

# Lake O' the Pines

## 2018 Fisheries Management Survey Report

### PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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## Contents

Contents .....	i
Survey and Management Summary .....	1
Introduction.....	2
Reservoir Description .....	2
Angler Access.....	2
Management History .....	2
Methods.....	4
Results and Discussion.....	5
Fisheries Management Plan for Lake O' the Pines, Texas.....	7
Objective-Based Sampling Plan and Schedule (2019–2023).....	8
Literature Cited.....	11
Tables and Figures .....	12
Water Level .....	12
Reservoir Characteristics .....	12
Boat Ramp Characteristics.....	13
Harvest Regulations .....	14
Stocking History.....	15
Objective Based Sampling Plan for 2018 - 2019 .....	16
Aquatic Vegetation .....	17
Directed Angler Effort .....	18
Total Fishing Effort and Fishing Expenditures.....	18
Gizzard Shad.....	19
Bluegill .....	20
Redear Sunfish.....	21
Channel Catfish.....	23
Largemouth Bass .....	26
Black Crappie .....	29
White Crappie.....	29
Proposed Sampling Schedule .....	33
APPENDIX A – Catch rates for all species from all gear types .....	34
APPENDIX B – Map of sampling locations.....	35
APPENDIX C – Reporting of creel ZIP code data .....	36

## Survey and Management Summary

Fish populations in Lake O' the Pines were surveyed in 2018 using electrofishing and dual-cod hoop nets and in 2019 using low-pulse electrofishing and tandem hoop nets. Anglers were surveyed from June 2018 through May 2019 with a creel survey. Historical data are presented with the 2018-2019 data for comparison. This report summarizes the results of the surveys and contains a fisheries management plan for the reservoir based on those findings.

**Reservoir Description:** Lake O' the Pines is a 16,269-acre reservoir located on Big Cypress Creek which was constructed in 1956 by the U.S. Army Corps of Engineers (USACE) for flood control, municipal and industrial water supply, and public recreation. Habitat features consisted of inundated timber, brush, creek channels, and riprap. Native aquatic vegetation covered about 3% of the reservoir in 2018, while non-native invasive species (i.e. hydrilla, water hyacinth, and giant salvinia) accounted for 1.5% of the reservoir surface.

**Management History:** Important sport fish include Largemouth Bass, Channel Catfish, sunfish, and crappie. All fish species except for crappie are currently managed under statewide harvest regulations. From 1 December until the last day of February, anglers are required to keep the first 25 crappie they catch each day regardless of size to minimize excess mortality due to fish being caught in deep water.

### Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. Electrofishing catch of Gizzard Shad has increased over the last few surveys with many being available as prey to most sport fish. The relative abundance of Bluegill was high providing good forage for sport fish. Electrofishing catch rate of Redear Sunfish decreased in 2018, though many caught were 7 inches or greater, providing an excellent angling opportunity.
- **Catfishes:** An increase in Channel Catfish greater than 12 inches was observed in tandem hoop nets since 2015. Low frequency electrofishing was conducted to survey Flathead Catfish, but none were collected.
- **White Bass:** White Bass catch rates in gill nets have historically been indicating low relative abundance. Few anglers have been documented targeting White Bass during previous creel surveys, and no direct angling pressure was observed this year. While fish can be caught during their spawning run, only a negligible fishery exists for them during the remainder of the year. Therefore they were not sampled in 2018/2019.
- **Largemouth Bass:** Largemouth Bass were abundant in 2018 with an increase in both small (<8 inches) and stock-sized (>8 inches) fish compared to previous years. Fifty percent of targeted angling effort was directed towards Largemouth Bass in the 2018/2019 creel survey.
- **Crappie:** Historically, crappie catches in standard trap nets were poor. In 2018, crappie were surveyed using dual-cod hoop nets and in 2019 with tandem hoop nets. The dual-cod nets caught more crappie than tandem hoop nets and their use may warrant further investigation. Crappie were the second highest targeted species by anglers during the 2018/2019 creel survey.

**Management Strategies:** We will request Florida Largemouth Bass stocking every other year. Additionally, electrofishing surveys in 2020 and 2022 will be used to monitor Largemouth Bass and prey fish populations. We will continue to assess the feasibility and practicality of using Louisiana Department of Wildlife and Fisheries (LDWF) dual-cod hoop nets for sampling crappie. Tandem hoop netting for Channel Catfish and low frequency electrofishing for Flathead Catfish will be conducted in 2022. Finally, annual vegetation surveys will be conducted to monitor invasive plant species.

## Introduction

This document is a summary of fisheries data collected from Lake O' the Pines 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 O' the Pines is a 16,269-acre impoundment located in Marion, Morris, Upshur, and Camp counties on Big Cypress Creek. It was constructed in 1956 by the U.S. Army Corps of Engineers (USACE) for flood control, municipal and industrial water supply, and public recreation. Shoreline length is 144 miles with a shoreline development index of 7.5. Normal annual water level fluctuation is 2-3 feet; however, the reservoir experienced a drought in 2006 and 2011 to 2013. High water levels have been documented in 2009, 2015, and 2019 (Figure 1). Other descriptive characteristics for Lake O' the Pines are listed in Table 1.

### Angler Access

Lake O' the Pines has 16 boat ramps operated by USACE and 9 boat ramps that are either county-controlled or privately owned. Bank angling access is available at numerous USACE parks. Additional boat ramp characteristics are recorded in Table 2.

### Management History

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Bister and Wright 2015) included:

1. Conduct annual surveys for invasive vegetation and work with USACE to develop management strategies.
 

**Action:** Annual invasive aquatic species surveys have been conducted as well as periodic inspections of high-use boat ramps throughout the year. USACE staff surveyed boat ramps and boat trailers for the presence of invasive species. When found, pictures of the invasive plants are taken, plants are removed and disposed, and a notification was placed on the windshield of the offending vehicle stating that the plants were found and that the Texas Parks and Wildlife Department (TPWD) Game Warden was notified. Citations were then issued accordingly. A memorandum of understanding (MOU) was entered into by TPWD, USACE, and the Northeast Texas Municipal Water District (NETMWD) to create an invasive species management task force.
2. Continue to monitor and manage the Largemouth Bass population with electrofishing, genetic sampling, and stocking of Florida-strain Largemouth Bass.
 

**Action:** Florida Largemouth Bass were stocked in 2015 and 2017. Genetic analysis was not conducted. Additional electrofishing was conducted in 2016 to monitor Largemouth Bass and important prey species populations.
3. Investigate ways to better monitor crappie populations in Lake O' the Pines.
 

**Action:** Dual-cod hoop nets from Louisiana Department of Wildlife and Fisheries (LDWF) were used during fall 2018 and baited tandem hoop nets in spring 2019 to investigate alternative methods to sample the crappie populations.
4. Inform the public about fisheries related information.
 

**Action:** Lake O' the Pines fisheries information has been released to the public through traditional media, social media, and public presentations.
5. Develop strategies to inform anglers about Bighead Carp in Big Cypress Bayou below Lake

O' the Pines and take steps to avoid transport of these invasive fish to other waters.

**Action:** Informational signs have been posted and maintained at the spillway. Environmental DNA has been collected in collaboration with Texas Tech University above and below the dam at Lake O' the Pines to monitor for the presence/absence of Asian carp (Barnes 2017).

**Harvest regulation history:** Sport fishes in Lake O' the Pines are currently managed with statewide regulations, except for the winter crappie fishery (Table 3). A special regulation for White Bass and Palmetto Bass (10-inch minimum length limit, daily aggregate bag limit of 25 fish of which only 5 may be 18 inches or greater) was removed after Palmetto Bass stocking was discontinued in 2000. Largemouth Bass have been managed with a 14-inch minimum length and 5-fish daily bag since 1986 and other black bass were included under this regulation in 1988. The minimum length limit on Spotted Bass was removed in 2000, but the daily bag for black bass in any combination remained at 5 fish/day. The 12-inch minimum length limit and 25 fish daily bag for Channel and Blue Catfish (in any combination) has been in effect since 1994. The minimum length limit for Flathead Catfish was reduced from 24 inches to 18 inches in 1994 with a 5-fish daily bag limit on Flathead Catfish. In 1991, a special winter season regulation for crappie was implemented, which states that for Black and White Crappie caught from 1 December through the last day of February, there is no minimum length limit, the daily bag limit is 25 fish in any combination, and all crappie caught must be retained.

**Stocking history:** Channel Catfish stockings in the late 1960s and 1970 established a self-sustaining population. Blue Catfish were stocked in 1971 and 1994, but a self-sustaining population was not established. Florida-strain Largemouth Bass were most recently stocked in 2011, 2013, 2015, and 2017. Palmetto Bass were stocked from 1977 to 2000 to create and sustain the fishery but was discontinued due to low angler utilization. The complete stocking history is in Table 4.

**Vegetation/habitat management history:** Historically, hydrilla has not caused any access issues at the reservoir and has not required treatment. Alligatorweed and water hyacinth have recently required treatment to prevent excessive growth and provide access to boaters in the Lone Star Landing area of the reservoir. The USACE conducted herbicide treatments in 2014 and 2015 for both species while alligatorweed flea beetles were released by USACE in 2015. An aquatic vegetation management plan was developed by TPWD, USACE, and NETMWD in January 2015 to guide invasive plant management in the reservoir. This plan also included the management of giant salvinia that has spread in 2017 on Lake O' the Pines. USACE and NETMWD have utilized herbicide application and the introduction of giant salvinia weevils to minimize the further spread of giant salvinia.

**Water transfer:** Lake O' the Pines provides water for eight cities, numerous rural water districts, and several steel manufacturers and electricity generators. Current authorized inter-basin transfers include the City of Longview and Brandy Branch Reservoir (American Electric Power), both of which are in the Sabine River watershed.

## Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake O' the Pines (TPWD unpublished). Primary components of the 2018-2019 OBS plan are listed in Table 5. All survey sites were randomly selected and conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

**Electrofishing** – Largemouth Bass, sunfish, Gizzard Shad, and Threadfin Shad were collected by fall nighttime 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. Ages for Largemouth Bass were determined using otoliths from 13 randomly-selected fish (range 13.0 to 14.9 inches).

**Low-frequency electrofishing** – Flathead Catfish were experimentally sampled by spring daytime low-frequency electrofishing at 13 stations. The minimum duration of electrofishing at each station was 3 minutes. CPUE for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

**Tandem hoop nets** – Channel Catfish were collected using 10 tandem hoop-net series in the spring at 10 stations. Nets were baited with soap and deployed for 2-night soak durations. CPUE for tandem hoop netting was recorded as the number of fish caught per tandem hoop net series (fish/series).

