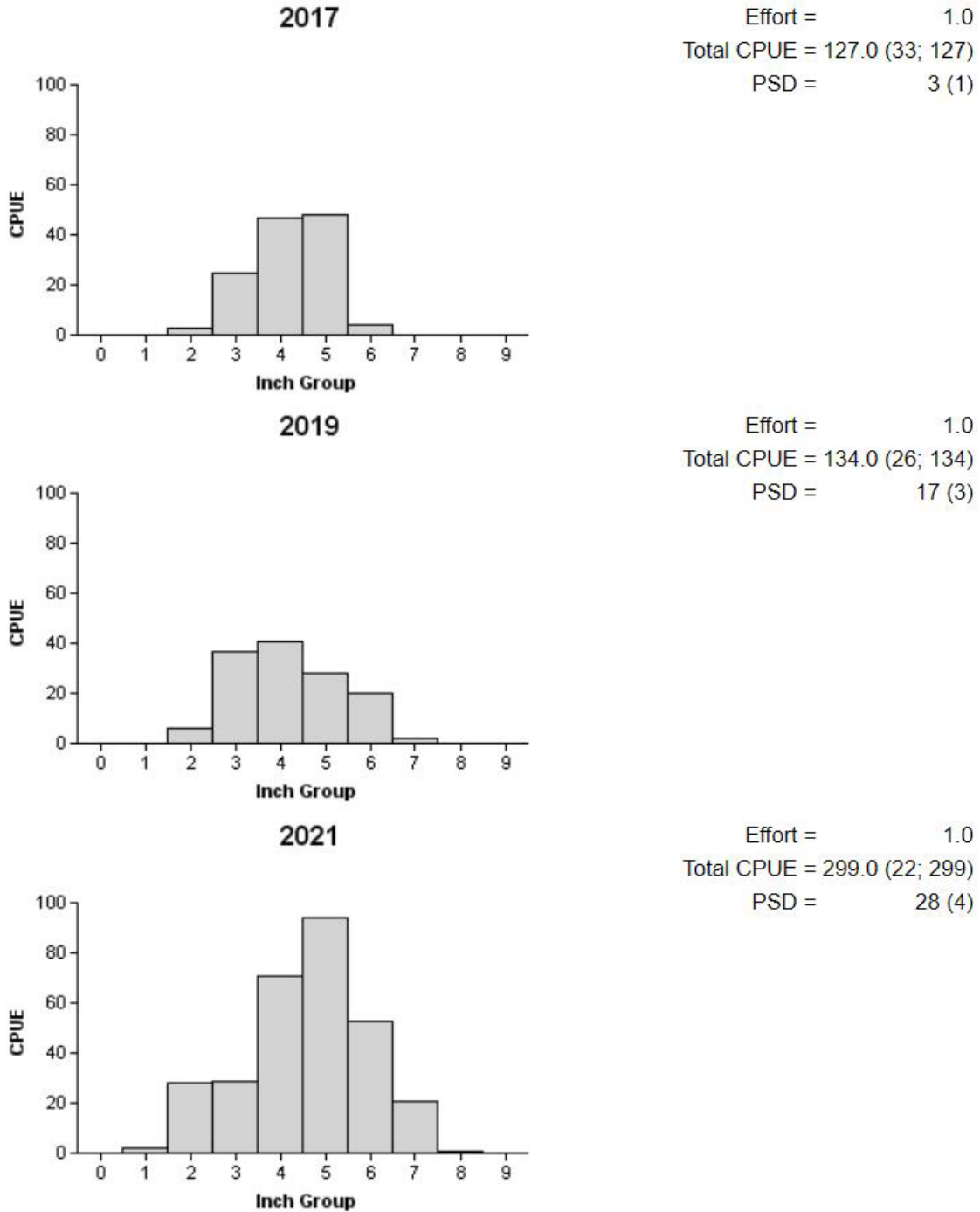


Figure 3. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2017, 2019, and 2021.

## Redear Sunfish

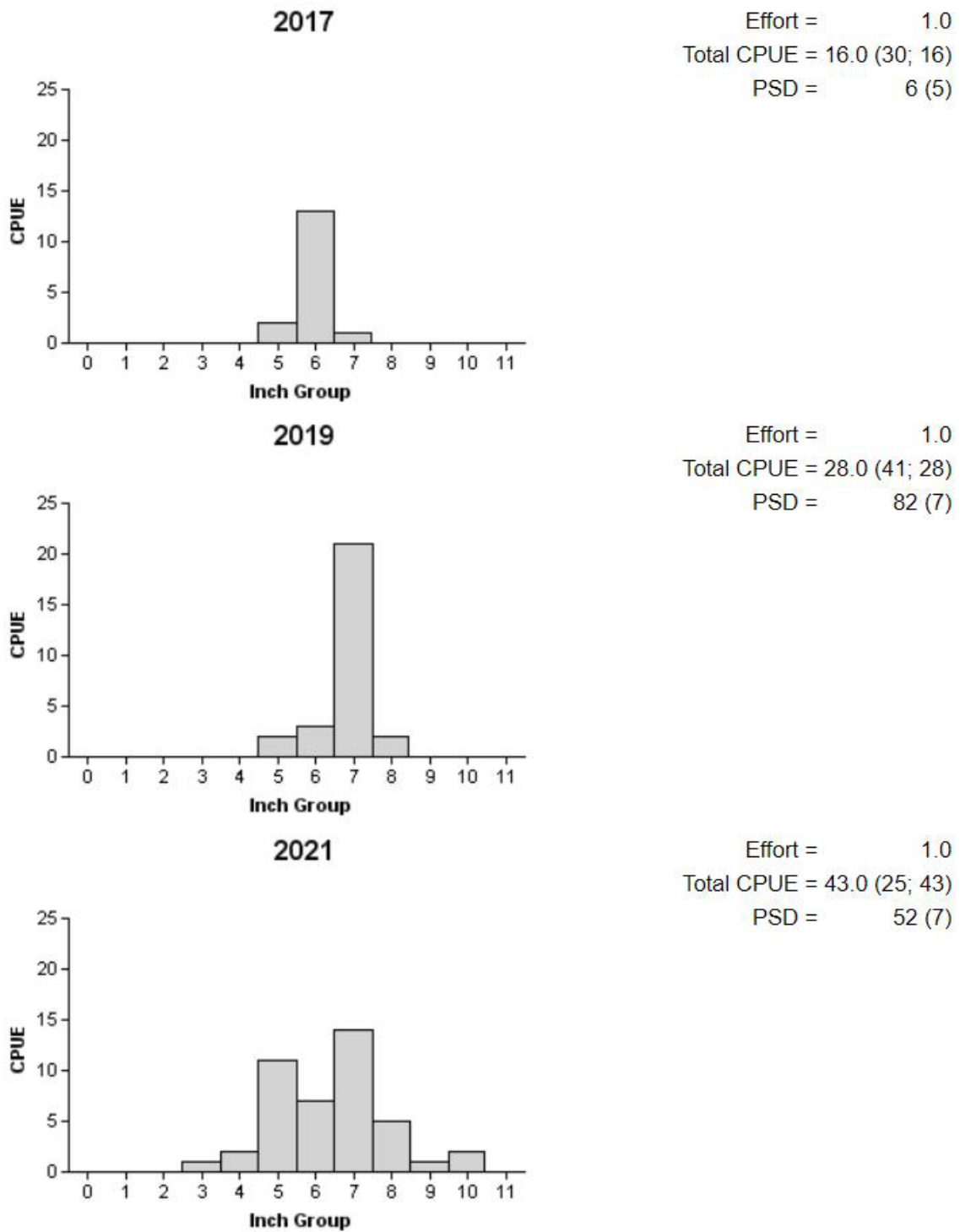


Figure 4. Number of Redear Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2017, 2019, and 2021.

