

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-221-M-2

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2016 Fisheries Management Survey Report

Bonham City Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Bonham City Reservoir were surveyed in 2016 using electrofishing and trap netting and in 2017 using gill netting. Anglers were surveyed from March 2017 through May 2017 with a creel survey. Habitat and aquatic vegetation was surveyed in 2016. Historical data are presented with the 2016-2017 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 on Timber Creek, a tributary to Bois d'Arc Creek, which is a tributary to the Red River in Fannin County Texas. Water level has been within 3 feet of conservation elevation since April 2013 and nearly crested the spillway elevation of 571 feet in November of 2015. The reservoir has high nutrient productivity. Habitat features consisted 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 stocked from 2009 through 2011. Florida Largemouth Bass were last stocked in 1998. The reservoir has always been managed with statewide fishing regulations.
- **Fish Community**
 - **Prey species:** Electrofishing catch rate of Gizzard Shad and Threadfin Shad was moderate and below historical averages. Bluegill and Longear Sunfish catch rates remained excellent and provide an adequate forage base.
 - **Catfishes:** Gill net catch rate of Blue Catfish was above average, and legal length Blue Catfish made up 100% of the sample population. Gill net catch rate of Channel Catfish remains consistent and natural reproduction is evident. Most of the sample population was of legal length and in good condition. Catfishes were the second most sought-after fish by anglers with good sizes and numbers being harvested.
 - **White Bass:** White Bass were collected for the first time when three mature females were collected in gill nets in 2012. No White Bass were collected in 2015 or 2017; however, a lake record White Bass was submitted by an angler in spring of 2017. Few were harvested by anglers and there was no directed effort.
 - **Black basses:** Electrofishing catch rate of Largemouth Bass was below the historical average, although the population structure was favorable with quality fish present and adequate recruitment. Largemouth bass were the third most sought-after fish with most fish being released. Spotted Bass are also present in the reservoir in low abundance.
 - **Crappie:** White Crappie and Black Crappie exhibited the highest catch rates since 2004. White Crappie are more abundant than Black Crappie. The majority of Crappie were 6 to 9 inches long. Crappie were the most sought-after fish by anglers.
- **Management Strategies:** Based on current information, Bonham City Reservoir should continue to be managed with existing fish harvest regulations. The controlling authority will be informed of erosion around the edges of the north public boat ramp. Stock Florida Largemouth Bass at 1,600/mi in 2018. Install fish attractors around public T-pier at the south boat ramp. Inform the public about the negative impacts of aquatic invasive species. General monitoring with electrofisher, trap nets, and gill nets will be conducted in 2020-2021.

INTRODUCTION

This document is a summary of fisheries data collected from Bonham City Reservoir in 2016–2017. 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 was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2016–2017 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 fluctuated between 3 and 5 feet since April 2008 (Figure 1). The average depth is 13 feet with a maximum depth of 30 feet. Habitat features consisted mainly of natural shoreline, bulkhead and boat docks, rip-rap, and native submersed and emergent aquatic vegetation. Native aquatic plants present are chara, cattail, bulrush, water-willow, and water primrose. Other descriptive characteristics for Bonham City Reservoir are in Table 1.

Angler Access

Bonham City Reservoir has two public boat ramps with lighted parking. Additional boat ramp characteristics are in Table 2. The north ramp shows signs of erosion around the edges. Addition of rip-rap could correct the situation. 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. Further information about Bonham City Reservoir and its facilities can be obtained by visiting the Texas Parks and Wildlife Department (TPWD) web site at <http://tpwd.texas.gov/fishboat/fish/recreational/lakes/bonham/>.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Moczygemba and Hysmith 2013) included:

1. Dam safety threatened due to excessive terrestrial vegetation. Advise the City of Bonham to remove vegetation.
Action: The vegetation has been removed.
2. Erosion around the edges of the north public boat ramp could cause damage to the ramp. Advise the City of Bonham to install rip-rap around the eroded areas.
Action: The City of Bonham was advised to install rip-rap around the edges of the north public boat ramp. To date, no repairs have been made.
3. White bass were observed for the first time in Bonham City Reservoir when three mature females were collected in gill nets. Monitor the status of the White Bass population with a supplemental gill netting survey in 2015.
Action: A supplemental gill netting survey was conducted in 2015 and no White Bass were collected.

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

Stocking history: Bonham City Reservoir was stocked with fingerling Blue Catfish from 2009 to 2011 at 50 to 108 per acre. Florida Largemouth Bass were last stocked in 1998. The complete stocking history is in Table 4.

Vegetation/habitat management history: No vegetation/habitat management has been conducted. The reservoir supports native submersed and emergent aquatic vegetation (Table 6).

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 sampling objectives in accordance with the objective-based sampling (OBS) plan for Bonham City 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 (1.17 hours at 14, 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 11 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). Ages for White Crappie were determined using otoliths from 13 randomly-selected fish (range 9.0 to 10.9 inches). Ages for Black Crappie were determined using otoliths from 8 randomly-selected fish (range 9.0 to 10.9 inches).

Gill netting – Blue and Channel Catfish were collected by gill netting (9 net nights at 9 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 8 randomly-selected fish (range 11.0 to 12.9 inches).

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 and creel statistics.

Creel survey – A roving creel survey was conducted spring of 2017. The creel period was March through May. Angler interviews were conducted on 5 weekend days and 4 weekdays to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Habitat – A vegetation survey was conducted in August 2016. 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 2017).

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of natural shoreline, bulkhead and boat docks, and rocky shoreline (Moczygemba and Hysmith 2013). Native submersed (chara) and native emergent (cattail, bulrush, water-willow, and water primrose) aquatic vegetation covered about one percent of the reservoir's surface area (Table 6).

Creel: Directed fishing effort by anglers was highest for Crappie (39.7%), followed by anglers fishing for Catfishes and Largemouth Bass (Table 7). Anglers fishing for Largemouth Bass increased from 8.3% in 2002, to 23.6% in 2017. The fishing effort was split between bank anglers and boat anglers 40% and 60% respectively. Total fishing effort for all species for 2002 and 2017, and directed expenditures for 2017 are presented in Table 8.

Prey species: Electrofishing CPUE of Gizzard Shad and Bluegill was 218.6/h and 909.4/h, respectively (Figures 2 and 3). Gizzard Shad IOV was high, indicating 83% of the Gizzard Shad sample was available as forage to existing predators; this was similar to IOV estimates in previous years (Figure 2). Total CPUE for Threadfin Shad was 259.7/h, which was considerably lower than the average of 1,553.2/h (Appendix A). The CPUE of Bluegill remained high and when combined with other sunfish species,

resulted in a catch rate of >1,100.0/h. Approximately half of the Bluegill sample population was ≤ 4 inches (Figure 3). Bonham City Reservoir has an excellent prey base.

Catfishes: The gill net catch rate of Blue Catfish was 11.1/nn (Figure 4), the third highest catch rate since 1997 (Appendix A). Relative weight was fair to good for all sizes, and 100% of the sample population were of legal length or larger. The high CPUE suggests fish stocked between 2009 and 2011 have recruited to the fishery.

The gill net catch rate of Channel Catfish was 7.2/nn (Figure 6). Relative weight was ≥ 85 for all size classes. Growth of Channel Catfish in Bonham City Reservoir was above average; average age at 12 inches (11.2 to 12.9) was 3.4 years (N = 8; range 3 – 4 years). Approximately 89% of the sample population was legal length and longer and natural reproduction is evident.

Catfishes were the second-most sought-after fish by anglers who harvested 1,771 Channel and Blue Catfish combined (Table 9) ranging from 12 to 22 inches in length (Figure 5). The Catfish fishery is harvest oriented with 11% of legal-length fish being released (Table 9).

White Bass: White Bass were observed for the first time in Bonham City Reservoir, when three females were collected in gill nets in 2012. No White Bass were sampled in 2015 or 2017 gill net surveys; however, a White Bass was submitted for a lake record in April 2017. Since there are no White Bass populations above the reservoir and the reservoir has not gone over the emergency spillway, White Bass may have been introduced by anglers. White Bass were not targeted by anglers.

