Belton 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 Belton Reservoir were surveyed in 2020 and 2022 using electrofishing and in 2023 using gill netting. Anglers were surveyed from December 2022 through February 2023 with a creel survey targeting Blue Catfish anglers as part of a statewide catfish project. Historical data are presented with the 2020-2023 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: Belton Reservoir is a 12,385-acre impoundment located in Bell County, Texas. Water levels fluctuated from nearly 10 feet above conservation pool (594 feet above mean sea level) to 14.5 feet below conservation pool between August 2019 and May 2023. Mean and maximum water depths are 37 and 124 feet respectively and the reservoir is classified as mesotrophic with Secchi depth averaging around six feet (Texas Commission on Environmental Quality 2011). Habitat features consisted mainly of rock/sand shorelines, bluffs, standing timber and riprap.

Management History: Important sport fish include Largemouth and Smallmouth Bass, Hybrid Striped Bass, White Bass, Blue Catfish, Channel Catfish and White Crappie. Smallmouth Bass were most recently stocked in 2015, 2018 and 2021. Historically, Palmetto Bass were the Hybrid Striped Bass (HSB) species of choice, being regularly stocked from 1977 to 2018. However, Sunshine Bass have been the only HSB species stocked since 2020. Native vegetation planting took place in 2012 and artificial fish habitat was deployed in 2021 and 2023. Despite a robust public relations campaign and associated efforts, Zebra Mussels were confirmed in Belton Reservoir in August 2013, and the reservoir remains infested. The statewide regulation for Blue and Channel Catfish changed on September 1, 2021; the current regulations are in this report. More recent management efforts have focused on fry density stocking evaluations for HSB, an evaluation of stocking effects on Smallmouth Bass recruitment, additional artificial habitat work and maintaining aquatic invasive species (AIS) signage and educating constituents about the threat of AIS.

Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. Electrofishing catch of Gizzard Shad was good, and most Gizzard Shad were available as prey to most sport fish. Electrofishing catch of Bluegill was good, but very few Bluegill were large enough for anglers.
- **Catfishes:** The Blue Catfish catch rate was very good, and condition ranged from good to excellent. The Channel Catfish catch rate was also good, but condition only ranged from fair to good. Flathead Catfish were present in the reservoir.
- **Temperate basses:** White Bass and HSB were present in the reservoir. White Bass catch was high and this, combined with good HSB abundance, provides a quality fishery.
- **Black Bass:** Largemouth Bass catch was fair. No fish over 18” were collected. Smallmouth Bass catch was very good compared to other Smallmouth Bass fisheries in the state. Most anglers at Belton Reservoir fish for black bass.
- **White Crappie:** White Crappie were moderately abundant with legal-length fish available to anglers.

Management Strategies: Continue managing sportfishes at Belton Reservoir with the current regulations. Stock HSB at 100 fry/acre annually. Stock Lonestar Bass in 2024 and 2025. Stock Smallmouth Bass during years with rising water levels in the spring. Continue the placement of artificial fish habitat into freshwater reefs throughout the reservoir when possible. Inform the public about the negative impacts of AIS and maintain appropriate signage at all access points that are open to the public. Conduct angler access, vegetation and electrofishing surveys in 2026 and gill netting surveys in 2027.

Introduction

This document is a summary of fisheries data collected at Belton Reservoir from 2020-2023. 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 2020-2023 data for comparison.

Reservoir Description

Belton Reservoir is located on the Leon River in Bell County, Texas. The reservoir was constructed in 1954 by the United States Army Corps of Engineers (USACE) to serve as a source of municipal water and for flood control and is managed by the same agency. The conservation pool is 594 feet above mean sea level, and the reservoir has a maximum and average depth of 124 and 37 feet respectively (Figure 1). The 12,385-acre impoundment has a drainage area of 3,531 square miles, a storage capacity of 457,600 acre-feet, and a shoreline length of 136 miles. Habitat at time of sampling consisted primarily of natural rock/sand shorelines, bluffs, standing timber and riprap. Water level was below conservation pool (594) for most of the period from July 2019 to May 2023 but peaked once to a level of nearly 10 feet above conservation pool during 2021. Water level was near conservation pool during the 2020 electrofishing and 2021 artificial habitat deployment, eight feet low during the 2022 vegetation survey and 14 feet below conservation pool at the start of the 2023 gill netting survey. Other descriptive characteristics for Belton Reservoir are in Table 1.

Angler Access

Bank fishing and boat access is excellent with numerous parks and seventeen public boat ramps. Due to low water levels and park road construction only six or so were open to the public as of March 2023. Additional boat ramp characteristics are in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Tibbs and Baird 2018) included:

1. Complete evaluation of HSB fry stocking rates.

   Action: Sunshine Bass fry were stocked at a rate of 50/acre in 2020, 100/acre in 2021, and 200/acre in 2022. A large age sample was collected in Spring, 2023. Sufficient data was collected to inform and refine fry stocking rates in future years.

2. Obtain additional electrofishing catch data due to high water preventing sampling in Fall 2018.

   Action: An additional electrofishing sample was collected in Fall, 2020 and is included in this report.

3. Continue evaluating the effects of Smallmouth Bass stocking on the population.

   Action: Based on the recommendation in the 2018 report, Smallmouth Bass were stocked in 2021 to take advantage of high water increasing young-of-the-year habitat. They were not stocked in the other three years covered by this report. The planned age sample was not collected in January 2023 since only a single year-class was potentially impacted from stockings and delaying the sample might yield better information.

Harvest regulation history: All sport fishes in Belton Reservoir were managed with statewide regulations until September 2021 when a quality/trophy regulation for Blue and Channel Catfish was implemented which was no minimum length limit; daily bag of 25 (in any combination – only 5 can be 20 inches or greater in length and only one of those can be over 30 inches). The current regulations for all sport fishes in Belton Reservoir can be found in Table 3.

Stocking history: Smallmouth stockings are requested every year and Belton remains a primary source for Smallmouth Bass brood stock. Smallmouth Bass were stocked in 2015, 2018 and 2021. Palmetto Bass were the HSB species of choice for decades, being regularly stocked from 1977 to 2018 with few exceptions. However, Sunshine Bass have been the only HSB species stocked since 2020. Blue Catfish were last stocked in 2008 and Florida Largemouth Bass were last stocked in 2016. The complete stocking history is in Table 4.

Vegetation/habitat management history: Belton Reservoir supports very little aquatic vegetation. There have been reports of hydrilla in the past, but none confirmed by TPWD surveys. A grass roots initiative began in 2006 by Centex Bass Hunters, in conjunction with Bass Anglers Sportsman's Society (BASS), Texas Parks and Wildlife Department (TPWD), and the USACE aquatic research laboratory in Lewisville, to establish native aquatic vegetation in Belton Reservoir. Funding contributions from that effort fell short of expectations, yet the interest and need to try and improve fish habitat in Belton remained. A second effort to introduce native vegetation into Belton Reservoir was initiated by TPWD in 2012, and three sites were planted with approximately 100 Water Willow plants each later that year. Monitoring of these sites over the next few years confirmed failed plantings due to drought conditions. In 2021, TPWD partnered with the Brazos River Authority (BRA), United States Army Corps of Engineers (USCOE), Tin Cup Whiskey, Centex Bass Hunters (CBH) and the Texas Anglers Bass Club (TABC) to build and deploy artificial fish habitat structures into reef complexes at four different sites near the lower end of the reservoir. These freshwater reef locations were enhanced with additional commercially available fish habitat structures in May 2023 and future plans include the addition of natural structure (cedar trees) to build-upon and add to the complexity of these freshwater reefs. Currently, no noxious vegetation is known to exist in the reservoir.

Water transfer: There are three raw water intake stations on Belton reservoir which transfer water offsite to water treatment facilities. The first is operated by the Water Control Improvement District #1(WCID#1), the second is Bluebonnet Water Supply and the third is for the City of Gatesville. They pump treated water to their destinations for use as municipal water. A pumping station and pipeline was proposed by the BRA to pump untreated water directly to Stillhouse Hollow Reservoir from Belton Reservoir during drought periods. As of the date of this report, construction is planned to begin in 2025.

Reservoir capacity: Belton was impounded in 1954. Original plans calculated the reservoir's capacity at conservation pool (594 feet above mean sea level) to be 457,600 acre-feet with a surface area of 12,300 acres. Two volumetric surveys were completed by the Texas Water Development Board (TWDB) on Belton since impoundment; one in 1994 and one in 2003. The 1994 survey calculated a volume of 434,500 acre-feet and a surface area of 12,385 acres at conservation pool, whereas the 2003 survey calculated a volume of 435,225 acre-feet and surface area of 12,135 acres. According to the TWDB, the two surveys are within the margin of error and are essentially identical indicating that sedimentation is not an issue in the reservoir.

Zebra Mussels: Zebra Mussel monitoring began on Belton Reservoir in 2012. Signage was posted at the 17 public boat ramps to make boaters aware of the threat of AIS including Zebra Mussels, yet by the end of summer 2013, Zebra Mussels were found throughout the reservoir. Educational signage posted in 2013 was then replaced with warning signage and boat ramp stencils warning boaters that the reservoir was infested with Zebra Mussels. During the summer of 2014 and 2015, TPWD continued the public awareness campaign by hiring two interns each summer to educate boaters and other watercraft users about Zebra Mussels, the new water draining rules in Texas public waters, how to properly inspect a watercraft, and the importance of the campaign slogan "Clean Drain and Dry" in maintaining their watercraft. After 2015, these internships were transferred to Austin headquarters and no further funding for on-site invasive species education has been allocated to the district.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Belton Reservoir (Tibbs and Baird 2018). Primary components of the OBS plan are listed in Table 5. All standard survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division,

unpublished manual revised 2022). Some HSB and catfish age data were collected with sites selected by biologists to optimize sample sizes. These data were not included in any other metrics.

Electrofishing – Black Basses, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (1.5 hour at 18, 5-min stations) in October 2020 and again in November 2022. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. No age and growth data were collected on these surveys.

Gill netting – Blue Catfish, Channel Catfish, HSB, White Bass and crappie were collected by gill netting (15 net nights at 15 random stations for catch-per-unit-effort (CPUE) and structural indices). Twenty-four additional net nights were collected at biologist-selected stations to accommodate additional research objectives: a category III age and growth sample (200 stock sized fish up to 5 fish per centimeter group) for a HSB project and a specifically designed age and growth sample (300 stock sized fish) for a statewide Blue/Channel Catfish project. Catch per unit effort for gill 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 Anderson and Neumann (1996). Hybrid Striped Bass PSD was calculated according to Dumont and Neely (2011). 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 winter quarter access-point creel survey was conducted from December 2022 through February 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 2022. This creel was designed to evaluate the magnitude of the winter fishery for Blue Catfish as part of a statewide catfish study. Information on other sportfish species is included in this report, but caution should be used expanding these results to other quarters since the winter quarter is generally not a high-use period.

Habitat – A structural habitat survey was conducted in 2010. The 2022 vegetation survey was conducted using an adaptation of the point method (TPWD, Inland Fisheries Division, unpublished manual revised 2022). A total of 136 points were randomly generated on the shoreline. A transect was made from each point out to deep water, and all encountered vegetation on that transect was recorded.

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

Results and Discussion

Habitat: A habitat survey was last conducted in 2010 (Tibbs and Baird 2010). Only trace amounts of a few aquatic vegetation species (e.g., Arrowhead, Chara and Naiad) were observed in 2018 and no aquatic vegetation was observed in 2022.

