

# Bonham City Reservoir

## 2020 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 Bonham City Reservoir were surveyed in 2020 using electrofishing and trap netting and in 2021 using gill netting and bass-only electrofishing. Aquatic vegetation and boat-angler access locations were surveyed in 2020. Historical data are presented with the 2020-2021 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:** Bonham City Reservoir is a 1,020-acre impoundment in Fannin County, Texas on Timber Creek, a tributary to Bois d'Arc Creek, which flows into the Red River. Water level has been within three feet of conservation pool elevation since 2014 except on three occasions when water level exceeded conservation pool elevation by more than three feet due to flood events. Habitat features consist of natural shoreline, bulkhead and boat docks, rip-rap, and native submerged and emergent aquatic vegetation.

**Management History:** Important sport fish include Blue and Channel Catfish, Largemouth Bass, and White and Black Crappie. Blue Catfish were last stocked in 2018. Florida Largemouth Bass were last stocked in 2018 and 2019. The reservoir has always been managed with statewide fishing regulations.

### Fish Community

- **Prey species:** Threadfin and Gizzard Shad were plentiful with above average electrofishing catches. Most Gizzard Shad were available as prey to sport fish. Electrofishing catch of Bluegill was close to the historical average with many available as forage.
- **Catfishes:** The Channel Catfish population has been steady with many individuals available to anglers. The gill net catch of Blue Catfish has declined since 2013, although some large individuals remain for anglers.
- **White Bass:** White Bass were first collected in gill nets in 2013. No White Bass were sampled in 2015, 2017, or 2021.
- **Largemouth Bass:** The electrofishing catch rate of legal-length Largemouth Bass appears to have declined since 2004. Larger bass up to 21 inches were collected during a spring bass-only electrofishing survey.
- **Crappie:** White Crappie were moderately abundant with legal-length fish available to anglers. Most White Crappie reached legal length in about two years. Black Crappie were present in low abundance.

**Management Strategies:** Bonham City Reservoir should continue to be managed using existing fish harvest regulations. Continue stocking Florida Largemouth Bass. Discontinue Blue Catfish stockings. Continue to inform the public about the negative impacts of aquatic invasive species. General monitoring with electrofishing, bass-only electrofishing, trap netting, and gill netting will be conducted in 2024-2025. Access and vegetation surveys will be conducted in 2024.

## Introduction

This document is a summary of fisheries data collected from Bonham City Reservoir from 2020-2021. 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 2020-2021 data for comparison.

## Reservoir Description

Bonham City Reservoir, a 1,020-acre impoundment on Timber Creek, is located northeast of Bonham in Fannin County. It was constructed in 1969 by the City of Bonham for municipal and industrial uses. The reservoir drains approximately 29 square miles and has a shoreline of 18 miles. Reservoir water level has remained within three feet of conservation pool elevation since 2014, except in 2015 and 2018 (Figure 1). The average depth is 13 feet with a maximum depth of 30 feet. Bonham City Reservoir was eutrophic bordering on hypereutrophic with a mean TSI chl-a of 69.08 (Texas Commission on Environmental Quality 2019). Habitat features consisted of natural shoreline, bulkhead and boat docks, rip-rap, and native submersed and emergent aquatic vegetation. Other descriptive characteristics for Bonham City Reservoir are in Table 1.

## Angler Access

Bonham City Reservoir has two public boat ramps with lighted parking. The north ramp is eroded around the edges. Addition of rip-rap may alleviate additional erosion. The south ramp has a fishing T-pier and boarding dock. The City of Bonham requires an annual \$10 boat-use fee for the reservoir. Most of the perimeter of Bonham City Reservoir is privately owned, occupied by homes with boat docks. Shoreline access is available adjacent to the public boat ramps and around bridge crossings on the north side of the reservoir. Additional boat ramp characteristics are in Table 2.

## Management History

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Robinson and Bennett 2017) included:

1. Discuss with the City of Bonham about installing rip-rap around the eroded areas of the north boat ramp.
 

**Action:** This issue has been brought to the attention of the City of Bonham. No further action has taken place possibly due to the erosion being underwater at normal lake level.
2. Stock Florida Largemouth Bass fingerlings in 2018 and 2019 to enhance trophy potential of Largemouth Bass. Assess genetics and continue to monitor population.
 

**Action:** Florida Largemouth Bass fingerlings were stocked in 2018 and 2019. Genetic introgression into the population and other population metrics were estimated in 2020 via an electrofishing survey.
3. Purchase, build, and deploy fish habitat near the fishing T-pier at the south boat ramp.
 

**Action:** Sixteen Mossback fish habitat structures were deployed around the T-pier in late 2017. Funds used to purchase habitat structures came from the Texas Parks and Wildlife Department (TPWD) Conservation License Plate funds.
4. Inform the public about the threats of invasive species and how to prevent their spread.

**Action:** Signage has been maintained and invasive species talking points have been presented on social media. A vegetation survey was completed in 2020 and no additional non-native aquatic vegetation species were found.

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

**Stocking history:** Bonham City Reservoir was last stocked with Blue Catfish in 2018 with 102,318 fingerlings. Florida Largemouth Bass fingerlings were stocked in 2018 (106,443) and 2019 (36,399). The complete stocking history is in Table 4.

**Vegetation/habitat management history:** In 2017, Mossback fish habitat structures were placed around the fishing T-pier at the south ramp to attract and hold fish for anglers. In 2019, stands of alligatorweed had established in some shoreline areas. Following some complaints by private property owners, one thousand flea beetles were placed by TPWD on several stands of alligatorweed on May 1, 2019. The City of Bonham contracted with Twin Oaks Lake and Land Management to apply herbicide to alligatorweed in July and August of 2019. Twin Oaks was later contracted to treat a small amount of alligatorweed and cattails in the Bonham City Lake Recreation Area in 2020. As of July 2020, there was approximately 3.5 acres of alligatorweed in the reservoir.

**Water transfer:** No inter-basin transfers are known to exist. The City of Bonham has transferred the water rights of Bonham City Reservoir to the North Texas Municipal Water District which now owns and operates the local water plant.

## Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Bonham City Reservoir (Robinson and Bennett 2017). Primary components of the OBS plan are listed in Table 5. All standard survey sites were randomly-selected and all standard 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 in the fall 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 nine randomly selected fish (range 13.0 to 14.9 inches).

**Bass-only electrofishing** – Largemouth Bass were collected by electrofishing (1 hour at 12, 5-min stations) during daylight in spring. Sites were selected to target spring habitat suitable for Largemouth Bass. 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). Ages for crappie were determined using otoliths from 13 randomly selected fish (range 9.0 to 10.9 inches).

**Gill netting** – Channel Catfish and Blue Catfish 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). Ages for Channel Catfish were determined using otoliths from six randomly selected fish (range 11.0 to 12.9 inches).

**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). 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 ( $RSE = 100 \times SE$  of the estimate/estimate) was calculated for all CPUE statistics.

**Habitat** – A structural habitat survey was conducted in 2012. A vegetation survey was conducted in July 2020. 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 2021).

## Results and Discussion

**Habitat:** Littoral zone habitat consisted primarily of natural shoreline, bulkhead and boat docks, and rocky shoreline (Moczygamba and Hysmith 2013). Aquatic vegetation declined from approximately 10% of reservoir area in 2012 to <1% in 2020 (Table 6). The reduction in littoral habitat could negatively impact bass and sunfish species. Native emergent vegetation in 2020 included cattails, bulrush, water willow, smartweed, and buttonbush (Table 6). Biological control of alligatorweed was not effective, so chemical herbicide has been used for treatment in 2019 and 2020.

