

Mexia 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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Survey and Management Summary

Fish populations in Mexia Reservoir were surveyed during winter 2019 with trap nets and during spring 2020 with gill nets. Historical data are presented with the 2019-2020 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: Mexia Reservoir is a 1,009-acre impoundment located on the Navasota River within the Brazos River Basin, Limestone County. Mexia Reservoir's water level has been within 6 feet of conservation pool (448.3 feet above mean sea level) since 2016 and was within two feet of conservation pool during the 2019-2020 surveys. Habitat features consisted of natural shoreline, rocky shoreline, bulkhead, boat docks and piers.

Management History: Important sport fish include Channel Catfish, Blue Catfish and White Crappie. Sport fish have always been managed with statewide regulations. Blue Catfish were stocked in 1975, 1995, 1996 and 2008 to establish a population. Recruitment was first observed in 2012, yet the population remained a low density one until 2020, when record numbers of the species were collected. A complete shoreline habitat survey was conducted in 2011 and no major changes have occurred on the reservoir since that time. In 2012, information about the reservoir's loss of volume was shared with Texas Parks and Wildlife Department's (TPWD's) habitat branch and others who might take on the issue on a watershed scale. No work has been done on this issue since that time. Electrofishing was discontinued in 2016 due to poor Largemouth Bass catch rates and anecdotal information suggesting the species was rarely sought by anglers on Mexia Reservoir. Data are currently collected on all sport fish and important prey species during trap net and gill net surveys. Recent management efforts include maintaining aquatic invasive species (AIS) signage and educating constituents about the threat of AIS, especially zebra mussels, whenever possible.

Fish Community

- **Prey species:** The forage base was dominated by Gizzard Shad. Threadfin Shad and sunfishes were not observed.
- **Catfishes:** Channel Catfish remain one of the most important sport fish in the reservoir and their catch rate was near the historical average. Blue Catfish were collected in record numbers. Both populations were dominated by legal-sized individuals and body condition for both species was good overall.
- **White Crappie:** White Crappie were abundant, but their catch rate was below the historical average. Body condition remained high.

Management Strategies: Continue managing sport fishes with statewide regulations. Inform the public about the negative impacts of AIS and maintain appropriate signage at the single access point. Conduct angler access, vegetation and trap net surveys in 2023 and a gill net survey in 2024.

Introduction

This document is a summary of fisheries data collected from Mexia Reservoir in 2019-2020. 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 2019-2020 data for comparison.

Reservoir Description

Mexia Reservoir is a 1,009-acre impoundment of the Navasota River within the Brazos River Basin, Limestone County, and is located approximately 7 miles west of Mexia. It is owned and operated by the Bistone Municipal Water Supply District (BMWSD) and primary water uses include municipal water supply and recreation. The reservoir has a drainage area of 200 square miles, a storage capacity of 10,000 acre-feet, and a shoreline length of 23.4 miles (Table 1). Mean and maximum depths are 10 and 20 feet respectively. Mexia Reservoir was eutrophic with a TSI *chl-a* of 66.0 (Texas Commission on Environmental Quality, 2020). Habitat at time of sampling was dominated by natural and rock shoreline, bulkhead, boat docks and piers. Littoral vegetation is dominated by giant cutgrass, American water willow and common buttonbush. Water level has been within six feet of conservation pool since the last report and was one foot low during the summer 2019 vegetation survey, two feet low during the 2019 winter trap net survey and two feet high during the spring 2020 gill net survey (Figure 1a and 1b). Other descriptive characteristics for Mexia Reservoir are in Table 1.

Angler Access

Mexia Reservoir has a single public boat ramp (Bistone Municipal Water Supply District, BMWSD) and several private boat ramps. The BMWSD ramp is a short, two-lane ramp near mid-reservoir, and is seldom used for launching anything other than small watercraft (Table 2). Most of Mexia Reservoir's shoreline is private and convenient shoreline access is limited to the public boat ramp area.

Management History

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

1. Discontinue electrofishing and genetic sampling as standard tools for Mexia Reservoir OBS Plan; collect data on all important prey species from other sampling methods and utilize White Crappie and Channel Catfish condition to provide information on forage abundance and vulnerability.

Action: Electrofishing was removed from the 2016 – 2020 Mexia Reservoir OBS Plan and schedule, data were collected on all important sport fish and prey species during winter trap net and spring gill net surveys, and White Crappie and Channel Catfish condition was examined to provide some information on forage abundance and vulnerability within the reservoir. These data are a part of this report.
2. Construct and deploy fish attractors into Mexia Reservoir, add new fish attractor map and coordinates to the Mexia Reservoir link of the TPWD website and release a news article describing the locations and benefits of the fish attractors to the fishery.

Action: Unfortunately, Mexia Reservoir is generally too shallow for the addition of habitat, and any rigid artificial habitats deployed would pose problems for boaters. Therefore, fish attractors were not deployed into the reservoir.
3. Cooperate with the BMWSD to maintain appropriate AIS signage, educate the public about AIS, make a speaking point about AIS when presenting to constituent and user groups and keep track of all inter-basin water transfer routes to facilitate potential AIS responses.

Action: Invasive species signage was posted at Mexia Reservoir during summer 2013 and has been maintained since that time. District biologists have continued to educate constituents about AIS in presentations, conversations and Facebook posts since the last

report writing. Inter-basin water transfers are a permanent fixture in this report and will be updated as needed.