Black basses: The electrofishing catch rate for Largemouth Bass (78.0/h) has declined since the 2004 sample and was below the average of 116.3/h (Appendix A). The PSD of 52 was similar to the last survey but higher than the PSD in 2008 (Figure 7). Relative weight indicated good condition and varied from 90 to 100. The sample population showed 14% were of legal length. Growth of Largemouth Bass in Bonham City Reservoir was average; age at 14 inches (13.1 to 14.7 inches) was 2.3 years (N = 11; range = 2 - 3 years). Collection of tournament data suggests that Bonham City Reservoir has a propensity for producing Largemouth Bass ≥ 8 pounds (Appendix B). Directed fishing effort, catch per hour, and harvest for Largemouth Bass was 5,074 h, 0.7 fish/h, and 385 fish, respectively, from March 2017 through May 2017 (Table 10). Tournament anglers accounted for 2,242 h of effort while non-tournament anglers accounted for 2,832 h of effort (Table 10). Figure 8 depicts the size of Largemouth Bass harvested (tournament and non-tournament) from the reservoir. Florida Largemouth Bass influence has remained low as Florida alleles have ranged from 6 to 36% and Florida genotype has ranged from 0 to 10% (Table 11).

Spotted Bass are present in Bonham City Reservoir. The electrofishing catch rate was 2.6/h which indicates low abundance (Appendix A).

Crappie: Trap net catch rate of White Crappie (21.0/nn) was the highest since 2004, and above the average of 19.6/nn (Figure 9 and Appendix A). Body condition was good with mean relative weights around 90. White Crappie reached legal length in 2 years (N=13). About 14% of the sample population was of legal length. The majority of the sample population was comprised of fish 6 to 8 inches long.

Trap net catch rate of Black Crappie (6.6/nn) was the highest since 2004 and above the average of 4.5/nn (Figure 10 and Appendix A). Body condition was good with mean relative weights around 90. Growth of Black Crappie was slow; average age to attain 10 inches (9.2 – 10.8 inches) was 4.7 years (N = 6; range 3 – 6 years). About 15% of the sample population was of legal length.

Crappie were the most sought-after sportfish with a directed effort of 8,547 h and a total harvest of 7,358 fish, for White and Black Crappie combined, from March 2017 through May 2017 (Table 12). Figure 11 depicts the size of Crappie harvested from the reservoir.

Fisheries management plan for Bonham City Reservoir, Texas

Prepared – July 2017.

ISSUE 1: Erosion around the edges of the north public boat ramp could cause damage to the ramp.

MANAGEMENT STRATEGIEY

1. Continue dialog with the City of Bonham to install rip-rap around the eroded areas and inform them of funds available for repairs through the TPWD boater access grants.

ISSUE 2: Bonham City Lake has not received a Florida Largemouth Bass stocking since 1998 but supports a quality Largemouth Bass population which continually produces fish \geq 8 pounds and is very popular with local bass fishing tournaments and other recreational bass anglers. Genetic analysis from 2012 shows Florida Largemouth Bass influence is low.

MANAGEMENT STRATEGIES

1. Stock Florida Largemouth Bass fingerlings at the rate of 1,600 per shoreline mile (28,800 total fish) in the spring of 2018 and 2019 to influence genetics and enhance the trophy Largemouth Bass fishery.
2. Assess the genetic composition of the Largemouth Bass population during fall electrofishing in 2020.
3. Continue to monitor relative abundance, size structure, and body condition with standard electrofishing survey in fall of 2020.

ISSUE 3: Bonham City Lake has a popular public fishing T-pier which could benefit from placement of fish attractors.

MANAGEMENT STRATEGIES

1. Investigate funding sources for the materials to build fish attractors.
2. Place several fish attractors around the public fishing T-pier.

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

MANAGEMENT STRATEGIES

1. Cooperate with City of Bonham personnel to post appropriate signage at access points around the reservoir.
2. Contact and educate City of Bonham personnel about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their reservoir visitors.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) any future inter-basin water transfers to facilitate potential invasive species responses.

Objective Based Sampling Plan and Schedule for Bonham City Reservoir 2017-2021

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; although, no White Bass were collected during additional gill net surveys in 2015 and 2017. White Bass are not expected to have established a population in Bonham City Reservoir. Any natural recruitment or increase in abundance of White Bass will be documented during sampling for Catfish species.

Spotted Bass: Spotted Bass are present in Bonham City Reservoir; however, average CPUE=5.9/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: Trend data for Largemouth Bass will be collected with nighttime electrofishing in the fall once every four years. Bonham City Reservoir maintains a quality bass fishery, and electrofishing catch rates have remained consistent, as has the size structure and condition of the bass population. Sampling once every four years to collect long-term monitoring trend data will allow for determination of any large-scale changes in the Largemouth Bass population that may spur further investigation. Results from seasonal, weekly tournaments will also provide supplemental data on catches of fish >8lbs.

A minimum of 12 randomly selected 5-min electrofishing sites will be sampled in 2020 (Table 13), but sampling will continue at random sites until 50 stock-size fish are collected or the RSE of CPUE-S is ≤ 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 between 13.0 and 14.9 inches will be collected to estimate age at the minimum length limit (14 inches). Relative weight of Largemouth Bass ≥ 8 " TL will be determined from their length/weight data (maximum of 10 fish weighed and measured per inch class). To determine percent Florida Largemouth Bass alleles, a genetic analysis will be conducted on 30 Largemouth Bass randomly collected during electrofishing.

Catfish: Stockings of both Blue and Channel Catfish have been conducted at Bonham City Reservoir, and currently both species provide a fishery. Blue Catfish stocked between 2009 and 2011 have established an abundant population of harvestable fish; however, natural recruitment is not evident. Catch rates suggest that trend data for monitoring Channel Catfish size structure, condition, and time required for fish to grow to the minimum length; can be obtained with reasonable effort.

A minimum of 5 randomly selected gill-net stations will be sampled in 2021 (Table 13). If a minimum of 50 stock-size Channel Catfish and an RSE of CPUE-S ≤ 25 is not obtained in the 5 gill-net nights, additional sampling will be conducted up to 10 gill net nights. The relative abundance of Blue Catfish and evidence of natural reproduction will be documented; however, no additional sampling effort will be conducted beyond that necessary to achieve objectives for Channel Catfish.

Crappie: Both White Crappie and Black Crappie are present in Bonham City Reservoir; however, White Crappie are in greater abundance. Crappie are historically the most sought after sport fish at Bonham City Reservoir. We will collect trend data on CPUE, 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 is

variable at Bonham City Lake and has ranged 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-size fish) for White Crappie to be between 7 and 10 net nights. This level of sampling should provide a sufficient number of 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 will be sampled if objectives are not met with the initial 5 sampling stations. 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 abundance, size structure, and prey availability for forage species (along with sampling for Largemouth Bass) once every four years. Effort expended to achieve desired relative abundance estimates for Bluegill should be similar to that required for Largemouth Bass.

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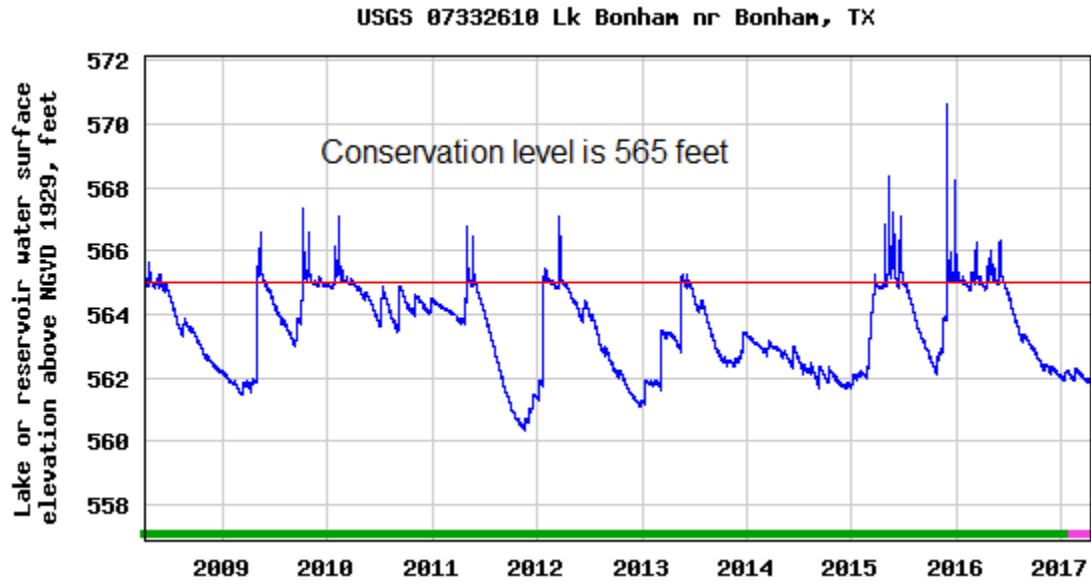


Figure 1. Daily mean average water level elevations in feet above mean sea level (MSL) recorded for Bonham City Reservoir, Texas, April 2008-April 2017.