**Prey species:** Electrofishing catch rates of Gizzard and Threadfin Shad were 374.0/h and 1,967.0/h, respectively, which were above their historical averages (Appendix B). Index of Vulnerability (IOV) for Gizzard Shad was good, indicating that 71% of Gizzard Shad were available to existing predators; this was lower than IOV estimates in previous years (Figure 2). Total CPUE of Bluegill (779.0/h) in 2020 was lower than total CPUE from the previous survey (909.4/h), but close to the historical average for the reservoir (Figure 3, Appendix B).

**Catfishes:** The gill net catch rate of Blue Catfish was 8.8/n in 2021, similar to 11.1/n in 2017 (Figure 4). Relative abundance of Blue Catfish was greater in 2013 after stockings in 2009, 2010, and 2011. Mean relative weights were good for all size classes and almost all Blue Catfish sampled were legal length (12 inches) or larger (Figure 4). A few Blue Catfish over 30 inches were available to anglers. Natural reproduction was minimal, and the population appeared to be dependent on stockings. Recruitment of Blue Catfish fingerlings stocked in 2018 was evident in our sample. Historically, Blue Catfish in the reservoir reached legal length (12 inches) in 3.0 years (Moczygamba and Hysmith 2013). Size structure over time has indicated that growth slows substantially beyond 12 inches. For example, the mode of CPUE in 2013 was 12 inches and the mode in 2017 was 16 inches, meaning it took Blue Catfish four years to grow another four inches (Figure 4).

The gill net catch rate of Channel Catfish was 12.2/n in 2021, which was greater than 7.2/n in 2017 (Figure 5). Channel Catfish relative abundance has ranged from 16.0 to 6.8/n with a historical average of 9.8/n (Appendix B). Most Channel Catfish were legal length (12 inches) and most size classes had good body condition (relative weight above 90). Natural reproduction was evident throughout survey years. Channel Catfish average age at 12 inches (11.0 to 12.9 inches) was 3.0 years (N = 6). We did not collect enough Channel Catfish in the target length range to reach our desired sample size of 13 fish for age and growth analysis. However, results were similar to the previous growth estimation of 3.4 years at legal length (Robinson and Bennett 2017).

**White Bass:** Three mature female White Bass were first collected in the reservoir in 2013 during a gill net survey. A gill net survey in 2015 targeting White Bass collected none. In 2017, an angler submitted a lake record White Bass (Robinson and Bennett 2017). Gill net sampling conducted in subsequent years including 2021, did not result in the collection of White Bass. It is likely past catches of White Bass were the result of angler introductions and a self-sustaining population has not established.

**Black basses:** The relative abundance of Largemouth Bass has generally declined since 2004 (Appendix B). The electrofishing catch rate of stock-length Largemouth Bass was 28.0/h in 2020, lower than the two previous surveys (Figure 6). Size structure was adequate as PSD ranged from 52 to 61 since 2012. However, CPUE-14 (legal-length bass) has been declining (Figure 6). In 2012, bass  $\geq$  14 inches were 20% of the sample, 14% in 2016, and 9% in 2020. The longest bass in the fall 2020 sample was 18 inches (Figure 6). Average age of Largemouth Bass at 14 inches (13.0 to 14.9 inches) was 2.2 years (N = 9; range = 2 – 3 years). We did not collect enough bass in the target length range to reach our desired sample size of 13 fish for age and growth analysis; however, growth appeared adequate. Body condition in 2020 was good (relative weight over 90) for most size classes of bass (Figure 6). Florida Largemouth Bass genetic influence increased to 54% in 2020 from 34% in 2012 after stockings in 2018 and 2019 (Tables 4 and 7).

A bass-only electrofishing survey was conducted in spring 2021 to ascertain presence/absence of larger fish (>18 inches). The electrofishing catch rate for stock-length Largemouth Bass was 50.0/h (Figure 7).

The PSD was 76 and legal-length bass comprised nearly 45% of the sample, with the longest bass at 21 inches (Figure 7). While spring surveys typically collect bigger fish, this result confirmed the presence of larger fish in the reservoir.

Spotted Bass were present in Bonham City Reservoir. The electrofishing catch rate in 2020 was 4.0/h, indicating low abundance (Appendix A). Historical average catch rate of Spotted Bass was 5.2/h (Appendix B).

**Crappie:** The trap net catch rate of White Crappie was 16.8/nn in 2020, slightly lower than 21.0/nn in 2016 (Figure 8). Historical catch rate has ranged from 2.8 to 51.6/nn with an average of 21.0/nn (Appendix B). The PSD in 2020 was 74 and was higher than the PSD of 54 in 2016 (Figure 8). About 31% of the sample population was of legal length. Mean relative weight was over 90 for most size categories in 2020 (Figure 8). Average age at 10 inches (9.0 to 10.9 inches) was 2.2 years.

Black Crappie were low in abundance compared to White Crappie but may supplement angler catch rates. The trap net catch rate of Black Crappie was 1.2/nn in 2020, much lower than in 2016 (6.6/nn) and lower than the historical average (Figure 9, Appendix B). About 33% of the sample population was of legal length.



# Fisheries Management Plan for Bonham City Reservoir, Texas

Prepared – July 2021

**ISSUE 1:** Largemouth Bass over 14 inches may be declining at Bonham City Reservoir. Angling mortality or the reduction in aquatic vegetation could be contributors to this trend. Local bass clubs regularly hold tournaments on the reservoir, and fish over 8 pounds have been documented in tournament results (Robinson and Bennett 2017). A Lunker Class ShareLunker was caught in 2020 weighing 9.2 pounds. The lake record Largemouth Bass is 11.5 pounds caught in 2010. Stockings in 2018 and 2019 increased Florida Largemouth Bass introgression from 34% (2012) to 54% (2020).

## MANAGEMENT STRATEGIES

1. Stock Florida Largemouth Bass fingerlings at the rate of 1,000 per shoreline kilometer (28,800) in 2022 to enhance trophy potential of Largemouth Bass.
2. Obtain tournament results from local bass clubs to get more information about larger bass in the reservoir.
3. Promote the ShareLunker program to increase angler-volunteered reporting of bass over 8 pounds.
4. If the fall 2024 electrofishing survey shows a continued decline in legal-length bass, then a spring, daytime bass-only electrofishing survey may be conducted in 2025 for further evaluation.

**ISSUE 2:** The Blue Catfish population in Bonham City Reservoir appears to be dependent on stockings. Stockings have occurred since 1978 and there is limited evidence of natural reproduction. Size structure over time suggests slow growth. Additional stockings of Blue Catfish could reduce relative weights, slow growth further, or negatively impact Channel Catfish. There are several popular Blue Catfish fisheries within 50 miles of Bonham City Reservoir (Lavon, Texoma, Tawakoni, Cooper, Ray Roberts, and Ray Hubbard Reservoirs). The Channel Catfish population in Bonham City Reservoir offers sufficient fishing opportunities and may benefit from decreased competition with Blue Catfish.

## MANAGEMENT STRATEGIES

1. Discontinue Blue Catfish stockings.
2. Continue to estimate Blue Catfish relative abundance, size structure, and body condition in gill net surveys until they become a low-density fishery.

**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 City of Bonham to maintain 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 future inter-basin water transfers to facilitate potential invasive species responses.

## Objective-Based Sampling Plan and Schedule (2021–2025)

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

Important sport fish in Bonham City Reservoir include Largemouth Bass, White Crappie, Black Crappie, Blue Catfish, and Channel Catfish. Important forage species include Bluegill Sunfish, and Gizzard and Threadfin Shad.

### Low-density fisheries

**White Bass:** Three White Bass were collected for the first time in gill nets in 2013. No White Bass were collected during gill net surveys in 2015, 2017, and 2021. White Bass are not expected to have established a population in Bonham City Reservoir. White Bass presence/absence will be evaluated using below described gill net sampling in 2025 and electrofishing sampling in 2024.

**Spotted Bass:** Spotted Bass are present in Bonham City Reservoir with an average CPUE of 5.0/h. Data on Spotted Bass will be recorded during sampling for Largemouth Bass; however, additional effort will not be expended to sample Spotted Bass.

