Lake Crook

2018 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Contents

Survey and Management Summary

Fish populations in Lake Crook were surveyed in 2018 using electrofishing and in 2019 using gill netting. Historical data are presented with the 2018-2019 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: Lake Crook is a 1,060-acre impoundment located on Pine Creek in the Red River Basin approximately 2 miles north of Paris, Texas. Primary water uses included municipal water supply and recreation. Water level has remained within two feet of conservation pool since 2008. Lake Crook has moderate productivity. Habitat features consisted of natural shoreline and native vegetation.

Management History: Important sport fish include White Crappie and catfish. Blue Catfish were stocked in 2015 and Channel Catfish were stocked in 2018. The management plan from the 2015 survey report primarily focused on monitoring the sportfish and preyfish populations through a combination of standard and low-frequency electrofishing in 2018 and gill netting in 2019.

Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. Electrofishing catch rate of Gizzard Shad was moderate and 76% were available as prey to most sport fish. Electrofishing catch of Bluegill was low and all were less than 6-inches long.
- **Catfishes:** Blue and Channel Catfish were present in the reservoir. Blue Catfish were abundant and have the potential to provide angling opportunities.
- **Largemouth Bass:** Largemouth Bass were present in the reservoir in low densities, likely from a combination of turbid water and limited littoral habitat resulting in poor recruitment.
- **Crappie:** White Crappie have historically been abundant however traditional survey methods produced primarily small (<10 inches) fish. Anecdotal information suggest quality White Crappie are present in the reservoir.

Management Strategies: Consider stocking Blue Catfish fingerlings at 50/acre contingent upon the results of the 2020 low-frequency electrofishing survey; stocking will be recommended if survey fails to collect sub-stock length fish (<12 inches). Inform the public about the negative impacts of aquatic invasive species.

Introduction

This document is a summary of fisheries data collected from Lake Crook in 2018-2019. 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 2018-2019 data for comparison.

Reservoir Description

Lake Crook is a 1,060-acre impoundment constructed in 1923 on Pine Creek, a tributary of the Red River. It is located in Lamar county approximately 2 miles North of Paris, Texas and is operated and controlled by the city of Paris. Primary water uses included municipal water supply and recreation. Lake Crook was mesotrophic with a mean TSI cl-a of 48.12 (Texas Commission on Environment Quality 2018). Habitat at time of sampling consisted of natural shoreline and native emergent vegetation. Water level has remained within 2 feet of conservation pool since 2008 (Figure 1). Other descriptive characteristics for Lake Crook are in Table 1.

Angler Access

Lake Crook has two public boat ramps and no private boat ramps. Additional boat ramp characteristics are in Table 2. Shoreline access is limited to the city park and public fishing pier.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Bennett and Storey 2015) included:

1. Monitor the Blue Catfish population dynamics with low-frequency electrofishing in 2018 and gill netting in 2019.

   Action: Low-frequency electrofishing was canceled due to poor success on a similar reservoir a week prior but gill net survey was completed as scheduled in 2019.

2. Consider management stocking of Threadfin Shad to increase diversity of the forage base if risks of invasive species introductions can be minimized.

   Action: Threadfin shad were present in the last electrofishing survey and subsequently have not been stocked.

Harvest regulation history: Sport fish in Lake Crook are managed under statewide regulations (Table 3).

Stocking history: Lake Crook was stocked with White Bass in 1953, Blue Catfish in 2015 and Channel Catfish in 2018 (Table 4).

Water transfer: No interbasin transfers are known to exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Crook (TPWD unpublished). Primary components of the OBS plan are listed in Table 5. In 2018, 12 randomly selected electrofishing sites were sampled during daytime to increase sampling efficiency due to the turbid nature of the reservoir. Otherwise, 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 daytime electrofishing (1.0 hours 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.

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

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 CPUE and creel statistics.

Habitat – A vegetation survey was conducted in 2018. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Water level – Source for water level data was the United States Geological Survey (USGS 2019).

Results and Discussion

Habitat: Vegetation coverage has historically fluctuated, likely attributable to fluctuating water levels, high turbidity and poor substrate composition. Aquatic vegetation has increased in recent years, covering 23% of the reservoir in 2018; American lotus accounted for 21% (225 surface acres) of the total coverage (Table 6). Emergent species including bulrush and cutgrass covered approximately 1.7% of the reservoir shoreline.

Prey species: Electrofishing catch rates of Bluegill and Gizzard Shad were 82.0/h and 218.0/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad was moderate and similar to previous daytime electrofishing surveys, indicating that 76% of Gizzard Shad were available to existing predators (Figure 2). Total CPUE of Gizzard Shad was substantially higher than the previous daytime survey (8.0/h). Total CPUE of Bluegill was low and similar over the last two daytime surveys (range: 82.0/h-83.0/h), and size structure continued to be dominated by small individuals (Figure 3).