**Dual-cod hoop nets** -- Crappie were collected using dual-cod hoop nets during the fall in cooperation with the Louisiana Department of Wildlife and Fisheries (LDWF) to gauge the nets efficiency of capturing crappie. LDWF dual-cod hoop nets were 16 feet long with a front hoop diameter of 3.5 feet. Openings of each hoop net faced each other with a 30-foot lead between the nets. Leads between the two nets were 3.5 feet in height with a mesh size of 1.0 inch with a twine size of #15. The bottom line is #30 lead core line and the top line is 3/16 inch braided propylene. Foam floats (2" x 1.5") are spaced 3 feet apart along the top line. Each net has 7 hoops with the first 5 being fiberglass and the last two being metal. The mesh size is a 1.0 inch bar and tied with a #15 nylon twine. Nets were set perpendicular to the shoreline starting in about 20 feet of water. Five nets were set at biologist-determined stations for a 2-night soak. CPUE for dual-cod hoop netting was recorded as number of fish caught per dual-cod hoop net set (fish/set). Ages for Black and White Crappie were determined using otoliths from 13 randomly selected fish (range 9.0 to 10.9 inches).

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

**Creel survey** – An annual roving creel survey was conducted from June 1<sup>st</sup>, 2018, through May 31<sup>st</sup>, 2019. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

**Habitat** – Vegetation surveys were conducted in 2014–2018 to monitor coverage of invasive plants. 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 2018).

## Results and Discussion

**Habitat:** The majority of the reservoir shoreline perimeter consisted of natural shoreline with no perceived changes since the structural habitat survey conducted in 2010 (Bister 2011). Native vegetation covered about 3.3% of the reservoir's surface area compared to 10.9% in 2014 (Bister and Wright, 2015). Native floating-leaved vegetation remained the dominant native vegetation type in 2018. Non-native vegetation covered about 1.5% of the surface area (Table 6). This was mostly hydrilla, which has expanded coverage from 191 acres in 2017 to 249 acres in 2018. No water hyacinth was found on Lake O' the Pines during the 2018 survey but will likely return in future years from seeds present in the reservoir.

Giant salvinia was discovered on Lake O' the Pines near boat ramp access in 2014 but did not establish until 2017 when about 28 acres was discovered (<1 % of the total surface area of Lake O' the Pines). The USACE and the Northeast Texas Municipal Water District (NETMWD) began treatment with herbicides and giant salvinia weevils to mitigate its spread. Additionally, the cold winter in 2017-2018, prevented much of the giant salvinia from re-growing on Lake O' the Pines and <1.0 acre was observed.

**Creel:** Directed fishing effort by anglers in Lake O' the Pines was greatest for Largemouth Bass (52.5%) followed by crappie species (24.5%; Table 7), which was similar to percentages during the 2010/2011 creel survey. Total fishing effort for all species and direct expenditures at Lake O' the Pines decreased from the 2010/2011 creel survey (267,245 hrs, \$1,604,036, respectively) to the 2018/2019 survey (180,757 hrs, \$1,219,903, respectively; Table 8). Anglers traveled from great distances to fish at Lake O' the Pines as evidenced by angler ZIP code data (Appendix C).

**Prey species:** Electrofishing catch rates for Gizzard Shad were 303.0/h in 2018 which increased from 2014 (225.0/h) and 2016 (236.0/h; Figure 2). The index of vulnerability (IOV) has been stable within the last three surveys, with approximately 50% of Gizzard Shad available for predators (Figure 2). Bluegill were the dominant prey species available in Lake O' the Pines. Catch rates for Bluegill were similar between 2018 (775.0/h) and 2016 (830.0/h), but were higher than rates observed in 2014 (560.0/h; Figure 3). In 2018, the size structure of Bluegill was dominated by smaller individuals ( $\leq 4$  inches) with no Bluegill over 8 inches observed. Catch rates for Redear Sunfish were reduced from 133.0/h in 2016 to 54.0/h in 2018 (Figure 4). The size structure of Redear Sunfish consisted of mostly larger fish ( $\geq 5$  inches; Figure 4).

**Channel Catfish:** The tandem hoop net catch rate of Channel Catfish was 59.4/series in 2019. There was an increase in the catch rate from spring 2015 to spring of 2019 particularly in stock-size fish  $\geq 12$  inches (Figure 5). Body condition for Channel Catfish was slightly improved from 2015 to 2018 with relative weights of  $\geq 90$  for most inch groups indicating adequate food availability. Directed fishing effort, catch per hour, and total harvest for Channel Catfish decreased from the numbers observed in 2010/2011 (Table 10). Anglers fishing for Channel Catfish continue to be harvest oriented as only 28% of the legal-sized fish were released. However, Channel Catfish angling catch rate and total number harvested in 2018/2019 significantly decreased compared to those in the 2010/2011 survey (Table 10). The majority of Channel Catfish harvested were between 12 and 17 inches (Figure 6).

**Flathead Catfish:** No Flathead Catfish were caught during low frequency electrofishing on Lake O' the Pines. During this time, the reservoir was 12 feet above conservation pool elevation during the time of the survey which may have impacted the survey results. Five Flathead Catfish were captured during our tandem hoop net survey. It is hypothesized that the Flathead Catfish caught were foraging on sunfish captured in the tandem hoop nets as opposed to being attracted to the soap bait. The five Flathead Catfish caught in the tandem hoop nets ranged from 25 – 35 inches in length and 15 – 23 pounds in weight.

**Largemouth Bass:** The electrofishing catch rate of Largemouth Bass in 2018 (202.0/h) was similar to 2014 (201.0/h; Figure 7) but increased from 2016 (98.0/h). Comparatively, catch rates of stock-length Largemouth Bass (8 inches) increased from 2014 to 2018 (2018 = 117.0/h; 2016 = 73.0/h; 2014 = 69.0/h; Figure 7). Largemouth Bass growth rates were fast with the average age of 14-inch Largemouth Bass (13.0 – 14.8 inches) being 2.5 years (N = 13, Range = 1 – 4). Though, the growth has slowed since 2014 when Bister and Wright (2015) found the average 14-inch Largemouth Bass to be 1.4 years. Body

condition was similar between 2018 and 2016 with a moderate condition for all size classes (mean relative weight > 85; Figure 7); however, the condition has decreased from 2014 when all size classes had a relative weight  $\geq 90$ .

There was less effort expended in the 2018/2019 creel survey (86,766 h) compared to the previous survey conducted in 2010/2011 (126,520 h). Catch rate (number/h) was consistent between the 2018/2019 survey (1.02 fish/h) and the 2010/2011 survey. There was a decrease in the estimate of non-tournament fishing effort and subsequently a decrease in the number of fish harvested per acre. Largemouth Bass total harvest in 2018/2019 was 2,111 fish (Table 11). The release of legal-size fish by non-tournament anglers increased in 2018/2019 (95%) from 2010/2011 (86%). The length range of harvested fish was from 14 – 20 inches with the majority being 14 or 15 inches (Figure 8).

**Crappie:** Crappie populations were surveyed in 2018 with dual-cod hoop nets and in 2019 with tandem hoop nets. While anecdotal information suggests that baited tandem hoop nets can be effective at capturing crappie in other reservoir systems, they were not as effective in Lake O' the Pines. Of the 10 tandem hoop net series deployed, 15 Black Crappie (length range: 8.2 – 11.3 inches) and 2 White Crappie (length range: 15.6 – 14.0 inches) were captured.

The dual-cod hoop nets were efficient at capturing Black Crappie with a catch rate of 48.4/set. The majority of Black Crappie captured were  $\geq 9$  inches (Figure 9) and no Black Crappie  $\leq 6$  inches were observed. This is most likely due to the larger mesh sized of the nets. The dominance of larger size classes likely resulted in an inflated PSD of 99 (Figure 9). The catch rate of White Crappie in the dual-cod nets (4.2/set; Figure 10) but net locations were limited to lower part of the reservoir and may not have sufficiently sampled the White Crappie population throughout the entire water body. This sampling strategy obtained the targeted number of crappie needed for age and growth without resorting to angler catches as was historically required (Bister and Wright, 2015). Growth of Black Crappie was good at Lake O' the Pines. Average age at 10 inches (9.0 - 10.8 inches) was 1.7 years ( $N = 13$ , range = 1 – 3 years). This growth rate has increased since 2014 when Bister and Wright (2015) observed an average age of 3.2 years for 10-inch Black Crappie.

The amount of directed fishing effort for crappie decreased in the 2018/2019 survey (40,020 h) compared to the 2010/2011 survey (90,888 h; Table 12). Additionally, the total harvest decreased from 119,942 fish in 2010/2011 to 65,651 fish in 2018/2019. There was a slight increase in the total catch per hour in 2018/2019 (2.75 fish/h). The majority of Black and White Crappie harvested in 2018/2019 were  $\geq 10$  inches (Figures 11 and 12).

# Fisheries Management Plan for Lake O' the Pines, Texas

Prepared – May 2019

**ISSUE 1:** Lake O' the Pines has experienced infestations of invasive aquatic plants. In the past, giant salvinia was discovered at two boat ramps on the reservoir. In recent years, larger mats of giant salvinia have been observed in northern sections of the reservoir. The USACE and the NETMWD have reduced the spread of giant salvinia through spraying and giant salvinia weevils. Regular monitoring will be conducted to identify future spread of giant salvinia, hydrilla, water hyacinth, and alligatorweed also occur in the reservoir. The coverage of alligatorweed and water hyacinth has the potential to cause boater access issues and has been treated by the USACE in recent years. Access restrictions due to these invasive plants should be monitored. An aquatic vegetation management plan was developed in January 2015 to guide nuisance species management in the reservoir.

## MANAGEMENT STRATEGY

1. Maintain communication with the USACE regarding invasive aquatic plant infestations.
2. Review and update Aquatic Vegetation Management Plan annually.
3. Work with USACE and NETMWD to develop aquatic vegetation treatment proposals as necessary to manage nuisance aquatic plant species.
4. Conduct an annual survey of invasive aquatic plants in the reservoir.

**ISSUE 2:** Lake O' the Pines has a quality Largemouth Bass fishery and has demonstrated the ability to produce trophy fish. Three Toyota ShareLunkers have come from Lake O' the Pines since 2010 with the most recent being a 13.23 lb fish caught in 2013. The reservoir is popular for big bass fishing including the KYKX Big Bass Bonanza, which continues to be a big tournament that draws hundreds of anglers to Lake O' the Pines for the weekend. In order to maintain the trophy potential of the Largemouth Bass fishery, supplemental stocking of Florida Largemouth Bass (FLMB) should be conducted. In addition, supplemental electrofishing surveys should be conducted to monitor the Largemouth Bass and prey fish populations.

## MANAGEMENT STRATEGY

1. Conduct electrofishing survey in fall 2020 and 2022 to monitor Largemouth Bass and prey species populations.
2. Request FLMB stocking every other year at a rate of 1,000 fish/km of shoreline beginning in 2019.

**ISSUE 3:** Lake O' the Pines supports a popular crappie fishery. However, traditional trap netting techniques have not been successful in collecting reliable data to monitor the populations.

## MANAGEMENT STRATEGY

1. Continue to investigate the use, efficiency, and need of dual-cod end hoop nets for crappie monitoring.

**ISSUE 4:** Bighead Carp were discovered in the spillway below Lake O' the Pines during fall 2010. Additional Bighead Carp were removed from the spillway during a dewatering operation in spring 2011. Currently, the dam at Lake O' the Pines is a barrier to the upstream movement of Bighead Carp. Bighead Carp are invasive and pose a risk to the ecosystem and fisheries of Lake O' the Pines. Anglers should be aware of the presence of this invasive species and its threat so they will not transport them to other waters.

