Cisco Reservoir

2023 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-5

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

Prepared by:

Thomas Johnson, Assistant District Management Supervisor
and
Michael D. Homer Jr., District Management Supervisor

Inland Fisheries Division
Abilene District, Abilene, Texas

David Yoskowitz, Ph.D.
Executive Director

Timothy Birdsong
Director, Inland Fisheries

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Survey and Management Summary

Fish populations in Cisco Reservoir were surveyed with electrofishing in 2021 and both electrofishing and trap netting in 2023. Historical data are presented with the 2021-2023 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: Cisco Reservoir is a 1,050-acre impoundment constructed in 1928 on Sandy Creek, in the Brazos River Basin. The reservoir's functions are municipal water supply and recreation, and it is controlled by the City of Cisco. The reservoir has a history of extreme water level fluctuations. Rain events raised the water level to conservation pool (CP) in 2016. Water level stayed at CP into 2017, then fluctuated between 4-5 ft below conservation pool until summer 2021 which was followed by a continuous decline. Fish habitat during the most recent survey consisted primarily of rock, flooded dead terrestrial vegetation, buttonbush, standing timber, and cattail. Boater access consisted of two public boat ramps. Bank fishing access was limited to the main boat ramp area.

Management History: Important sport fish include Largemouth Bass, White Crappie, catfishes, and White Bass. Redbreast Sunfish and Redear Sunfish have historically been present. Attempts to establish a Smallmouth Bass population in the 1990s was unsuccessful. Florida Largemouth Bass were last stocked in 2020 and Lone Star Bass were stocked in 2022. Sport fish are managed with statewide harvest regulations.

Fish Community

- **Prey species:** Bluegill, Redbreast Sunfish, and Longear Sunfish were the predominant prey species. Gizzard Shad catch was low. Threadfin Shad and minnows were present but difficult to enumerate because of their limited susceptibility to the standardized sampling gear. Sizes of prey species except for Gizzard Shad were optimal.
- **Catfishes:** Flathead Catfish, Blue Catfish, and Channel Catfish were present in the reservoir.
- **White Bass:** White Bass were not sampled during the monitoring period but are still suspected to be present in the reservoir.
- **Largemouth Bass:** Largemouth Bass catch has fluctuated and is lower from the 2021 survey. Legal fish catch declined since prior surveys, and body conditions were suboptimal. Fish retained for genetic analysis contained 59% Florida Largemouth Bass alleles.
- **White Crappie:** White Crappie catch was low. No legal White Crappie were caught in the 2023 survey.

Management Strategies: Electrofishing will be conducted during fall 2025 and fall 2027. Trap netting will be conducted during fall 2027. Gill netting will be conducted during spring 2028. Lone Star Bass will be stocked once water level is >75% capacity. Access and vegetation surveys will be conducted in summer 2027. A roving creel survey will be conducted during 2027-2028.

Introduction

This document is a summary of fisheries data collected from Cisco Reservoir from 2021-2023. 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 2021-2023 data for comparison.

Reservoir Description

Cisco Reservoir is a 1,050-acre impoundment constructed in 1928 on Sandy Creek, in the Brazos River Basin. The reservoir is in Eastland County, approximately 5 miles north of Cisco, TX and is controlled by the City of Cisco. The reservoir was built primarily for municipal water supply and recreation. The reservoir is considered mesotrophic and has a mean TSI chl-*a* of 43.9 (Texas Commission on Environmental Quality 2024). The reservoir has been subjected to extreme water level fluctuations. Cisco Reservoir experienced long periods of reduced water level broken by occasional heavy rain events. Rain events raised the water level to conservation pool (CP) in 2016. Water level stayed at CP into 2017, then fluctuated between 4-5 ft below CP. until summer 2021 which was followed by a continuous decline to 9 ft below CP (Figure 1). Other descriptive characteristics for Cisco Reservoir are in Table 1.

Angler Access

Cisco Reservoir has two public boat ramps. Additional boat ramp characteristics are found in Table 2. Bank fishing access is limited to the main boat ramp area.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Goldstrohm and Homer 2020) included:

1. Continue to monitor sport fishes and prey populations to determine trends in relative abundance, size structure, and body condition by conducting electrofishing for prey species and Largemouth Bass.

   Action. Electrofishing surveys were conducted in 2021 and 2023. Fin clips were collected for assessing prevalence of Florida Largemouth Bass alleles.

2. Stock Florida Largemouth Bass when suitable habitat is available.

   Action: Florida Largemouth Bass were stocked in 2020, and Lone Star Bass fingerlings were stocked in 2022.

3. Contact City of Cisco and discuss needed improvements that could be made to the main boat ramp and the boat dock.

   Action: Some attempts to discuss the access conditions at the reservoir were discussed with the controlling authority, but no actions have been taken.

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

   Action: Controlling authority has been notified about the threat of invasive species. Signs are posted and maintained that educate about the threat of invasive species. Media and internet post have been made about invasive species and invasive species was a talking point when presenting to constituents.

Harvest regulation history: All sport fish are regulated with statewide harvest regulations. The statewide harvest regulation for Blue and Channel Catfish was changed to a 25 fish/day limit without a minimum length limit and 10≥ can be ≥20 inches in length (Table 3).

Stocking history: Blue Catfish were stocked in 1980 and 2001. Over 100,000 Smallmouth Bass were stocked from 1984 to 1997 although no viable population became established. Florida Largemouth Bass

were first stocked in 1991 and were recently stocked in 2020. Lonestar bass fingerling were stocked in 2022. The complete stocking history is in Table 4.

Vegetation/habitat management history: Prior to 2016, Cisco Reservoir had no directed management of vegetation or structural improvements to the reservoir. In 2016, City of Cisco and Still Waters Bass Club collaborated with Texas Parks and Wildlife Department to create 10, 10-tree brush piles by using recycled Christmas trees. The project was intended to increase structural fish habitat and increase angler catch rates in the reservoir. The GPS coordinates and a printable map of the brush piles sites were made accessible to the public via the Texas Parks and Wildlife Department website and social media.

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 Cisco Reservoir (Goldstrohm and Homer 2020). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected unless otherwise stated and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

Common names of fishes and their hybrids in this report are used following Page et al. (2023) with an exception for Largemouth Bass. While we recognize recent changes to black bass names, Texas reservoirs contain a mix of Florida Bass, Largemouth Bass, and their intergrade offspring. Therefore, Largemouth Bass is used in this report for simplicity as well as consistency with previous reports.

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.5 hours at 18, 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. Electrofishing in 2023 was conducted using a Smith-Root Apex electrofisher, while previous surveys used GPP 5.0 electrofisher.

Trap netting – Crappie were collected using trap nets (10 net nights at 10 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn).

Genetics – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2022). Micro-satellite DNA analysis was used to determine genetic composition of individual fish since 2005. Electrophoresis analysis was used prior to 2005.

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to Neuman et al. (2012). 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 statistics.