## Blue Catfish

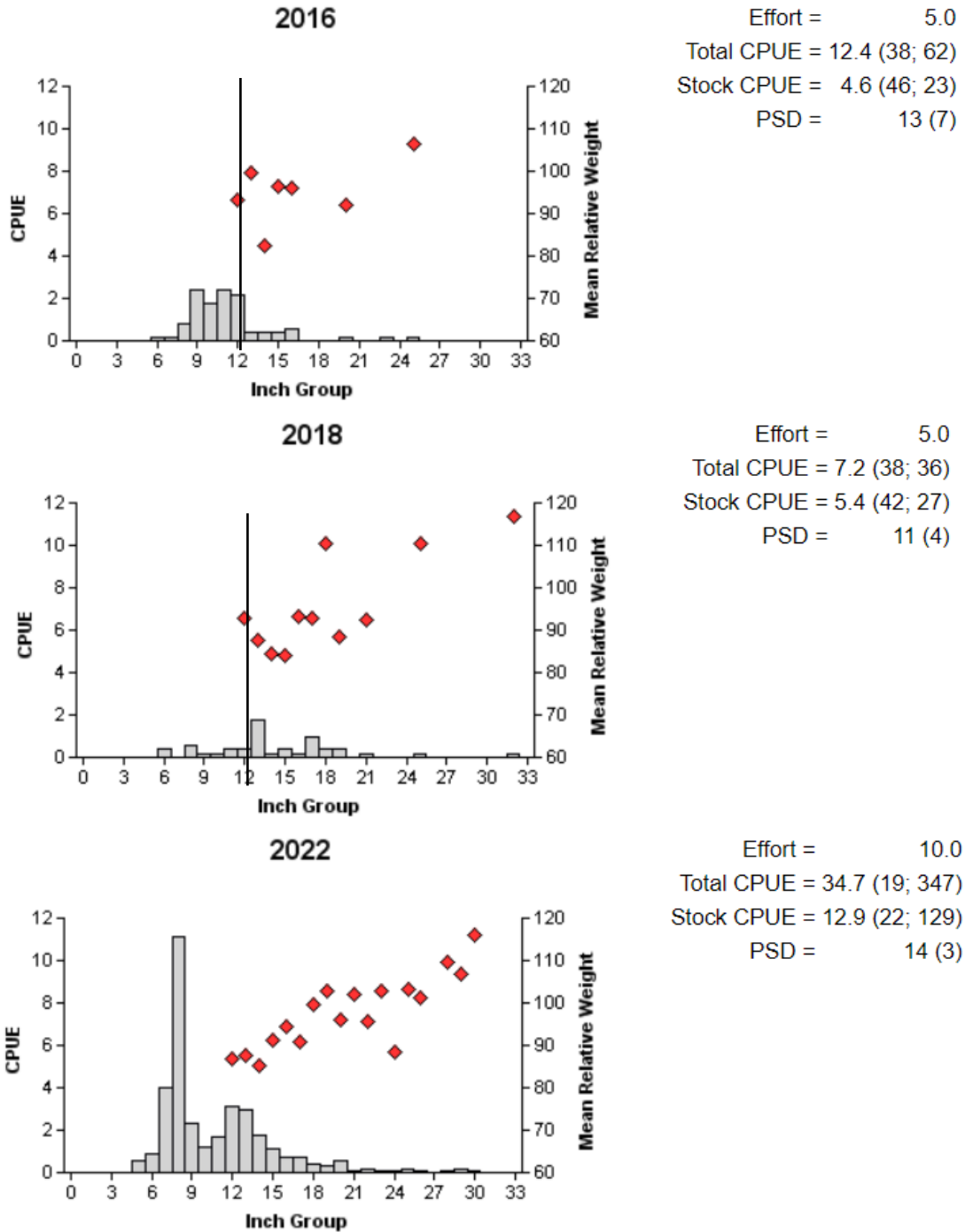


Figure 5. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2016, 2018, and 2022. Vertical line represents minimum length limit at time of sampling.

Table 10. Creel survey statistics for Blue Catfish at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22. Total catch per hour is for anglers targeting Blue Catfish and total harvest is the estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2008/2009	2013/2014	2021/2022
Surface area (acres)	2,334.0	1,722.4	2,307.0
Directed effort (h)	0 ()	0 ()	1,705.4 (38)
Directed effort/acre	0 ()	0 ()	0.7 (38)
Total catch per hour	0 ()	0 ()	0.5 (100)
Total harvest	20.1 (825)	263.5 (386)	293.2 (190)
Harvest/acre	<0.1 (825)	0.2 (386)	0.1 (190)
Percent legal released	0	0	69.7

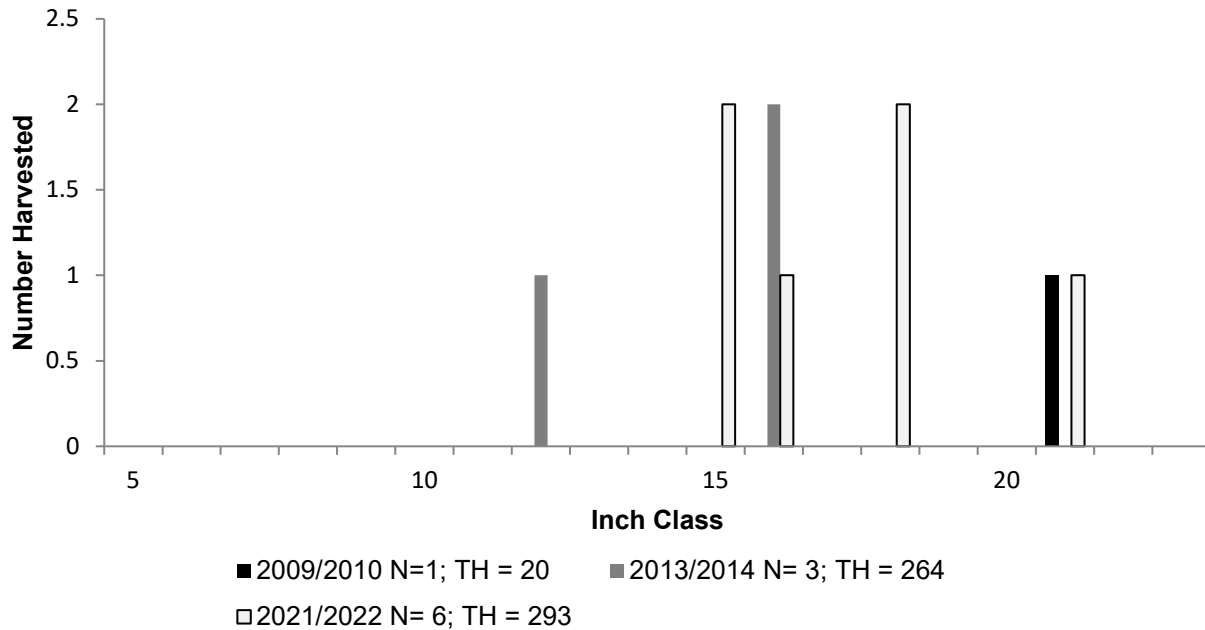


Figure 6. Length frequency of harvested Blue Catfish observed during creel surveys at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

### Channel Catfish

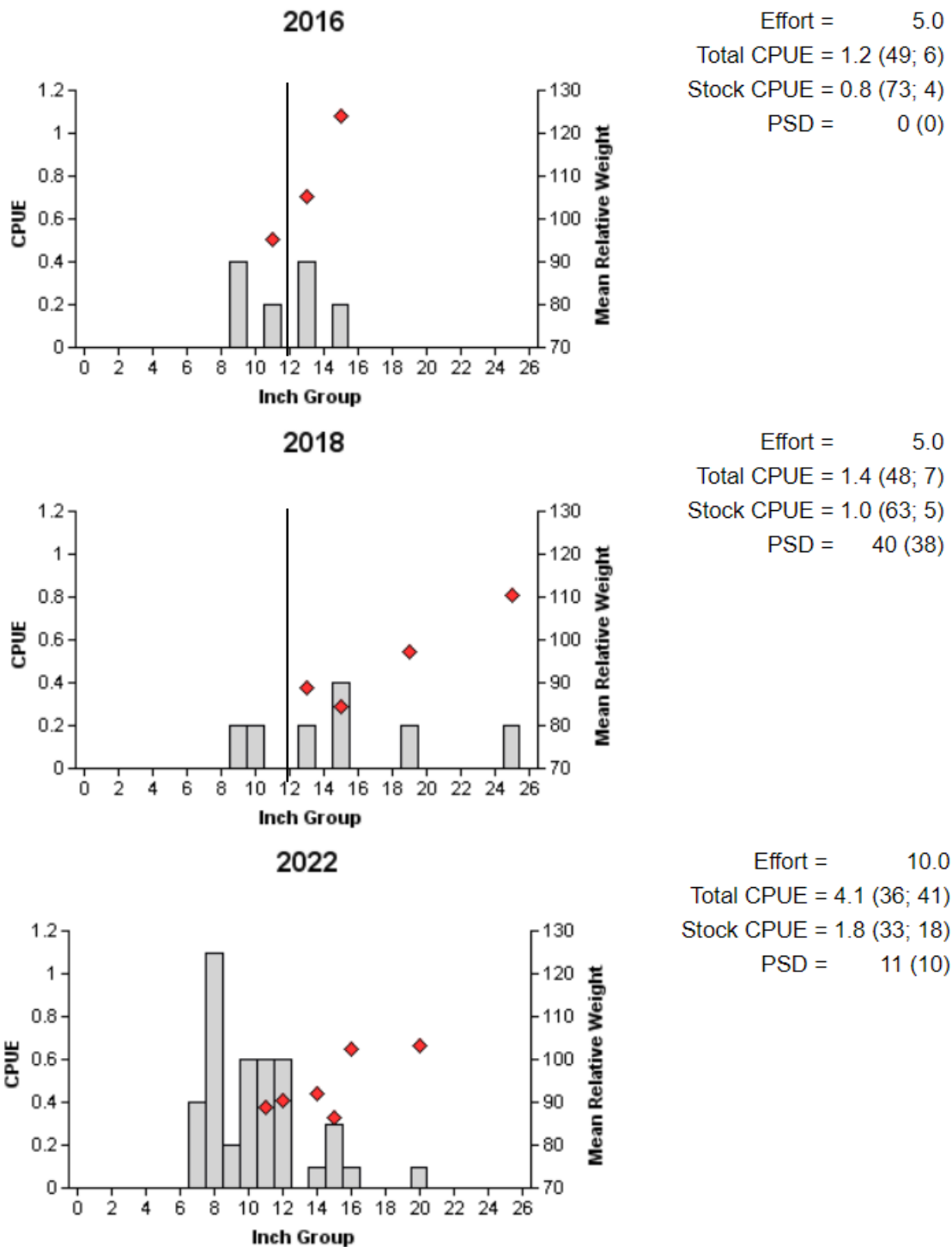


Figure 7. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2016, 2018, and 2022. Vertical line represents minimum length limit at time of sampling.