Catfish: The 2019 gill net catch rate of Blue Catfish was 10.6/nn and consisted primarily of fish ≤ 20 inches (PSD = 4; Figure 4); the 2015 survey contained a better size structure (PSD = 22). Several fish were collected from 20-34 inches in the 2015 survey, indicating the potential for larger (>20 inches) Blue Catfish production. While no catfish were collected in the 2011 gill net survey, the recent size structure and catch rate data suggest Blue Catfish natural reproduction and recruitment was occurring in Lake Crook; Blue Catfish were only stocked in 2015. Body condition was moderate in 2007 and 2015 (W_r range: 48-88; average W_r = 77) suggesting potential forage limitations.

The 2019 gill net catch rate of Channel Catfish was 2.2/nn, up from 0.2/nn in 2015 (Figure 5); no fish were collected in the 2011 gill net survey. While Channel Catfish exist in low density in Lake Crook, size structure remains good (PSD = 44); 37% of fish collected were ≥ 16 inches.

Largemouth Bass: The 2018 daytime electrofishing catch rate (21.0/h) was higher than the previous survey in 2014 (7.0/h) (Figure 6). High turbidity and poor littoral habitat continue to result in a low-density

Largemouth Bass population. The small sample size from recent surveys limits the merit of other population indices (PSD, W_r, length-at-age).

Crappie: White Crappie have historically been abundant in the reservoir; however, trap net data suggested the population predominately contained small fish. Several legal-length crappie were observed during the 2019 gill net survey, suggesting trap nets were not effectively sampling the crappie population in Lake Crook. Future crappie monitoring efforts are described in the objective based sampling plan below.

Fisheries Management Plan for Lake Crook, Texas

Prepared – July 2018

ISSUE 1: Largemouth Bass are present in the reservoir, however TPWD has never stocked Florida Largemouth Bass. Limited historical genetic data indicates a strong influence of Northern Largemouth Bass in the reservoir. Texas contains very few reservoirs dominated by pure Northern Largemouth Bass (NLMB) and Lake Crook could provide brood stock to hatcheries in the rare event that NLMB's are required.

MANAGEMENT STRATEGY

1. Attempt to collect fin clips from 30 Largemouth Bass for genetic analysis with electrofishing in Fall 2019.

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

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through the use of media and the internet, when appropriate.
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 (2019–2023)

Sport fish, forage fish and other important fishes

Sport fish in Lake Crook include White Crappie, Blue and Channel Catfish, and Largemouth Bass. Important forage species include Gizzard and Threadfin Shad, and sunfishes.

Low-density fisheries

Channel Catfish have historically been present in the reservoir as well, however gill net surveys have produced low and variable catch rates. The historical data suggests it would take 50+ net nights to estimate size structure or relative abundance with 80% confidence. Therefore, Channel Catfish will be monitored for presence/absence during the low-frequency electrofishing survey, or the 2023 gill net survey if needed.

Survey objectives, fisheries metrics and sampling objectives

White Crappie: Lake Crook has historically contained a abundant population of White Crappie; trap net catch rates from the last three surveys (2006 – 2014) ranged from 25.4/nn – 71.2/nn. However, the majority of the fish sampled were ≤ 6 inches and trap net surveys were canceled in 2014 due to poor size structure and believed poor fishing opportunities. While trap net survey results suggested the crappie population was stunted and primarily contained fish under harvestable size, the 2019 gill net survey contained numerous legal-length crappie in each net. A rod and reel survey will be conducted in the summer of 2019 to further investigate the presence of legal-length crappie in the reservoir and obtain a better understanding of the potential crappie fishery on Lake Crook. In addition to the cursory rod and reel survey, trap net surveys will resume in the fall of 2022. Five randomly selected trap nets will be set to monitor crappie population indices (relative abundance and size structure). The historically high trap net catch rates suggest no additional effort will be required to collect an adequate sample size (N ≥ 50) with acceptable survey precision (RSE ≤ 25).

Blue Catfish: It is unclear if the Blue Catfish population is still expanding, stable or decreasing. Historical data suggests over 15 net-nights may be necessary to estimate relative abundance, size structure and body condition with acceptable precision, however the limited importance of this fishery does not warrant intensive sampling (10+ net nights). Therefore, in the summer of 2022 Blue Catfish will be surveyed with low-frequency electrofishing. Fifteen randomly selected sites will be sampled for a minimum of 3 minutes each, with up to 5 more sites if necessary, to estimate relative abundance and size structure with acceptable precision. No additional electrofishing effort will be conducted if survey objectives are not met after a total sampling time of 1 hour. If the electrofishing produces poor results, Blue Catfish will be monitored with winter gill netting in 2023.