Table 1. Characteristics of Bonham City Reservoir, Texas.

Characteristic	Description
Year constructed	1969
Controlling authority	City of Bonham
County	Fannin
Reservoir type	Offstream
Shoreline development index	4.1
Conductivity	123 $\mu\text{S/cm}$

Table 2. Boat ramp characteristics for Bonham City Reservoir, Texas, October, 2016. Reservoir elevation at time of survey was 563 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 erosion.

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 ^a	None
Bass, Largemouth	5 ^a	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies.	25 (in any combination)	10-inch minimum

^a Daily bag for Largemouth Bass and Spotted Bass = 5 fish in any combination.

Table 4. Stocking history for Bonham City, Texas. Life stages are fingerlings (FGL), advanced fingerlings (AFGL), and unknown (UNK).

Species	Year	Number	Life Stage
Blue Catfish	1978	25,486	UNK
	2009	50,685	FGL
	2010	103,128	FGL
	2011	<u>110,440</u>	FGL
	Total	289,739	
Channel Catfish	1969	50,000	AFGL
	1994	<u>1,634</u>	AFGL
	Total	51,634	
Florida Largemouth Bass	1996	101,900	FGL
	1997	104,206	FGL
	1998	<u>103,324</u>	FGL
	Total	309,430	
Largemouth Bass	1969	200,000	UNK
	Total	<u>200,000</u>	
Palmetto Bass	1978	<u>26,313</u>	UNK
	Total	26,313	

Table 5. Objective-based sampling plan components for Bonham City Reservoir, Texas 2016 – 2017.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Age-and-growth	Age at 14 inches	$N = 13, 13.0 - 14.9$ inches
	Condition	W_r	10 fish/inch group (max)
Bluegill ^a	Abundance	CPUE – total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad ^a	Abundance	CPUE – total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
	Prey availability	IOV	$N \geq 50$
<i>Trap netting</i>			
White Crappie	Abundance	CPUE-stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N = 50$
	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 ≤ 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 ≤ 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)

^a No additional effort will be expended to achieve an RSE ≤ 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 and 2016. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2012	2016
Native submerseda	99.6 (9.8)	<1 (<1)
Native emergentb,c,d,e	100.7 (9.8)	11.3 (1)

^aChara
^bCattail
^cBulrush
^dWater willow
^eWater primrose

Table 7. Percent directed angling effort by species for Bonham City Reservoir, Texas, 2002 and 2017. Survey periods were from 1 March through 31 May.

Species	2002	2017
Catfishes	20.1	27.1
Sunfishes	0.9	0.1
Largemouth Bass	8.3	23.6
Crappie	36.1	39.7
Anything	34.6	9.5

Table 8. Total fishing effort (h) for all species and total directed expenditures at Bonham City Reservoir, Texas, 2002 and 2017. Survey periods were from 1 March through 31 May. Relative standard error is in parentheses.

Creel Statistic	2002	2017
Total fishing effort	21,676 (NA)	21,530 (20)
Total directed expenditures	NA	\$86,393 (34)

Gizzard Shad

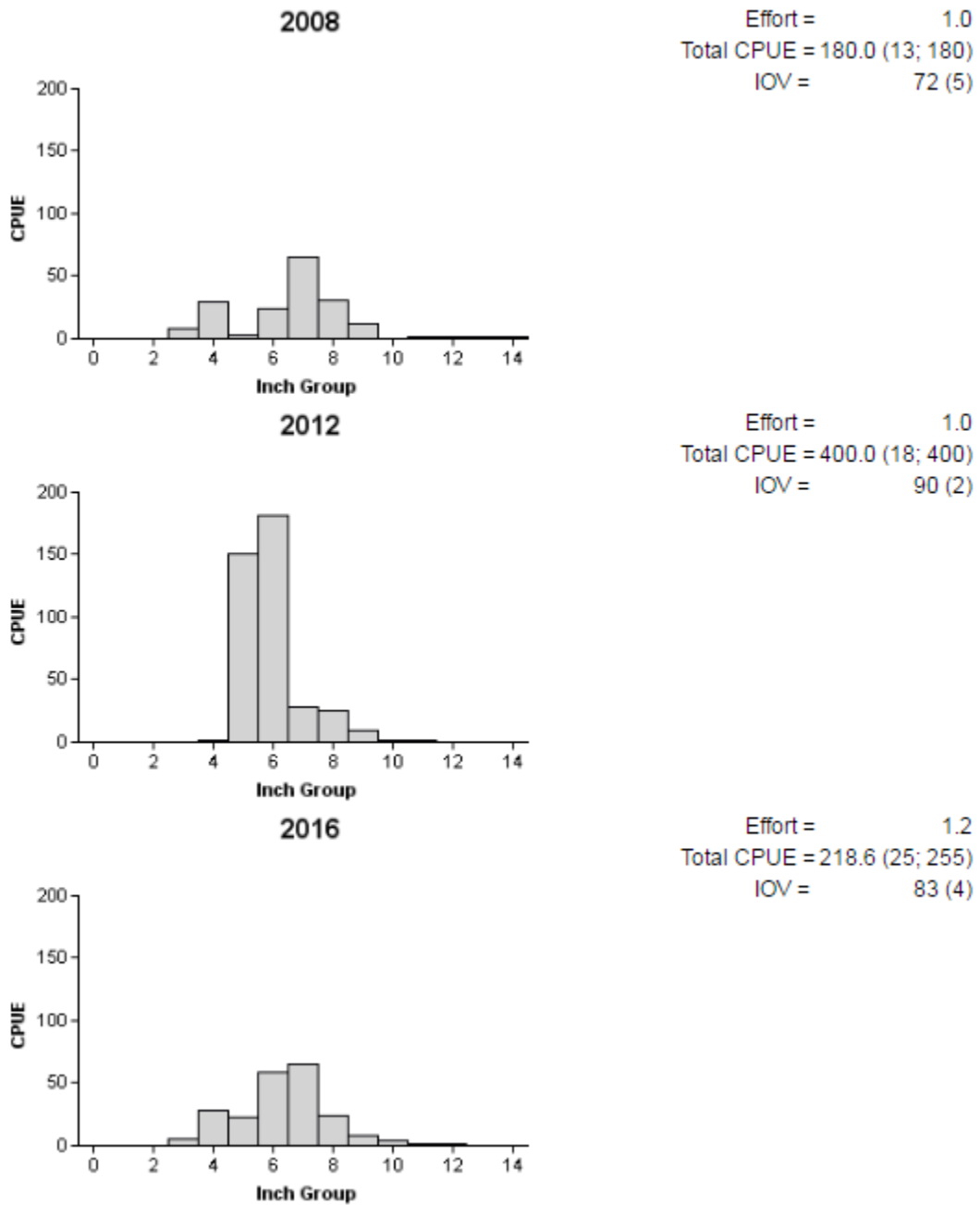


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Bonham City Reservoir, Texas 2008, 2012, and 2016.