Harvest Regulation History: Sport fishes in Mexia Reservoir have always been managed with statewide regulations. The current harvest regulations are listed in Table 3.

Stocking History: Mexia Reservoir has not been stocked since 2008, when Blue Catfish fingerlings were stocked at a rate of 60 fish/acre. Over half a million Florida Largemouth Bass were stocked into the reservoir between 1974 and 1998. The complete stocking history is in Table 4.

Water Transfer: Mexia Reservoir is primarily used for municipal water supply and recreation. The BMWSD has the only raw water intake structure on the reservoir which transfers water offsite during peak water demand events. There are currently no additional water transfers being considered.

Reservoir capacity: Mexia Reservoir was impounded in 1961. Original plans calculated the reservoir's capacity at conservation pool (448.3 feet above mean sea level) to be 10,000 acre-feet with a surface area of 1,200 acres. Two volumetric surveys have been conducted by the Texas Water Development Board (TWDB) on Mexia Reservoir since impoundment; one in 1996 and one in 2008. The 2008 survey found a volume of 4,687 acre-feet and a surface area of 1,009 acres at conservation pool elevation. According to the TWDB, Mexia Reservoir has accumulated 1,021 acre-feet of sediment volume, which equates to a loss of roughly 22 acre-feet of volume each year since impoundment.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Mexia Reservoir (Baird and Tibbs 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 2019).

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

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

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Standard error (SE) was calculated for structural indices. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics.

Habitat – The 2011 structural habitat survey was conducted according to Tibbs and Baird (2012). The 2019 vegetation survey was conducted using an adaptation of the point method (TPWD, Inland Fisheries Division, unpublished manual revised 2019). Points were randomly generated on the shoreline and averaged a minimum of one point per shoreline mile. Aquatic vegetation has always been found close to the shore in Mexia Reservoir, so stratifying the random points to exclude deep-water areas increased precision and resulted in better data.

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

Results and Discussion

Habitat: The last structural habitat survey estimated 19.9 miles (85.1%) of natural shoreline, 1.9 miles (8.3%) of bulk headed shoreline and 1.6 miles (6.6%) of rock shoreline (Tibbs and Baird 2012). Littoral zone habitat in summer 2019 was dominated by cutgrass (68% or 17 of 25 randomly selected shoreline points; Table 6). Structural habitat and open water vegetation were scarce.

Gizzard Shad: Gizzard Shad were collected with gill nets at 25.0 fish/nn and ranged from 5 to 15 inches in length (Figure 2; Appendix A). The current CPUE was not comparable to the historical average because different gears were used for the collections; Index of Vulnerability (IOV) was not calculated for the same reason (Figure 2; Appendices A and B). No other forage species were collected, and this is probably due to the inherent bias and size selectivity involved with gill netting. The 2016 Management plan outlined the use of White Crappie and Channel Catfish body condition as a proxy for forage abundance and/or vulnerability. Condition for both sport fishes was similar if not improved over previous surveys suggesting no major changes in forage abundance or vulnerability.

Catfishes: Channel Catfish were collected with gill nets at a rate of 7.0 fish/nn in 2020 which was near the historical average for the species (Figure 3 Appendices A and B). The OBS goal for Channel Catfish size structure (PSD and length-frequency; $N \geq 50$) was not met as only 35 individuals of stock length and greater were collected (Table 5; Figure 3). The PSD value in 2020 increased, reflecting a slightly higher proportion of larger fish in the population. Body condition, expressed as relative weight (W_r), remained very good and improved across size classes. Most of the Channel Catfish collected were legal length as seen by the high PSD-12 value (97).

Blue Catfish were not listed as an important sport fish in the 2016 – 2020 OBS Plan and were not targeted because historical catch rates were erratic and mostly low. The 2020 gill net catch rate was the highest on record for the species however, and it appeared the population might now be established (Figure 4 Appendices A and B). Most of the Blues collected were legal length as seen by the high PSD-12 value (100).

White Crappie: White Crappie were collected with trap nets at 51.6 fish/nn in 2019. This catch rate was less than the historical average (Figure 5; Appendices A and B) but still high relative to most reservoirs in the district. The OBS goal for White Crappie size structure (PSD and length-frequency; $N \geq 50$) was easily reached ($N = 182$ individuals; Figure 5). The PSD and PSD-10 values decreased significantly from 2015 to 2019 reflecting a lower proportion of larger fish in the population. Body condition was excellent and generally improved with increasing length (Figure 5). White Crappie greater than 12 inches were seldom collected in surveys (Figure 5).

Fisheries management plan for Mexia Reservoir, Texas

Prepared – July 2020

ISSUE 1: The 2016 – 2020 OBS Plan lists Blue Catfish as a low-density fishery however, the 2020 gill net survey collected them in surprisingly good numbers (3.2 fish/nn).

MANAGEMENT STRATEGY

1. Upgrade the status of Blue Catfish from a low-density fishery to an important sport fish.

ISSUE 2: 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 BMWSD 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 (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, forage fish and other important fishes

Recent survey data now suggest important sport fishes in Mexia Reservoir include White Crappie, Channel Catfish and Blue Catfish. Important forage fishes include Gizzard Shad, Threadfin Shad, Bluegill and Longear Sunfish, although only Gizzard Shad were collected during 2020 gill net surveys. The proposed sampling schedule (Table 7) lists trap net and gill net surveys in 2023 and 2024.