Table 11. Creel survey statistics for Channel Catfish at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22. Total catch per hour is for anglers targeting Channel Catfish and total harvest is the estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2008/2009	2013/2014	2021/2022
Surface area (acres)	2,334.0	1,722.4	2,307.0
Directed effort (h)	768.0 (58)	341.9 (91.2)	0 ()
Directed effort/acre	0.3 (58)	0.2 (91.2)	0 ()
Total catch per hour	1.3 (105)	0.8 ()	0 ()
Total harvest	20.1 (826)	521.7 (170)	363.8 (142)
Harvest/acre	<0.1 (826)	0.3 (170)	0.2 (142)
Percent legal released	41.8	0.9	65.7

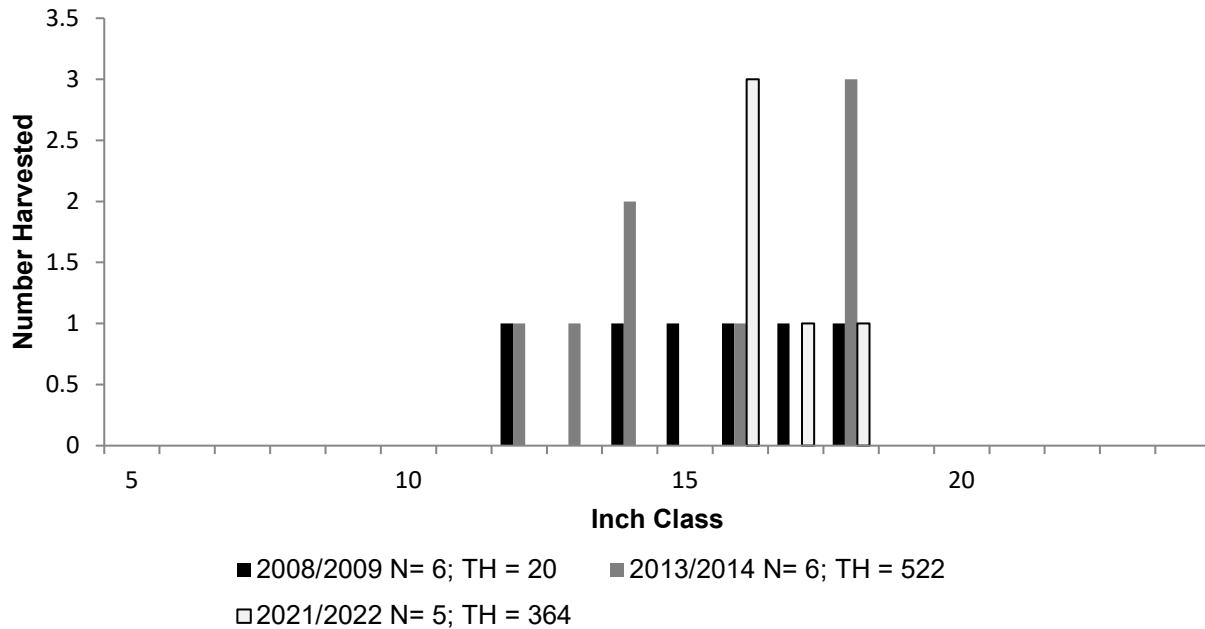


Figure 8. Length frequency of harvested Channel Catfish observed during creel surveys at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass

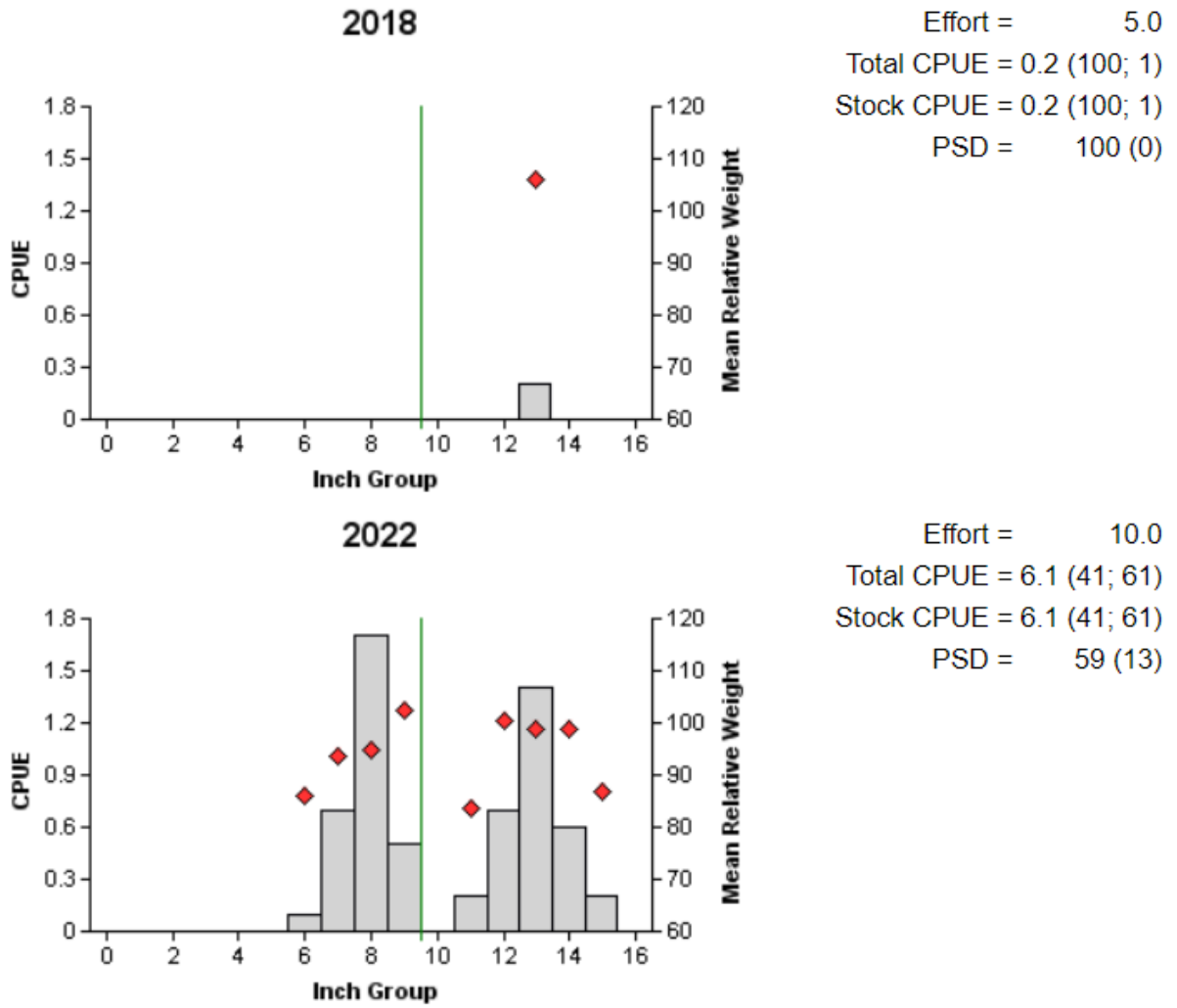


Figure 9. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2018 and 2022. No White Bass were sampled in 2016. Vertical line represents minimum length limit at time of sampling.