Bluegill

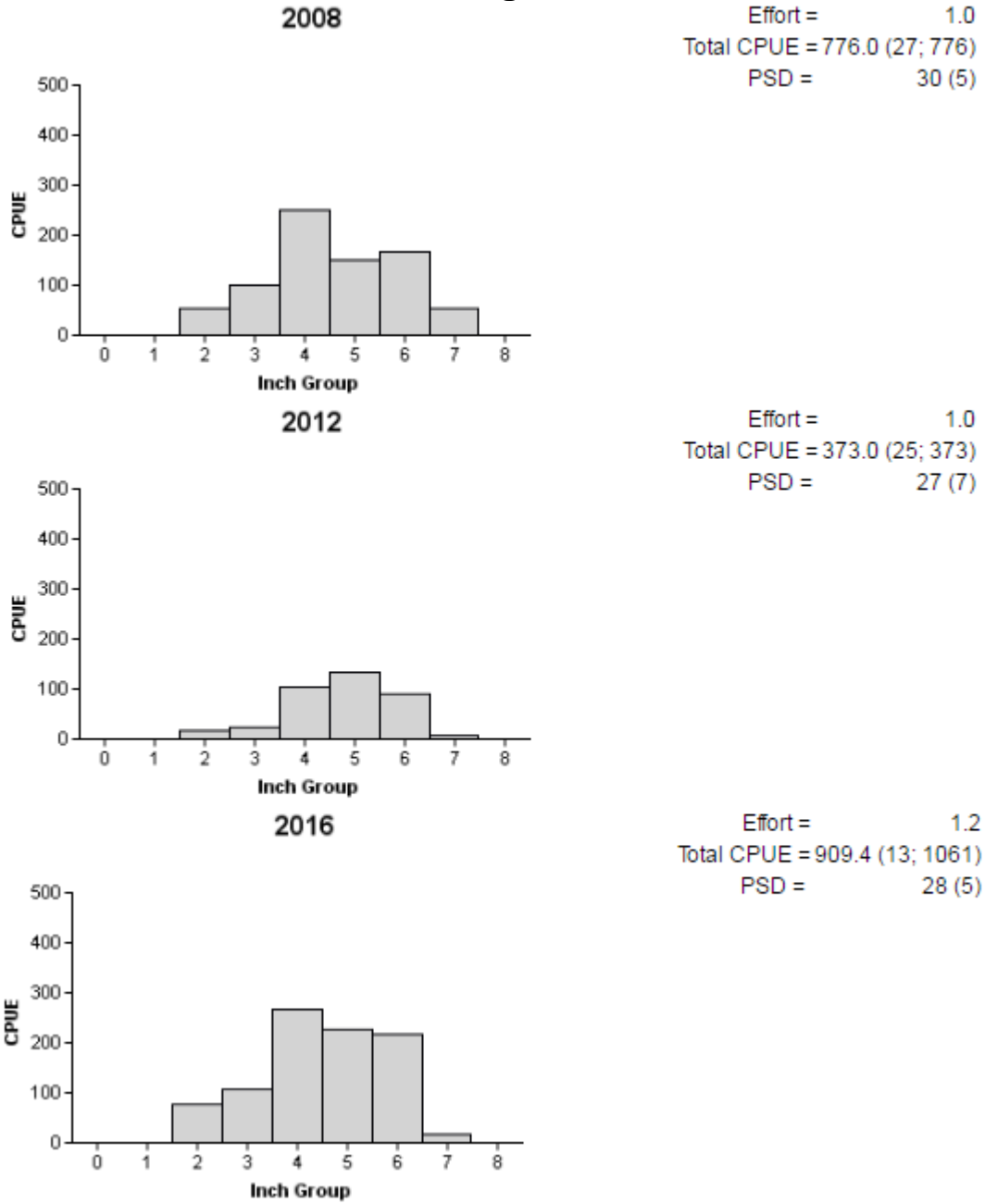


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Bonham City Reservoir, Texas, 2008, 2012, and 2016.

Blue Catfish

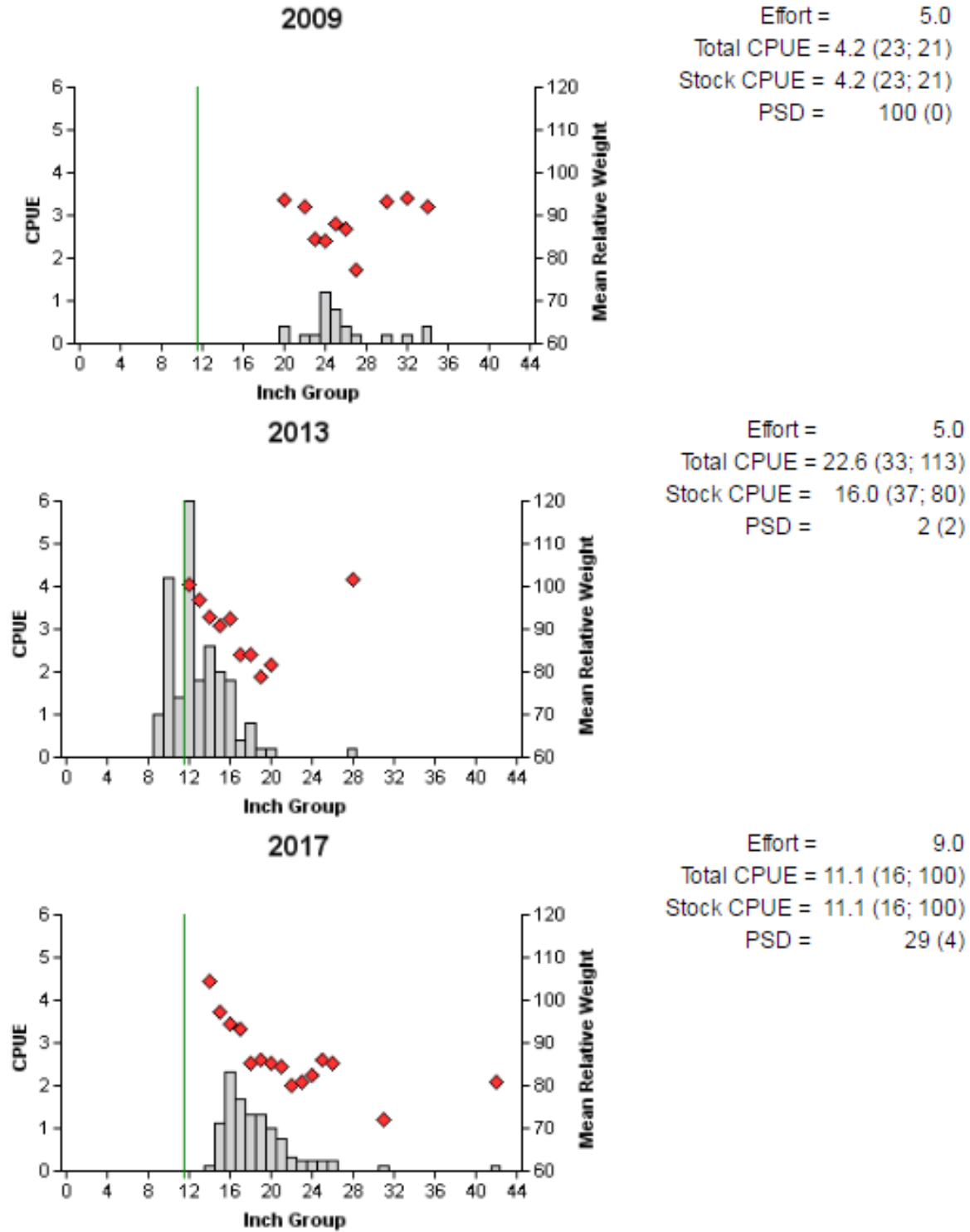


Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Bonham City Reservoir, Texas, 2009, 2013, and 2017. Vertical lines represent length limit at time of collection.

