

Lake Bryan

2022 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in Lake Bryan were surveyed in 2021 using electrofishing and in 2022 using gill netting. Anglers were surveyed from March through May 2022 with a creel survey. Historical data are presented with the 2021-2022 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 Bryan is a 737-acre reservoir in Brazos County, Texas, built by Bryan Texas Utilities (BTU) to provide water for power-plant cooling. The lake has a small 1.97 square mile watershed and water level is maintained by a BTU-owned well resulting in a nutrient-limited reservoir ecosystem and fishery. BTU has worked to increase recreational opportunities and fishery quality since renovating the public park in 2018. The reservoir is located within a public park, and access for both boat and bank angling are excellent. The primary fish habitat is limestone riprap and scattered native emergent vegetation.

Management History: Primary sport fishes in Lake Bryan include Largemouth Bass, Blue Catfish, and Channel Catfish. A variety of small sunfish species are also present with Bluegill and Green Sunfish available in high densities along the rip rap serving as the primary prey for sport fish. Sport fish species are managed under statewide length and bag limits.

Fish Community

- **Prey species:** Bluegill, Green Sunfish, and Longear Sunfish comprised most of the available prey. Threadfin and Gizzard Shad are present in limited numbers. Bluegill were the most abundant of the sunfish species, and all were < 7 inches in length.
- **Catfishes:** Channel Catfish and Blue Catfish were both available to anglers at low densities.
- **Largemouth Bass:** Growth, body condition and size structure of the Largemouth Bass population has moderately improved from previous surveys. Largemouth Bass up to 17 inches were observed in the electrofishing survey with a greater abundance of smaller sized fish than previous surveys. Body condition and growth of Largemouth Bass were good and showed improvement from recent surveys with observed relative weights (W_r range: 90–120) and average age at 14 inches at 2 years. The current lake record Largemouth Bass (8.7 lb, 23.25 inches) was caught in November 2021. Thirty seven percent of anglers targeted black basses.
- **Crappies:** Both White Crappie and Black Crappie are present in Lake Bryan and were observed during the spring creel survey. Crappies were targeted by 19% of anglers.
- **Red Drum:** Red Drum were stocked annually from 2015–2020. The stockings were unsuccessful, presumably due to limited forage for juvenile life stages.

Management Strategies: Increase feeding and refuge habitat by planting native aquatic plants in shallow parts of the reservoir to improve prey base and sportfish growth. Use straw or hay bales to protect young plants from wave action and increase nutrient input to the system in the form of detritus. Stock Largemouth Bass and catfishes if there is evidence of increased abundance of prey species after the electrofishing survey in 2023.

Introduction

This document is a summary of fisheries data collected from Lake Bryan from 2021-2022. 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 2021-2022 results.

Reservoir Description

Lake Bryan is a 737-acre reservoir in Brazos County, Texas, built by BTU to provide water for power-plant cooling. Since 2018, BTU has dedicated efforts to increasing recreational opportunities at Lake Bryan such as angling, boating, and camping. These efforts have included improving reservoir productivity, habitat quality, and ecosystem robustness to improve fisheries in the system. The lake has a small watershed of only 1.97 square miles and water level is maintained by well, which has historically been moderately saline. With a limited watershed, there is little nutrient input from terrestrial or stream sources, resulting in a very nutrient-limited reservoir ecosystem and low fisheries productivity. The reservoir is located within a public park, and access for both boat and bank angling are excellent. The primary fish habitat is limestone riprap and scattered native emergent vegetation. Although there are no water-level data available for Lake Bryan, the reservoir generally remains within four feet of conservation pool which is 355.5 feet above sea level. Other descriptive characteristics for Lake Bryan are listed in Table 1.

Angler Access

Lake Bryan has one public boat ramp and no private boat ramps. The reservoir is contained completely within the Lake Bryan Park and has excellent shoreline access. The boat ramp provided good boat access even during drought. Additional boat ramp characteristics are listed in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Ragan-Harbison, Best, and Webb 2018) included:

1. Improve littoral and pelagic primary production through increased littoral native vegetation and whole-lake fertilization.

Action: Native vegetation, including white waterlily (*Nymphaea odorata*), eelgrass (*Vallisneria americana*), and bull tongue (*Sagittaria lancifolia*) were planted in 2019 inside wire-mesh fences to protect young plants from herbivory and continue to persist. Whole-lake fertilization treatments were conducted in 2019 and 2020: chlorophyll a levels increased however the phytoplankton community became dominated by undesirable genera including *Planktolyngbya* spp. *Cylindrospermopsis* spp. *Anabaenopsis* spp.
2. Monitor chloride ion concentration in Lake Bryan to determine suitability for future Red Drum stocking and monitor for successful Red Drum recruitment from stocked fish.

Action: Water chemistry remains within Red Drum suitability range despite use of a new well to maintain water level that draws from a different ground water source; however, traditional fisheries survey methods (electrofishing and gill net), and non-traditional surveys (angling and community outreach) failed to collect sub-adult or adult Red Drum. Red Drum stockings are assumed to have failed due to low prey availability for fingerling and juvenile fish.
3. Stock Blue Catfish if available and monitor natural recruitment and reproduction of Blue Catfish.

Action: Blue Catfish have not been stocked in Lake Bryan since 2009; however, Blue Catfish persist at low abundance in the reservoir and gill netting in 2022 found subadults (< 10 inches) and adults over stock-size, up to 21 inches.

Harvest regulation history: Largemouth Bass in Lake Bryan were managed under an 18-inch minimum length limit from 1996 to 2018 in an attempt to increase the relative abundance of larger fish available to anglers. On September 1, 2018, the Largemouth Bass length limit changed to the state-wide 14-inch minimum length limit. All sportfish in Lake Bryan are currently managed under statewide length and bag limits. This includes the updated regulation for Channel Catfish and Blue Catfish which took effect on September 1, 2021: a 25-fish bag limit for both species combined and, in any combination with no minimum size limit (of which, only 10 fish can be 20 inches or greater in length). Current regulations are found in Table 3.

Stocking history: Notable stockings at Lake Bryan included initial stockings of Florida Largemouth Bass in 1993, Threadfin Shad in 1992, hybrid crappie in 1997, and Blue Catfish in 2009. Red Drum were stocked from 2015–2020. Recent stockings include Florida Largemouth Bass and Channel Catfish in 2018 and 2019. The complete stocking history is recorded in Table 4.

Vegetation/habitat management history: Habitat is limited in Lake Bryan. Limestone riprap is the most abundant littoral habitat available to juvenile fish (Table 6). Historically, native emergent plants including cattails, bulrush, and spike rush provided limited littoral habitat. Bulrush and spike rush were introduced into the reservoir by TPWD in the late 1990s as part of a fish kill mitigation project funded by the City of Bryan. In 2017, limited stands of cattail and bulrush totaling less than 5 acres were observed at Lake Bryan (Table 7).

Water transfer: The reservoir is located on top of a hill and has a very small watershed. Water level is maintained by a water well. No inter-basin transfers exist.

Methods

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

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by nighttime electrofishing (1 hour at 12, 5-min stations) at biologist-selected 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). Historical electrofishing surveys were conducted using a 7.5 GPP Smith-Root Electrofisher. Electrofishing in 2021 was conducted using a Smith-Root APEX Electrofisher.

Gill netting – Catfishes and Red Drum were targeted with 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.

Creel survey – A spring-quarter access-point creel survey was conducted from March 2022 – May 2022. 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).

Water Chemistry and Nutrient Analysis – Water chemistry parameters (alkalinity and hardness) nutrient levels (total phosphorus, free reactive phosphorous, total kjeldahl nitrogen, nitrates, nitrites, total nitrogen and chlorophyll a), and planktonic identification were performed by SePRO Research and Technology Campus, a private water testing company. Analyses were conducted twice in 2019 and 2020 (before and after whole-lake fertilization) and once in 2022.