Creel: Percent directed effort by species for the period of December 2022 through February 2023 can be found in Table 6. Directed fishing effort by anglers was highest for Largemouth and Smallmouth Bass combined (47.6%). Catch-and-release was common, with 86% of legal-length bass returned to the water. No bass tournament angers were encountered during this period. Blue Catfish comprised 12.9% of fishing effort during this winter quarter creel, with a directed effort of 0.3 h/acre, a total harvest of 0.2

fish/acre and 33% of legal Blue Catfish released. Catfish regulations on Belton were recently changed to the quality/trophy regulation which is more restrictive than the statewide. We are expecting increased Blue Catfish angling effort in the future based on angler response at Lake Waco, another district reservoir which has had restrictive catfish regulations for 15 years. This baseline angling information can be used to compare future creel surveys designed to evaluate winter pole-and-line angling for Blue Catfish. Total fishing effort for Lake Belton during the period was 19,174 hours with total directed expenditures of $142,052 (Table 7).

Prey species: Electrofishing catch rates of Bluegill and Gizzard Shad were 150.7/h and 90.7/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad was good, indicating that 82% of Gizzard Shad were available to existing predators (Figure 2). Total CPUE of Gizzard Shad was similar to 2020 and higher than 2014 (Figure 2; Appendix A). Total CPUE of Bluegill in 2022 was similar to the 2020 and 2014 surveys (Figure 3; Appendix A).

Catfishes: The gill net catch rate of Blue Catfish was 4.3/nn in 2023 (Figure 4; Appendix A). While not as good as 2020, it was still much improved over 2015, and good numbers of 20”-30” fish were available. Condition (Wr) was good to excellent and appeared to improve with length, ranging from 85 to 105. Directed fishing effort was low at 0.3/h as was harvest at 0.2/h (Table 8). Approximately a third of legal-length fish were released. Harvested fish ranged in length from 17 to 24 inches (Figure 5).

The gill net catch rate of Channel Catfish was 2.9/nn in 2023 which was an increase compared to 2019 (1.7/nn) and 2015 (1.3/nn) (Figure 6; Appendix A). Condition (Wr) was fair to good and ranged from 80 to 105. There was no directed fishing effort for Channel Catfish during the winter creel quarter, which is not surprising since few anglers traditionally target them at that time (Table 9).

White Bass: The gill net catch rate of White Bass was 7.1/nn in 2023, which was an increase compared to 2019 (2.2/nn) and similar to 2015 (6.7/nn; Figure 7; Appendix A). The majority of collected fish were of legal length and condition (Wr) ranged from 80 to 90. Directed fishing effort, catch per hour, and total harvest for White Bass was 3,586 h, 7.9 fish/h, and 2,462 fish, respectively, during the winter creel quarter (Table 10). Somewhat surprising, 91% of legal fish were released, possibly indicating a different mindset among winter anglers as compared to White Bass anglers during the spring run up the tributaries. Harvested fish ranged in length from 10 to 13 inches (Figure 8).

Hybrid Striped Bass: The gill net catch rate of HSB was 4.6/nn in 2023, similar to 2019 (4.5/nn) but still down from 2015 when 8.4/nn were collected (Figure 9; Appendix A). Size structure among years was similar. Aged fish ranged from 1 to 10 years old (Figure 10). All HSB three years old or older exceeded the minimum length of 18”. When results from fry stocking rates were compared, the two strongest year classes documented were 100 fry/acre stockings, whereas the two weakest year classes were 50 fry/acre stockings. There was no directed fishing effort for HSB during the winter creel quarter (Table 11).

Black Bass: The electrofishing catch rate of Smallmouth Bass was 45.3/h in 2023, similar to 2020 (51.3/h) and 2014 (49.0/h) (Figure 11; Appendix A). Relative weights (Wr) remained low, averaging between 70 and 80. Angler catch per hour for Smallmouth Bass was 4.4 fish/h from December 2022 through February 2023 (Table 12). No Smallmouth Bass were harvested resulting in 100% release of legal-length fish. Total directed effort in the creel for Smallmouth and Largemouth Bass combined was 9,136 hours, or 1.0 hours/acre.

The electrofishing catch rate of stock-length Largemouth Bass was 46.7/h in 2023, lower than 2020 (85.3/h) but similar to 2014 (41.0/h; Figure 12; Appendix A). No bass larger than 18” were collected. Condition in 2023 was fair to good and ranged from 80 to nearly 100. Catch per hour and total harvest for Largemouth Bass was 2.6 fish/h and 0.1 fish/acre, respectively, from December 2022 through February 2023 (Table 13). Most legal Largemouth Bass were released (86%). Harvest of Largemouth Bass was insignificant, and harvested fish ranged in length from 15 to 16 inches (Figure 13). Florida Largemouth Bass influence has remained relatively constant as Florida alleles have ranged from 46 to 57%; the Florida genotype has decreased from 17% in 2002 to 0% in 2022 (Table 14).

White Crappie: The gill net catch rate of White Crappie was 2.7/nn in 2012, higher than in 2019 (1.9/nn) and 2015 (0.7/nn; Figure 14; Appendix A). Mean relative weight ranged from 100 to 110 (Figure 14).

There was no directed effort for White Crappie during the creel period (Table 15). However, 2,154 were harvested incidentally by anglers fishing for other species, with only 14% of legal-sized fish released. Size of harvested White Crappie ranged from 10 to 13 inches in total length (Figure 15).

Fisheries Management Plan for Belton Reservoir, Texas

Prepared – July 2023

ISSUE 1: Annual stocking of HSB is required to sustain the population and maintain a fishery. These fish are all stocked, so optimizing stocking efficiency and success is critical to maximizing the number of reservoirs with fishable HSB populations. Multiple evaluations have been completed on Belton to evaluate stocking size and density, the most recent being a comparison between 100 fry/acre and 50 fry/acre. Results showed that 100 fry/acre resulted in the two strongest years of adult fish recruitment across all stockings. However, recruitment was still documented in all years where 50 fry/acre were stocked except one. It was concluded that 100 fry/acre should be the recommendation for annual stockings. Due to previous production failures, a non-profit group called "Belton Anglers Stocking Hybrids" (BASH) was formed in 2021 by a local guide and sportsman, Bob Maindelle. Their stated purpose was purchasing hybrid fry from Keo Fish Farms in years when production fell short and TPWD requested their help.

MANAGEMENT STRATEGIES

1. Stock HSB annually at 100 fry/acre.
2. In years where production is limited and Belton receives 50 fry/acre or less, contact BASH and give them the opportunity to purchase enough HSB to bring the total to 100 fry/acre. In years where no fry are available, or when stocking rates have fallen short for two years or more, Make a formal request that BASH purchase fry for stocking.
3. Evaluate every four years with standard gill netting.

ISSUE 2: Belton Reservoir has not received a Florida Largemouth Bass stocking since 2016. Since that time, anglers have entered 5 Lunker Class (8+ pounds) and 1 Legacy Class (13+ pounds) fish into the ShareLunker program. Lonestar Bass are now available for stocking statewide and are the result of broodfish grown from ShareLunker spawn. Stocking Lonestar Bass has the potential to improve quality and trophy opportunities for black bass anglers in Belton Reservoir.

MANAGEMENT STRATEGY

1. Stock Lone Star Bass fingerlings, which are 2nd generation offspring of pure Florida strain ShareLunker Largemouth Bass ≥ 13 pounds, at a rate of 1,000/km shoreline.

ISSUE 3: The Smallmouth Bass population in Belton Reservoir has been extensively evaluated in previous reports with additional electrofishing and large age datasets collected via additional electrofishing in January or February. Natural spawning has been documented as the primary source of recruitment to the population, although some evidence suggests that stocking during a high-water period in the spring results in additional recruitment, possibly due to increased habitat for young-of-the-year.

MANAGEMENT STRATEGIES

1. Do not stock Smallmouth Bass fingerlings during years with stable or decreasing water levels.
2. Consider stocking additional Smallmouth fingerlings when water levels increase significantly during the stocking period.

3. If standard electrofishing in fall, 2026 doesn't result in sufficient data to evaluate Smallmouth Bass recruitment and relative abundance, sample biologist-selected stations with electrofishing during January/February 2027 to document Smallmouth Bass status.

ISSUE 4: Aquatic habitat is a key component of quality sportfish populations. While Belton Reservoir has a large amount of quality habitat, additional habitat in the form of artificial fish reefs can serve as fish attractors, improving angling success and ultimately improving sportfish populations if sufficient habitat is deployed. A partnership between TPWD, BASS Nation, USACOE, and the BRA along with several bass clubs and volunteers resulted in the deployment of 4 large reefs in Fall 2021, and supplemental habitats to two of those reefs in Spring 2023.

MANAGEMENT STRATEGIES

1. Augment these four reefs with additional habitats as the opportunity arises.
2. Publicize the reefs by listing them on the TPWD website and in social media posts.

ISSUE 5: The Zebra Mussel population has declined significantly from its initial highs. However, they remain a threat and can easily be transported to other reservoirs as well.

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 media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

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

Important sport and forage fishes

Abundant and/or important sport fishes in Belton Reservoir include Largemouth and Smallmouth Bass, Hybrid Striped Bass, White Bass, White Crappie, Channel Catfish and Blue Catfish. Important forage fishes include Gizzard and Threadfin Shad, Bluegill and Redear Sunfish.

Sport fishes with low-density populations

Spotted Bass, Flathead Catfish, and Black Crappie occur in very low abundance in Belton Reservoir and are generally caught incidentally to other targeted species. We will still collect them with relevant sampling gear, length will be recorded in the FMF, and CPUE will be recorded in the management report.

Survey objectives, fisheries metrics, and sampling objectives

Fall Electrofishing: A minimum of 18 randomly selected 5-min electrofishing stations will be sampled at night in fall 2026. This survey will be used to evaluate Largemouth and Smallmouth Bass and primary forage species (Gizzard and Threadfin Shad, Bluegill and Redear Sunfish) by general monitoring (using CPUE, size structure and relative weight as metrics) to characterize Black Bass populations and make comparisons with historical and future data. Catch per unit effort target precision will be an RSE $\leq$ 25. Target sample size will be an N $\geq$ 50 stock-sized fish to determine population size structure, allowing us to calculate proportional size distribution with 80% confidence. Fin clips will be taken from 30 Largemouth Bass of any size to monitor Florida Largemouth Bass influence and Florida genotype percentage. The forage species goals will also be general monitoring (using CPUE and size structure as metrics) to characterize Gizzard Shad, Threadfin Shad, Bluegill and Redear Sunfish populations and make comparisons with historical and future data. Catch per unit effort target precision will be an RSE $\leq$ 25. Target sample size will be N $\geq$ 50 stock-sized fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence. Index of vulnerability (IOV) will also be calculated for Gizzard Shad to assess the relative proportion of individuals in the population suitable as prey for sport fish.

Winter Electrofishing: A minimum of 1 hour of electrofishing will be completed at biologist-selected stations during January or February 2027 to evaluate Smallmouth Bass recruitment and size structure. No precision or sample size requirements are indicated.

Spring Gill Netting: A minimum of 15 randomly selected gill net stations will be sampled in spring, 2027. This survey will be used to evaluate HSB, White Bass, Blue Catfish, Channel Catfish and White Crappie. For all species, catch per unit effort target precision will be an RSE $\leq$ 25. Target sample size will be N$\geq$ 50 stock-sized fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence.