Low-density fisheries

Largemouth Bass, Spotted Bass, Flathead Catfish, White Bass and Black Crappie occur in low abundance in Mexia Reservoir. We will continue collecting and reporting data for these species and upgrade their status if appropriate.

Survey objectives, fisheries metrics, and sampling objectives

Winter trap netting: Anecdotal evidence suggests White Crappie are highly sought after in Mexia Reservoir. The goal of the 2023 trap net survey will be general monitoring of trend data to characterize the White Crappie population and make comparisons with historical and future data. Collecting 50 or more stock-length fish during winter 2023 will allow us to calculate proportions (i.e., size structure indices) with an 80% confidence interval. Catch per unit effort target precision will be an RSE < 25. Also, since body condition will be used to help determine forage availability, at least 5 fish per represented inch group \geq stock-length will be measured and weighed. A minimum of 5 randomly selected trap net stations will be sampled. If the goal is not attained, and catch rates indicate that collecting the proposed number of fish is reasonable, sampling will continue at pre-determined random stations until the target is reached.

Spring gill netting: This survey will be used to evaluate Channel Catfish and Blue Catfish. The goal of the survey will be general monitoring of trend data to characterize the populations and make comparisons with historical and future data. Collecting 50 or more stock-length fish during spring 2024 will allow us to calculate proportions (i.e., size structure indices) with an 80% confidence interval. Catch per unit effort target precision will be an RSE < 25. Also, since body condition will be used to help determine forage availability, at least 5 fish per represented inch group \geq stock-length will be measured and weighed. A minimum of 5 randomly selected gill net stations will be sampled. If the goal is not attained, and catch rates indicate that collecting the proposed number of fish is reasonable, sampling will continue at pre-determined random stations until the target is reached.

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Tables and Figures

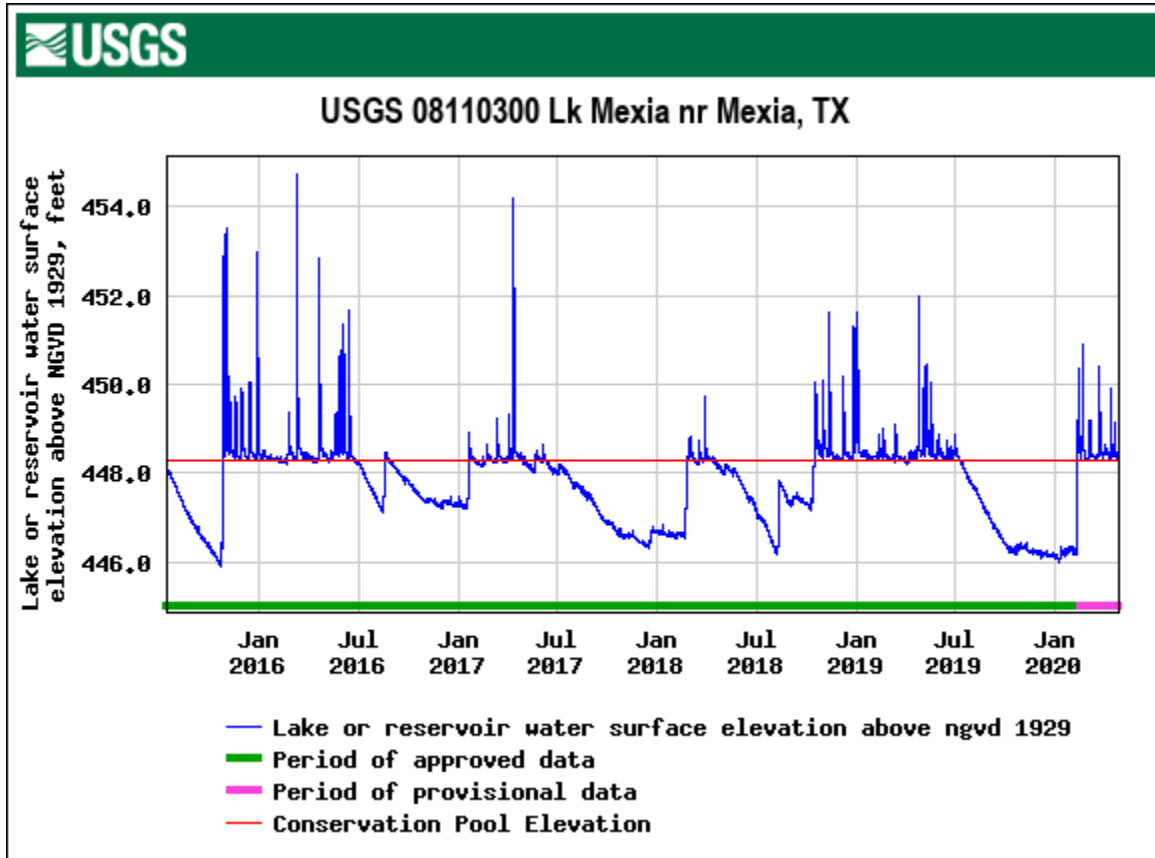


Figure 1a. Daily mean water levels for Mexia Reservoir from July 15, 2016 through April 27, 2020. Conservation pool level (red line) is 448.3 feet above MSL. Figure from the USGS website.