Habitat – A structural habitat survey was conducted in 2017. Exotic vegetation surveys were conducted in 2018-2020 and a full plant community survey was conducted in 2021 to monitor expansion of native vegetation. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017). Bathymetric and bottom hardness maps of Lake Bryan were generated using the BioBase software from C-Map.

Results and Discussion

Habitat: A full structural habitat survey was last completed in 2017 and structure has not changed significantly since (Table 6). A bathymetric scan was conducted in 2022, revealing more bathymetric variation than expected (Figure 1). This information will be used to determine future structural and vegetative habitat efforts. Vegetation remains sparse at Lake Bryan. Though more native emergent and floating leaf plants were present in the 2021 survey, most vegetation at Lake Bryan is composed of native emergent species such as bulrushes and spike rushes. Giant reed was observed for the first time in 2022 (Table 7).

Water Chemistry and Nutrient Analysis: Though total phosphorous is generally relatively high in Lake Bryan, planktonic primary productivity is limited by low free reactive phosphorus (<6 µg/L) and at times, low nitrogen levels (Table 8). Chlorophyll-a levels increased following 2019 and 2020 whole-lake fertilization efforts. However, pre-fertilization analysis indicated high levels of cyanobacteria (*Planktolyngbya* sp. *Cylindrospermopsis* sp. *Anabaenopsis* sp) in 2022, and fertilization was not conducted.

Creel: All anglers interviewed during the 2022 spring quarter creel survey were from Brazos County, the same county in which Lake Bryan is located. Estimated total fishing pressure was 1,811h and estimated expenditures were \$11,077 (Table 10 and Table 11). Most Lake Bryan anglers were opportunistic with more anglers targeting anything they could catch (44%) than any other species group (black bass at 37% and crappies at 19%). Catch rates for all target species were low. No anglers targeted catfishes or Red Drum, and none were observed during the creel survey.

Prey species: Prey species in Lake Bryan consisted primarily of Gizzard Shad (26/h), Bluegill (83/h), Green Sunfish (203/h), and Threadfin Shad in 2021 (Figure 2, Figure 3, and Appendix A). Gizzard Shad relative abundance has increased and IOV remains low, indicating much of the population is available as prey fish. Total CPUE of sunfish species were 336/h; however, Bluegill relative abundance decreased and large Bluegill and other sunfish were rare and not available to anglers. Other major components of the forage fish community included Longear Sunfish (50/h), Tilapia (26/h), and Bullhead Minnow (25/h, Appendix A).

Catfishes: Catfish populations continued to have low relative abundance, poor body condition, and poor population size structure: however, abundance of stock-sized Blue Catfish has marginally improved. Gill net catch rate of Blue Catfish in 2022 was 3.8/nn, 4.4/nn in 2018, and 0.8/nn in 2014 (Figure 5). Blue

Catfish population size structure marginally improved in 2022 with a PSD of 6 (all previous surveys results had a PSD of 0). While at very low rates, natural recruitment into the population was observed with catches of subadult fish (last stocked in 2009). The 2022 gill net survey indicated the presence of quality-sized (> 20 inches) catfish for the first time, however, at very low abundance. Channel Catfish populations have also responded from recent stocking efforts. Gill net catch rate of Channel Catfish was 3.2/nn in 2022, 1.6/nn in 2018, and 0.2/nn in 2014. Body condition for both species remains poor with W_r values below 70 (Figure 6).

The 2018 OBS plan (Ragan-Harbison, *et al.* 2018) called for a low-frequency electrofishing survey of Blue Catfish smaller than 12 inches to determine if natural reproduction has occurred in the reservoir. This survey was not completed due to staffing limitations and the observation of sub-adult sized fish during the gill net survey.

No catfish were observed during the creel and no anglers targeted either species (Table 12).

Largemouth Bass: Collection sites were biologist-selected in 2021 and electrofishing was conducted at night. Previous surveys with nighttime, randomly selected sites indicated a decline in relative abundance of Largemouth Bass through the 2000s, followed by an increase in 2013. historical catch rates were 95/h in 2005, 46/h in 2007, 1.0/h in 2009, and 35/h in 2013 (Figure 7 and Figure 8, Henson and Webb 2010).

The 2017 and 2021 surveys were conducted with biologist-selected stations in an effort to collect sufficient fish for age, growth, and population structure analytics and are not comparable to historic surveys. Both surveys had total catch rates of 36/h (Figure 9, Figure 10,). Although data did not meet total catch objectives of over 50 stock-sized Largemouth Bass, RSE value of less than 25 in both 2017 and 2021 indicates that these data are relatively representative of the Largemouth Bass population.

Largemouth Bass collected in 2021 were in good condition (W_r range: 90–120) and exhibited increased growth rates since the previous survey in 2017 (Figure 11, Ragan-Harbison, *et al.* 2018). All fish sampled in 2021 reached 14 inches (13.0 to 14.9 inches) in 2 years (N = 13).

Estimated fishing effort targeting Largemouth bass was 1,811 hours, catch rate was 1.46 fish/h, and all Largemouth Bass were caught and released (Table 13). This was an increase from the last creel survey in 2008, but still below rates seen in 2004 (Henson and Webb 2010). Additionally, the current lake record Largemouth Bass (8.7 lb, 23.25 inches) was caught in November 2021.

Crappies: Crappies were present in Lake Bryan but were not collected in sufficient numbers to estimate abundance: one White Crappie was captured during the gill net survey and both a White Crappie and Black Crappie each were observed during the spring quarter creel survey (Appendix A – Catch rates for all species from all gear types, Table 14). All crappies caught during the creel survey were harvested.

Red Drum: Red Drum were stocked annually from 2015–2020 and while chloride ion concentrations were conducive to Red Drum survival, no Red Drum were observed during 2017-2018 or 2021-2022 (electrofishing, and gillnetting surveys Attempts to collect red drum by hook-and-line were also unsuccessful. No verified catches of Red Drum were reported from anglers and no Red Drum were observed during the creel survey. The stocking of Red Drum is assumed to have failed due to insufficient forage for fingerling and sub-adult fish.

Fisheries Management Plan for Lake Bryan, Texas

Prepared – July 2022

ISSUE 1: Lake Bryan fisheries continue to be nutrient-limited due to its small watershed and ground water source. This hampers primary production and subsequently limits primary consumers (such as insects and planktivore fishes), secondary consumers (such as medium-sized fish), and ultimately sport fish abundance at higher trophic levels.

MANAGEMENT STRATEGY

1. Plant native vegetation in efforts to increase coverage in the lake to improve habitat for fish and aquatic invertebrates and increase nutrients available to the lower trophic levels.
2. Increase nutrients available to lower trophic levels from detritus by increasing vegetative material in the lake. This will be done by using hay or straw bales in front of native vegetation planting. This will both protect the young plants from wave action and supply nutrients to primary consumers (aquatic invertebrates and small fishes).

ISSUE 2: Recent surveys indicate recruitment of stocked fingerling catfishes to the adult population and possible evidence of Blue Catfish reproduction, but relative abundance of both Blue Catfish and Channel Catfish remains low. During the 2008 creel survey catfishes were the most-sought-after fish by anglers (Henson and Webb 2010).

MANAGEMENT STRATEGIES

1. Stock Blue Catfish when available to supplement natural reproduction if there is evidence of increased prey availability and promote the fishery via local press releases and social media.
2. Stock Channel Catfish when available to support the Channel Catfish fishery if there is evidence of increased prey availability and promote the fishery via local press releases and social media.

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 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.

Giant reed (*Arundo donax*) and cattail (*Typha* spp.) are present in Lake Bryan. Giant reed is an invasive species and can inhibit angler access. Cattail, while native, can create

angle access issues and should be kept clear of high-use areas such as the boat ramp and pier and can become problematic.