#### MANAGEMENT STRATEGY

1. Continue to work with the USACE to maintain signage at the Lake O' the Pines spillway to alert anglers of the presence of Bighead Carp and the environmental threat they pose to surrounding waters.
2. Have sampling crews be alert to the potential encounter of Asian carp during routine and non-routine sampling in Lake O' the Pines, the spillway, and in downstream areas.

**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. 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. Effective July 1, 2014 boaters are required to drain all water from boats, live wells, and bait buckets when leaving the reservoir to prevent the spread of invasive aquatic species. Personally-caught live bait cannot be transported from the reservoir where the fish were caught. Bighead Carp have been documented in the Big Cypress Bayou in the past; however, subsequent investigations could not document their presence. Bighead Carp abundance is low enough to not cause any issues at this time.

#### MANAGEMENT STRATEGY

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) 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 fishes in Lake O' the Pines include Largemouth Bass, White Crappie, Black Crappie, Channel Catfish, and Flathead Catfish. Known important forage species include Bluegill, Redear Sunfish, Gizzard Shad, and Threadfin Shad. The proposed sampling schedule to meet the following OBS plan can be found in Table 13.

### Low-density or underutilized fisheries

White Bass are present in Lake O' the Pines, but population abundance has been low. Additionally, past creel surveys have indicated that there is minimal directed effort towards this species and thus sampling this population is unnecessary. Spotted Bass are also present in Lake O' the Pines; however, fish are generally <14 inches, and abundance observed during electrofishing surveys has been low. This species comprises only an incidental portion of the black bass fishery at the reservoir. No specific directed angling effort toward Spotted Bass was documented in the 2018/2019 creel survey. Sampling this population is unnecessary, but their presence will be noted during other surveys.

### Survey objectives, fisheries metrics, and sampling objectives

**Largemouth Bass:** Largemouth Bass are the most popular sport fish in Lake O' the Pines. More than 50% of angling effort was directed toward Largemouth Bass during a 2018/2019 creel survey. The popularity and reputation for quality Largemouth Bass fishing at this reservoir warrant sampling time and effort. Trend data on relative abundance, size structure, growth, and body condition have been collected biennially since 1996 with fall nighttime electrofishing. The average age of Largemouth Bass at 14 inches (13.0 – 14.9 inches) has also been calculated to monitor how long it takes fish to reach legal harvest length. Continuation of biennial trend data listed above in this reservoir with fall night electrofishing will allow for determination of any large-scale changes in the Largemouth Bass population that may spur further investigation.

Fall nighttime electrofishing surveys will be conducted in 2020 and 2022 to assess relative abundance, size structure (PSD and length frequency), growth, and condition (mean Wr using lengths and weights from 5 fish per inch group). A minimum of 12 randomly selected 5-min electrofishing sites will be sampled and sampling will continue at up to 8 additional random sites until 50 stock-size fish are collected and the RSE of CPUE-S is  $\leq 25$ . This objective was met after 12 stations in 2018, but the anticipated effort to meet both sampling objectives with an 80% confidence interval is 14-16 stations. A maximum of 24 stations will be surveyed. Otoliths from 13 fish between 13.0 and 14.9 inches will be collected in 2020 and 2022 to determine mean age at 14 inches.

**Crappie:** Traditional trap netting and dual-cod trap netting has not been successful for adequately sampling the crappie populations at Lake O' the Pines. A popular fishery exists for crappie at the reservoir, and there is a special harvest regulation in place from December through February that requires anglers to keep the first 25 crappie they catch regardless of size to reduce unnecessary mortality of fish caught from deep water. For these reasons, it is important to determine the best way to sample the crappie populations. The dual-cod hoop nets were effective at capturing crappie in Lake O' the Pines and further evaluation of their use in sampling crappie populations in Texas is worthwhile. The nets will be considered effective if 50 stock-size fish of each species are collected with RSE of 25 for CPUE-Stock. Additionally, either through nets or angler-caught crappie, we will collect otoliths from 13 fish (range 9.0-10.9 inches) in January 2023 to monitor growth of Black Crappie and White Crappie.

**Channel Catfish:** Channel Catfish was the third most popular species for anglers to fish for during the 2010/2011 and 2018/2019 creel surveys (16.5% and 15.8% directed effort, respectively). Tandem hoop nets used to sample Channel Catfish in 2015 caught an adequate number of fish, but the precision for the CPUE-Stock estimate was slightly higher than desired. Though the 10 nets with a 2-night soak in 2018 were sufficient to catch 100 stock-size fish and obtain an RSE  $\leq 25$  for CPUE-Stock. We will continue to use tandem hoop nets in 2023 to gather information on relative abundance and size structure. Our target sampling precision will be RSE  $\leq 25$  for CPUE-Stock. Our targeted minimum sample size for size structure will be 100 stock-size fish. We will set a minimum of 10 net series.

**Flathead Catfish:** Flathead Catfish are present in Lake O' the Pines; however traditional gill netting has not been an effective gear to sample the population. While no directed effort by rod and reel anglers was documented during the 2018/2019 creel survey, this population is likely utilized by passive gear anglers and hand fishers. Low frequency electrofishing (LFE) was attempted in 2018 but, due to time and weather constraints, sampling occurred during flood stages. Thus, it may be beneficial to conduct low

frequency electrofishing at Lake O' the Pines again in 2023 preferably during average mean water levels to reassess its effectiveness to determine abundance and size structure. Our target sampling precision will be 50 stock-size fish collected and the RSE of CPUE-Stock is  $\leq 25$

**Prey Species:** Bluegill, Redear Sunfish, and Gizzard Shad are the primary forage at Lake O' the Pines. Trend data on relative abundance and size structure of forage species has been collected biennially since 1996. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in sunfish and shad relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers of Bluegill, Redear Sunfish, and Gizzard Shad for size structure estimation (PSD and IOV; 50 fish at a minimum of 12 stations with 80% confidence). RSE for relative abundance estimates has been  $\leq 25$  of CPUE-Total using the traditional 24 randomly-selected stations. No additional effort will be expended to achieve an RSE25 for CPUE of sunfish and 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. Relative weight of Largemouth Bass  $\geq 8"$  TL will be determined from their length/weight data (maximum of 10 fish weighed and measured per inch group).

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## Tables and Figures

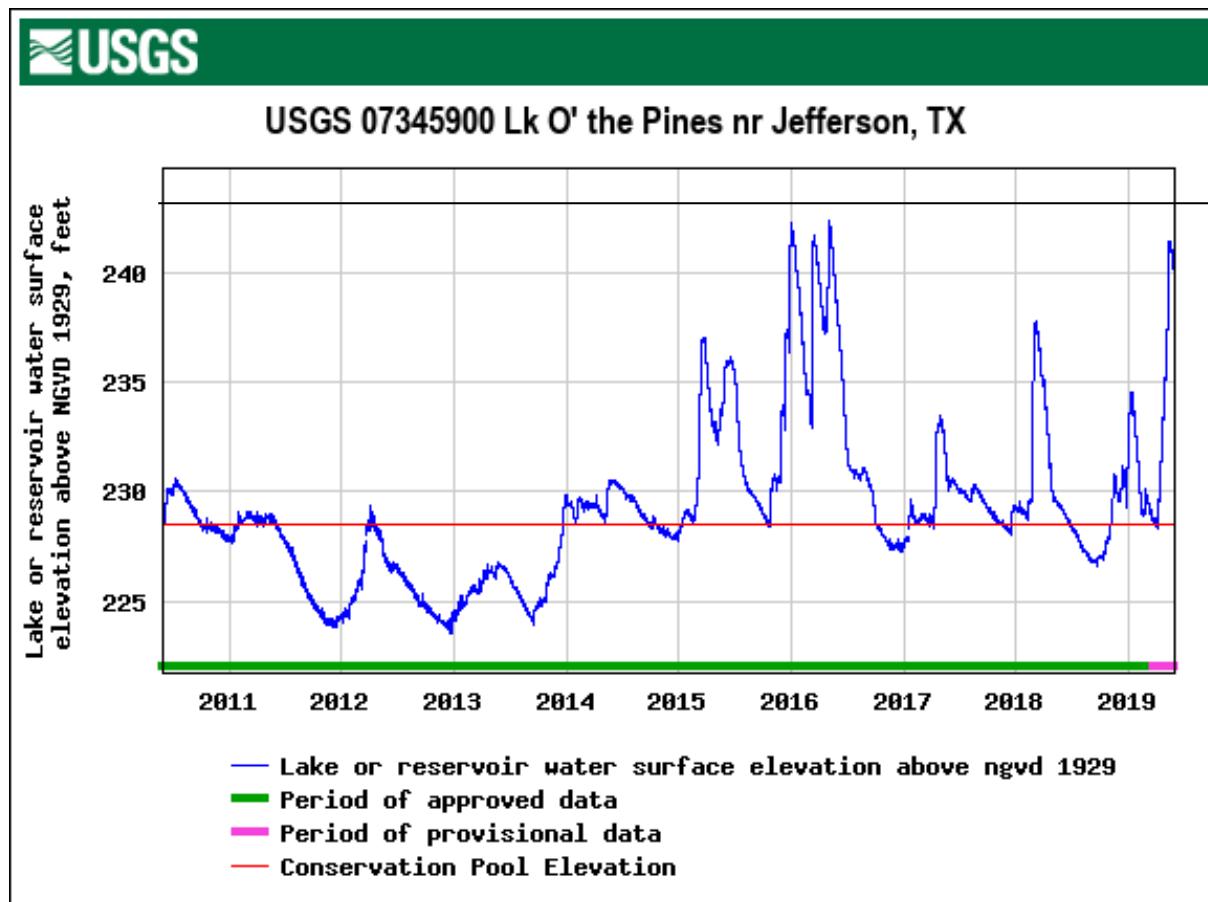


Figure 1. Daily water level elevations in feet above mean sea level (MSL) recorded for Lake O' the Pines, Texas. Conservation pool elevation is 228.5 feet. Source for water level data is U.S. Geological Survey website.

Table 1. Characteristics of Lake O' the Pines, Texas.