Habitat – In summer 2023, structural habitat and vegetation composition were determined by conducting a survey using the random point method assessing 75 random stations distributed along the shoreline. Vegetation data were also collected at these 75 sites. Additionally, a habitat survey was conducted during the same time at 150 random stations distributed throughout the reservoir. Habitat types and vegetation were identified at or below the waterline and marked as “1” for present or “0” for absent. Percent occurrence (% = [# stations present / total stations sampled] X 100) and associated 95% confidence intervals were calculated for structural habitat (Table 6; Kohn and Senyak 2024).

Water level – Source for water level data was the United States Geological Survey (USGS 2024).

Results and Discussion

Habitat: Nearly all (98%) points sampled throughout the reservoir were featureless and open water, and sparse coverage (2%) of dead terrestrial vegetation was found. Shoreline habitat features that occurred at the sampling locations consisted mostly of dead terrestrial vegetation (67.3%), rocky shoreline (46.7%), gravel (28.7%), docks (28.0%), natural shoreline (15.3%), docks (23%), rock bluff (8.7%), and standing timber (3.3%), and bulkhead (<1.0%; Table 6).

Prey species: The prey base primarily consisted of Gizzard Shad, Threadfin Shad, and Bluegill, though Threadfin Shad and smaller minnows were challenging to enumerate because of their limited susceptibility to standardized gear. Catch rate of Gizzard Shad in 2023 (8.0/h) was lower than previous surveys in 2019 (36.0/h) and 2015 (36.0/h) (Figure 2). IOV varied from 37 in 2015 to 12 in 2019 to 17 in 2023, indicating most fish were not optimal prey size for sport fish. Bluegill CPUE declined from 323.5/h in 2015 to 47/h in 2019 to 37.3/h in 2023 (Figure 3). PSDs from 2015-2023 remained consistently low, which indicated that the size structure was dominated by smaller fish. Most Bluegill were of adequate prey size for sport fish. Redbreast Sunfish catches have fluctuated from 95.0/h in 2013 to 29.3/h in 2015 to 0.0/h in 2019 to 26.7/h in 2023 (Figure 4). The PSDs for Redbreast Sunfish have also fluctuated from 51 in 2013 to 64 in 2019 to 26 in 2023. In 2023, catch rate of Redear Sunfish increased to 8.0/h from 2.5/h in 2019 but substantially lower than 37.3/h reported in 2015 (Figure 5). There were limited stock length Redear Sunfish (≥ 7 inches) sampled at Cisco Reservoir. Historically, some larger Redear and Redbreast sunfish (i.e., ≥7 inches) were present that could potentially provide a sunfish fishery if numbers increase. Redear Sunfish sampling goals for abundance and sample size were not met during sampling. Catch rates of prey species during the 2023 electrofishing survey may have been lower due to sampling issues as well as lower water level from drought.

Catfishes: Low frequency electrofishing could not be conducted because of suboptimal weather conditions (i.e., too windy) at the reservoir as well as man-power shortage attributed to the COVID-19 pandemic. However, Blue, Channel, and Flathead Catfish were present during the 2023 electrofishing survey.

Largemouth Bass: Total catch rate of Largemouth Bass fluctuated from 27.0/h in 2019 to 85.3/h in 2021 to 36.0/h in 2023 (Figure 6). Relative abundance of Largemouth Bass ≥ stock length (≥ 8 inches) varied from 22.5/h in 2019 to 53.3/h in 2021 to 28.7/h in 2023. The catch rates of legal Largemouth Bass were variable from 3.0/h in 2019 to 13.3/h in 2021 to 0.7/h in 2023. Catch rates during the 2019 electrofishing survey may have been lower due to sampling issues and lower water level attributed to drought. The 2023 survey resulted in a decreased PSD of 23 compared to the 2021 (51) and 2019 (58) surveys, which indicated a greater representation of smaller fish. OBS objectives for size distribution and body conditions were not met during our sampling efforts. Only 43 ≥ stock-length were sampled and we were unable to collect 10 fish per inch group to assess body conditions. Mean relative weights ranged from 75-83 in the 2023 survey were suboptimal. Historically, there have been very few pure Florida Largemouth Bass in Cisco Reservoir. During the 2023 survey no pure Florida Largemouth Bass were sampled, and all 30 fish were intergrade bass; this result is consistent with prior surveys (Table 7).

White Crappie: Sampling objectives for White Crappie were not met in the 2023 trap netting survey because of poor sample size. White Crappie catch rate was 0.9/nn in 2023 was similarly low compared to the 0.4/nn in 2019, but the result was lower than 2.9/nn recorded in 2017 (Figure 7). The size structure in 2019 and 2017 was comprised mostly of fish ≥ stock-length, but the 2023 sample was dominated by smaller subquality fish (Figure 7). The 2023 survey resulted in a substantial decrease of PSD (12) compared to the 2021 (100) and 2019 (96), which indicates a greater representation of smaller fish. Only 1 legal White Crappie has been sampled in the last two trap netting surveys.

Fisheries Management Plan for Cisco Reservoir, Texas

Prepared – July 2024

ISSUE 1: Largemouth Bass support the most popular fishery at Cisco Reservoir (Goldstrohm and Homer 2016). Electrofishing catch rates have varied likely due to fluctuations in water level and availability of habitat. In the most recent survey, catch of legal Largemouth Bass was low, and body conditions were mostly suboptimal. Overharvest of legal fish may be a concern for this reservoir. Further evaluation of the fishery is necessary to determine future management approaches for Largemouth Bass.

MANAGEMENT STRATEGIES

1. Continue to monitor Largemouth Bass and prey populations to determine trends in relative abundance, size structure, genetics, and body conditions by conducting electrofishing surveys in fall 2025 and fall 2027.
2. Conduct a Category II and/or a Category III age and growth survey.
3. Conduct a year-long roving creel survey during 2027-2028.

ISSUE 2: Boater access is limited to two ramps, but parking at these locations is limited when water level is near CP. Furthermore, the ramps' conditions are deteriorating.

MANAGEMENT STRATEGY

1. Contact the City of Cisco and discuss needed improvements that could be made for access to the reservoir as well as potential funding opportunities such as the Boating Access Grant and Habitat and Angler Access Program.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

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

Objective-Based Sampling Plan and Schedule (2024–2028)

Sport fish, prey fish, and other important fishes: Sport fishes in Cisco Reservoir include Blue Catfish, Channel Catfish, Flathead Catfish, White Bass, Largemouth Bass, and White Crappie. Known important prey fish are Gizzard Shad, Threadfin Shad, Bluegill, and other sunfish species.

Low-density fisheries:

Blue Catfish: Blue Catfish were stocked into Cisco Reservoir in 1980 and 2001, and they have been managed with the statewide harvest regulations. Blue Catfish in the reservoir have been monitored with periodic gill netting surveys. However, relative abundance of Blue Catfish has been low and suggest they are not abundant in the reservoir as well as support a small proportion of the overall catfish fishery. Presence/absence of this species will be recorded during other sampling.

