

Lake Houston Reservoir

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 Houston were surveyed in 2022 using electrofishing and trap netting and in 2023 using gill netting. Anglers were surveyed from March 2023 through May 2023 with a creel survey. Historical data are presented with the 2022-2023 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: Lake Houston is a 10,160-acre reservoir constructed on the San Jacinto River by the City of Houston in 1954 to provide water for municipal and industrial purposes. Its location within the Houston metropolitan area results in heavy recreational use. Habitat features consisted of standing timber, rocks, native and invasive submerged aquatic plants.

Management History: All sport fishes at Lake Houston are regulated under statewide length and bag limits. Important sport fish include White Bass, Largemouth Bass, White Crappie, Black Crappie, Blue Catfish, and Channel Catfish. Primary productivity and habitat have been limited and impacted by silt loading. Efforts to mitigate the sedimentation include solar water circulators, native vegetation restoration, legislative action to better regulate sand and gravel mining, and dredging to mitigate the effects of Hurricane Harvey. Aside from efforts to increase habitat the management plan from the 2018 survey report included stocking Florida Largemouth Bass to continuously increase the Florida genetics within the reservoir. Florida Largemouth Bass were stocked in 2018 and 2020, and Lone Star Bass in 2022 and 2023.

Fish Community

- **Prey species:** Gizzard and Threadfin Shad, Bluegill, Longear Sunfish, and Inland Silversides were the predominant prey species in Lake Houston. Prey species abundance was adequate to support sport fish.
- **Catfishes:** Blue and Channel Catfish were both present in Lake Houston, and both provided fisheries. Catfish angling remains an important segment of the Lake Houston fishery, comprising 32.3% of all angling effort.
- **White Bass:** Thirty White Bass were captured in 2022-2023 which is an increase from 2018-2019 where only 20 fish were captured. Poor spring flows, spawning habitat, sedimentation, and sampling locations impacted the data. Past creel surveys recorded directed angling effort toward temperate bass species, but none was documented in 2013-2014, 2019 or Spring 2023.
- **Largemouth Bass:** Genetic analysis indicates the percentage of pure Florida Largemouth Bass in Lake Houston has improved with recent stockings, however, overall Largemouth Bass abundance decreased. Anglers seeking Largemouth Bass made up 7.7% of all directed angling effort.
- **Crappie:** Both Black Crappie and White Crappie are present in Lake Houston. The percentage of anglers seeking crappie, total crappie harvest and trap net catch decreased in 2023 compared to 2019.

Management Strategies: Statewide length and bag limits will continue to be used to regulate sport fish harvest. Cooperative efforts with the City of Houston and the Lake Houston Sports and Recreation Foundation (LHSRF) will continue to address water quality and habitat issues. Exotic vegetation will continue to be monitored, by TPWD. TPWD will assist the City of Houston and the Coastal Water Authority with their control efforts whenever possible. If there are improvements to the habitat and water quality Florida Largemouth Bass genetics will be increased by stocking Lone Star Bass, which are 2nd generation offspring of pure Florida strain ShareLunker Largemouth Bass. Additional Largemouth Bass genetic information will be gained by working with marinas and tournament anglers to collect samples of fish 4 pounds or larger. A river above creel, targeting river access points will be used to determine the presence or absence of a White Bass targeted fishery to support the need for additional White Bass sampling and management efforts.

Introduction

This document is a summary of fisheries data collected from Lake Houston from 2022-2023. 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 2022-2023 data for comparison.

Reservoir Description

Lake Houston is a 10,160-acre reservoir constructed on the San Jacinto River by the City of Houston in 1954 to provide water for municipal and industrial purposes. Its location within the Houston metropolitan area results in heavy recreational use. Lake Houston has a drainage area of approximately 2,600 square miles and lies within the Gulf Coast Eco-region. Rainfall in the watershed averages 46.6 inches per year. Conservation pool elevation is 41.73 feet above mean sea level. Daily elevations are reported in Figure 1. Other physical characteristics of Lake Houston are presented in Table 1.

Angler Access

Lake Houston has four public boat ramps, and all ramps were available to boaters during the reporting period. Only boats shorter than 8 feet can access Ponderosa Marina from the main lake because of a low bridge on Luce's Bayou. Additional boat ramp characteristics are listed in Table 2. Shoreline access is limited to the public boat ramp areas and the shoreline at Deussen Park.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Ragan-Harison and Webb 2019) included:

1. Continue working with the Lake Houston Sports and Recreation Foundation (LHSRF)/Lake Houston Friends of Reservoirs Chapter on habitat improvement projects including native vegetation restoration.

Action: The LHSRF rebuilt their native plant nursery after it was destroyed in 2017 by Hurricane Harvey. Since then, they have performed native vegetation plantings on multiple dates in 2018 and 2019. Our district continues to support LHSRF with their native aquatic plant nursery and planting efforts and have promoted cooperative projects widely since the last report via social media, traditional media, and The Dockline magazine.
2. Work with tournament anglers on Lake Houston to collect fin clips from Largemouth Bass greater than 4 pounds and encourage anglers to submit genetic samples to the ShareLunker program by working with tournament directors, boat ramp owners, and LHSRF.

Action: These management efforts were not completed in the 2019-2023 management years and will be continued in the 2023-2027 management years.
3. Support LHSRF and Lake Houston Friends of Reservoirs Chapters on fundraising efforts to construct an Americans with Disabilities Act (ADA) compliant fishing pier at Deussen Park.

Action: These management efforts were not completed in the 2019-2023 management years and will be continued in the 2023-2027 management years.
4. Spread awareness about the risk of invasive species focusing on zebra mussels (*Dreissena polymorpha*) and giant salvinia (*Salvinia molesta*) which pose a threat to lakes in Texas. Strategies to implement this management plan included coordinating with the controlling authority to post signage at access points around the reservoir, speaking with marina owners about invasive species and providing them with educational material, utilize social media and

internet, ensuring that this is a speaking point when presenting to constituent and user groups at outreach events, and monitor existing and future inter-basin water transfers to facilitate potential invasive species response plans.

Action: Luce Bayou Interbasin Transfer Project was completed in 2021 which connects the Trinity River Basin to the San Jacinto River Basin. Monitoring of aquatic vegetation in the inlet area and Luce Bayou was completed while monitoring for invasive species on the lake. Due to the amount of potential inflow these actions are continuous and ongoing.

Harvest regulation history: Crappie have been managed under a 10-inch minimum-length limit with a 25 fish daily bag since 1988. Channel and Blue Catfish were managed with a 9-inch minimum-length limit and 25 fish daily bag until 1995 when the length limit was increased to 12 inches. The statewide harvest regulation for Channel Catfish and Blue Catfish was changed in 2021 to no minimum length limit with 25 fish daily bag limit (in any combination), of which no more than 10 fish can be over 20 inches in length. All other fish have been managed under statewide regulations. Current regulations are found in Table 3.

Stocking history: Channel Catfish were stocked in Lake Houston in 1972, 1973, and an additional stocking was made in 2022. Palmetto Bass were stocked 13 times between 1979 and 1999 and Striped Bass were substituted for Palmetto Bass in 1989 and 1990. Florida Largemouth Bass were stocked in 1990, annually from 2013-2018, and in 2020 by TPWD, and in 2012 by the Lake Houston Sports and Recreation Foundation. Lone Star Bass were stocked in 2022 and 2023 by TPWD. A complete stocking history is presented in Table 4.

Vegetation/habitat management history: Historically, Lake Houston has had limited littoral habitat. Heavy silt loading in the upper reaches of the reservoir has inhibited the growth of desirable aquatic vegetation; however, with the regulation of gravel mining upstream from Lake Houston and native aquatic vegetation restoration projects in the reservoir, the conditions are improving. In recent years, Lake Houston has been infested with nuisance aquatic plants such as common salvinia, water hyacinth, and water lettuce. TPWD provided annual funding to the Coastal Water Authority (CWA) for exotic vegetation control. In September 2018, the Army Corps of Engineers began dredging the West Fork of the San Jacinto River to remove sediment washed into the waterway by Hurricane Harvey. The project was extended and removed roughly 4 million cubic yards of sediment. Due to flooding, additional dam improvements are underway to aid in water level with a completion date set for year 2024.

Water transfer: Lake Houston is used for municipal water supply and recreation. There is currently one water treatment facility on the reservoir that provides municipal water for the City of Houston. Luce Bayou Interbasin Transfer Project was completed in June of 2021. The project can transfer up to 940,000 acre-feet of water from the Trinity River below Lake Livingston to Lake Houston (San Jacinto River Drainage) along a newly dug channel parallel with Luce Bayou.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Houston (Ragan- Harbison and Webb 2019). 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 2022).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by daytime electrofishing (2 hour at 24, 5-min randomly 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 12 randomly selected fish (range 13.2 to 14.0 inches).

Trap netting – Crappie were collected using trap nets (15 net nights at 15 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Although there were minimal fish captured, ages for crappie were determined using otoliths from 6 randomly selected White Crappie and 2 randomly selected Black Crappie (range 9.6 to 14.4 inches).

Gill netting – Channel Catfish, Blue Catfish, and White Bass were collected by gill netting (15 net nights at 15 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). White Bass were captured, and otoliths were prepared for ageing.

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.

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 (March through May) roving creel survey was conducted in 2023. Angler interviews were conducted on 5 weekend days and 4 weekdays 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 2019-2022 to monitor expansion of non-native species and habitat was surveyed in 2022. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2022).

Water level – Source for water level data was the United States Geological Survey (USGS 2023).

Results and Discussion

Habitat: Bulkhead construction covers about 30% of the shoreline (Table 6). Native vegetation occupied 147.41 acres which is less than 0.1% of total surface acres of Lake Houston in 2022 (Table 7). Non-native (invasive) species for the 2019-2022 period included common and giant salvinia, water hyacinth, water lettuce, alligator weed, elephant ear, arundo, Asian marshweed, red lotus, parrotfeather, thalia, crested floating heart, and fanwort. Non-native plants have increased with <0.1 acres in 2019 to 209.27 acres in 2023. This is likely due to the reduction in plants after Hurricane Harvey. The Coastal Water Authority is provided funding from Texas Parks and Wildlife which is utilized for invasive species

management. We will continue to work with the CWA and Lake Houston Sports and Recreation Foundation to maintain a treatment plan and plant and get native aquatic vegetation re-established.

Creel: Directed fishing effort by anglers was highest for Blue and Channel Catfish and any species both at 32.3%, followed by anglers fishing for crappies 27.7% (Table 8). Total fishing expenditures for all species was highest in 2019 at \$62,839 compared to \$42,507 in 2023. While direct expenditures at Lake Houston highest in 2023 at \$249,133 compared to 2019 at \$217,242 (Table 9).

