

Mill Creek Reservoir

2020 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

Prepared by:

David R. Smith, Assistant District Management Supervisor
and
Quintin Dean, Assistant District Management Supervisor
and
Jake Norman, District Management Supervisor

Inland Fisheries Division
Tyler District, Tyler, Texas



Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

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Survey and Management History

Fish populations in Mill Creek Reservoir were surveyed in the fall of 2020 using electrofishing and trap netting. An aquatic vegetation survey was conducted in the summer of 2020. An additional electrofishing survey was conducted in fall 2018 to monitor Largemouth Bass and an additional hoop netting survey was conducted in summer 2019 to monitor Channel Catfish. Historical data are presented with 2018–2020 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: Mill Creek Reservoir is a 237-acre impoundment located in Van Zandt County, Texas, on Mill Creek, a tributary of the Sabine River. The reservoir was constructed by the City of Canton in 1976 for municipal water supply. Habitat features consisted primarily of submersed and emergent vegetation.

Management History: Important sportfish include Largemouth Bass and crappie. The management plan from 2017 included continuing to manage for a trophy Largemouth Bass fishery and continuing efforts to establish a variety of native submersed and emergent aquatic vegetation. Efforts were made to establish desirable native species of aquatic vegetation in the reservoir with a series of plantings within enclosure cages and a floating wetland. Florida Largemouth Bass fingerlings were stocked in 2018.

Fish Community

- **Prey species:** The prey fish community of Mill Creek Reservoir was dominated by Bluegill, and other sunfish species. Electrofishing catch of Bluegill was high, with approximately two-thirds of those fish measuring less than five inches in length. Gizzard Shad and Threadfin Shad catch was moderate; however, less than 25% of Gizzard Shad were available as forage for most sport fish.
- **Channel Catfish:** Channel Catfish were present in the 2019 survey but in low abundance. Channel Catfish in the reservoir suffer from poor recruitment, likely the result of predation by Largemouth Bass and insufficient spawning habitat.
- **Largemouth Bass:** Largemouth Bass were fairly abundant, with moderate numbers of fish in the 14- to 21-inch protected slot limit. Largemouth Bass displayed adequate growth, reaching 14 inches in two years. Body condition of Largemouth Bass was good, indicating an adequate supply of prey.
- **Crappies:** Both White and Black Crappie were moderately abundant. Both species displayed adequate growth and good body condition.

Management Strategies: Inform the public about the negative impacts of aquatic invasive species. Continue to manage the Largemouth Bass population with a 14–21-inch protected slot limit. Stock Florida Largemouth Bass biennially at 1000/km of shoreline to increase the trophy potential in the reservoir. Assess aquatic vegetation growth biennially, beginning with a summer survey in 2022. Conduct electrofishing and trap net surveys in the fall of 2024 and an additional electrofishing survey to monitor Largemouth Bass in the spring of 2022. Assess angler effort, catch, harvest, and expenditures through a spring-quarter creel survey in 2025. Improve bank angling access through the purchase and installation of several fishing piers near the boat ramp.

Introduction

This document is a summary of fisheries data collected from Mill Creek Reservoir in 2018–2020. The purpose of this 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 2018–2020 data for comparison.

Reservoir Description

Mill Creek Reservoir is a 237-acre impoundment constructed in 1976 on Mill Creek, a tributary of the Sabine River. The reservoir is in Van Zandt County approximately 34 miles west of Tyler, Texas, and is operated and controlled by the City of Canton. Primary water uses include municipal water supply and recreation. Habitat at time of sampling consisted of natural shoreline and abundant submersed and emergent aquatic vegetation. Other descriptive characteristics for Mill Creek Reservoir are in Table 1.

Angler Access

Mill Creek Reservoir has one public boat ramp and no private boat ramps. Boaters using the ramp are required to obtain a launch permit from the City of Canton Police Department. Additional boat ramp characteristics are in Table 2. The city park offers quality shoreline access including several fishing piers near the boat ramp. Four fishing piers recently purchased with the Bass Conservation License Plate (CLP) funds were installed in 2020 to the east of the boat ramp. Five more fishing piers have been purchased with CLP funds to be installed by the City of Canton in 2021 to the west of the boat ramp.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Cartabiano and Storey 2017) included:

1. Continue to manage Mill Creek Reservoir as a trophy Largemouth Bass fishery and monitor relative abundance, condition, and population size structure by conducting biennial electrofishing surveys.

Action: Mill Creek Reservoir was sampled using electrofishing in fall 2018 and 2020. Lengths and weights were measured from Largemouth Bass collected in 2018 and 2020. Otoliths were collected for age and growth analysis in 2020. Florida Largemouth Bass fingerlings were stocked in 2018.

2. Enhance habitat in Mill Creek Reservoir by planting native aquatic vegetation to influence growth rates, reproduction, and recruitment of sport fishes.

Action: District staff maintained the native vegetation project initiated in 2013 through 2019 on the reservoir with various native aquatic vegetation plantings within enclosure cages and a floating wetland.

Harvest regulation history: Sport fishes in Mill Creek Reservoir continue to be managed under statewide regulations except for Largemouth Bass, which are managed using a 14- to 21-inch protective slot length limit and a five-fish daily bag limit; of which one fish 21 inches or longer may be retained. Current regulations are found in Table 3.

Stocking history: Florida Largemouth Bass (FLMB) were initially introduced in 1976 (26,400 fingerlings) and stocked 12 more times between 1978 and 2018. Two special stockings of advanced-fingerling (6 inches) ShareLunker offspring (from the Toyota ShareLunker selective breeding program) were introduced in fall 2005 and 2007. Adult Blue Catfish were stocked in 1992. Channel Catfish fingerlings were stocked in 1978, 1991, 1993, and adults were stocked in 2017 and 2020. The complete stocking history is in Table 4.

Vegetation/habitat history: A series of droughts in 2005–2006 and 2010–2015 led to variable water levels in the reservoir and drastically reduced native aquatic vegetation coverage to less than 2% of the reservoir in 2016 (Cartabiano and Storey 2017). A native vegetation enhancement project involving submersed and emergent species was initiated in 2013. A mixture of American pondweed, Illinois pondweed, waterwillow, bulrush, eelgrass, and buttonbush were planted in enclosure cages in 2017–2019. Additionally, in 2017 a floating wetland was created with buttonbush, waterwillow, bulrush, and coontail. This structure was continually maintained through 2019. With water levels now stabilized near full pool, native aquatic vegetation is thriving with 21.8% coverage of reservoir surface area.

Water transfer: Mill Creek Reservoir is a water supply for the City of Canton and no inter-basin transfers are known to exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan (Cartabiano and Storey 2017). Primary components of the 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, Gizzard Shad, and Threadfin Shad were collected by a fall electrofishing survey (one hour at 12, five-min stations) in 2020 and an additional Largemouth Bass only survey was conducted in fall 2018 (one hour at 12, five-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Mean age at the lower limit of the slot for Largemouth Bass was determined using otoliths from 13 randomly-selected fish (range 13.0–14.7 inches) within the 2020 survey.