Channel Catfish

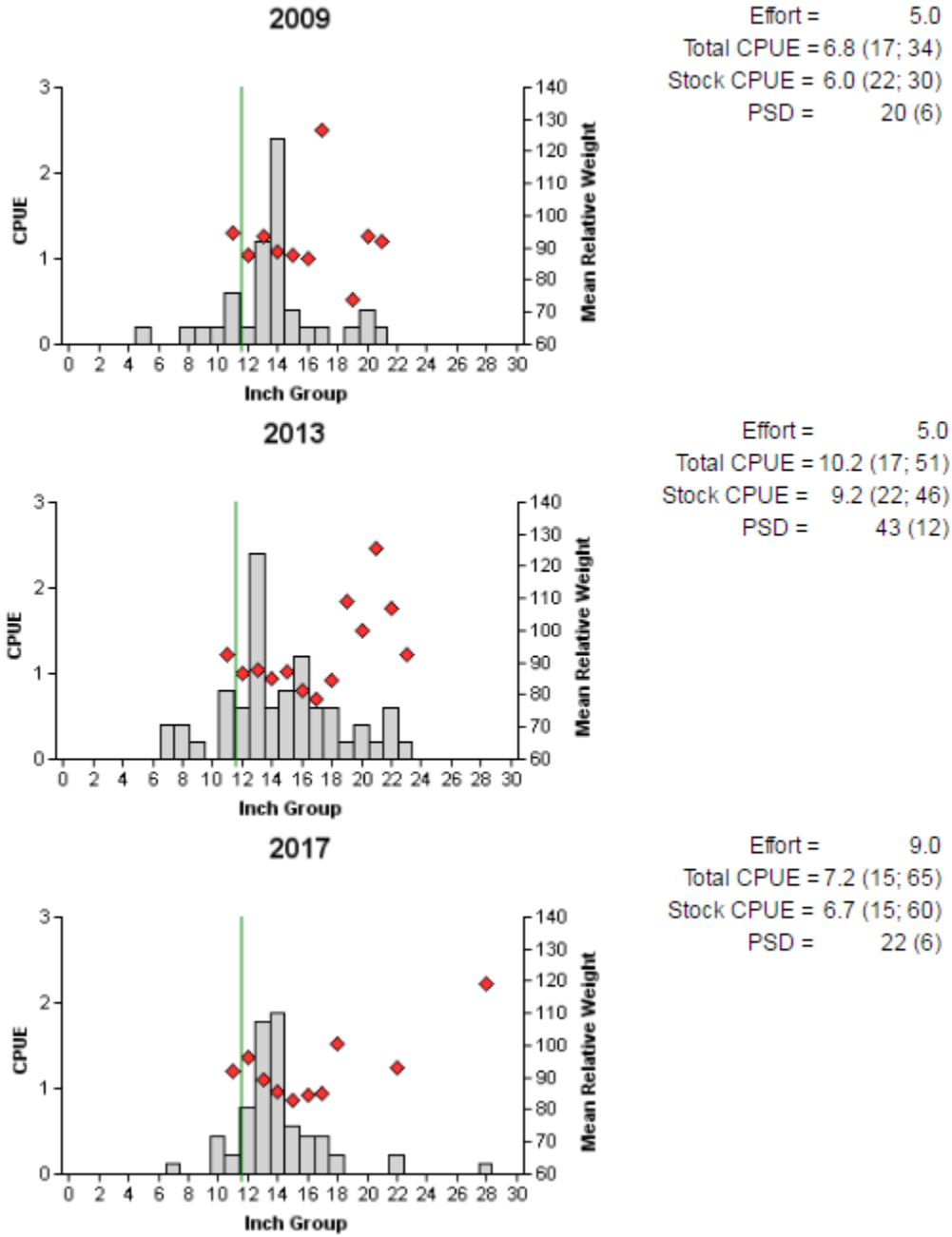


Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Bonham City Reservoir, Texas, 2009, 2013, and 2017. Vertical lines represent length limit at time of collection.

Catfish

Table 9. Creel survey statistics for Channel Catfish and Blue Catfish at Bonham City Reservoir, Texas, from March 2017 through May 2017. Total catch per hour is for anglers targeting Catfish and total harvest is the estimated number of Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses. **[RSE for directed effort and total harvest is the same as directed effort/acre and total harvest/acre, respectively]**

Creel survey statistic	Year	
	2017	
Surface area (acres)	919	
Directed effort (h)	5,838 (22)	
Directed effort/acre	6.4 (22)	
Total catch per hour	0.4 (158)	
	Channel Catfish	Blue Catfish
Total harvest	829 (87)	942 (103)
Harvest/acre	0.9 (87)	1.0 (103)
Percent legal released	11	

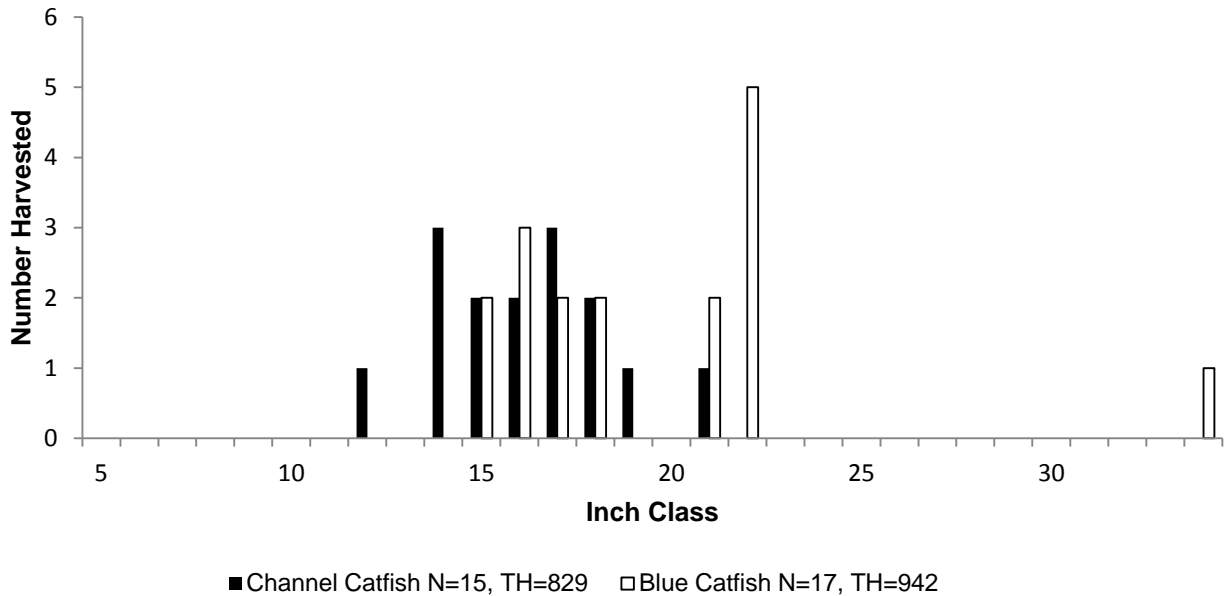


Figure 5. Length frequency of harvested Channel Catfish and Blue Catfish observed during creel surveys at Bonham City Reservoir, Texas, March 2017 through May 2017, all anglers combined. N is the number of harvested Channel Catfish and Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass

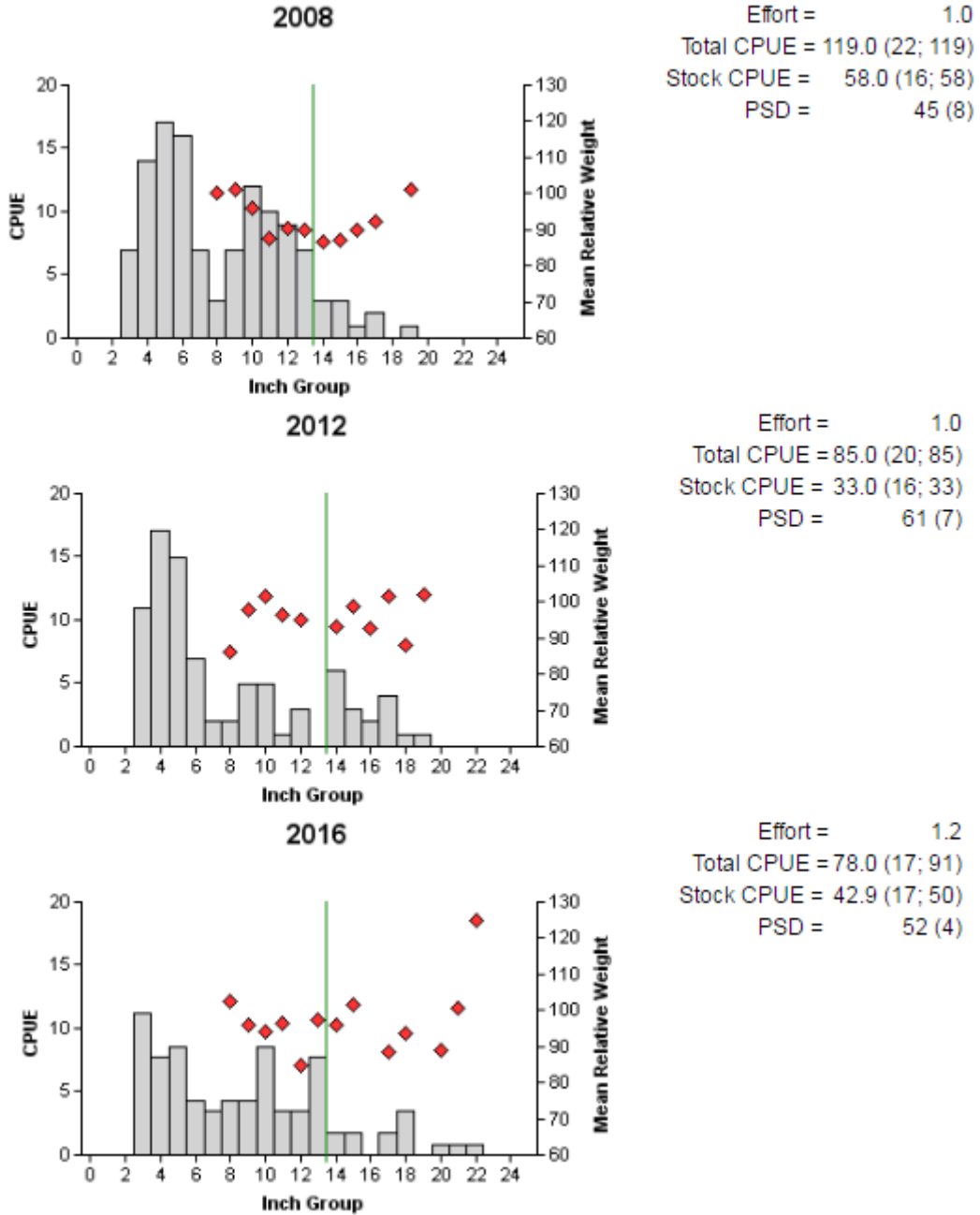


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Bonham City Reservoir, Texas, 2008, 2012, and 2016. Vertical lines represent length limit at time of collection.