Channel Catfish: Channel Catfish are present in the reservoir and have been managed with the statewide harvest regulations. The 2014-2015 creel survey results indicated that directed angling effort towards the catfishes group was 8.4% of the overall directed effort (Goldstrohm and Homer 2016). Channel Catfishes have been monitored with gill netting surveys and tandem hoop net surveys. Channel Catfish relative abundance has been low in prior surveys. Due to the high number of gill net stations and tandem hoop net series needed to achieve desirable sample sizes (i.e., >50 stock-sized fish) and optimal precision (i.e., RSE ≤ 25) for relative abundance estimates, directed sampling effort targeting this species may be impractical. Channel Catfish will be monitored for presence/absence during other sampling.

White Bass: White Bass were first discovered in the reservoir in 2004, and the population has since been managed with the statewide 10-inch MLL and 25-fish bag limit. The 2014-2015 creel survey results indicated that directed angling effort towards White Bass was the lowest of any species (1.0% of the directed angling effort [Goldstrohm and Homer 2016]). Gill net catch rates of White Bass has been low. Presence/absence will be recorded during other sampling.

Flathead Catfish: Flathead Catfish are present at the reservoir, but angling effort has been traditionally low and mainly by passive gear anglers. Flathead Catfish presence in historical monitoring efforts has been minimal. Therefore, monitoring for Flathead Catfish will be conducted as presence/absence in conjunction with sampling for other species.

Survey objectives, fisheries metrics, and sampling objectives

Prey species: Bluegill and Redbreast Sunfish were the primary prey in Cisco Reservoir in 2023. Longear Sunfish, Gizzard Shad, Redear Sunfish, and Threadfin Shad were also present and available as prey. Historically, some species of sunfishes (e.g., Redear Sunfish and Redbreast Sunfish) have provided an opportunity for anglers to catch larger sunfishes. However, larger sunfishes (≥ 7 inches) have declined in relative abundance likely due to fluctuating water level and reduced amount of littoral habitat. Relative abundance and size structure estimates of prey species have been collected at least every four years with occasional biennial sampling. The survey objective for these species is to monitor trends in relative abundance and size structure. Data will be collected for prey species by electrofishing during fall 2025 and 2027. Sampling will be conducted at 18, 5-minute stations (1.5 hours total) in conjunction with Largemouth Bass sampling, and a target RSE ≤ 25 will be attempted for relative abundance data (i.e., CPUE-Total) for Gizzard Shad, Bluegill, Redbreast Sunfish, and Redear Sunfish. Prey availability (IOV) will be calculated for Gizzard Shad. At least 50 fish ≥ stock-length will be collected for size structure estimation (PSD) for Bluegill, Redbreast Sunfish, and Redear Sunfish. No additional effort will be expended if objectives for prey species are not met during designated Largemouth Bass sampling. Instead, Largemouth Bass body conditions can provide information on prey vulnerability to predation and prey relative abundance.

Largemouth Bass: Largemouth Bass are relatively abundant and support the most popular sport fishery in Cisco Reservoir (nearly 50% of angler directed effort based on 2014/2015 creel survey

results; [Goldstrohm and Homer 2016]). Largemouth Bass are managed with the statewide 14-inch minimum length limit and 5-fish daily bag limit. Largemouth Bass relative abundance has been variable in monitoring surveys. More recent surveys have suggested that while reproduction is occurring, recruitment to legal length is likely poor and/or overharvest of legal fish is an issue. Additionally, body conditions of Largemouth Bass have been poor. Limitations in forage may be attributed, but more investigation into growth and mortality may be warranted. Continuation of electrofishing is necessary to monitor Largemouth Bass, and data will be used to inform anglers on the status of the fishery as well as to assess management strategies. Electrofishing will be conducted at 18 random, 5-minute stations in fall 2025 and 2027. A target RSE of ≤ 25 for CPUE-Total and Stock CPUE will be attempted. A target of 50 fish ≥ stock length will be sampled to achieve an estimate of size structure, and 5 fish per inch group ≥ stock-length will be measured and weighed for body condition. If desired level of precision (i.e., RSE) and other sampling objectives are not met for Largemouth Bass and if objectives are not achieved, additional sampling up to 12, 5-minute stations may be added to improve data quality. Fin clips from a random sample of 30 Largemouth Bass will be collected for microsatellite DNA genetic analysis in 2027. Otoliths will be collected from 13 fish, 13.0-14.9 inches to assess age at legal length in 2025. In the 2027 survey, a Category III age sample may be collected if growth and conditions continue to be poor in the 2025 survey. If additional specimens are needed for genetics and/or age and growth additional daytime bass-only electrofishing may be conducted if deemed feasible.

White Crappie: White Crappie are present and have been managed under the statewide 10-inch MLL and 25-fish daily bag limit. The 2014-2015 creel results indicated that White Crappie support a popular, harvest-oriented fishery and that directed angling effort towards them was 20.3%, 1,127 fish were harvested, and anglers reported no legal fish being released (Goldstrohm and Homer 2016). Catch rates of White Crappie have been traditionally low in trap netting surveys. Since, White Crappie support a popular fishery, sampling should continue and will be conducted in fall 2027. Fall trap netting to maintain trend data will allow for determination of any large-scale changes in the crappie population, inform anglers on the status of the fishery, and to help identify management needs. Based on past data, to achieve a CPUE-Total and CPUE-Stock RSE ≤ 30, sampling ≥10 random stations will need to be conducted. During this survey period, no target for precision will be set. A target of a 50 fish ≥ stock-length will be attempted to be collected to monitor trends in size structure (PSD), and 5 fish per inch group ≥ stock-length (≥ 5 inches) will be measured and weighed to estimate body conditions. Otoliths will be collected in a Category I sample from all White Crappie collected during fall surveys conducted during 2027 to estimate age and growth. If sampling objectives are not achieved, up to 10 additional stations may be sampled if feasible. Creel survey data will also be used to evaluate the status of the fishery.

Creel Survey: A creel survey was last conducted during 2014-2015. Given concerns with the Largemouth Bass and White Crappie stocks, creel data will be useful in evaluating harvest of these species. Therefore, a roving creel survey will be conducted during June 1, 2027-May 31, 2028.