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

**Largemouth Bass:** Largemouth Bass were the third most sought-after sport fish at Bonham City Reservoir in 2017 (Robinson and Bennett 2017). Trend data for Largemouth Bass relative abundance, size structure, and body condition will be collected with nighttime electrofishing in the fall once every four years. Long-term monitoring trend data will allow for determination of any large-scale changes in the Largemouth Bass population that may spur further investigation. A minimum of 12 randomly selected 5-min electrofishing sites will be sampled in 2024 (Table 8), but sampling will continue at random sites until 50 stock-length fish are collected or the RSE of CPUE-S is  $\leq 25$ . Exclusive of the original 12 random stations, 6 additional random stations will be pre-determined in the event some additional sampling is necessary. Thirteen Largemouth Bass between 13.0 and 14.9 inches will be collected to estimate age at the minimum length limit (14 inches). A daytime, spring, bass-only electrofishing survey will be conducted in 2025 with a minimum of 12 biologist-selected stations. Sampling will continue until 50 stock-size fish are collected and the RSE of CPUE-S is  $\leq 25$  for relative abundance and size structure data.

**Catfish:** Catfish were the second most sought-after sport fish at Bonham City Reservoir in 2017 (Robinson and Bennett 2017). Stockings of both Blue and Channel Catfish have been conducted at Bonham City Reservoir, and currently both species provide a fishery. Blue Catfish have established a population of harvestable fish; however, natural reproduction is minimal. Catch rates suggest that trend data for monitoring Channel Catfish relative abundance, size structure, and body condition can be

obtained with reasonable effort. A minimum of five randomly selected gill-net stations will be sampled in 2025 (Table 8). If a minimum of 50 stock-length Channel Catfish and an RSE of CPUE-S  $\leq 25$  is not obtained in the five gill-net nights, additional sampling may be conducted up to 10 gill net nights if objectives are likely to be met with reasonable effort. Relative abundance, size structure, and body condition will be estimated for Blue Catfish; however, no additional effort will be expended beyond that necessary to achieve objectives for Channel Catfish.

**Crappie:** Crappie are the most sought-after sport fish in Bonham City Reservoir. Both White Crappie and Black Crappie are present in Bonham City Reservoir; however, White Crappie are in greater abundance. We will collect data on relative abundance, size structure, age and growth, and body condition of White Crappie with trap nets every four years to monitor trends in the population. Trap net catch rate has been variable ranging from 2.8/nn to 51.6/nn for White Crappie in the past two decades. However, we estimate that the effort required to meet sampling objectives (RSE of CPUE-S  $\leq 25$  and collect at least 50 stock-length fish) for White Crappie to be between 7 and 10 net nights. This level of sampling should provide 13 White Crappie between 9.0 and 10.9 inches to estimate growth to legal length (10 inches). We plan to sample a minimum of 5 random shoreline trap net stations; however, an additional 5 net nights may be sampled if objectives can be met with reasonable effort. Data on Black Crappie will be collected along with White Crappie; however, no additional effort will be expended beyond that which is necessary to achieve sampling objectives for White Crappie.

**Sunfish and Shad:** Sunfish, along with Gizzard and Threadfin Shad are the primary forage at Bonham City Reservoir. We intend to collect trend data on relative abundance, size structure, and prey availability for forage species once every four years. No additional effort beyond that necessary to achieve our desired number of Largemouth Bass will be expended to achieve an RSE  $\leq 25$  for CPUE of Bluegill and Gizzard Shad. Instead, predator body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

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## Tables and Figures

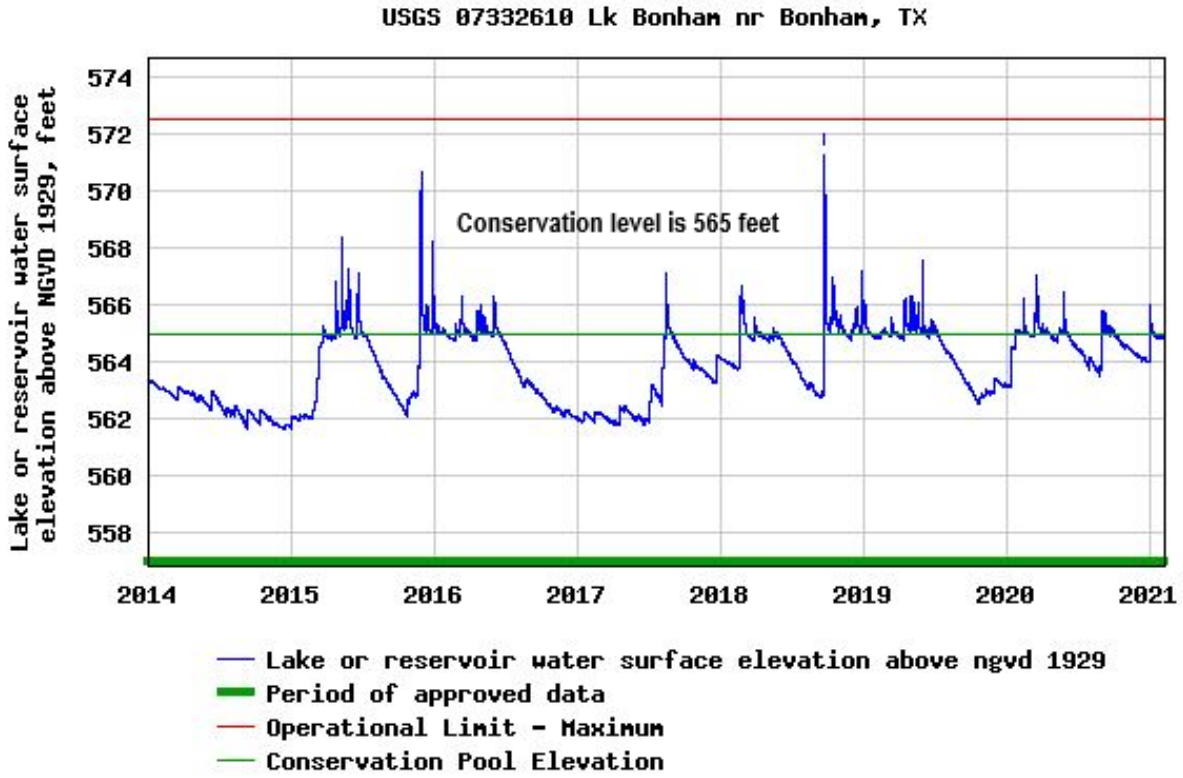


Figure 1. Daily water level elevations in feet above National Geodetic Vertical Datum (NGVD) recorded for Bonham City Reservoir, Texas, January 2014 to February 2021.

Table 1. Characteristics of Bonham City Reservoir, Texas.

Characteristic	Description
Year constructed	1969
Controlling authority	City of Bonham
County	Fannin
Reservoir type	Tributary
Shoreline development index	4.1
Conductivity	101 $\mu$ mhos/cm

Table 2. Boat ramp characteristics for Bonham City Reservoir, Texas, July 2020. Reservoir elevation at time of survey was 564.27 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
South ramp	33.6461 -96.1394	Y	30	557	Excellent
North ramp	33.6573 -96.1482	Y	10	555	Needs rip-rap along edges of boat ramp to prevent washing out.

Table 3. Harvest regulations for Bonham City Reservoir, Texas.

Species	Bag Limit	Length Limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Spotted	5 <sup>a</sup>	None
Bass, Largemouth	5 <sup>a</sup>	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies.	25 (in any combination)	10-inch minimum

<sup>a</sup> Daily bag for Largemouth Bass and Spotted Bass = 5 fish in any combination.

Table 4. Stocking history of Bonham City Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; UNK = unknown.

