

Graham Reservoir

2017 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in Graham Reservoir were surveyed in 2017 using electrofishing and trap netting and in 2018 using gill netting. Historical data are presented with the 2017-2018 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 near 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, Palmetto Bass, Largemouth Bass, White Crappie and catfish spp. Palmetto Bass were stocked in 2015 and 2016. Palmetto and Sunshine Bass were stocked in 2017 and 2018 as part of a research project comparing their performance. Florida Largemouth Bass were stocked in 2015 and 2016 in response to poor population abundance caused by the prolonged drought.

Fish Community

- **Prey species:** Threadfin Shad continued to be present in the reservoir in great abundance. Electrofishing catch rates of Gizzard Shad were above the historical reservoir average and Gizzard Shad size structure was dominated by larger sized fish with only 20% of the population vulnerable to predators. This is a substantial change from previous surveys where most Gizzard Shad were vulnerable to predation. Bluegill abundance greatly improved from the two previous surveys but was still below the historical reservoir average. Redear Sunfish abundance was down compared to previous surveys.
- **Catfishes:** Blue Catfish abundance was at the historical average for the reservoir but down from the previous survey. Channel Catfish abundance has been consistently low the last few gill net surveys. Flathead Catfish have historically been present in the reservoir but were not collected during the 2018 survey.
- **Temperate basses:** White Bass were sampled in very low abundance with only one specimen captured during the 2018 survey. No White Bass were captured in the 2016 survey. No Palmetto Bass were sampled in 2018, despite stockings occurring in 2015, 2016, and 2017. This apparent low abundance could be a result of some of the stocked Palmetto Bass dispersing downstream into the Brazos River when heavy rains increased the reservoir elevation above full pool. A new lake record Hybrid Striped Bass of 12.7-pounds and 29-inches was caught on 5/31/2017.
- **Largemouth Bass:** The electrofishing catch rate of Largemouth Bass was below the historical reservoir average. However, it was higher than rate observed in the 2015 survey. Body condition was good for legal length fish.
- **White Crappie:** White Crappie abundance and size distribution continued to be good. The catch rate was the highest recorded at the reservoir with lots of legal length crappie present. Black Crappie, which were first sampled in 2005, are still present in low abundance but there has been a noticeable decrease in their abundance over the past three surveys. New lake records for White Crappie (2.26-pounds and 15.75-inches) and Black Crappie (1.47-pounds and 14.25-inches) were established in 2017.

Management Strategies: Stock Palmetto (7/acre) and Sunshine Bass (7/acre) in 2019 as part of a special research project. Conduct gill netting in 2021 for Hybrid Striped Bass as part of the research project. Conduct electrofishing surveys for Largemouth Bass, sunfishes, and Threadfin and Gizzard Shad in 2019 and 2021. Conduct trap netting survey for crappie in 2021.

Introduction

This document is a summary of fisheries data collected from Graham Reservoir in 2017-2018. 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 species of fishes were collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2017-2018 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, Graham dam was constructed on Salt Creek. The two reservoirs were connected via a canal sometime after June of 1959 creating Graham reservoir. It is located 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 mi², 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, 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 and several private boat ramps (Table 2). Bank fishing access was available around the boat ramps, bridges, and other shoreline areas. A user-pay crappie house is 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 2014) included:

1. The Palmetto Bass population was improving with relative weights suggesting that prey abundance was sufficient to support increased stocking numbers and frequency.

Action: Palmetto Bass were requested annually at a rate of 5-10/acre. Gill netting occurred every two years to monitor the population. In 2017, Graham was stocked with both Palmetto and Sunshine Bass as part of a special project.
2. The Largemouth Bass fishery is very popular with lots of tournaments being held on Graham. The population is cyclic in nature and bass often exhibit poor body conditions. It has been observed that some tournaments do not handle the bass properly.

Action: Monitored Largemouth Bass population every two years with an electrofishing survey. Florida Largemouth Bass were stocked in 2015 and 2016 to improve the population after water levels increased. The office also offered to give a presentation on proper tournament care of bass to participants of a bass tournament. However, the participants were not interested. We also make proper tournament care of bass a talking point with bass tournament anglers and provide information on how to better handle their catch and improve their weigh-in process.
3. The potential spread of zebra mussels and other invasive species exists. Informing the public and reservoir authorities of what to do to prevent the spread and what to do if they suddenly appear in the reservoir are prudent actions.

Action: Spoke and gave material about invasive species to fishing barge operator and city authorities. Signage was posted at the boat ramps to make boaters aware of invasive species. Articles about invasive species were written and published in local newspaper.

Harvest regulation history: Sport fish in Graham Reservoir have always been managed with statewide regulations (Table 3).

Stocking history: Graham Reservoir was stocked in 2017 and 2018 with Palmetto and Sunshine Bass as part of a research project. Prior to 2017, Graham Reservoir was stocked with Palmetto Bass when available from the hatchery system. Florida Largemouth Bass were stocked in 2015 and 2016 in response to the end of a severe drought that negatively affected the population. There is no record of Blue Catfish having been stocked into the reservoir but they were collected in the 2002 survey and are now well established. The complete stocking history is in Table 4.

Vegetation/habitat management history: Graham Reservoir has no significant vegetation or habitat management history.

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 the Brazos River to 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 (TPWD unpublished). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

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.

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 – Channel Catfish, Blue Catfish, Palmetto Bass, and White Bass were collected by gill netting (5 net nights at 5 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (*Wr*)] 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.

Habitat – A structural habitat survey was conducted in 2017. Vegetation surveys were conducted in 2009, 2013, and 2017 to monitor aquatic vegetation. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Water level – Source for water level data was the United States Geological Survey (USGS 2018).

Results and Discussion

Habitat: Structural and aquatic vegetation surveys were conducted in August 2017 (Tables 6 and 7). Reservoir elevation at time of survey was 1,074.5 ft. above mean sea level. Emergent aquatic vegetation was abundant, with some floating-leaved aquatic vegetation also present.

Prey species: Electrofishing catch rates of Gizzard Shad and Threadfin Shad were 322.0/h and 605.0/h, respectively (Appendix A). Index of Vulnerability (IOV) for Gizzard Shad was 20% which was well below the IOV estimates in 2015 (88%) and 2013 (89%; Figure 2). Total CPUE of Gizzard Shad (322.0/h) was higher than in 2015 (125.0/h) and 2013 (220.0/h) and above the historical average of 239.4/h. Threadfin Shad (605.0/h) make up for the low IOV of Gizzard Shad. Total CPUE of Bluegill (Figure 3) in 2017 (127.0/h) was below the historical average of 179.3/h but much higher than the two previous surveys. The Redear Sunfish population in 2017 (16.0/h) was an improvement over 2015 (0.0/h) but below 2013 (35.0/h; Figure 4).

Blue Catfish: There is no record of Blue Catfish having been stocked into the reservoir but they were collected in the 2002 survey and are now well established. By 2008 the population apparently stabilized with little variation in gill net survey catch rates since. Blue Catfish abundance in 2018 was at the historical average (7.2/nn; Figure 5). Body condition of Blue Catfish was adequate ranging from 84 to 117 with *Wr* exhibiting an increasing trend with length from 15-inches and greater.

Channel Catfish: The gill net catch rate of Channel Catfish was 1.4/nn in 2018, very similar to the previous two surveys (Figure 6) but slightly below the historical average for the reservoir. The catch rate was higher before Blue Catfish were identified in the reservoir and became established. The current catch

rate appears to be where the population has stabilized. With a small sample size, it is difficult to infer much about size structure or body condition.