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Tables and Figures

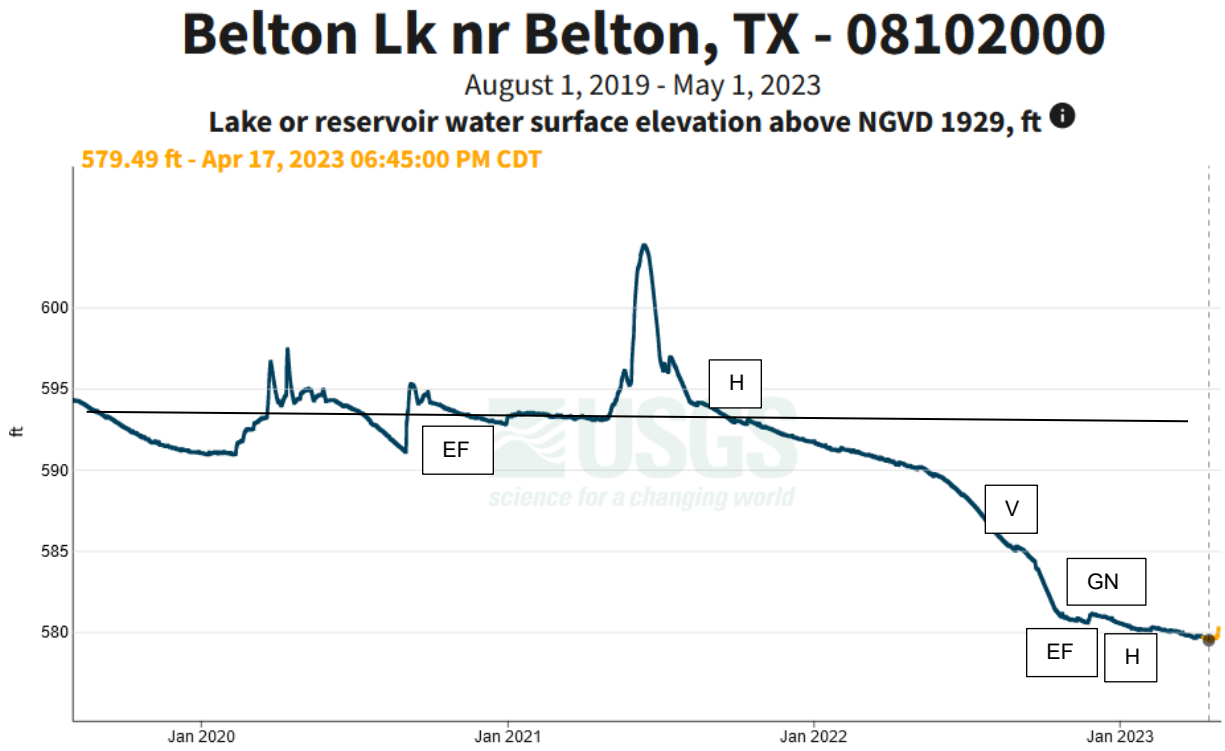


Figure 1. Daily water level elevations in feet above mean sea level (MSL) recorded for Belton Reservoir, Texas, August 1, 2019, through May 1, 2023. The figure is from the United States Geological Survey (USGS) website. NGVD 1929 refers to the National Geodetic Vertical Datum of 1929. The dashed line represents the lowest water elevation during the period (579.5) and the horizontal line indicates Conservation pool (594.0). The timing of the artificial fish habitat deployment (H), as well as vegetation (V), electrofishing (EF) and gill netting (GN) surveys is noted.

Table 1. Characteristics of Belton Reservoir, Texas.

Characteristic	Description
Year constructed	1954
Controlling authority	United States Army Corps of Engineers
County	Bell
Reservoir type	Mainstem
Shoreline Development Index	8.8
Conductivity	370 µS/cm

Table 2. Boat ramp characteristics for Belton Reservoir, Texas, September 2022. Reservoir elevation at time of survey was approximately 585.1 feet above mean sea level (9' below conservation pool). Ramp closures are as of June 2023.

Boat ramp	Latitude Longitude (dd)	Parking capacity (N)	Condition
Temples Lake Park (N)	31.13833/-97.49645	40	Good; open
Temples Lake Park (S)	31.12794/-97.49581	41	Good; open
Arrowhead Point	31.12317/-97.48866	30	Good; open
Live Oak Ridge	31.11661/-97.47684	24	Good; closed
Lakeview Park	31.10460/-97.48495	68	Good; open
Westcliff Park	31.12094/-97.51823	41	Good; open
Sparta Valley Park	31.13461/-97.52651	19	Good; closed
BLORA (E)	31.138553/-97.54579	50	Good; open
BLORA (W)	31.14826/-97.55858	16	Good; closed
Rogers Park	31.16089/-97.48048	33	Good; open
Cedar Ridge Park (W)	31.16710/-97.45373	63	Good; open
Cedar Ridge Park (E)	31.16519/-97.44086	22	Good; closed
McGregor Park	31.21159/-97.48188	12	Good; closed
Leona Park	31.22018/-97.46734	32	Good; open
White Flint Park	31.22632/-97.47418	27	Good; closed
Owl Creek Park	31.21750/-97.51383	30	Good; closed
Iron Bridge Park	31.28071/-97.47229	18	Good; open

Table 2. Harvest regulations for Belton Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (only 5 ≥ 20 inches; 1 ≥ 30 inches)	None
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Hybrid Striped	5	18-inch minimum
Bass, Largemouth and Smallmouth	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 for Belton (Bell County), Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adult (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined. Palmetto Bass are a female Striped Bass crossed with a male White Bass and Sunshine Bass are a male Striped Bass crossed with a female White Bass.

Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1998	308,987	FGL	2.2
	2008	312,748	FGL	2.1
	Total	621,735		
Channel Catfish	1971	44,000	AFGL	7.9
	Total	44,000		
Florida Largemouth Bass	1989	307,142	FRY	0.8
	1991	357,741	FGL	1.2
	1995	308,552	FGL	1.2
	2016	160,740	FGL	1.8
	Total	1,134,175		
Largemouth Bass	1967	4,600	UNK	0.0
	1969	350,000	FRY	0.7
	1970	100,000	UNK	0.0
	1972	225,000	UNK	0.0
	Total	679,600		
Palmetto Bass	1977	60,455	UNK	0.0
	1979	65,518	UNK	0.0
	1981	120,625	UNK	0.0
	1983	125,550	UNK	0.0
	1984	242,239	FGL	2.0
	1987	250,850	FRY	1.0
	1988	259,977	FRY	1.0
	1989	88,000	FGL	1.2
	1991	133,832	FGL	1.3
	1992	218,884	FGL	1.3
	1993	92,386	FGL	1.2
	1994	185,744	FGL	1.3
	1995	185,151	FGL	1.3
	1996	187,907	FGL	1.6
	1997	101,100	FGL	1.5
	1998	189,434	FGL	1.2
	1999	94,098	FGL	1.4
	2000	93,674	FGL	1.6
	2002	94,200	FGL	1.8
	2004	99,180	FGL	1.6
	2004	1,337,574	FRY	0.4
	2005	124,081	FGL	1.7
	2006	123,337	FGL	1.8
	2007	1,039,169	FRY	0.2

Table 4. Stocking history for Belton (Bell County), Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adult (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined. Palmetto Bass are a female Striped Bass crossed with a male White Bass and Sunshine Bass are a male Striped Bass crossed with a female White Bass.

Species	Year	Number	Life Stage	Mean TL (in)
	2008	124,433	FGL	1.5
	2009	116,731	FGL	1.4
	2010	1,130,132	FRY	0.3
	2011	88,000	FGL	1.5
	2013	1,243,445	FRY	0.2
	2014	36,136	FGL	1.9
	2015	494,926	FRY	0.2
	2016	909,513	FRY	0.2
	2017	1,022,578	FRY	0.2
	2018	627,581	FRY	0.2
	Total	11,306,440		
Sauger	1985	54,113		1.5
	Total	54,113		
Smallmouth Bass	1978	99,850	UNK	0.0
	1979	100,000	UNK	0.0
	1980	101,320	UNK	0.0
	1995	28,450	FGL	1.5
	1997	302,150	FGL	1.1
	1998	184,500	FGL	1.2
	1999	189,258	FGL	1.4
	2000	130,000	FGL	1.5
	2007	4,373	ADL	8.4
	2007	12,500	FGL	3.0
	2008	87,250	FGL	1.4
	2010	289,719	FGL	1.3
	2012	20,225	FGL	2.1
	2014	171,381	FGL	1.4
	2015	54,573	FGL	1.9
	2018	5,945	FGL	1.8
	2021	51,308	FGL	1.5
	Total	1,832,802		
Sunshine Bass	2014	21,699	FGL	1.5
	2016	300,000	FRY	0.2
	2020	594,240	FRY	0.2
	2021	1,242,003	FRY	0.2
	2022	2,204,492	FRY	0.2
	Total	4,362,434		
Walleye	1973	493,000	FRY	0.2
	1974	327,000	FRY	0.2

Table 4. Stocking history for Belton (Bell County), Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adult (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined. Palmetto Bass are a female Striped Bass crossed with a male White Bass and Sunshine Bass are a male Striped Bass crossed with a female White Bass.

Species	Year	Number	Life Stage	Mean TL (in)
	Total	820,000		

Table 3. Objective-based sampling plan components for Belton Reservoir, Texas 2022–2023.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Condition	W_r	10 fish/inch group (max)
	Genetics	% FLMB	N = 30, any age
Smallmouth Bass	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Condition	W_r	10 fish/inch group (max)
Bluegill [a]	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Redear [a]	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad [a]	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50
Gill netting			
Blue Catfish	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure	Length frequency	N ≥ 50 stock
	Condition	W_r	10 fish/inch group (max)
	Age	Length at age	20 fish/inch group <17; 10 fish/inch group >16
Channel Catfish	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure	Length frequency	N ≥ 50 stock
	Condition	W_r	10 fish/inch group (max)
	Age	Length at age	20 fish/inch group <17; 10 fish/inch group >16

White Bass	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure	Length frequency	N ≥ 50 stock
	Condition	W_r	10 fish/inch group (max)
	Age	Length at age	5 fish/cm group
Hybrid Striped Bass	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure	Length frequency	N ≥ 50 stock
	Condition	W_r	10 fish/inch group (max)
	Age	Length at age	5 fish/cm group
Crappie	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N = 50 stock
	Condition	W_r	10 fish/inch group (max)

[a] No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill, Redear 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 directed angler effort by species for Belton Reservoir, Texas, 2022-23. Survey periods was from December 2022 through February 2023.

Species	2022/2023
Blue Catfish	12.9
White Bass	18.7
Largemouth and Smallmouth Bass	47.6
Anything	20.8

Table 7. Total fishing effort (h) for all species and total directed expenditures at Belton Reservoir, Texas, 2022-2023. Survey period was from December 2022 through February 2023. Relative standard error is in parentheses.