Species	Year	Number	Size
Blue Catfish	1978	25,486	UNK
	2009	50,685	FGL
	2010	103,128	FGL
	2011	110,440	FGL
	2018	102,318	FGL
	Total	392,057	
Channel Catfish	1969	50,000	AFGL
	1994	1,634	AFGL
	Total	51,634	
Florida Largemouth Bass	1996	101,900	FGL
	1997	104,206	FGL
	1998	103,324	FGL
	2018	106,443	FGL
	2019	36,399	FGL
	Total	452,272	
Largemouth Bass	1969	200,000	UNK
	Total	200,000	
Palmetto Bass (Striped X White Bass hybrid)	1978	26,313	UNK
	Total	26,313	

Table 5. Objective-based sampling plan components for Bonham City Reservoir, Texas 2020–2021.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age-and-growth	Age at 14 inches	$N = 13, 13.0 - 14.9$ inches
	Condition	$W_r$	10 fish/inch group (max)
	Genetics	% FLMB	$N = 30$ , any age
Bluegill <sup>a</sup>	Abundance	CPUE – Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad <sup>a</sup>	Abundance	CPUE – Total	RSE $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$
	Prey availability	IOV	$N \geq 50$
<i>Bass-only Electrofishing</i>			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$ stock
<i>Trap netting</i>			
White Crappie	Abundance	CPUE-stock	RSE-Stock $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$
	Age-and-growth	Age at 10 inches	$N = 13, 9.0 - 10.9$ inches
	Condition	$W_r$	10 fish/inch group (max)
<i>Gill netting</i>			
Blue Catfish	Abundance	CPUE-Stock	RSE-Stock $\leq 25$
	Size Structure	PSD, length frequency	$N \geq 50$ stock
	Condition	$W_r$	10 fish/inch group (max)
Channel Catfish	Abundance	CPUE– stock	RSE-Stock $\leq 25$
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age-and-growth	Age at 12 inches	$N = 13, 11.0 - 12.9$ inches
	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 and Gizzard Shad if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.



Table 6. Survey of aquatic vegetation, Bonham City Reservoir, Texas, 2012, 2016, and 2020. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2012	2016	2020
Native submerseda	99.6 (9.8)	<1 (<1)	trace
Native emergentb	100.7 (9.8)	11.3 (1)	5.5 (<1)
Non-native			
Alligatorweed (Tier III)*			3.5 (<1)

a Chara

b Cattail, bulrush, water willow, smartweed, buttonbush

\*Tier III is watch status

## Gizzard Shad

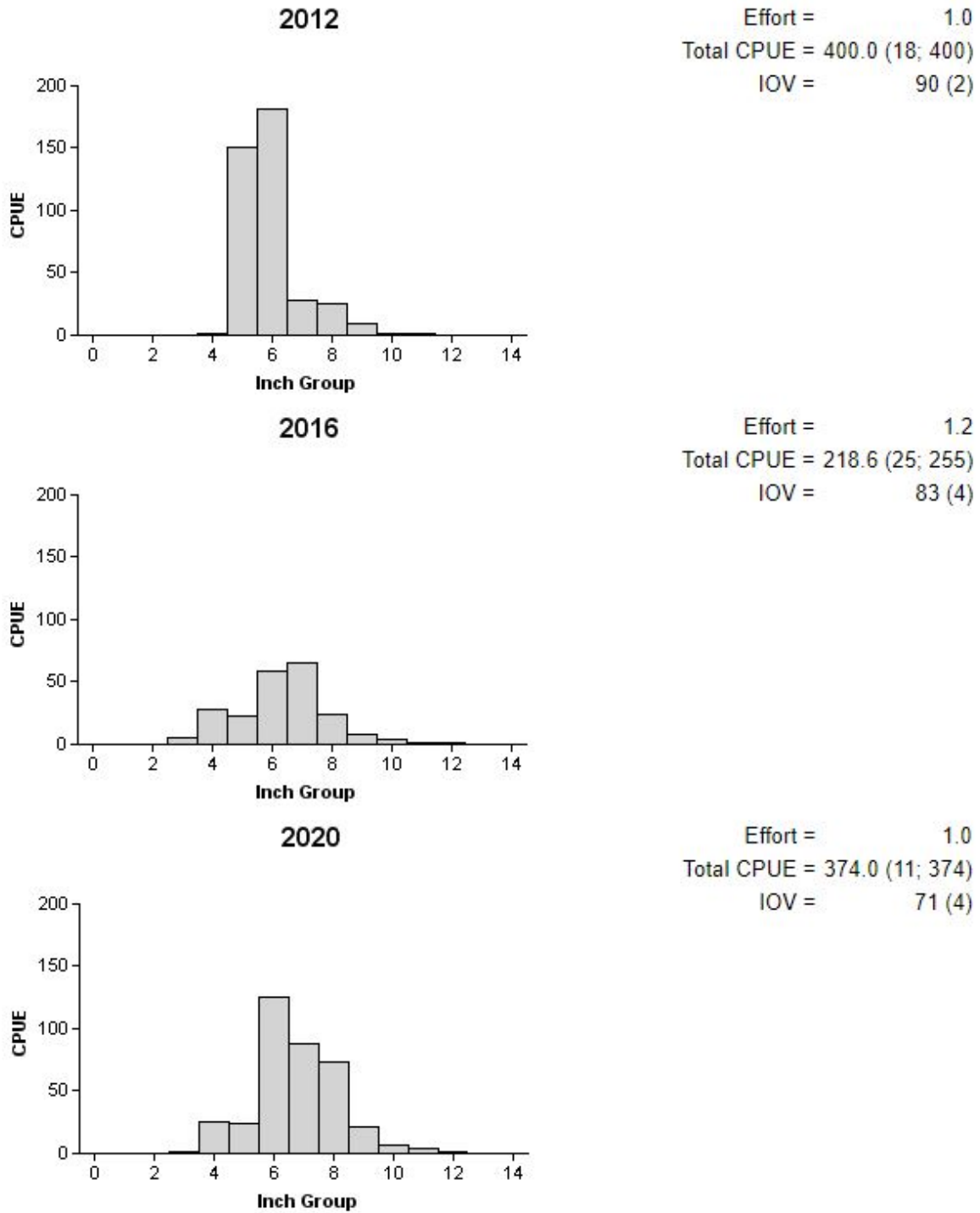
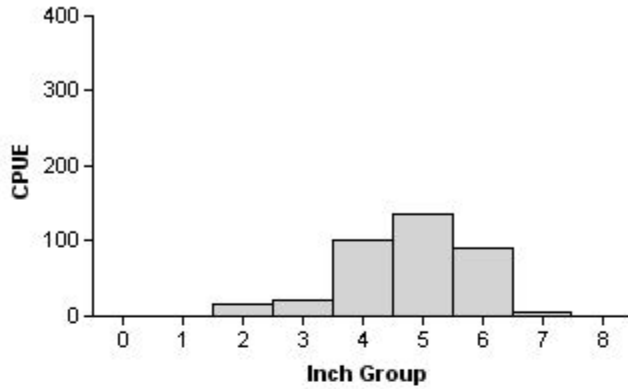


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Bonham City Reservoir, Texas, 2012, 2016, and 2020.