Prey species: Electrofishing catch rates of Threadfin Shad and Gizzard Shad were 391/h and 206/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad was good at 87% (Figure 2). Electrofishing CPUE for Bluegill was 21/h in 2022 which is lower than 2014 at 73/h and 60/h in 2018 (Figure 3).

Catfish: Most anglers targeting catfish were fishing for either Blue Catfish or Channel Catfish making up 32.2% of the targeted fishery. The gill net catch rate of Blue Catfish and Channel Catfish was 16/nn and 13/nn, respectively (Figure 4 and 5). There was one Flathead Catfish captured during sampling, but no specific fishing effort was directed towards this species. Blue Catfish had a significant reduction in total harvest from 1,819 in 2019 to 858 in 2023. Blue Catfish had an acceptable relative weight with an average of 102, suggesting adequate forage. The majority of Blue Catfish captured in 2023 were 8-10 inches in length and 2023 showed good angler compliance with harvested fish ranging in length from 12 to 20 inches (Figure 6). Channel Catfish total harvest was similar between 2019 at 7,446 fish and 2023 at 7,016 fish (Table 10). Relative weight and body condition were good with an average relative weight of 96 for Channel Catfish, suggesting adequate forage. The size distribution for Channel Catfish ranged between 5 and 20 inches (Figure 4 and 5). Fish harvested in 2023 ranged between 12 and 20 inches (Figure 7).

White Bass: The gill net catch rate of White Bass was 2.0/nn in 2023. Catch rates indicated that White Bass continue to be present in the reservoir with multiple spawning years and an increase in abundance with 5 fish captured in 2015, 20 fish captured in 2019, and 30 fish captured in 2023 (Figure 8). There was no White Bass directed fishing effort in 2023 (Table 11). During the 2023 creel, only one White Bass was harvested at 13 inches (Figure 9). Based on the creel data there is no fishery present within Lake Houston for White Bass.

Largemouth Bass: The electrofishing catch rate of stock-length Largemouth Bass was 20/h. There was an oversight on sampling site locations and 24 random sampling sites were selected instead of 24 biologist selected sampling sites. Growth of Largemouth Bass in Lake Houston was adequate; average age at 14 inches was 2.25 years (N = 12; range = 1 – 5 years). Body condition in 2022 was good (Wr > 90) for nearly all size classes with an average relative weight of 102.8 (Figure 10). Directed fishing effort decreased from 2019 to 2023, from 6,601.8 hours to 3,270.5 hours, respectively. The catch rate per hour decreased over the three years with 3.5 fish/h in 2014, 2.4 fish/hour in 2019, and 1 fish/hour in 2023. In 2014 there was an estimated 1,730 fish harvested (Table 12). There has been no recorded harvest of Largemouth Bass in the 2019 and 2023 creel (Table 12 and Figure 11). Florida Largemouth Bass influence has remained low, with 21% alleles in 2023, compared to 13% in 2018 (Table 13). There has been a reduction in the directed fish effort toward Largemouth Bass in Lake Houston and the habitat is inadequate likely leading to a reduced survival rate of stocked fingerling Largemouth Bass.

Crappie: Both White Crappie and Black Crappie were present in Lake Houston, historically White Crappie have been more numerous in the lake. The sampling objectives of collecting 50 fish and ageing 13 fish between 9-10.9 inches were not met due to poor sample size and turbid water conditions. Data from the spring quarter creel was used to understand the fishing pressure. For the 2026 sampling year we will utilize additional sampling sites if the objectives are not met by the original sampling. Trap net sampling in 2022 captured 13 White Crappie and 8 Black Crappie (Figures 12 and 13). Anglers harvested an estimated 2,371 White Crappie during the 2023 creel period which is a decrease from 11,280 White Crappie harvested in 2019. There were no Black Crappie harvested in 2023. The catch rate for White Crappie was 0.4 fish per hour. (Table 14).

Fisheries Management Plan for Lake Houston Reservoir, Texas

Prepared – July 2023

ISSUE 1: Harvey increased reservoir sedimentation, increasing turbidity over time due to the shallow water where boats, wind, and flows consistently disturb sediment. LHSRF/Lake Houston Friends of Reservoir Chapter rebuilt their native vegetation nursery and conducted planting in 2018 and 2019. Establishment has been slow, and plantings should be continued.

MANAGEMENT STRATEGY

1. Continue working with LHSRF/Lake Houston Friends of Reservoirs Chapter on new and ongoing habitat and vegetation projects. Look for additional funding to install other types of vegetation cages such as floating aquatic vegetation cages.

ISSUE 2: Lake Houston has had a reduction in the angling effort for Largemouth Bass between 2019 and 2023 and the habitat for the fishery remains low within the reservoir. Florida strain fingerlings were stocked for several years in a row (2013-2018, 2020). Lone Star Bass with Florida genetics were stocked in 2022 and 2023.

MANAGEMENT STRATEGIES

1. Work with tournament anglers to collect fin clips from tournament fish greater than 4 pounds for genetic analysis.
2. Work with tournament directors, boat ramp owners, and LHSRF to encourage anglers to submit any qualifying bass to the ShareLunker program and to submit scales for genetic analysis.
3. If reservoir habitat is improved through plantings and vegetation control, continue to request stocking of Lone Star bass.
4. Target larger Largemouth Bass with biologist selected sampling sites during the spring spawning period.

ISSUE 3: Support LHSRF and Lake Houston Friends of Reservoirs Chapters on fundraising efforts to construct an Americans with Disabilities Act (ADA) compliant fishing pier at Deussen Park.

1. Apply for the Habitat and Angler Access grant during the next submission cycle to install an ADA-compliant fishing pier.
2. Research and apply for other funded grant programs related to access.

ISSUE 4: Luce Bayou Interbasin Transfer Project presents a unique management challenge with water transfers from outside the system. The water transfer increases the threat of invasive species and threatens aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to maintain 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 using social media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Continue to monitor and track invasive species found in the Trinity River to facilitate and invasive species response.

Objective-Based Sampling Plan and Schedule (2023-2027)

Sport fish, forage fish, and other important fishes

Sport fishes in Lake Houston include Blue Catfish, Channel Catfish, Largemouth Bass, Black Crappie, and White Crappie. Important forage species include Gizzard Shad and Threadfin Shad.

Low-density or underutilized fisheries

Spotted Bass, White Bass, and Flathead Catfish: have been collected within the reservoir in low numbers and no directed fishing effort has been recorded. Sampling the populations is unnecessary, but their presence will be noted. A complete sampling schedule is listed in Table 15.

Survey objectives, fisheries metrics, and sampling objectives

Crappie: During the 2022 spring-quarter creel survey crappie anglers represented 27.7% of the directed angler effort at Lake Houston. White Crappie were present in both trap netting surveys and angler creels. Based on bootstrap analysis of historical data, it would take 15 trap nets to attain acceptable precision and catch of stock-length fish ($RSE < 25$, $N > 50$) at least 80% of the time for White Crappie. White Crappie trend data (CPUE, PSD, W_r) will be monitored during the fall of 2026 in order to detect any larger scale population fluctuations. Trend data will be measured with 15 single-cod shoreline trap net sets at randomly selected sites, which should be sufficient effort to achieve an $RSE < 25$ of CPUE-total and collect at least 50 stock-size individuals. Black Crappie data will be used to show presence/absence since this is a very minor part of the crappie fishery. If the sampling objectives are not met with 15 trap net fish captured in the gill nets set for catfish will be utilized, if this sampling effort does not meet the sampling objective an additional 15 trap nets will be set and a spring-quarter creel survey will be used to provide supplemental population data.

Catfish: Blue and Channel Catfishes combined accounted for 32% of directed angler effort during the 2023 spring-quarter creel survey. Based on bootstrap analysis of historical data, 15 gill nets should obtain data with an acceptable precision and catch (CPUE-total, RSE < 25, N > 50) at least 80% of the time for both Blue and Channel Catfish. Blue and Channel Catfish trend data (CPUE, PSD, W_r) will be monitored during the spring of 2027 with gill nets in order to detect any large-scale population fluctuations. Trend data will be surveyed with 15 gill net nights at randomly selected sites, which should be sufficient effort to achieve a CPUE-total RSE < 25 and collect at least 50 stock size individuals. If the sampling objectives are not met with the gill nets an additional fifteen gill net nights will be set and a spring-quarter creel survey will be used to provide supplemental population data.

Largemouth Bass: Largemouth Bass abundance is limited by turbidity and the commensurate lack of submerged aquatic vegetation. There are Largemouth Bass tournaments on Lake Houston, but none were intercepted in the 2014 or 2023 creel surveys. There were 435.3 angling hours of tournaments in the 2019 creel. Bootstrap analysis of historic data suggests reliable population metrics (CPUE-Stock; RSE < 50 stock-size individuals) would require well over 24 randomly selected 5-minute electrofishing stations. Our survey objective is to continue monitoring population trend data on relative abundance, size structure, body condition, growth, genetics, and angling effort, catch, and harvest of Largemouth Bass every four years with fall electrofishing and a spring quarter creel survey. This will allow for the detection of any large-scale fluctuations in the Largemouth Bass population that may warrant further investigation. Our sampling objective is to collect at least 50 stock-size Largemouth Bass by sampling 24 biologist-selected electrofishing sites during the spring spawning season (daytime sampling). Biologist-selected sites were chosen over randomly selected sites due to the minimal habitat within Lake Houston after Hurricane Harvey. If the stated effort is inadequate to achieve the sampling objective a spring-quarter creel survey will be used to provide supplemental population data.

Forage Species: Gizzard Shad, Threadfin Shad, and Bluegill are the primary forage species at Lake Houston. Based on sampling history, fall electrofishing generally provides adequate data to evaluate the overall forage base at Lake Houston; therefore, our survey objective is to monitor long-term trends in size structure and relative abundance of these important forage species. For size structure, our sampling objective is to collect 50 individuals for PSD and IOV of Gizzard Shad and PSD of Bluegill with sampling effort used to meet Largemouth Bass sampling objectives. No additional sampling will occur beyond what is done to meet Largemouth Bass sampling objectives.

Creel Survey: A stratified roving angler creel survey will be conducted from March 1, 2027 – May 31, 2027 to estimate directed angling effort, catch, harvest, and expenditures for all game fish species. This is a general monitoring creel survey that intends to capture information about all species sought by anglers, economic expenditures, travel distances for anglers, and angling pressure on Lake Houston fisheries.