Characteristic	Description
Year constructed	1956
Controlling authority	U.S. Army Corps of Engineers
County	Marion, Morris, Upshur, and Camp
Reservoir type	Mainstem
Shoreline Development Index	7.5
Conductivity	178 $\mu$ S/cm

Table 2. Boat ramp characteristics for Lake O' the Pines, Texas, June, 2018. Reservoir elevation at time of survey was 228 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Lone Star Landing	32.901055 -94.715666	Y	15	222	Good
Highway 155	32.848450 -94.708011	Y	10	225	Good
Cedar Springs	32.842407 -94.696842	Y	25	226	Good
Pine Hill	32.802333 -94.654667	Y	15	222	Good
Pop's Landing	32.798812 -94.639817	Y	10	227	Good
Oak Ridge	32.787618 -94.628884	Y	5	227	Good
Woody's	32.759955 -94.609482	Y	5	N/A	Under water
Copeland Creek	32.754607 -94.597067	Y	10	224	Good
Island View Marina	32.763465 -94.553684	Y	15	N/A	Under water
Tejas	32.740709 -94.546065	Y	15	224	Good
Brushy Creek (day use)	32.739067 -94.523765	Y	15	223	Good
Brushy Creek (park)	32.744889 -94.534965	Y	5	224	Good
Lakeside Park	32.749776 -94.510197	Y	15	223	Good
Hurricane Creek	32.785813 -94.514513	Y	10	222	Good
Pine Harbor	32.769332 -94.506584	Y	5	225	Ramp in good condition, but road leading to ramp is poor.
Holiday Harbor	32.764255 -94.498785	Y	5	227	Poor – needs repair
Big Cypress Marina	32.762829 -94.496966	Y	20	228	Good
Overlook Park	32.754756 -94.498329	Y	40	219	Good
Buckhorn Creek	32.758198 -94.496686	Y	15	222	Good
Bull Frog Marina	32.795569 -94.546075	Y	15	224	Good
Johnson Creek Marina	32.789987 -94.541464	Y	8	N/A	Dirt ramp
Johnson Creek Park (day use)	32.788982 -94.547710	Y	30	221	Good
Johnson Creek Park (campground)	32.780667 -94.547367	Y	5	223	Good
Alley Creek Park (day use)	32.798761 -94.589058	Y	35	222	Good
Alley Creek Park (campground)	32.795868 -94.598268	Y	10	224	Good
Mims Chapel	32.8 18591 -94.629681	Y	5	225	Good
Oak Valley Park	32.828958 -94.663758	Y	5	N/A	Closed

Table 3. Harvest regulations for Lake O' the Pines, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Palmetto	5	18-inch minimum
Bass, Largemouth	5 <sup>a</sup>	14-inch minimum
Bass, Spotted	5 <sup>a</sup>	None
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum <sup>b</sup>

<sup>a</sup> Daily bag for Largemouth Bass and Spotted Bass = 5 fish in any combination.

<sup>b</sup> For Black and White Crappie caught from 1 December through the last day of February, there is no minimum length limit, daily bag = 25 in any combination, and all crappie must be retained.

Table 4. Stocking history of Lake O' the Pines, Texas. FRY = fry; FGL = fingerling; AFGL = advanced fingerling; UNK = unknown.

Species	Year(s) Stocked	Number of Years	Number Stocked	Life Stage
Blue Catfish	1971	1	19,654	UNK
	1994	1	307,248	FGL
	Total		326,902	
Channel Catfish	1968-1970	3	550,763	AFGL
Florida Largemouth Bass	1982	1	500	AFGL
	1982-2000	6	2,206,972	FGL
	2009	5	408,658	FGL
	2010	1	407,949	FGL
	2011	1	408,862	FGL
	2013	1	408,581	FGL
	2015	1	184,935	FGL
	2017	1	142,242	FGL
	Total		4,168,699	
Paddlefish	1992	1	15,401	
	1998	1	9,646	
	Total		25,047	
Palmetto Bass (striped X white bass hybrid)	1977-1981	3	515,320	UNK
	1994-2000	6	821,700	FGL
	1996	1	140,612	FRY
	Total		1,477,632	
ShareLunker Largemouth Bass	2010	1	2,017	FGL
	2013	1	4,677	FGL
	Total		6,694	
Smallmouth Bass	1980-1982	2	315,000	UNK

Table 5. Objective-based sampling plan components for Lake O' the Pines, Texas 2018–2019.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE-Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 14 inches	N = 13, 13.0 – 14.9 inches
	Condition	W <sub>r</sub>	10 fish/inch group (max)
	Genetics	% FLMB	N = 30, any age
Bluegill <sup>a</sup>	Abundance	CPUE-Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad <sup>a</sup>	Abundance	CPUE-Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
	Prey availability	IOV	
<i>Low-frequency electrofishing</i>			
Flathead Catfish	Abundance	CPUE-Stock	RSE-Stock ≤ 25
	Size structure	Length frequency	N ≥ 50 stock
<i>Trap netting</i>			
Crappie	Size structure	PSD, length frequency	RSE-Stock ≤ 25
			N ≥ 50 stock
	Age-and-growth	Age at 10 inches	N = 13 9.0 – 10.9 inches
<i>Tandem hoop netting</i>			
Channel Catfish	Abundance	CPUE-Stock	RSE-Stock ≤ 25
	Size structure		N ≥ 50 stock

<sup>a</sup> 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 O' the Pines, Texas, 2015–2018. Surface area (acres) is listed with percent of total reservoir surface area in parentheses. Native vegetation was not surveyed 2015 - 2017.

Vegetation	2015	2016	2017	2018
Native submersed				59.0 (0.4)
Native floating-leaved				473.0 (2.9)
Native emergent				<3.0 (<0.1)
Non-native				
Giant Salvinia (Tier II)*	0.0	0.0	28.0 (0.2)	<1.0 (<0.1)
Hydrilla (Tier III)*	0.0	0.0	191.0 (1.2)	249.0 (1.5)
Water Hyacinth (Tier II)*	363.0 (2.2)	178.0 (1.1)	12.0 (0.1)	0.0

\*Tier I is immediate response, Tier II is maintenance, Tier III is watch status

Table 7. Percent directed angler effort by species for Lake O' the Pines, Texas, for 2010/2011 and 2018/2019. Survey periods were from 1 June through 31 May.

Species	2010/2011	2018/2019
Catfish	16.5	15.8
White Bass	0.4	0.0
Sunfishes	1.2	0.6
Largemouth Bass	47.4	53.1
Crappie	34.0	24.5
Anything	0.6	6.0

Table 8. Total fishing effort (h) for all species and total directed expenditures at Lake O' the Pines, Texas, 2010/2011 and 2018/2019. Survey periods were from 1 June through 31 May. Relative standard error is in parentheses.

Creel statistic	2010/2011	2018/2019
Total fishing effort	267,245 (22)	180,757 (21)
Total directed expenditures	\$1,604,036 (28)	1,219,903 (39)

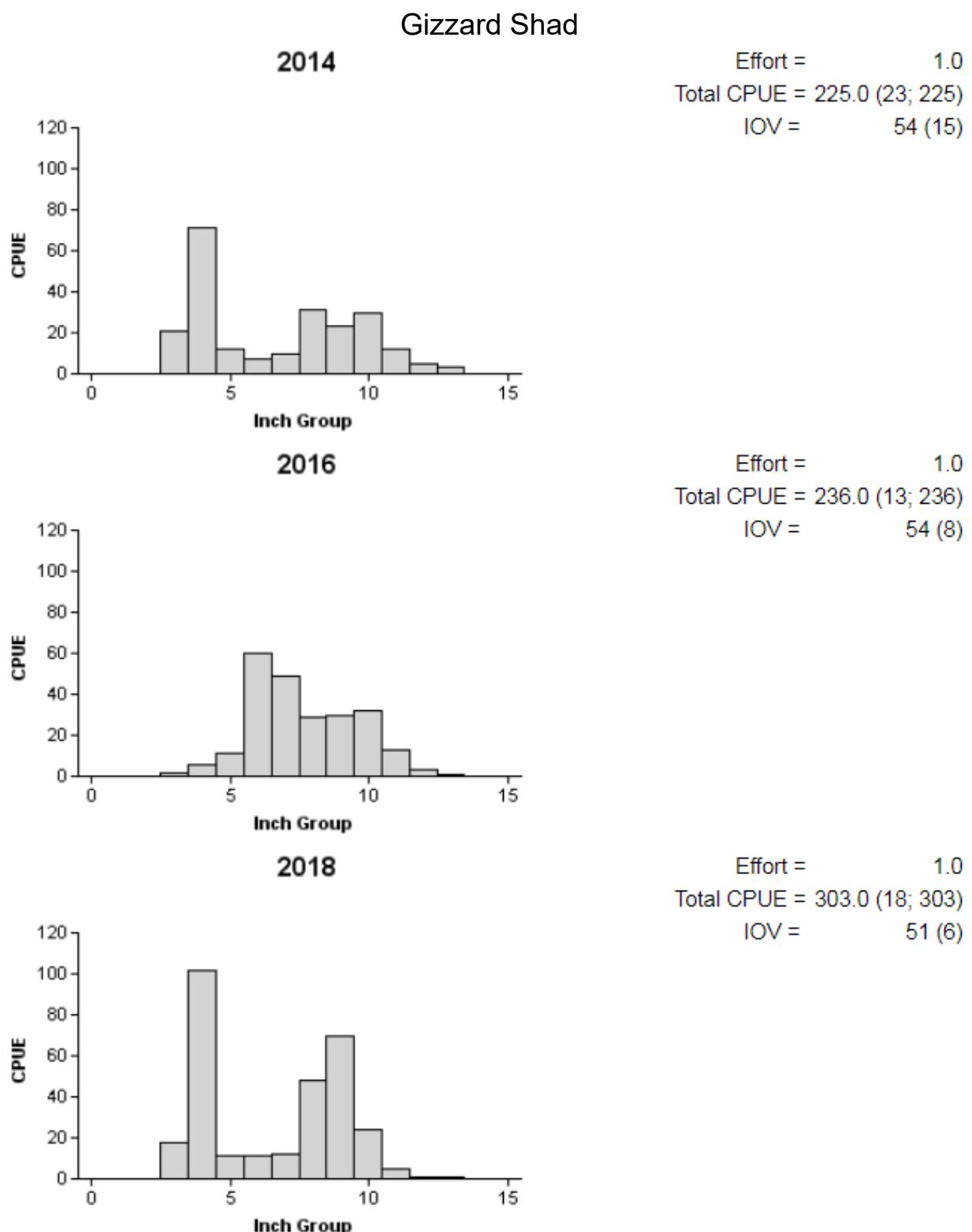


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake O' the Pines, Texas, 2014, 2016, and 2018.