## Bluegill

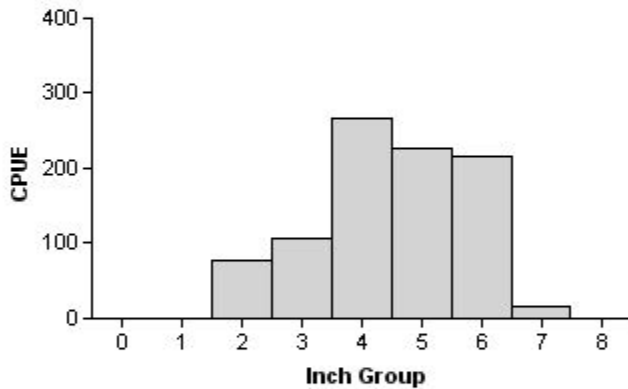
**2012**

Effort = 1.0  
 Total CPUE = 373.0 (25; 373)  
 PSD = 27 (7)



**2016**

Effort = 1.2  
 Total CPUE = 909.4 (13; 1061)  
 PSD = 28 (5)



**2020**

Effort = 1.0  
 Total CPUE = 779.0 (26; 779)  
 PSD = 4 (1)

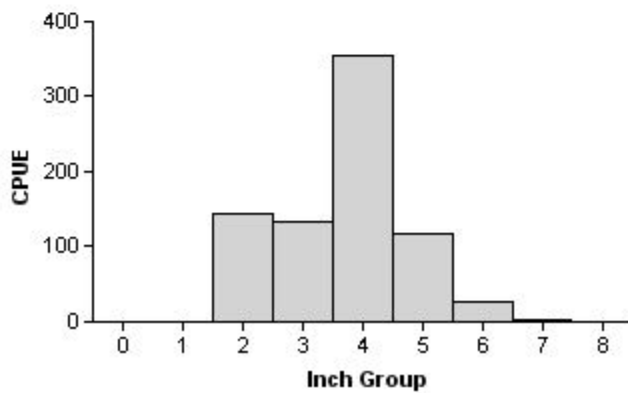


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Bonham City Reservoir, Texas, 2012, 2016, and 2020.

## Blue Catfish

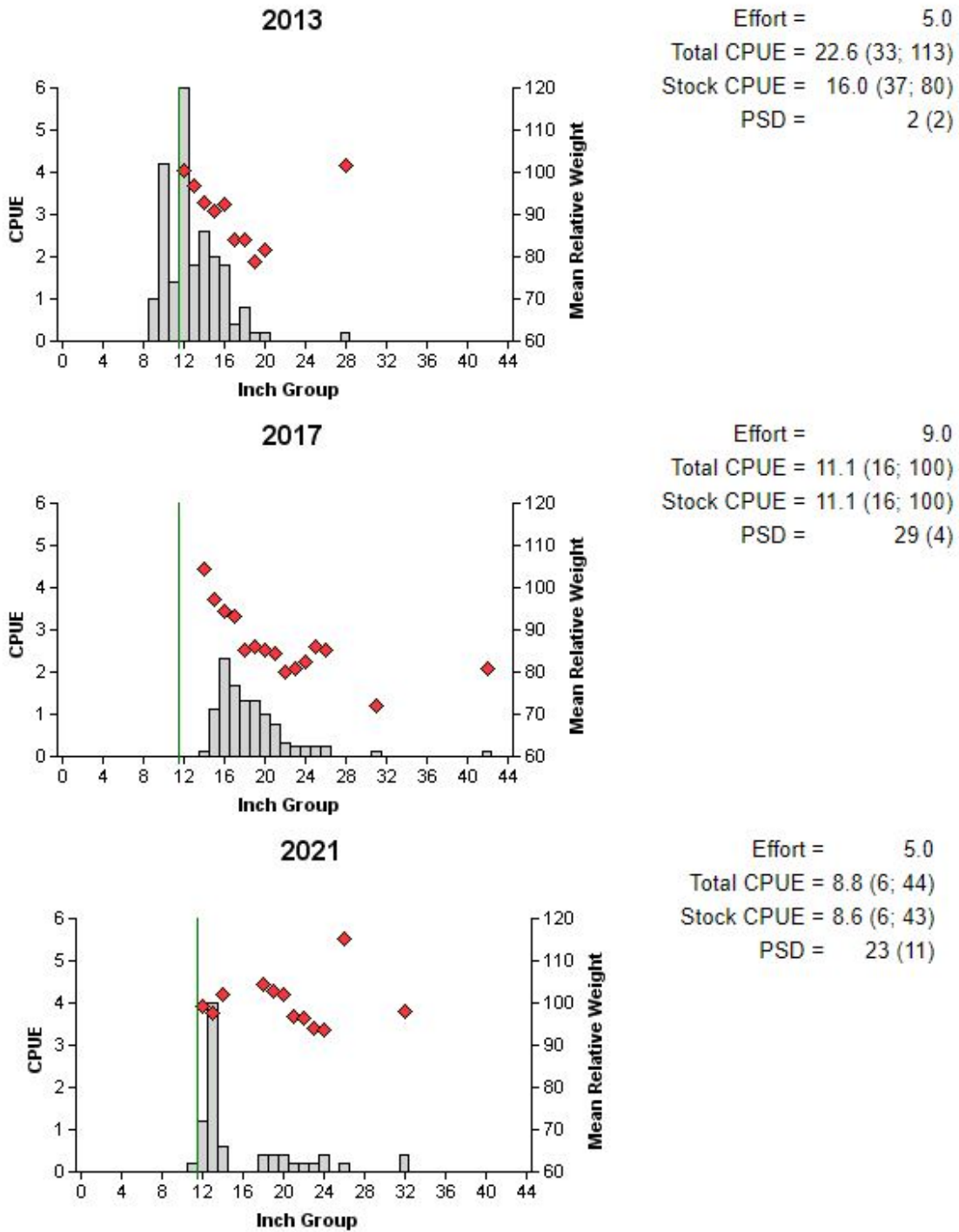


Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Bonham City Reservoir, Texas, 2013, 2017, and 2021. Vertical line indicates minimum length limit.