MANAGEMENT STRATEGIES

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 various literature (e.g., posters, pamphlets) to 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.
6. Monitor giant reed and cattail abundance and advise controlling authority on control measures if warranted.

Objective-Based Sampling Plan and Schedule (2022–2026)

Developed July, 2022

Sport fishes in Lake Bryan include Blue Catfish, Channel Catfish, Largemouth Bass, Black Crappie, and White Crappie. Known forage species include Bluegill, Green Sunfish, Longear Sunfish, Tilapia, Gizzard Shad, and Threadfin Shad. Efforts to improve the fishery at Lake Bryan are ongoing and surveying all sport fish species at Lake Bryan to monitor fishery development are necessary and justify sampling effort. Future sampling will be conducted to achieve the following objectives.

Sport fish, forage fish, and other important fishes

Catfish: Historically, catfish have been sampled with five randomly selected gill net sites with catch rates ranging from 0.2–4.4 fish/nn (2006–2022). Based on bootstrap analysis of historical data, it would take > 20 net nights to reliably attain acceptable precision ($RSE \leq 25$, $N > 50$) for either catfish species. However, with ongoing habitat enhancement efforts and the increasing popularity of Lake Bryan as a family-friendly recreation location, some indication of catfish relative density and size structure over time is important to management at Lake Bryan even if precision is low. Catfish relative abundance and size structure will be measured with CPUE and PSD, respectively, with standard 5 net night spring gill net surveys in 2026. No survey objectives will be set.

Largemouth Bass: Bootstrap analysis of 2021 nighttime electrofishing data with biologist-selected stations suggests it would take > 15 stations to attain acceptable precision ($RSE \leq 25$, $N > 50$) for either biologist-selected stations or randomly selected stations. However, some indication of Largemouth Bass relative density and size structure is important to management at Lake Bryan even if precision is low. Monitoring will continue by gathering abundance and size structure data through CPUE and PSD, respectively, during fall nighttime electrofishing sampling efforts in 2025 at 12, biologist-selected stations. No survey objectives will be set. If vegetation coverage has expanded sufficiently by 2023, an additional electrofishing survey of Largemouth Bass relative abundance and body condition may be conducted to determine future stocking options.

Prey Species: Bluegill, Green Sunfish, Longear Sunfish, Tilapia, Gizzard Shad, and Threadfin Shad are the primary forage at Lake Conroe. Trends in forage fish relative abundance and size structure will be measured with CPUE and PSD, respectively, during the Largemouth Bass electrofishing surveys, as described above. Largemouth Bass body condition can provide additional information on forage availability as well.

Vegetation Survey: A complete vegetation survey will be conducted annually to determine the success of native vegetation establishment efforts, and to monitor giant reed and cattail abundance to determine if control efforts are needed.

Creel Survey: To better determine the extent of all fisheries at Lake Bryan a creel survey will measure fishing effort, catch, and expenditures during a spring quarter creel survey in 2026.

Low-density fisheries

Crappie: Historically, crappies have been sampled with 15 single-cod, shoreline set trap nets in late fall, with catch rates ranging from 0.2–1.2 fish/nn from 2005–2013. Based on bootstrap analysis of historical data, it would take > 30 trap nets to attain acceptable precision ($RSE < 25$, $N > 50$). Therefore, crappie presence/absence will be determined during electrofishing efforts, spring gill net surveys, and a spring-quarter creel survey in 2025-2026 as described above.

Red Drum: Red Drum were stocked in 2015-2020 but no evidence of successful recruitment was seen during fish population surveys, creel surveys, or supplemental angling. Dedicated efforts to sample Red Drum will be discontinued, but Red Drum catches will be recorded if caught incidentally in fisheries surveys, creel surveys, or reported by anglers.

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Tables and Figures

Table 1. Characteristics of Lake Bryan, Texas.

Characteristic	Description
Year constructed	1973
Controlling authority	Bryan Texas Utilities
County	Brazos
Reservoir type	Power-plant
Shoreline Development Index	1.80
Conductivity	1,200 $\mu\text{S}/\text{cm}$
Conservation pool elevation	355.5 ft
Salinity	1.00-4.00 ppt

Table 2. Boat ramp characteristics for Lake Bryan, Texas, 2022. Reservoir elevation at time of survey was 355.5 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Lake Bryan Park	30.705972 -96.466185	Y	20	353	Good

Table 3. Harvest regulations for Lake Bryan, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	No minimum length limit, but only 10 can be 20 inches or greater in length
Catfish, Flathead	5	18-inch minimum
Bass, Largemouth	5	14-inch minimum
Bass: Spotted and Guadalupe	5 ^a	None
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

^a Daily bag for Largemouth Bass, Spotted Bass, and Guadalupe Bass = 5 fish in any combination.

Table 4. Stocking history of Lake Bryan, Texas. FGL = fingerling; ADL = adults.

Year	Number	Size
Threadfin Shad		
1992	2,000	ADL
Blue Catfish		
2009	100,011	FGL
Channel Catfish		
1974	120,000	FGL
2019	3,820	FGL
Species Total	123,820	
Florida Largemouth Bass		
1993	83,401	FGL
2019	20,704	FGL
2020	21,550	FGL
Species Total	125,655	
Hybrid Crappie		
1997	80,490	FGL
Walleye		
1974	200,000	FGL
1977	90,000	FGL
Species Total	290,000	
Red Drum		
1983	39,800	FGL
2015	53,180	FGL
2016	207,136	FGL
2017	164,242	FGL
2018	138,791	FGL
2019	169,958	FGL
2020	196,724	FGL
Species Total	969,831	

Table 5. Objective-based sampling plan components for Lake Bryan, Texas 2018–2022.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing – Nighttime Biologist-Selected Stations</i> ^a			
Largemouth Bass	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
Bluegill ^b	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
Gizzard Shad ^b	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$
	Prey availability	IOV	$N \geq 50$
Crappies	Presence / Absence		$N > 0$
Red Drum	Presence / Absence		$N > 0$
<i>Gill Netting</i>			
Catfishes	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
Red Drum	Presence / Absence		$N > 0$
<i>Hook and Line</i>			
Red Drum	Presence / Absence		$N > 0$

^a Electrofishing was changed from daytime biologist-selected stations to nighttime biologist-selected stations to provide more comparable data to historic surveys.

^b 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 structural habitat types, Lake Bryan, Texas, 2017. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Natural shoreline	7.6 miles	41
Natural shoreline/ Native emergent	3.1 miles	25
Rock	2.4 miles	24

Table 7. Survey of aquatic vegetation, Lake Bryan, Texas, 2017-2021. Surface area (acres) is listed with percent of total reservoir surface area in parentheses. Surveys from 2018-2020 were for exotics only. The 2017 and 2021 surveys were complete aquatic plant community survey.

Vegetation	2017	2018	2019	2020	2021
Native submersed	0				0
Native floating-leaved	0				< 1
Native emergent	23.0 (3%)				22.2 (3%)
Non-native					
Giant reed (aka <i>Arundo donax</i>)	0	0	0	0	< 1

Table 8. Nutrient and chlorophyll-a levels in Lake Bryan, Tx, prior to and after whole-lake fertilization treatments in 2019 and 2020, and prior to fertilization in 2022.

