

Abilene Reservoir

2019 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Contents

Survey and Management Summary	1
Introduction.....	2
Reservoir Description	2
Angler Access.....	2
Management History	2
Methods.....	4
Results and Discussion.....	4
Fisheries Management Plan for Abilene Reservoir, Texas.....	6
Objective-Based Sampling Plan and Schedule (2020–2024).....	8
Literature Cited.....	9
Tables and Figures	10
Water Level	10
Reservoir Characteristics	11
Boat Ramp Characteristics.....	12
Harvest Regulations	12
Stocking History.....	13
Objective-Based Sampling Plan for 2019-2020	14
Structural Habitat Survey.....	15
Aquatic Vegetation Survey	15
Gizzard Shad.....	16
Bluegill	17
Largemouth Bass	18
White Crappie.....	20
Proposed Sampling Schedule	21
APPENDIX A – Catch rates for all species from all gear types	22
APPENDIX B – Map of sampling locations.....	23

Survey and Management Summary

Fish populations in Abilene Reservoir were surveyed by electrofishing in 2017 and 2019 and by trap netting in 2019. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

Reservoir Description: Abilene Reservoir is a 640-acre impoundment constructed on Elm Creek in the Brazos River Basin, and it is approximately 18 miles southwest of Abilene, Texas. The reservoir's primary function is recreation, but it historically provided some municipal water supply to City of Abilene. In 2005, operation and control of the reservoir was transferred from City of Abilene to Texas Parks and Wildlife Department (TPWD) – Abilene State Park. The reservoir experiences extreme water level fluctuations and went completely dry in spring 2014. Between winter 2015 and the spring 2016, the reservoir filled to over conservation pool elevation. During this study period, water level fluctuated between conservation pool elevation and nearly 12 feet below conservation pool elevation.

Management History: After TPWD – Abilene State Park took control of the reservoir, harvest regulations for Blue Catfish and Channel Catfish were changed to a no minimum length limit and a five-fish daily bag limit in any combination. Management stockings of Gizzard Shad and sunfishes were conducted in spring 2016 to reestablish the prey species community following reservoir refill. Following the prey species stockings, Bluegill, Channel Catfish, and Florida Largemouth Bass were stocked in 2016 and 2017. White Crappie were stocked in 2016.

Fish Community

- **Prey species:** Gizzard Shad and sunfish were the predominant prey species. Gizzard Shad catch rate was good but declined. However, numbers were fair and Gizzard Shad were a suitable prey size for sport fish. Relative abundance of Bluegill had substantially declined. Number of prey should not be limiting sport fish growth.
- **Catfish:** Channel Catfish have been restocked in the reservoir and were observed during the electrofishing and trap netting surveys. Targeted sampling for Channel Catfish was not conducted during this survey period.
- **Largemouth Bass:** Largemouth Bass were present in low numbers in 2019 and moderate numbers in 2017. In 2017, PSD was indicative of a reestablishing population with many fish \geq stock-length with few larger size fish. Mean relative weights were optimal ($W_r > 90$) to excellent ($W_r \geq 100$). There was a high percentage of Florida Largemouth Bass alleles.
- **White Crappie:** Total catch rate of White Crappie was great and catch rate of stock-length fish was good. There were many fish \geq stock-length with few fish \geq quality-length. Condition was optimal ($W_r > 90$) to excellent ($W_r \geq 100$).

Management Strategies: Tandem hoop netting will be conducted in late spring 2024 to sample Channel Catfish. Largemouth Bass and prey items will be surveyed with electrofishing in fall 2020 and 2023. White Crappie will be surveyed with trap netting in fall 2023. Relative abundance, size structure, and mean relative weight data will be collected on targeted sport fish. Access and habitat surveys will be conducted in summer 2023. Develop a plan for boat access improvements to be implemented during extended period of low water level. Inform the public of the threat and negative impacts of invasive species.

Introduction

This document is a summary of fisheries data collected from Abilene Reservoir in 2016-2020. 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 2016-2020 data for comparison.

Reservoir Description

Abilene Reservoir is a 640-acre impoundment that was built in 1921 on Elm Creek in the Brazos River Basin, and it is approximately 18 miles southwest of Abilene, Texas. The reservoir's primary function was recreation, but it has also historically provided some municipal water supply to City of Abilene. In 2005, operation and control of the reservoir was transferred from City of Abilene to Texas Parks and Wildlife Department (TPWD) – Abilene State Park. The reservoir has been subject to extreme fluctuations in water level due to drought. Prior to this sampling period, Abilene Reservoir experienced three severe low-water periods, in the mid-1980s and late 1990s-early 2000s. During the third event, the reservoir went completely dry by spring 2014 then caught about eight feet of water between winter 2015 and spring 2016, then rose to over conservation pool (CP). Subsequently, the water level fluctuated often, rising during periods of heavy rain and decreasing during low rainfall periods (Figure 1). Other descriptive characteristics for Abilene Reservoir are in Table 1.

Angler Access

Abilene Reservoir is only accessible through a gate requiring a passcode that can be obtained from the TPWD – Abilene State Park front office. A fee is required for state park entry. A fishing pier is located at the south corner of the dam. There are two public boat ramps on the reservoir. During most of the survey period, both ramps were useable. The ramp near the dam occasionally becomes unusable during low water periods. Additional boat ramp characteristics are located in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Homer and Goldstrohm 2016) included:

1. Continue to stock important prey and sport fish to reestablish and maintain the fisheries.

Action: Bluegill, Channel Catfish, and Largemouth Bass were stocked in 2016 and 2017. White Crappie were reintroduced in 2016.
2. Sample fish to determine stocking success by electrofishing in 2017 and 2019 as well as trap netting in fall 2019.