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Tables and Figures

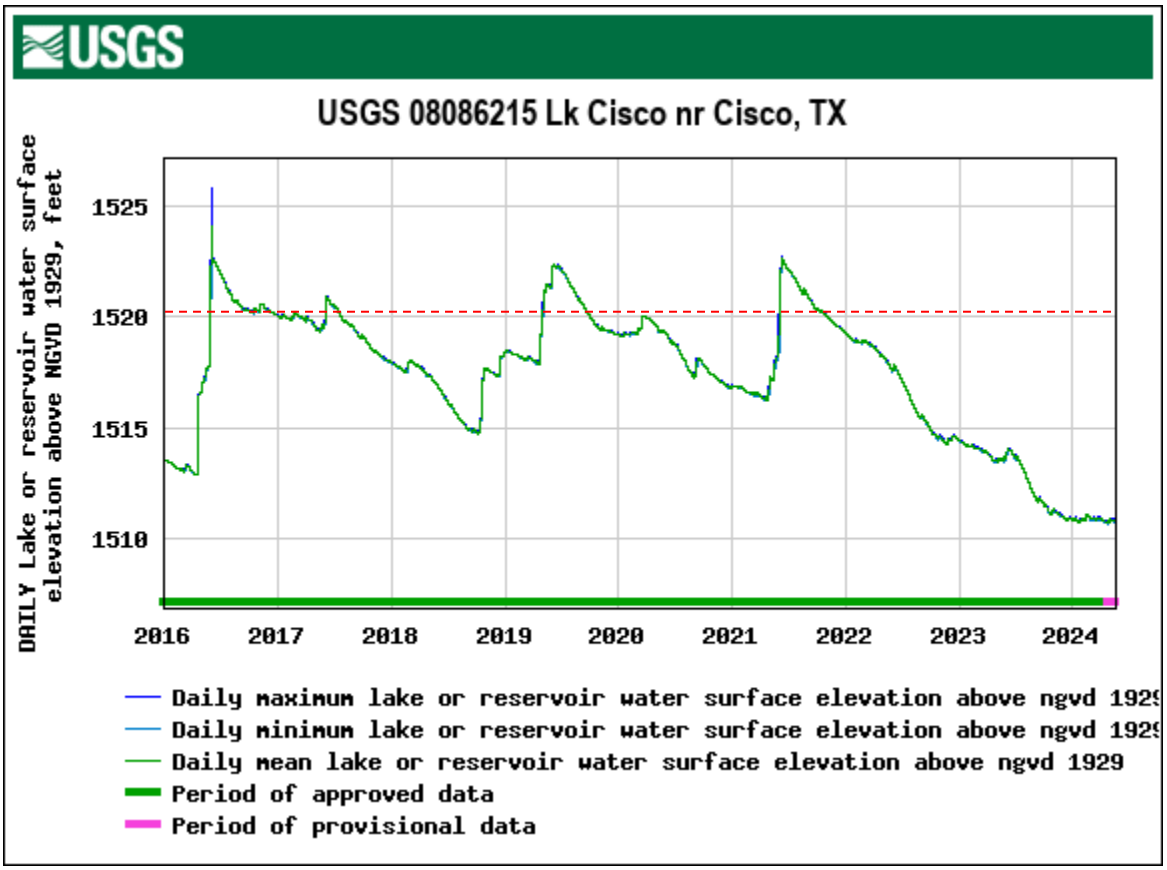


Figure 1. Mean daily water level elevations in ft. above mean sea level (MSL) and conservation pool (dashed line) recorded for Cisco Reservoir, Texas (USGS 2024).

Table 1. Characteristics of Cisco Reservoir, Texas.

Characteristic	Description
Year Constructed	1928
Conservation pool	1,520 ft. above mean sea level
Maximum depth (at CP)	1,457 ft. below mean sea level
Controlling authority	City of Cisco
County	Eastland
Reservoir type	Tributary
River basin	Brazos River Basin
U.S. Geological Survey 8-Digit Hydrologic Unit Watershed Code	12060105
Carlson's Trophic State Index Chl-*a*	43.9 (Mesotrophic)

Table 2. Boat ramp characteristics for Cisco Reservoir, Texas, April 2024. Reservoir elevation at time of survey was 1,511 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Main Ramp	32.4374 -99.0018	Y	15	1,502	Accessible
Lake Shore Drive Ramp	32.4439 -99.0013	Y	5	1,496	Accessible

Table 3. Harvest regulations for Cisco Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination only 10 ≥ 20 inches)	None
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Cisco Reservoir, Texas. Size categories are FRY =<1 inch, FGL = 1-3 inches, AFGL = 8 inches, and UNK = unknown.

Species	Year(s) Stocked	Number of Years	Number Stocked	Size
Blue Catfish	1971	1	19,654	UNK
	1994	1	307,248	FGL
Channel Catfish	1968–1970	3	550,763	AFGL
Florida Largemouth Bass	1982	1	500	AFGL
	1982–2000	6	2,206,972	FGL
	2009	1	408,658	FGL
	2010	1	407,949	FGL
	2011	1	408,862	FGL
	2013	1	408,581	FGL
	2015	1	184,935	FGL
ShareLunker Largemouth Bass[a]	2010	1	2,017	FGL
	2013	1	4,677	FGL
Lone Star Bass[b]	2022	1	125,000	FGL
Paddlefish	1992	1	15,401	FGL
	1998	1	9,646	FGL
Palmetto Bass	1977–1996	6	987,412	FGL
	1996	1	140,612	FRY
	1997	1	50,658	FGL
	1998	1	191,837	FGL
	1999	1	62,182	FGL
	2000	1	44,931	FGL
	1980–1982	2	315,000	UNK

[a] ShareLunker Largemouth Bass are 1st generation offspring from angler-donated Largemouth Bass ≥ 13 pounds from the Toyota ShareLunker program.

[b] Lone Star Bass are 2nd generation offspring of pure Florida strain ShareLunker Largemouth Bass that have proven to be able to grow to ≥ 13 pounds.

Table 5. Objective-based sampling plan components for Cisco Reservoir, Texas 2023-2024.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Relative Abundance	CPUE-Total and Stock CPUE	RSE-Total and 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_r	10 fish/inch group
	Genetics	% FLMB	N = 30, any age
Bluegill [a]	Relative Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad [a]	Relative Abundance	CPUE–Total	RSE ≤ 25
	Size Structure	Length Frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50
Low-frequency electrofishing			
Flathead Catfish	Relative Abundance	CPUE-Total	Practical effort
	Size Structure	Length frequency	Practical effort
Trap netting			
White Crappie	Relative Abundance	CPUE-Total, Stock CPUE	
	Size structure	PSD, length frequency	N = 50
	Age-and-growth	Age at 10 inches	N = 13, 9.0 – 10.9 inches
	Body Condition	W_r	10 fish/inch group

[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. Percent occurrence with lower and upper 95% confidence limits (CL) of shoreline habitat at 150 random sites in Cisco Reservoir, Texas, August, 2023. Water level at time of survey was 13 feet below conservation elevation.