White Bass: The gill net catch rate of White Bass was 0.2/nn in 2018, compared to 0.0/nn in 2016 and 10.2/nn in 2014 (Figure 7). The 2014 catch rate was the highest documented and possibly a product of the reservoir being low and connectivity with the tributaries being non-existent. Thus, spawning White Bass had to remain in the reservoir and were more vulnerable to sampling gear compared to the 2016 and 2018 survey years. The drought years that ended in 2015 probably influenced recruitment since White Bass could not run up the tributaries to spawn and reproduction in the reservoir proper was poor.

Palmetto Bass: No Palmetto Bass were sampled during the 2018 gill net survey, a decrease from 0.4/nn in 2016 and 2.0/nn in 2014 (Figure 8). The 2018 survey result was unexpected, especially since stocking efforts occurred in 2015, 2016, and 2017. Palmetto Bass are present in the reservoir as District team members have caught them with rod and reel in 2017 and a new lake record Hybrid Striped Bass of 12.7-pounds and 29.0-inches was registered in 2017. Historically, the catch rates have been low. During 2015 and 2016, heavy precipitation caused the reservoir elevation to rise over the spillway releasing water into the Brazos River. Palmetto Bass seem to escape as a result eventually reaching Possum Kingdom Reservoir where they are not stocked but show up in our surveys and in anglers' catch.

Largemouth Bass: The electrofishing catch rate of Largemouth Bass was 82.0/h in 2017, considerably higher than the previous 2015 survey (Figure 9) but below the historical average (109.7/h). Size structure greatly improved from a PSD of 0 in 2015 to 65 in the recent survey. Body condition as measured by W_r ranged from 90 to 115 for legal length bass.

Crappie: The trap net catch rate of White Crappie was 11.8/nn in 2017, higher than in 2013 (7.8/nn) and 2009 (4.7/nn; Figure 10) and the highest ever documented for this reservoir. Body condition measured as W_r ranged from 85 to 105 and showed no pattern as to length class. A single 10-inch Black Crappie was sampled in 2017, which is down compared to the two previous surveys (Figure 11). Black Crappie were first sampled in the reservoir in 2009, but have never been sampled in overly abundant numbers. New lake record White Crappie (2.26-pounds and 15.75-inches) and Black Crappie (1.47-pounds and 14.25-inches) were registered in 2017.

Fisheries Management Plan for Graham Reservoir, Texas

Prepared – July 2018

ISSUE 1: Hybrid Striped Bass are a popular sport fish in Graham Reservoir but past stocking rates have been conservative and often no stockings occurred. The most recent gill net surveys demonstrated low population numbers of Palmetto Bass. In addition to conservative stocking practices, it appears Palmetto Bass escape during high water events, eventually showing up in Possum Kingdom Reservoir.

MANAGEMENT STRATEGIES

1. Include Graham in the approved research project to evaluate the Hybrid Striped Bass fishery.
2. Request Palmetto Bass and Sunshine Bass at a rate of 7 fish/acre for each cross every year as part of the approved research project.
3. Collect population structure, age and growth data, and genetics on the two crosses in 2021.

ISSUE 2: Largemouth Bass relative abundance fluctuates greatly at this reservoir and body condition has been of concern. The reservoir has been a very popular tournament site (Howell and Mauk 2010). The results of the 2008 to 2009 creel survey showed that the ratio of tournament angler caught to non-tournament angler harvested bass exceeded 3:1 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. Poor handling practices were observed for some tournaments in the previous survey.

MANAGEMENT STRATEGIES

1. Continue to monitor Largemouth Bass and prey populations frequently by conducting electrofishing surveys every other year.
2. Work with anglers and tournament groups on methods for enhancing fish survival.

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

MANAGEMENT STRATEGIES

1. Cooperate with the City of Graham 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 (2018–2022)

Sport fish, forage fish, and other important fishes

Sport fishes in Graham Reservoir have historically included White Bass, Palmetto Bass, Largemouth Bass, and crappie *spp.* The primary forage species have been Bluegill and Gizzard Shad.

Low-density fisheries

Year-long creel surveys were conducted in 2008-2009 and 2013-2014 finding directed effort towards catfish *spp.* comprising from 2.3% to 8.2% of the total angling effort, respectively. This was the least amount of targeted effort in the surveys.

Survey objectives, fisheries metrics, and sampling objectives

Creel surveys have indicated crappie *spp.* are the most sought after species in the reservoir. However, since the population has always been in good condition and there are few management options available to manage the species (such as stocking or regulation changes), extra survey work is not necessary. A trap netting survey will occur in the fall of 2021 with the sampling objective of collecting at least 50 stock length White Crappie for an adequate size structure estimate.

Largemouth Bass is a popular species in the reservoir with many bass tournaments fishing the reservoir when the population is good. The population has been cyclic in nature having boom and bust years, being influenced by reservoir elevations and high fishing effort. Monitoring this population with fall electrofishing is required every two years to adequately manage the population. Sampling objective should be to collect at least 50 stock length bass for an adequate size structure estimate. Electrofishing survey work will occur in the fall of 2019 and 2021.

During 2021, gill netting will be conducted for Hybrid Striped Bass as part of an approved state-wide research project. To obtain desired data precision ($RSE \leq 15$) for CPUE as well as adequate sample sizes (≥ 200 hybrids) for age and growth estimation and evaluating size structure, effort beyond traditional monitoring survey levels will most likely be needed. Will deploy rod and reel sampling to support data collection efforts as appropriate. A target of ≥ 200 Hybrid Striped Bass will be the sampling objective. Data on White Bass and catfish *spp.* will be collected with the Hybrid Striped Bass data.

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Tables and Figures

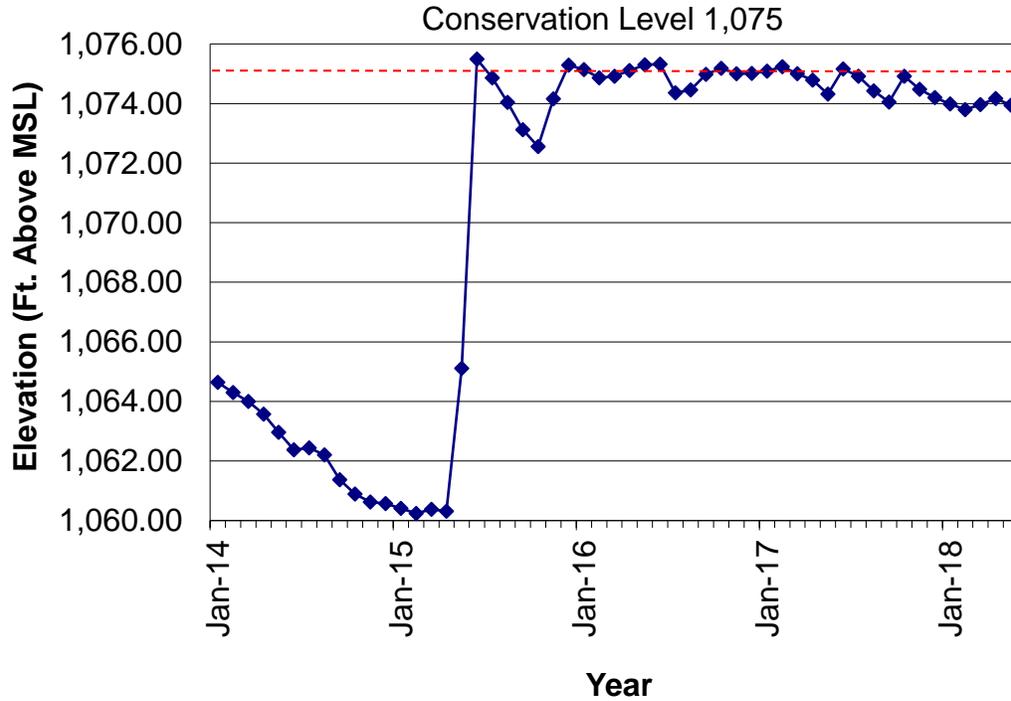


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Graham Reservoir, Texas

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	445 μ S/cm

Table 2. Boat ramp characteristics for Graham Reservoir, Texas, August, 2017. Reservoir elevation at time of survey was 1,074.5 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.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Hybrid Striped	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