Action: Electrofishing was conducted in 2017 and 2019 to sample Largemouth Bass, and prey species. Trap netting was conducted in 2019 to sample White Crappie.
3. Work with TPWD – Abilene State Park to develop a boat ramp improvement plan to be implemented during future low water levels. The plan should include application for a boater access grant, dredging excess sediment, and improving the slope of the ramp.

Action: Plans for boater access grant, dredging, and slope improvement are still being developed. The boat trailer parking area at the west boat ramp was expanded and improved via gravel placement.
4. Meet with City of Abilene and TPWD invasive species experts to discuss salt cedar establishment, potential problems, possible monitoring efforts, as well as prospective measures for control.

Action: City of Abilene and TPWD invasive species experts discussed salt cedar distribution and abundance and possible control strategies. No salt cedar management has occurred at this time. However, much of the salt cedar has been inundated since the salt cedar survey and coverage has likely been reduced as a result.

5. Educate the public about the threats of invasive species.

Action: There were signs that were posted and maintained that educate about the threat of invasive species. Media and internet post have been made about invasive species. Invasive species was a talking point when presenting to constituents.

Harvest regulation history: Prior to 2005, fish populations were managed with statewide harvest regulations. Once TPWD – Abilene State Park assumed control of the reservoir in 2005, all sport fish, except Blue Catfish and Channel Catfish, have been managed with statewide harvest regulations. Blue Catfish and Channel Catfish have been managed with no minimum length limit and five-fish daily bag limit (in combination), the same regulation used at community fishing lakes and water bodies entirely enclosed within state park boundaries. Harvest regulations for sport fish are listed in Table 3.

Stocking history: Abilene Reservoir's fish populations have been maintained by stockings of multiple species following reservoir refill events. In 2016, the reservoir was stocked with Gizzard Shad, Bluegill, Fathead Minnows, Orangespotted Sunfish, Longear Sunfish, Channel Catfish, Florida Largemouth Bass, and White Crappie. Bluegill, Florida Largemouth Bass, and Channel Catfish were stocked in 2017. A complete stocking history is presented in Table 4.

Vegetation/habitat management history: Cypress trees and American lotus were planted in the 1990's, but the establishment of these species was unsuccessful. Since the reservoir refilled in 2016, fish habitat have been deployed around the fishing pier. Mossback structures were hung from the fishing pier in 2016 and additional structures were deployed near the fishing pier in 2017. In 2019, Fishiding structures were deployed near the fishing pier.

Water transfer: No interbasin water transfers exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Abilene Reservoir (Homer and Goldstrohm 2016). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Electrofishing – Largemouth Bass, sunfishes, and Gizzard 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).

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.

Habitat – In August 2019, structural habitat composition was determined by conducting a survey using the random point method assessing 75 random stations distributed along the shoreline. Vegetation data were also collected at these 75 sites. A total of 8 stations could not be sampled and were omitted from analysis. Additionally, a habitat survey was conducted during the same time at 150 random stations distributed throughout the reservoir. Some stations ($N=2$) could not be sampled and were omitted from analysis. Structural habitat types and vegetation were identified at or below the waterline and marked as “1” for present or “0” for absent. Percent occurrence ($\% = [\# \text{ stations present} / \text{total stations sampled}] \times 100$) and associated 95% confidence intervals (AusVet 2020) were calculated for structural habitat and habitat.

Water level – Source for water level data was the United States Geological Survey (USGS 2020).

Results and Discussion

Habitat: Water level at the time of the habitat survey was 2.5 feet below CP. The majority of the shoreline was characterized as natural/featureless (59.7%) followed by gravel shoreline (25.4%; Table 6). Rocky shoreline represented 14.9% of the shoreline. Nearly 60% of the reservoir was open water, 42.6% was occupied by flooded terrestrial vegetation, and 8.1% was occupied by pondweed. All other vegetation species occupied less than 5% of the reservoir (Table 7). Flooded terrestrial vegetation was present along 94% of the shoreline. Pondweed, common buttonbush, and water willow were found along 85.1%, 35.8%, and 25.4% of the shoreline (Table 7).

Prey species: The prey base primarily consisted of Gizzard Shad and Bluegill. Catch rate of Gizzard Shad was 109.0/h in 2019 and declined from 319.0/h in 2017. In 2019, IOV was 100 and in 2017 was 84 (Figure 2), indicating that the majority of Gizzard Shad were a suitable prey size for sport fish. Bluegill CPUE was 2.0/h in 2019 and substantially decreased from 166.0/h in 2017. Size structure of Bluegill consisted primarily of fish 2-5 inches in 2017 (Figure 3). Bluegill were of adequate prey size for sport fish. Although prey availability has declined, growth and condition of sport fishes remained good. Sampling objective for Gizzard Shad abundance and Bluegill abundance and size structure were not met. Catch

rate during 2019 may have been lower due to a cold front that arrived the evening of sampling. Fish may have moved into deeper water which could have impact sampling effectiveness resulting in fewer fish being captured during sampling. Additionally, there was an issue with the pulsator that may have resulted in catching fewer fishes. The pulsator has since been fixed, however time did not allow for additional sampling.

Channel Catfish: Channel Catfish have been restocked at the reservoir and were observed during electrofishing and trap netting surveys. Channel Catfish were not targeted during sampling efforts during this report period.