Creel statistic	2022/2023
Total fishing effort	19,174 (38)
Total directed expenditures	$142,052 (157)

Gizzard Shad

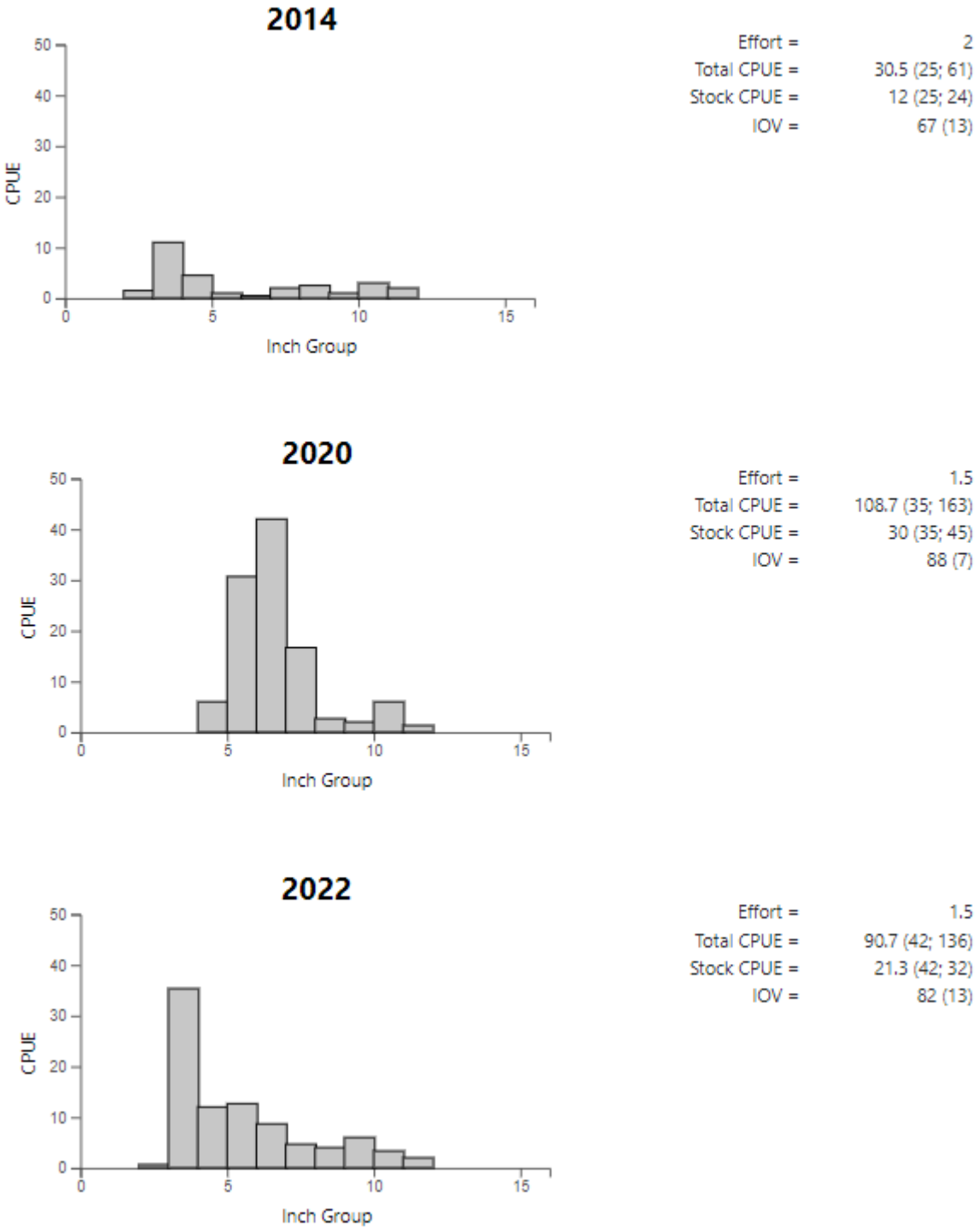


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Belton Reservoir, Texas, 2014, 2020, and 2022.

Bluegill

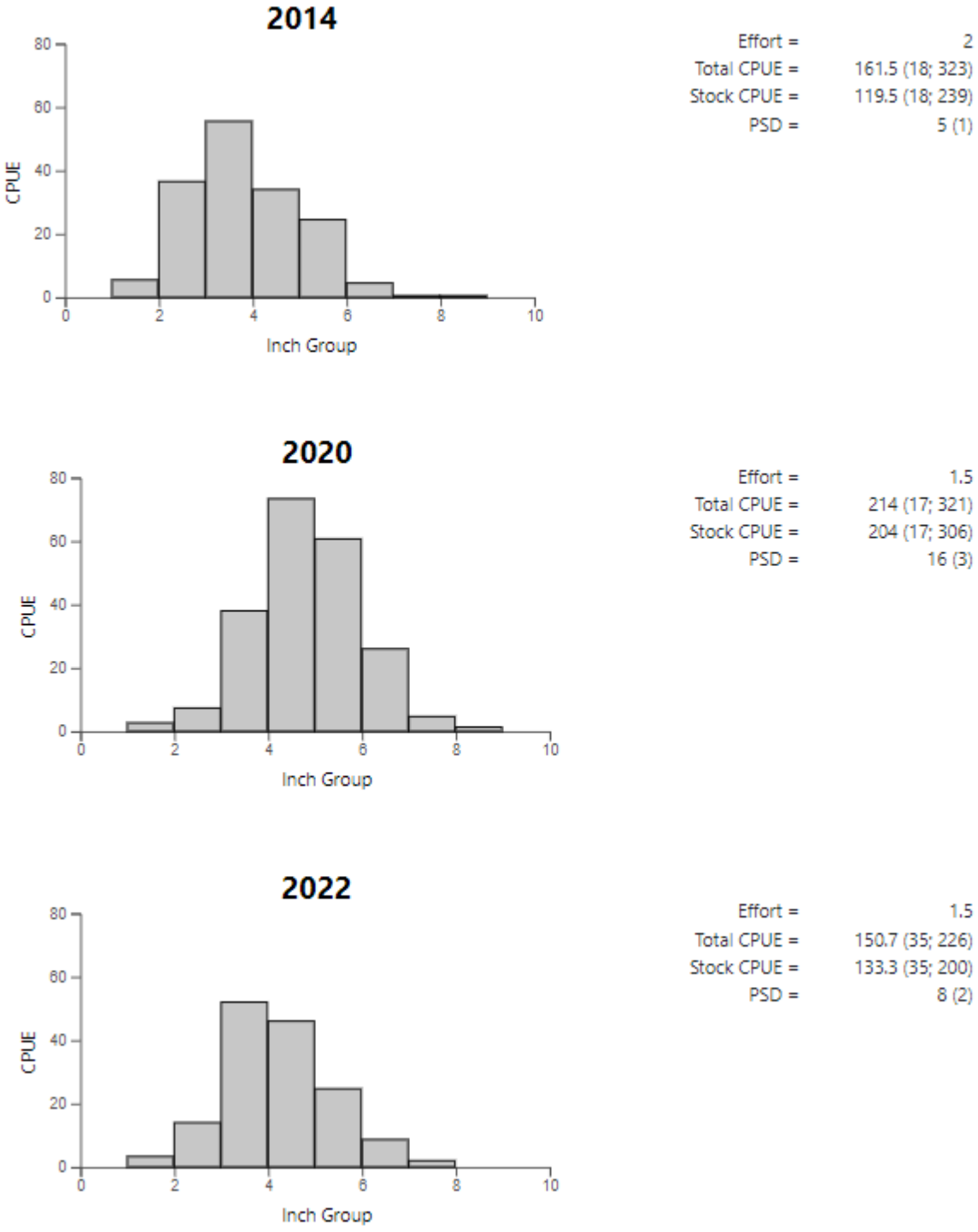


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Belton Reservoir, Texas, 2014, 2020, and 2022.

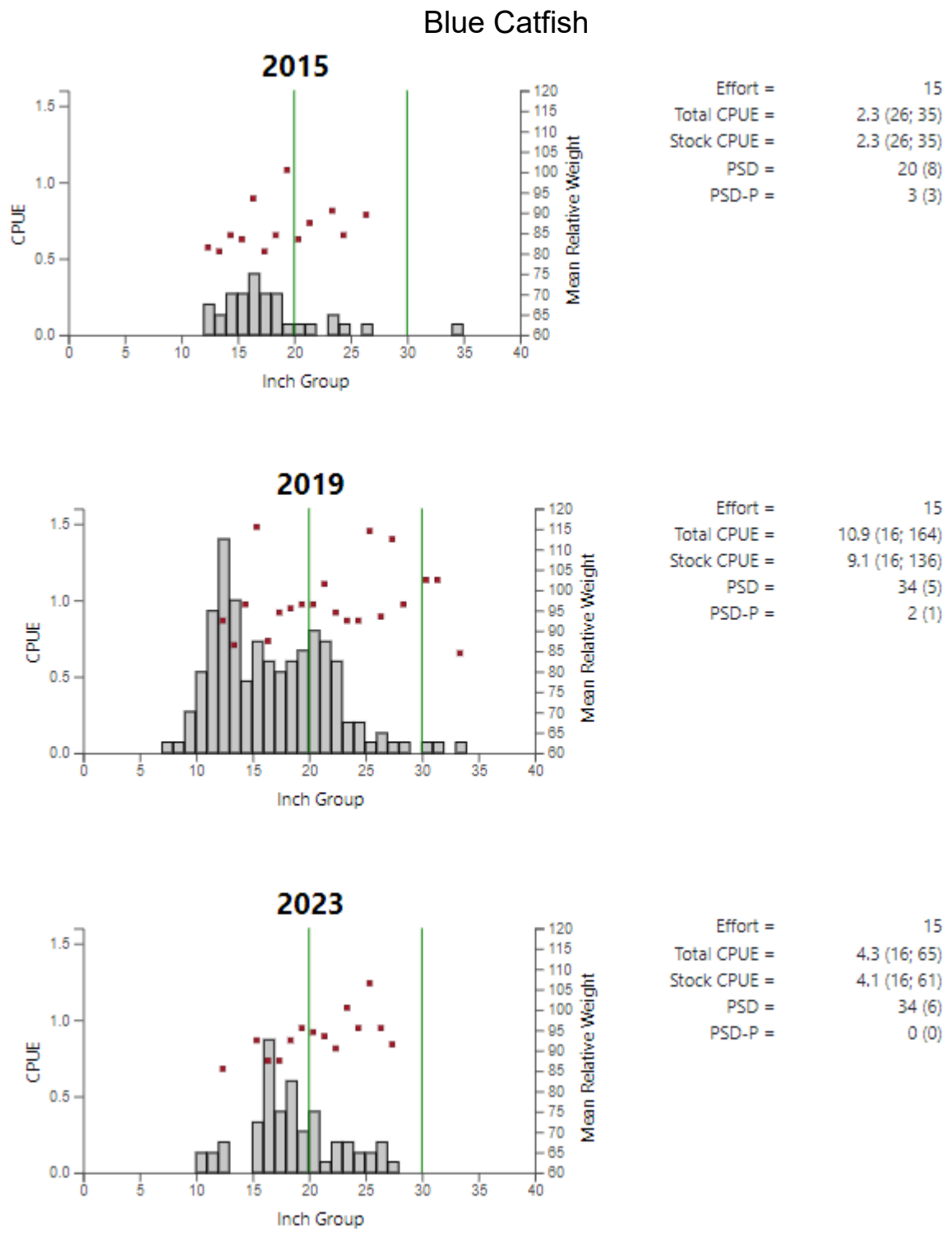


Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Belton Reservoir, Texas, 2015, 2019, and 2023. Vertical lines indicate lengths in the regulation.