	2019 Pre-fertilization	2019-Post fertilization	2020 Pre-fertilization	2020 Post-fertilization	2022
Total Phosphorus ($\mu\text{g/L}$)	47.7	54.8	38.3	14.4	42.9
Free Reactive Phosphorus ($\mu\text{g/L}$)	6	6	6	<5	5
Nitrates & Nitrites (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02
Total Nitrogen (mg/L)	1.4	1	0.5	1.1	1.6
Chlorophyll a	32.4	44.8	<10	26.3	30.1

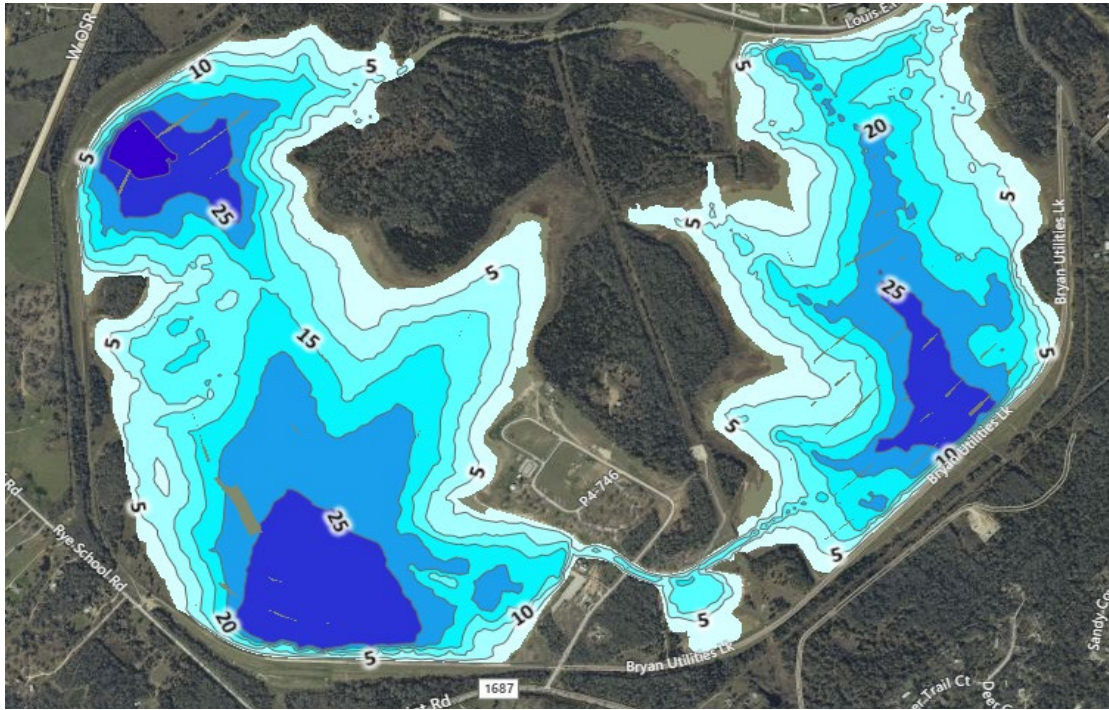


Figure 1. Bathymetric map of Lake Bryan.

Table 9. Percent directed angler effort by species for Lake Bryan, Texas, 2009–2012. Survey periods were from 1 June through 31 May.

Species	2004	2008	2022
Anything	7.9	21.3	43.8
Catfishes	24.6	37.4	0
Black Basses	44.4	14.3	37.4
Crappies	13.7	26.9	18.8

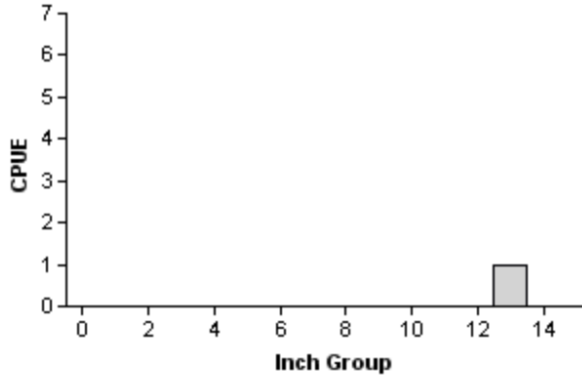
Table 10. Total fishing effort (h) for all species and total directed expenditures at Lake Bryan, Texas, 2009–2012. Survey periods were from 1 June through 31 May. Relative standard error is in parentheses.

Creel statistic	2004	2008	2022
Total fishing effort	9,920 (31)	7,740 (22)	1,811 (44)
Total directed expenditures	\$38,989 (212)	\$25,991 (53)	\$11,077 (278)

Gizzard Shad

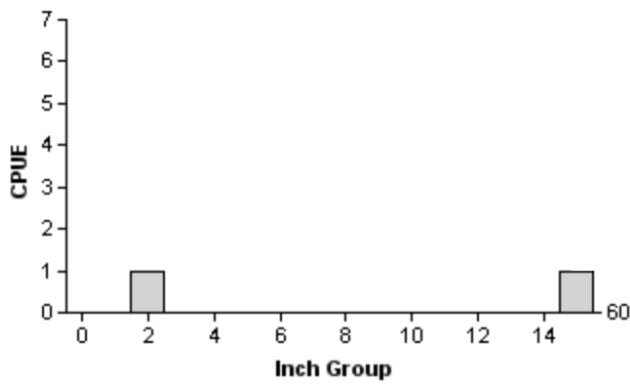
2013

Effort = 1.0
 Total CPUE = 2.0 (100; 2)
 IOV = 0 (0)



2017

Effort = 1.0
 Total CPUE = 2.0 (100; 2)
 IOV = 50 (0)



2021

Effort = 1.0
 Total CPUE = 26.0 (61; 26)
 IOV = 8 (3)

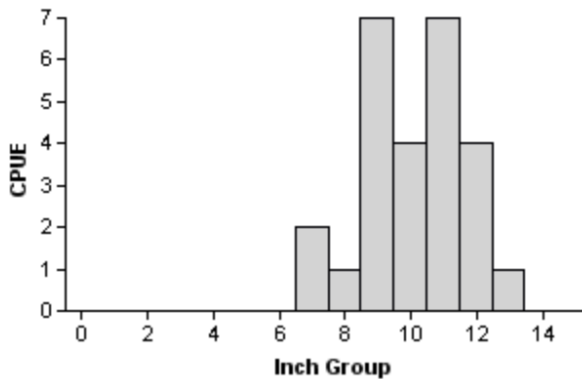
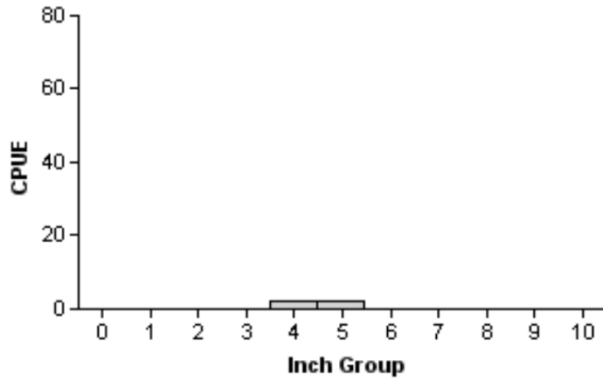


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Bryan, Texas, 2013, 2017, and 2021.