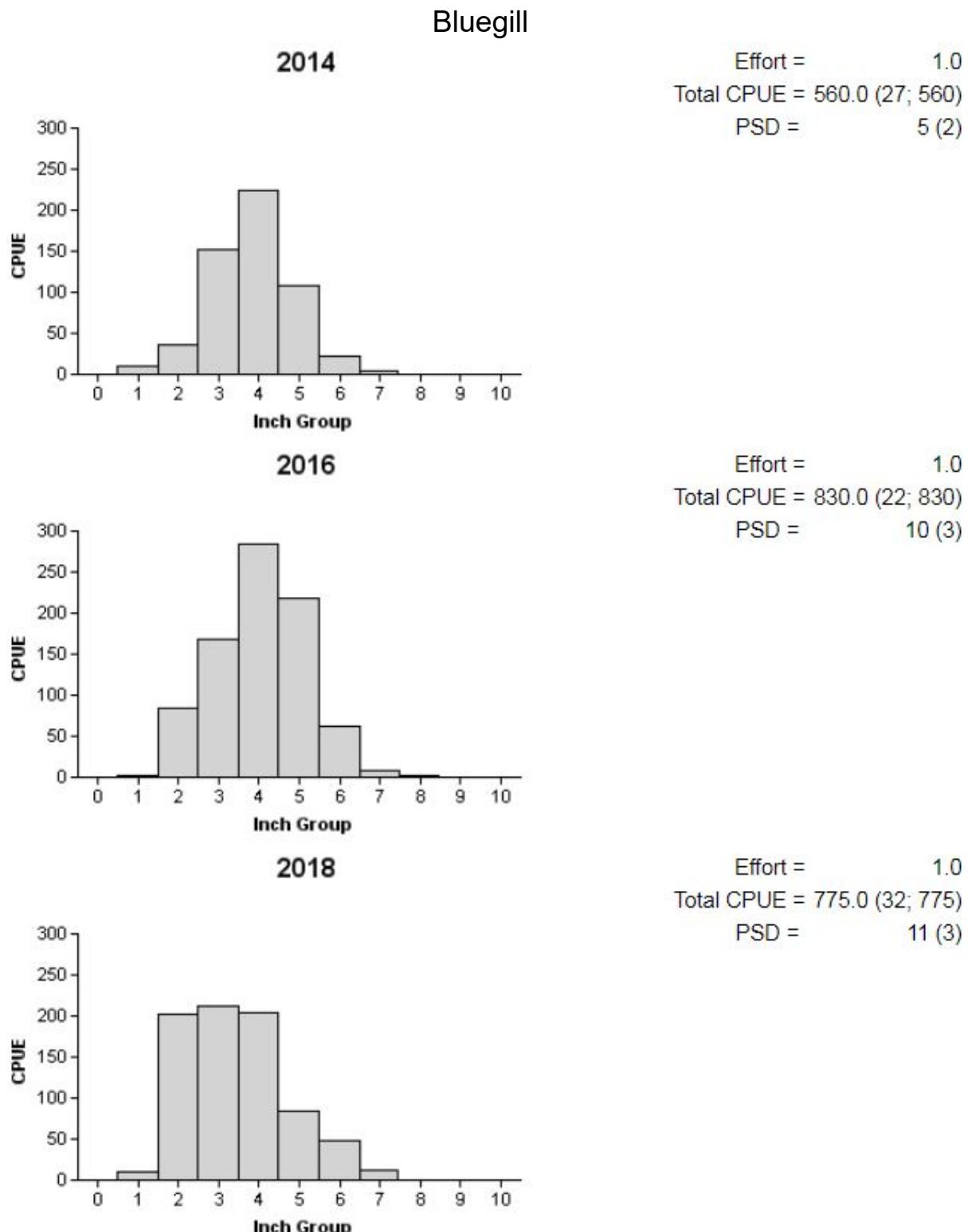


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake O' the Pines, Texas, 2014, 2016, and 2018.

## Redear Sunfish

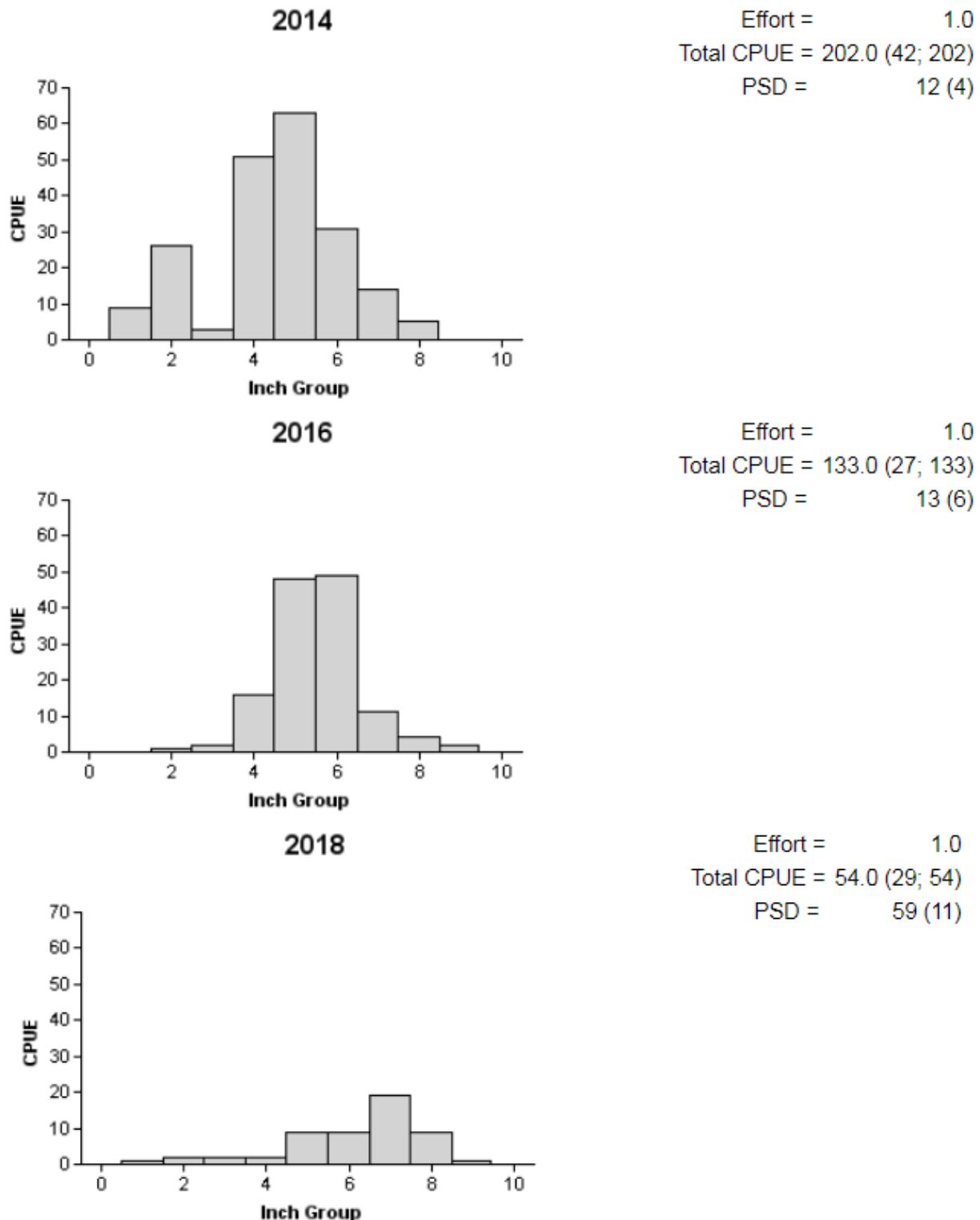


Figure 4. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake O' the Pines, Texas, 2014, 2016, and 2018.

Table 9. Creel survey statistics for sunfishes at Lake O' the Pines, Texas, from June 2010 through May 2011 and June 2018 through May 2019. Total catch per hour is for anglers targeting sunfish and total harvest is the estimated number of sunfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2010/2011	2018/2019
Surface area (acres)	16,269	16,269
Directed effort (h)	3,117 (59)	1,048 (144)
Directed effort/acre	0.19 (59)	0.06 (144)
Total catch per hour	7.02 (18)	0.0
Total harvest	2,680 (232)	244 (722)
Sunfish (unidentified)	379 (210)	0.0
Bluegill	1,273 (195)	244 (722)
Redear Sunfish	1,028 (286)	0.0
Harvest/acre	0.16 (232)	0.02 (722)
Percent legal released	90	98

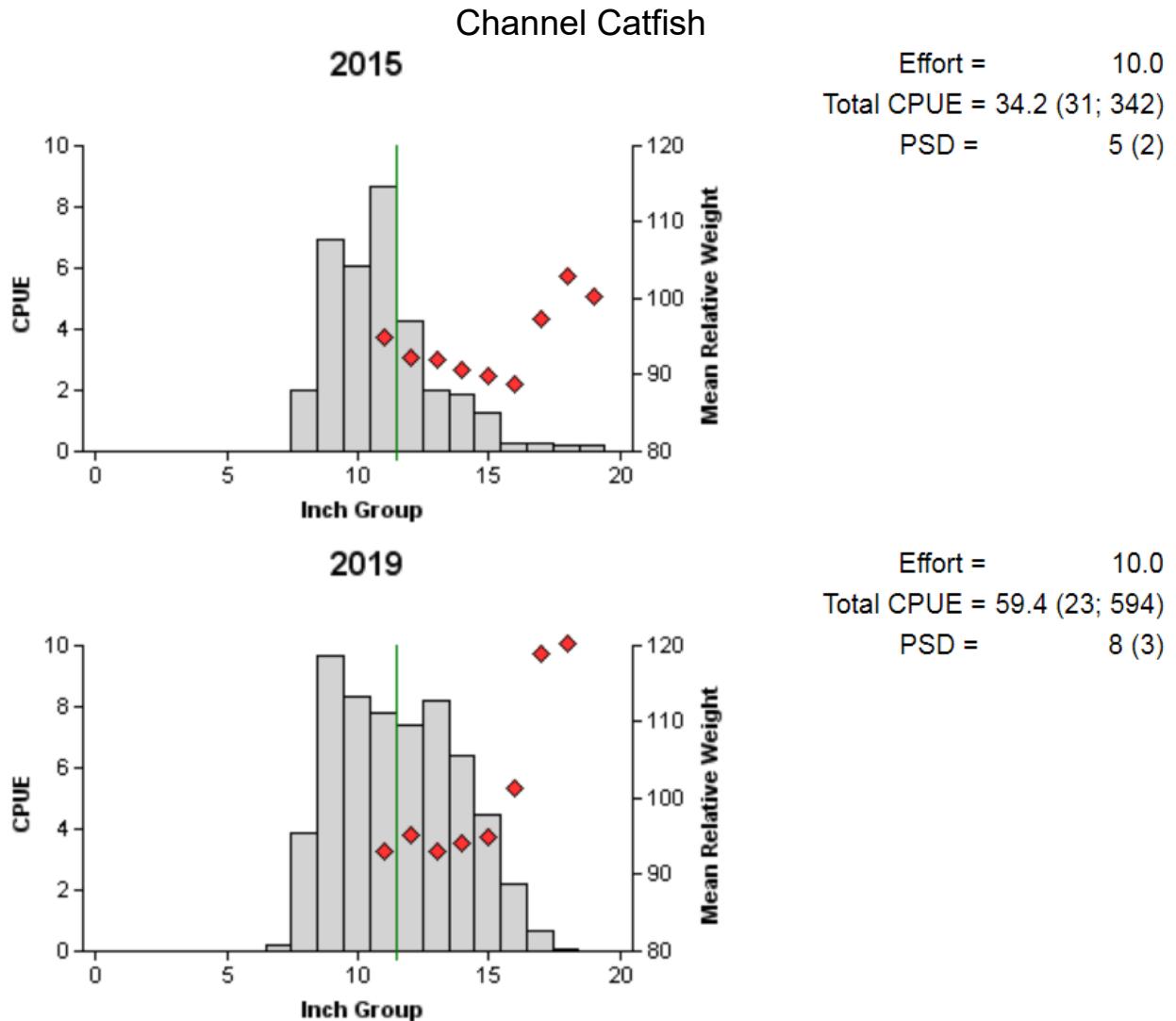


Figure 5. Number of Channel Catfish caught per series (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring tandem hoop net surveys, Lake O' the Pines, Texas, 2015 and 2019. Vertical line indicates minimum length limit.