Table 12. Creel survey statistics for White Bass at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22. Total catch per hour is for anglers targeting White Bass and total harvest is the estimated number of White Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2008/2009	2013/2014	2021/2022
Surface area (acres)	2,334.0	1,722.4	2,307.0
Directed effort (h)	2,399.6 (39)	1,181.6 (53)	547.6 (72)
Directed effort/acre	2.1 (39)	0.7 (53)	0.2 (72)
Total catch per hour	1.9 (20)	3.6 (57)	5.2 (100)
Total harvest	2,609.8 (44)	1,807.8 (64)	2,203.1 (58)
Harvest/acre	1.1 (44)	1.0 (64)	1.0 (58)
Percent legal released	35.7	33.8	74.0

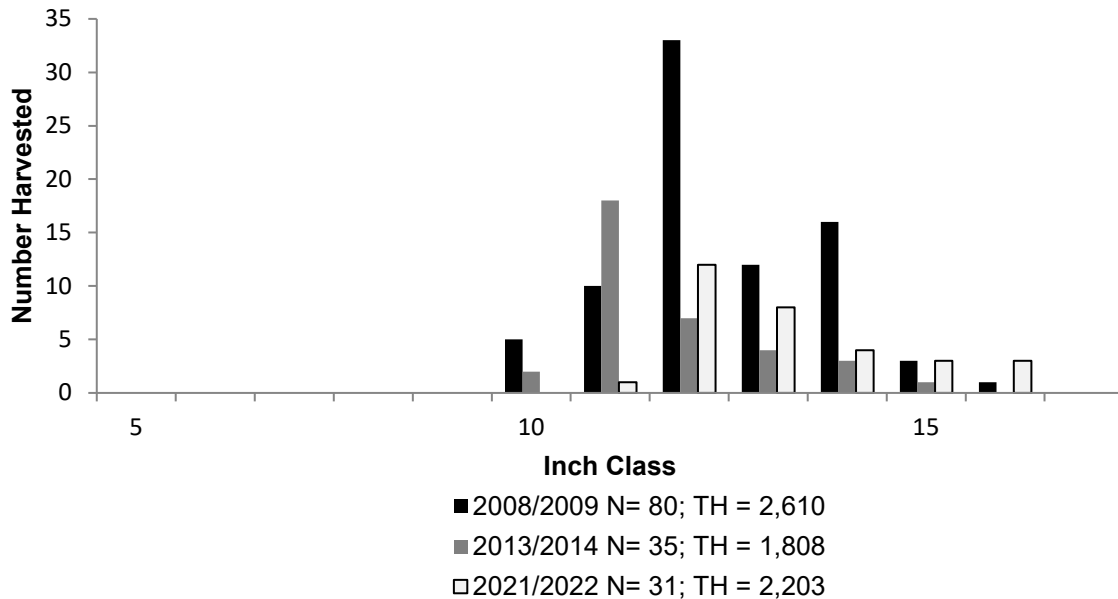
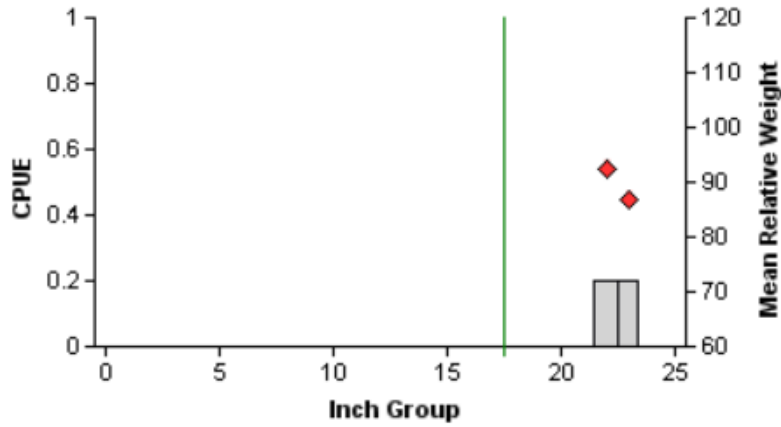


Figure 10. Length frequency of harvested White Bass observed during creel surveys at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

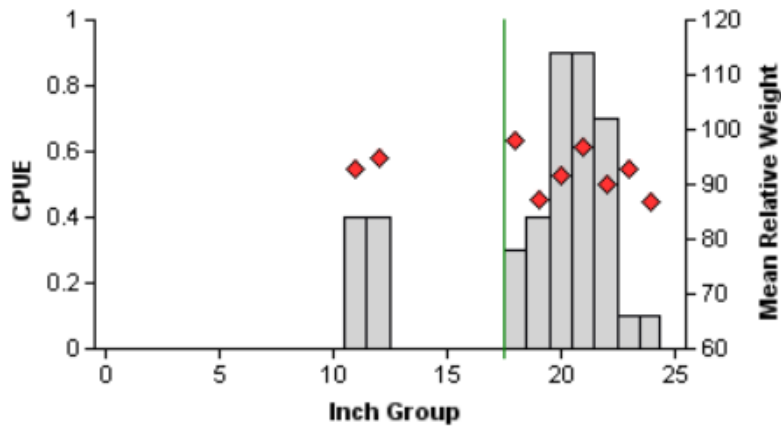
Palmetto and Sunshine Bass

2016



Effort = 5.0  
 Total CPUE = 0.4 (100; 2)  
 Stock CPUE = 0.4 (100; 2)  
 PSD = 100 (0)

2022



Effort = 10.0  
 Total CPUE = 4.2 (39; 42)  
 Stock CPUE = 4.2 (39; 42)  
 PSD = 81 (11)

Figure 11. Number of Palmetto and Sunshine 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, Graham Reservoir, Texas, 2016 and 2022. No Palmetto Bass were sampled in 2018. Vertical line represents minimum length limit at time of sampling.

Table 13. Creel survey statistics for Palmetto and Striped Bass at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22. Total catch per hour is for anglers targeting Palmetto Bass and total harvest is the estimated number of Palmetto Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2008/2009	2013/2014	2021/2022
Surface area (acres)	2,334.0	1,722.4	2,307.0
Directed effort (h)	339 (90)	0 ( )	766.3 (56)
Directed effort/acre	0.1 (90)	0 ( )	0.3 (56)
Total catch per hour	0.7 (50)	0 ( )	0 ( )
Total harvest	475.2 (168)	0 ( )	99.9 (134)
Harvest/acre	0.2 (168)	0 ( )	>0.1 (134)
Percent legal released	0.3	0	78.4

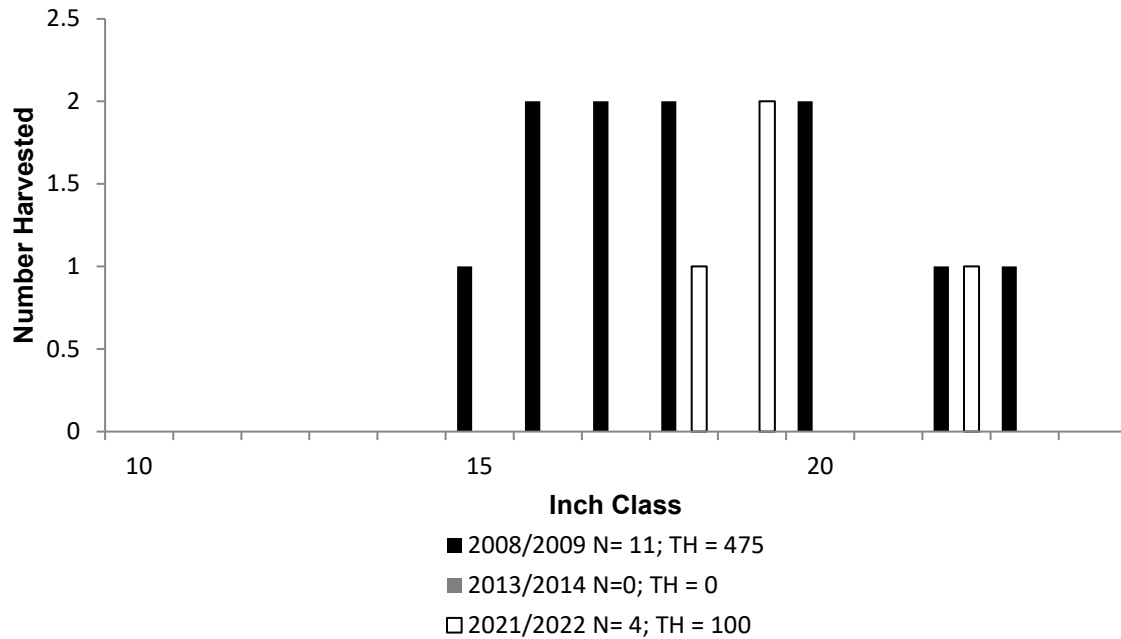


Figure 12. Length frequency of harvested Palmetto and Striped Bass observed during creel surveys at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22, all anglers combined. N is the number of harvested Palmetto Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