Green Sunfish

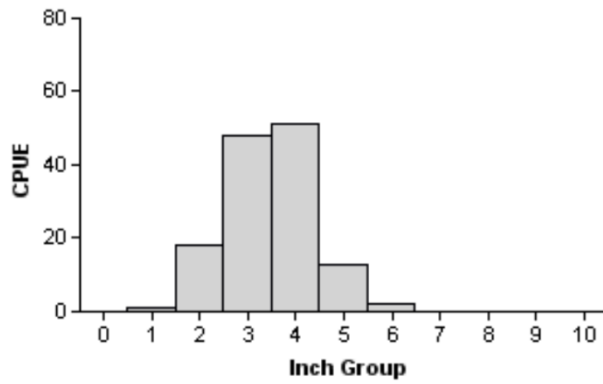
2013

Effort = 1.0
Total CPUE = 4.0 (56; 4)



2017

Effort = 1.0
Total CPUE = 133.0 (18; 133)



2021

Effort = 1.0
Total CPUE = 203.0 (27; 203)

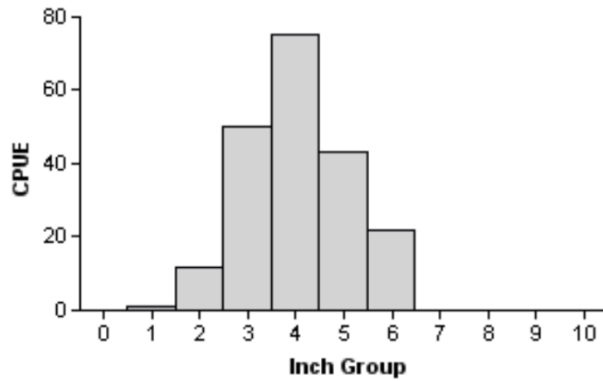
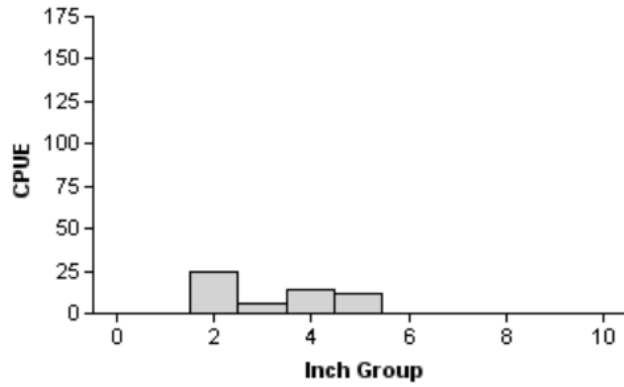


Figure 3. Number of Green Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Bryan, Texas, 2013, 2017, and 2021.

Bluegill

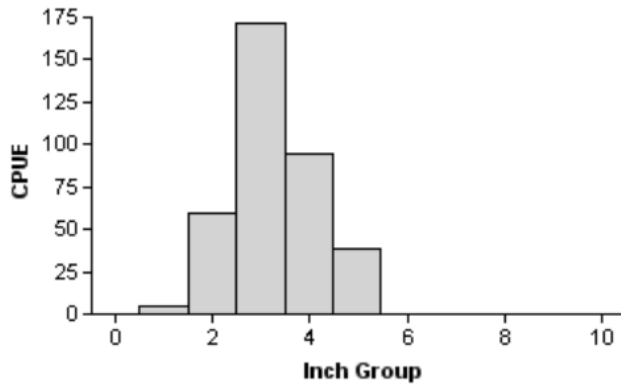
2013

Effort = 1.0
 Total CPUE = 57.0 (28; 57)
 PSD = 0 (0)



2017

Effort = 1.0
 Total CPUE = 369.0 (20; 369)
 PSD = 0 (0)



2021

Effort = 1.0
 Total CPUE = 83.0 (25; 83)
 PSD = 4 (2)

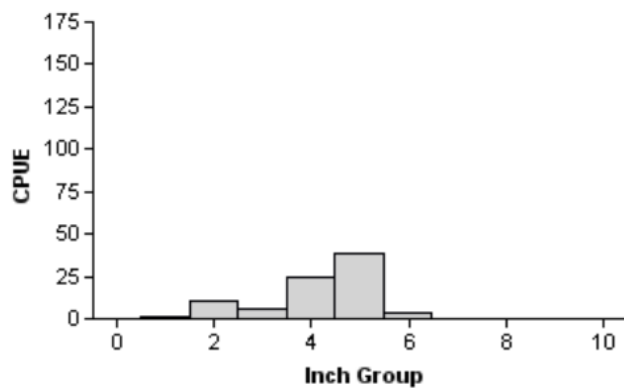


Figure 4. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Bryan, Texas, 2013, 2017, and 2021.

Blue Catfish

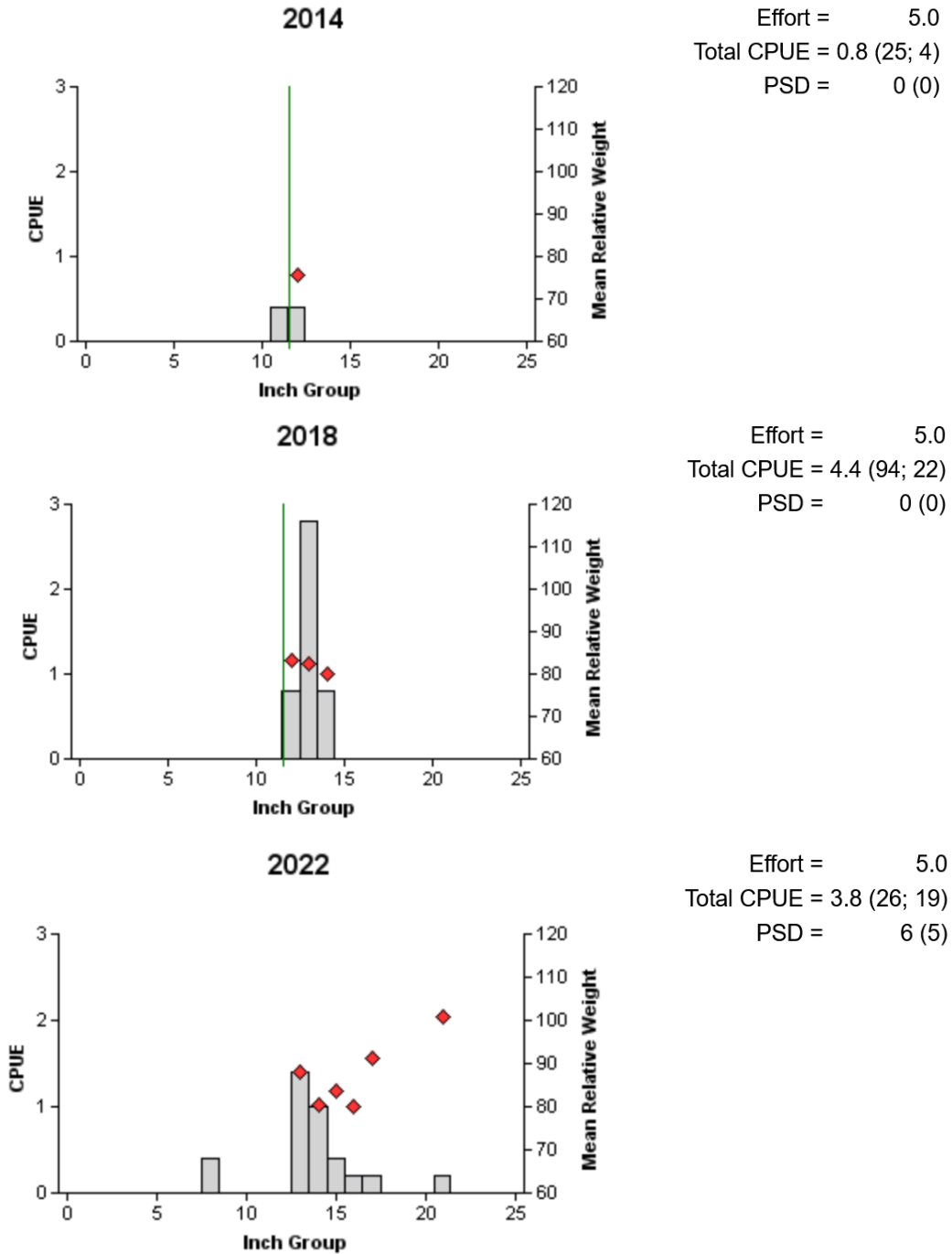


Figure 5. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Bryan, Texas, 2014, 2018, and 2022. Red diamonds indicate mean relative weight (W_r). Green lines indicate the 12-inch minimum length limit, which was removed per changes in statewide regulations in 2021.