Structural habitat type	Percent occurrence	Lower CL	Upper CL
Dead terrestrial vegetation	67.3	59	75
Rocky shoreline	46.7	56	76
Gravel	28.7	22	37
Docks	28.0	21	36
Natural	15.3	10	22
Rock Bluff	8.7	5	14
Standing Timber	3.3	1	8
Bulkhead	<1.0	0	4

Gizzard Shad

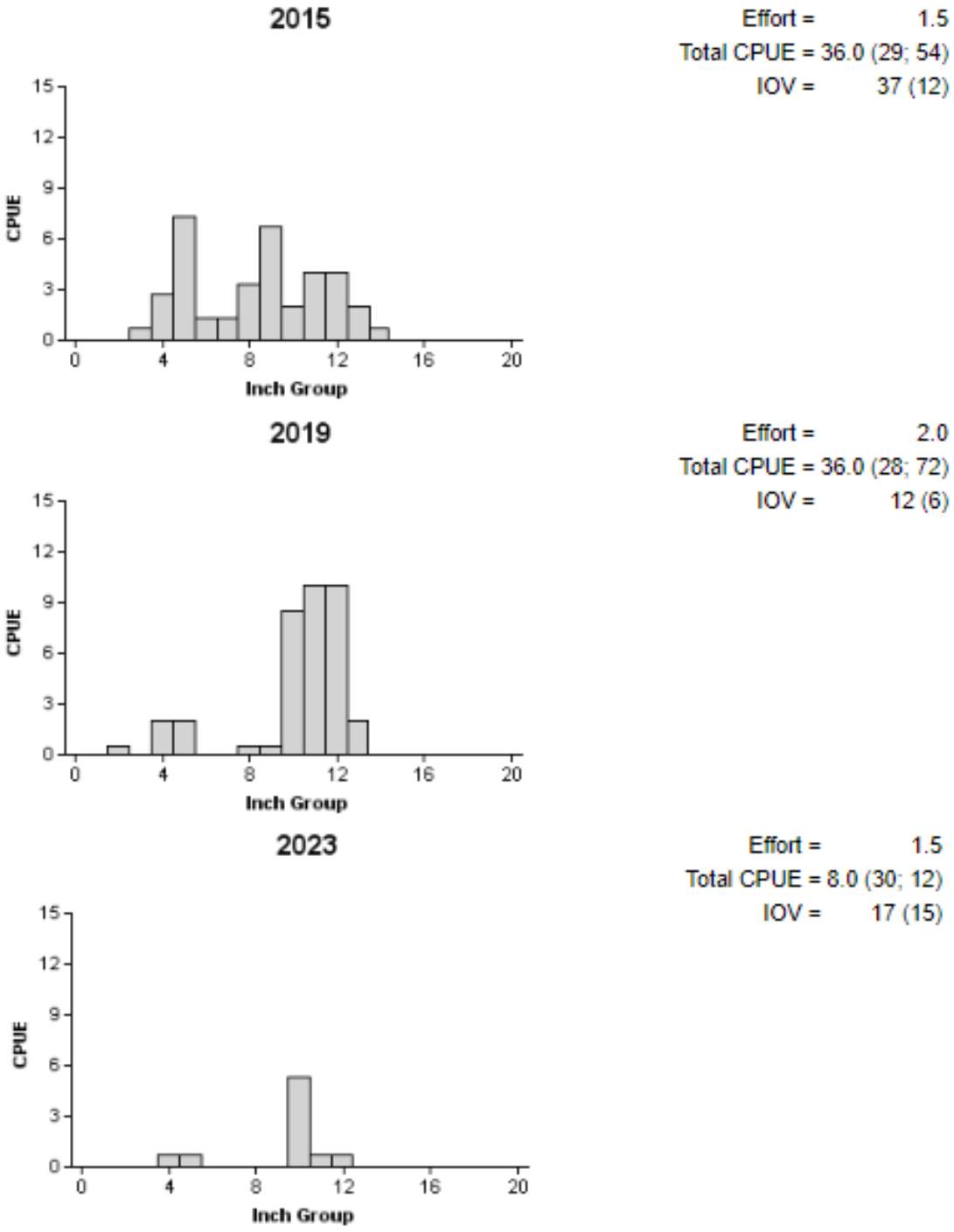


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2015, 2019, and 2023.

Bluegill

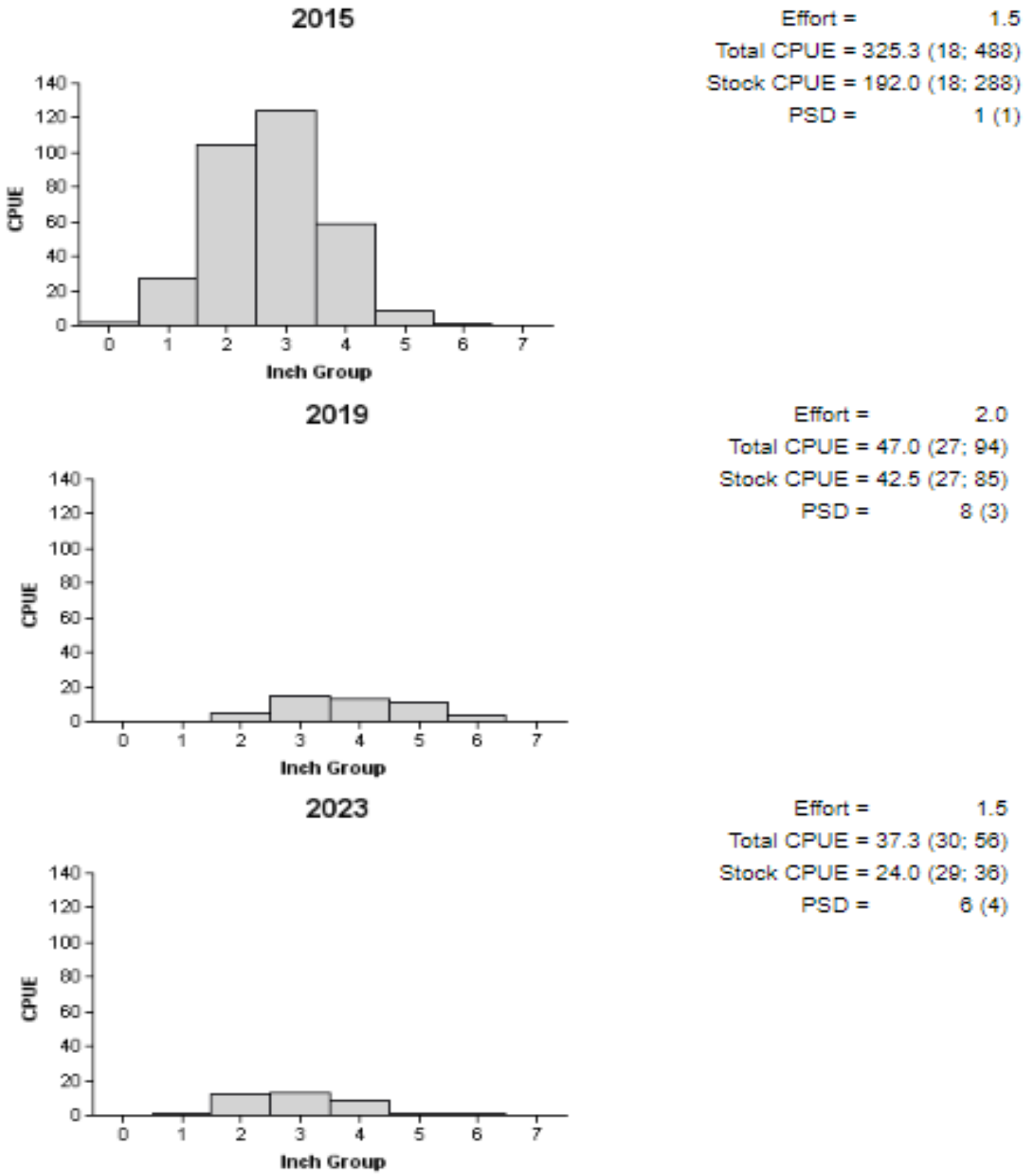


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2015, 2019, and 2023.