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
			1967	60,000	UNK
	<u>Sunshine Bass</u>		1969	10,000	UNK
2017	13,328	FGL	1970	50,000	UNK
<u>2018</u>	<u>17,527</u>	FGL	<u>1971</u>	<u>4,000</u>	UNK
Species Total	30,855		Species Total	427,000	
	<u>Palmetto Bass</u>			<u>Florida Largemouth Bass</u>	
1979	100,000	UNK		50,022	FRY
1981	100,000	UNK	1979	50,022	FRY
1983	148,500	UNK	1992	151,869	FRY
1985	60,600	FGL	1994	150,217	FGL
1986	59,900	FRY	1997	151,247	FGL
1987	59,900	FRY	2015	43,906	FGL
1988	60,868	FRY	<u>2016</u>	<u>65,007</u>	FGL
1989	69,426	FGL	Species Total	612,268	
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			
<u>2018</u>	<u>25,501</u>	FGL			
Species Total	1,193,272				

Table 4. Objective-based sampling plan components for Graham Reservoir, Texas 2017–2018.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Exploratory	Presence/absence	Practical effort
Bluegill	Exploratory	Presence/absence	Practical effort
Gizzard Shad	Exploratory	Presence/absence	Practical effort
<i>Gill netting</i>			
Catfish <i>spp.</i>	Exploratory	Presence/absence	Practical effort
Morone <i>spp.</i>	Exploratory	Presence/absence	Practical effort
<i>Trap netting</i>			
Crappie	Exploratory	Presence/absence	Practical effort

Table 5. 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 6. Survey of aquatic vegetation, Graham Reservoir, Texas, 2009, 2013, and 2017. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2009	2013	2017
Native submersed			
Native floating-leaved	58.6 (2.4)		5.3 (0.2)
Native emergent	59.3 (2.5)		27.0 (1.1)

Gizzard Shad

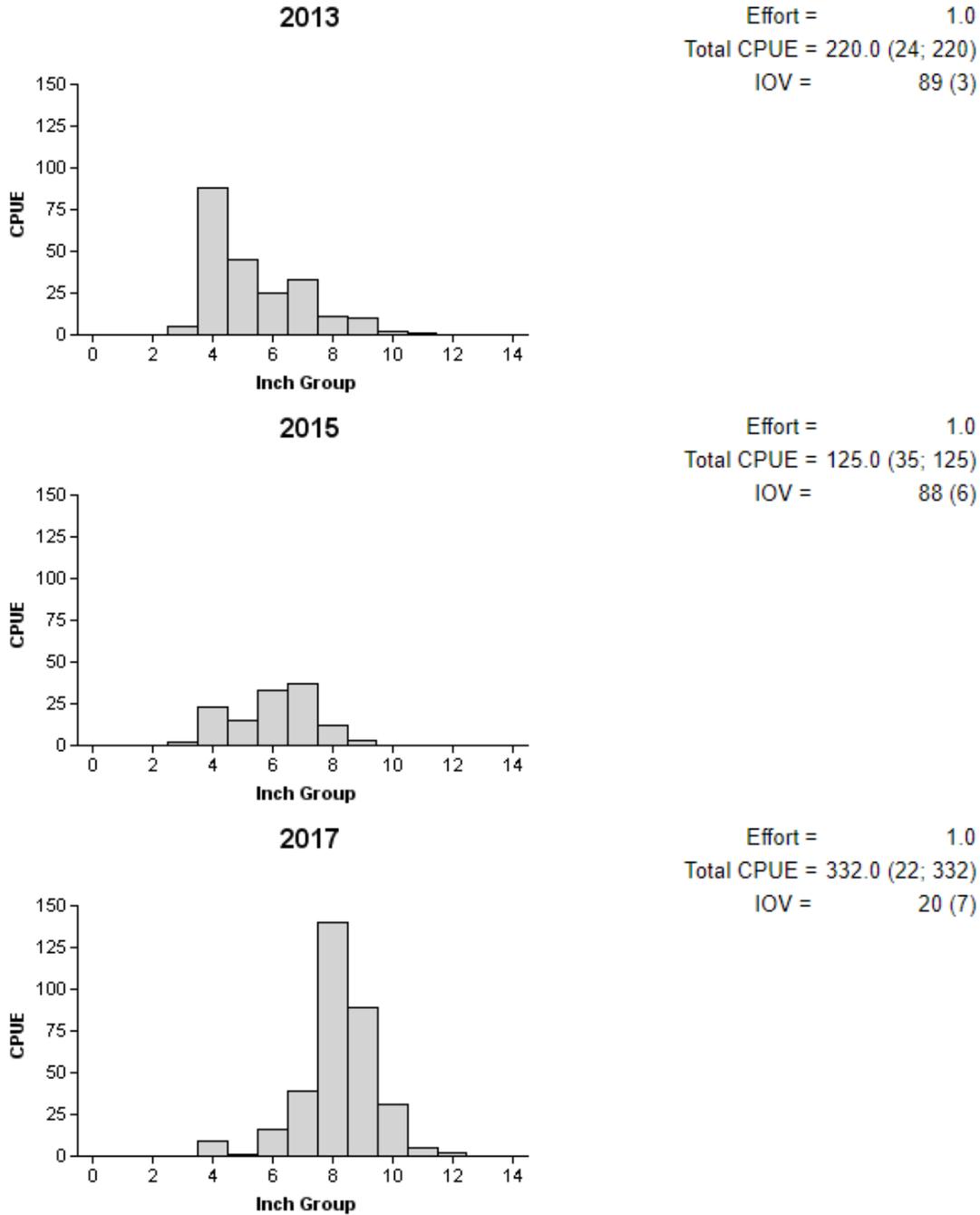


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2013, 2015, and 2017.