Channel Catfish

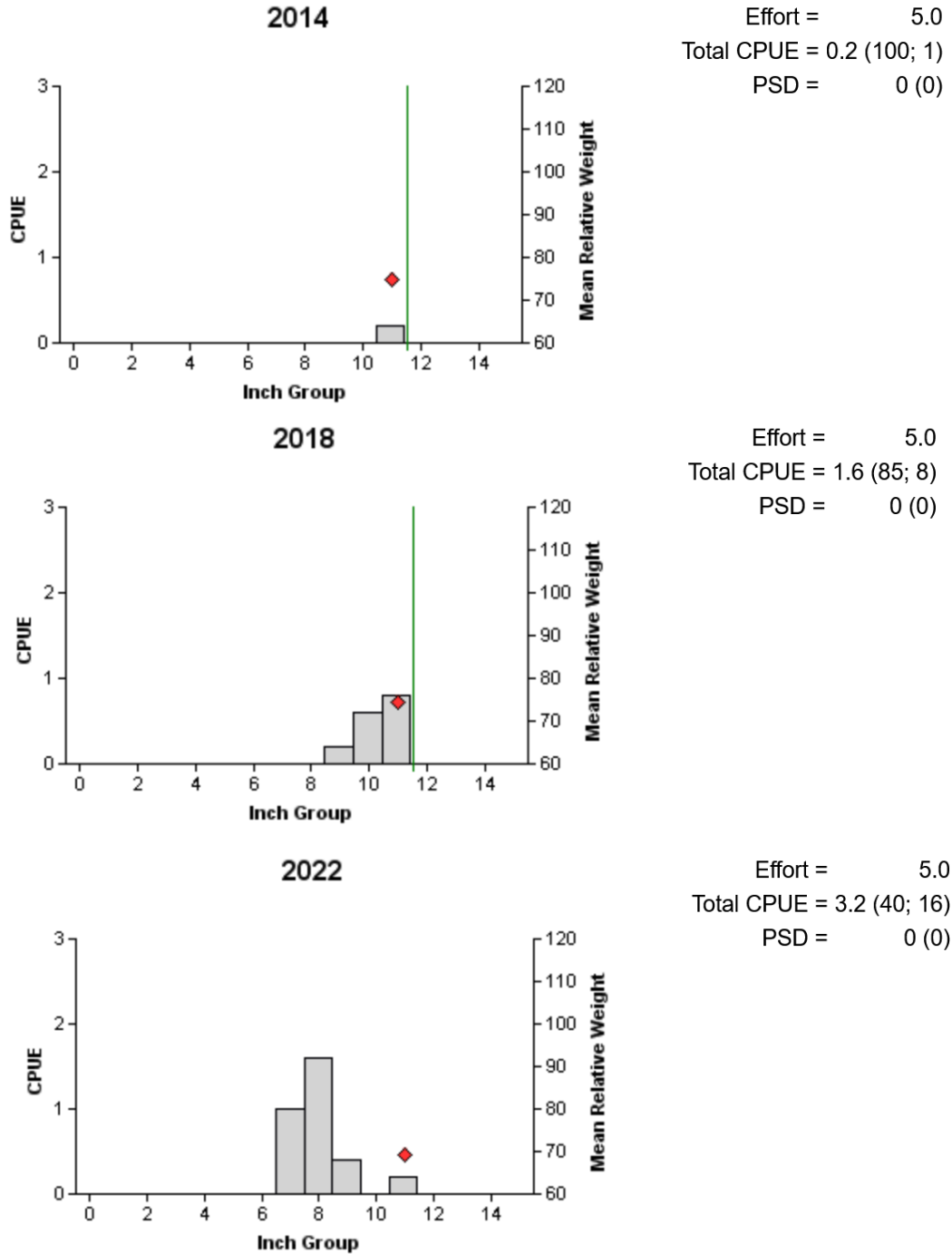


Figure 6. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Bryan, Texas, 2014, 2018, and 2022. Red diamonds indicate mean relative weight (W_r). Green lines indicate the 12-inch minimum length limit, which was removed per changes in statewide regulations in 2021.

Table 11. Creel survey statistics for catfishes at Lake Bryan, Texas, from March 2022 through May 2022. Total catch per hour is for anglers targeting all catfishes and total harvest is the estimated number of catfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2004	2008	2022
Directed effort (h)	2,436 (44)	2,893 (34)	0
Directed effort/acre	3.33 (44)	3.95 (34)	0
Total catch per hour	0.31	0.16	0
Total harvest	0.8 (58)	0.74 (101)	0
Harvest/acre	587 (74)	542 (67.9)	0
Percent legal released	4.6 16.1	16.1	0

Largemouth Bass

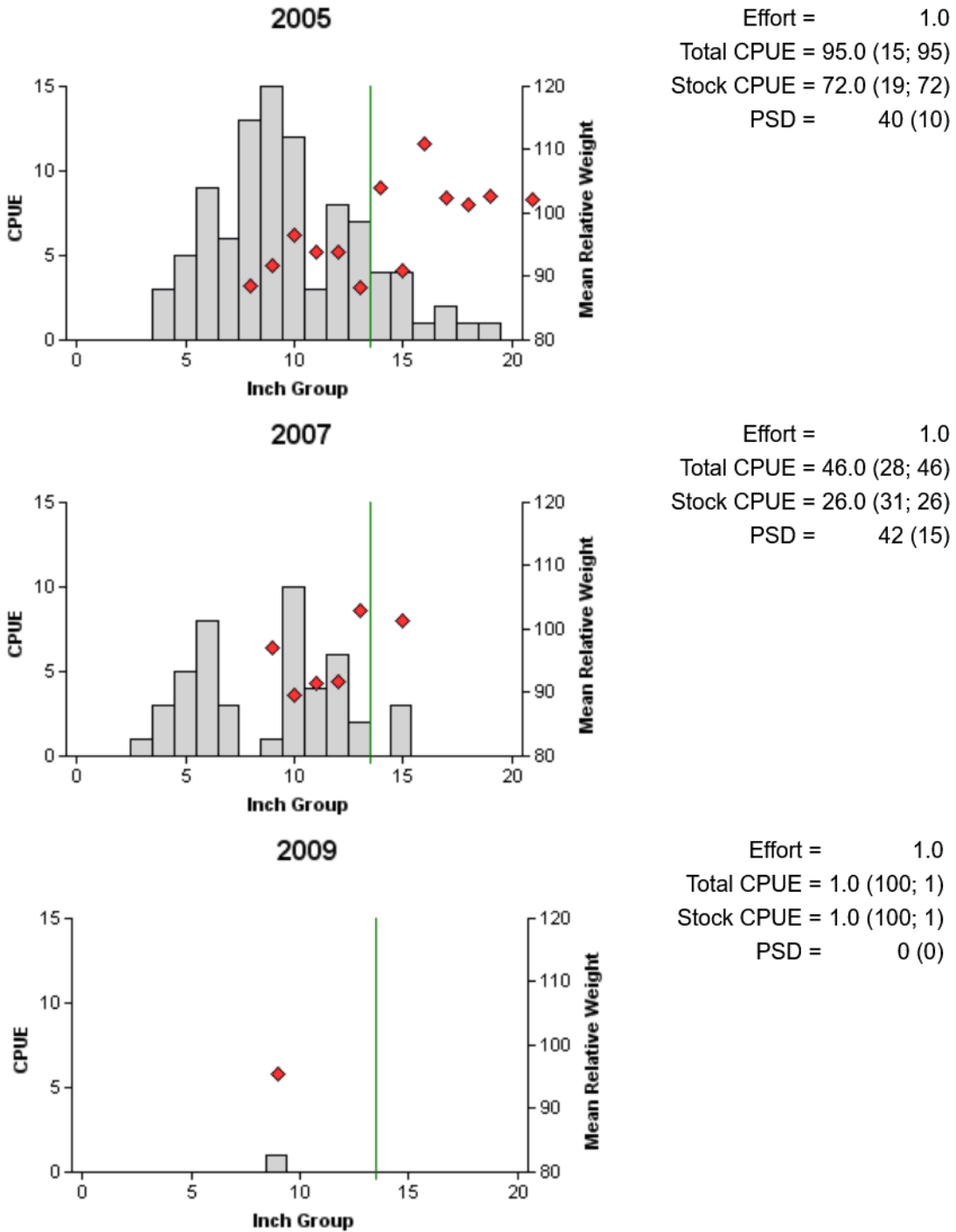


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for historical fall, nighttime electrofishing surveys with randomly selected stations, Lake Bryan, Texas, 2005, 2007, and 2009. Vertical line indicates minimum length limit.