Table 10. Creel survey statistics for Channel Catfish at Lake O' the Pines, Texas, from June 2010 through May 2011 and June 2018 through May 2019. Total catch per hour is for anglers targeting Channel Catfish and total harvest is the estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2010/2011	2018/2019
Surface area (acres)	16,269	16,269
Directed effort (h)	44,010 (22)	25,902 (29)
Directed effort/acre	2.71 (22)	1.59 (29)
Total catch per hour	3.17 (38)	1.35 (57)
Total harvest	52,571 (51)	9,837 (43)
Harvest/acre	3.21 (51)	0.6 (43)
Percent legal released	12	28

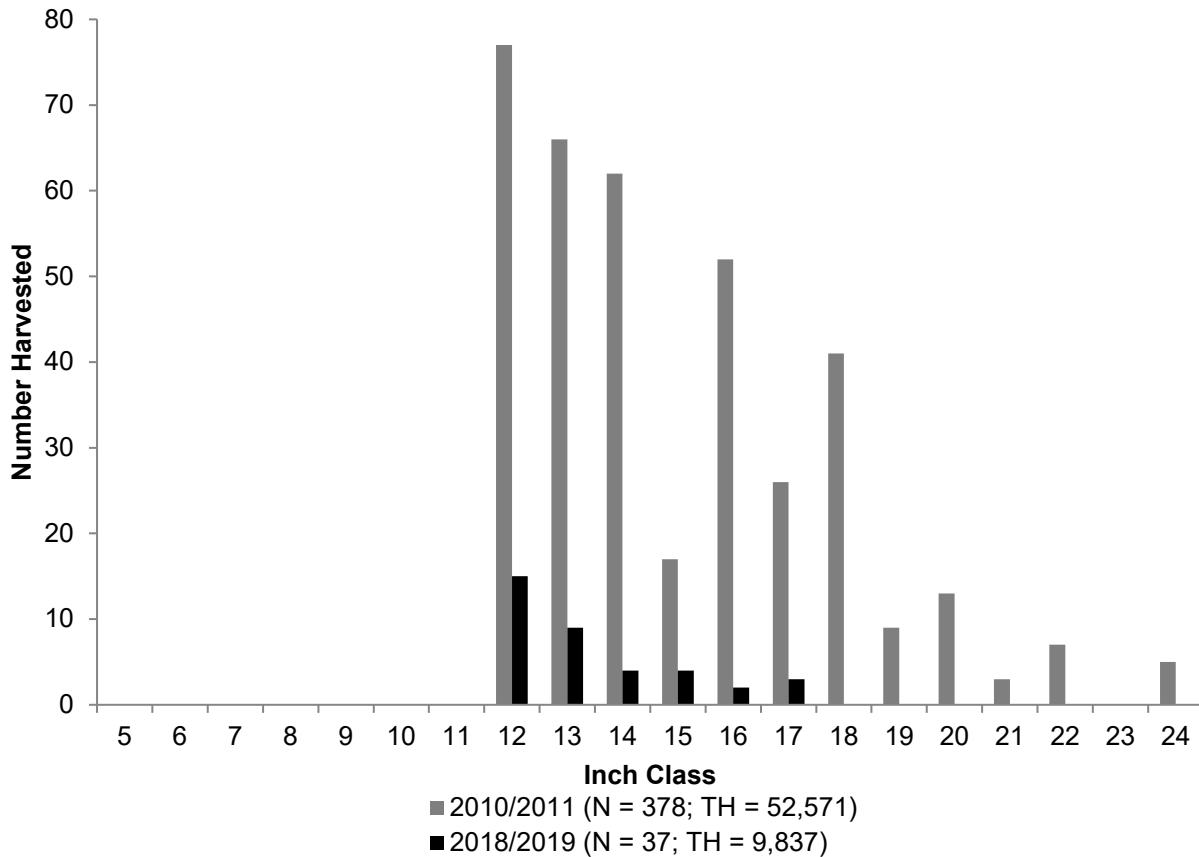


Figure 6. Length frequency of harvested Channel Catfish observed during creel surveys at Lake O' the Pines, Texas, June 2010 through May 2011 and June 2018 to May 2019, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

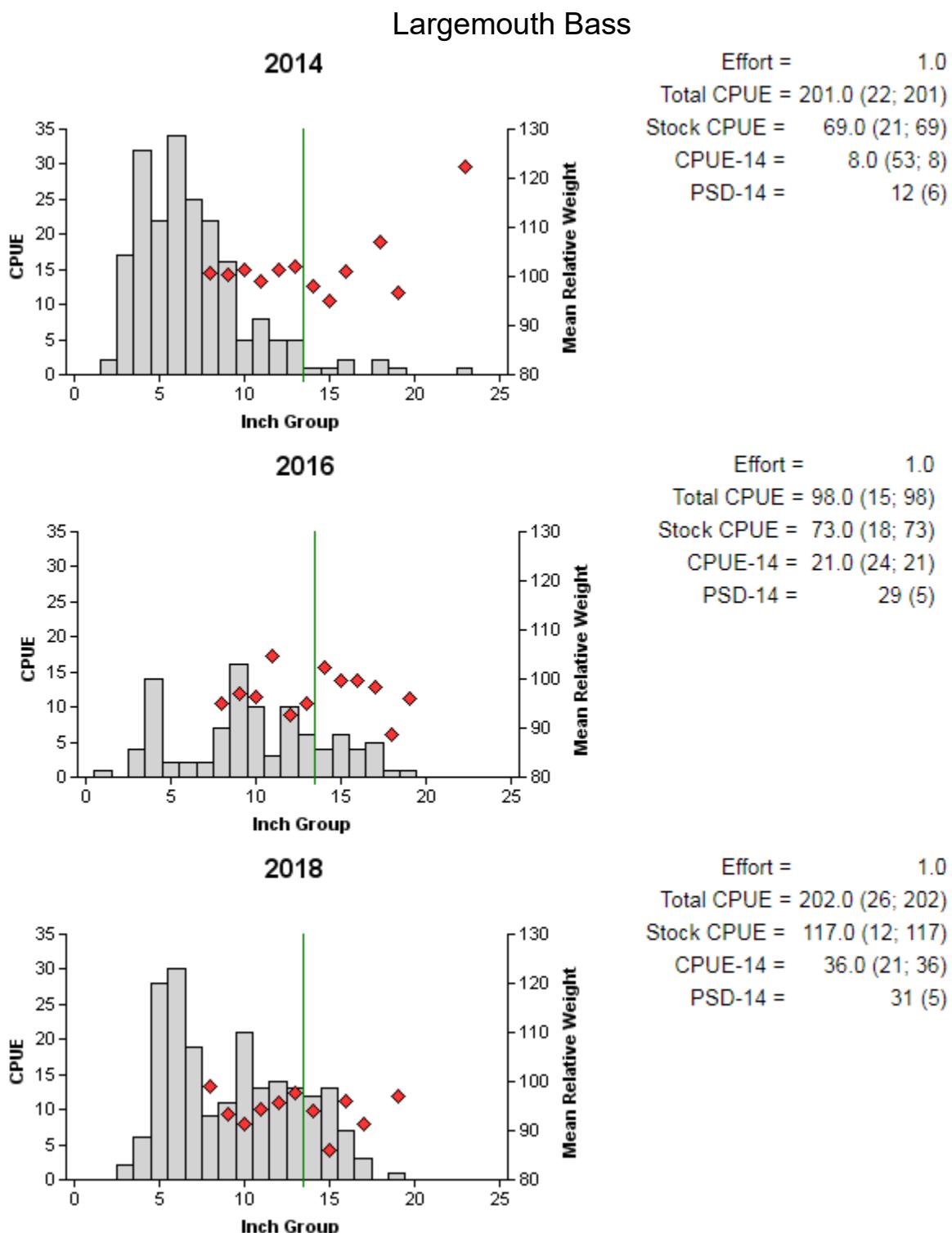


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake O' the Pines, Texas, 2014, 2016, and 2018. Vertical line indicates minimum length limit

Table 11. Creel survey statistics for Largemouth Bass at Lake O' the Pines, Texas, from June 2010 through May 2011 and June 2018 through May 2019. Catch rate is for all anglers targeting Largemouth Bass. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Statistic	2010/2011	2018/2019
Surface area (acres)	16,269	16,269
Directed angling effort (h)		
Tournament	28,491 (24)	35,037 (29)
Non-tournament	97,579 (28)	51,729 (30)
All black bass anglers combined	126,520 (23)	86,766 (28)
Angling effort/acre	7.78 (23)	5.33 (24)
Catch rate (number/h)	1.01 (23)	1.02 (24)
Harvest		
Non-tournament harvest	14,974 (69)	2,111 (73)
Harvest/acre	0.92 (69)	0.13 (73)
Tournament weigh-in and release	9,742 (52)	11,083 (46)
Release by weight		
<4.0 lbs	72,748 (54)	
4.0-6.9 lbs		7,064 (68)
7.0-9.9 lbs		2,284 (78)
≥10.0 lbs		0.0
Percent legal released (non-tournament)	86	95

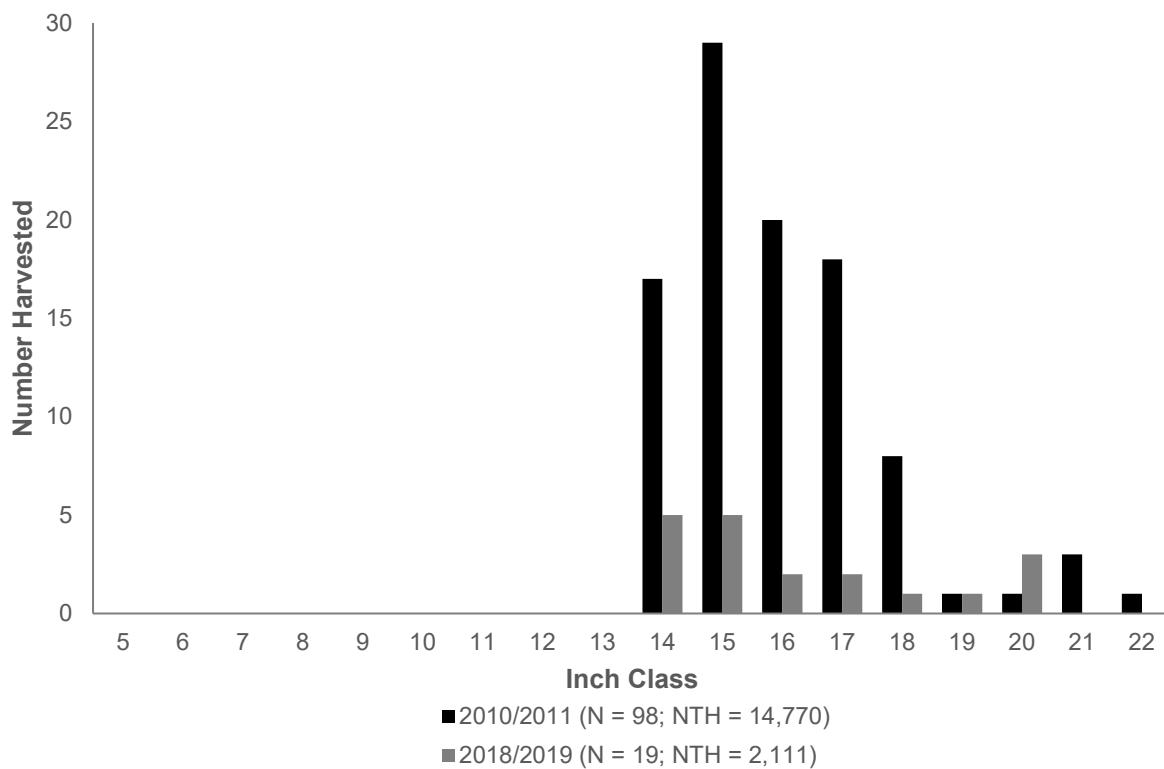


Figure 8. Length frequency of non-tournament harvested Largemouth Bass observed during creel surveys at Lake O' the Pines, Texas, from June 2010 through May 2011 and June 2018 to May 2019, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and NTH is the estimated non-tournament harvest for the creel period.