Trap netting – Crappie were collected with trap netting in fall 2020 (five net nights at five stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Mean age at harvest length was determined using otoliths from 13 randomly selected White Crappie (length range 9.1–10.9 inches) and 13 randomly selected Black Crappie (length range 9.1–10.9 inches) collected in trap netting in November 2020.

Tandem hoop nets – Channel Catfish were collected using five tandem hoop-net series at five stations. Nets were baited with soap and deployed for two-night soak durations. CPUE for tandem hoop netting was recorded as the number of fish caught per tandem hoop net series (fish/series).

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 X SE of the estimate/estimate) was calculated for all CPUEs.

Habitat – A vegetation survey was conducted in 2020 to evaluate the coverage of native species and monitor expansion of exotic species. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Water level – No gauging station exists on Mill Creek Reservoir, and reported elevations were based on estimates made during sampling.

Results and Discussion

Habitat: Total native aquatic vegetation coverage was estimated at 21.8% of reservoir area (16% submersed and 5.8% emergent; Table 6). While native submersed vegetation is below previous levels (43%; Storey and Jubar 2005), the current coverage represents a healthy recovery. Submersed aquatic vegetation coverage consisted mainly of coontail (14.3%) and emergent aquatic vegetation consisted mainly of button bush (2.7%) and American lotus (1.9%). Hydrilla (0.5%) and alligator weed (1.3%) were also present. While we can attribute some of the successes in native vegetation regrowth to plantings within enclosure cages, specifically among pondweed species (1.2%), it is unknown exactly to what extent the vegetation recovery is a function of stable water levels or plantings across the reservoir. Coontail is the dominant vegetation coverage within the reservoir and the source of that species may have come from the floating wetland; however, data is not available to directly pinpoint the source of the vegetation recovery to our efforts.

Prey species: Gizzard Shad, Threadfin Shad, and sunfishes were all present in the 2020 survey. Catch of Gizzard Shad and Threadfin Shad were both moderate (112.0/h and 149.0/h, respectively). Index of vulnerability (IOV) for Gizzard Shad was low, indicating that only 21% of Gizzard Shad were available to existing predators. IOV for Gizzard Shad in 2020 was much lower than the 2016 survey (67%) but

approximately equal to the 2012 survey (20%; Figure 1). Prey populations in Mill Creek Reservoir were dominated by sunfishes, mostly Bluegill. Electrofishing CPUE of Bluegill in 2020 (332.0/h) was high and size structure was dominated by small individuals (PSD = 14) with 66% of Bluegill captured measuring less than five inches in length (Figure 2). Catch rates and size structure in 2020 were similar to 2016 (320.8/h; PSD = 8), but lower than catch rates in 2012 which also displayed a size structure more proportionally dominated by small individuals (583.0/h, PSD = 5). Redear Sunfish were substantially less abundant in 2020 (86.0/h) than in 2012 (330.0/h) but similar to catch rates in 2016 (55.2/h; Figure 3). Only 33% of Redear Sunfish measured less than five inches in length. Catch rates of other sunfishes included Longear Sunfish (40.0/h) and Warmouth (21.0/h; Appendix A). Overall, prey abundance and size composition should not be a limiting factor to the growth and body condition of sport fishes. Body condition of Largemouth Bass within electrofishing surveys (2018 mean $W_r = 98$; 2020 mean $W_r = 94$) indicates that the prey base within the reservoir has the potential to sustain a trophy Largemouth Bass fishery.

Catfishes: Historically, gill net CPUEs of Blue and Channel Catfish have been low with surveys in 2009 and 2013 producing zero Blue or Channel Catfish catches. In 2019, an experimental hoop net survey was conducted to assess the Channel Catfish population (Figure 4). Catch rates remained low (2.2/series) but body condition was good (mean $W_r = 97$) with most fish captured in the quality-size range (> 16 inches; PSD = 89). Channel Catfish in the reservoir suffer from poor recruitment, likely the result of predation by Largemouth Bass and insufficient spawning habitat. Efforts will remain focused on maintaining more sought-after sportfish populations, specifically the Largemouth Bass population, within the reservoir unless angler data is collected illustrating significant effort within this fishery.

Largemouth bass: Largemouth Bass continue to be moderately abundant within the reservoir. Total CPUE in fall electrofishing for surveys in 2018 and 2020 were 203.0/h and 122.0/h respectively (Figure 5). These catch rates are both increases from historic fall electrofishing surveys (2010–2016 average CPUE = 98.1/h). CPUE of Largemouth Bass within the protective slot limit (14–21 inches) has also increased from historic levels (2010–2016 average slot-CPUE = 12.1/h) with catch rates of 17.0/h and 22.0/h for 2018 and 2020, respectively. CPUE of Largemouth Bass greater than slot length (> 21 inches) has remained relatively low historically (2010–2016 average 0.75/h) and for both of the most recent surveys (1.0/h and 2.0/h for 2018 and 2020, respectively) which may suggest alternative sampling (e.g., spring electrofishing) would provide a better overall picture of trophy Largemouth Bass in the reservoir. Size structure suggests a balanced population (PSD = 46 in 2018 and 2020) and improved from 2016 (PSD = 34). Body condition was good in both the 2018 (mean $W_r = 98$) and 2020 (mean $W_r = 94$) surveys for each inch class of fish collected (range: 90–106), indicating an ample supply of prey. Body condition was also improved from the 2016 survey (2016 mean $W_r = 89$) which may be a result of improved foraging efficiency as aquatic vegetation coverage has significantly increased since 2016. Growth of Largemouth Bass was adequate, with fish ages averaging two years ($N = 13$; all two years) at 14 inches (range 13.0–14.7 inches). Fin clips were taken for genetic analysis from fish captured in 2020 ($N = 30$). Since 2008, genetics have been taken every four years. Florida LMB influence has remained relatively constant over this time period as the percent of Florida alleles have ranged from 52% to 63% and pure Florida genotypes have ranged from 0% to 13% (Table 7).

Crappie: Both White and Black Crappie were collected in trap net sampling in 2020. Black Crappie (16.6/nn) were more abundant than White Crappie (11.0/nn) but a much larger percentage of White Crappie (53%) collected were of legal-size as opposed to Black Crappie (10%). Size structure was good for both species with a PSD of 87 for White Crappie and 78 for Black Crappie (Figures 6 and 7). Body condition was good for both Black Crappie (mean $W_r = 104$) and White Crappie (mean $W_r = 95$) for each inch class of fish collected (range: 84–109). White Crappie growth was adequate and mean age at legal length was 1.7 years ($N = 13$; range: one–two years). Black Crappie growth was also adequate with fish reaching legal length in 2.4 years ($N = 13$; range: two–three years).