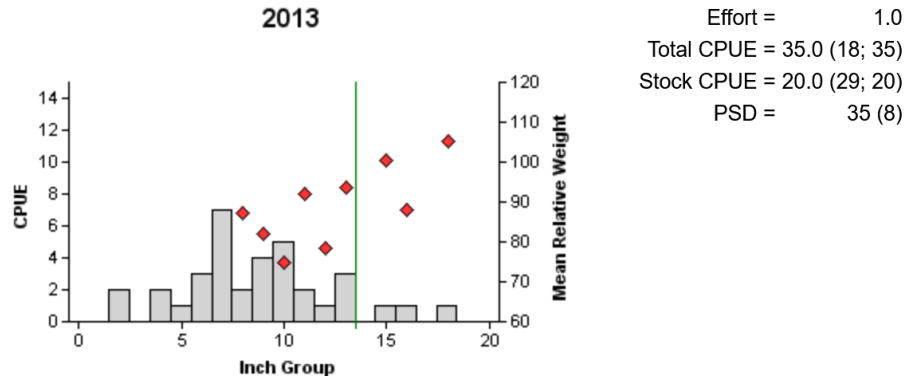


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for nighttime electrofishing surveys with randomly-selected station, Lake Bryan, Texas, 2013. Vertical line indicates minimum length limit.

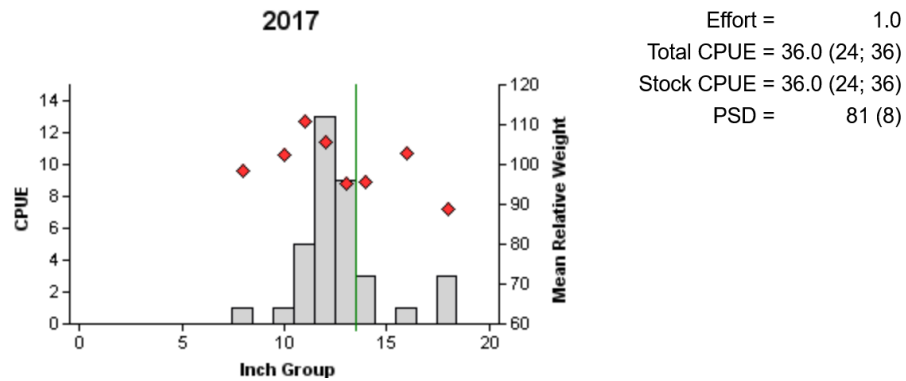


Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for daytime electrofishing surveys with biologist-selected stations, Lake Bryan, Texas, 2017. Vertical line indicates minimum length limit.

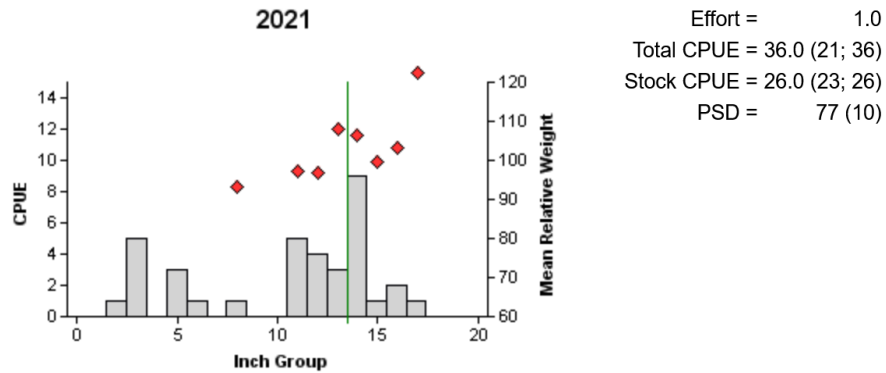


Figure 10. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for nighttime electrofishing surveys with biologist-selected stations, Lake Bryan, Texas, 2021. Vertical line indicates minimum length limit.

Table 12. Creel survey statistics for Largemouth Bass at Lake Bryan, from March 2022 through May 2022. 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	2004	2008	2022
Directed angling effort (h)			
Tournament	0	0	0
Non-tournament	4,404 (40)	1,111 (56)	678 (57)
All black bass anglers combined	4,404 (40)	1,111 (56)	678 (57)
Angling effort/acre	6.02 (40)	1.52 (56)	2.46 (44)
Catch rate (number/h)	0.17 (75)	0 0	1.46 (71)
Harvest			
Non-tournament harvest	62 (95)	77 (363)	0
Harvest/acre	0.08 (95)	0.12 (363)	0
Tournament weigh-in and release	0 0	0	0
Release by weight	N/A	N/A	
<4.0 lbs			
4.0-6.9 lbs			
7.0-9.9 lbs			
≥10.0 lbs			
Percent legal released (non-tournament)	31.8	0	100