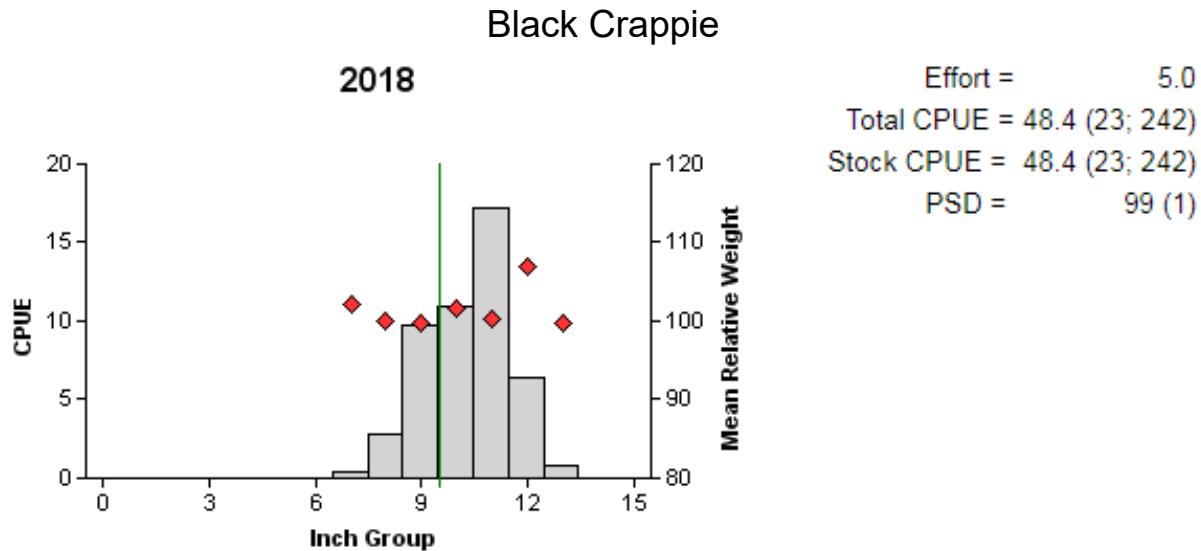


Figure 9. Number of Black Crappie caught per net set (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall dual-cod hoop netting survey, Lake O' the Pines, Texas. 2018. Vertical line indicates minimum length limit.

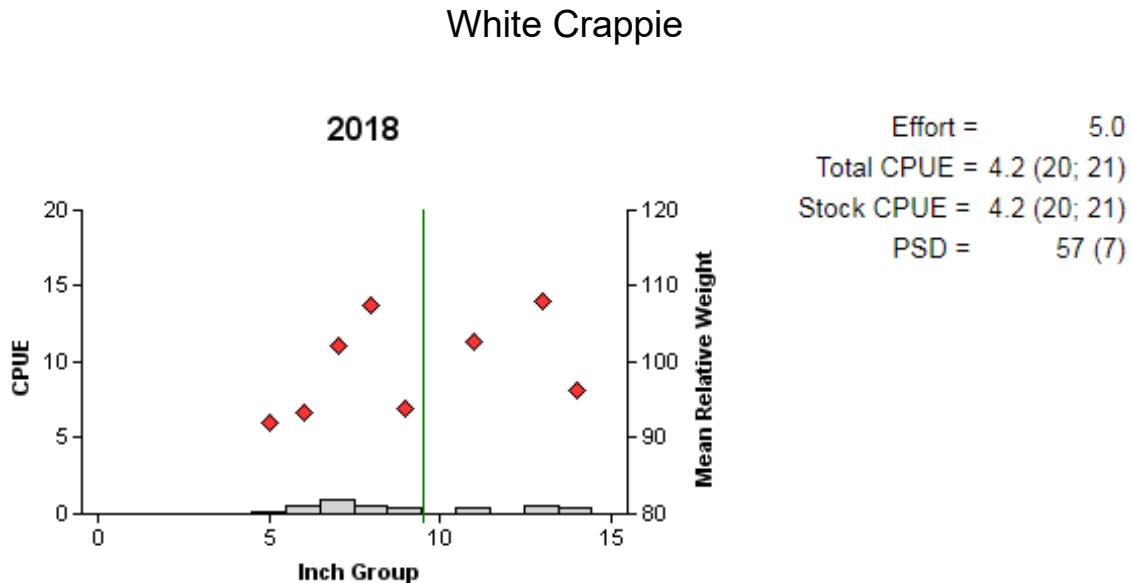


Figure 10. Number of White Crappie caught per net set (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall dual-cod hoop netting survey, Lake O' the Pines, Texas. 2018. Vertical line indicates minimum length limit.

Table 12. Creel survey statistics for crappie species at Lake O' the Pines, Texas, from June 2010 through May 2011 and June 2018 through May 2019. Total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie species harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2010/2011	2018/2019
Surface area (acres)	16,269	16,269
Directed effort (h)	90,888 (40)	40,020 (24)
Directed effort/acre	5.59 (40)	2.46 (24)
Total catch per hour	1.93 (18)	2.75 (35)
Total harvest	119,942 (60)	65,651 (40)
Crappie (unidentified)	31,951 (71)	0.0
White Crappie	17,981 (56)	9,725 (51)
Black Crappie	70,010 (56)	55,926 (38)
Harvest/acre	7.37 (60)	4.04
Percent legal released	1	2

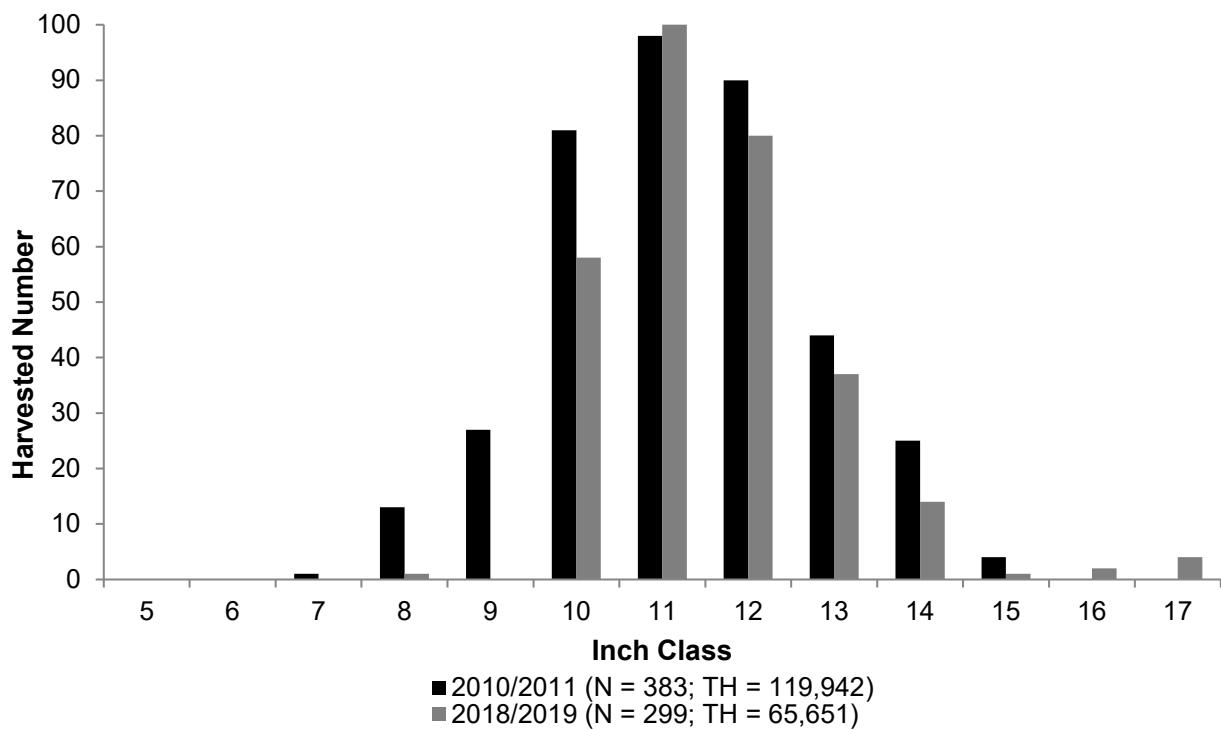


Figure 11. Length frequency of harvested Black Crappie observed during creel surveys at Lake O' the Pines, Texas, for June 2010 through May 2011 and June 2018 to May 2019, all anglers combined. N is the number of harvested crappie species observed during creel surveys, and TH is the total estimated harvest for the creel period.

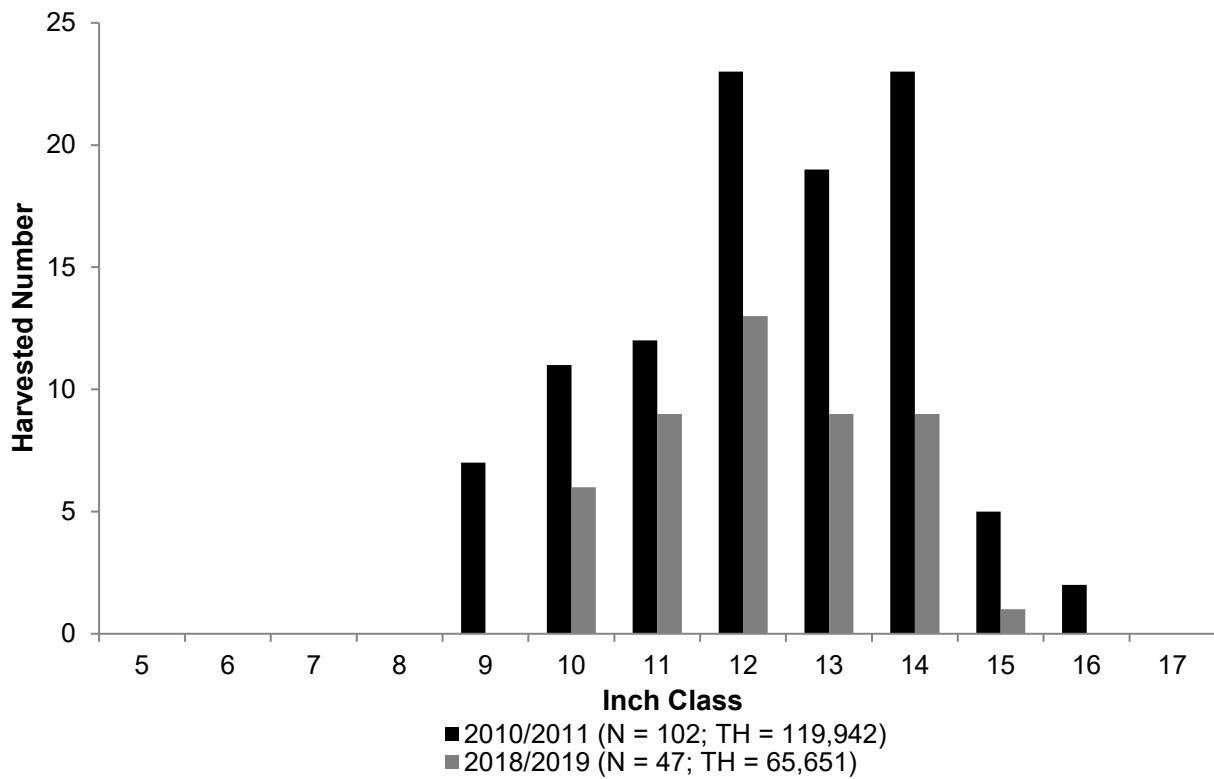


Figure 12. Length frequency of harvested White Crappie observed during creel surveys at Lake O' the Pines, Texas, for June 2010 through May 2011 and June 2018 to May 2019, all anglers combined. N is the number of harvested crappie species observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Proposed Sampling Schedule