Bluegill

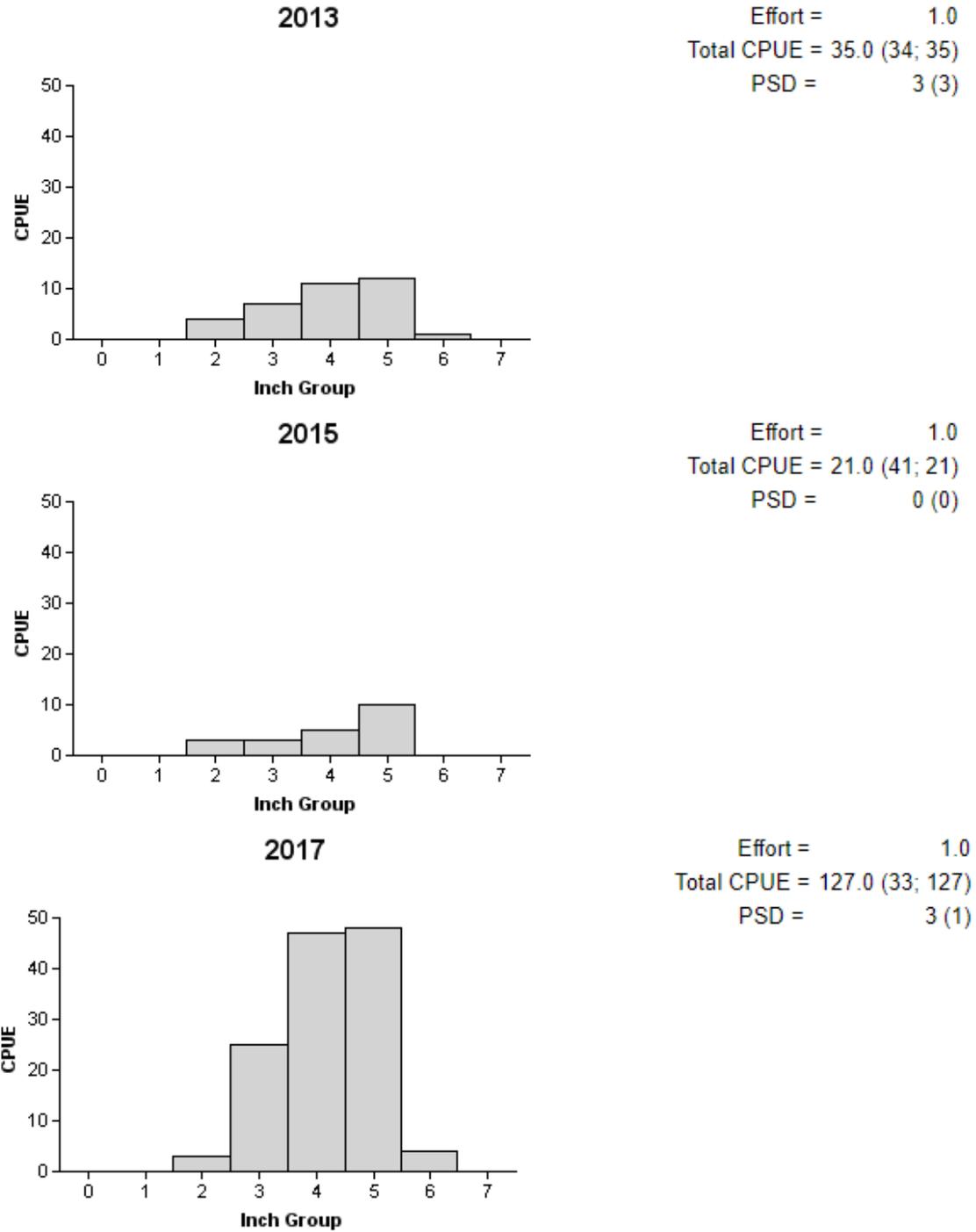


Figure 3. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2013, 2015, and 2017.

Redear Sunfish

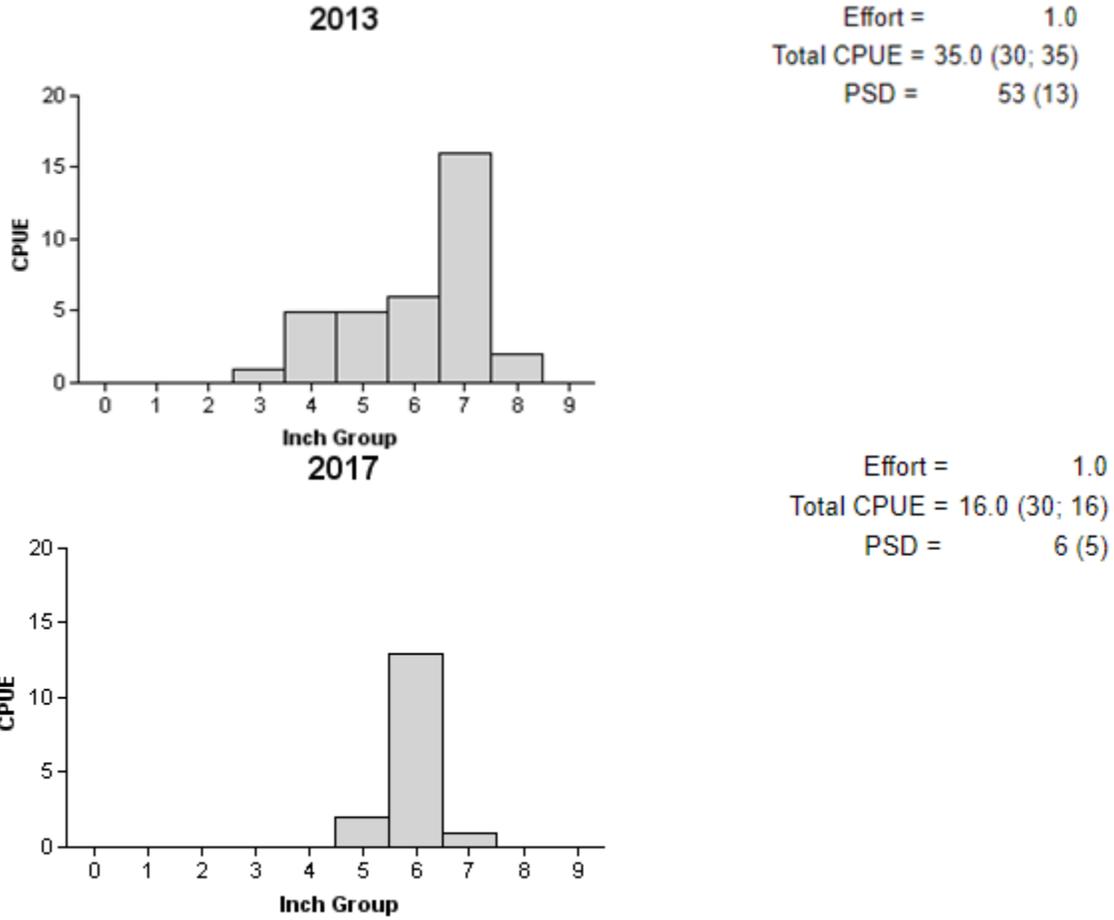


Figure 4. Number of Redear Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2013, 2015, and 2017. No Redear Sunfish were collected in 2015.