Largemouth Bass: Electrofishing catch rate for Largemouth Bass was 9.0/h in 2019 and decreased from 84.0/h in 2017 (Figure 4). Likewise, relative abundance of stock-length (≥ 8 inches) Largemouth Bass declined; catch rate of stock-length fish was 4.0/h in 2019 and 61.0/h in 2017. In 2019, PSD was 100, however sample size was low and may not be representative of the true population size structure. The Largemouth Bass population was dominated by smaller fish in 2017 with a PSD value of 23. Body condition was optimal ($W_r > 90$) to excellent ($W_r \geq 100$) for most inch classes in 2019 and 2017. Of the Largemouth Bass that were sampled during 2019 electrofishing survey, 37.5% were pure Florida Largemouth Bass. All other Largemouth Bass collected were second or higher generation hybrid between a Florida Largemouth Bass and a Northern Largemouth Bass. Overall percent Florida Largemouth Bass alleles was 72.9% (Table 8). None of the sampling goals (abundance, size structure, condition, or genetics) were met during sampling. Catch rate during 2019 may have been lower due to a cold front that arrived the evening of sampling. Fish may have moved into deeper water which could have impact sampling effectiveness. Additionally, there was an issue with the pulsator that may have resulted in catching fewer Largemouth Bass. The pulsator has since been fixed, however time did not allow for additional sampling.

White Crappie: A trap net survey was conducted three years after White Crappie were stocked into the reservoir. White Crappie catch rate was 58.4/nn in 2019 and White Crappie CPUE-Stock catch rate was 12.8/nn (Figure 5). White Crappie PSD was 39. Collection of 2-4 inch fish indicates natural reproduction was occurring. Legal-length White Crappie were present but in low relative abundance. Condition was optimal ($W_r > 90$) to excellent ($W_r \geq 100$) for most inch classes. The reintroduction of White Crappie had been successful.

Fisheries Management Plan for Abilene Reservoir, Texas

Prepared – July 2020

ISSUE 1: Historically, Abilene Reservoir has been a popular Largemouth Bass fishery, but the reservoir went dry in summer of 2014. Since then, water levels have increased, and stocking efforts have been carried out to rebuild the fishery. Catch rates of Largemouth Bass and prey species have dramatically declined in recent surveys. Further sampling is needed to determine if these species have successfully been reintroduced to the reservoir.

MANAGEMENT STRATEGIES

1. Continue to monitor Largemouth Bass and prey populations to determine trends in relative abundance, size structure, and body condition by conducting an electrofishing survey in 2020 and 2023.
2. Continue to monitor Florida Largemouth Bass genetic integration by collecting genetic samples from Largemouth Bass in 2023 since Florida Largemouth Bass have recently been stocked in 2016 and 2017.

ISSUE 2: Channel Catfish have been restocked but have not been surveyed to determine if reintroduction to the reservoir has been successful.

MANAGEMENT STRATEGY

1. Conduct an exploratory tandem hoop net survey in late spring 2024 to assess relative abundance, size structure, and body condition of Channel Catfish.

ISSUE 3: Abilene Reservoir is subject to rapidly fluctuating water levels which can have major implications to fisheries and access. During low water periods, boat access at the ramp near the dam becomes unavailable and there is limited designated parking at the west boat ramp available for vehicles with trailers.

MANAGEMENT STRATEGIES

1. Investigate opportunities for additional habitat enhancement efforts and coordinate with City of Abilene and TPWD – Abilene State Park.
2. Continue discussions about boat access improvements. Develop a plan that could be implemented during an extended period of low water level.

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 the controlling authority to post and 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 (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

Objective-Based Sampling Plan and Schedule (2020–2024)

Sport fish, prey fish, and other important fishes: Main prey species in Abilene Reservoir include Gizzard Shad and Bluegill. Sport fish present in the reservoir include Channel Catfish, Largemouth Bass, and White Crappie.

Low-density fisheries: There are no low-density fisheries.

Survey objectives, fisheries metrics, and sampling objectives

Prey species: Gizzard Shad and Bluegill comprise most of the prey species community in the reservoir. Prey populations have been traditionally monitored by fall electrofishing surveys conducted at 12, 5-minute random stations (1 hour total). Electrofishing every four years has been appropriate for monitoring prey species, however because there was a large reduction in prey abundance from 2017 to 2019, sampling will be conducted in 2020 and 2023 (Table 9). This sampling will allow for higher-resolution temporal monitoring of prey species populations. A target RSE ≤ 25 will be set for Gizzard Shad and Bluegill CPUE-Total. IOV will be estimated for Gizzard Shad and PSD will be estimated for Bluegill with a sampling objective of ≥ 50 fish of each species. No additional sampling effort will be conducted if objectives are not met during designated Largemouth Bass sampling.

Channel Catfish: Channel Catfish are present in the reservoir and have been managed with the no minimum length limit (MLL) and 5-fish (in combination with Blue Catfish) daily bag limit. Traditionally, Channel Catfish have been sampled by gill nets (with varying effort; 5-13 stations) and occur in low relative abundance in the reservoir. Because gill net catch rates have been low, baited tandem hoop nets will be used to sample Channel Catfish during late spring 2024 (Table 9) at 6 random stations. Collection of relative abundance data (CPUE-Total and CPUE-12), size structure, PSD, and body condition will all be exploratory.