Table 8. Creel survey statistics for Blue Catfish at Belton Reservoir, Texas, from December 2022 through February 2023. Total catch per hour is for anglers targeting Blue Catfish and total harvest is the estimated number of Blue Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	2022/2023
Surface area (acres)	9,500
Directed effort (h)	2,472.3 (79)
Directed effort/acre	0.3 (79)
Total catch per hour	0.6 (94)
Total harvest	2,154 (73)
Harvest/acre	0.2 (73)
Percent legal released	33

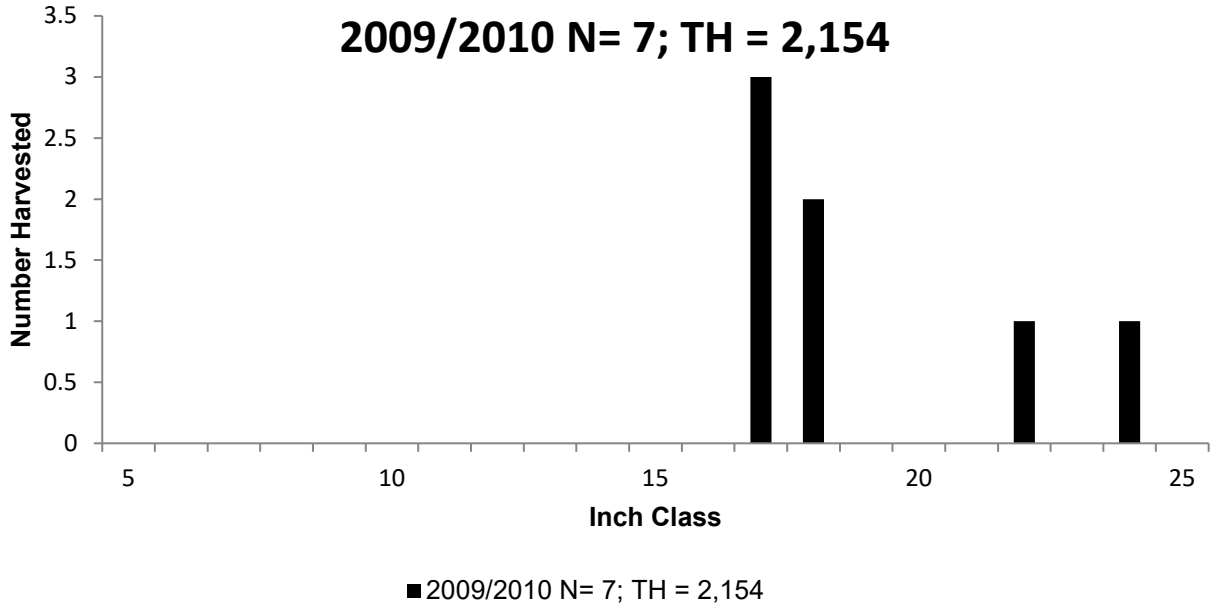


Figure 5. Length frequency of harvested Blue Catfish observed during creel surveys at Belton Reservoir, Texas, December 2022 through February 2023, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

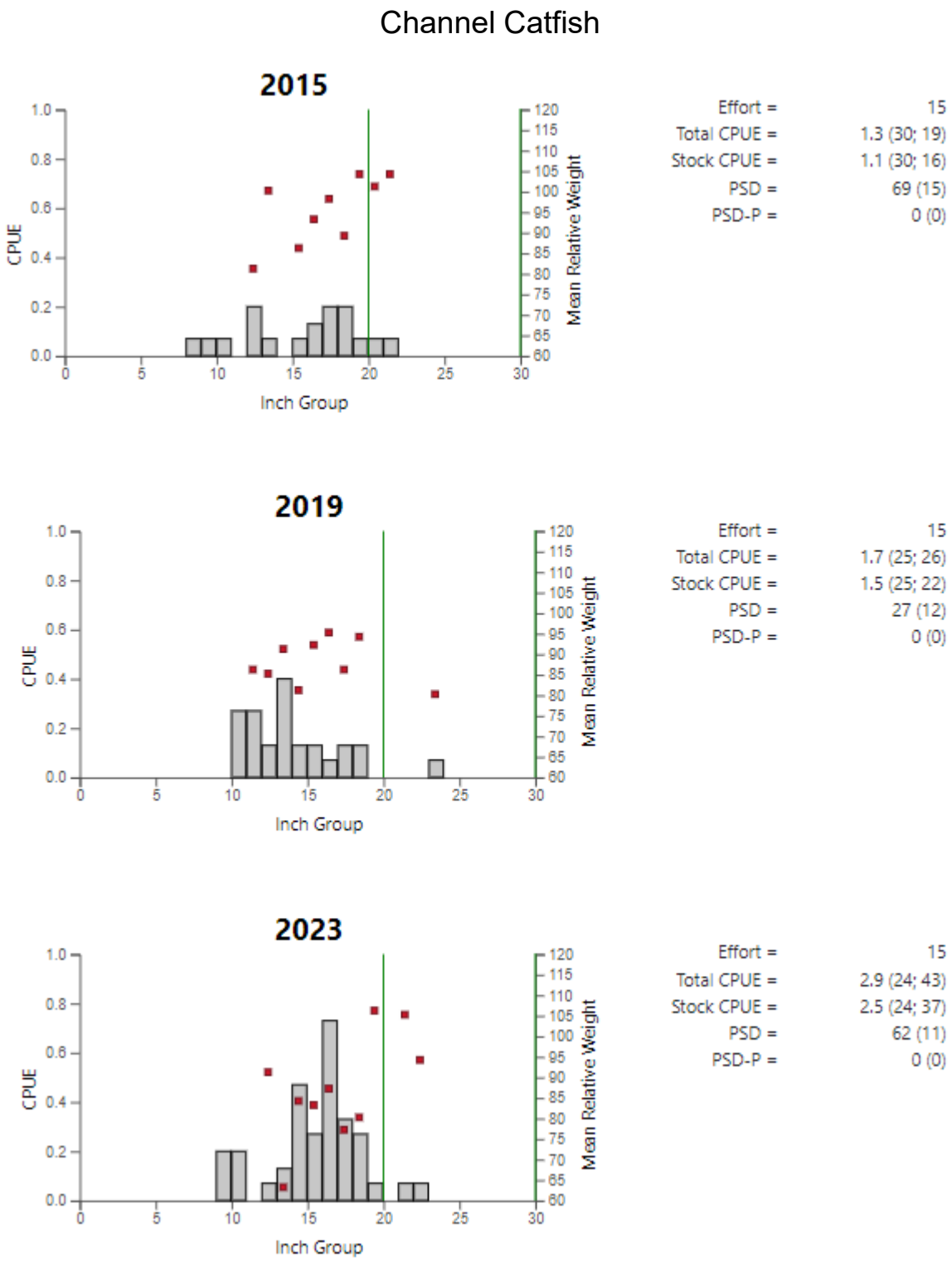


Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Belton Reservoir, Texas, 2015, 2019, and 2023. Vertical lines indicate lengths in the regulation.

Table 9. Creel survey statistics for Channel Catfish at Belton Reservoir, Texas, from December 2022 through February 2023. Total catch per hour is for anglers targeting Channel Catfish and total harvest is the estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	2022/2023
Surface area (acres)	9,500
Directed effort (h)	0.0 (NA)
Directed effort/acre	0.0 (NA)
Total catch per hour	0.0 (NA)
Total harvest	0.0 (NA)
Harvest/acre	0.0 (NA)
Percent legal released	100

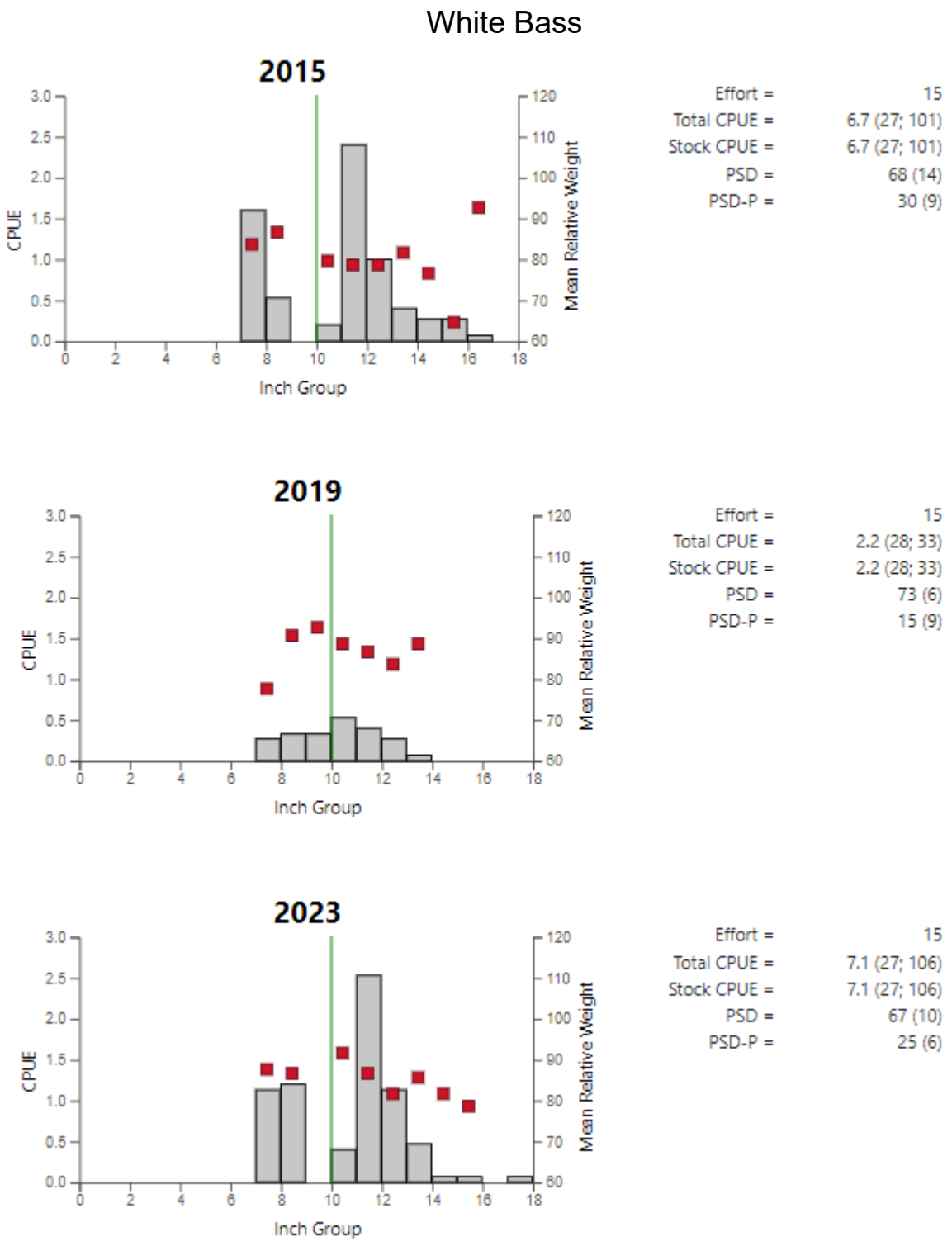


Figure 7. Number of White Bass caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Belton Reservoir, Texas, 2015, 2019, and 2023. Vertical line represents the minimum length limit.