Table 13. Proposed sampling schedule for Lake O' the Pines, Texas. Survey period is June through May. Electrofishing surveys are conducted in the fall, low-frequency is conducted in the spring, and tandem hoop netting surveys are conducted in the spring. Standard survey denoted by S and additional survey denoted by A.

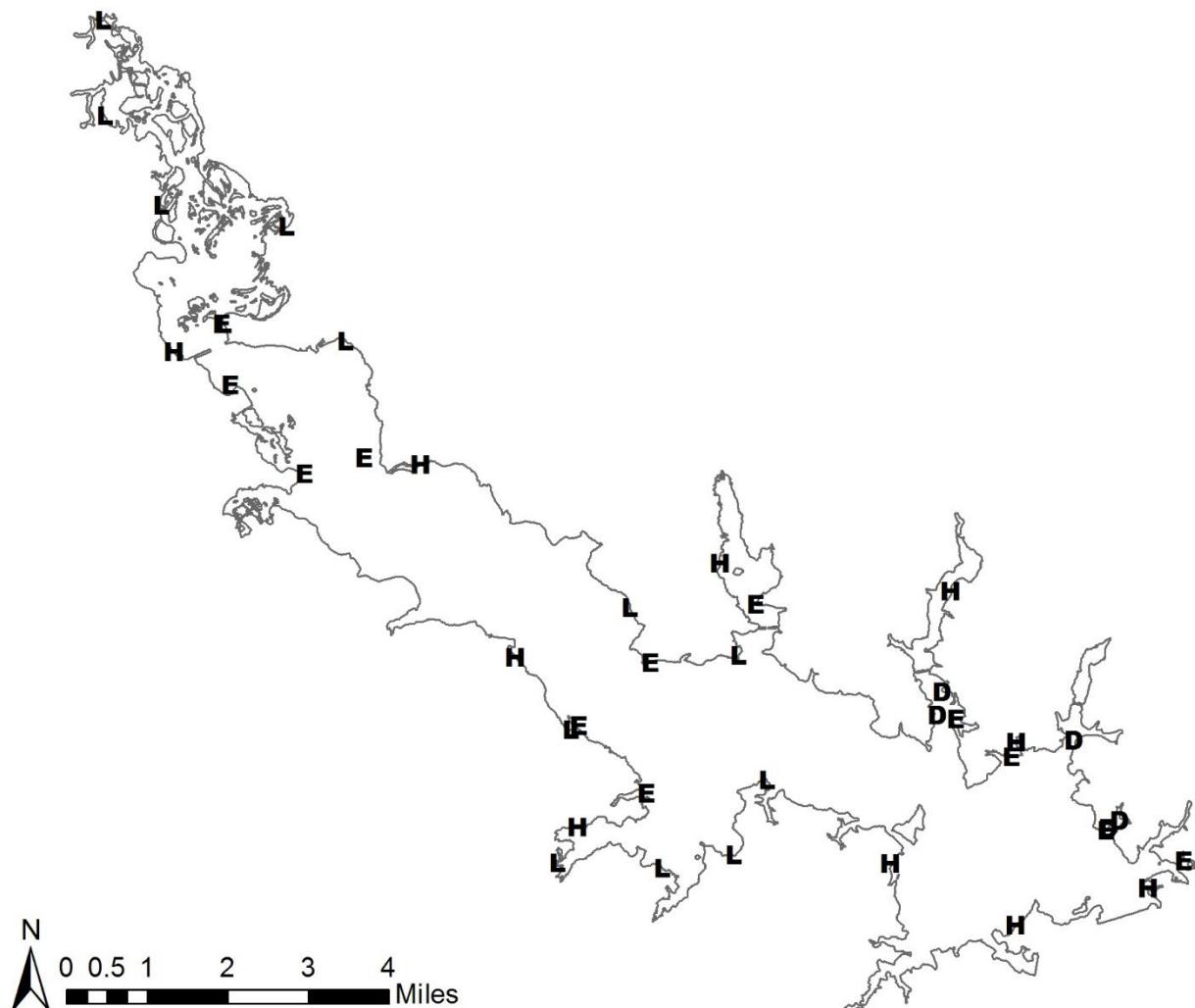
	Survey year			
	2019-2020	2020-2021	2021-2022	2022-2023
Angler Access				S
Structural Habitat				S
Vegetation	A	A	A	S
Electrofishing – Fall			A	S
Electrofishing – Low frequency				A
Tandem hoop netting				A
Report				S

## 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 Lake O' the Pines, Texas, 2018-2019. Sampling effort was 10 net nights for hoop netting and 1 hour for electrofishing.

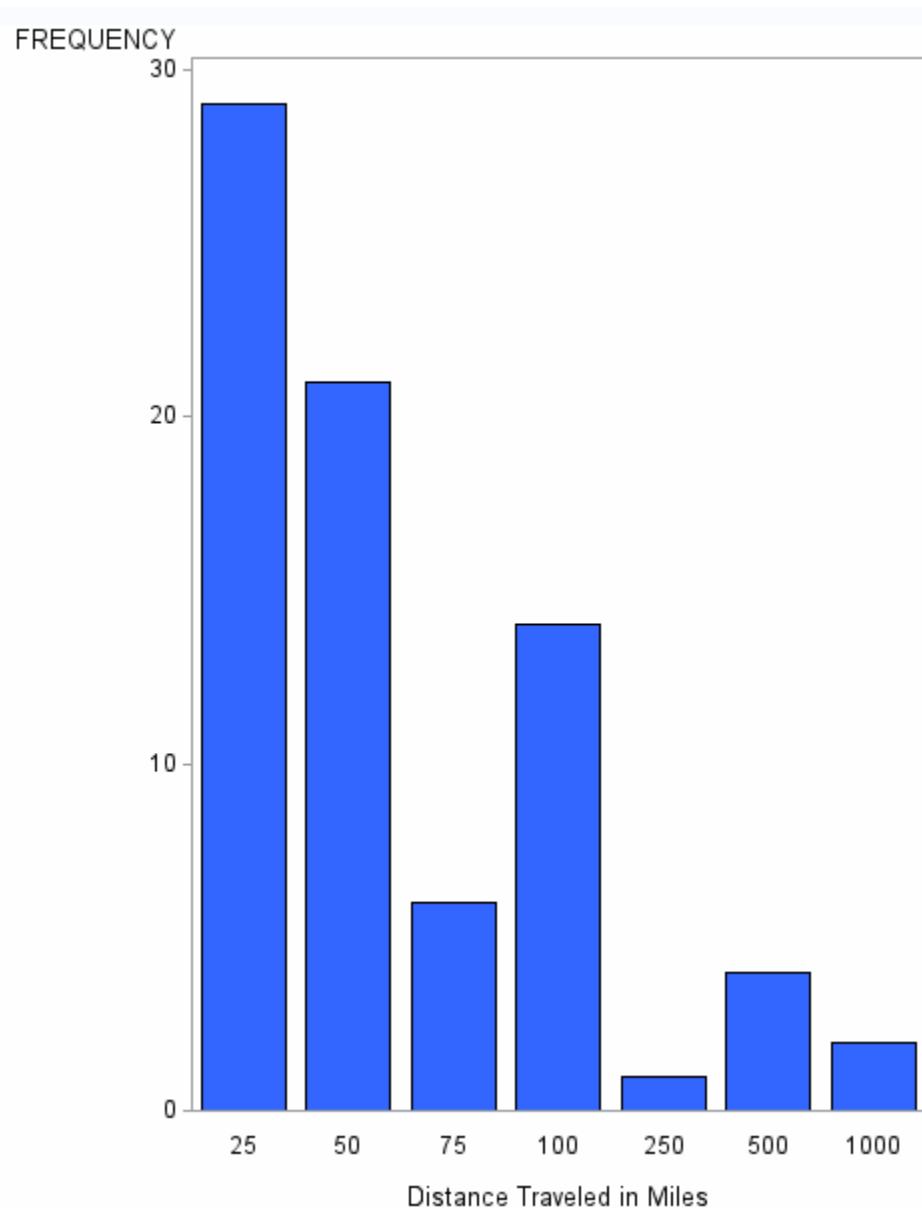
Species	Tandem Hoop Nets		Electrofishing		Dual-Cod Hoop Nets		Low-Frequency Electrofishing		
	N	CPUE	N	CPUE	N	CPUE	N	CPUE	
Gizzard Shad			303	303.0 (18)					
Threadfin Shad			451	451.0 (43)					
Channel Catfish	594	59.4 (23)							
Flathead Catfish	5	0.50 (45)					0	0.0	
Redbreast Sunfish			6	6.0 (72)					
Green Sunfish			2	2.0 (100)					
Warmouth			1	1.0 (100)					
Orangespotted Sunfish			1	1.0 (100)					
Bluegill			775	775.0 (32)					
Longear Sunfish			63	63.0 (43)					
Redear Sunfish			54	54.0 (29)					
Largemouth Bass			202	202.0 (26)					
White Crappie	2	0.20 (67)					21	4.2 (20)	
Black Crappie	14	1.40 (32)					242	48.4 (23)	

## APPENDIX B – Map of sampling locations



Location of sampling sites, Lake O' the Pines, Texas, 2018-2019. Tandem hoop net, LDWF dual-cod hoop nets, nighttime electrofishing, and low-pulse electrofishing stations are indicated by H, D, E and L, respectively. Water level was near full pool at time of sampling in the fall and high during spring sampling.

## APPENDIX C – Reporting of creel ZIP code data



Frequency of anglers that traveled various distances (miles) to Lake O' the Pines, Texas, as determined from the June 2018 through May 2018 creel survey.



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