Blue Catfish

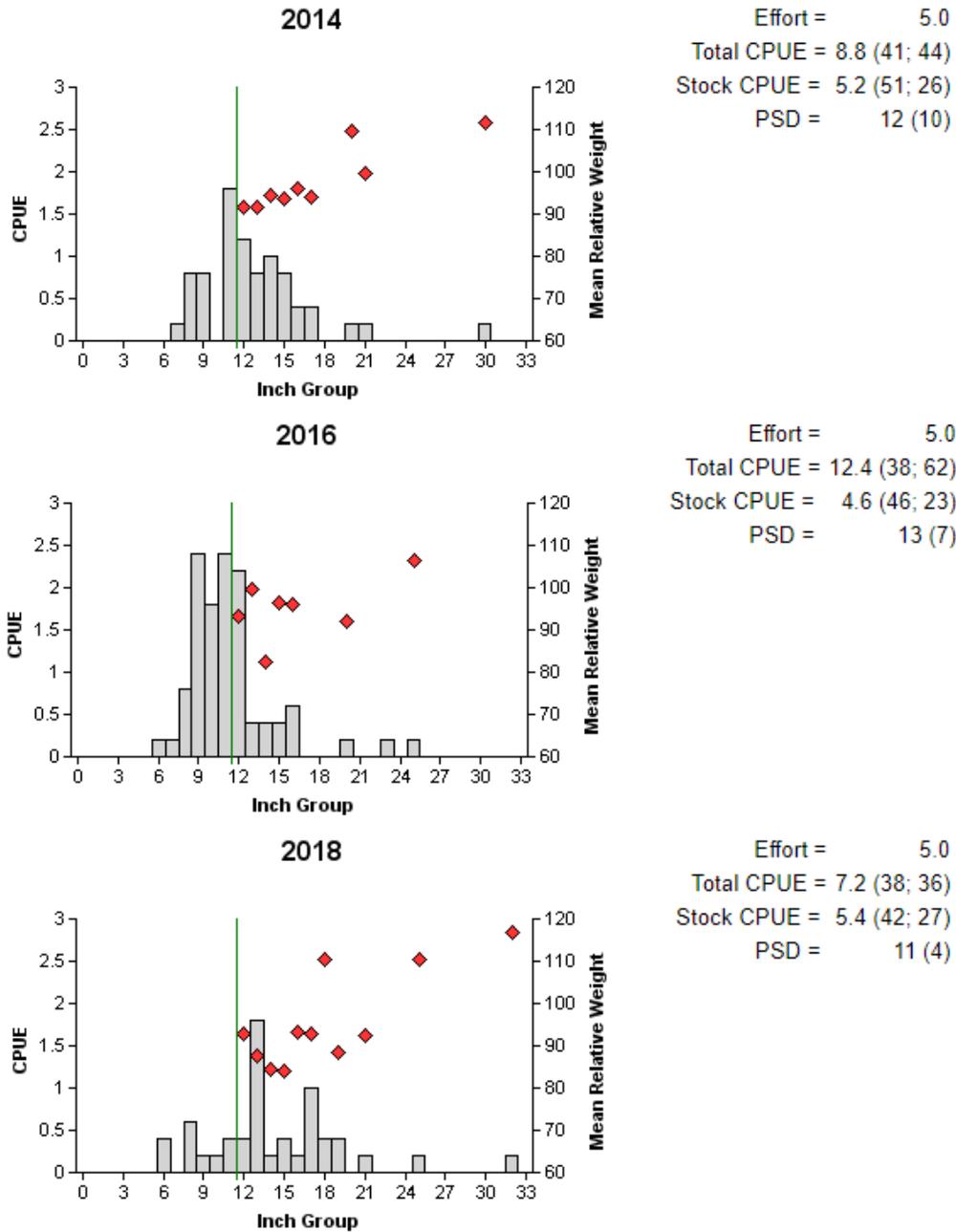


Figure 5. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2014, 2016, and 2018. Vertical line represents minimum length limit at time of sampling.

Channel Catfish

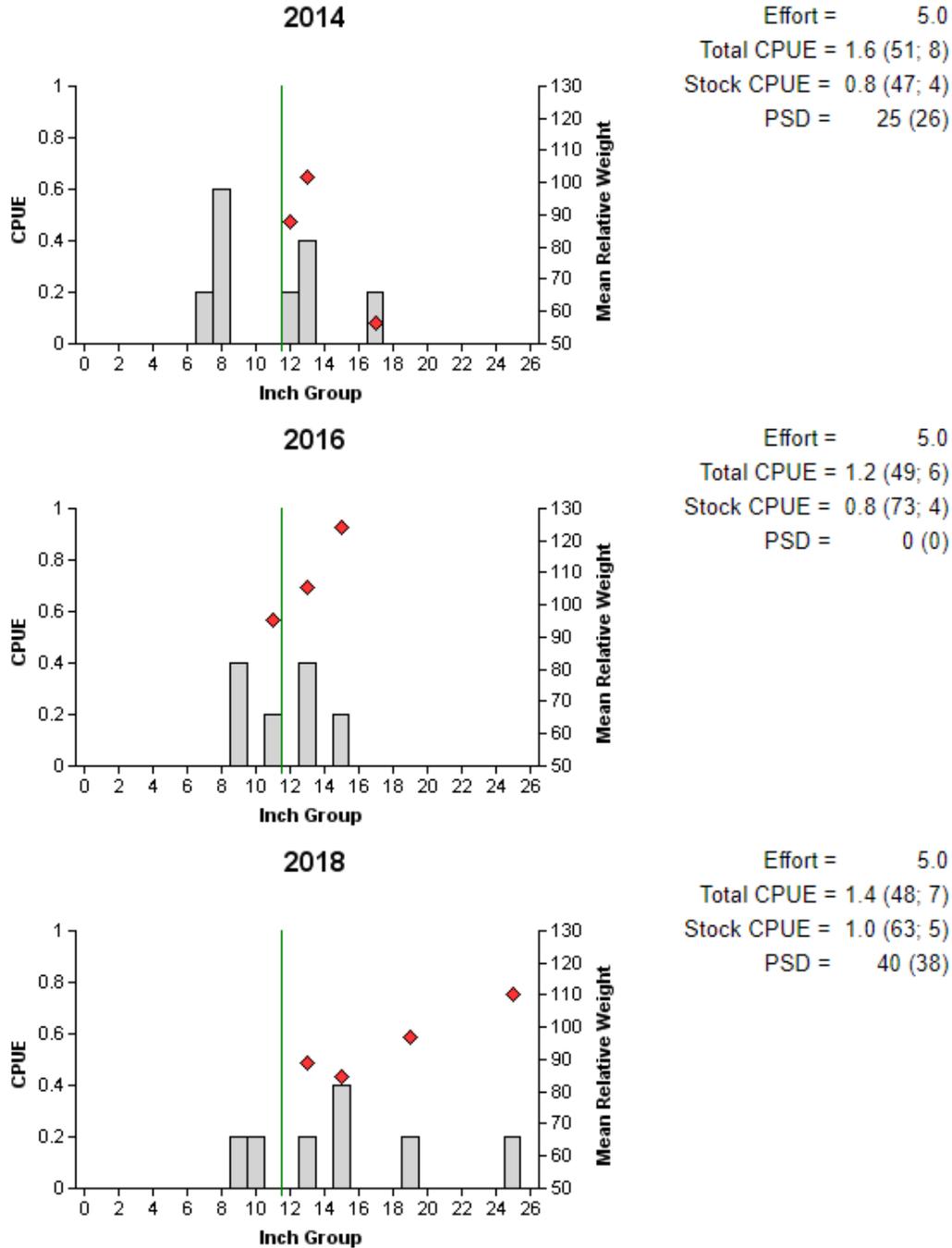


Figure 5. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2014, 2016, and 2018. Vertical line represents minimum length limit at time of sampling.