Largemouth Bass: Largemouth Bass are present and are managed with the statewide 14-inch MLL and 5-fish daily bag limit. Traditionally, Largemouth Bass have been sampled with electrofishing with varying effort 0.9-1.3/h (11-16, 5-minute stations). Electrofishing is necessary once every study period to monitor long-term trends in relative abundance, growth, size structure, and relative weights. However, with the dramatic declines in the Largemouth Bass catch rate, additional sampling is needed to determine if the Largemouth Bass reintroduction was successful. Electrofishing will be conducted for 1 hour at 12 random 5-minute stations in fall 2020 and 2023 (Table 9). A target RSE ≤ 25 will be attempted for relative abundance data (i.e., CPUE-Total and CPUE-Stock). A sample size of 50 fish \geq stock-length (≥ 8 inches) will be targeted for size structure determination (PSD). At least 5 fish per represented inch group \geq stock-length will be measured and weighed for estimating body condition. Fin clips from 30 randomly collected fish of any size will be collected for microsatellite DNA analysis to estimate Florida Largemouth Bass genetic introgression in 2023. Otoliths from 13 fish, 13.0-14.9 inches, will be used to estimate average age at legal length. If sampling objectives are not achieved, up to 6 additional random 5-minute stations may be added if deemed feasible.

White Crappie: White Crappie are managed with the statewide 10-inch MLL and 25-fish daily bag limit. Traditionally, crappie have been sampled with fall trap netting with varying effort from (5-10 stations). Continuation of trap netting every four years is necessary to reveal large-scale changes in White Crappie relative abundance, size structure (PSD), and body condition (mean relative weight). Trap netting will be conducted in fall 2023 (Table 9) at a minimum of 5 random stations. A target RSE ≤ 25 will be attempted for relative abundance data (CPUE-Total and CPUE-Stock). A target sample size of 50 fish \geq stock-length (≥ 5 inches) will be collected to determine size structure (PSD). At least 5 fish per represented inch group \geq stock-length will be measured and weighed for estimating body condition. Also, otoliths will be collected from 13 fish, 9-10.9 inches, to assess growth. If these objectives are not achieved, up to 5 additional random sampling stations may be added if deemed feasible.

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Tables and Figures

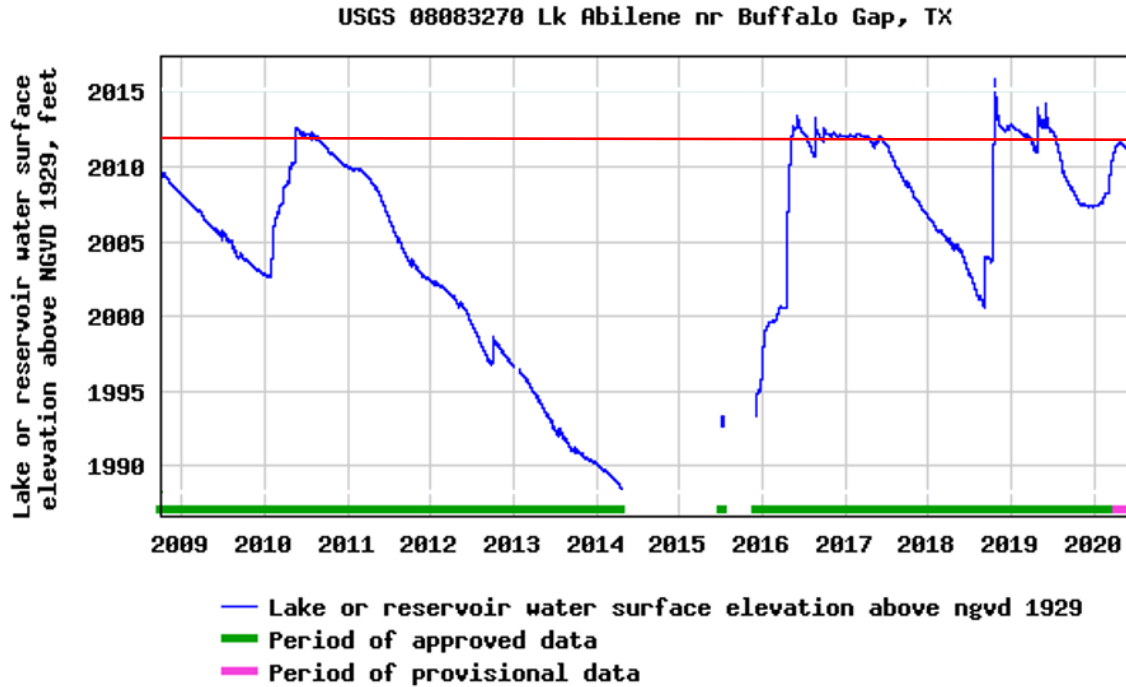


Figure 1. Daily water level data for Abilene Reservoir, Texas, October 2008- June 2020 (USGS 2020). Water level data is missing from 2014-2016 because the reservoir's water level was too low to be detected by the gauge. NGVD 1929 refers to the National Geodetic Vertical Datum of 1929. The red line indicates the conservation pool elevation.

Table 1. Characteristics of Abilene Reservoir, Texas.

Characteristic	Description
Year constructed	1921
Conservation pool	2,012 feet above mean sea level
Maximum depth	1,987 feet above mean sea level
Controlling authority	City of Abilene
County	Taylor
Reservoir type	Tributary
River basin	Brazos River Basin
Shoreline Development Index	2.27
USGS 8-Digit HUC Watershed	12060102 (Upper Clear Fork Brazos)
Conductivity	672 μ S/cm

Table 2. Boat ramp characteristics for Abilene Reservoir, Texas, August, 2019. Reservoir elevation at time of survey was 2,009.5 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Dam Ramp	32.232234 -99.890853	Y	10	2,005	Accessible, except during periods of low water
West Boat Ramp	32.233609 -99.903101	Y	10	2,004	Accessible

Table 3. Harvest regulations for Abilene Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	5 (in any combination)	no 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 Abilene Reservoir, Texas. FGL = fingerling; ADL = adults.