Fisheries Management Plan for Mill Creek Reservoir, Texas

Prepared – July 2021

ISSUE 1: Mill Creek Reservoir has a history of producing trophy Largemouth Bass. The lake record, a 16.77-pound fish caught in 1990, is the tenth heaviest Largemouth Bass ever caught in Texas. The lake has produced four TPWD Legacy ShareLunker entries, most recently in February 2006, and anecdotal reports of angler-caught trophy (≥ 8 pound) fish are frequent. Given the adequate growth and abundant forage, stocking Florida Largemouth Bass should increase trophy fish abundance. Additionally, spring electrofishing surveys generally provide a better overall picture of size structure within a reservoir, specifically for larger fish. This type of survey has not been conducted on Mill Creek Reservoir since 2005. Moving to collect spring trend data will provide more data on the trophy Largemouth Bass population in the reservoir.

MANAGEMENT STRATEGIES

1. Stock Florida Largemouth Bass fingerlings biennially at 1000/km of shoreline to increase the trophy potential in the reservoir.
2. Promote TPWD ShareLunker program to get more consistent supplemental reporting of trophy Largemouth Bass catches within the reservoir.
3. Sampling objectives outlined in the OBS plan will be focused on monitoring Largemouth Bass size structure to help justify and continue stocking. Biennial electrofishing surveys will continue; however, moving forward these surveys will alternate between spring and fall to collect trend data.

ISSUE 2: Angler data does not currently exist describing various aspects of angler trips on Mill Creek Reservoir. The need exists to characterize important fisheries within the reservoir through the collection of baseline angler data.

MANAGEMENT STRATEGIES

1. Conduct a spring-quarter creel survey from March through May 2025 to establish a baseline in angler effort, catch, harvest, and expenditures.

ISSUE 3: Native aquatic vegetation has a recent history of being limited within Mill Creek Reservoir. This has mainly been the result of extended droughts and fluctuating water levels within the reservoir. Currently, water levels have stabilized, and native aquatic vegetation coverage has recovered to an ideal level ($> 20\%$ coverage of reservoir area). The habitat provided by aquatic vegetation drives the trophy potential for Largemouth Bass within the reservoir; therefore, this habitat is incredibly important to maintain. With the understanding that fluctuating water levels could once more drastically impact the available habitat within the reservoir, aquatic vegetation in the reservoir will be surveyed biennially to ensure that aquatic vegetation coverage remains adequate.

MANAGEMENT STRATEGIES

1. Monitor aquatic vegetation with biennial surveys beginning in 2022.
2. Resume attempts to increase the diversity of aquatic vegetation by establishing a variety of native submersed or emergent species if a significant decline in vegetation coverage is detected.

ISSUE 4: Shoreline access within the reservoir was historically limited by dense emergent aquatic vegetation coverage near the boat ramp. When the City of Canton shared plans to improve access, we partnered to explore strategies to improve bank angling opportunities without clearing shoreline vegetation. This led to the purchase of four fishing piers with the Bass Conservation License Plate (CLP) funds which were installed by the City of Canton in 2020 to the east of the boat ramp.

MANAGEMENT STRATEGIES

1. Five additional fishing piers have been purchased with CLP funds to be installed by the City of Canton in 2021 to the west of the boat ramp.
2. Continue to build upon our partnership with the City of Canton in cooperating to improve and maintain angler access within the reservoir.

ISSUE 5: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

3. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
4. Educate the public about invasive species through the use of media and the internet.
5. Make a speaking point about invasive species when presenting to constituent and user groups.
6. Keep track of (e.g., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

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

Sport fish, forage fish, and other important fishes

Sport fishes in Mill Creek Reservoir include Largemouth Bass and crappie. Sunfish and shad are the primary prey species.

Low-density fisheries

Catfish: The population abundance of Blue Catfish and Channel Catfish in Mill Creek Reservoir is low, likely due to Largemouth Bass predation and inadequate spawning habitat. Previous gill net sampling in 2009 and 2013 did not capture either species. A hoop net survey in 2019 detected low abundance of Channel Catfish.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Mill Creek Reservoir supports a moderately abundant Largemouth Bass population managed under a 14–21-inch protected slot limit. The fishery has an impressive history of producing trophy Largemouth Bass including the lake record, a 16.77-pound fish caught in 1990, the tenth heaviest Largemouth Bass ever caught in Texas, and four TPWD ShareLunker entries (1988, 1991, 1992, 2006). Due to the importance of the fishery, trend data on relative abundance, body condition, size structure, and growth are desired for monitoring this fishery (measured by CPUE, PSD, W_r , and age at 14 inches). These data will allow for determination of any large-scale changes in the Largemouth Bass population that may initiate further investigation. Historical electrofishing data suggests that sampling objectives ($RSE \leq 25$ for CPUE-stock, $N \geq 50$ for stock-size fish) can be obtained by sampling 12–18 stations. A minimum effort of 12 randomly selected nighttime electrofishing stations will be conducted and an additional six random stations will also be generated in the event additional sampling is required to meet OBS plan objectives for Largemouth Bass in spring 2022 (Table 8). This sampling plan will be repeated in the fall 2024 (Table 8) with a sample of 13 fish, if captured, for ageing near the lower bound of the slot-length limit (13.0 to 14.9 inches). The Largemouth Bass fishery will also be assessed through a spring-quarter creel survey from March through May 2025 to establish a baseline in angler effort, catch, harvest, and expenditures (Table 8). Five weekend days and four weekdays will be surveyed.

Crappie: Both White and Black Crappie are present in Mill Creek Reservoir. Sampling effort will continue to determine long term trend information of basic population parameters (relative abundance, size structure, body condition, and growth) of these species with five single-cod, shoreline trap net sets during fall 2024 (Table 8). These parameters will be measured by CPUE, PSD, W_r , and age at 10 inches. No sampling objectives will be set for this survey therefore additional sampling effort beyond five trap net sets will not be expended. If captured, a sample of 13 White Crappie and 13 Black Crappie will be collected for ageing near the minimum length limit (9.0 to 10.9 inches). The Crappie fishery will also be assessed through a spring-quarter creel survey from March through May 2025 to establish a baseline in angler effort, catch, harvest, and expenditures (Table 8). Five weekend days and four weekdays will be surveyed.

Prey Species: Gizzard Shad, Threadfin Shad, and sunfish are the primary prey species in Mill Creek Reservoir. Long term monitoring trend data is desired for these populations to evaluate their relative abundance (CPUE), size structure (PSD), and IOV. Relative weights of the Largemouth Bass population, along with size structure of the sunfish and shad communities will be used to gauge prey fish availability for sport fishes. In accordance with the Largemouth Bass sampling objectives, a minimum of 12 randomly selected night-time electrofishing sites will be sampled in the fall of 2024. No additional sampling effort be expended for Bluegill, Redear Sunfish, Gizzard Shad, or Threadfin Shad.

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Tables and Figures

Table 1. Characteristics of Mill Creek Reservoir, Texas.