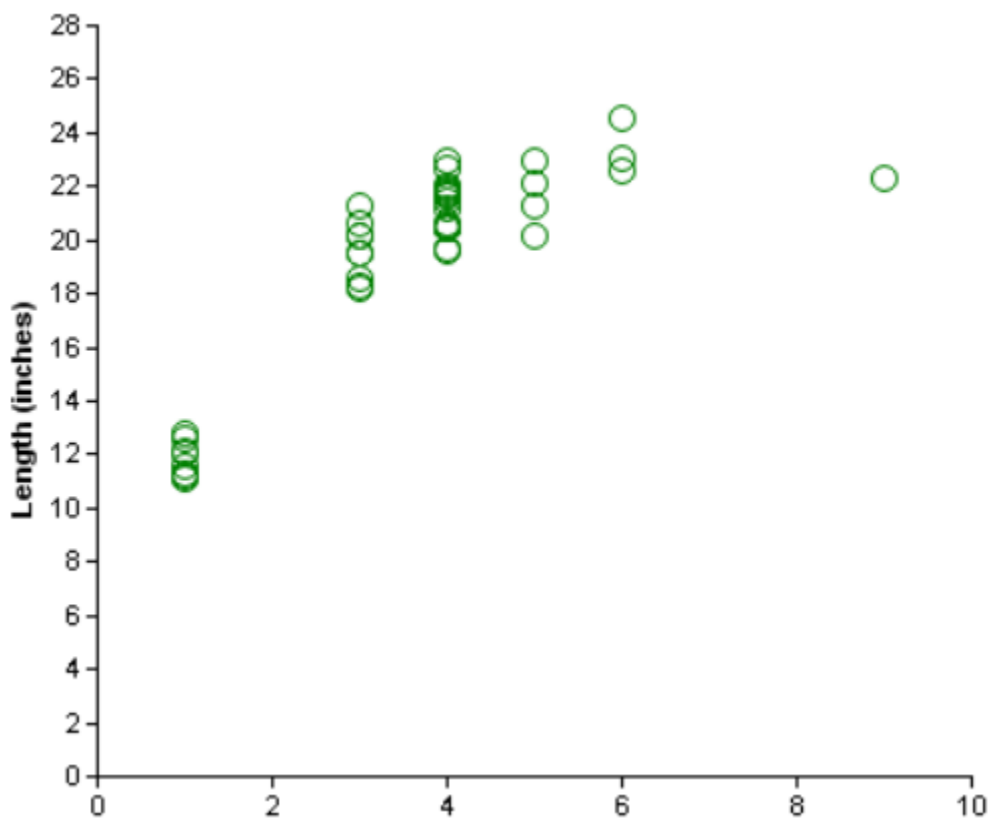


Figure 13. Length at age for hybrid Striped Bass (Palmetto and Sunshine Bass, combined) collected from gill nets at Graham Reservoir, Texas, March 2022.

### Largemouth Bass

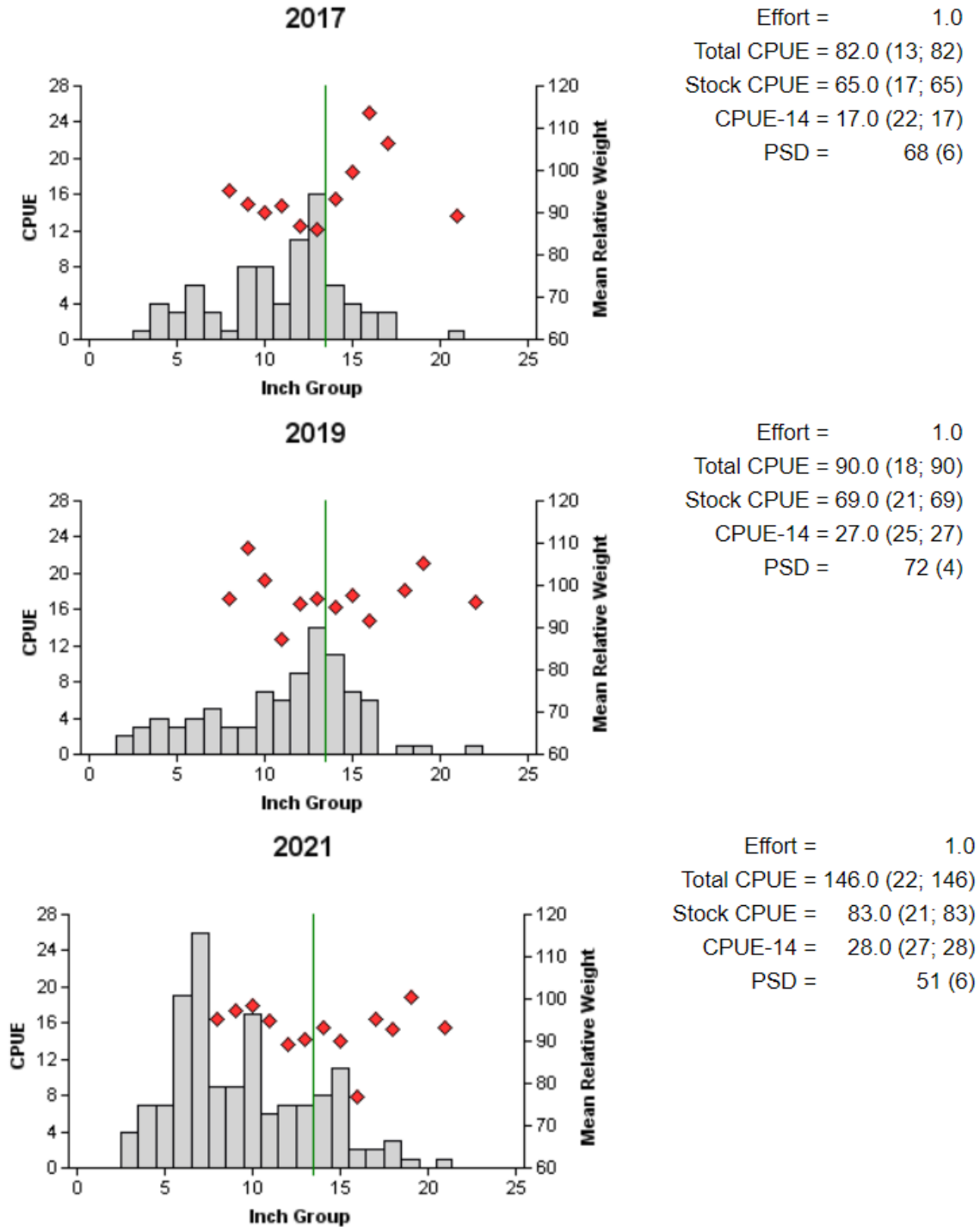


Figure 14. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2017, 2019, and 2021. Vertical line represents minimum length limit at time of sampling.

Table 14. Creel survey statistics for Largemouth Bass at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22. Catch rate is for all anglers targeting Largemouth Bass. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Statistic	2008/2009	2013/2014	2021/2022
Surface area (acres)	2,334.0	1,722.4	2,307.0
Directed angling effort (h)			
Tournament	6,381.8 (74)	593.0 (74)	6,613.6 (24)
Non-tournament	4,219.4 (31)	1,033.6 (55)	8,165.8 (24)
All black bass anglers combined	10,601.2 (38)	1,626.6 (45)	14,779.4 (24)
Angling effort/acre	4.5 (38)	0.9 (45)	6.4 (24)
Catch rate (number/h)	0.7 (25)	0.8 (35)	1.3 (42)
Harvest			
Non-tournament harvest	417.0 (84)	0 ()	434.5 (89)
Harvest/acre	0.2 (84)	0 ()	0.2 (89)
Tournament weigh-in and release	319.2 (137)	0 ()	3,880.4 (43)
Release by weight			
<4.0 lbs.	NA	1,860 (88)	12,821 (37)
4.0-6.9 lbs.	NA	0 ()	2,471 (60)
7.0-9.9 lbs.	NA	0 ()	0 ()
≥10.0 lbs.	NA	0 ()	0 ()
Percent legal released (non-tournament)	75.3	100	16.4



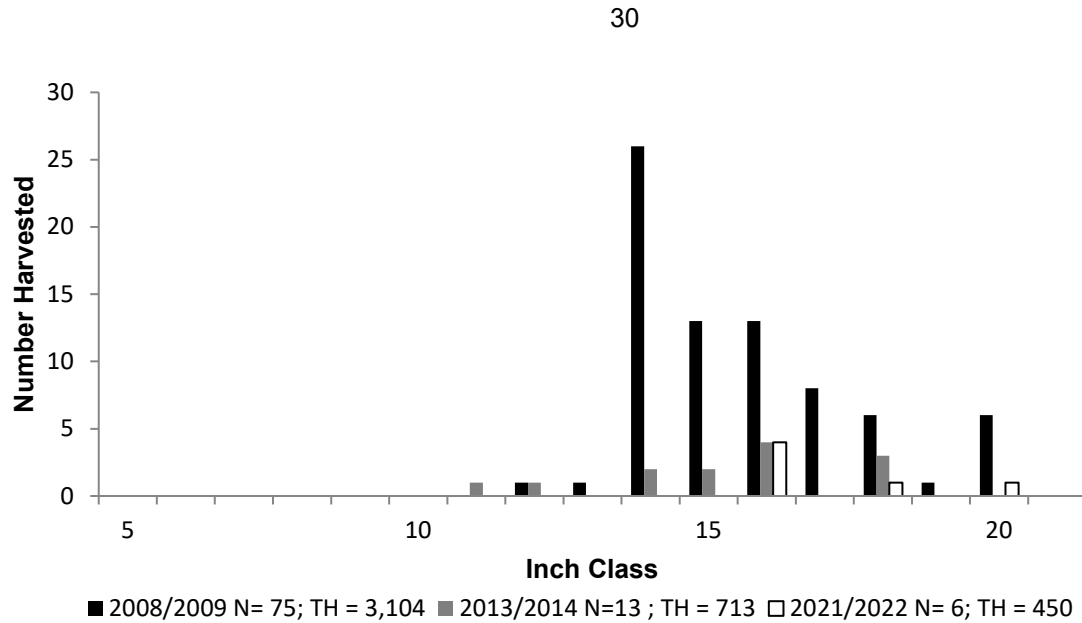


Figure 15. Length frequency of non-tournament harvested Largemouth Bass observed during creel surveys at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and NTH is the estimated non-tournament harvest for the creel period.