Species	Year	Number	Size
Gizzard Shad	2016	486	ADL
Bluegill	2001	81,238	FGL
	2016	27	ADL
	2016	31,362	FGL
	2017	63,999	FGL
	Total	176,626	
Longear Sunfish	2016	6	ADL
Orangespotted Sunfish	2016	9	ADL
Fathead Minnow	2016	6,944	ADL
Blue Catfish	1995	36,883	FGL
	1996	64,429	FGL
	2004	59,893	FGL
	Total	161,205	
Channel Catfish	1970	550	FGL
	1973	200,000	FGL
	1974	10,000	FGL
	1998	19,362	FGL
	2004	53,981	FGL
	2005	401	FGL
	2016	58,808	FGL
	2017	65,379	FGL
Total	408,481		
Florida Largemouth Bass	1988	64,000	FGL
	1991	30,030	FGL
	1994	64,026	FGL
	2009	59,516	FGL
	2016	55,367	FGL
	2017	73,808	FGL
	Total	346,747	
Largemouth Bass	2005	63,695	FGL
Palmetto Bass	1977	6,500	FGL
	1979	7,400	FGL
	Total	13,900	
White Crappie	2016	117	ADL

Table 5. Objective-based sampling plan components for Abilene Reservoir, Texas 2019–2020.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE – Total	RSE-Total ≤ 25
	Abundance	CPUE – Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
	Condition	W_r	5 fish/inch group (max)
	Genetics	% FLMB	$N = 30$, any age
Gizzard Shad ^a	Abundance	CPUE – Total	RSE-Total ≤ 25
	Prey availability	IOV	$N \geq 50$
Bluegill ^a	Abundance	CPUE – Total	RSE-Total ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
<i>Trap netting</i>			
White Crappie	Abundance	CPUE – Total	Exploratory
	Abundance	CPUE – Stock	Exploratory
	Size structure	PSD, length frequency	Exploratory
	Condition	W_r	Exploratory

^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 structural habitat types, Abilene Reservoir, Texas, August, 2019. Percent occurrence with lower and upper 95% confidence limits (CL) of shoreline structural habitat at 67 random sites. Water level at time of survey was 2.5 feet below conservation pool elevation.

Structural habitat type	Percent occurrence	Lower CL	Upper CL
Natural shoreline	59.7	47.7	70.6
Gravel	25.4	16.5	36.9
Rocky shoreline	14.9	8.3	25.3

Table 7. Percent occurrence with lower and upper 95% confidence limits (CL) of structural habitat at 148 random sites throughout the reservoir and 67 sites along the shoreline in Abilene Reservoir, Texas, August, 2019. Water level at time of survey was at conservation pool elevation.

Habitat	Entire reservoir			Shoreline only		
	Percent occurrence	Lower CL	Upper CL	Percent occurrence	Lower CL	Upper CL
Open Water	57.4	49.4	65.1	0.0	0.0	0.0
Flooded Terrestrial Brush	42.6	34.9	50.6	94.0	85.6	97.7
Pondweed	8.1	4.7	13.6	85.1	74.7	91.7
Star Grass	3.4	1.5	7.7	1.5	0.3	8.0
Common Buttonbush	2.0	0.7	5.8	35.8	25.4	47.8
Water-willow	2.0	0.7	5.8	25.4	16.5	36.9
Black Willow	2.0	0.7	5.8	9.0	4.2	18.2
Standing Timber	1.4	0.4	4.8	1.5	0.3	8.0
Smartweed	0.7	0.0	3.7	0.0	0.0	0.0
Spikerush	0.7	0.0	3.7	3.0	0.8	10.2
Logs/Fallen Timber	0.7	0.0	3.7	1.5	0.3	8.0
Lotus	0.7	0.0	3.7	0.0	0.0	0.0
Bulrush	0.0	0.0	0.0	6.0	2.3	14.4
Cattail	0.0	0.0	0.0	1.5	0.3	8.0