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Tables and Figures

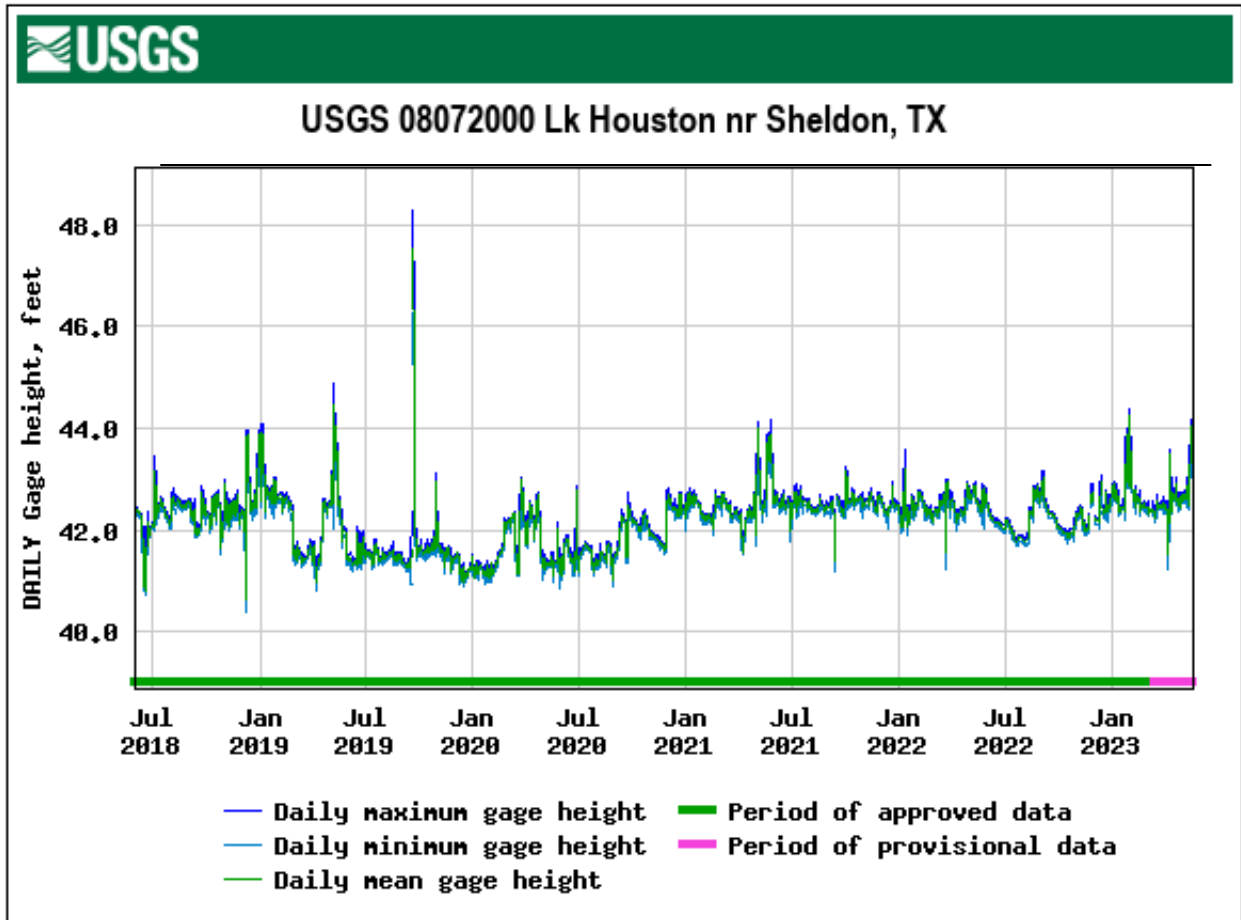


Figure 1. Daily water level elevations in feet above mean sea level (MSL) recorded for Lake Houston, Texas, June 2018 – May 2023. Conservation pool for Lake Houston is 41.73 feet.

Table 1. Characteristics of Lake Houston, Texas.

Characteristic	Description
Year constructed	1954
Controlling authority	City of Houston
County	Harris (location of dam)
Reservoir type	Mainstem
Shoreline Development Index	10.1
Conductivity	164 μ S/cm

Table 2. Boat ramp characteristics for Lake Houston, Texas May 2023. Reservoir elevation at time of survey was 42.5 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Alexander Deussen Park	29.91687 -95.14800	Y	260	39	2 boat ramps with 8 lanes plus a 1 lane small boat ramp. Excellent condition.
Lake Houston Marina	30.01868 -95.11914	Y	45	40	1 boat ramp with 2 lanes. Excellent condition.
Ponderosa Marina	30.056362 -95.098797	Y	30	41	1 boat ramp with 2 lanes. Good condition but a low- clearance bridge on Luces' Bayou prevents access to main reservoir by large boats.
Waterside Marina	30.059160 -95.131397	Y	30	41	1 boat ramp with 2 lanes. Good condition, Renovated in 2022.

Table 3. Harvest regulations for Lake Houston, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (only 10 \geq 20 inches)	None
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5 ^a	14-inch minimum
Bass, Spotted	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 Houston, Texas. FRY = fry, FGL = fingerling; AFGL = advanced fingerling; ADL = adults, and UNK = unknown.

Species	Year	Number	Size
Channel Catfish	1972	132,724	AFGL
	1973	35,000	AFGL
	2022	75,391	AFGL
	Total	243,115	
Florida Largemouth Bass	1990	306,965	FRY
	2012	10,000	FGL
	2013	100,370	FGL
	2014	99,463	FGL
	2015	76,260	FGL
	2016	80,041	FGL
	2017	50,195	FGL
	2018	74,801	FGL
	2020	39,151	FGL
Total	837,254		
^a Lone Star Bass	2022	75,031	FGL
	2023	75,227	FGL
	Total	150,062	
Palmetto Bass	1979	123,200	UNK
	1981	135,638	UNK
	1983	122,459	UNK
	1984	362,450	FGL
	1986	237,083	FGL
	1986	123,932	FRY
	1991	134,600	FGL
	1992	103,180	FGL
	1994	62,000	FGL
	1995	187,650	FGL
	1996	122,416	FGL
	1997	61,351	FGL
	1998	63,236	FGL
	Total	1,839,195	
Striped Bass	1989	246,000	FGL
	1990	122,879	FGL
	Total	368,879	

^a Lone Star Bass are 2nd generation offspring of pure Florida strain ShareLunker Largemouth Bass that have proven to be able to grow to \geq 13 pounds.

Table 5. Objective-based sampling plan components for Lake Houston, Texas 2022-2023.

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

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

Table 6. Survey of structural habitat types, Lake Houston, Texas, 2023. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Bulkhead with open water	5.5	5.2
Bulkhead with piers and boat docks	24.7	23.4
Bulkhead with dead timber	1.9	1.8
Concrete with open water	3.7	3.5
Eroded bank with concrete	0.4	0.4
Eroded bank with dead timber	7.1	6.7
Eroded bank with piers and docks	0.9	0.9
Eroded banks with standing timber	0.9	0.9
Overhanging brush with dead timber	36.5	34.3
Overhanging brush with standing timber	23.8	22.3
Riprap with dead timber	0.5	0.5
Riprap with open water	0.5	0.5
Rocky shoreline with piers and docks	0.1	0.1

Table 7. Survey of aquatic vegetation, Lake Houston, Texas, 2019-2022. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2019	2020	2021	2022
Native submersed				4.36 (<0.1)
Native floating-leaved				9.46 (<0.1)
Native emergent				133.59 (<0.1)
Total Native				147.41 (<0.1)
<hr/>				
Non-native*				
Common and Giant Salvinia (Tier II)				164.61 (<0.1)
Common salvinia (Tier II)		0.55 (<0.1)	8.11 (<0.1)	
Water hyacinth (Tier II)	<0.1 (<0.1)	0.50 (<0.1)	12.62 (<0.1)	<0.1 (<0.1)
Water lettuce (Tier II)	<0.1 (<0.1)	2.63 (<0.1)	48.85 (<0.1)	30.84 (<0.1)
Alligator weed (Tier III)	<0.1 (<0.1)	0.40 (<0.1)	6.05 (<0.1)	9.32 (<0.1)
Elephant ear (Tier III)	<0.1 (<0.1)	0.68 (<0.1)	0.85 (<0.1)	3.29 (<0.1)
Arundo (Tier III)	<0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)
Asian marshweed (Tier III)		<0.1 (<0.1)	2.45 (<0.1)	0.41 (<0.1)
Red lotus (Tier III)			<0.1 (<0.1)	<0.1 (<0.1)
Parrotfeather (Tier III)				<0.1 (<0.1)
Thalia (Tier III)		<0.1 (<0.1)		<0.1 (<0.1)
Crested Floating Heart (Tier III)				0.80 (<0.1)
Fanwort (Tier III)		<0.1 (<0.1)		
Total Non-native	<0.1 (<0.1)	4.76 (<0.1)	78.93 (<0.1)	209.27 (<0.1)

*Non-native vegetation data provided by the Coastal Water Authority

**Tier I is immediate Response, Tier II is Maintenance Status, Tier III is Watch Status

Table 8. Percent directed angler effort by species for Lake Houston, Texas, 2014–2023. Survey periods were from 1 June of 2013 through 31 May of 2014 for 2014, and 1 March through 31 May for 2019, and 2023.

Species	2014	2019	2023
Catfishes	22.9	21.1	32.3
Temperate Bass	0	0	0
Sunfishes	0	0	0
Black Bass	29.6	10.5	7.7
Crappies	4.9	42.8	27.7
Anything	42.6	25.6	32.3

Table 9. Total fishing effort (h) for all species and total directed expenditures at Lake Houston, Texas, 2014-2023. Survey periods were from 1 June of 2013 through 31 May of 2014, and 1 March through 31 May for 2019, and 2023. Relative standard error is in parentheses.