Largemouth Bass

Table 10. Creel survey statistics for Largemouth Bass at Bonham City Reservoir, March 2017 through May 2017. 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. **[RSE for directed effort and total harvest is the same as directed effort/acre and total harvest/acre, respectively]**

Statistic	2017
Surface area (acres)	919
Directed angling effort (h)	
Tournament	2,242 (34)
Non-tournament	2,832 (30)
All black bass anglers combined	5,074 (26)
Angling effort/acre	5.5 (26)
Catch rate (number/h)	0.7 (28)
Harvest	
Non-tournament harvest	385 (97)
Harvest/acre	0.4 (97)
Tournament weigh-in and release	1,110 (85)
Release by weight	
<4.0 lbs	3404 (51)
4.0-6.9 lbs	51 (84)
7.0-9.9 lbs	51 (84)
≥10.0 lbs	0
Percent legal released (non-tournament)	77

Largemouth Bass

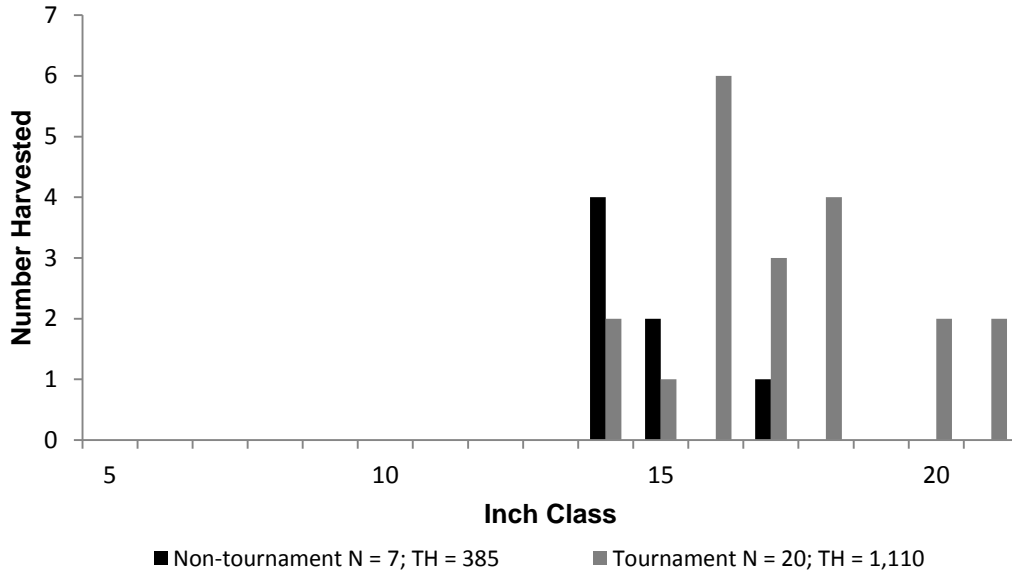


Figure 8. Length frequency of non-tournament harvested and tournament retained Largemouth Bass observed during creel surveys at Bonham City Reservoir, Texas, March 2017 through May 2017, all anglers combined. N is the number of harvested and temporarily retained Largemouth Bass observed during creel surveys, and TH is the estimated non-tournament harvest and tournament retained fish during the creel period.

Table 11. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Bonham City Reservoir, Texas, 1999, 2000, 2004, and 2012. 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

White Crappie

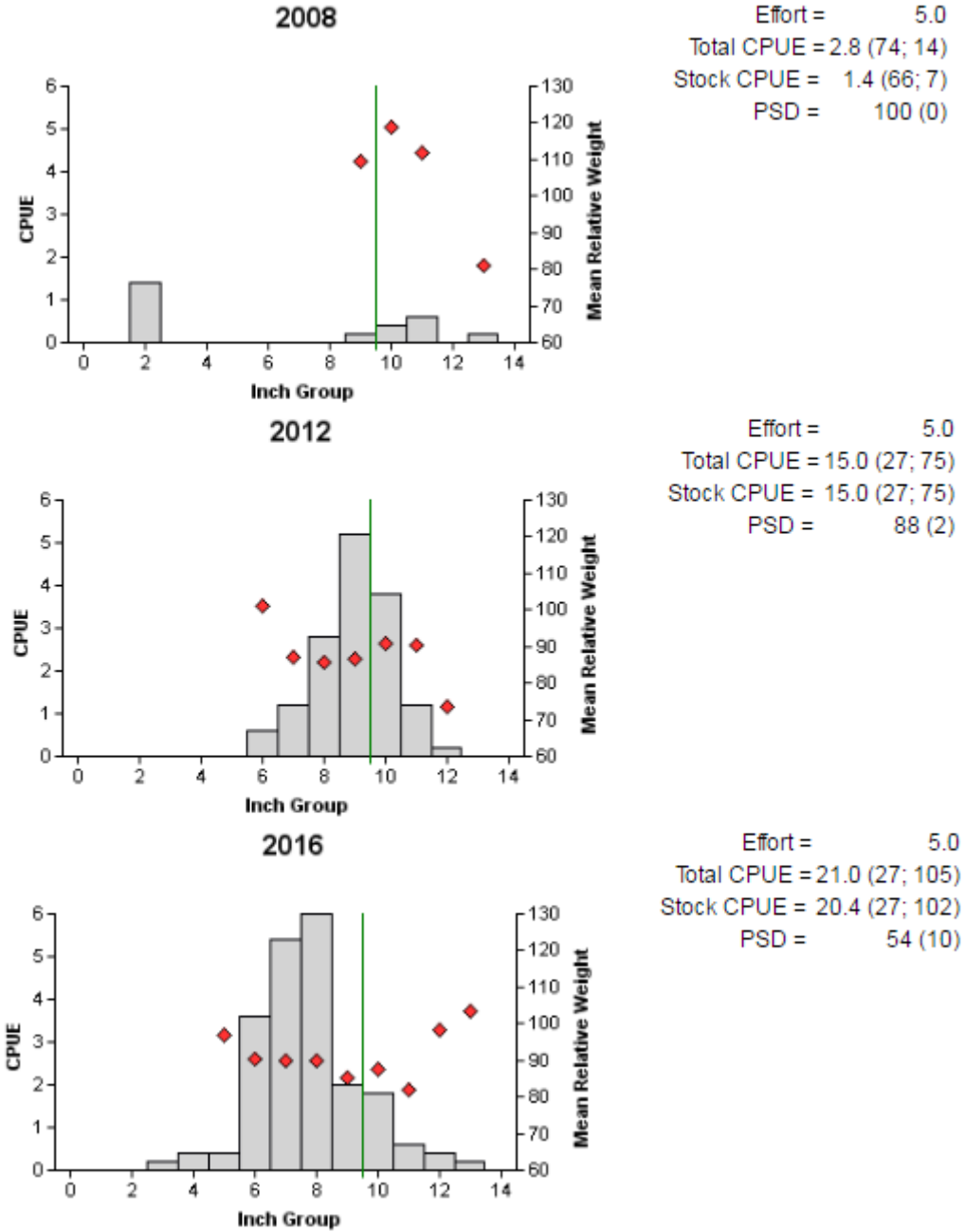


Figure 9. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Bonham City Reservoir, Texas, 2008, 2012, and 2016. Vertical lines represent length limit at time of collection.