Characteristic	Description
Year constructed	1976
Controlling authority	City of Canton
Surface area	237 acres
County	Van Zandt
Reservoir type	Tributary
Mean depth	10.0 ft.
Maximum depth	25.0 ft.
Shoreline Development Index (SDI)	3.5
Conductivity	0.000075 mho/cm
Secchi disc range	1–4 ft.

Table 2. Boat ramp characteristics for Mill Creek Reservoir, Texas, July 2020. Reservoir elevation at time of survey was at conservation pool (CP).

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Lakeside Marina	32.53693 - 95.85003	Y	15	5.5 ft below CP	Excellent, no access issues

Table 3. Harvest regulations for Mill Creek Reservoir.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, Largemouth	5 (only 1 > 21 inches)	14- to 21-inch protective slot
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Mill Creek Reservoir, Texas. Size categories are: FGL = fingerling; AFGL = advanced fingerling; ADL = adults.

Species	Year	Number	Size
Threadfin Shad	1982	4,000	ADL
	1983	1,000	ADL
	Total	5,000	
Northern Pike x Muskellunge	1976	9,000	FGL
Blue Catfish	1992	577	ADL
Channel Catfish	1978	15,500	FGL
	1991	9,120	FGL
	1993	9,090	FGL
	2017	1,152	ADL
	2020	500	ADL
Total	35,362		
Florida Largemouth Bass	1976	26,400	FGL
	1978	1,085	AFGL
	1980	39,845	FGL
	1983	52,902	FGL
	1998	166	ADL
	1998	36,603	FGL
	1999	36,000	FGL
	2010	45,822	FGL
	2015	24,025	FGL
	2016	25,091	FGL
	2017	347	ADL*
2018	25,713	FGL	
Total	313,999		
ShareLunker Largemouth Bass	2005	5,949	AFGL
	2007	5,928	AFGL
	Total	11,877	

*Largemouth Bass were of a mixed genetic heritage

Table 5. Objective-based sampling plan components for Mill Creek Reservoir, Texas for 2018–2020.

Gear/ target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing (fall 2018)</i>			
Largemouth Bass	Relative abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	10 fish/inch group (max)
<i>Electrofishing (fall 2020)</i>			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	10 fish/inch group (max)
	Genetics	% FLMB	$N = 30$, any age
	Age-and-growth	Age at 14 inches	$N = 13$, 13.0 – 14.9 inches
Bluegill ^a	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 150$ total
Redear Sunfish ^a	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad ^a	Abundance	CPUE-Total	RSE ≤ 25
	Prey availability	IOV	$N \geq 50$
Threadfin Shad	Abundance	CPUE-Total	
<i>Trap netting</i>			
Crappie	Abundance	CPUE – stock	
	Size structure	PSD, length frequency	
	Age-and-growth	Age at 10 inches	$N = 13$, 9.0 – 10.9 inches
	Condition	W_r	

^a No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill, Redear Sunfish, or 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, Mill Creek Reservoir, Texas, 2008, 2012, 2016, and 2020. Surface area (acres) is listed with percent of total reservoir surface area in parentheses. Reservoir water level was estimated to be at conservation pool elevation. Individual native species observed during surveys are listed in footnotes.

Vegetation	2008	2012	2016	2020
Native emergent	0.5 (0.2) ¹	Trace ³	2.8 (1.2) ⁴	13.8 (5.8) ⁵
Native submersed	0.2 (< 0.1) ²	-	-	38.0 (16.0) ⁶
Non-native				
Alligator weed (Tier III)*	2.3 (1.0)	0.8 (0.3)	6.4 (2.7)	3.0 (1.3)
Hydrilla (Tier III)*	Trace	-	-	1.2 (0.5)
Total	3.0 (1.3)	0.8 (0.3)	9.2 (3.9)	56.0 (23.6)

* Tier III is Watch Status

¹ *Bulrush, common reed, maidencane*

² *Bushy pondweed, muskgrass*

³ *American lotus*

⁴ *American lotus, buttonbush, common reed, smartweed, waterprimrose, waterwillow*

⁵ *American lotus, buttonbush, spike rush, waterwillow, common reed, waterleaf, bull tongue*