White Bass

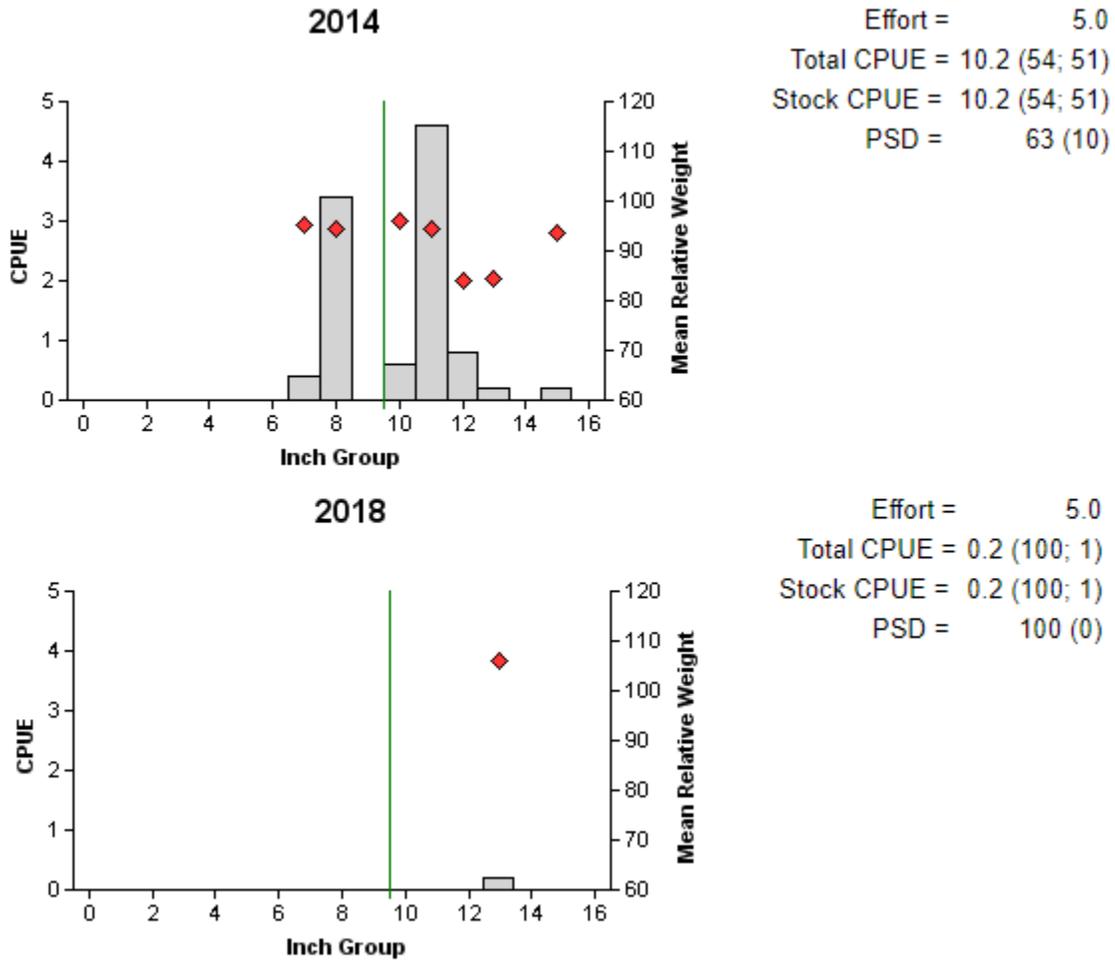


Figure 7. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2014, 2016, and 2018. No White Bass were collected during the 2016 gill net survey. Vertical line represents minimum length limit at time of sampling.

Palmetto Bass

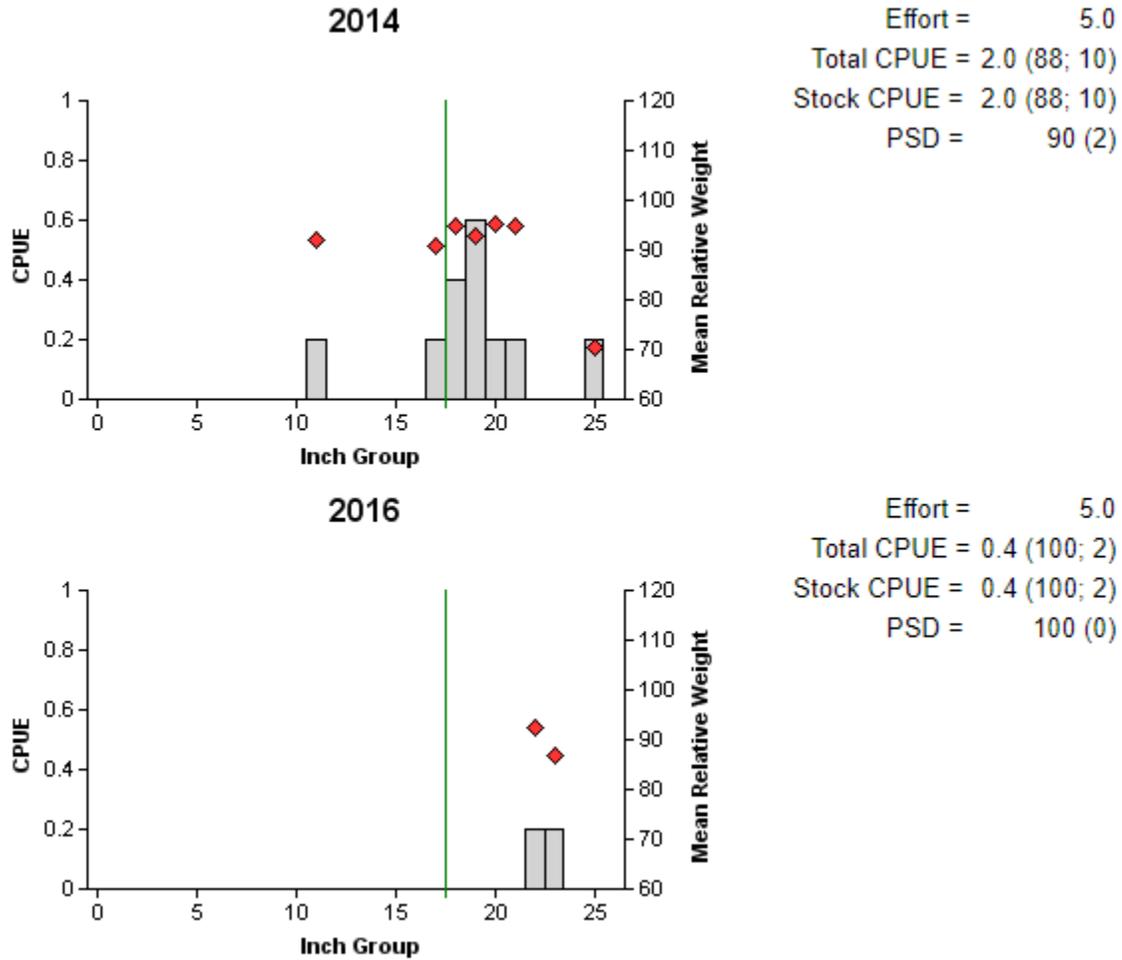


Figure 6. Number of Palmetto Bass caught per net night (CPUE, bars) mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Graham Reservoir, Texas, 2014, 2016, and 2018. No Palmetto Bass were collected during the 2018 gill net survey. Vertical line represents minimum length limit at time of sampling.