Gizzard Shad

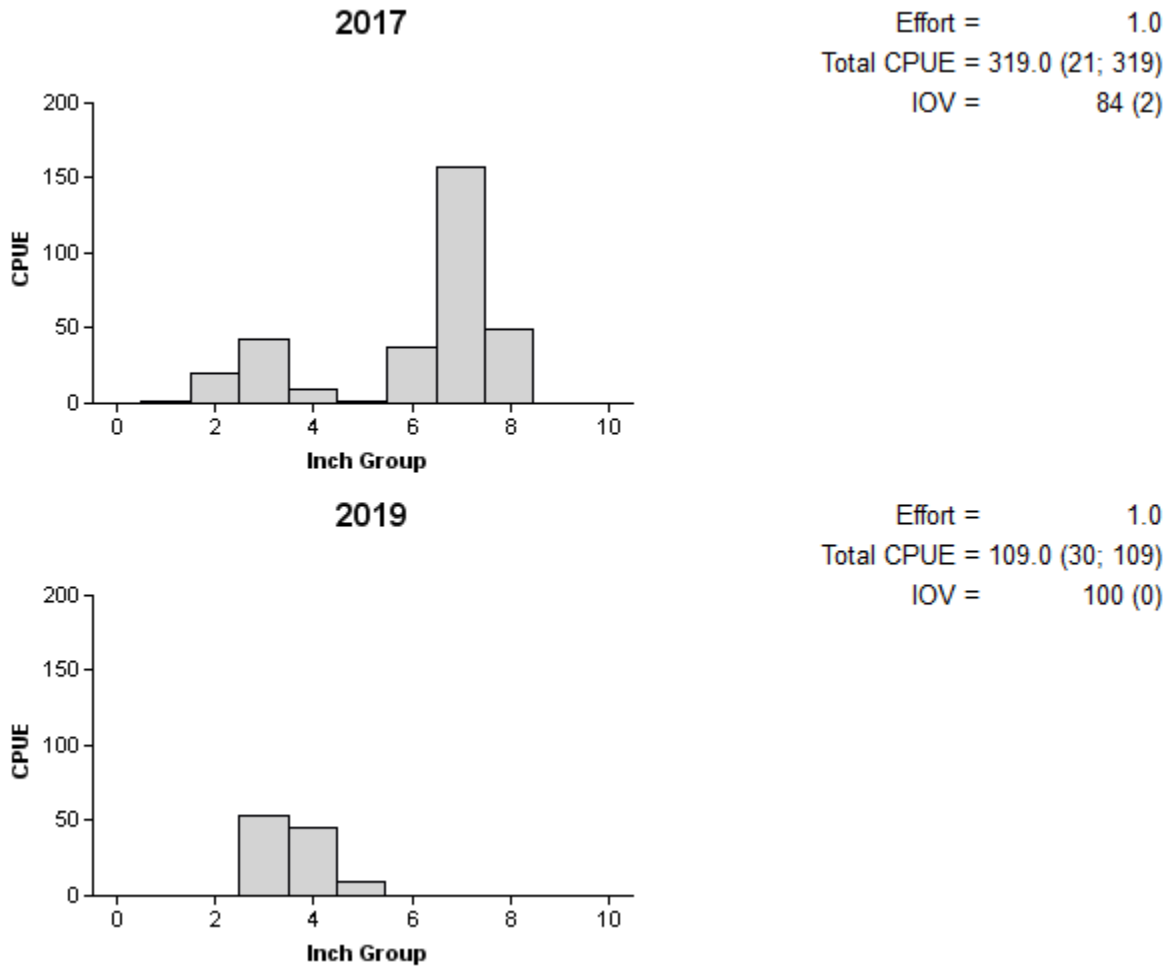


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Abilene Reservoir, Texas 2017 and 2019.

Bluegill

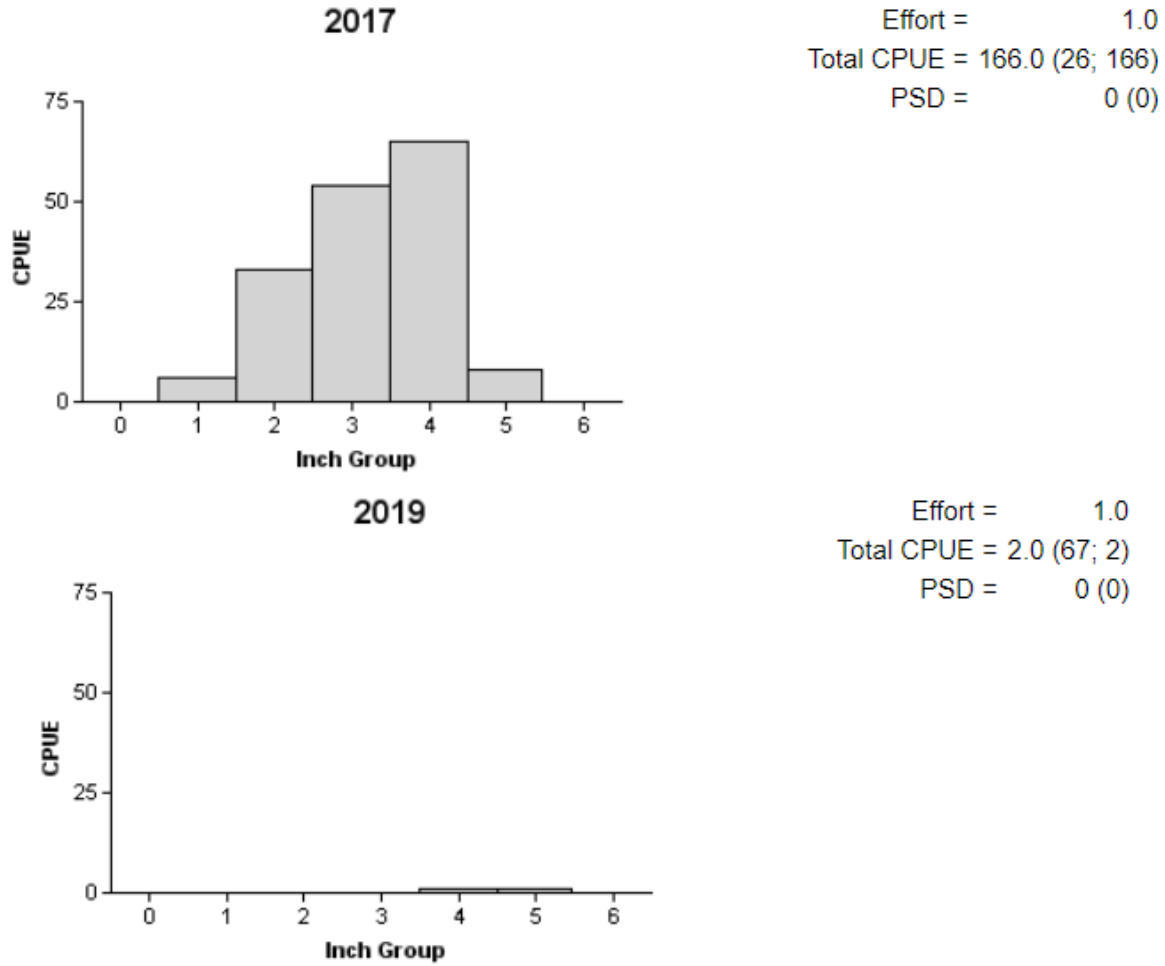


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Abilene Reservoir, Texas, 2017 and 2019.