⁶ *Coontail, pondweed*

Gizzard Shad

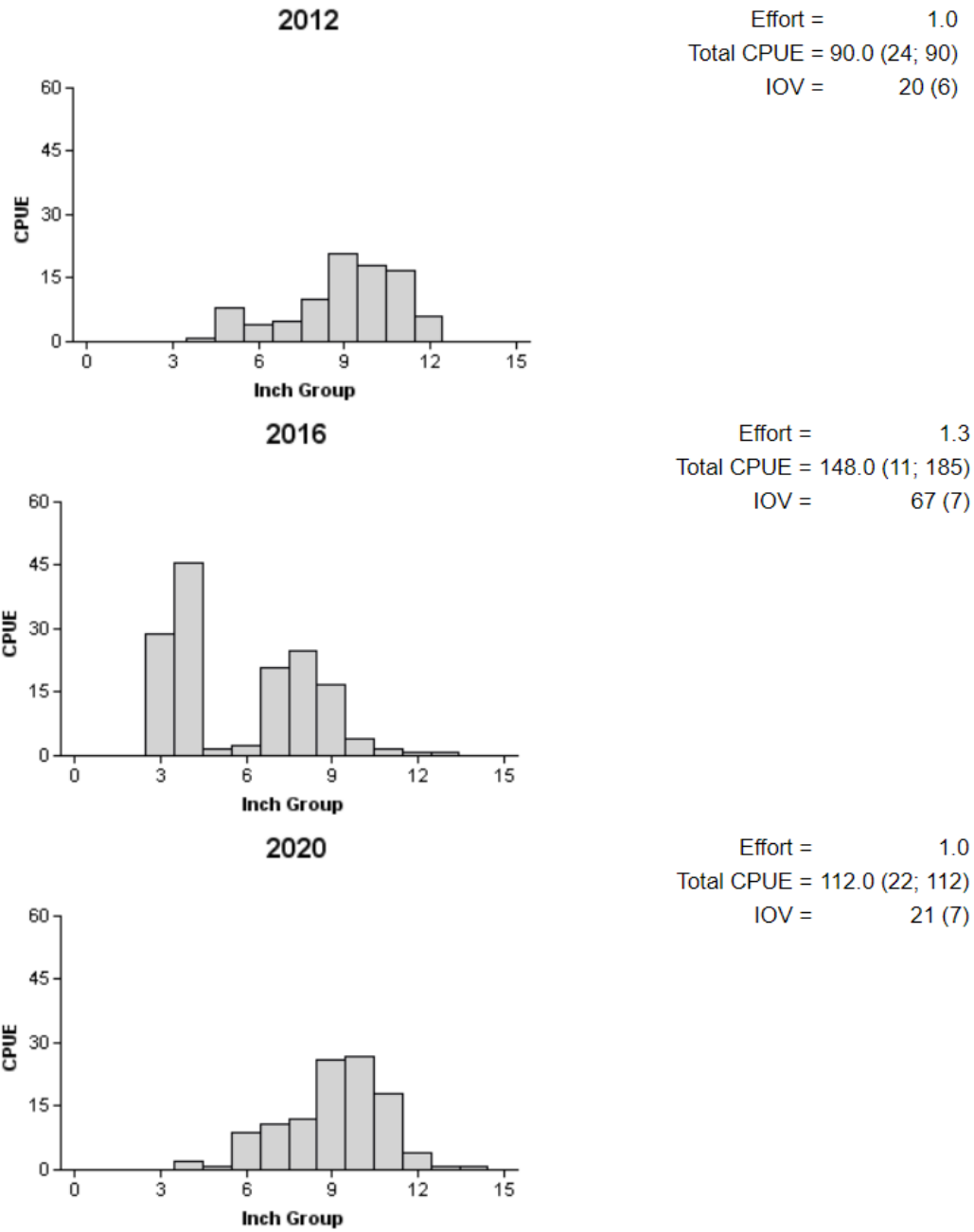
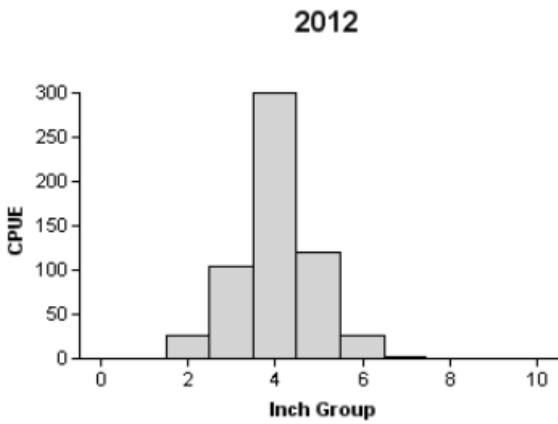
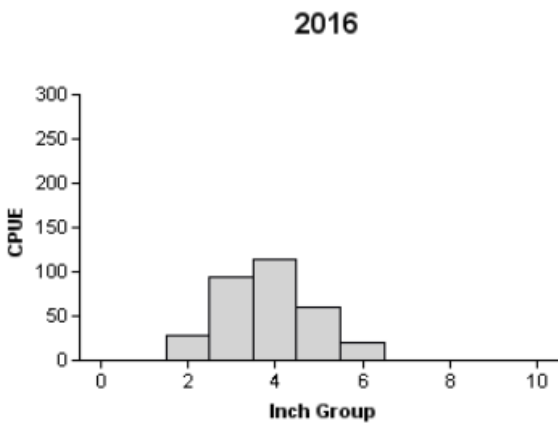


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Mill Creek Reservoir, Texas, 2012, 2016, and 2020.

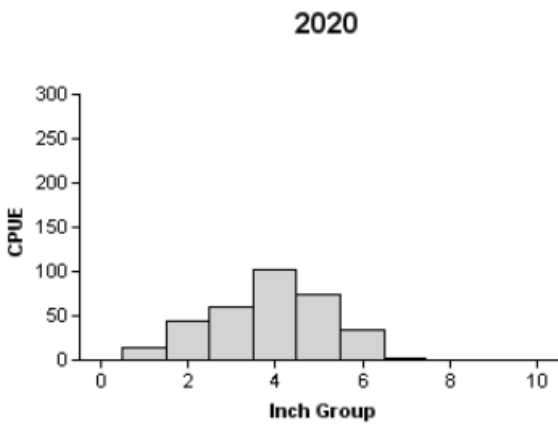
Bluegill



Effort = 1.0
 Total CPUE = 583.0 (14; 583)
 PSD = 5 (2)



Effort = 1.3
 Total CPUE = 320.8 (15; 401)
 PSD = 8 (2)



Effort = 1.0
 Total CPUE = 332.0 (23; 332)
 PSD = 14 (3)

Figure 2. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mill Creek Reservoir, Texas, 2012, 2016, and 2020.