Redbreast Sunfish

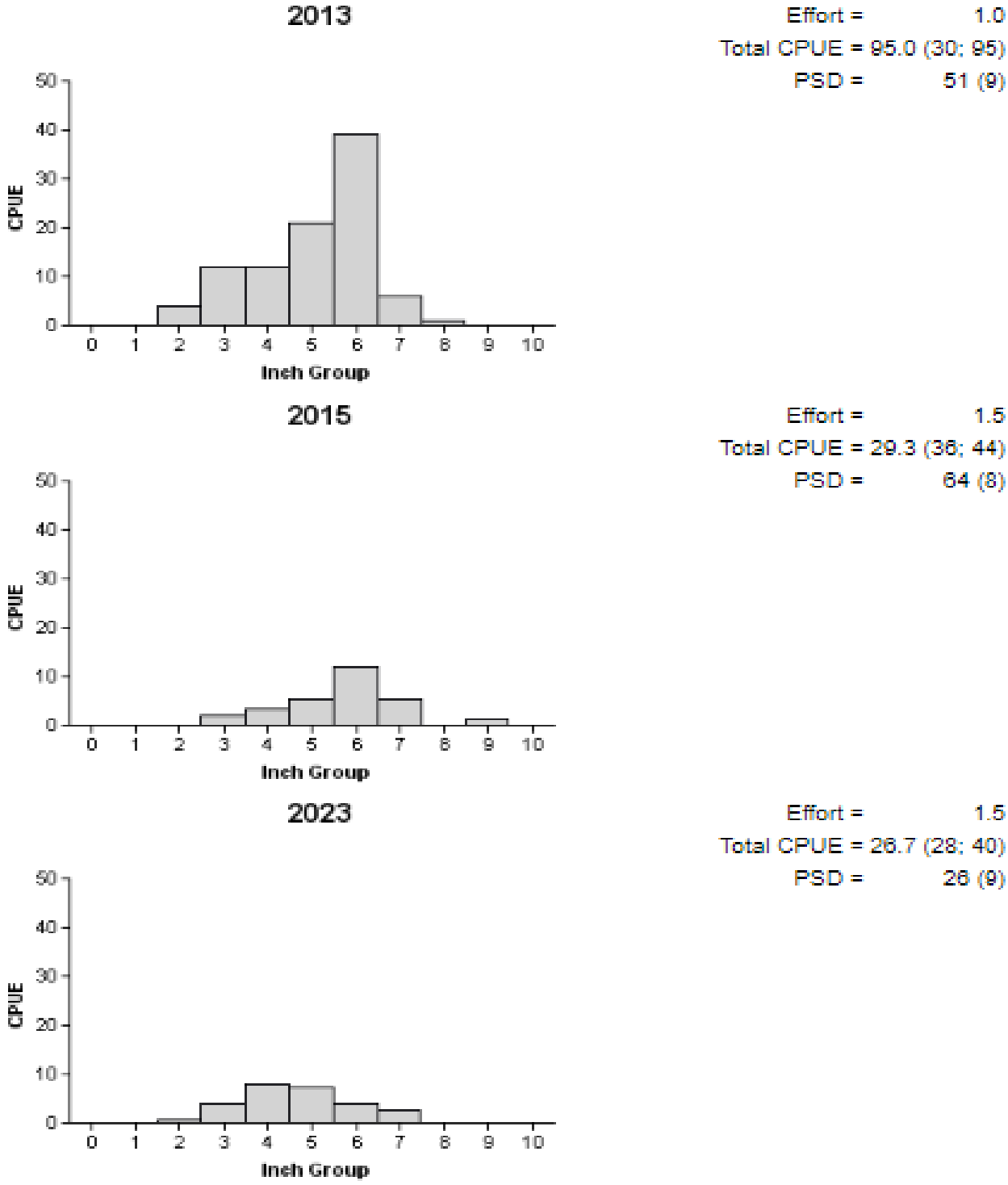


Figure 4. Number of Redbreast Sunfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cisco Reservoir, Texas, 2005, 2009, and 2013.