Largemouth Bass

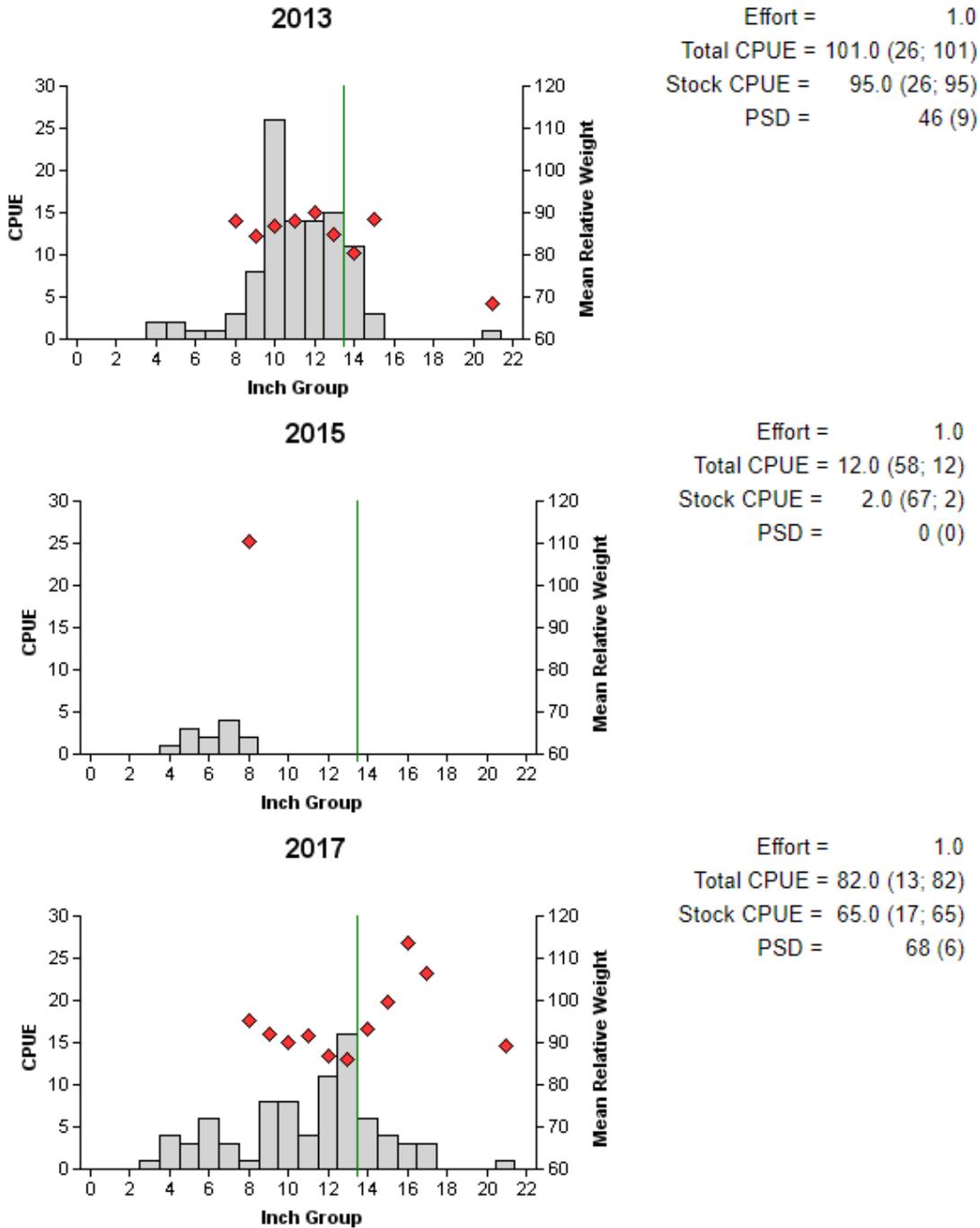


Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Graham Reservoir, Texas, 2013, 2015, and 2017. Vertical line represents minimum length limit at time of sampling.

White Crappie

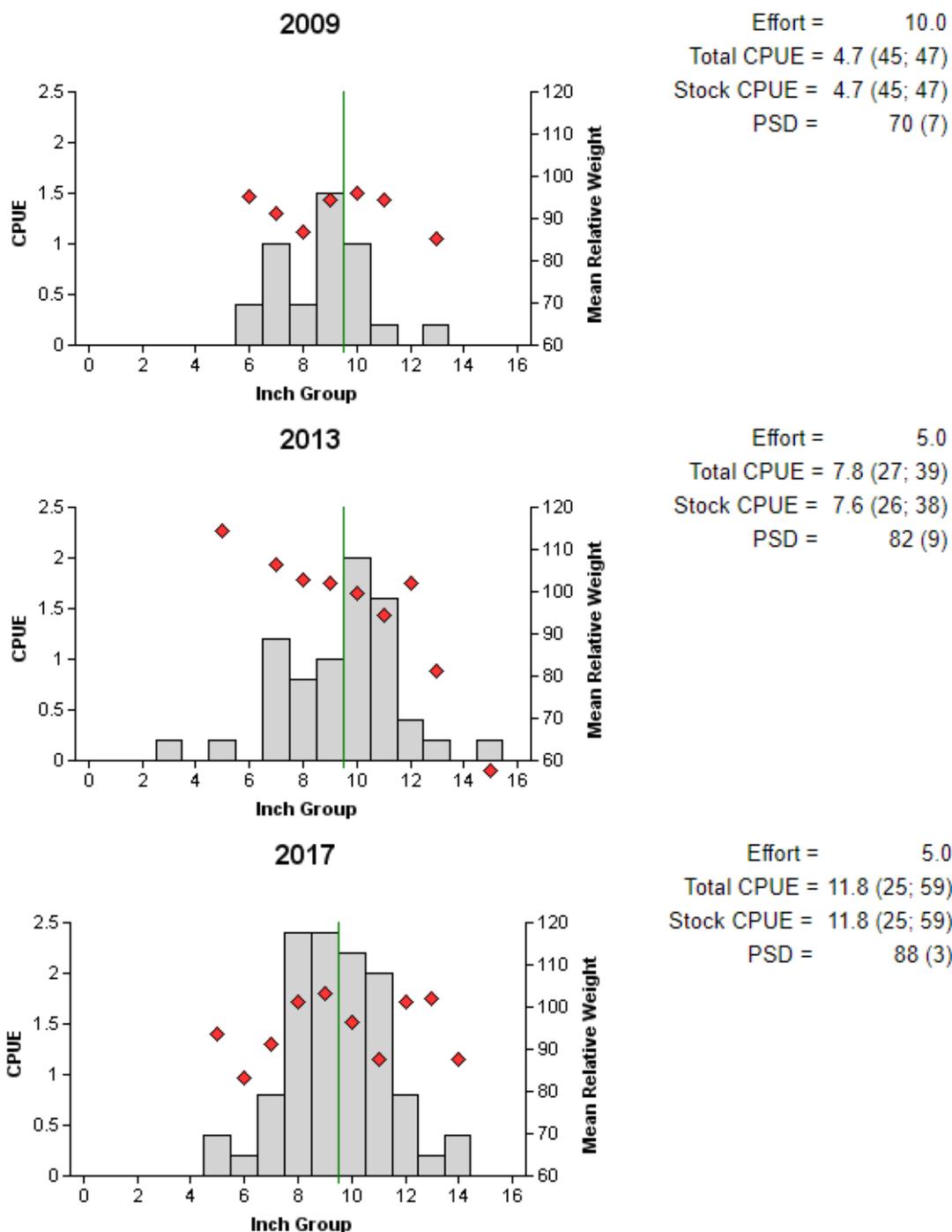


Figure 70. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Graham Reservoir, Texas, 2009, 2013, and 2017. Vertical line represents minimum length limit at time of sampling.