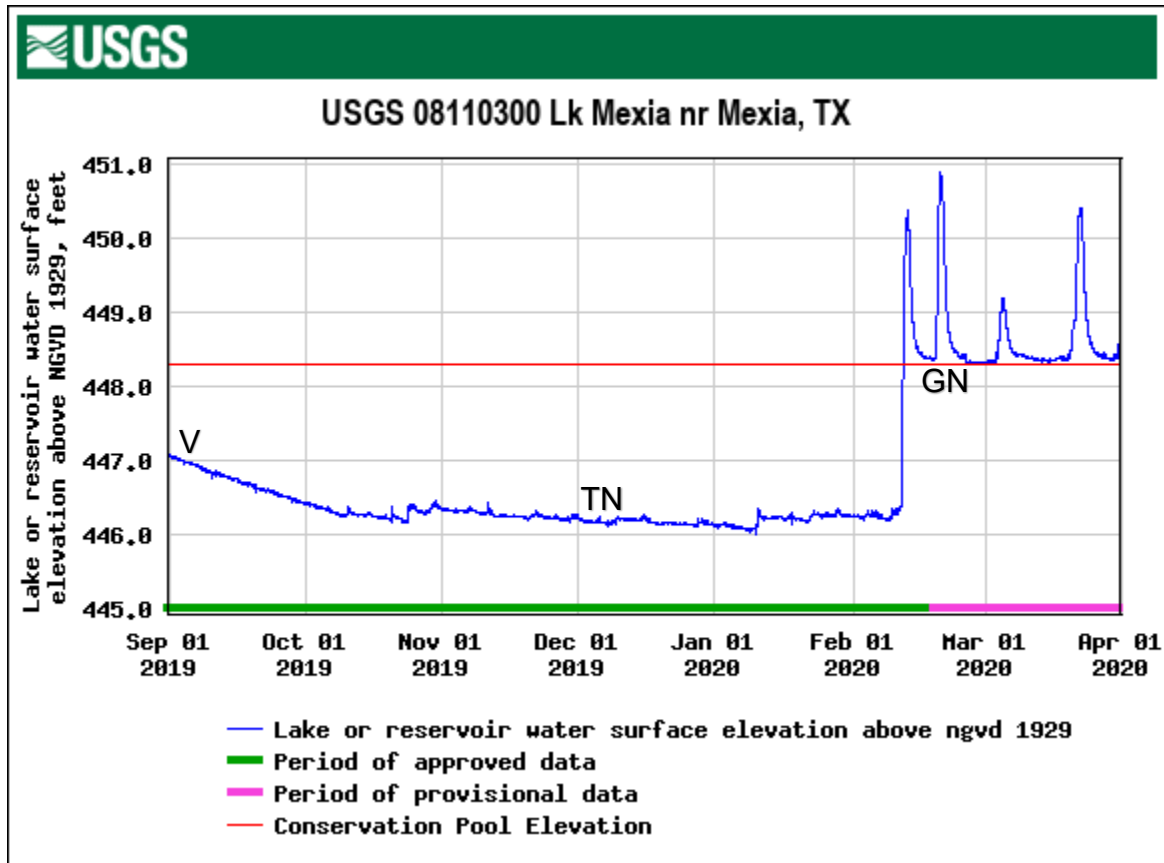


Figure 1b. Daily mean water level elevations in feet above mean sea level (MSL) recorded for Mexia Reservoir, Texas, September 2019 through March 2020. NGVD 1929 refers to the National Geodetic Vertical Datum of 1929. The red line indicates conservation pool (448.3 feet above MSL) and scheduled surveys are indicated by V (vegetation), TN (trap netting) and GN (gill netting).

Table 1. Characteristics of Mexia Reservoir, Texas 2019 - 2020.

Characteristic	Description
Year Constructed	1961
Controlling authority	BMWSD
County	Limestone
Reservoir type	Tributary, Brazos River Basin
Shoreline Development Index	8.0
Conductivity	220 umhos

Table 2. Boat ramp characteristics for Mexia Reservoir, Texas, September 2019. Reservoir elevation at time of survey was 447.0 feet above MSL (1.3 feet below conservation pool).

Boat ramp	Latitude Longitude (dd)	Parking capacity (N)	Public	Condition
Bistone MWSD	31.65416/-96.59361	15	Y	Double lane; good

Table 3. Harvest regulations for Mexia Reservoir, 2019 - 2020.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: Channel Catfish, Blue Catfish, their hybrids and subspecies	25 (in any combination)	12 - No Limit
Catfish, Flathead	5	18 - No Limit
Bass, White	25	10 - No Limit
Bass: Largemouth	5	14 - No Limit
Crappie: White Crappie, Black Crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

Table 4. Stocking history of Mexia Reservoir, Texas. Life stages are fry (FRY), fingerling (FGL), adult (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1975	30,000	UNK	UNK
	1995	140,000	FGL	1.9
	1996	140,000	FGL	1.9
	2008	60,061	FGL	2.0
	Total	370,061		
Flathead Catfish	1969	3,806	UNK	UNK
	Total	3,806		
Florida Largemouth Bass	1974	63,745	FGL	2.2
	1974	11,375	FRY	1.0
	1976	70,000	FRY	1.0
	1977	140,340	FRY	1.0
	1995	142,384	FGL	1.3
	1998	140,668	FGL	1.3
	Total	568,512		
Green Sunfish x Redear Sunfish	1980	1,000	UNK	UNK
	Total	1,000		
Largemouth Bass	1996	43	ADL	12.0
	Total	43		

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

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Gill netting</i>			
Channel Catfish	Size Structure	PSD, length frequency	N ≥ 50 stock
<i>Trap netting</i>			
White Crappie	Size Structure	PSD, length frequency	N ≥ 50 stock

Since electrofishing is no longer used as a management tool for Mexia Reservoir (Largemouth Bass and prey species are no longer collected), body condition from sport fish will continue to be used as a proxy for forage abundance and vulnerability.