Black Crappie

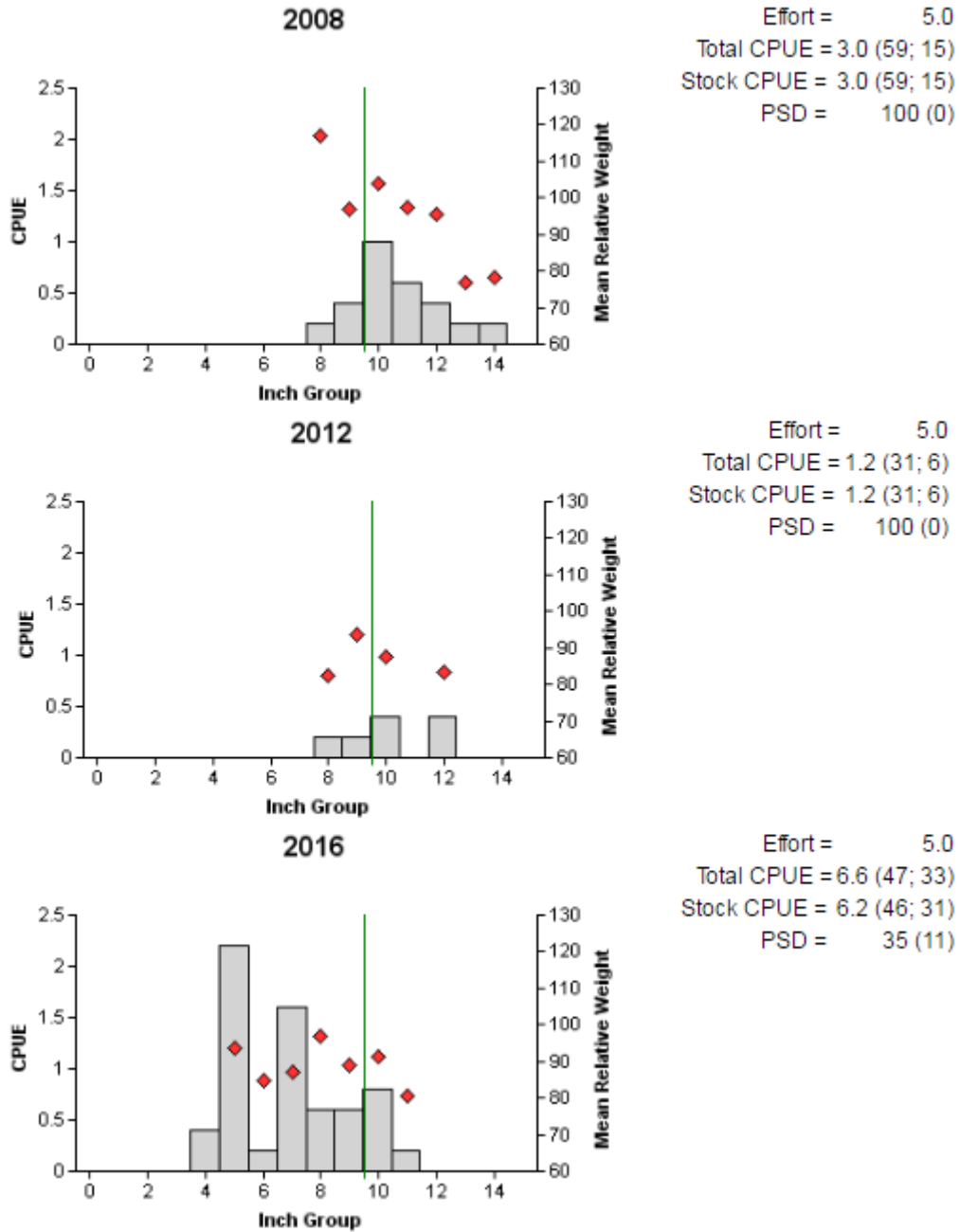


Figure 10. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Bonham City Reservoir, Texas, 2008, 2012, and 2016. Vertical lines represent length limit at time of collection.

Crappie

Table 12. Creel survey statistics for crappie at Bonham City Reservoir, Texas, from March 2017 through May 2017. Total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2017	
Surface area (acres)	919	
Directed effort (h)	8,547 (20)	
Directed effort/acre	9.3 (20)	
Total catch per hour	2.3 (39)	
	White Crappie	Black Crappie
Total harvest	6,863 (36)	495 (165)
Harvest/acre	7.5 (36)	0.5 (165)
Percent legal released	6	

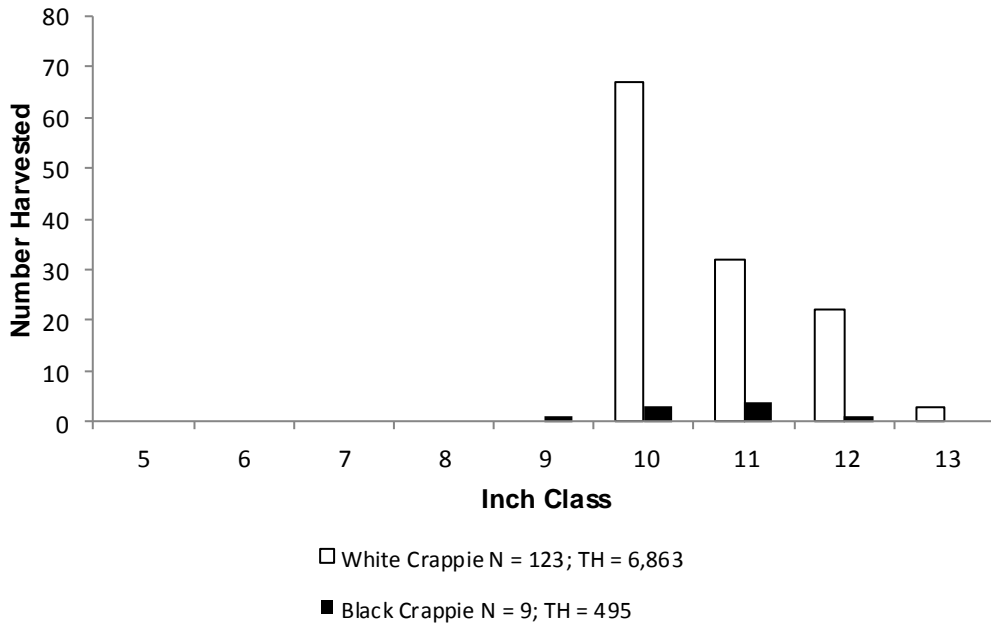


Figure 11. Length frequency of harvested White Crappie observed during creel surveys at Bonham City Reservoir, Texas, March 2017 through May 2017, all anglers combined. N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Bonham City Reservoir, Texas, 2016-2017.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					255	218.6
Threadfin Shad					303	259.7
Blue Catfish	100	11.1				
Channel Catfish	65	7.2				
Green Sunfish					9	7.7
Warmouth					7	6.0
Orangespotted Sunfish					1	0.9
Bluegill					1061	909.4
Longear Sunfish					254	217.7
Redear Sunfish					7	6.0
Largemouth Bass					91	78.0
White Crappie			105	21.0		
Black Crappie			33	6.6		

APPENDIX B

Catch rates (CPUE) of targeted species by gear type for Bonham City Reservoir, Texas, 1997, 2000, 2004, 2006 - 2008, 2010, 2012, 2015, and 2016.

Gear	Species	Year										Avg.
		1997 ^a	2000 ^{a,e}	2004 ^{a,e}	2006 ^{a,b}	2007 ^c	2008 ^{a,d,e}	2010 ^a	2012 ^{a,e}	2015 ^a	2016 ^{a,e,f}	
Gill Netting (fish/net night)	Blue Catfish	9.0	5.0	3.4		2.2	4.2		22.6	24.8	11.1	10.3
	Channel Catfish	16.0	9.2	8.4		11.8	6.8		10.2	3.4	7.2	9.1
	White Bass								0.6	0.0	0.0	0.2
Electrofishing (fish/hour)	Gizzard Shad	123.3	409.0	163.0			108.0		400.0		218.6	237.0
	Threadfin Shad	392.7	777.0	3,486.0			1,962.0		2442.0		259.7	1,553.2
	Green Sunfish	0.7	0.0	2.0			2.0		0.0		7.7	2.1
	Warmouth	12.0	28.0	35.0			0.0		2.0		6.0	13.8
	Orangespotted Sunfish	0.0	0.0	0.0			0.0		0.0		0.9	0.2
	Bluegill	364.0	1207.0	1178.0			776.0		373.0		909.4	801.2
	Longear Sunfish	137.3	197.0	589.0			112.0		73.0		217.7	221.0
	Redear Sunfish	13.3	131.0	154.0			109.0		46.0		6.0	76.6
	Spotted Bass	6.7	12.0	7.0	10.0		2.0		1.0		2.6	5.9
Largemouth Bass	124.0	79.0	172.0	157.0		119.0		85.0		78.0	116.3	
Trap Netting (fish/net night)	White Crappie	28.8	6.8	51.6			2.8	11.4	15.0		21.0	19.6
	Black Crappie	0.6	3.2	10.6			3.0	6.0	1.2		6.6	4.5

^a All sampling stations for all gear were randomly selected.