Creel statistic	2014	2019	2023
Total fishing effort	9,478.0 (22.6)	62,838.6 (40.3)	42,507.6 (29.5)
Total directed expenditures	\$77,188 (70.4)	\$217,242 (52.5)	\$249,133 (69.4)

Gizzard Shad

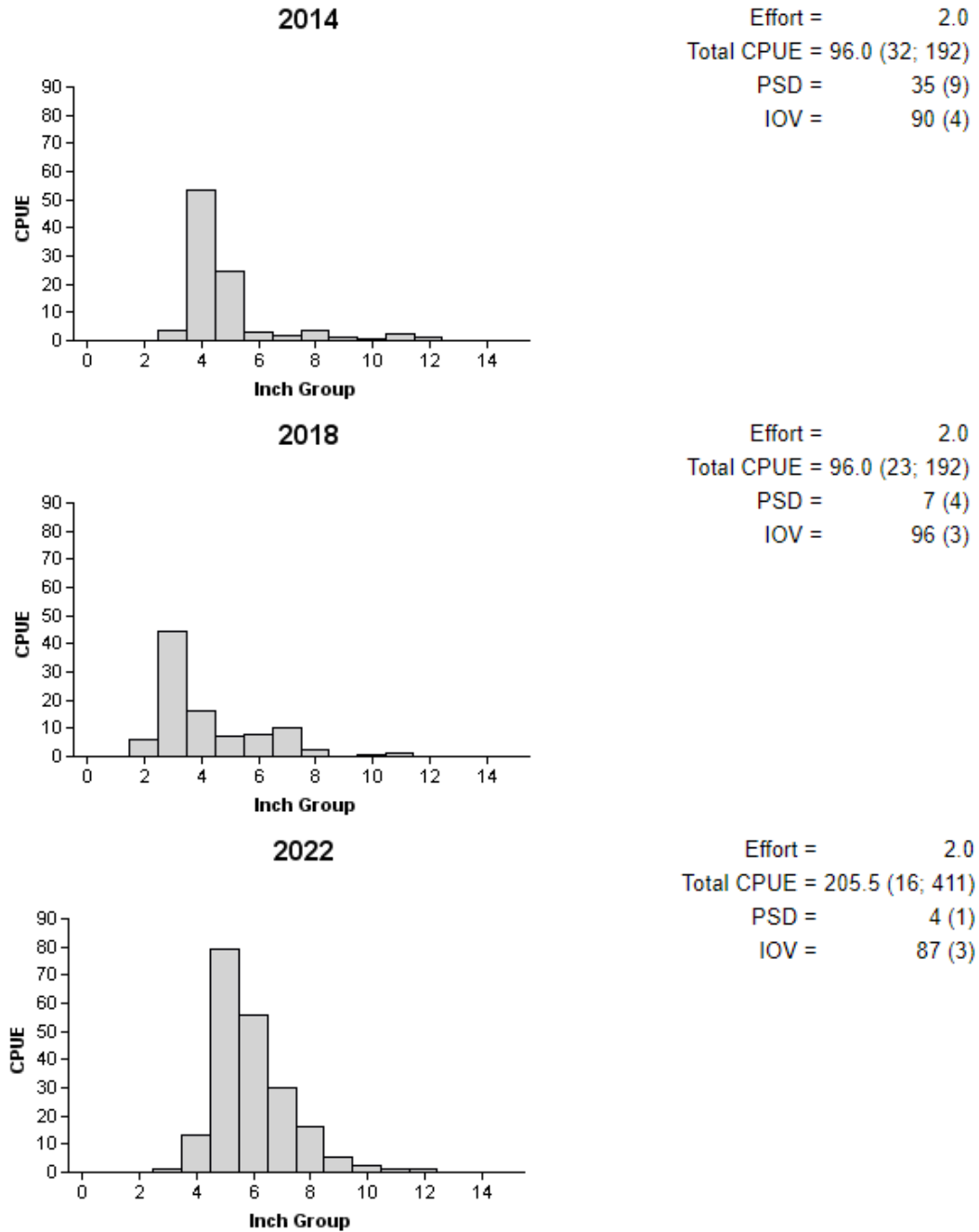


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Houston, Texas, 2014, 2018, and 2022.

Bluegill

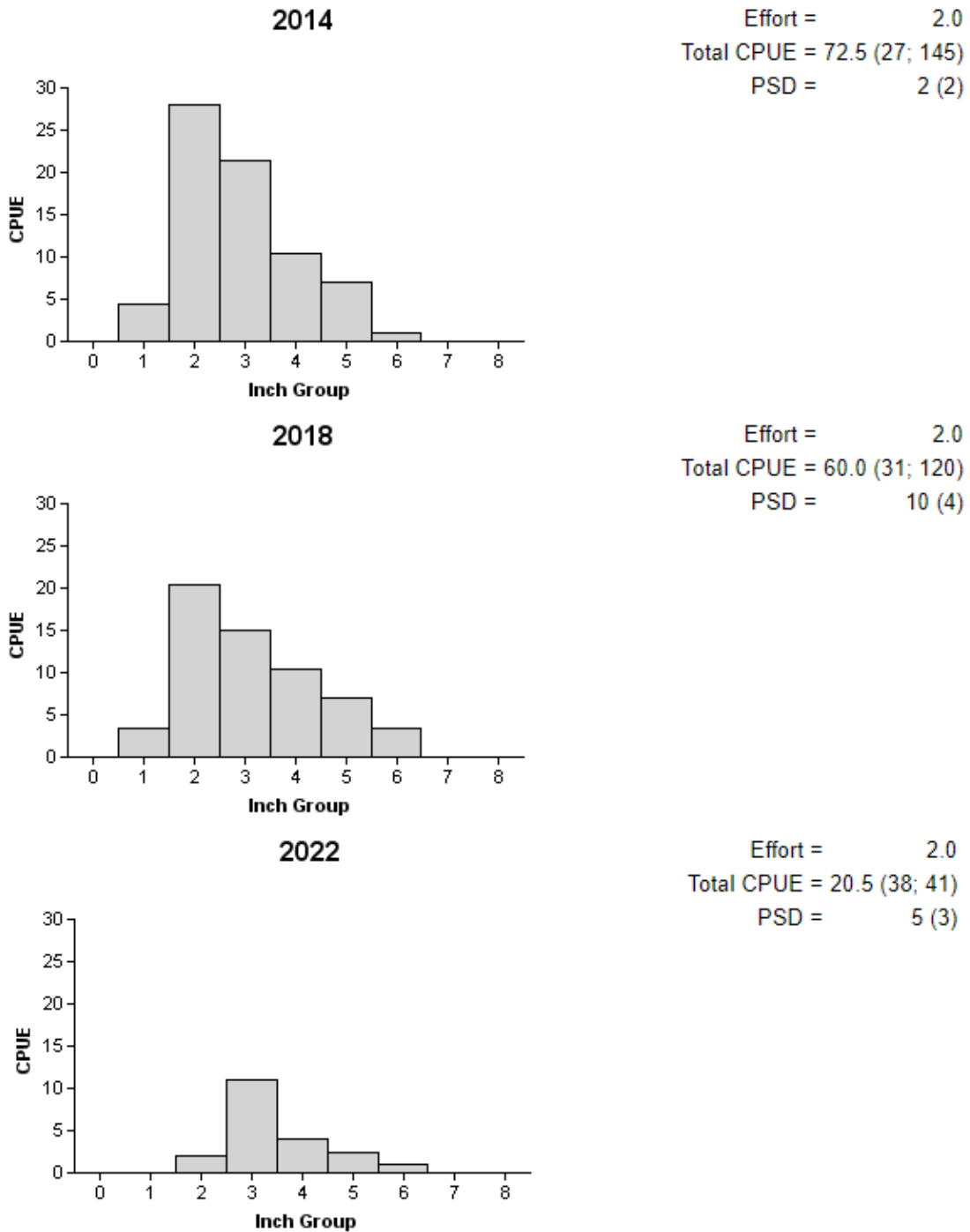


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Houston, Texas, 2014, 2018, and 2022.

Blue Catfish

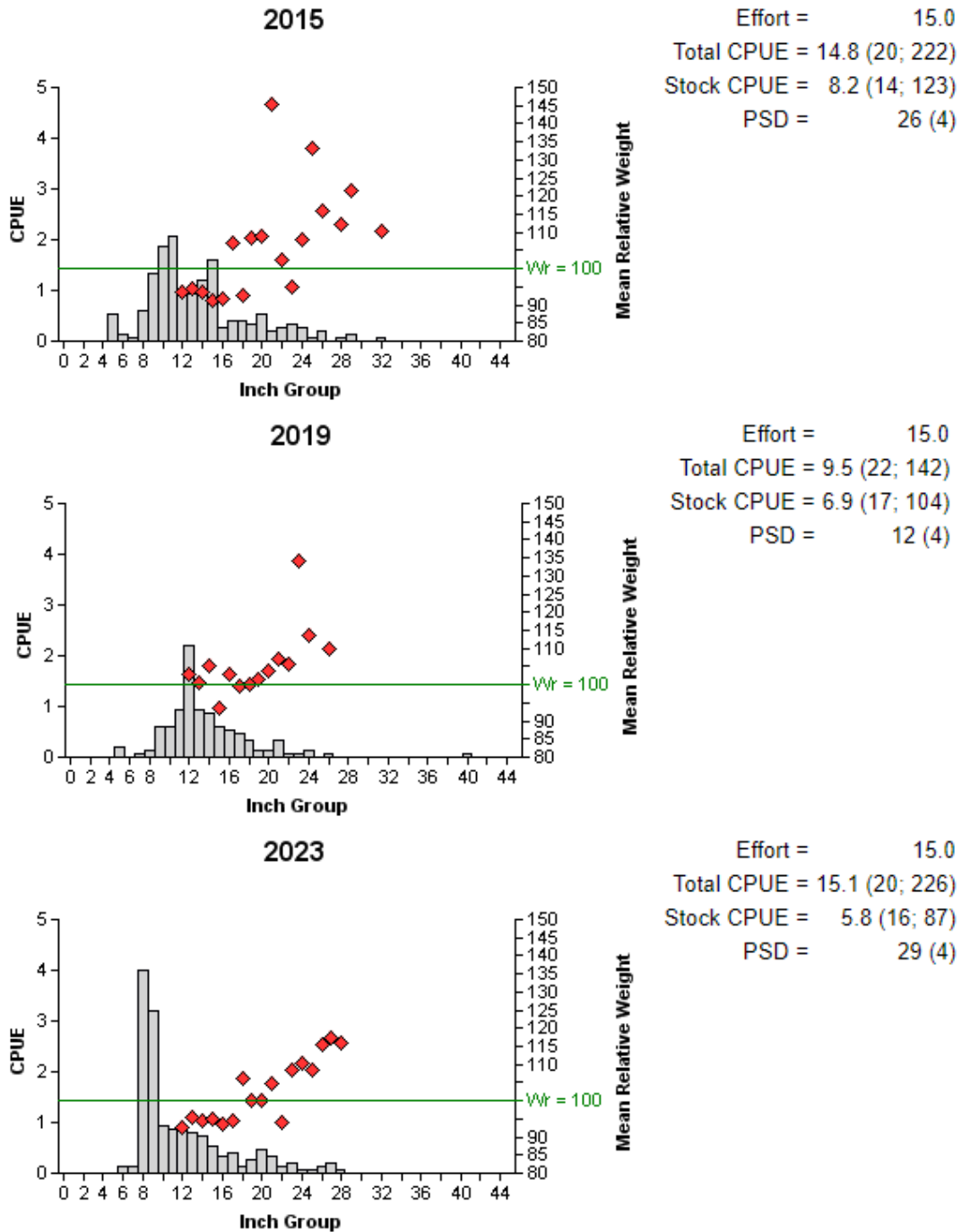


Figure 4. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses), mean relative weight (diamonds), for spring gill net surveys, Lake Houston Texas, 2015, 2019, and 2023. Horizontal line represents optimal relative weight.