Table 6. Survey of aquatic vegetation, Mexia Reservoir, Texas, 2011, 2015 and 2019. Percent of total reservoir surface area is listed for 2011, while percent of randomly selected points where species occurred, is listed for 2015 and 2019. Water level was 448.3, 447.9 and 447.0 feet above MSL, respectively, at the time of the surveys. Nonnative species are noted with an asterisk.

Vegetation	2011	2015	2019
American water-willow	6.2%	56% (14 of 25)	48% (12 of 25)
Bulrush	56.5%	16% (4 of 25)	4% (1 of 25)
Common buttonbush		36% (9 of 25)	24% (6 of 25)
Cattail		8% (2 of 25)	0% (0 of 25)
Giant cutgrass *	61.8%	68% (17 of 25)	68% (17 of 25)
Giant reed *		12% (3 of 25)	0% (0 of 25)
Alligator weed *			12% (3 of 25)
Common reed			12% (3 of 25)

Gizzard Shad

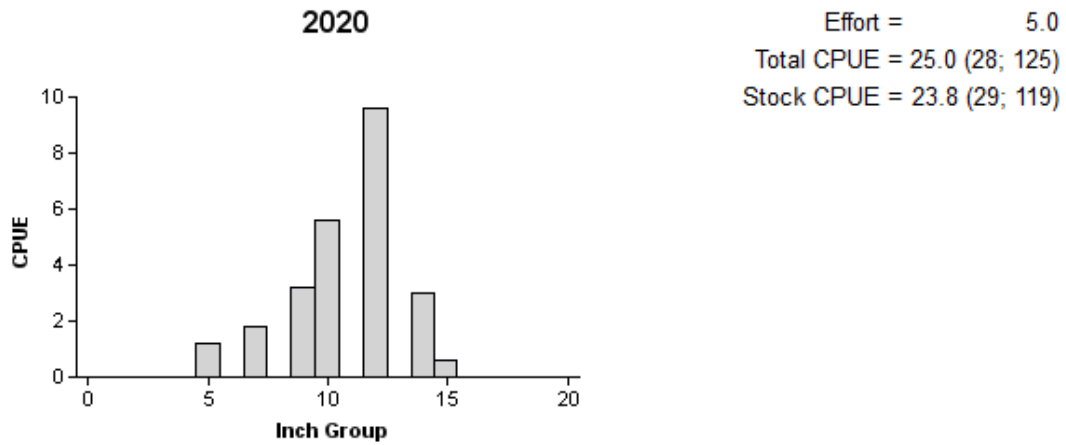


Figure 2. Number of Gizzard Shad caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Mexia Reservoir, Texas, 2020. Historical data for this species can be found in Appendix B.