Largemouth Bass: Lake Crook has historically supported a low-density Largemouth Bass population; electrofishing catch rates have ranged from 0/h – 1.0/h from previous nighttime electrofishing surveys and 7/h – 21/h from recent daytime surveys. High turbidity has likely limited recruitment of bass within the reservoir. However, the increased catch rate observed in 2018 suggest the population still deserves monitoring. Twelve randomly selected daytime electrofishing sites will be sampled in the fall of 2022 to determine presence/absence of Largemouth Bass. No additional effort will be expended and the results of the 2022 survey will be used to determine future sampling efforts. If catch rates remain low and water quality conditions remain poor, electrofishing will be discontinued after the 2022 survey.

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Tables and Figures

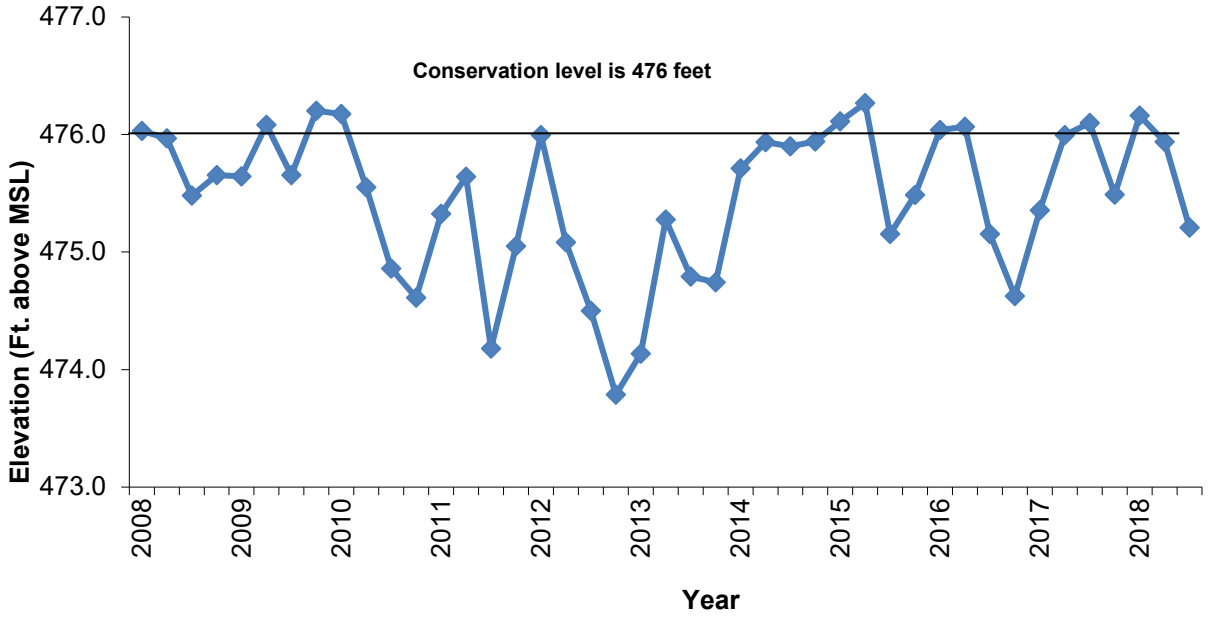


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Crook, Texas.

Table 1. Characteristics of Lake Crook, Texas.

Characteristic	Description
Year constructed	1923
Controlling authority	City of Paris
County	Lamar
Reservoir type	Tributary
Shoreline Development Index	3.4
Conductivity	111 µS/cm

Table 2. Boat ramp characteristics for Lake Crook, Texas July, 2018. Reservoir elevation at time of survey was 475 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft.)	Condition
East Ramp	33.72421 - 95.57044	Y	20	474	Shallow slope. Extension not feasible
West Ramp	33.72113 - 95.57761	Y	15	473	Excellent, no access issues

Table 3. Harvest regulations for Lake Crook, Texas.

Species	Bag Limit	Length limit
Catfishes: Channel and Blue, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Lake Crook, Texas. FGL = fingerling.

Species	Year	Number	Size
Blue Catfish	2015	107,118	FGL
Channel Catfish	2018	2,091	FGL
White Bass	1953	2,000	FGL

Table 5. Objective-based sampling plan components for Lake Crook, Texas 2018–2019.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Relative Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	
Bluegill [a]	Relative Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad [a]	Relative Abundance	CPUE–Total	
	Prey availability	IOV	N ≥ 50
Gill netting			
Blue Catfish	Relative Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
Channel Catfish	Relative Abundance	CPUE–stock	
	Size structure	PSD, length frequency	

[a] No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill and Gizzard Shad if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Survey of aquatic vegetation, Lake Crook, Texas, 2010–2018. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2010	2014	2018
American lotus	2.7(0.2)	69.2(6.5)	224.8(21.2)
Native emergent	14.1(1.3)	21.4(20)	18.1(1.7)