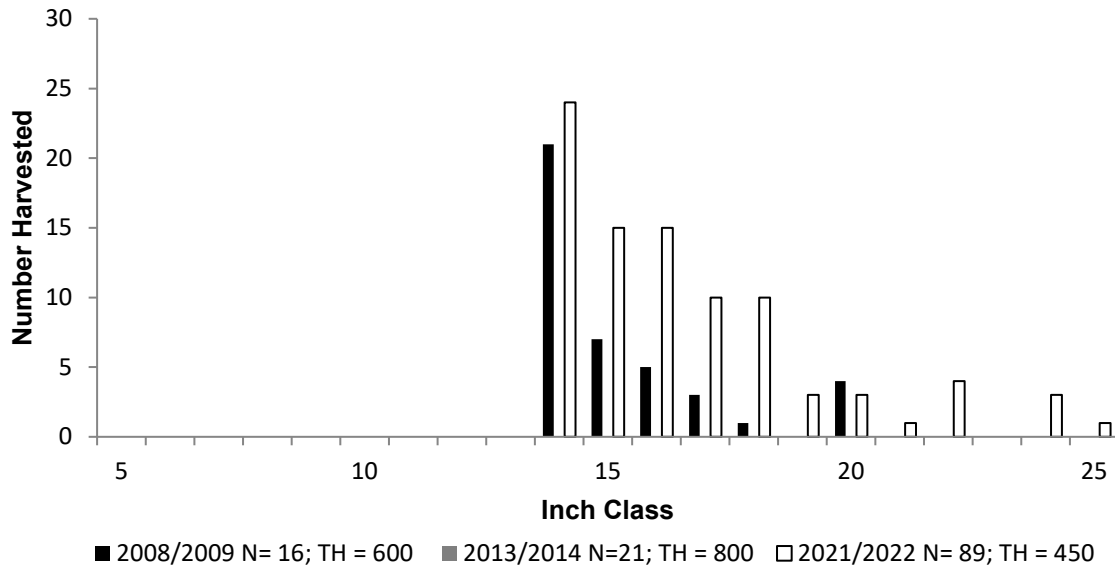


Figure 16. Length frequency of tournament Largemouth Bass observed during creel surveys at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and NTH is the estimated tournament for the creel period.

Table 15. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Graham Reservoir, Texas, 1994, 1997, 2001, 2005, 2006, 2009, and 2021. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
1994	33	0	19	14	23	0
1997	30	1	12	17	18	3
2001	28	1	20	7	37	4
2005	34	0	26	8	31	0
2006	30	0	28	2	46	0
2009	30	0	29	1	46	0
2021	30	3	26	1	58	10

## White Crappie

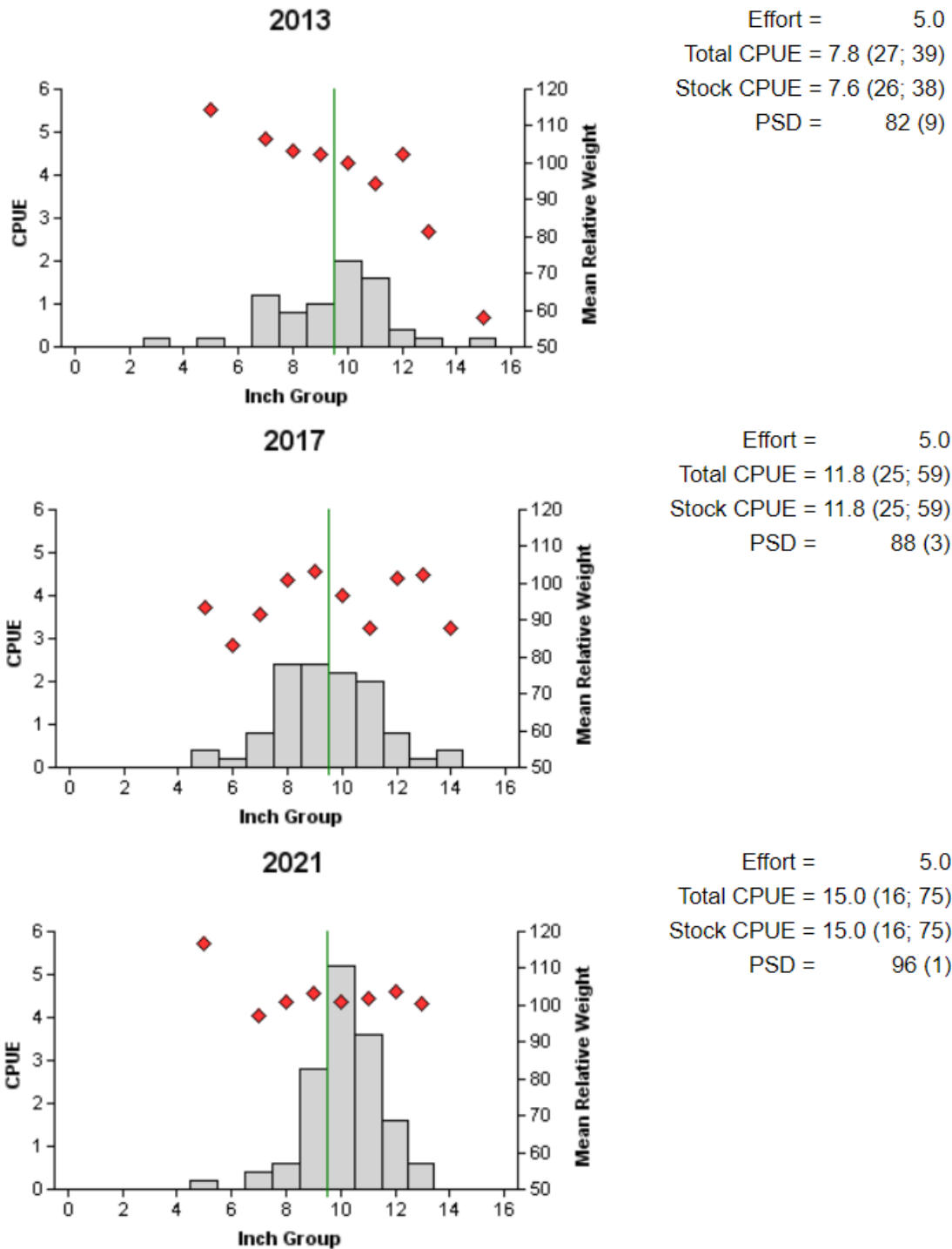


Figure 17. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure) for fall trap netting surveys, Graham Reservoir, Texas, 2013, 2017, and 2021. Vertical line indicates minimum length limit.