Largemouth Bass

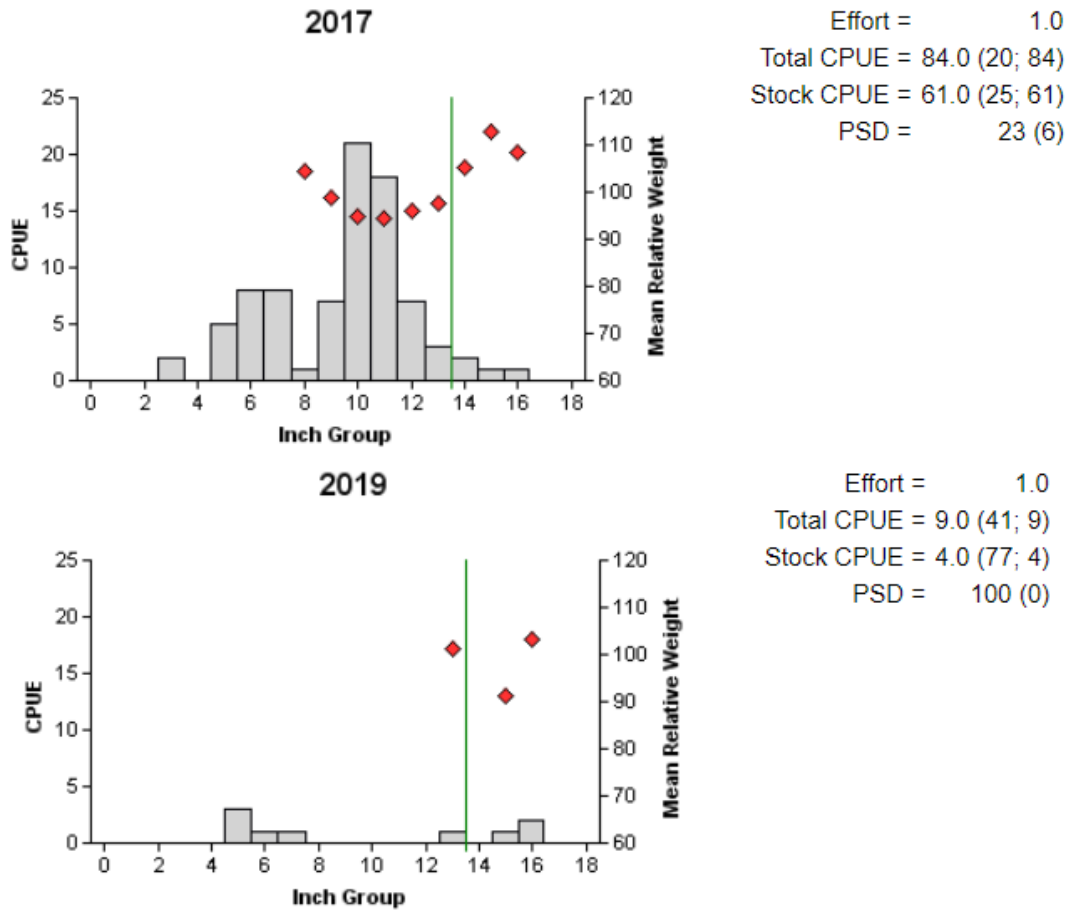


Figure 4. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Abilene Reservoir, Texas, 2017 and 2019. Vertical line indicates minimum length limit.

Table 8. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Abilene Reservoir, Texas, 1993-2019. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation 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	F1	Fx	NLMB		
1993	14	0	NA	1 ^a	13	3.6	0.0
1996	15	0	NA	0 ^a	15	0.0	0.0
1999	25	1	NA	15 ^a	9	29.0	4.0
2007	28	0	NA	6 ^a	22	5.0	0.0
2019	8	3	0	5	0	72.9	37.5

^a Determination of hybrid status not conducted.

White Crappie

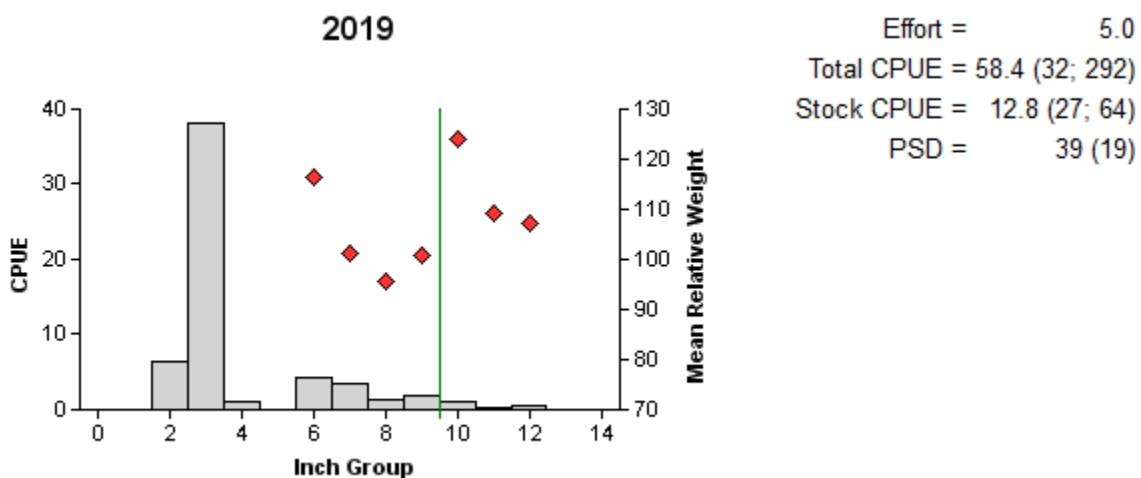


Figure 5. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting survey, Abilene Reservoir, Texas, 2019. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 9. Proposed sampling schedule for Abilene Reservoir, Texas. Survey period is June through May. Electrofishing and trap netting surveys are conducted in the fall and hoop netting is conducted in late spring or through early fall. Standard survey denoted by S and additional survey denoted by A.