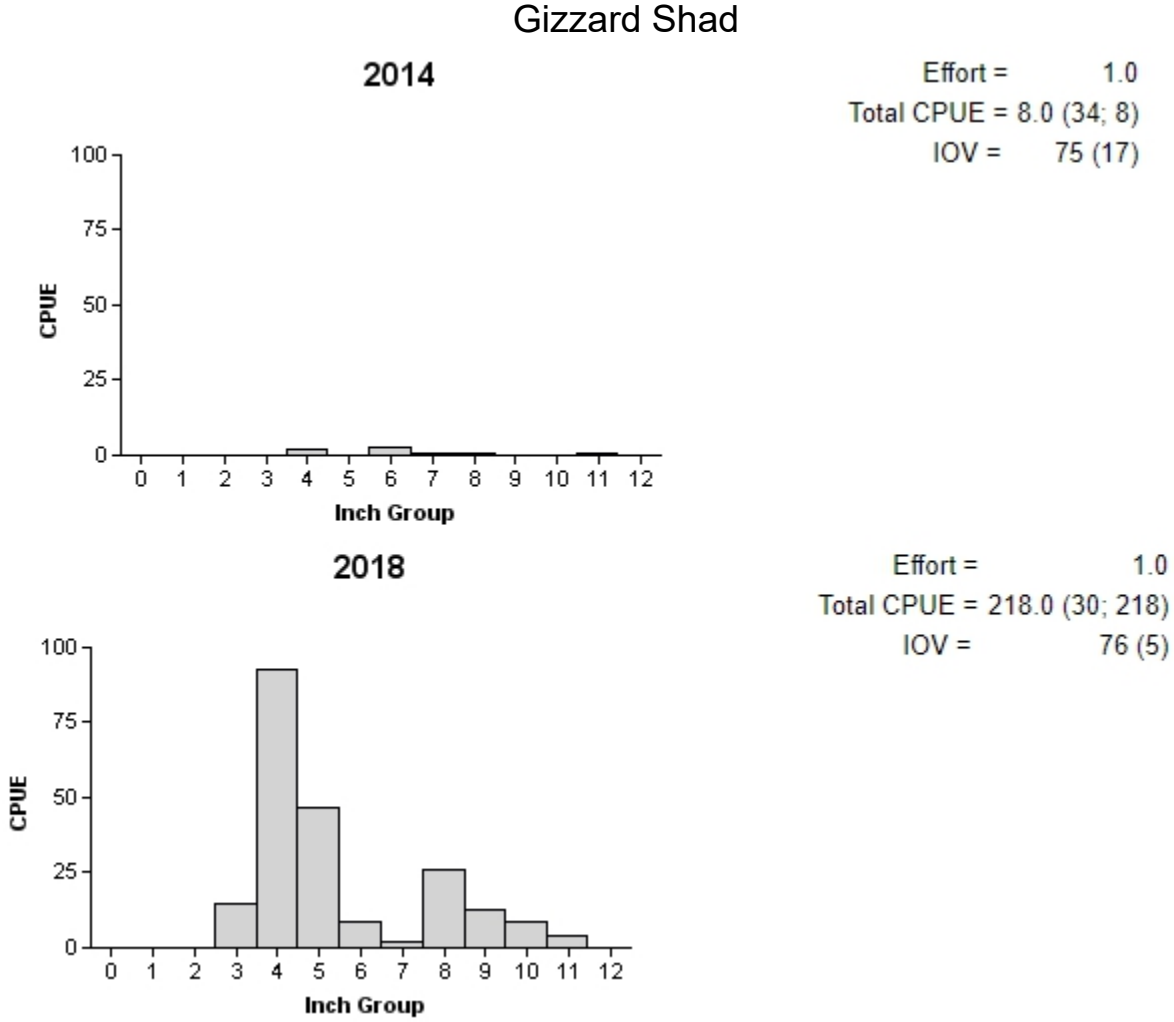


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for daytime fall electrofishing surveys, Lake Crook, Texas, 2014 and 2018.