### Black Crappie

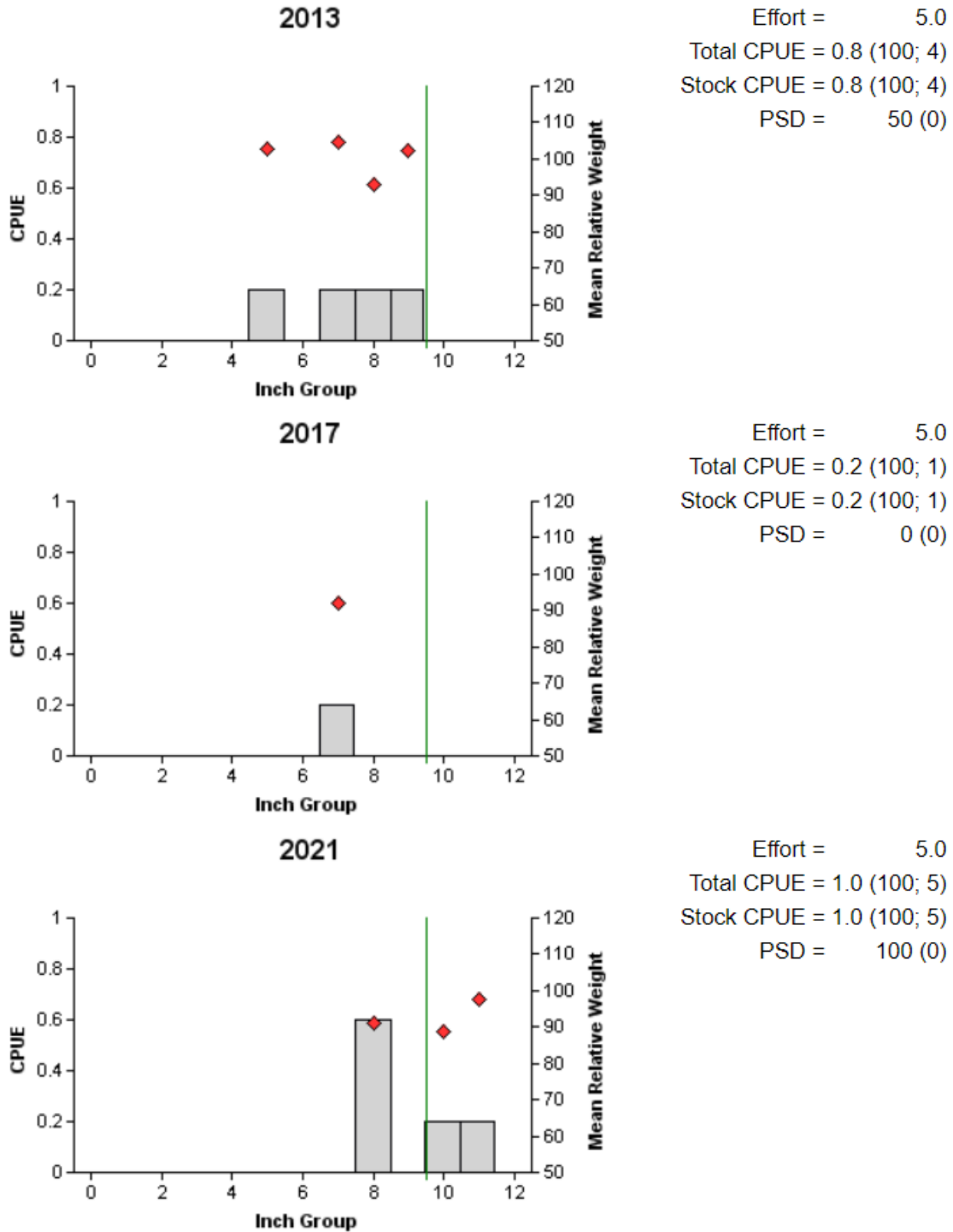


Figure 18. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Graham Reservoir, Texas, 2013, 2017, and 2021. Vertical line indicates minimum length limit.

## Crappie

Table 16. Creel survey statistics for crappie at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22. Total catch per hour is for anglers targeting crappie *spp.* and total harvest is the estimated number of crappie *spp.* harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2008/2009	2013/2014	2021/2022
Surface area (acres)	2,334.0	1,722.4	2,307.0
Directed effort (h)	12,296.9 (20)	9,514.1 (23)	5,658.0 (27)
Directed effort/acre	5.3 (20)	5.5 (23)	2.5 (27)
Total catch per hour	2.8 (29)	2.3 (32)	2.1 (128)
Total harvest	8,848.9	13,579.6	7,059.9 (42)
Harvest/acre	3.8	7.9	3.1 (42)
Percent legal released	9.4	2.1	12.9

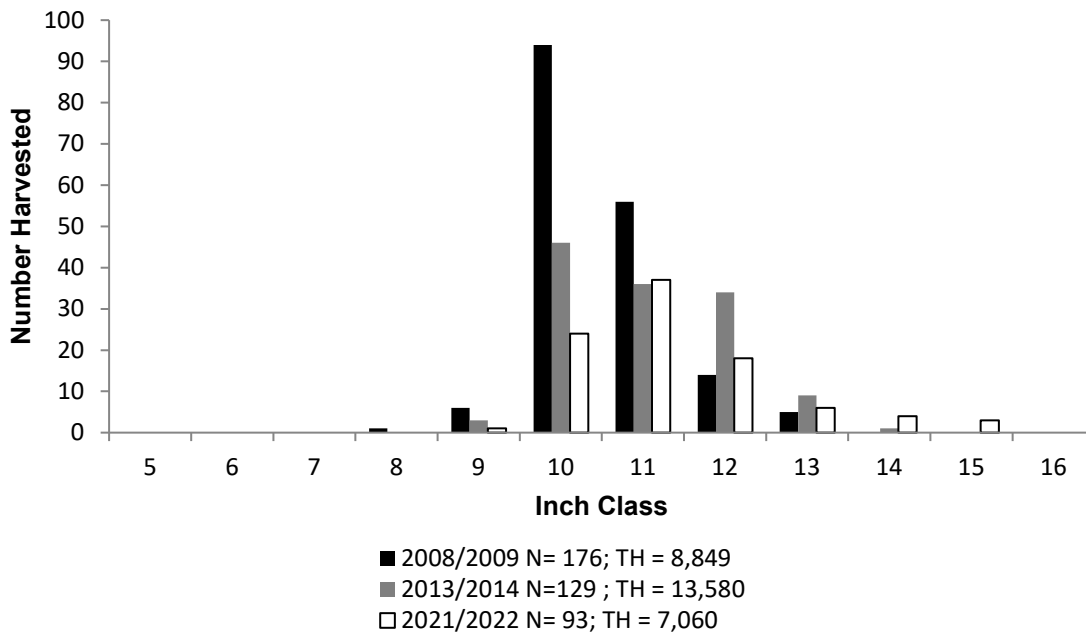


Figure 19. Length frequency of harvested crappie observed during creel surveys at Graham Reservoir, Texas, from November 1 through May 31, 2008-09, 2013-14, and 2021-22, all anglers combined. N is the number of harvested crappie *spp.* observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Proposed Sampling Schedule

Table 17. Proposed sampling schedule for Graham 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

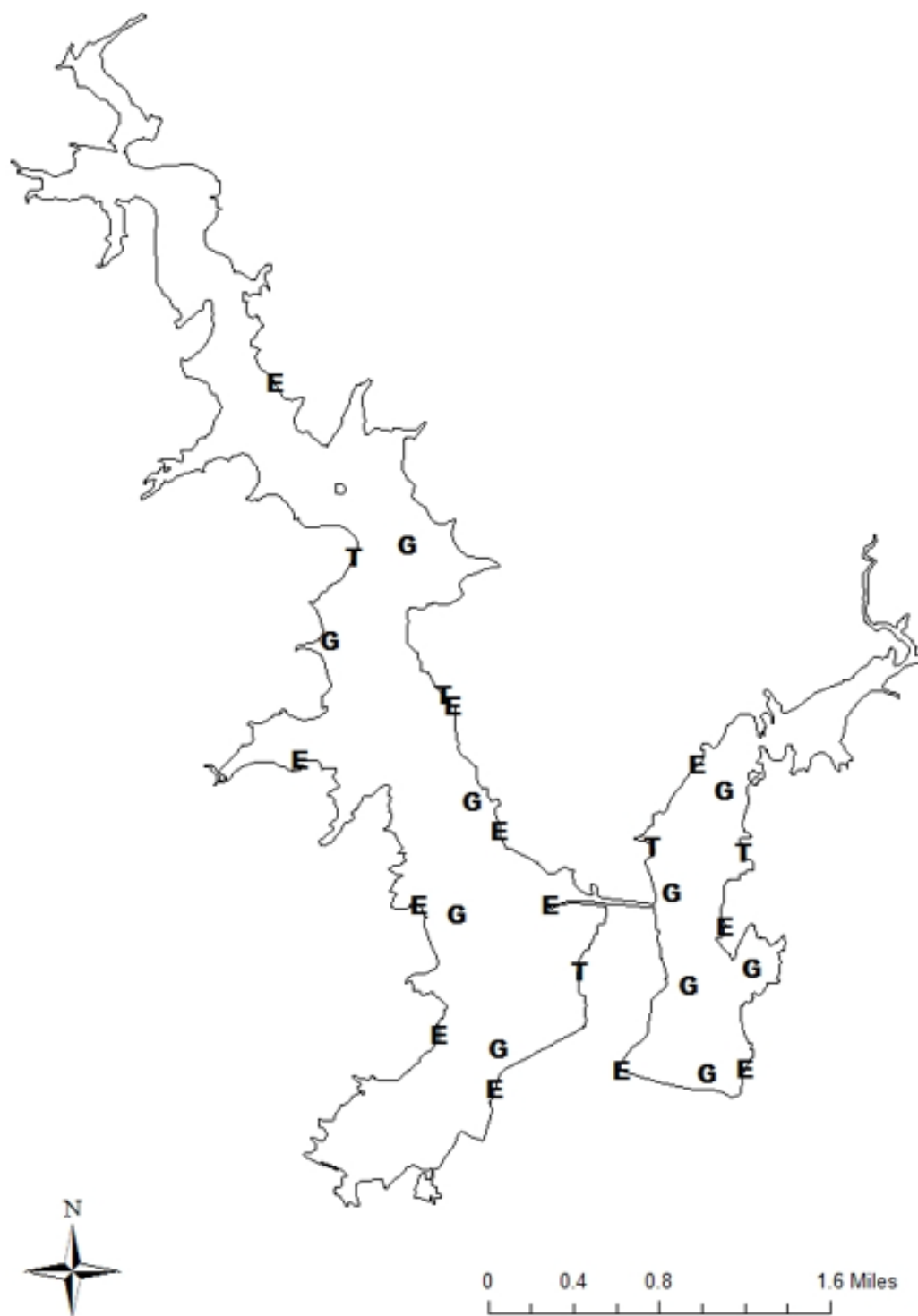
	Survey year			
	2022-2023	2023-2024	2024-2025	2025-2026
Angler Access				X
Vegetation				X
Electrofishing – Fall		X		X
Trap netting				X
Gill netting		X		X
Report				X