Black Crappie

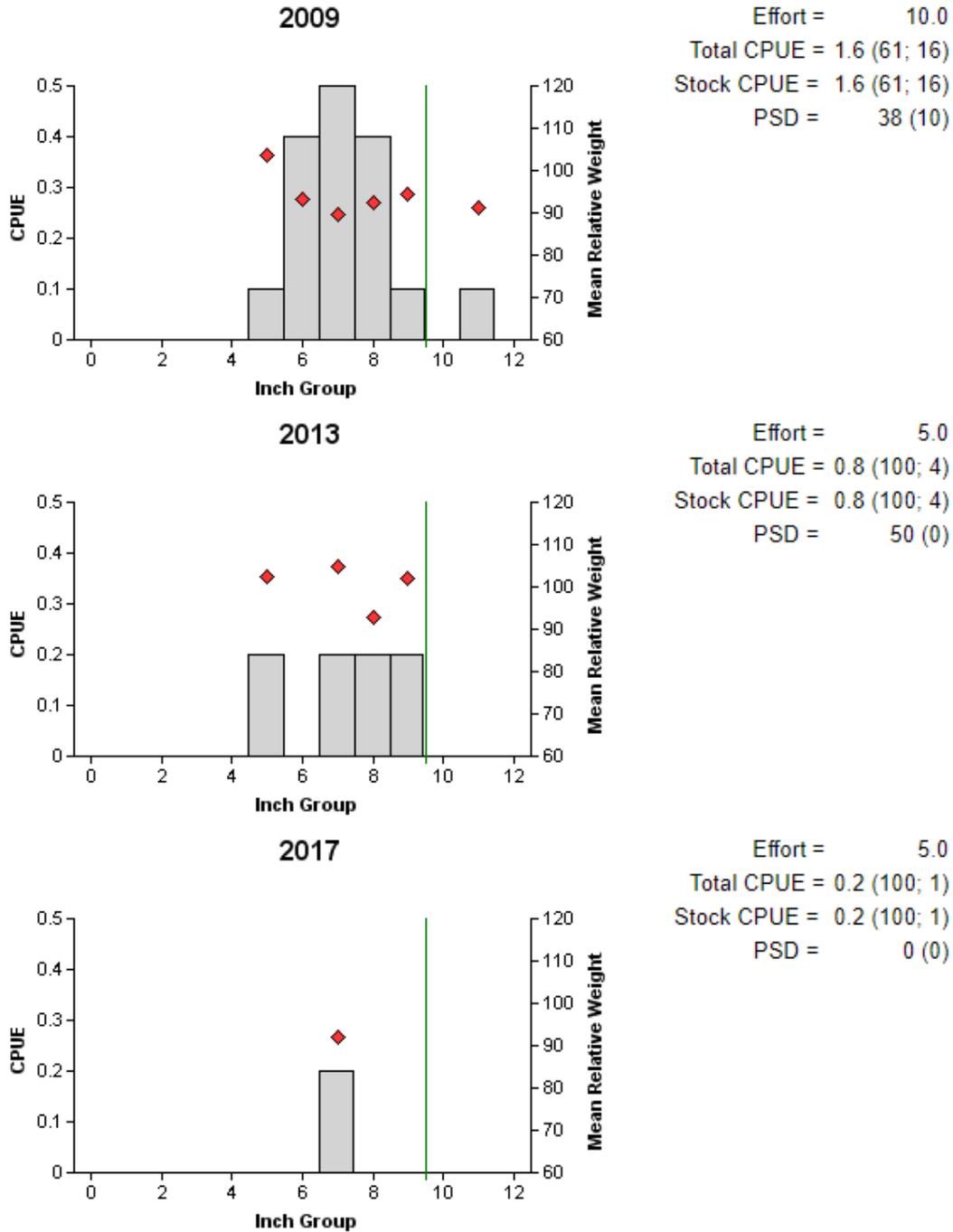


Figure 11. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Graham Reservoir, Texas, 2009, 2013, and 2017. Vertical line represents minimum length limit at time of sampling.

Proposed Sampling Schedule

Table 8. 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. Standard survey denoted by S and additional survey denoted by A.

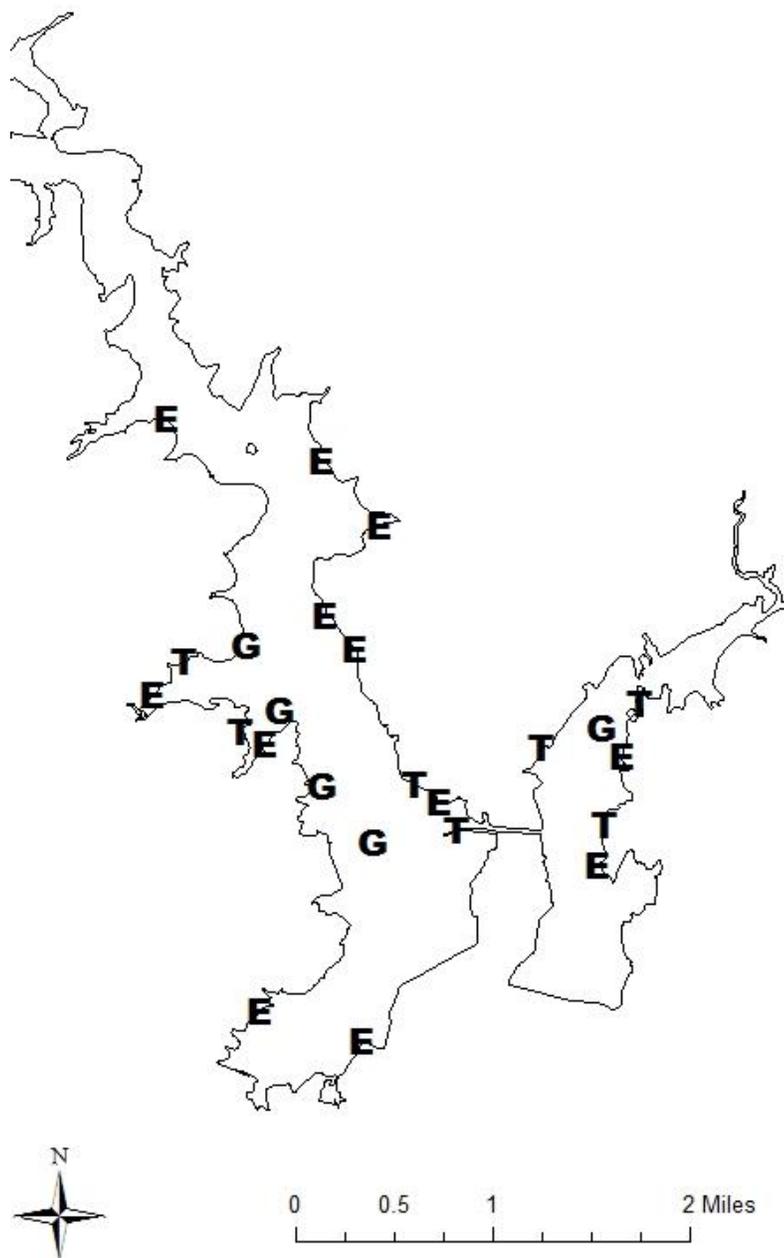
	Survey year			
	2018-2019	2019-2020	2020-2021	2021-2022
Angler Access				S
Structural Habitat				S
Vegetation				S
Electrofishing – Fall		A		S
Trap netting				S
Gill netting			S	
Report				S

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all species collected from all gear types from Graham Reservoir, Texas, 2017-2018. Sampling effort was 5 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
Gizzard Shad	60	12.0 (30)	1	0.2 (100)	332	332.0 (22)
Threadfin Shad					605	605.0 (29)
Blue Catfish	36	7.2 (38)				
Channel Catfish	7	1.4 (48)	1	0.2 (100)		
White Bass	1	0.2 (100)				
Warmouth					1	1.0 (100)
Bluegill			34	6.8 (46)	127	127.0 (33)
Longear Sunfish			4	1.0 (77)	27	27.0 (38)
Redear Sunfish			1	0.2 (100)	16	16.0 (30)
Largemouth Bass			1	0.2 (100)	82	82.0 (13)
White Crappie	16	3.2 (71)	59	11.8 (25)		
Black Crappie			1	0.2 (100)		

APPENDIX B – Map of sampling locations



Location of sampling sites, Graham Reservoir, Texas, 2017-2018. 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.



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