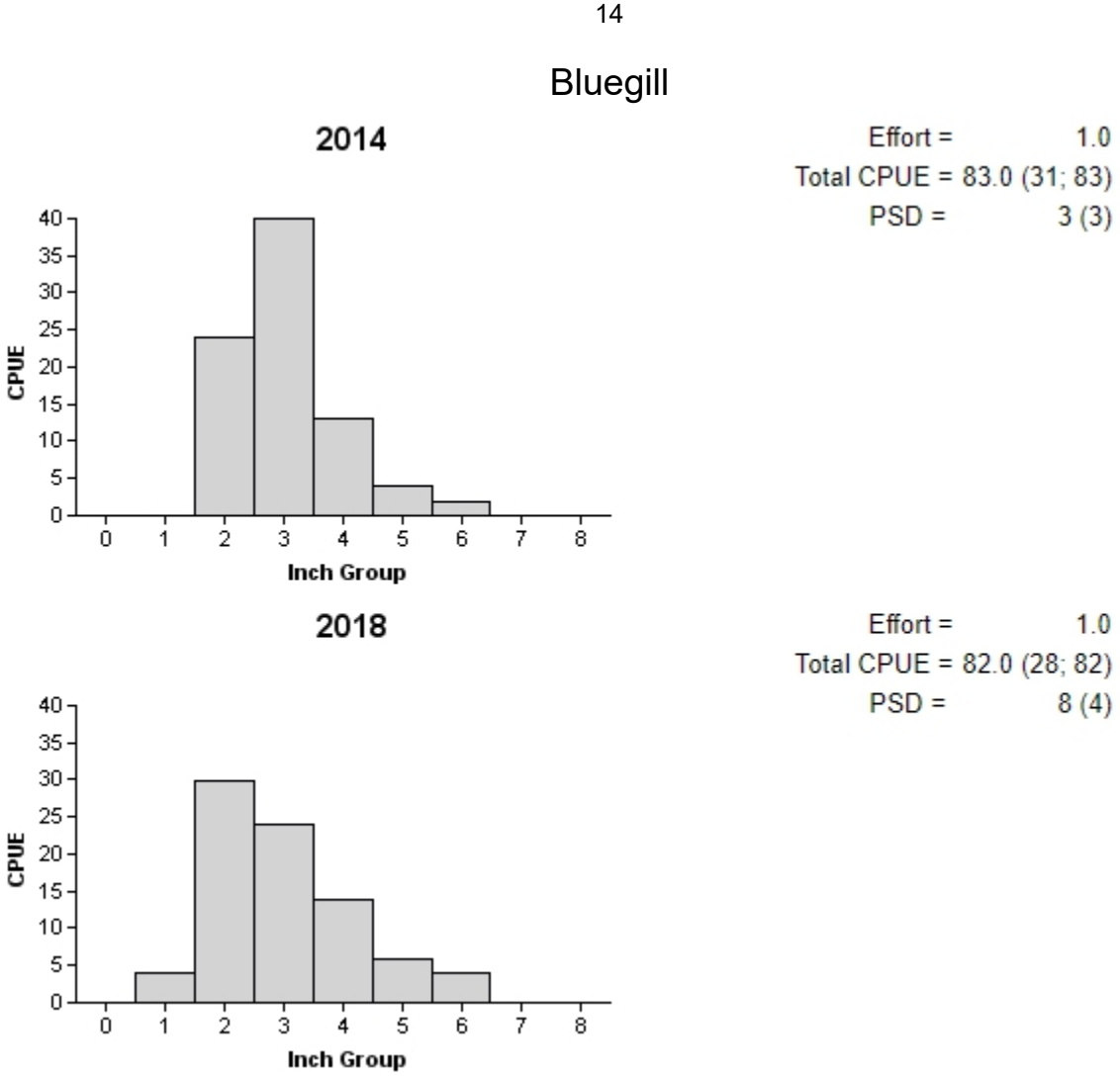


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for daytime fall electrofishing surveys, Lake Crook, Texas, 2014 and 2018.