Redear Sunfish

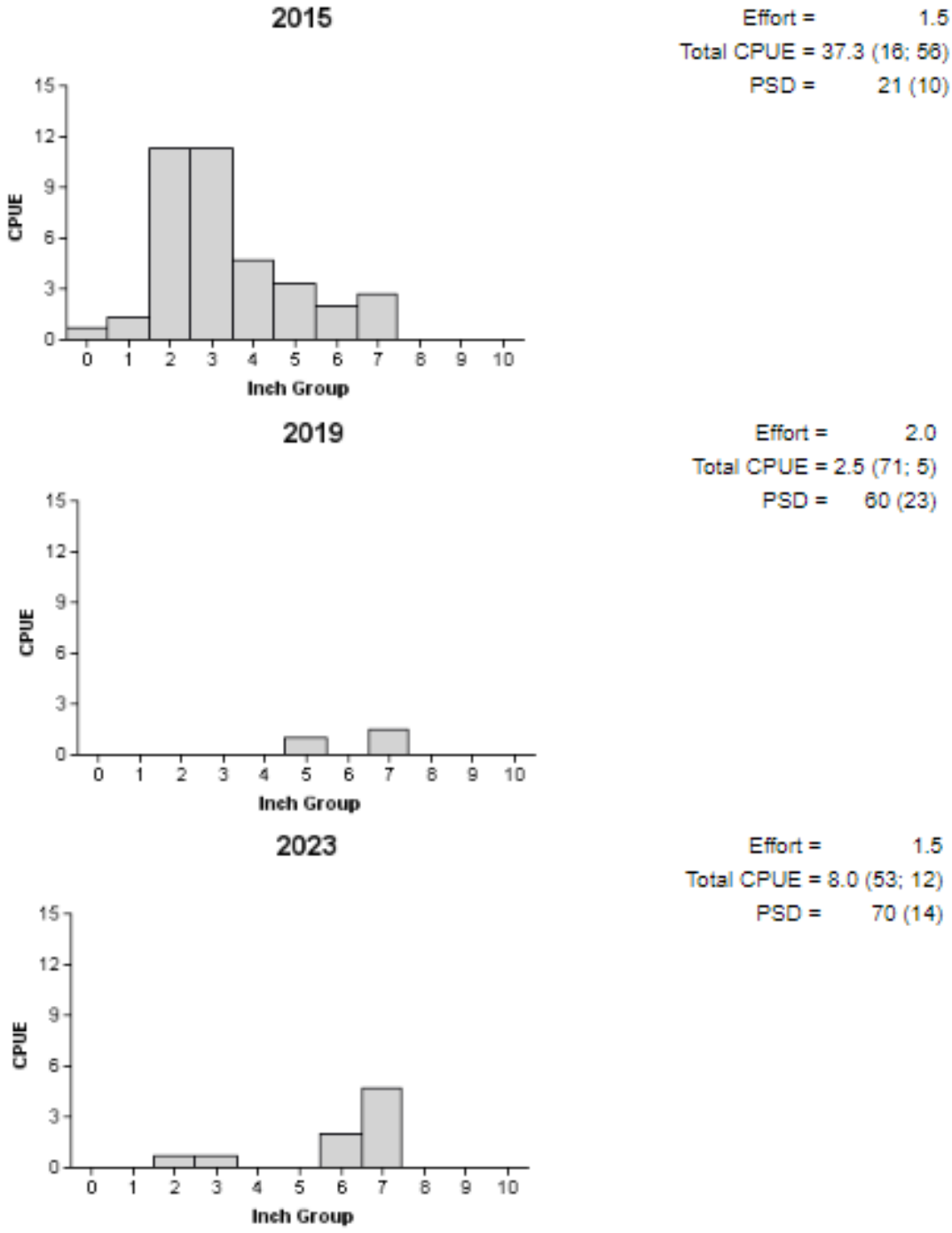


Figure 5. Number of Redear Sunfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2015, 2019, and 2023.

Largemouth Bass

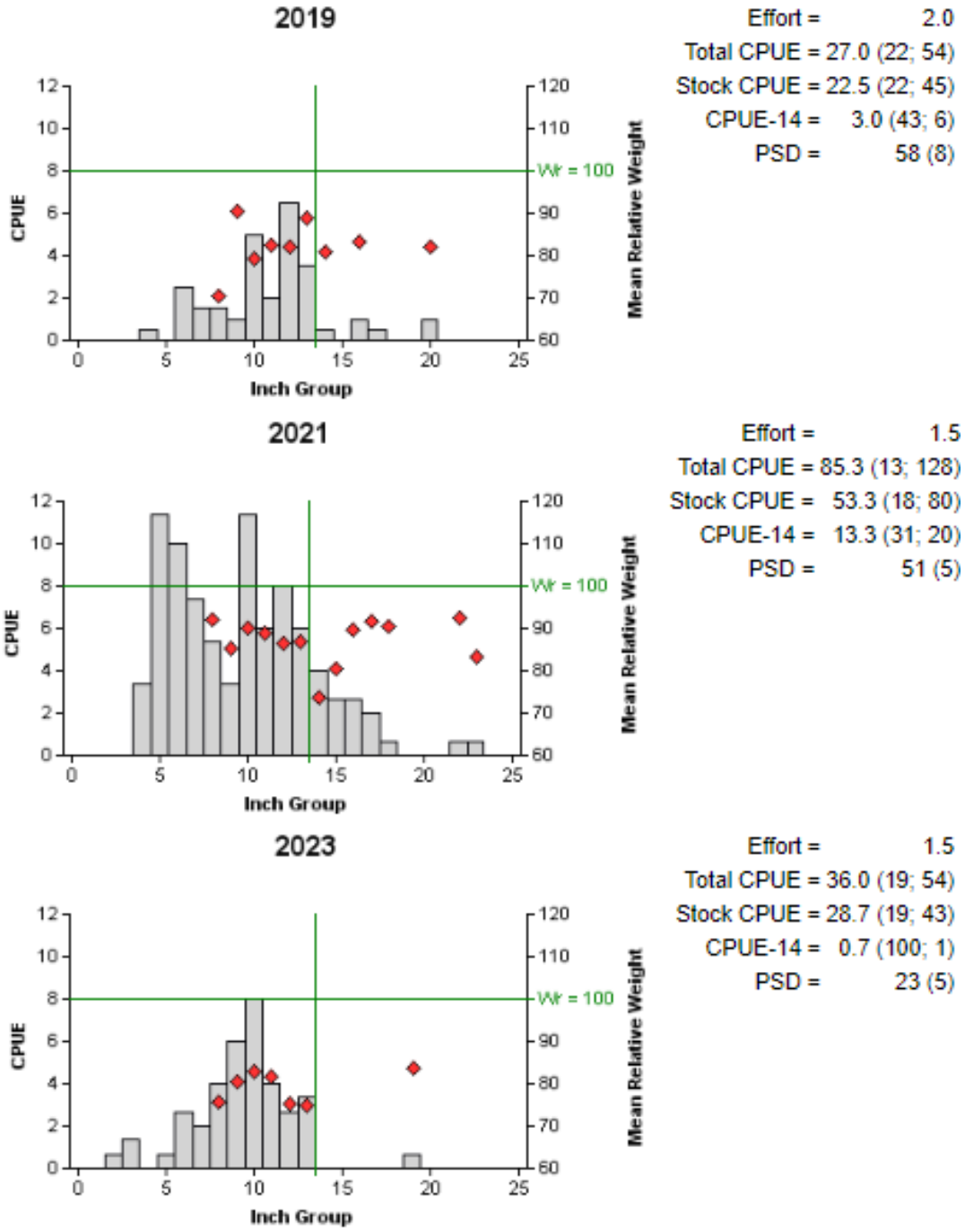


Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2019, 2021, and 2023. The vertical line indicates the 14-in. total length minimum length limit, and the horizontal line denotes optimum relative weight of 100.

Largemouth Bass

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Cisco Reservoir, Texas, 2004, 2008, and 2012. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

Year	Number of fish					% FLMB alleles	% FLMB
	Sample size	FLMB	F1	Fx	NLMB		
1993	26	0	NA	4[a]	22	4.8	0.0
1996	27	1	NA	19[a]	7	37.0	3.7
1999	40	10	NA	28[a]	2	61.3	25.0
2005	30	1	NA	26[a]	3	45.5	3.3
2011	30	0	1	29	0	52.0	0.0
2015	30	0	0	30	0	56.0	0.0
2017	30	0	3	27	0	53.6	0.0
2019	29	0	0	29	0	57.8	0.0
2023	30	0	1	29	0	59.0	0.0