Channel Catfish

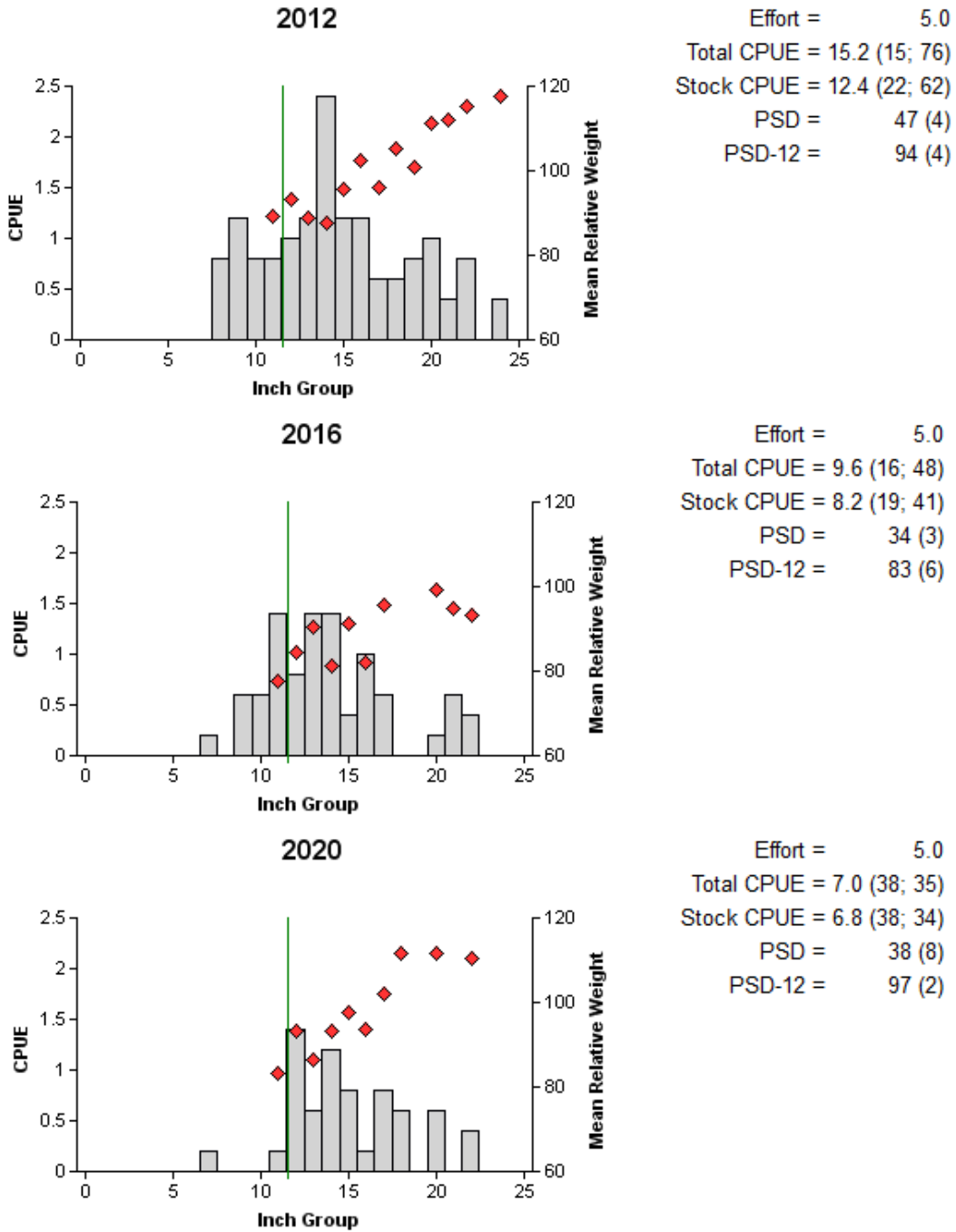


Figure 3. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weights (diamonds) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Mexia Reservoir, Texas, 2012, 2016 and 2020. Vertical line represents minimum length limit.

Blue Catfish

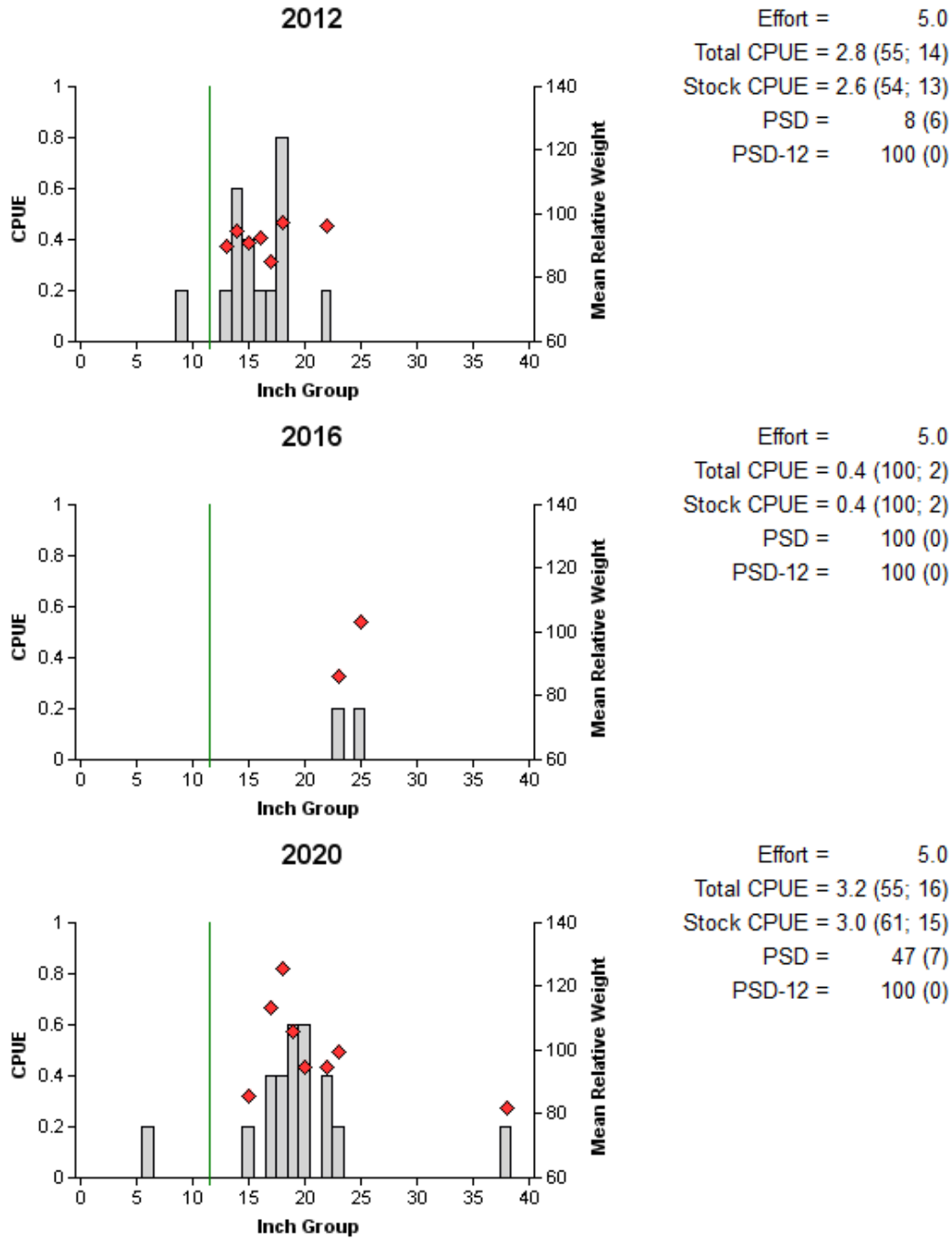


Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weights (diamonds) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Mexia Reservoir, Texas, 2012, 2016 and 2020. Vertical line represents minimum length limit.