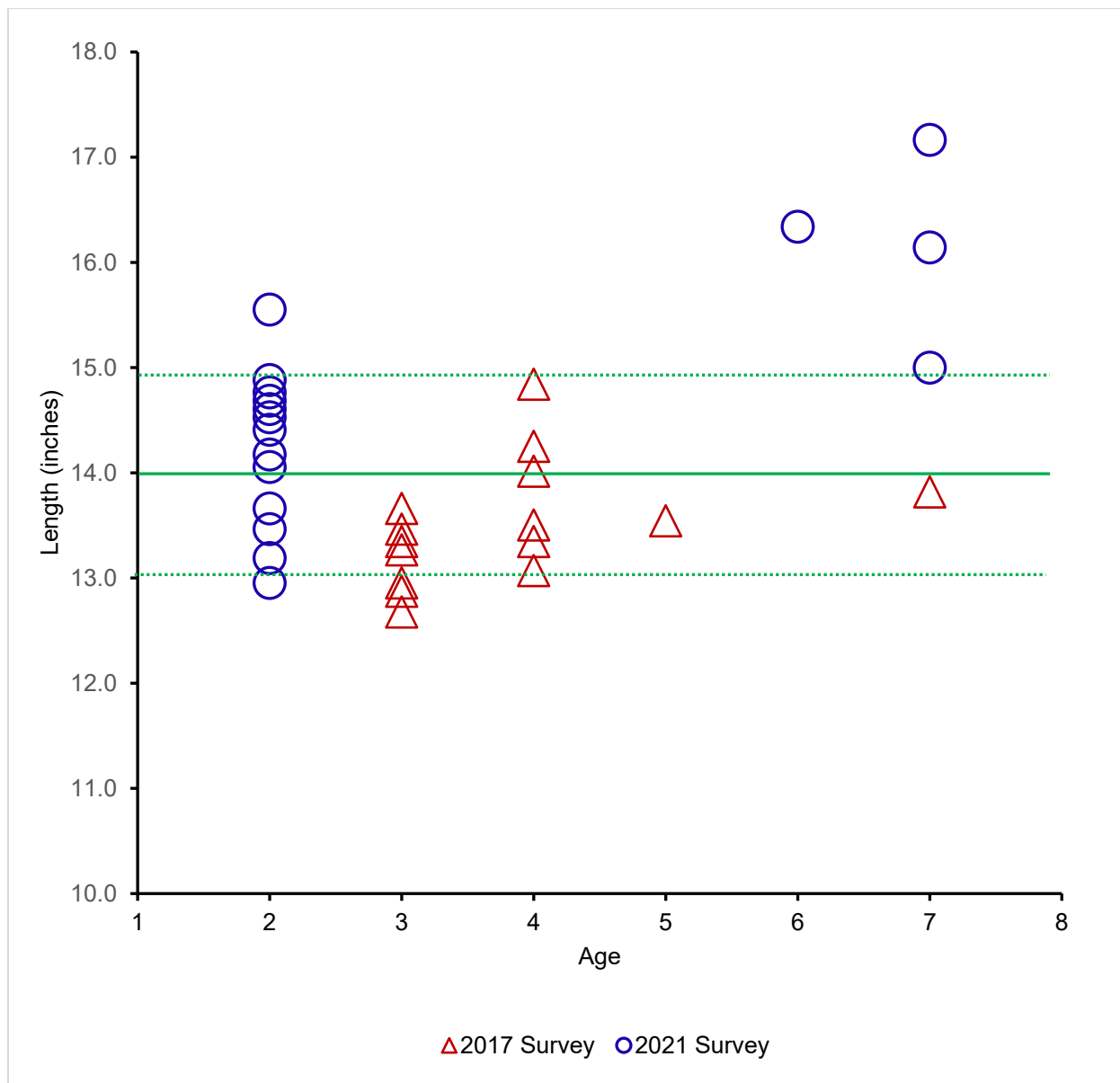


Figure 11. Length at age for Largemouth Bass collected from fall electrofishing at Lake Bryan, Texas, 2017 and 2021. Solid green line indicates 14-inch minimum length limit with dotted lines indicating + / - one inch.

Crappies

Table 13. Creel survey statistics for crappies at Lake Bryan, Texas, from March through May 2022. Total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2004	2008	2022
Directed effort (h)	782 (57.6)	1,652 (44.4)	340 (79)
Directed effort/acre	1.06 (57.6)	2.26	0.460 (79)
Total catch per hour	0.51 (111.2)	0.87 (74.1)	0.91
Total harvest	0	851 (126)	131 (100)
Harvest/acre	0	0.23 (126)	0.18 (100)
Percent legal released	0	0	0

Proposed Sampling Schedule

Table 14. Proposed sampling schedule for Lake Bryan, Texas. Survey period is June 1 through May 31. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall.

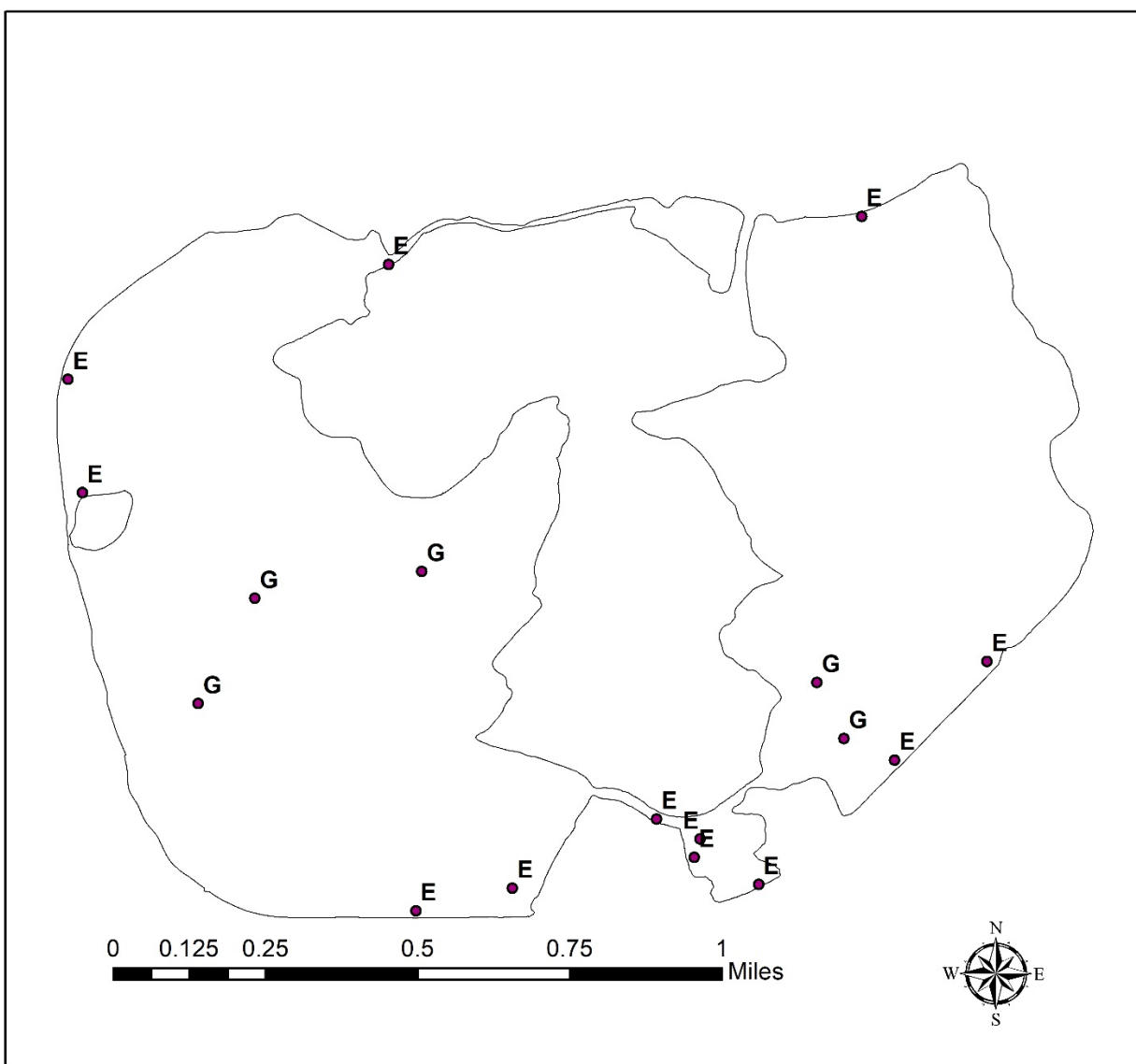
	Survey year			
	2022-2023	2023-2024	2024-2025	2025-2026
Angler Access				X
Structural Habitat				X
Vegetation	X	X	X	X
Electrofishing – Fall				X
Gill netting				X
Creel survey				X
Report				X

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Lake Bryan, Texas, 2021–2022. Sampling effort was 1 hour for electrofishing and 5 net nights for gill netting.

Species	Electrofishing		Gill Netting	
	N	CPUE	N	CPUE
Gizzard Shad	26	26.0 (61)	100	20.0 (23)
Threadfin Shad	61	61.0 (64)		
Common Carp	6	6.0 (39)	17	3.4 (36)
Bullhead Minnow	25	25.0 (43)		
Inland Silverside	3	3.0 (52)		
Blue Catfish			19	3.8 (26)
Channel Catfish	7	7.0 (39)	16	3.2 (40)
Green Sunfish	203	203.0 (27)		
Bluegill	83	83.00(25)	3	0.6 (41)
Longear Sunfish	50	50.0 (16)		
Largemouth Bass	36	36.0 (21)	10	2.0 (42)
White Crappie			1	0.2 (100)
Tilapia (unspecified)	26	26.0 (32)		

Appendix B – Map of sampling locations



Location of sampling sites, Lake Bryan, Texas, 2021-2022. 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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