Channel Catfish

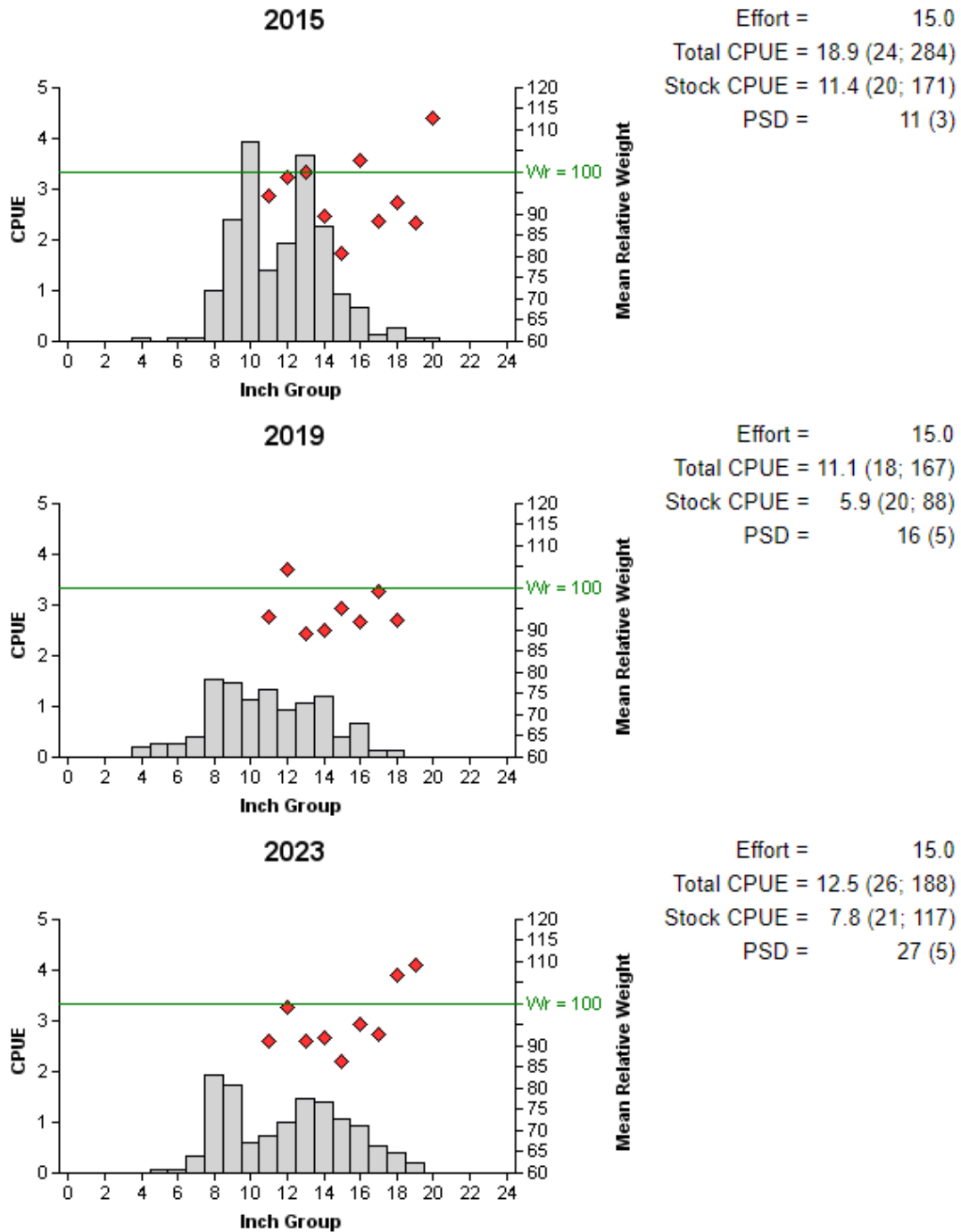


Figure 5. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses), mean relative weight (diamonds), for spring gill net surveys, Lake Houston, Texas, 2015, 2019, and 2023. Horizontal line represents optimal relative weight.

Table 10. Creel survey statistics for Blue Catfish and Channel Catfish at Lake Houston, Texas, from June 2013 through May 2014, March 1, 2019, through May 31 2019, and March 1 2023 through May 31 2023. Total catch per hour is for anglers targeting Blue Catfish or Channel Catfish, and total harvest is the estimated number of Blue Catfish or Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2014	2019	2023
Surface area (acres)	10,160	10,160	10,160
Directed effort (h)	2,168.0 (49.8)	13,288.8 (35.5)	13,734.9 (30.4)
Directed effort/acre	0.2 (49.8)	1.3 (35.5)	1.4 (30.4)
Total catch per hour	0.1 (0.0)	0.6 (64.1)	2.0 (84.4)
Total harvest			
Blue Catfish	247.2 (330.5)	1,819.6 (100.7)	858.3 (125.7)
Channel Catfish	494.4 (229.9)	7,446.0 (46.1)	7,015.9 (57.4)
Harvest/acre			
Blue Catfish	< 0.1 (330.5)	0.2 (100.7)	<0.1 (125.7)
Channel Catfish	< 0.1 (229.9)	0.7 (46.1)	0.7 (57.7)
Percent legal released			
Blue Catfish	17.1	0	NA
Channel Catfish	0	0	NA
Any Catfish			59

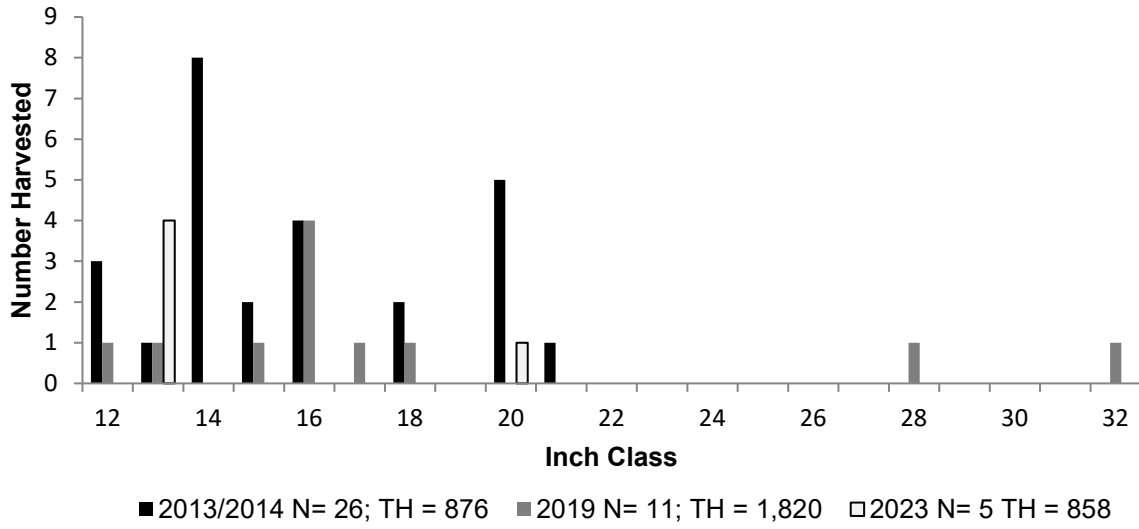


Figure 6. Length frequency of harvested Blue Catfish observed during creel surveys at Lake Houston, Texas, from June 2013 through May 2014, March 2019 through May 2019, and March 2023 through May 2023 all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period

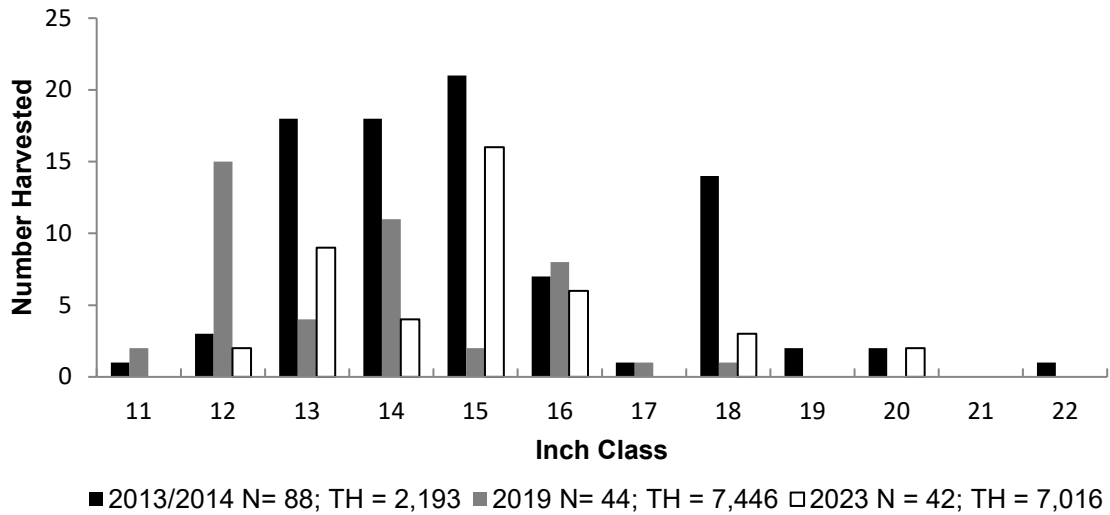


Figure 7. Length frequency of harvested Channel Catfish observed during creel surveys at Lake Houston, Texas, from June 2013 through May 2014, March 2019 through May 2019, and March 2023 through May 2023, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass

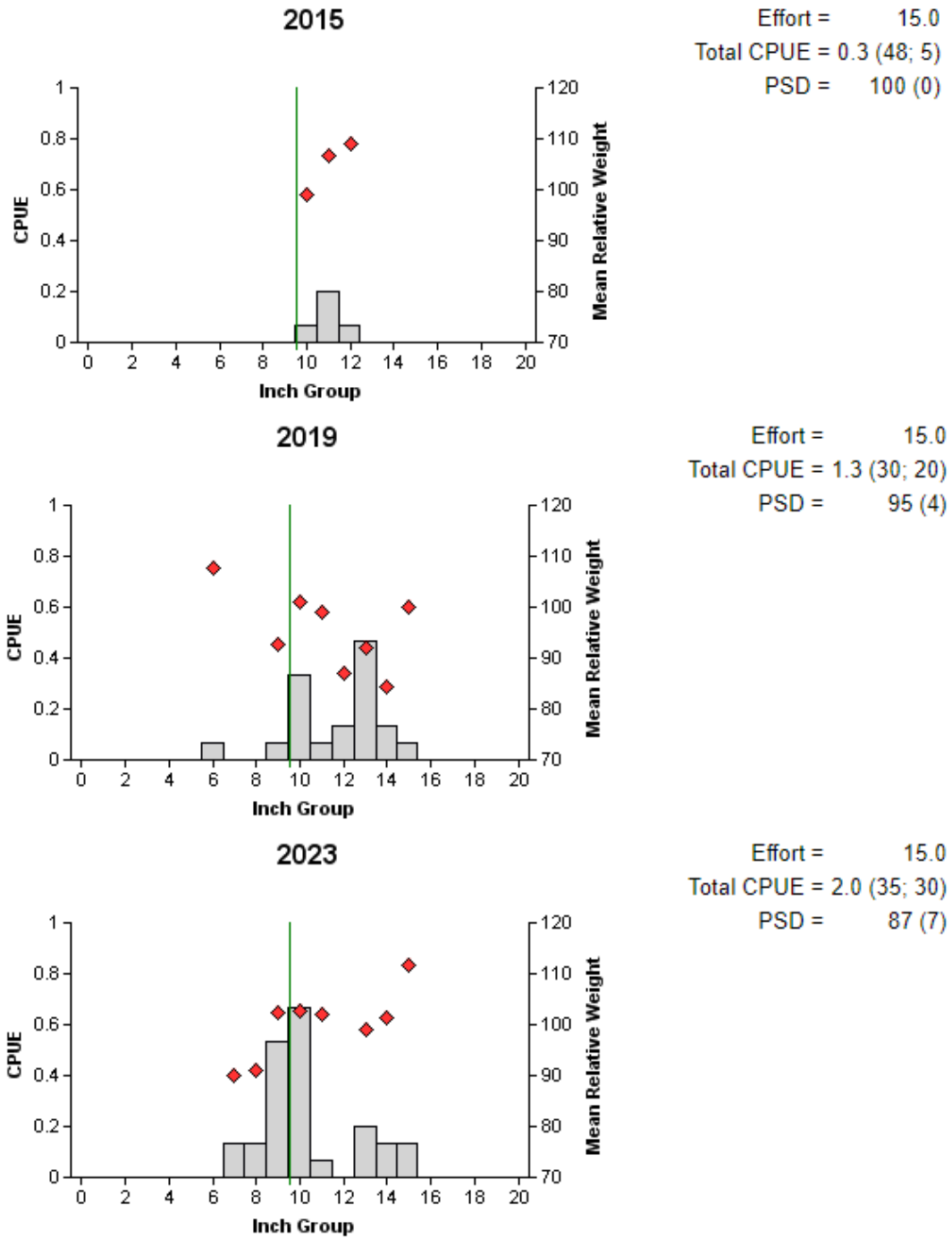


Figure 8. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Houston, Texas, 2015, 2019, and 2023. Vertical line indicates minimum length limit.

Table 11. Creel survey statistics for White Bass at Lake Houston, Texas, from June 2013 through May 2014, March 2019 through May 2019, and March 2023 through May 2023. Total catch per hour is for anglers targeting White Bass and total harvest is the estimated number of White Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2014	2019	2023
Surface area (acres)	10,160	10,160	10,160
Directed effort (h)	0 (0)	0 (0)	0 (0)
Directed effort/acre	0 (0)	0 (0)	0 (0)
Total catch per hour	NA*	NA*	NA*
Total harvest	0 (0)	718.5 (168.4)	343.3 (249.1)
Harvest/acre	0 (0)	< 0.1 (168.4)	<0.1 (249.1)
Percent legal released	0	8.1	0

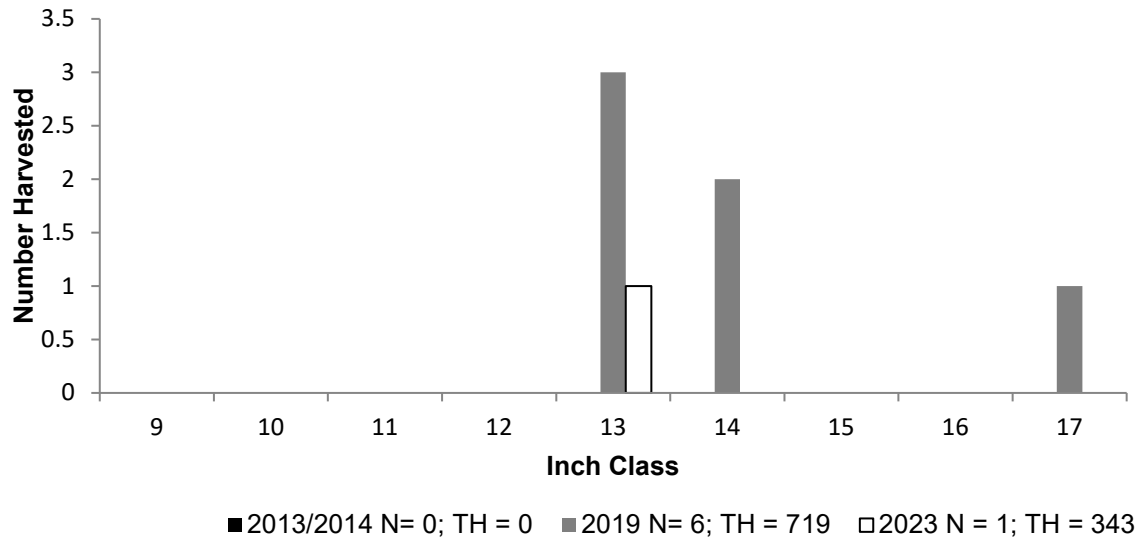


Figure 9. Length frequency of harvested White Bass observed during creel surveys at Lake Houston, Texas, from June 2013 through May 2014, March 2019 through May 2019, and March 2023 through May 2023, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period

Largemouth Bass

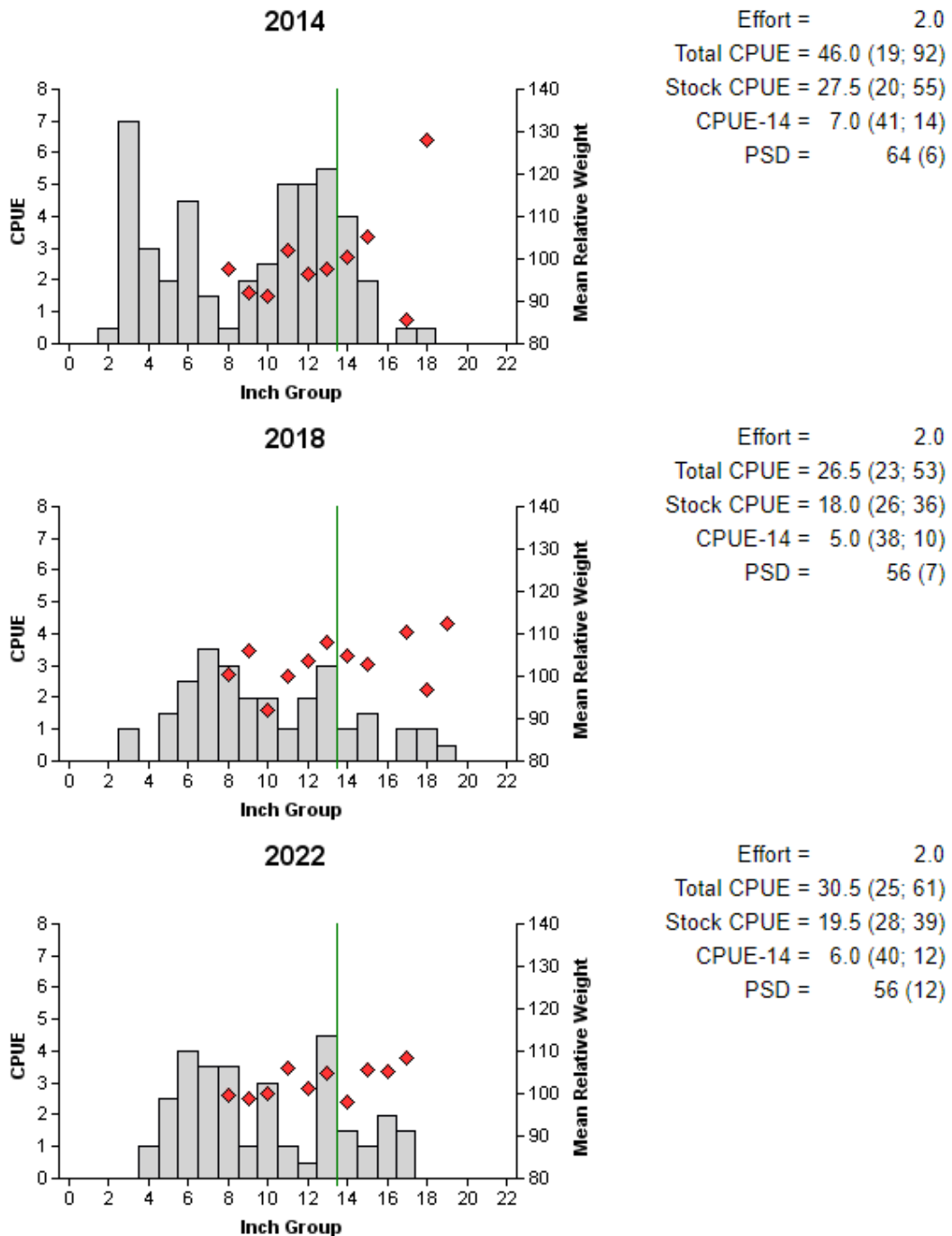


Figure 10. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Houston, Texas, 2014, 2018, and 2022. Vertical line indicates minimum length limit. The 2014 and 2018 samples were biologist-selected daytime sampling, while the 2022 sample was randomly selected daytime sampling.