White Crappie

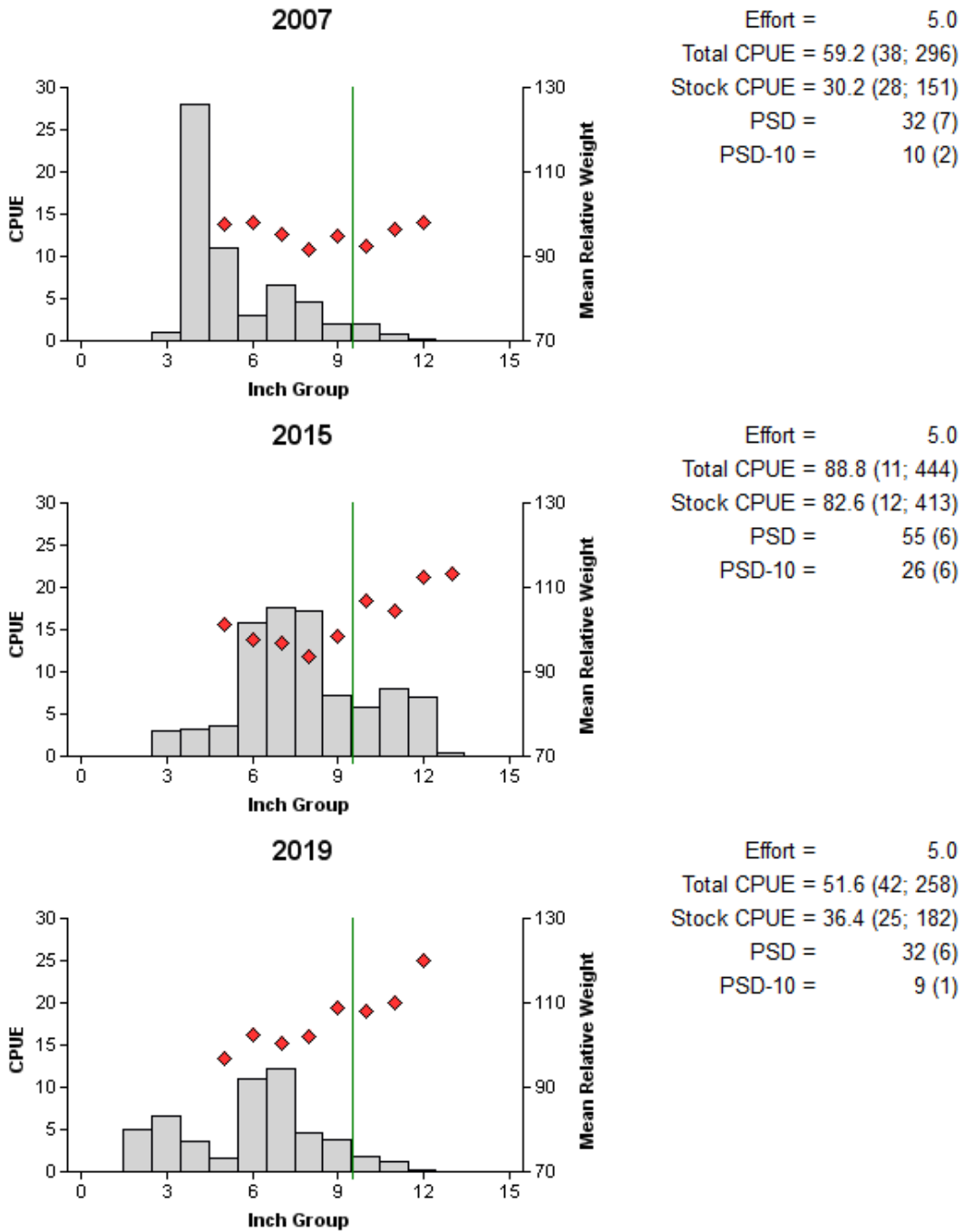


Figure 5. Number of White Crappie caught per net night (CPUE, bars), mean relative weights (diamonds) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for winter trap net surveys, Mexia Reservoir, Texas, 2007, 2015 and 2019. Vertical line represents minimum length limit.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for Mexia Reservoir, Texas. Survey period is June through May. Gill net surveys are conducted in the spring while trap net surveys are conducted in the fall and winter. Standard survey denoted by S.

	Survey Year			
	2020-2021	2021-2022	2022-2023	2023-2024
Vegetation				S
Access				S
Trap Net				S
Gill Net				S
Report				S

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

Number (N), relative standard error (RSE) and catch rate (CPUE) for all target species collected with all gear types from Mexia Reservoir, Texas, 2019-2020.