Redear Sunfish

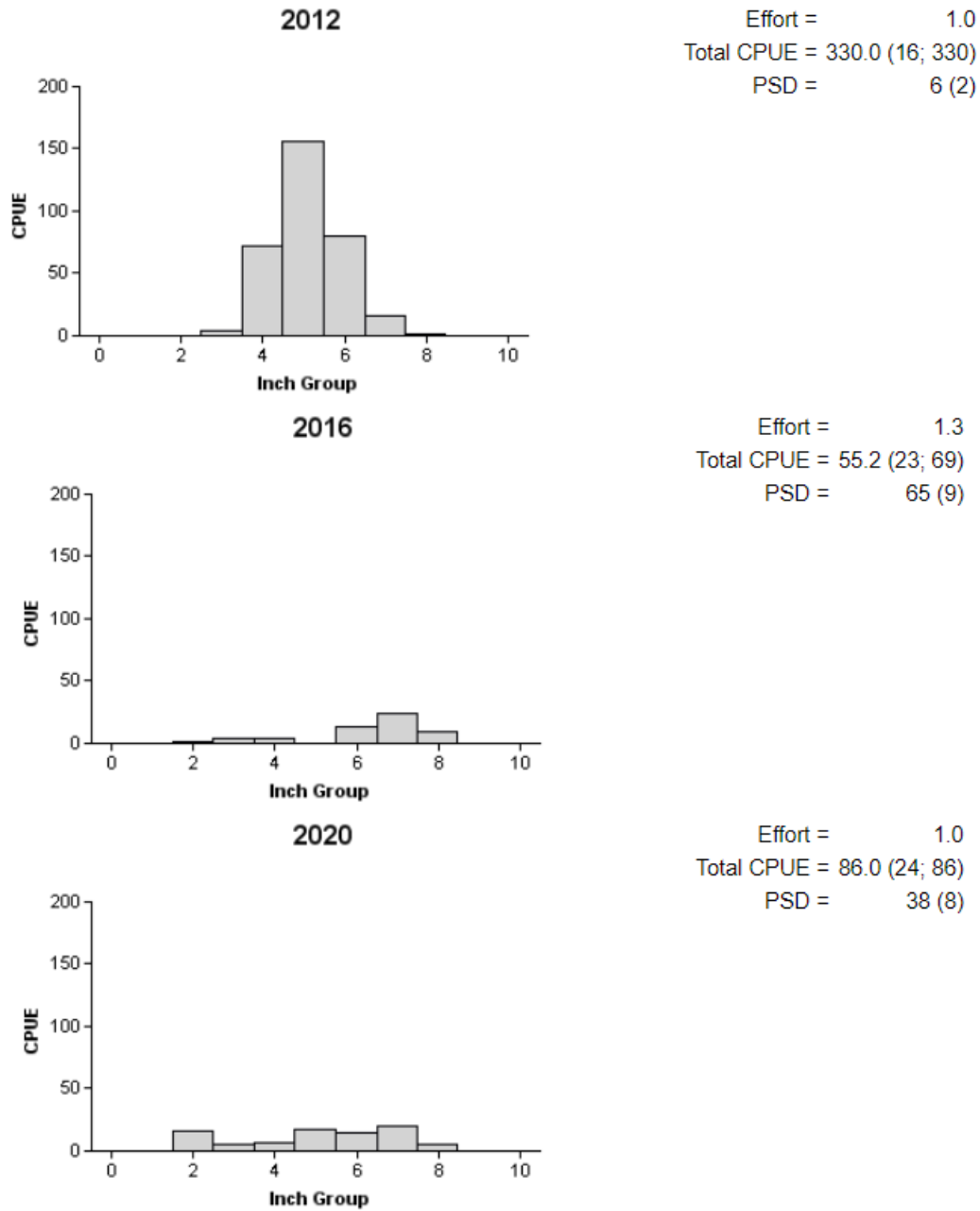


Figure 3. Number of Redear Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mill Creek Reservoir, Texas, 2012, 2016, and 2020.

Channel Catfish

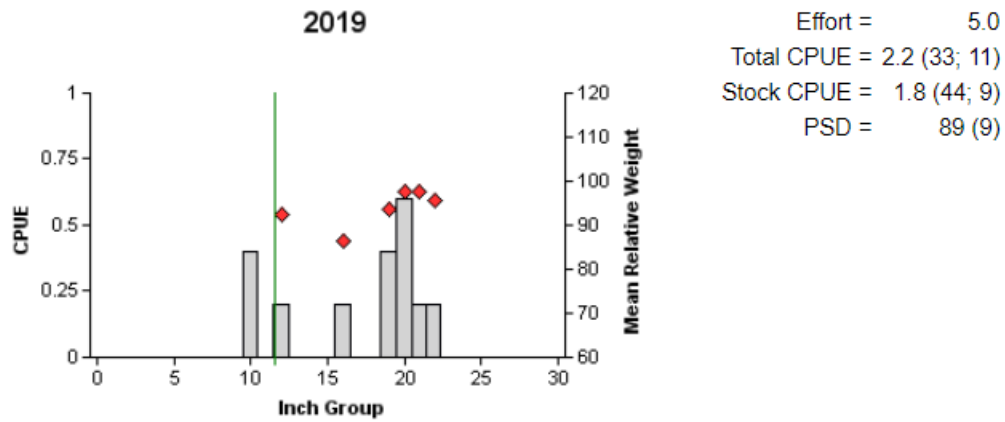


Figure 4. Number of Channel Catfish caught per series (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure) for fall hoop net survey, Mill Creek Reservoir, Texas, 2019. Vertical line indicates minimum length limit.

Largemouth Bass

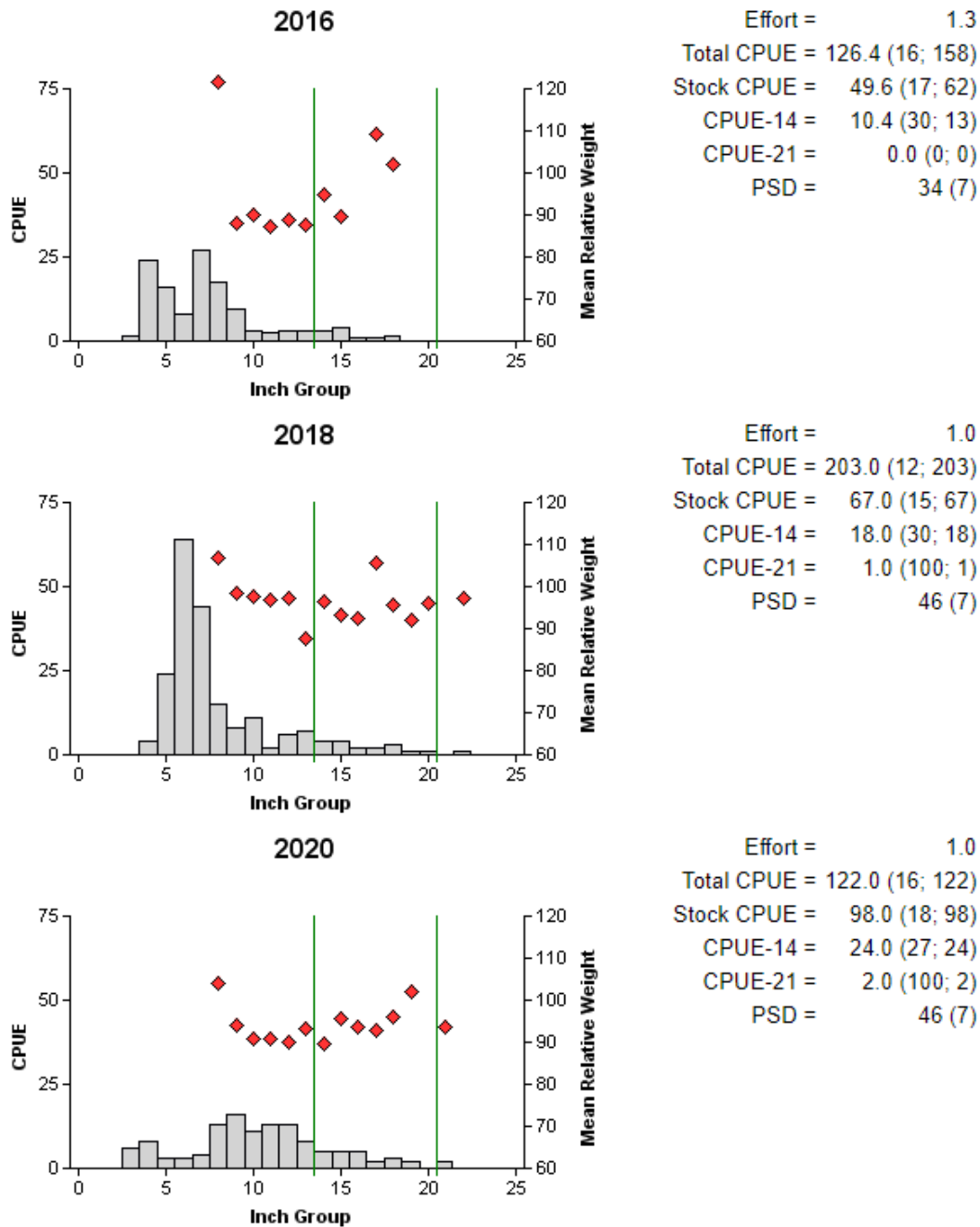


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mill Creek Reservoir, Texas, 2016, 2018, and 2020. The 2018 survey was for Largemouth Bass-only. Vertical lines indicate minimum and maximum limits of protective slot.