^b Bass only electrofishing survey.

^c All sampling stations for all gear were subjectively selected.

^d Electrofishing survey was conducted using a 7.5 Smith-Root GPP (Gas Powered Pulsator). Electrofishing surveys prior to 2007 were conducted using a Smith-Root 5.0 GPP.

^e Gill netting was conducted in the spring of the following year.

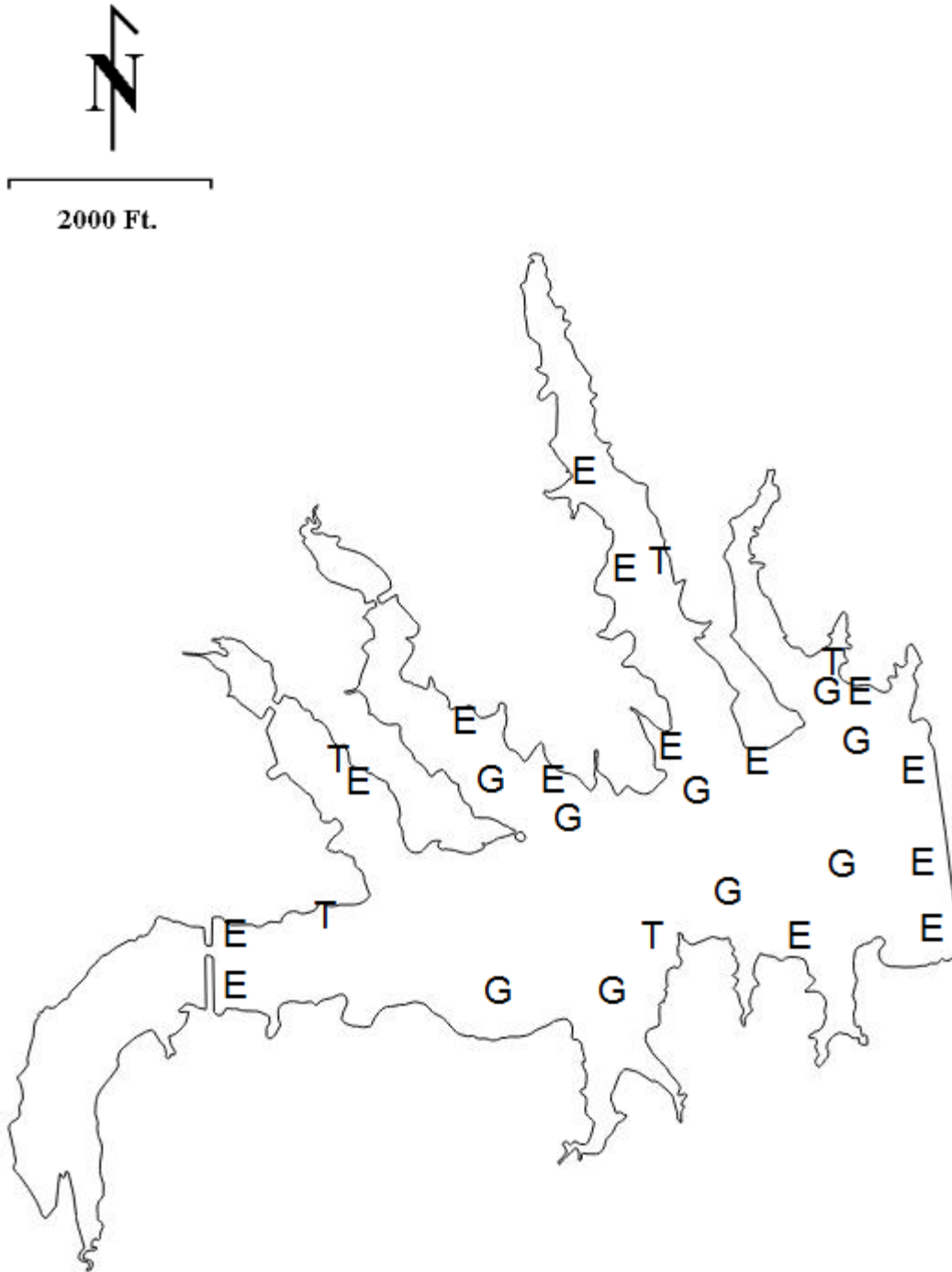
^f Began using objective based sampling.

APPENDIX C

Thursday night working man's tournament results, Bonham City Reservoir, Texas, 2017. Number of fish per bag is in parentheses.

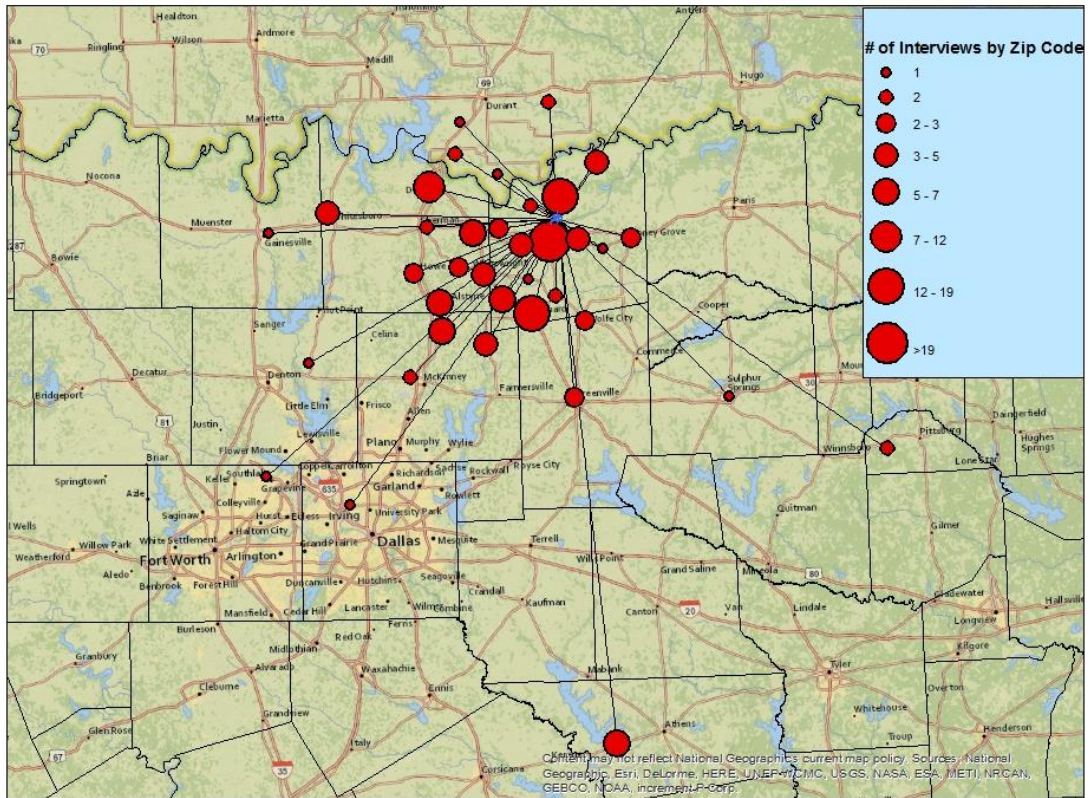
Date	1 st Place Weight	2 nd Place Weight	3 rd Place Weight	Big Bass Weight
03-27-2017	28.7 (5)	21.7 (5)	21.5 (5)	8.4; 7.7; 7.4
03-31-2017	8.8 (3)	8.6 (3)	7.4 (2)	4.8; 4.7; 4.4
04-06-2017	18.2 (5)	18.1 (5)	9.9 (5)	10.2; 6.5; 6.1
04-13-2017	14.1 (5)	12.8 (4)	11.2 (4)	6.9; 6.6; 6.1
05-04-2017	20.0	16.1	11.7	8.0
06-15-2017	19.8	NA	NA	9.8
06-22-2017	18.3	NA	NA	NA
06-29-2017	30.1	NA	NA	8.0; 8.0

APPENDIX D



Location of sampling sites, Bonham City Reservoir, Texas, 2016–2017. Trap netting, gill netting, and electrofishing are indicated by E, G, and T, respectively. Water level was 2.2 feet below conservation level for electrofishing, 3.0 feet below conservation level during gill netting, and 2.6 feet below conservation level for trap netting.

APPENDIX E



Location, by ZIP code, and frequency of anglers that were interviewed at Bonham City Reservoir, Texas, during the March 2017 through May 2017 creel survey. One angler from Illinois not included in map.