## Channel Catfish

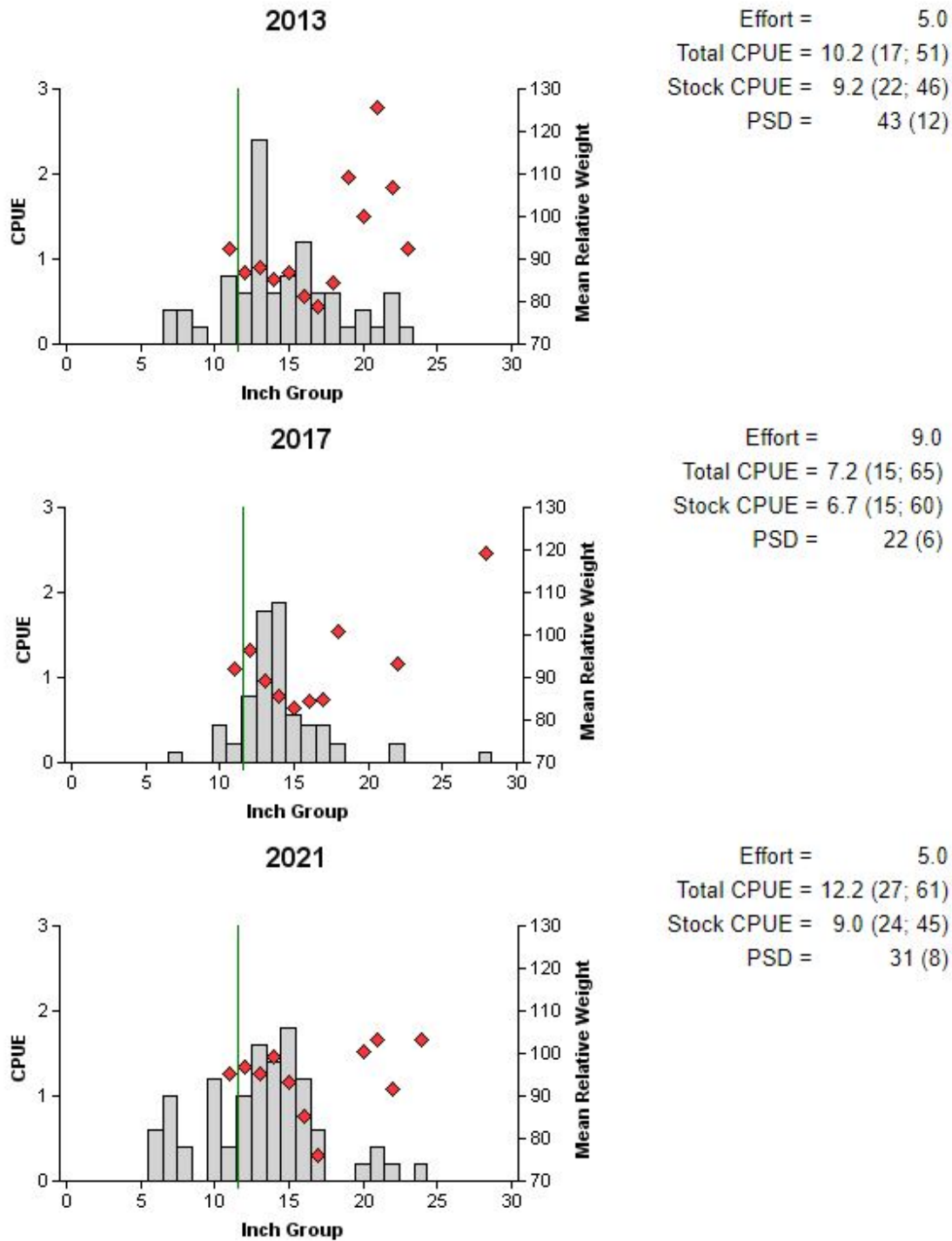


Figure 5. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Bonham City Reservoir, Texas, 2013, 2017, and 2021. Vertical line indicates minimum length limit.

## Largemouth Bass

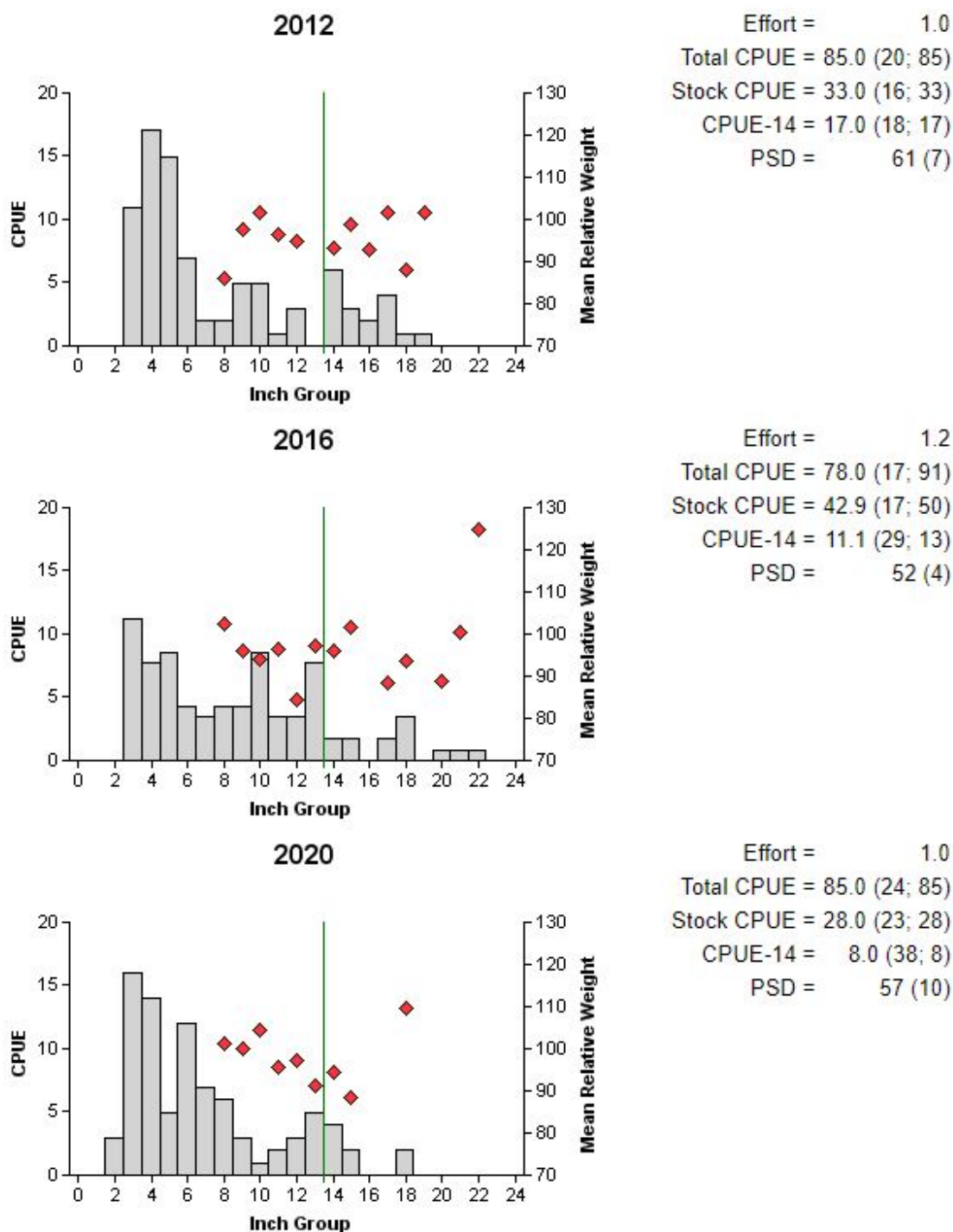


Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Bonham City Reservoir, Texas, 2012, 2016, and 2020. Vertical line indicates minimum length limit.

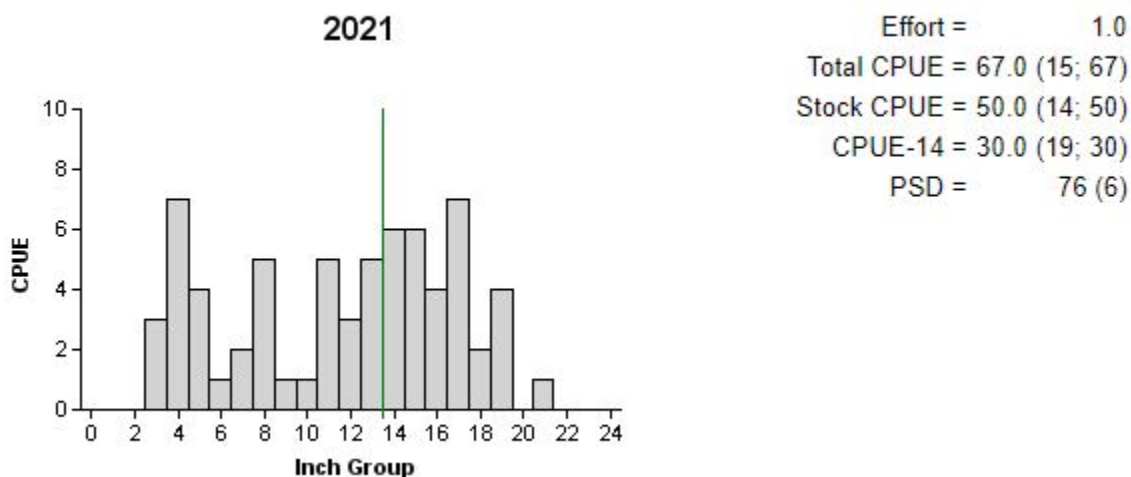


Figure 7. Number of Largemouth Bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for a spring bass-only electrofishing survey, Bonham City Reservoir, Texas, 2021. Vertical line indicates minimum length limit.