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Mill Creek Reservoir, Texas, 2008, 2012, 2016, and 2020. 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 an FLMB and an NLMB, Fx-F = second or higher generation hybrid between a FLMB and a NLMB with a higher percentage of FLMB alleles, Fx-N = second or higher generation hybrid between a FLMB and a NLMB with a higher percentage of NLMB alleles. Genetic composition was determined with micro-satellite DNA analysis.

Year	Sample size	Number of fish						% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	Fx-F	Fx-N	NLMB		
2008	30	1	2	27	-	-	0	52.0	3.3
2012	29	1	0	28	-	-	0	58.0	3.4
2016	30	0	1	7	15	7	0	59.0	0.0
2020	30	4	1	3	17	5	0	63.0	13.3

White Crappie

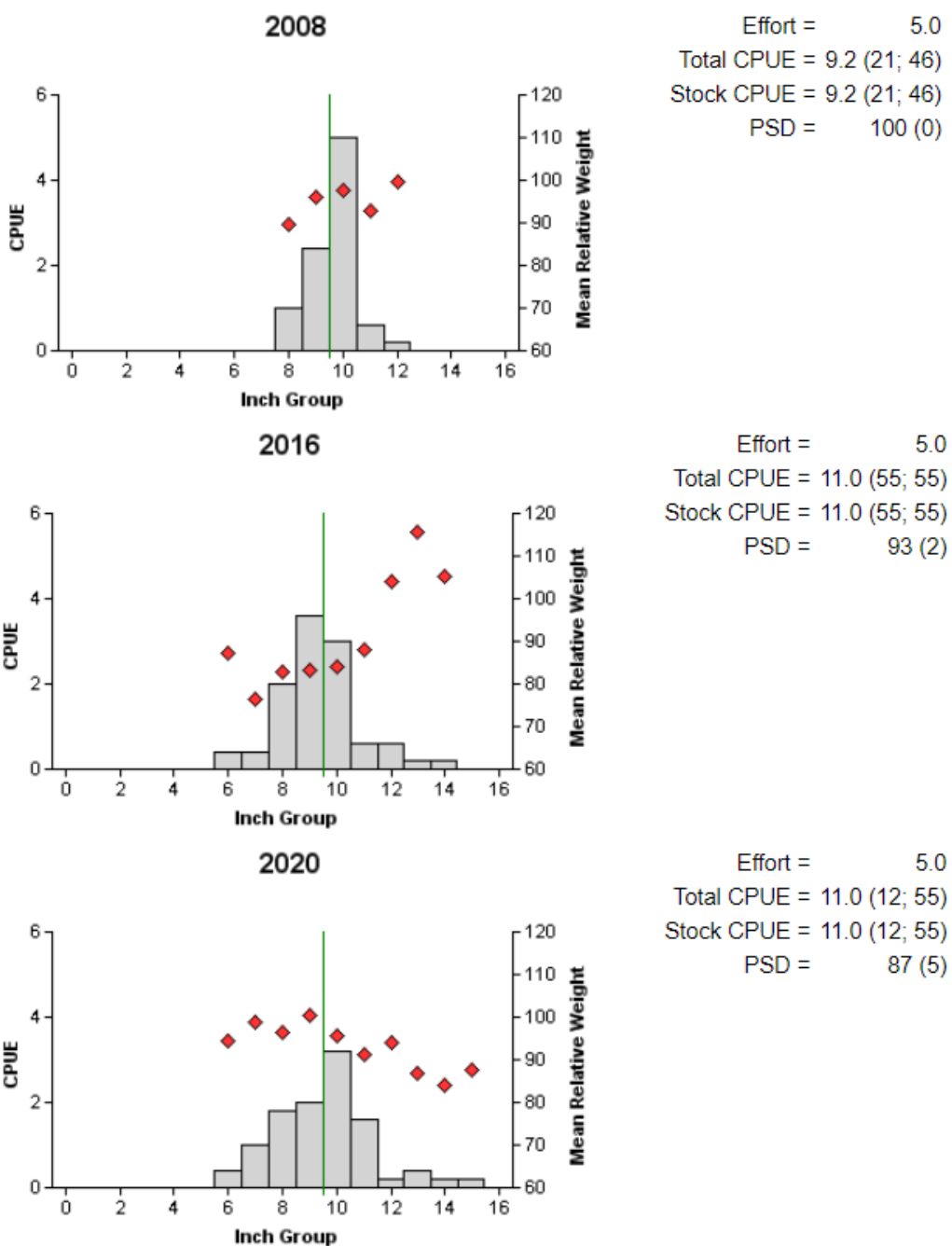


Figure 4. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Mill Creek Reservoir, Texas, 2008, 2016, and 2020. Vertical lines indicate minimum length limit.