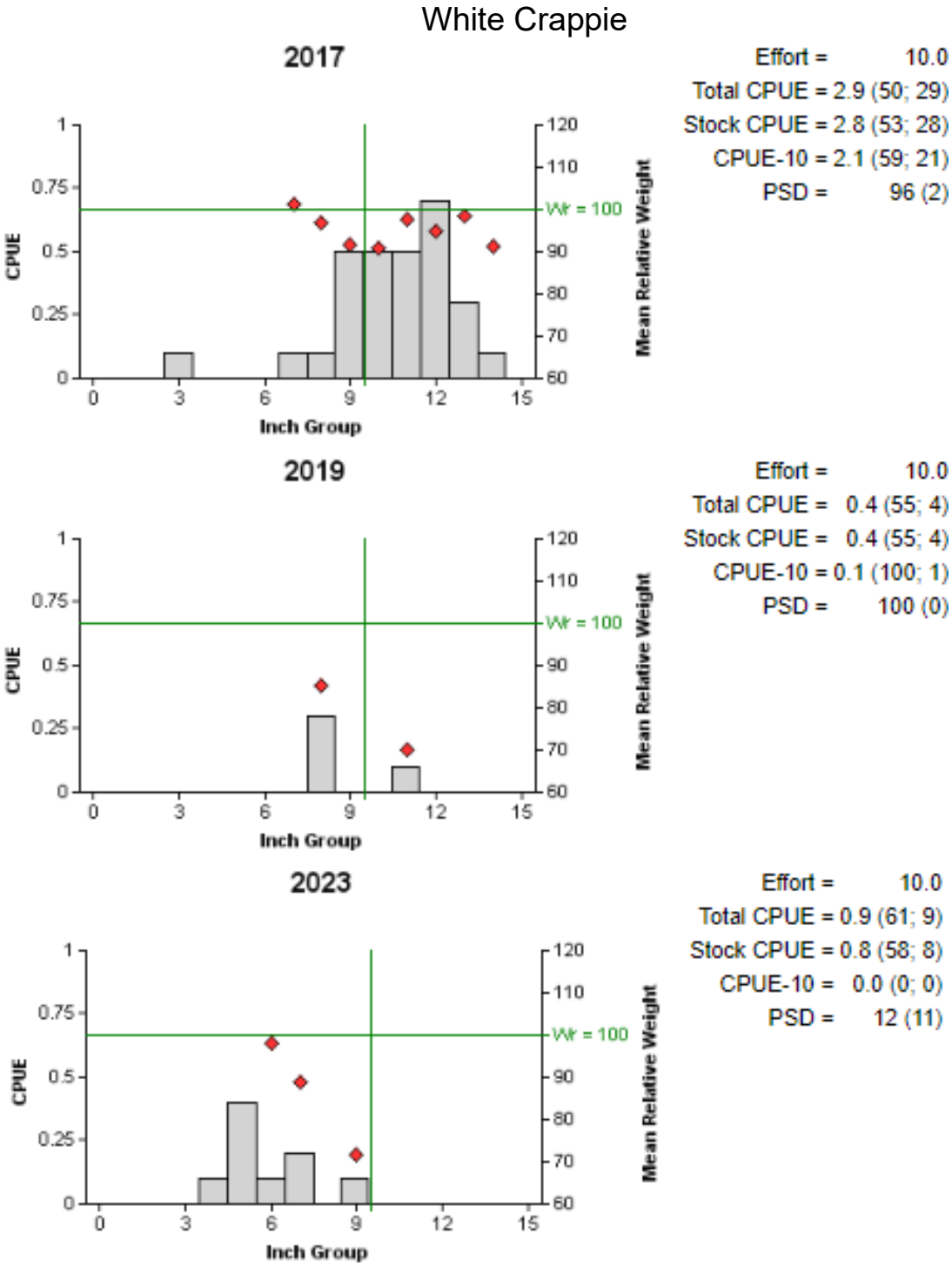


Figure 7. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Cisco Reservoir, Texas, 2017, 2019, and 2023. The vertical line indicates the 10-in. total length minimum length limit, and the horizontal line denotes optimum relative weight of 100.

Proposed Sampling Schedule

Table 8. Proposed sampling schedule for Cisco Reservoir, Texas, 2024-2028. 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.

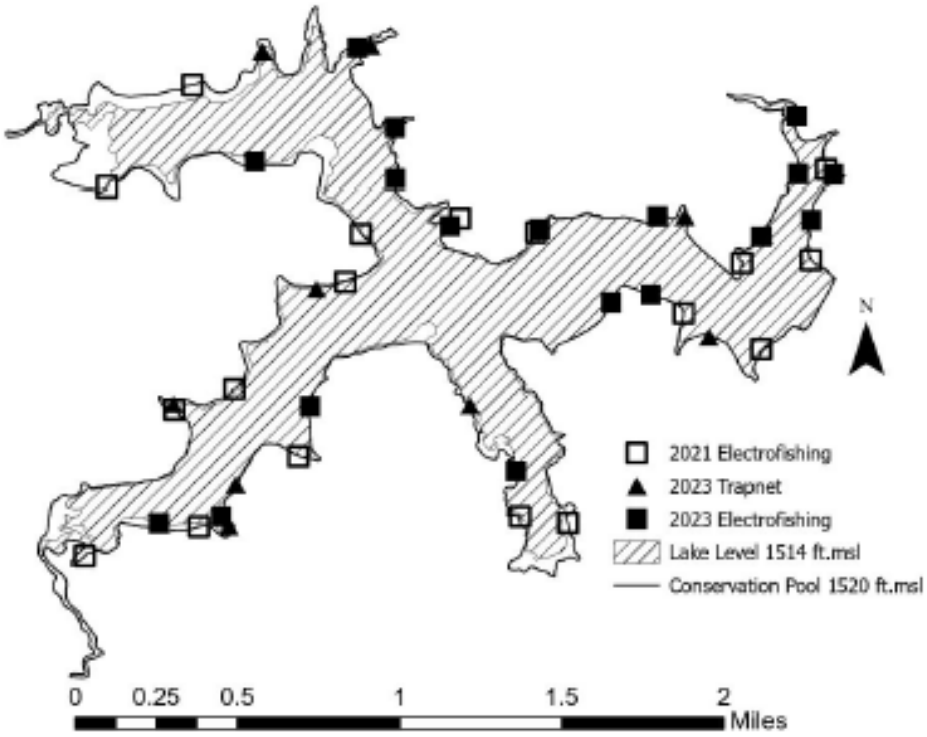
	Survey year			
	2024-2025	2025-2026	2026-2027	2027-2028
Angler Access				X
Structural Habitat				X
Vegetation				X
Electrofishing – Fall		X		X
Trap netting				X
Gill netting				X
Creel				X
Report				X

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

Number (N) and catch rate (CPUE; RSE in parentheses) of all target species collected from all gear types from Cisco Reservoir, Texas, 2023-2024. Sampling effort was 1.5 hour for electrofishing and10 net nights for trap netting.

Species	Electrofishing		Trap Netting	
	N	CPUE	N	CPUE
Gizzard Shad	12	8.0 (30)		
Threadfin Shad	3	2.0 (100)		
Common Carp	13	8.7 (56)		
Blue Catfish	5	3.3 (39)		
Channel Catfish	7	4.7 (42)		
Flathead Catfish	1	0.7 (100)		
Redbreast Sunfish	40	26.7 (28)	1	0.1 (100)
Green Sunfish	6	4.0 (73)		
Warmouth	1	0.7 (100)	3	0.3 (51)
Orangespotted Sunfish	1	0.7 (100)		
Bluegill	56	37.3 (30)	50	5.0 (39)
Longear Sunfish	16	10.7 (37)	22	2.2 (29)
Redear Sunfish	12	8.0 (53)	15	1.5 (39)
Largemouth Bass	54	36.0 (19)	1	0.1 (100)
White Crappie			9	0.9 (61)
Hybrid Sunfish	1	0.7 (100	1	0.1 (100)

APPENDIX B – Map of sampling locations



Map of electrofishing stations (squares) and trap netting stations (triangles) at Cisco Reservoir, Texas, 2021 and 2023.

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