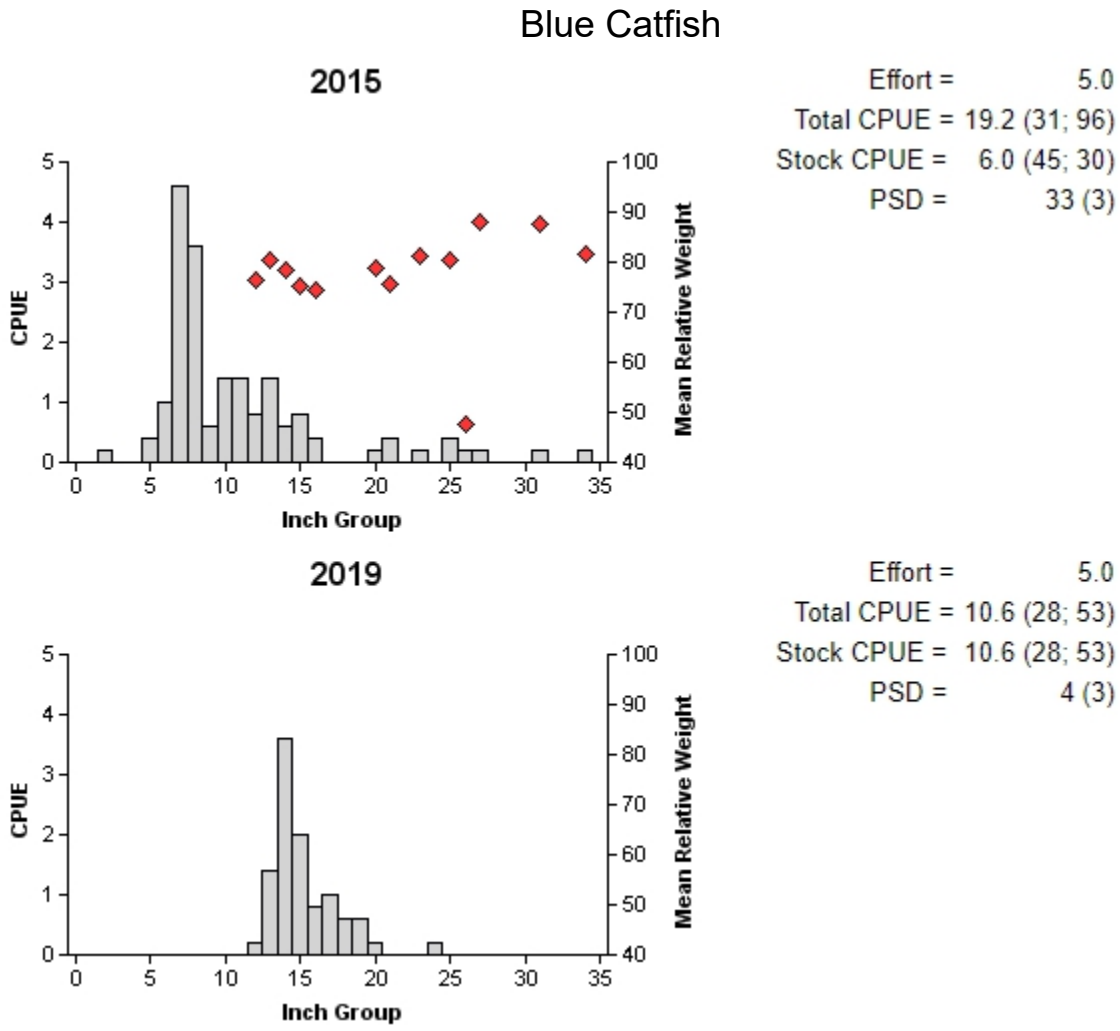


Figure 4. Number of Blue Catfish caught per net night (CPUE), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Crook, Texas, 2011 (no fish collected) 2015 and 2019.