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Bonham City Reservoir, Texas, 1999, 2000, 2004, 2012, and 2020. 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		
1999	50	2	14	34	16.0	4.0
2000	29	0	4	25	6.8	0.0
2004	30	3	19	8	35.8	10.0
2012	30	0	27	3	34.0	0.0
2020	30	2	28	0	54.0	6.7

## White Crappie

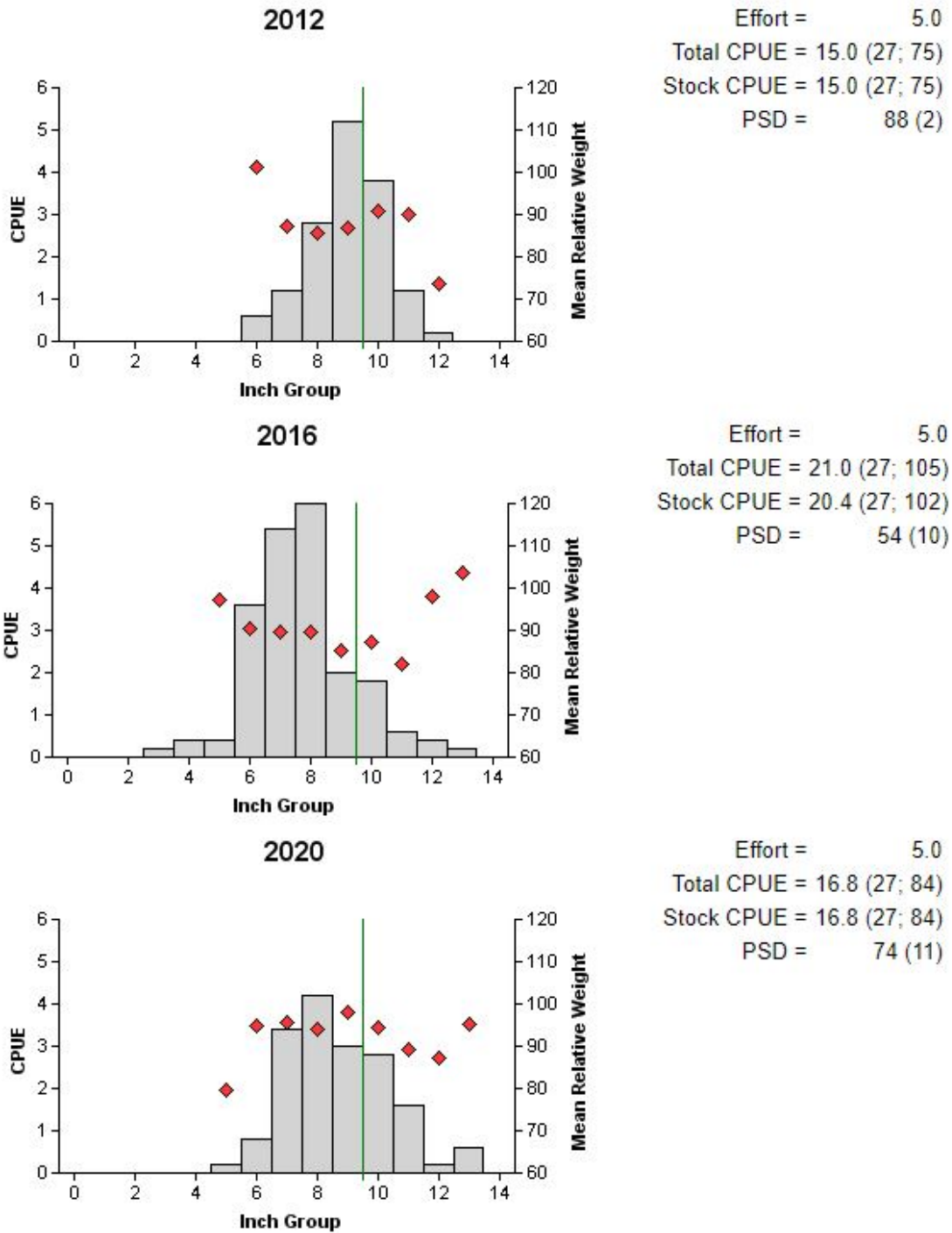


Figure 8. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Bonham City Reservoir, Texas, 2012, 2016, and 2020. Vertical line indicates minimum length limit.



## Black Crappie

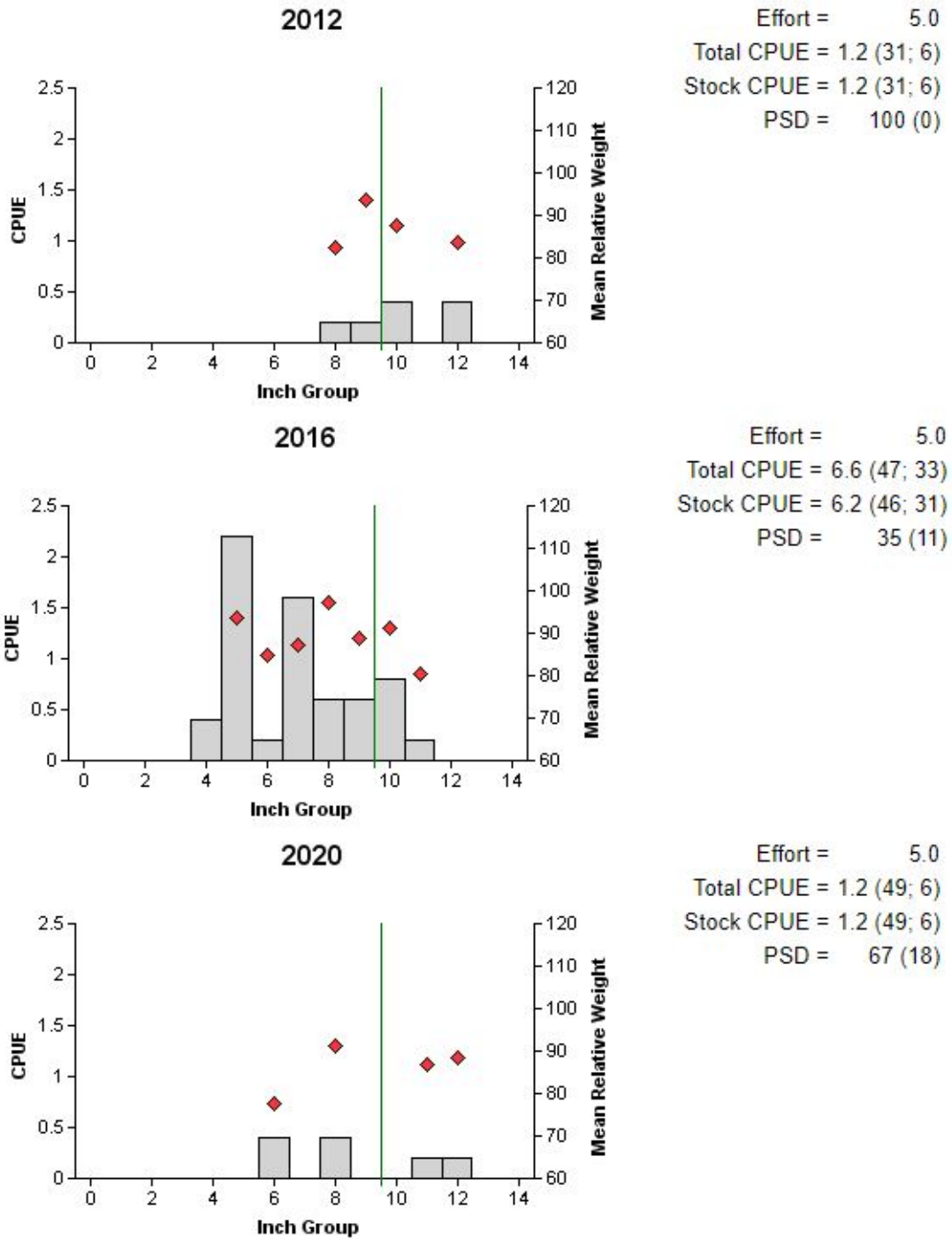


Figure 9. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Bonham City Reservoir, Texas, 2012, 2016, and 2020. Vertical line indicates minimum length limit.