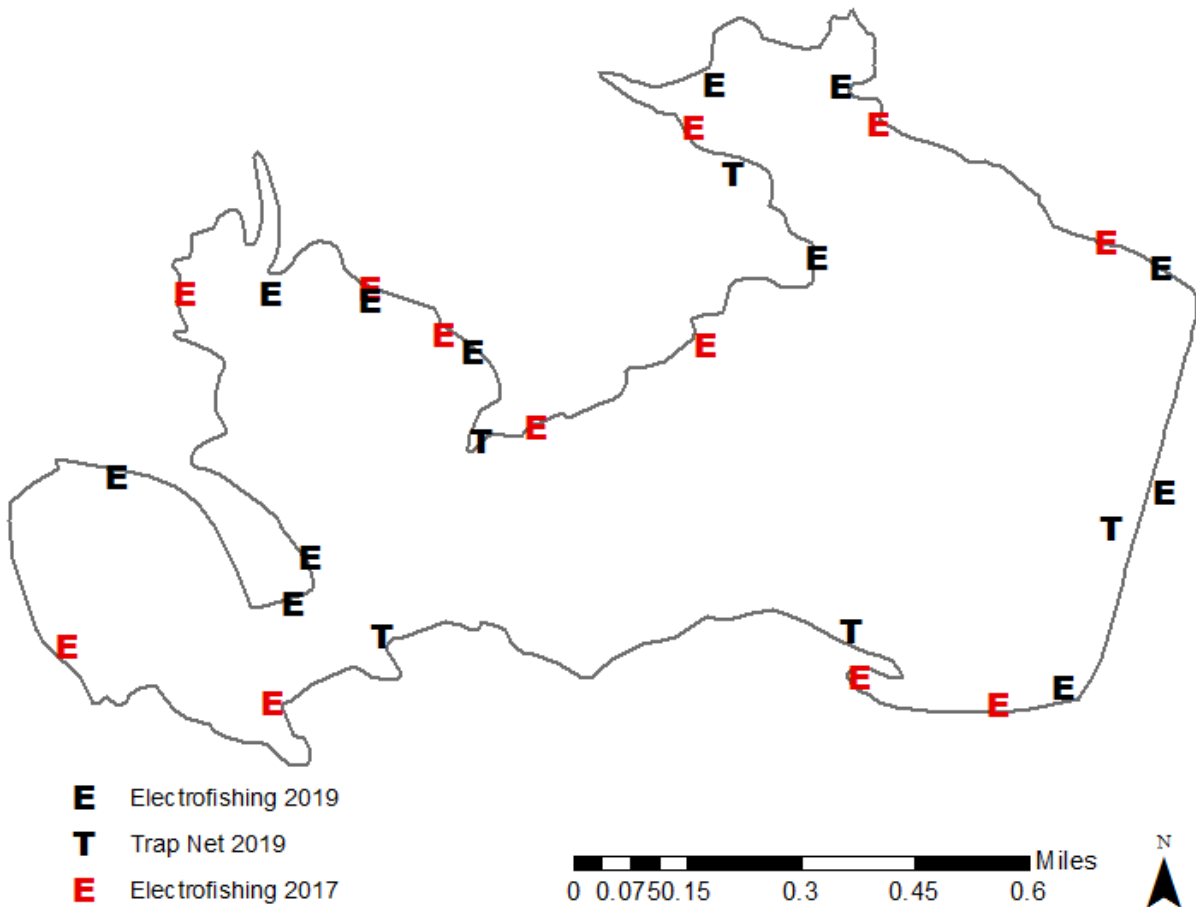
	Survey year			
	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Structural Habitat				S
Vegetation				S
Electrofishing – Fall	A			S
Trap Netting				S
Baited Tandem Hoop Netting				S
Report				S

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Abilene Reservoir, Texas, 2019-2020. Sampling effort was 1 hour for electrofishing and 5 net nights for trap netting.

Species	Electrofishing		Trap Netting	
	N	CPUE(RSE)	N	CPUE(RSE)
Gizzard Shad	109	109.0 (30)	22	4.4 (58)
Black Bullhead			3	0.6 (100)
Channel Catfish			1	0.2 (100)
Green Sunfish			4	0.8 (73)
Warmouth			1	0.2 (100)
Bluegill	2	2.0 (67)	51	10.2 (35)
Longear Sunfish			4	0.8 (100)
Hybrid sunfish			4	0.8(100)
Largemouth Bass	9	9.0 (41)	1	0.2 (100)
White Crappie			292	58.4 (32)

APPENDIX B – Map of sampling locations



Location of sampling sites, Abilene Reservoir, Texas, 2017-2019. Trap net and electrofishing stations are indicated by T and E, respectively. Water level was, 3.3 feet below CP during the 2017 electrofishing survey, 4.0 feet below CP during the 2019 electrofishing survey, and 4.5 feet below CP during the 2019 trap netting survey.



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