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Graham Reservoir, Texas, 2021-2022. Sampling effort was 10 net nights for gill netting, 5 net nights for trap netting, and 1 hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Spotted Gar	2	0.2 (100)				
Longnose Gar	8	0.8 (41)				
Gizzard Shad	280	28.0 (11)			293	293.0 (27)
Threadfin Shad					249	249.0 (78)
River Carpsucker	27	2.7 (35)				
Smallmouth Buffalo	35	3.5 (24)				
Blue Catfish	347	34.7 (19)				
Channel Catfish	41	4.1 (36)				
Flathead Catfish	1	1.0 (100)				
White Bass	61	6.1 (41)	1	0.2 (100)		
Palmetto Bass	42	4.2 (39)				
Green Sunfish					5	5.0 (46)
Warmouth					10	10.0 (44)
Bluegill	3	0.3 (100)	74	14.8 (54)	299	299.0 (22)
Longear Sunfish			4	0.8 (73)	128	128.0 (34)
Redear Sunfish	1	1.0 (100)	8	1.6 (64)	43	43.0 (25)
Largemouth Bass	5	0.5 (61)			146	146.0 (22)
White Crappie	28	2.8 (20)	75	15.0 (16)		
Black Crappie	3	0.3 (51)	5	1.0 (100)		
Freshwater Drum	11	1.1 (42)				

## APPENDIX B – Map of sampling locations



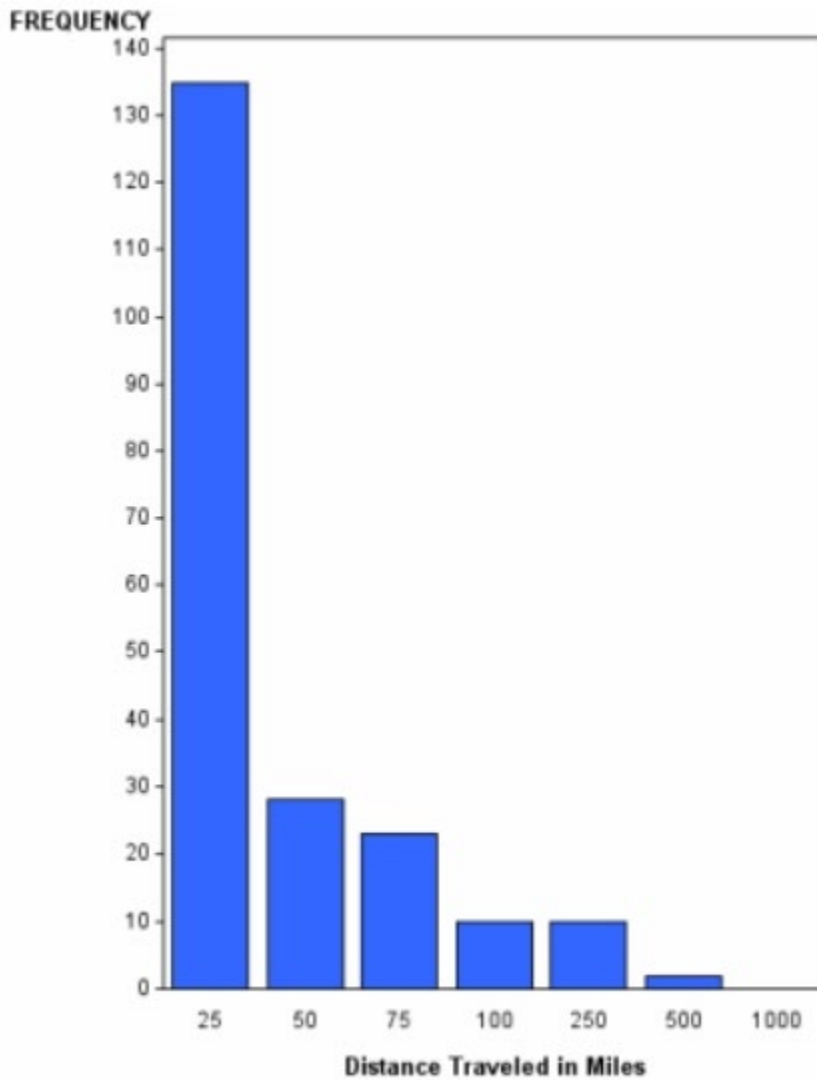
Location of sampling sites, Graham Reservoir, Texas, 2021-2022. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was near full pool at time of sampling.



### APPENDIX C – reporting of creel ZIP code data

*[Optional: Graphical representation can be in the form of a bar chart of angler distance from reservoir or map of angler frequency by county (from SAS creel data analysis program) or other options at author's discretion.]*

Example A1: Reporting ZIP code data using a bar chart



Frequency of anglers that traveled various distances (miles) to Graham Reservoir, Texas, as determined from the December 2021 through May 2022 creel survey.

## APPENDIX D – Historical catch rates of targeted species by gear type for Graham Reservoir, Texas.

Historical catch rates for targeted species by gear type for Graham Reservoir, Texas.

Gear	Species	Year											
		1997	2001	2002	2005	2006	2008	2009	2010	2011	2012	2013	2014
Gill Netting (fish/net night)	Blue Catfish			0.7		3.2	7.0		8.0		9.6		8.8
	Channel Catfish	4.0		3.1		2.0	2.2		2.3		1.0		1.6
	White Bass	4.3		2.9		5.6	4.8		2.2		0.8		10.2
	Hybrid Striped Bass	12.5		2.7		0.8	0.7		1.0		0.2		2.0
Electrofishing (fish/hour)	Gizzard Shad	202.7	555.2		77.0	240.0		242.0		161.0		220.0	125.0
	Threadfin Shad	12.7	88.8		57.0	241.0		39.0		108.0		274.0	6.0
	Green Sunfish	0	4.8		6.0	4.0		10.0		2.0		0	4.0
	Warmouth	3.3	2.4		3.0	15.0		7.0		1.0		2.0	0
	Bluegill Sunfish	316.7	324		97.0	281.0		266.0		146.0		35.0	21.0
	Longear Sunfish	59.3	11.2		30.0	123.0		58.0		24.0		19.0	16.0
	Redear Sunfish	24.0	56.8		29.0	45.0		89.0		32.0		35.0	0
	Largemouth Bass	149.3	188.8		75.0	203.0		113.0		63.0		101.0	12.0
Trap Netting (fish/net night)	White Crappie	10.8	3.7		10.0			4.7				7.8	
	Black Crappie	0	0		0.2			1.6				0.8	

**APPENDIX D – Continued**

Gear	Species	Year					Avg	
		2016	2017	2018	2019	2021		2022
Gill Netting (fish/net night)	Blue Catfish	12.4		7.2			34.7	10.2
	Channel Catfish	1.2		1.4			4.1	2.3
	White Bass	0		0.2			6.1	3.7
	Hybrid Stiped Bass	0.4		0			4.2	2.5
Electrofishing (fish/hour)	Gizzard Shad		332.0		510.0	293.0		268.9
	Threadfin Shad		605.0		486.0	249.0		197.0
	Green Sunfish		0		1.0	5.0		3.3
	Warmouth		1.0		1.0	10.0		4.2
	Bluegill Sunfish		127.0		134.0	299.0		186.1
	Longear Sunfish		27.0		66.0	128.0		51.0
	Redear Sunfish		16.0		28.0	43.0		36.2
	Largemouth Bass		82.0		90.0	146.0		111.2
Trap Netting (fish/net night)	White Crappie		11.8			15.0		9.1
	Black Crappie		0.2			1.0		0.5



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