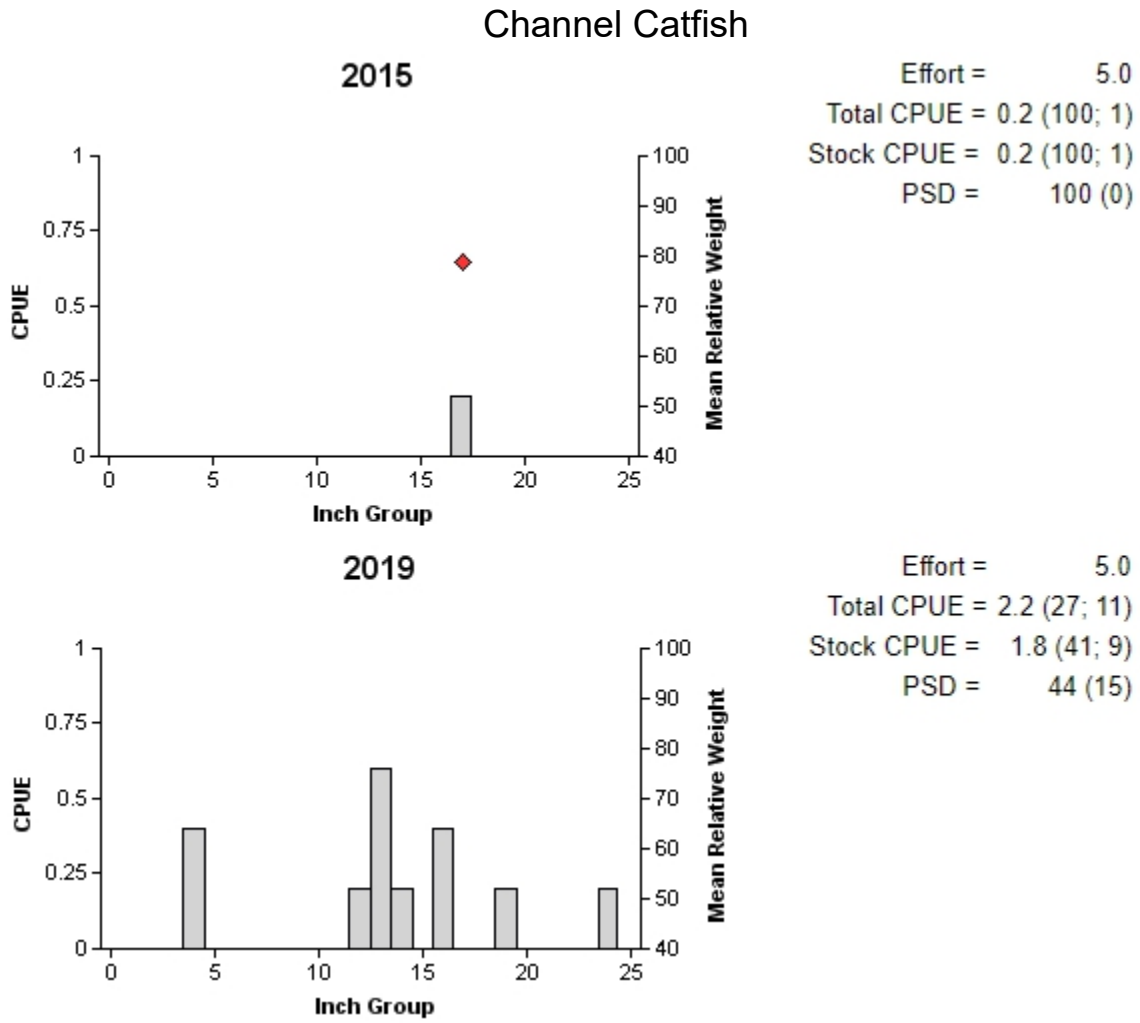


Figure 5 Number of Channel Catfish caught per net night (CPUE), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Crook, Texas, 2011(no fish collected), 2015 and 2019

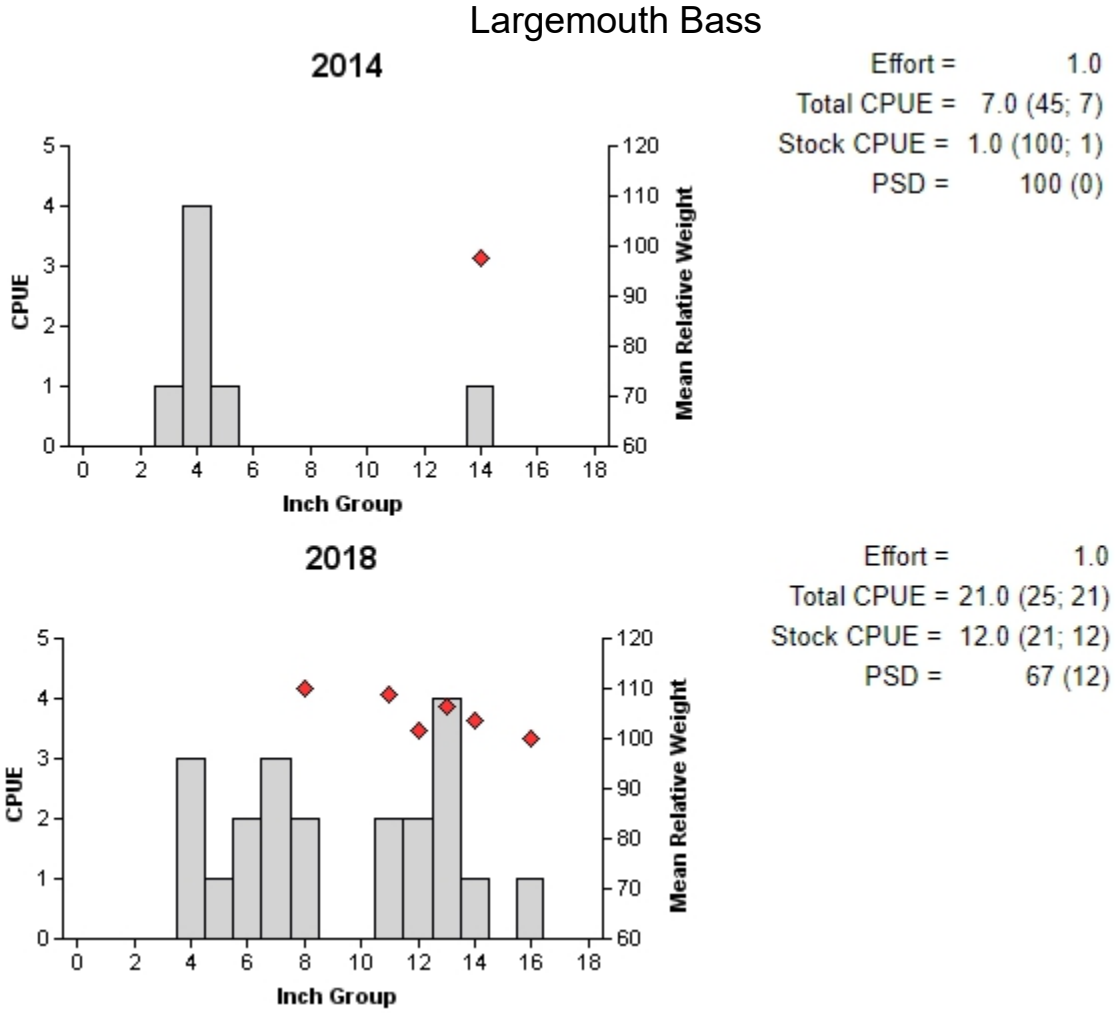


Figure 6. Number of Largemouth Bass caught per hour (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for daytime fall electrofishing surveys, Lake Crook, Texas, 2014 and 2018.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for Lake Crook, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