Table 12. Creel survey statistics for Largemouth Bass at Lake Houston, Texas, from June 2013 through May 2014, March 2019 through May 2019, and March 2023 through May 2023. 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	2014	2019	2023
Surface area (acres)	10,160	10,160	10,160
Directed angling effort (h)			
Tournament	0 (0)	435.3 (114.4)	0 (0)
Non-tournament	2,808.8 (41.6)	6,166.5 (49.1)	3,270.5 (56.4)
All black bass anglers combined	2,808.8 (41.6)	6,601.8 (53.5)	3,270.5 (56.4)
Angling effort/acre	0.3 (41.6)	0.6 (53.5)	0.3 (56.4)
Catch rate (number/h)	3.5 (28.5)	2.4 (3.2)	1.0 (73.1)
Harvest			
Non-tournament harvest	1,730.4 (57.4)	0 (0)	0 (0)
Harvest/acre	0.2 (57.4)	0 (0)	0 (0)
Tournament weigh-in and release	0 (0)	0 (0)	0 (0)
Release by weight			
<4.0 lbs	3,101 (45.2)	3,800 (125.0)	2,056 (111.2)
4.0-6.9 lbs	0 (0)	760 (123.8)	294 (109.8)
7.0-9.9 lbs	0 (0)	0 (0)	0 (0)
≥10.0 lbs	0 (0)	0 (0)	0 (0)
Percent legal released (non-tournament)	58.8	100.0	100.0

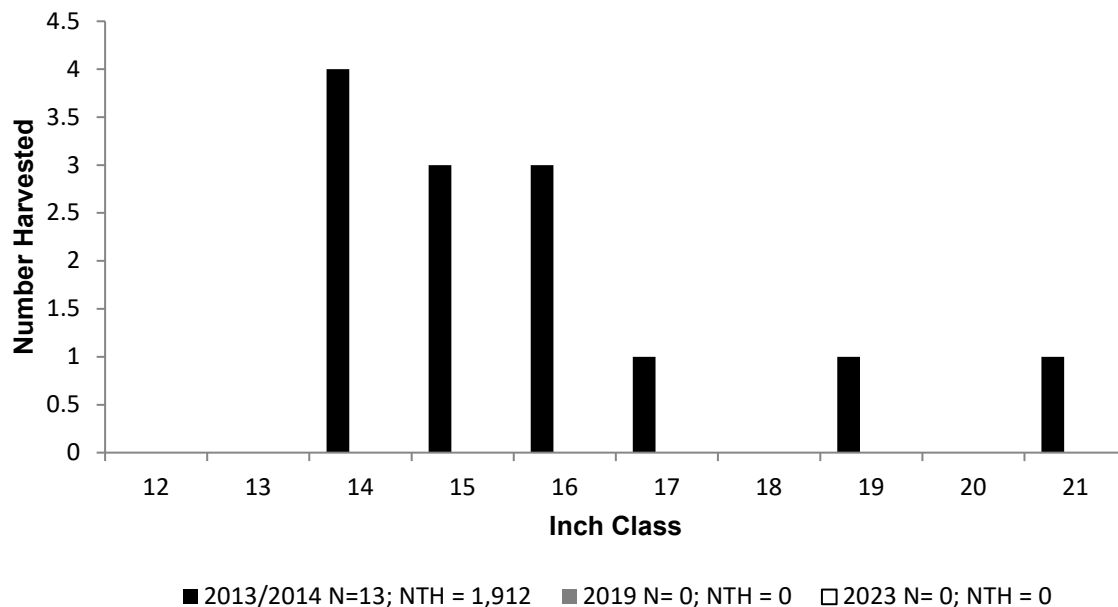


Figure 11. Length frequency of non-tournament harvested Largemouth Bass observed during creel surveys at Lake Houston, Texas, from June 2013 through May 2014, March 2019 through May 2019, and March 2023 through May 2023, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and NTH is the estimated non-tournament harvest for the creel period.

Table 13. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Houston, Texas, 2014, 2018, and 2022. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB Genetic composition was determined by electrophoresis.

Year	Sample size	Number of fish				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
2014	30	0	1	18	11	12	0
2018	29	1	0	16	12	13	3
2022	30	0	10	3	17	21	0

White Crappie

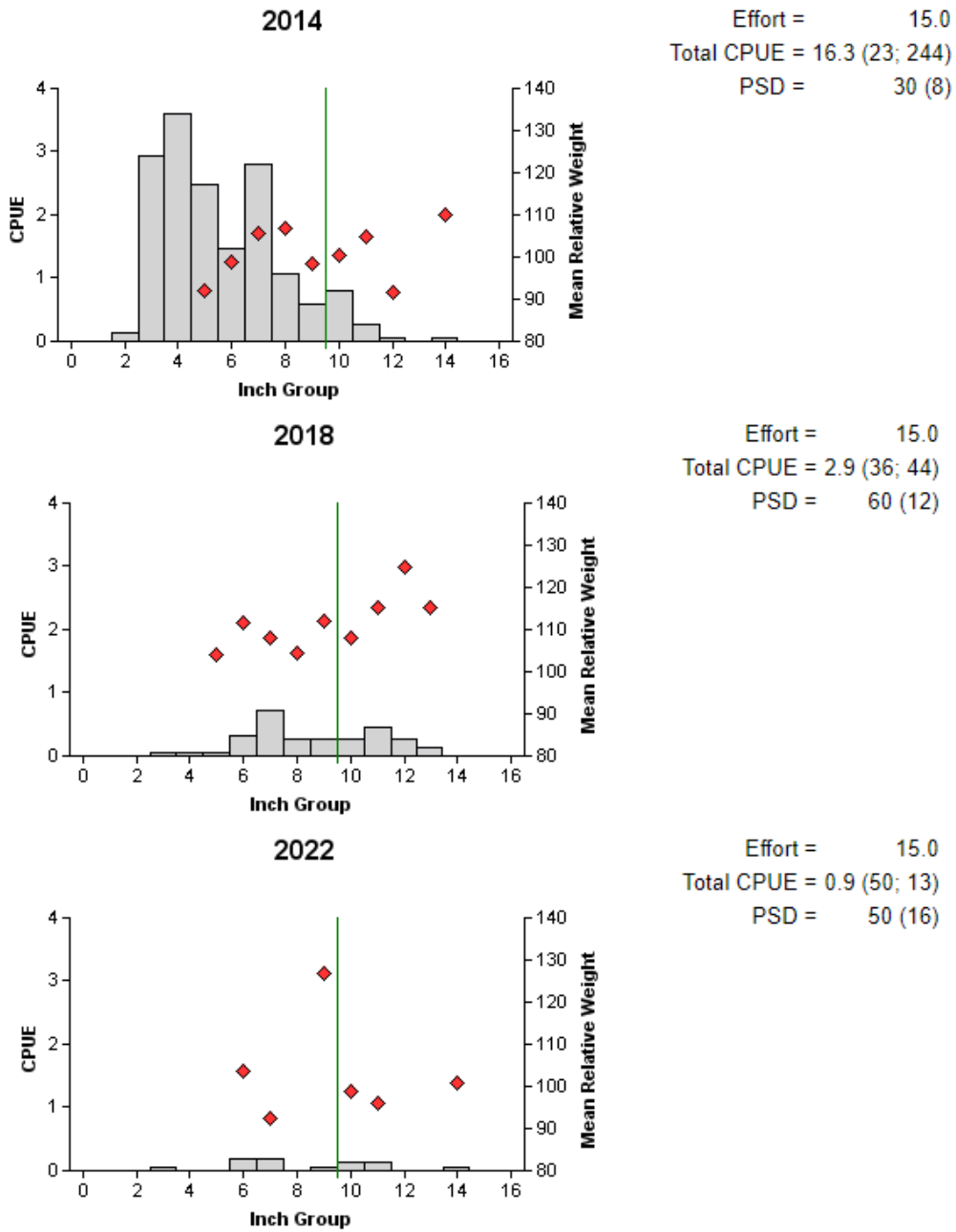


Figure 12. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Lake Houston, Texas, 2014, 2018, and 2022. Vertical line indicates minimum length limit.

Black Crappie

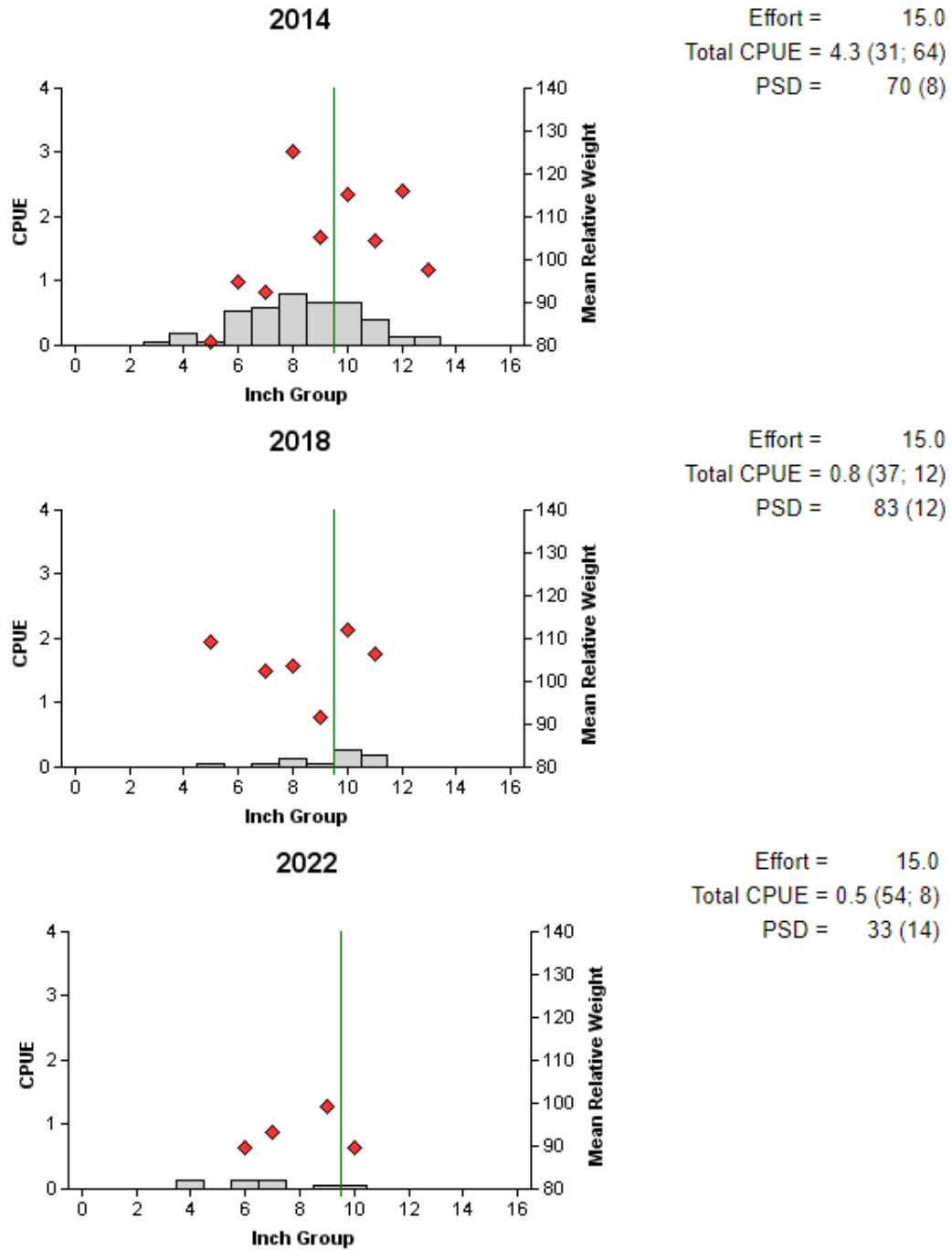


Figure 13. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Lake Houston, Texas, 2014, 2018, and 2022. Vertical line indicates minimum length limit.