Table 10. Creel survey statistics for White Bass at Belton Reservoir, Texas, from December 2022 through February 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	2022/2023
Surface area (acres)	9,500
Directed effort (h)	3585.7 (68)
Directed effort/acre	0.4 (68)
Total catch per hour	7.9 (76)
Total harvest	2,462 (63)
Harvest/acre	0.3 (63)
Percent legal released	91

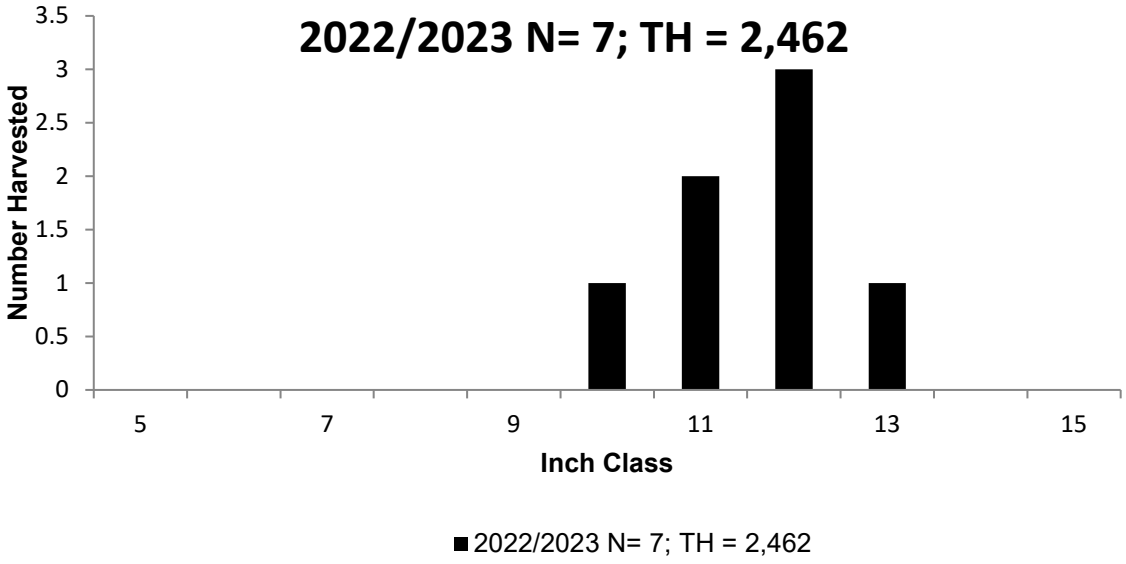


Figure 8. Length frequency of harvested White Bass observed during creel surveys at Belton Reservoir, Texas, December 2022 through February 2023, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

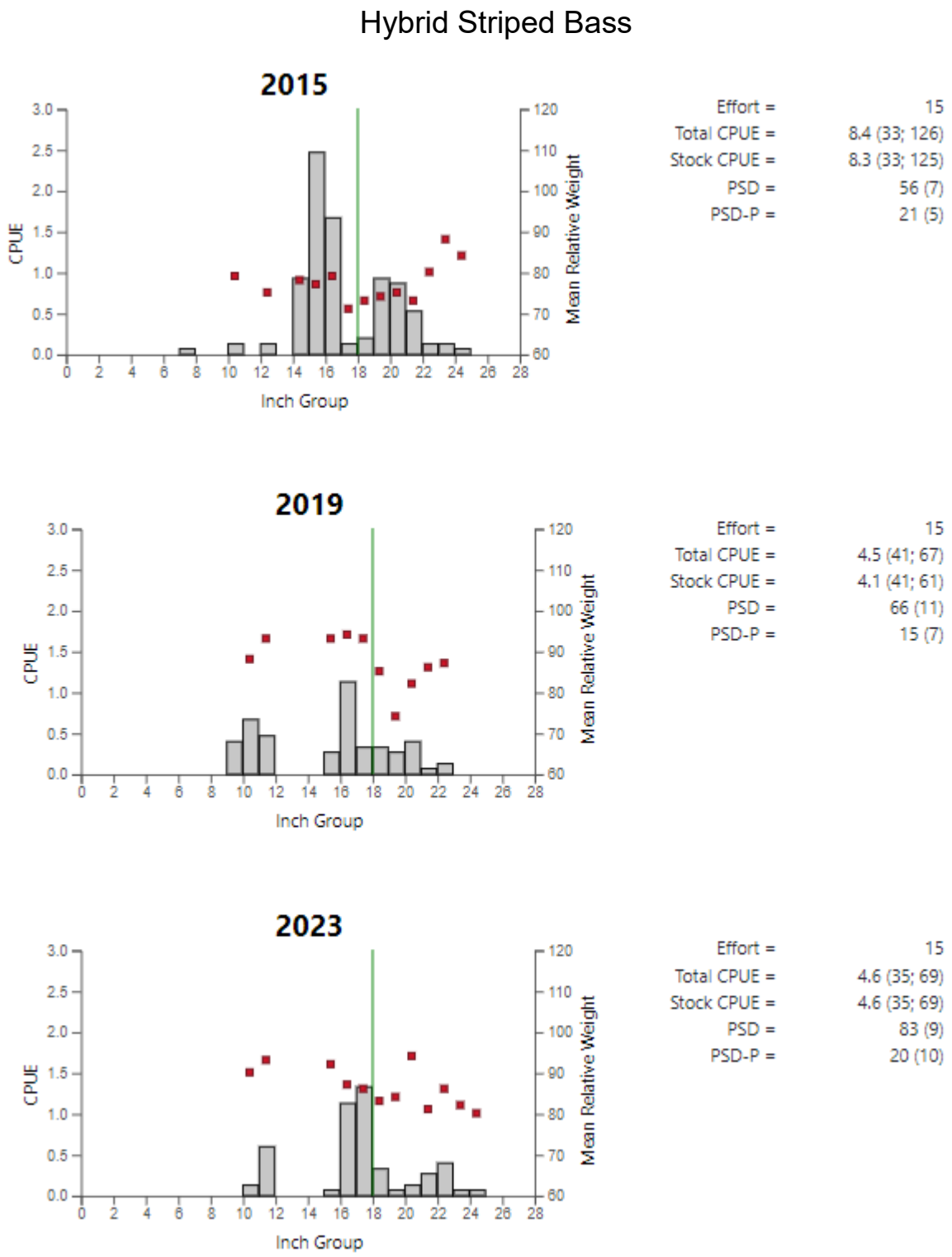


Figure 9. Number of Hybrid Striped Bass caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Belton Reservoir, Texas, 2015, 2019, and 2023. Vertical line represents the minimum length limit.

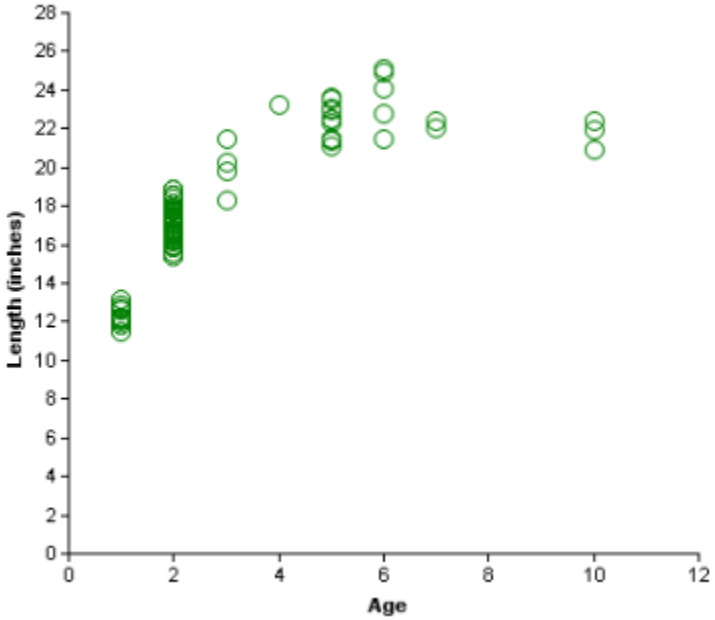


Figure 10: Length at age for Hybrid Striped Bass collected by gill netting, Belton Reservoir, Texas 2023.

Table 11. Creel survey statistics for Hybrid Striped Bass at Belton Reservoir, Texas, from December 2022 through February 2023. Total catch per hour is for anglers targeting Hybrid Striped Bass and total harvest is the estimated number of Hybrid Striped Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	2022/2023
Surface area (acres)	9,500
Directed effort (h)	0.0 (NA)
Directed effort/acre	0.0 (NA)
Total catch per hour	0.0 (NA)
Total harvest	0.0 (NA)
Harvest/acre	0.0 (NA)
Percent legal released	NA

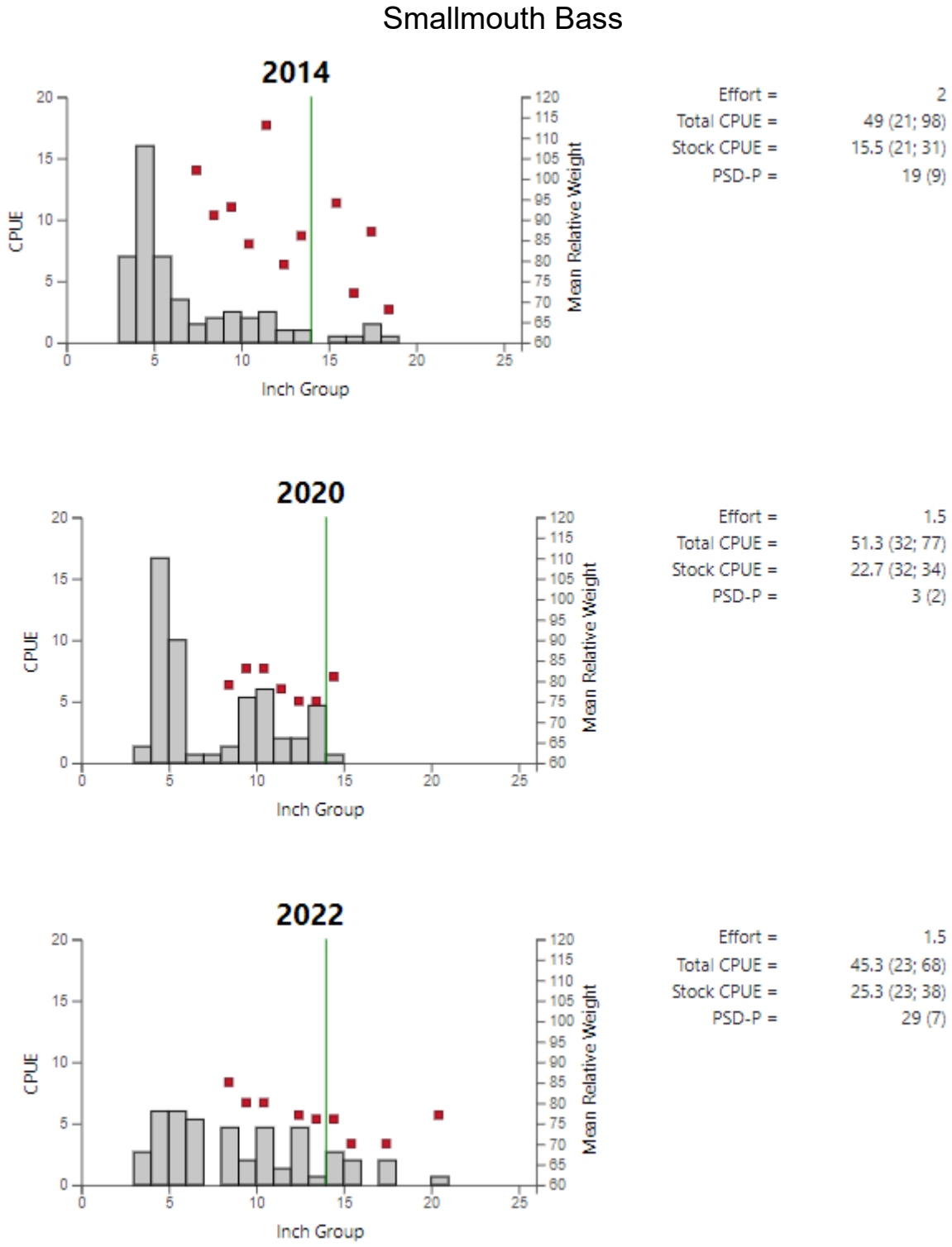


Figure 11. Number of Smallmouth Bass caught per hour (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Belton Reservoir, Texas, 2014, 2020, and 2022. Vertical line represents the minimum length limit.