Black Crappie

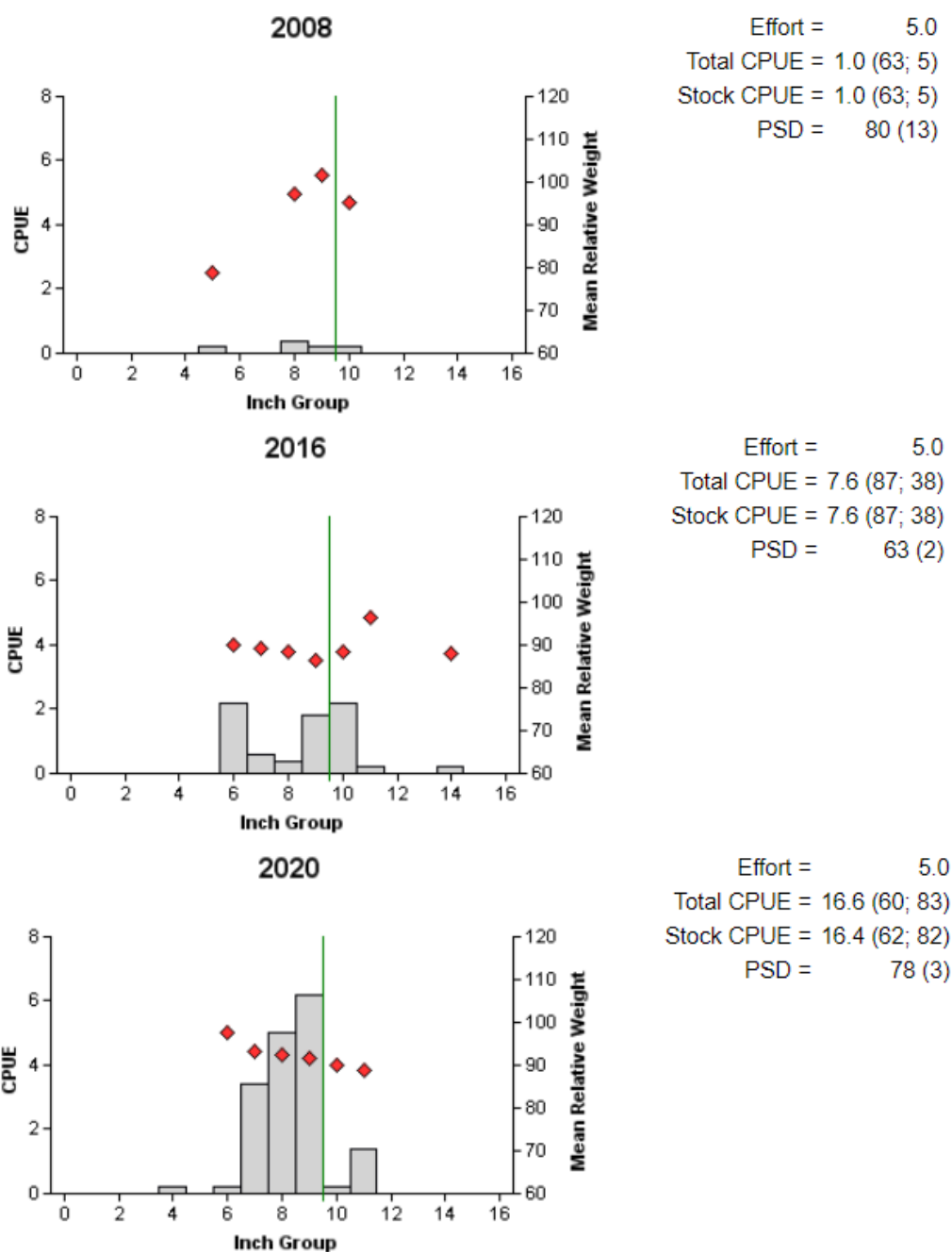


Figure 5. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Mill Creek Reservoir, Texas, 2008, 2016, and 2020. Vertical lines indicate minimum length limit.

Table 8. Proposed sampling schedule for Mill Creek Reservoir, Texas. Survey period is June through May.

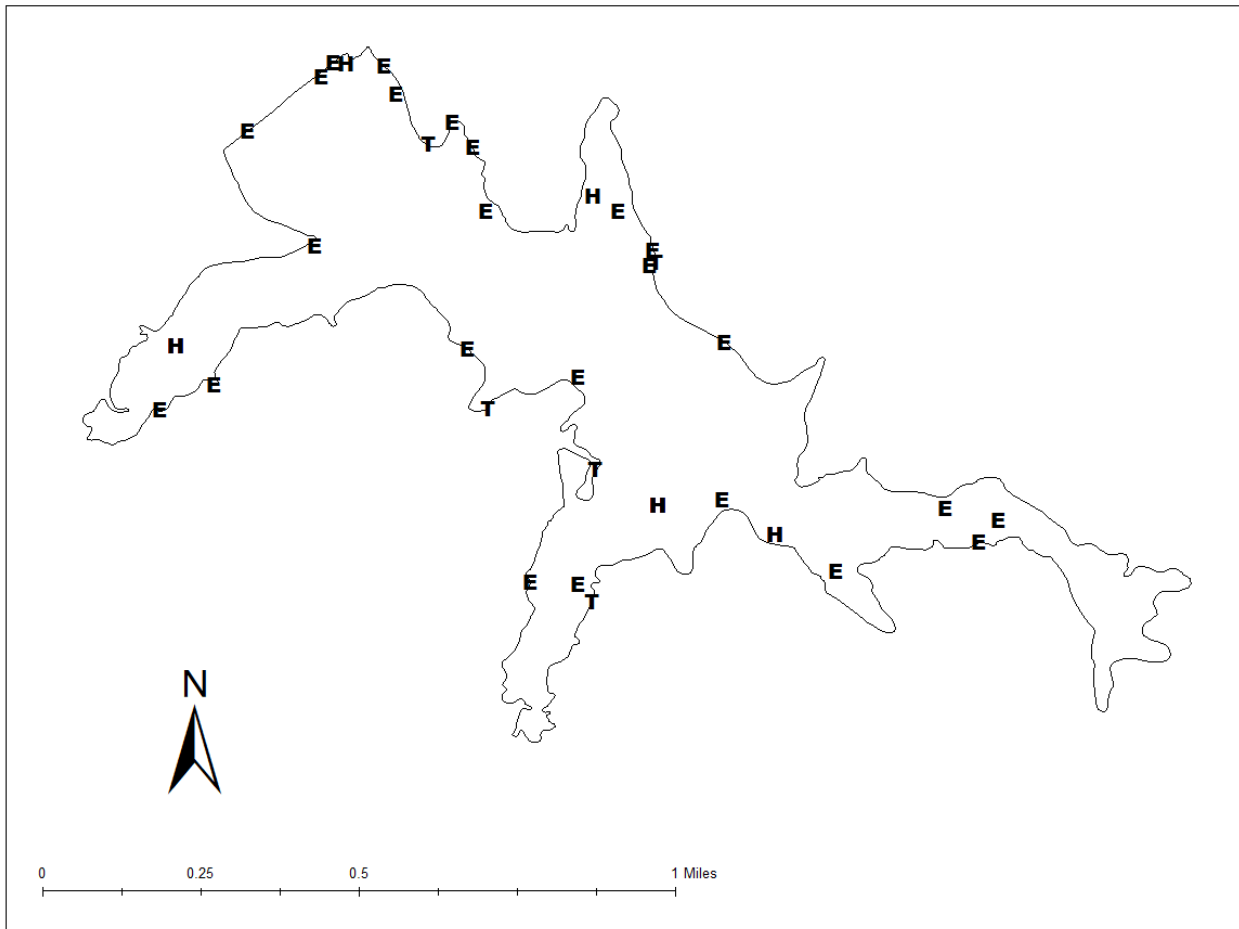
	Survey year			
	2021–2022	2022–2023	2023–2024	2024–2025
Angler Access				X
Vegetation		X		X
Electrofishing – Fall				X
Electrofishing – Spring	X			
Trap netting				X
Creel survey				X
Report				X

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 Mill Creek Reservoir, Texas, 2019–2020. Sampling effort was five series for hoop netting, five net nights for trap netting, and one hour for electrofishing.

Species	Hoop Netting		Electrofishing (2020)		Trap Netting	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad			112	112.0 (22)		
Threadfin Shad			149	149.0 (31)		
Channel Catfish	11	2.2 (33)				
Warmouth			21	21.0 (47)		
Bluegill			332	332.0 (23)		
Longear Sunfish			40	40.0 (24)		
Redear Sunfish			86	86.0 (24)		
Largemouth Bass			122	122.0 (16)		
White Crappie					55	11.0 (12)
Black Crappie					83	16.6 (60)

APPENDIX B – Map of sampling locations



Location of electrofishing (E), trap netting (T), and hoop netting (H) stations, Mill Creek Reservoir, Texas, 2018–2020. Water was approximately 2–3 feet below full pool at the time of the 2018 electrofishing survey and approximately full pool at the time of 2019–2020 surveys (no gauge station on reservoir).



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