Table 14. Creel survey statistics for crappies at Lake Houston, Texas, from, June 2013 through May 2014, March 2019 through May 2019, and March 2023 through May 2023. Total catch per hour is for anglers targeting crappies, and total harvest is the estimated number of White Crappie or Black Crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2014	2019	2023
Surface area (acres)	10,160	10,160	10,160
Directed effort (h)	462.4 (104.6)	26,875.2 (33.0)	11,768.9 (35.3)
Directed effort/acre	< 0.1 (104.6)	2.6 (33.0)	1.2 (35.3)
Total catch per hour	1.2 (100.0)	0.9 (19.9)	0.4 (73.2)
Total harvest			
White Crappie	3,708.1 (42.8)	11,280.1 (49.2)	2,370.9 (73.3)
Black Crappie	0 (0)	2,514.8 (79.6)	0 (0)
Harvest/acre			
White Crappie	0.4 (42.8)	1.1 (49.2)	0.2 (73.3)
Black Crappie	NA	0.2 (79.6)	0
Percent legal released			
White Crappie	0	2.2	26
Black Crappie	0	0	NA

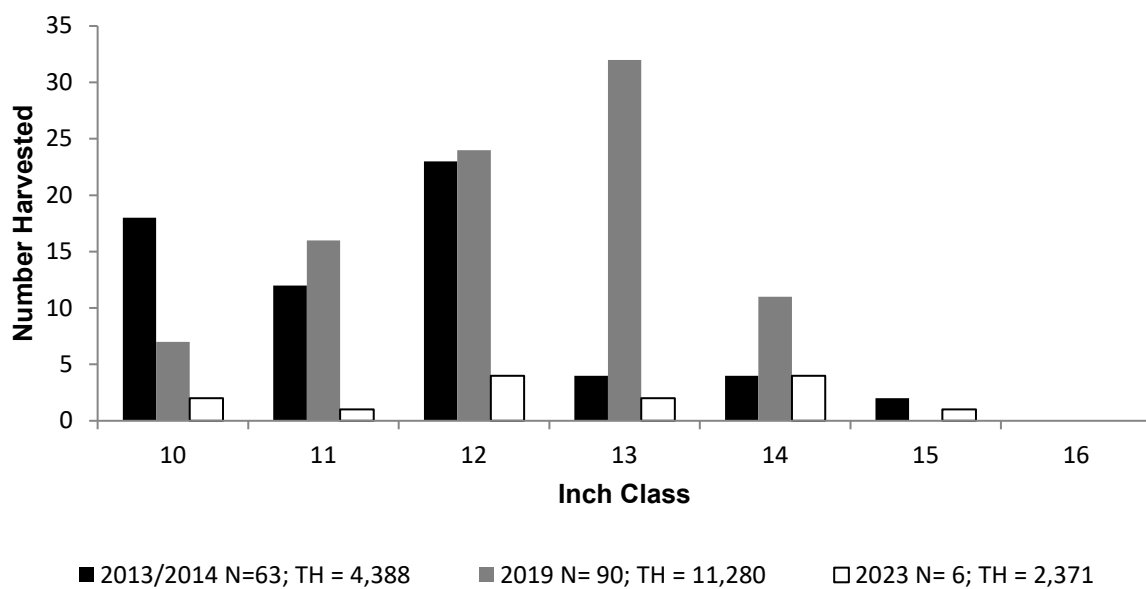


Figure 14. Length frequency of harvested White Crappie observed during creel surveys at Lake Houston, Texas, from June 2013 through May 2014, March 2019 through May 2019, and March 2023 through May 2023, all anglers combined. N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Proposed Sampling Schedule

Table 15. Proposed sampling schedule for Lake Houston, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall.

	Survey year			
	2023-2024	2024-2025	2025-2026	2027-2028
Angler Access				X
Structural Habitat				X
Vegetation	X	X	X	X
Electrofishing – Fall				X
Trap Netting				X
Gill Netting				X
Creel Survey – Spring Quarter				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 Houston, Texas, 2022-2023. Sampling effort was 15 net nights for gill netting and trap netting and 2 hours for electrofishing.

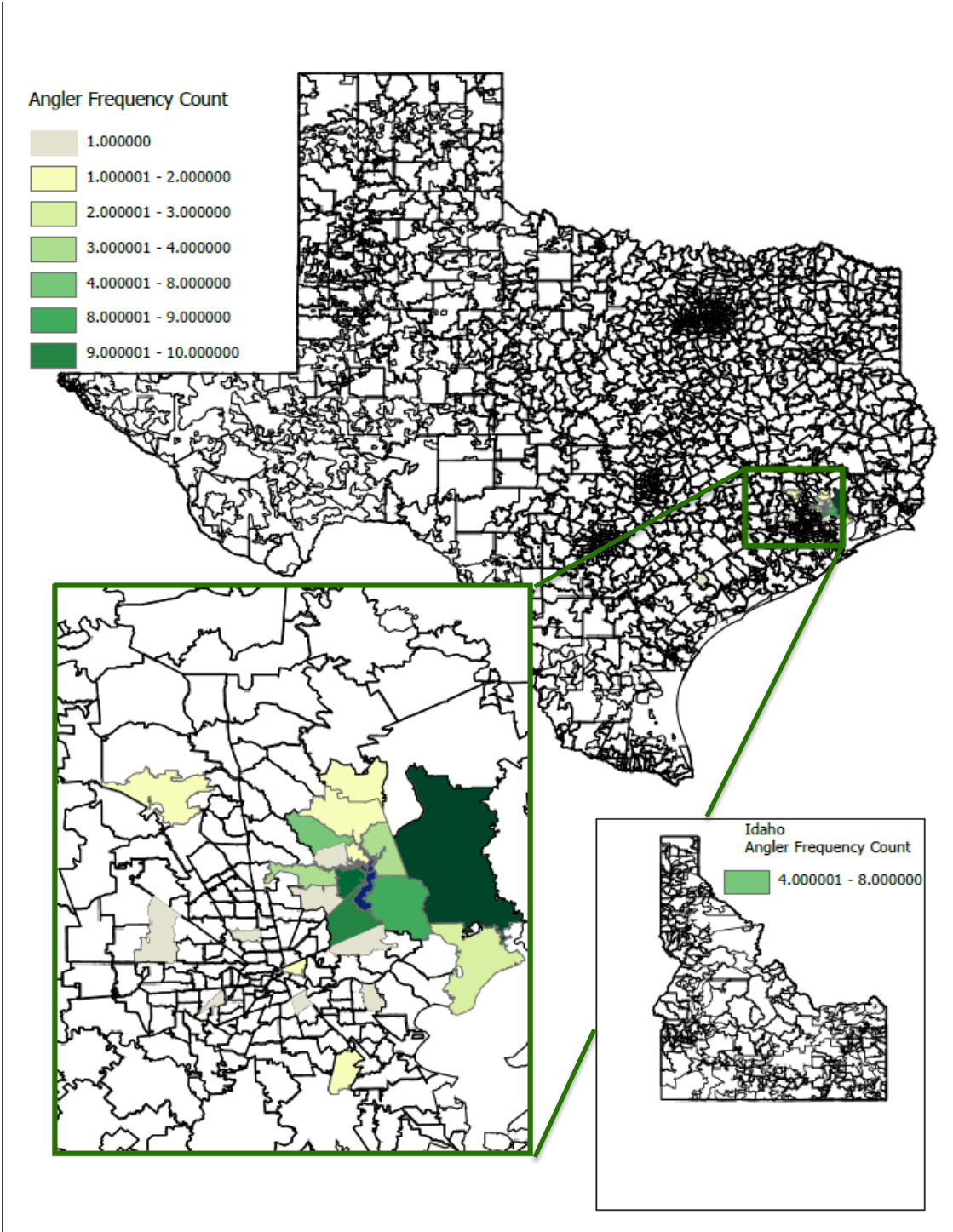
Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Spotted Gar	6	0.4 (59)			16	8 (33)
Gizzard Shad	141	9.4 (12)			411	205.5 (16)
Threadfin Shad					782	391 (35)
Redfin Pickerel					1	0.5 (100)
Common Carp					25	12.5 (72)
Golden Shiner					3	1.5 (73)
Pugnose minnow					1	0.5 (100)
Inland Silverside					35	17.5 (51)
Brook Silverside					3	1.5 (100)
River carpsucker	1	0.07 (100)				
Spotted sucker					4	2 (69)
Blue Catfish	226	15.07 (20)				
Yellow bullhead					1	0.5 (100)
Channel Catfish	188	12.53 (26)			7	3.5 (38)
Flathead Catfish	1	0.07 (100)				
Blackstripe topminnow					1	0.5 (100)
White Bass	30	2 (35)			3	1.5 (100)
Yellow Bass	23	1.53 (54)			5	2.5 (41)
Bluegill					41	20.5 (38)
Longear sunfish					28	14 (47)
Redear Sunfish					1	0.5 (100)
Largemouth Bass					61	30.5 (25)
White crappie	6	0.4 (48)	13	0.87 (50)	1	0.5 (100)
Black crappie			8	0.53 (54)	2	1 (69)
Freshwater drum	49	3.27 (26)			6	3 (43)
Hybrid Striped Bass	1	0.07 (100)				
Hybrid tilapia					2	1 (100)

APPENDIX B – Map of sampling locations



Location of sampling sites, Lake Houston, Texas, 2022-2023. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was near full pool at time of sampling.

A2: Reporting of ZIP code data using a map



Location, by ZIP code, and frequency of anglers that were interviewed at Lake Houston, Texas, during the March 2023 through May 2023 creel survey.



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