Table 4. Creel survey statistics for Smallmouth Bass at Belton Reservoir, Texas, from December 2022 through February 2023. Total catch per hour is for anglers targeting Black Bass (Largemouth and Smallmouth combined) and total harvest is the estimated number of Smallmouth Bass harvested by all anglers. No tournament anglers were interviewed during the creel period. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	2022/2023
Surface area (acres)	9,500
Directed effort (h)	9,136 (47)
Directed effort/acre	1.0 (47)
Total catch per hour	4.4 (138)
Total harvest	0.0 (NA)
Harvest/acre	0.0 (NA)
Percent legal released	100

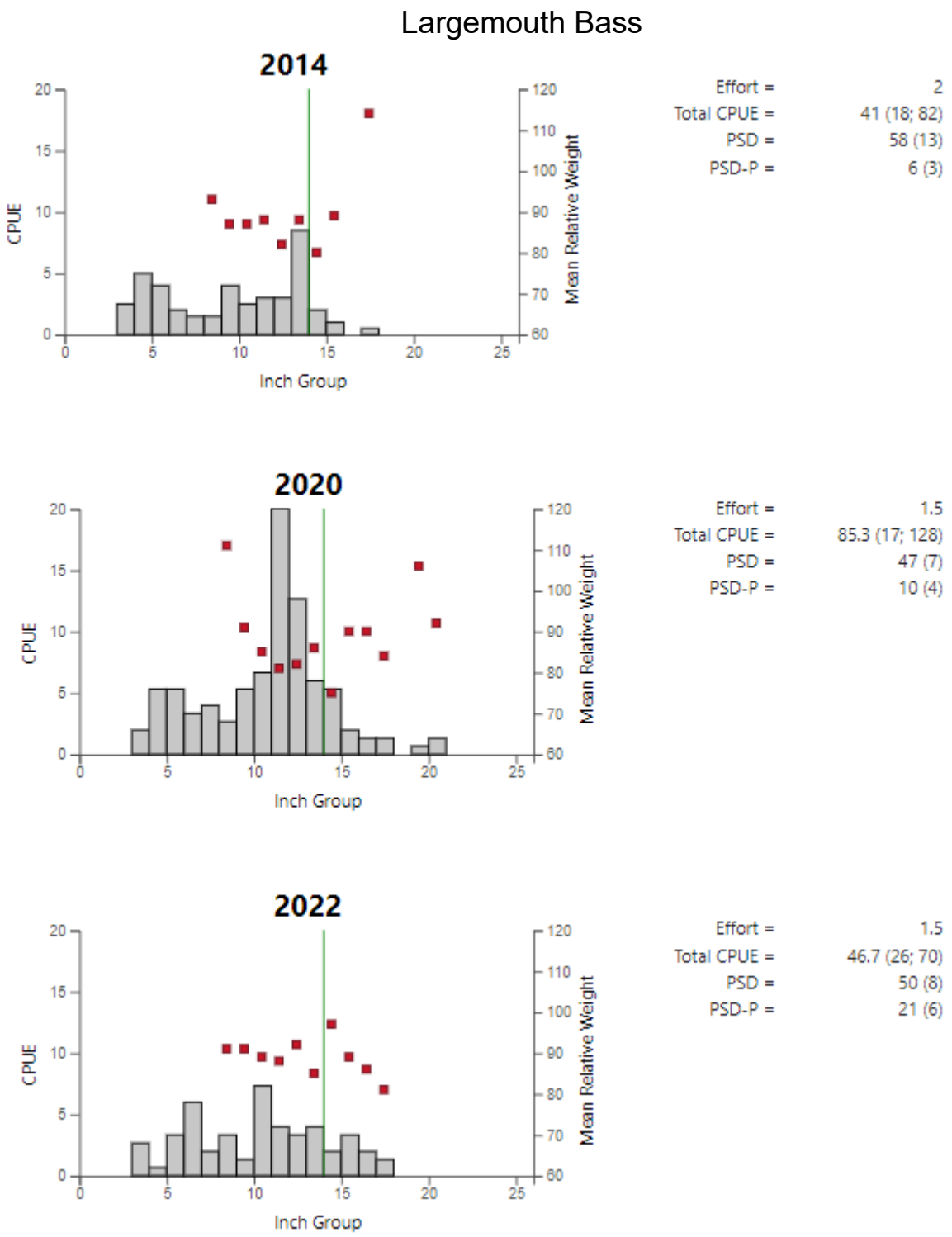


Figure 12. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Belton Reservoir, Texas, 2014, 2020, and 2022. Vertical line represents the minimum length limit.

Table 13. Creel survey statistics for Largemouth Bass at Belton Reservoir, Texas, from December 2022 through February 2023. Total catch per hour is for anglers targeting Black Bass (Largemouth and Smallmouth combined) and total harvest is the estimated number of Largemouth Bass harvested by all anglers. No tournament anglers were interviewed during the creel period. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	2022/2023
Surface area (acres)	9,500
Directed effort (h)	9,136 (47)
Directed effort/acre	1.0 (47)
Total catch per hour	2.6 (76)
Total harvest	923 (76)
Harvest/acre	0.1 (76)
Percent legal released	86

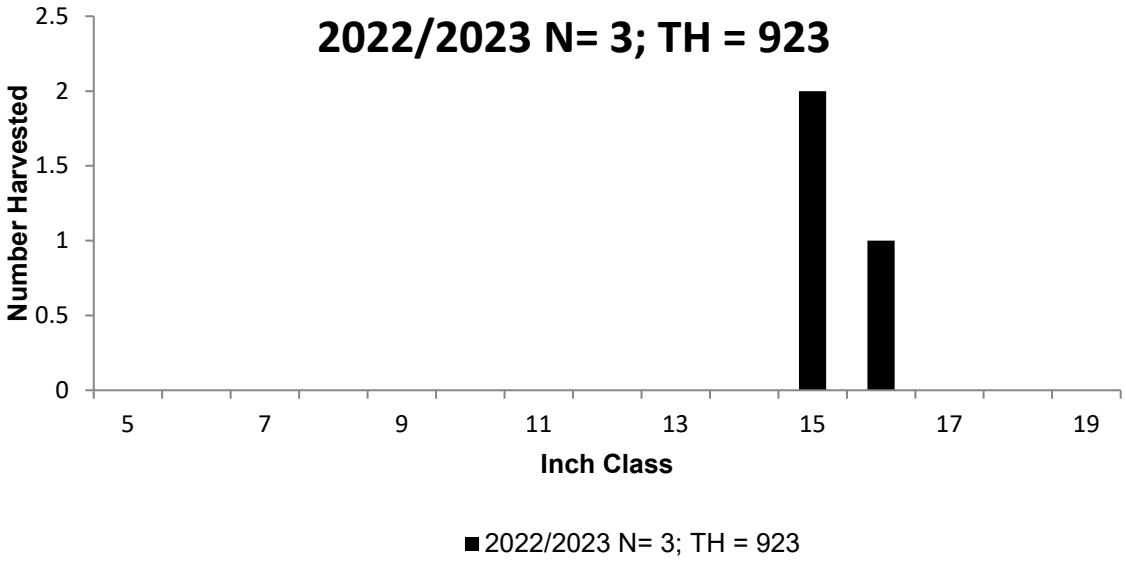


Figure 13. Length frequency of harvested Largemouth Bass observed during creel surveys at Belton Reservoir, Texas, December 2022 through February 2023, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period. No tournament anglers were interviewed during the creel period.

Table 5. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Belton Reservoir, Texas, 2002, 2006, 2014 and 2022. 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.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2002	30	5	24	1	57	17
2006	30	1	29	0	49	7
2014	30	0	30	0	46	0
2022	30	0	30	0	47	0

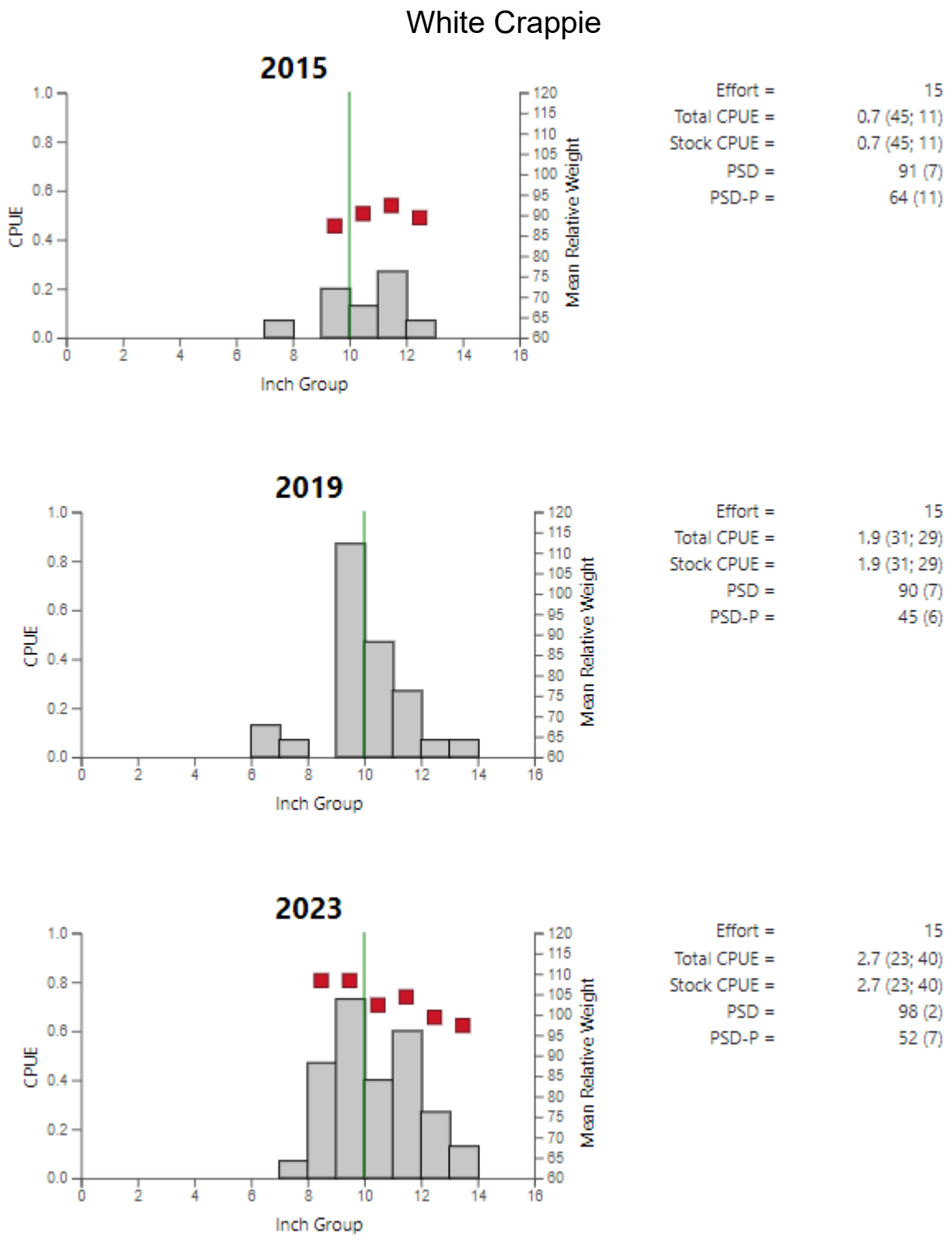


Figure 14. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Belton Reservoir, Texas, 2015, 2019, and 2023. Vertical line indicates minimum length limit.