	Survey year			
	2019-2020	2020-2021	2021-2022	2022-2023
Angler Access				S
Vegetation				S
Day Electrofishing - Fall				S
Electrofishing – Low frequency				S
Gill netting				S*
Crappie Assessment (rod and reel)	A			
Trap netting				S
Report				S

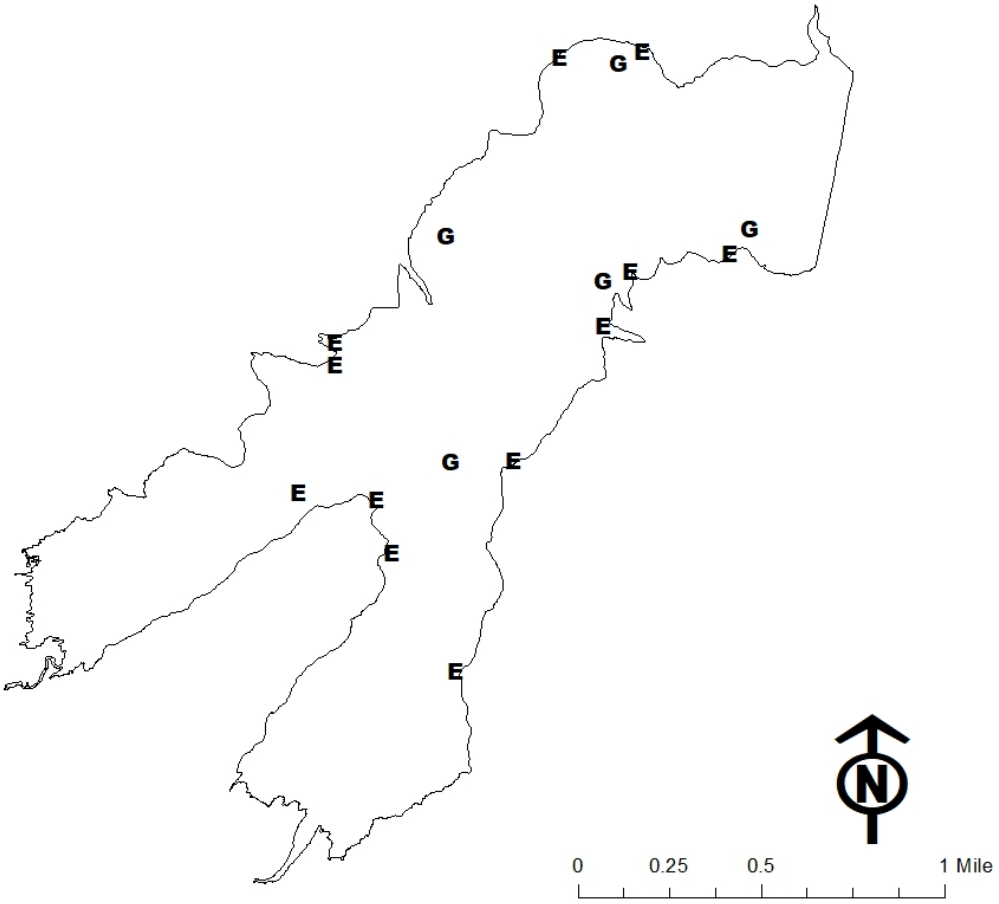
*Gill net survey will only be conducted if low-frequency electrofishing does not meet survey objectives outlined in OBS plan.

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 Lake Crook, Texas, 2018-2019. Sampling effort was 5 net nights for gill netting, and 1 hour for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			218	218.0 (30)
Threadfin Shad			41	41.0 (39)
Blue Catfish	10.6	53 (28)		
Channel Catfish	2.2	11 (27)		
White Bass	0.4	2 (61)		
Bluegill			82	82.0 (28)
Longear Sunfish			3	3.0 (72)
Redear Sunfish			7	7.0 (45)
Largemouth Bass			21	21.0 (25)

APPENDIX B – Map of sampling locations



Location of sampling sites, Lake Crook, Texas, 2018-2019. Gill net and electrofishing stations are indicated by G and E, respectively. Water level was near full pool at time of sampling.

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