Species	Gill Netting		Trap Netting	
	N/RSE	CPUE	N/RSE	CPUE
Gizzard Shad	125/28	25.0		
Blue Catfish	16/55	3.2		
Channel Catfish	35/38	7.0		
White Bass	12/80	2.4		
White Crappie	15/46	3.0	258/42	51.6

APPENDIX B – Historical catch rates for targeted species by gear type

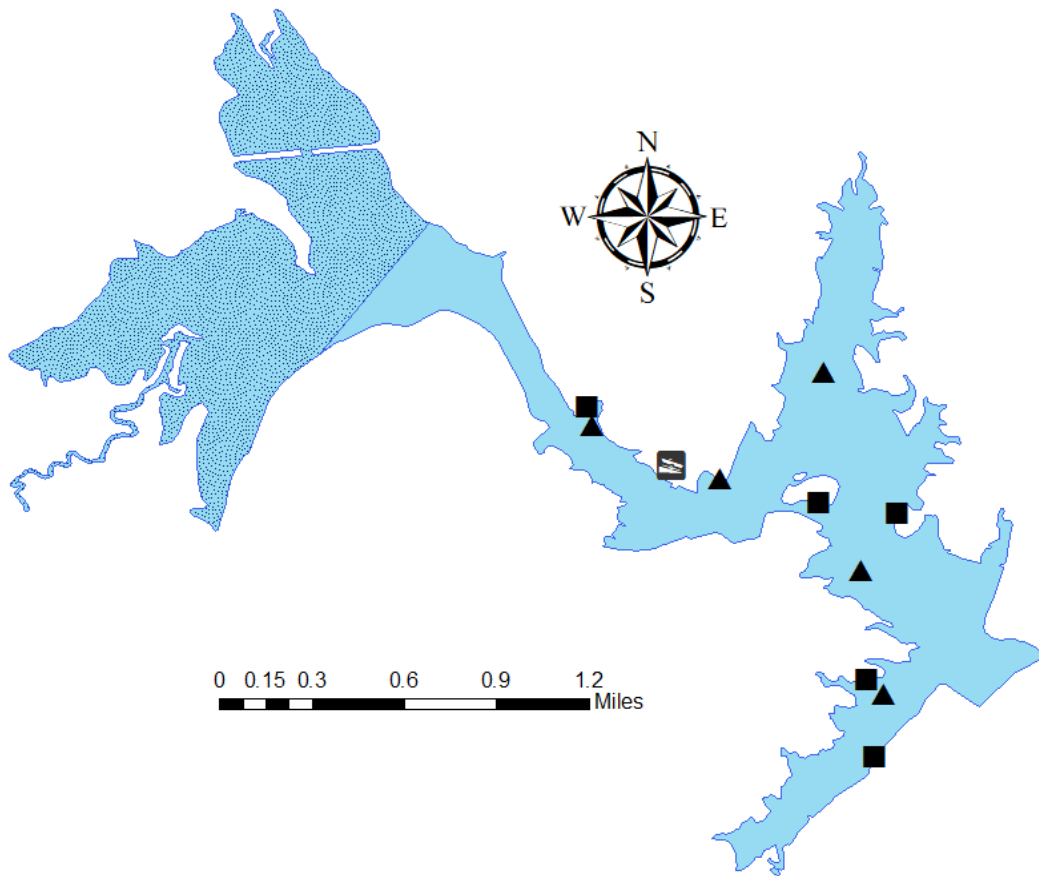
Catch rates (CPUE) of targeted species by gear type for standard surveys on Mexia Reservoir, Texas, 1990 to present. Surveys prior to 1996 utilized biologist-selected stations while those after 1996 utilized randomly selected stations. Electrofishing stations were shocked with a 5.0 Smith-Root GPP (Gas Powered Pulsator) through 2010, then a 7.5 Smith-Root GPP was used. Objective based sampling began in 2015. Species averages are in bold. Dashes represent no data; asterisks represent a survey conducted outside the normal time range for that gear.

Year	Electrofishing						
	Bass		Shad		Sunfish		
	Largemouth	Gizzard	Threadfin	Bluegill	Longear	Green	Warmouth
1990	32.0	544.7	0.0	147.3	34.7	0.7	40.7
1991	10.7	524.7	0.0	51.3	18.0	0.0	0.7
1993	34.7	434.7	216.7	94.0	11.3	1.3	2.0
1996	28.0	1877.3	256.0	23.3	8.7	0.0	4.7
1999	108.7	107.3	0.0	89.3	91.3	68.0	2.7
2003	62.0	505.0	2007.0	86.0	10.0	0.0	1.0
2007	26.0	519.0	18.0	143.0	20.0	1.0	4.0
2011	40.0	1432.0	1379.0	186.0	47.0	5.0	5.0
2015	12.0	2,152.8	674.4	21.6	12.0	2.4	0.0
Avg.	39.3	899.7	505.7	93.5	28.1	8.7	6.8

APPENDIX B Continued

Year	Gill nets			Trap nets	
	Blue	Channel	Flathead	Bass White	Crappie White
1990	0.6	4.6	0.0	1.0	256.2
1991	2.8	5.6	0.0	2.8	123.4
1993	0.2	11.6	0.2	0.7	63.8
1996	0.0	4.0	0.0	5.0	38.8
1999	1.8	1.6	0.0	1.0	49.6*
2003	-	-	-	-	36.4
2004	0.0	6.6	0.0	2.6	-
2007	-	-	-	-	59.2
2008	0.2*	4.8*	0.0*	0.0	-
2012	2.8	15.2	0.0	1.4	6.6
2015	0.4	9.6	0.0	1.0	89.0*
2019	-	-	-	-	51.6
2020	3.2	7.0	-	2.4	
Avg.	1.2	7.1	0.0	1.8	77.5

APPENDIX C – Map of sampling locations



Location of sampling sites, Mexia Reservoir, Texas, 2019-2020. Trap net and gill net stations are indicated by squares and triangles respectively. Water level was within two feet of conservation pool at time of sampling. The upper one-third of the reservoir (shading) is not navigable and was not sampled.



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