## Proposed Sampling Schedule

Table 8. Proposed sampling schedule for Bonham City Reservoir, Texas. Survey period is June through May. Gill netting and bass-only electrofishing surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall.

	Survey year			
	2021-2022	2022-2023	2023-2024	2024-2025
Angler Access				X
Vegetation				X
Electrofishing - Fall				X
Electrofishing - Spring				X
Trap netting				X
Gill netting				X
Creel survey				
Report				X

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all species collected from standard gear types from Bonham City Reservoir, Texas, 2020-2021. Sampling effort was five net nights for gill netting, five net nights for trap netting, and one hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					374	374.0 (11)
Threadfin Shad					1967	1967.0 (38)
Inland Silverside					3	3.0 (100)
Blacktail Shiner					2	2.0 (100)
Blue Catfish	44	8.8 (6)				
Channel Catfish	61	12.2 (27)				
Warmouth					2	2.0 (67)
Orangespotted Sunfish					4	4.0 (100)
Bluegill					779	779.0 (26)
Longear Sunfish					123	123.0 (32)
Redear Sunfish					47	47.0 (26)
Spotted Bass					4	4.0 (100)
Largemouth Bass					85	85.0 (24)
White Crappie			84	16.8 (27)		
Black Crappie			6	1.2 (49)		

## APPENDIX B – Historical catch rates

Catch rates (CPUE) of targeted species by standard gear type for Bonham City Reservoir, Texas, 1997 – 2016.

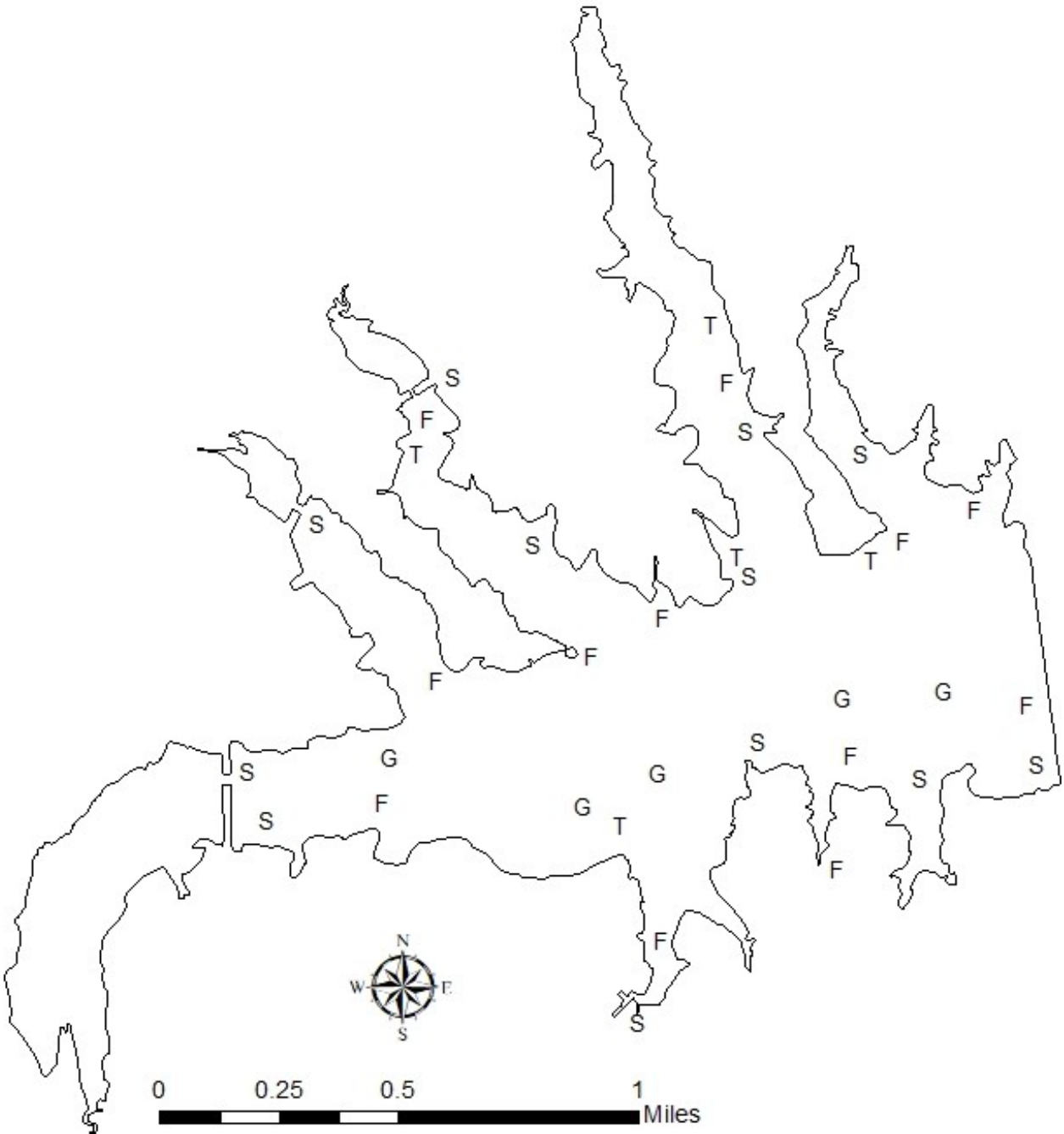
Gear	Species	Year						Avg.
		1997	2000	2004	2008	2012	2016	
Gill Netting (fish/net night)	Blue Catfish	9.0	5.0	3.4	4.2	22.6	11.1	<b>9.2</b>
	Channel Catfish	16.0	9.2	9.2	6.8	10.2	7.2	<b>9.8</b>
	White Bass					0.6	0.0	<b>0.3</b>
Electrofishing (fish/hour)	Gizzard Shad	123.3	409.0	163.0	108.0	400.0	218.6	<b>237.0</b>
	Threadfin Shad	392.7	777.0	3,486.0	1,962.0	2,442.0	259.7	<b>1,553.2</b>
	Green Sunfish	0.7	0.0	2.0	2.0	0.0	7.7	<b>2.1</b>
	Warmouth	12.0	28.0	35.0	0.0	2.0	6.0	<b>13.8</b>
	Orangespotted Sunfish	0.0	0.0	0.0	0.0	0.0	0.9	<b>0.2</b>
	Bluegill	364.0	1,207.0	1,178.0	776.0	373.0	909.4	<b>801.2</b>
	Longear Sunfish	137.3	197.0	589.0	112.0	73.0	217.7	<b>221.0</b>
	Redear Sunfish	13.3	131.0	154.0	109.0	46.0	6.0	<b>76.6</b>
	Spotted Bass	6.7	12.0	7.0	2.0	1.0	2.6	<b>5.2</b>
Largemouth Bass	124.0	79.0	172.0	119.0	85.0	78.0	<b>109.5</b>	
Trap Netting (fish/net night)	White Crappie	28.8	6.8	51.6	2.8	15.0	21.0	<b>21.0</b>
	Black Crappie	0.6	3.2	10.6	3.0	1.2	6.6	<b>4.2</b>

\*Electrofishing surveys prior to 2007 were conducted using a Smith-Root 5.0 GPP (gas powered pulsator). Since 2007, surveys have been conducted using a Smith-Root 7.5 GPP.

\*Except for 1997, gill netting surveys were conducted in the spring following the posted year.

\*Objective based sampling started in 2016.

## APPENDIX C – Map of sampling locations



Location of sampling sites, Bonham City Reservoir, Texas, 2020-2021. Trap net, gill net, spring electrofishing, and fall electrofishing stations are indicated by T, G, S and F, respectively. Water level was near full pool at time of sampling.



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