Table 15. Creel survey statistics for White Crappie at Belton Reservoir, Texas, from December 2022 through February 2023. Total catch per hour is for anglers targeting White Crappie and total harvest is the estimated number of White Crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	2022/2023
Surface area (acres)	9,500
Directed effort (h)	0.0 (NA)
Directed effort/acre	0.0 (NA)
Total catch per hour	0.0 (NA)
Total harvest	2,154 (75)
Harvest/acre	0.2 (75)
Percent legal released	14

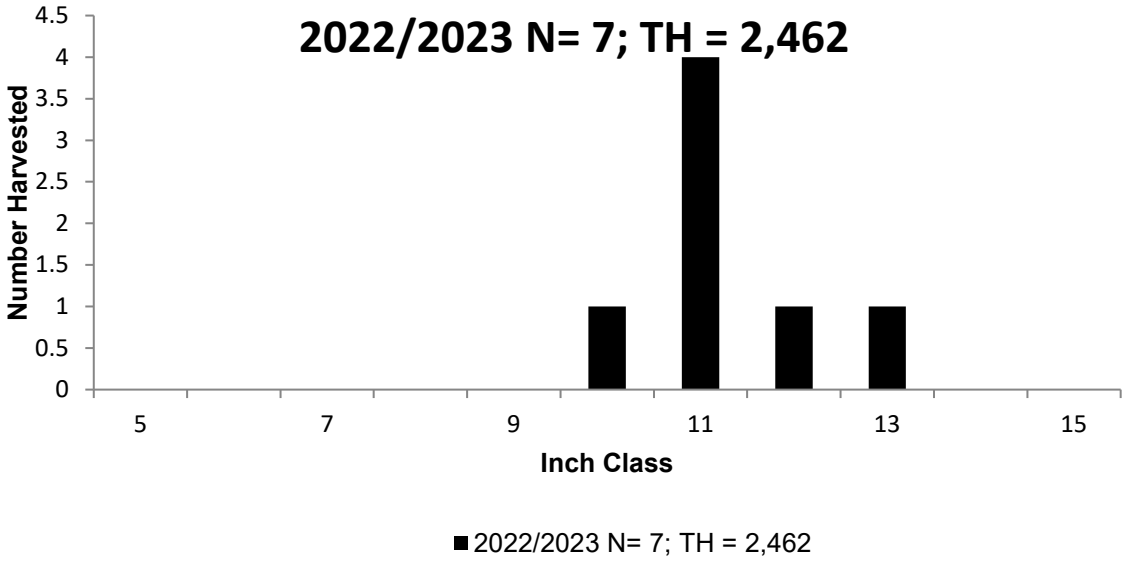


Figure 15. Length frequency of harvested White Crappie observed during creel surveys at Belton Reservoir, Texas, December 2022 through February 2023, all anglers combined. N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Proposed Sampling Schedule

Table 16. Proposed sampling schedule for Belton Reservoir, Texas. Survey period is June through May. Trap netting and gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall.

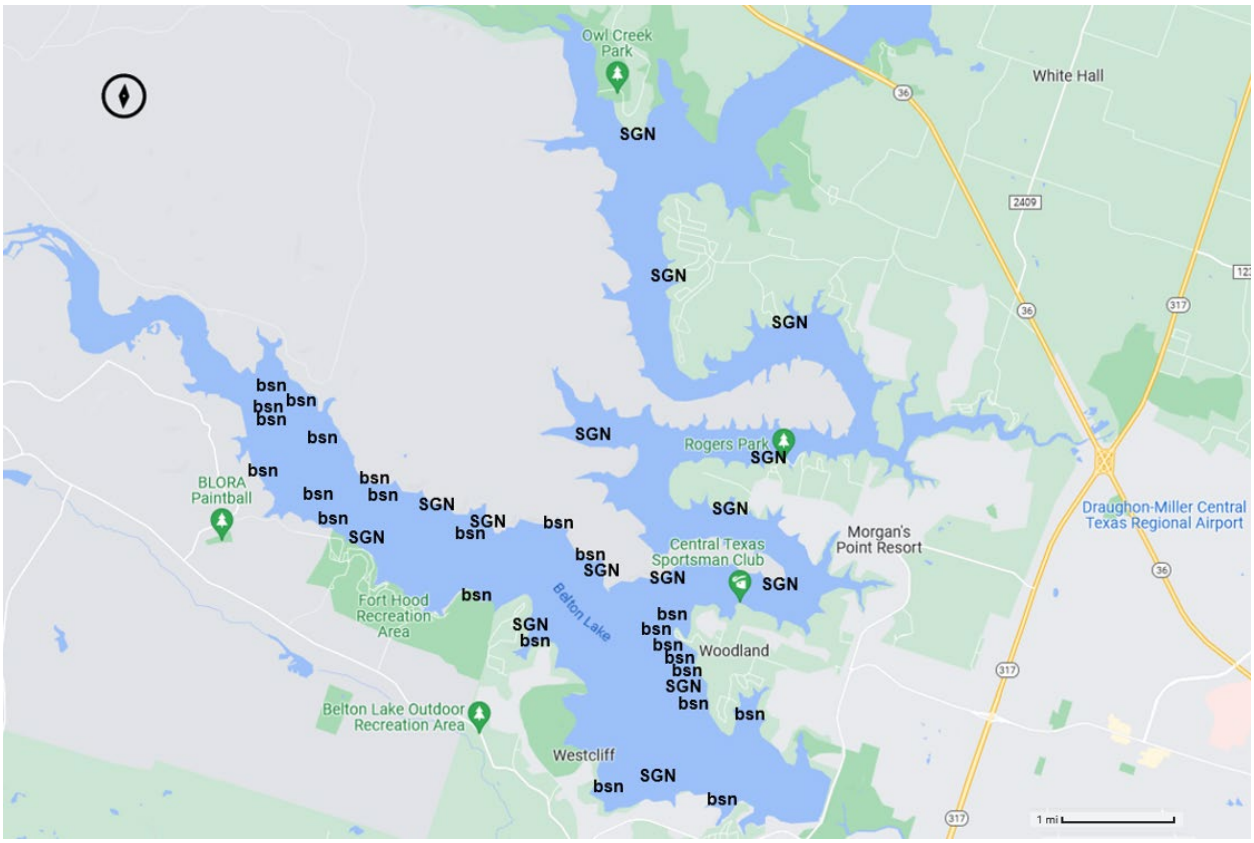
	Survey year			
	2023-2024	2024-2025	2025-2026	2026-2027
Angler Access				X
Vegetation				X
Electrofishing – Fall				X
Gill netting				X
Report				X

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

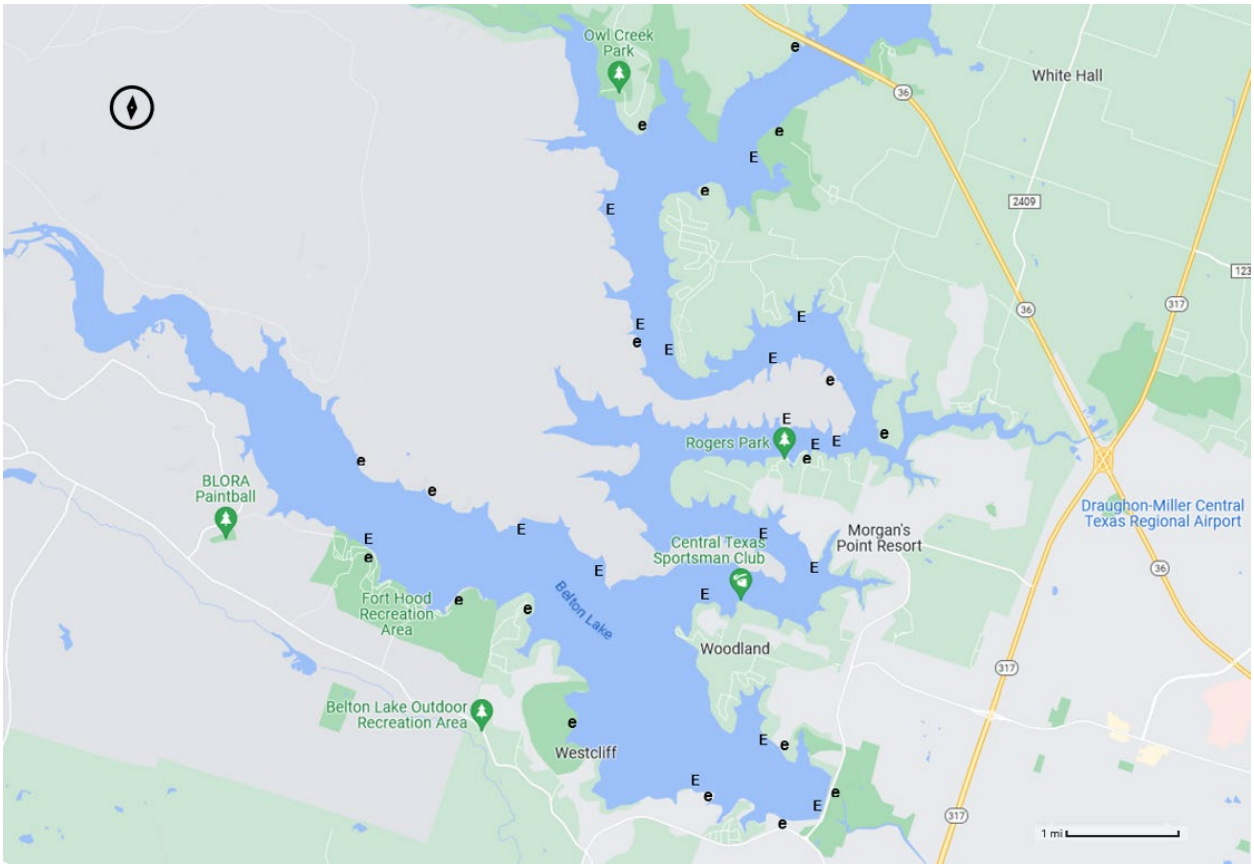
Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Belton Reservoir, Texas, 2022-2023. Sampling effort was 15 net nights for gill netting and 1.5 hours for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			136	90.7 (42)
Threadfin Shad			10	6.7 (55)
Blue Catfish	65	4.3 (16)		
Channel Catfish	43	2.9 (24)		
Flathead Catfish	3	0.2 (53)		
White Bass	106	7.1 (27)		
Palmetto Bass	69	4.6 (35)		
Redbreast Sunfish				
Green Sunfish			24	16.0 (45)
Redbreast Sunfish			17	11.3 (51)
Bluegill			226	150.7 (35)
Longear Sunfish			27	18.0 (35)
Redear Sunfish			9	6.0 (46)
Smallmouth Bass			68	45.3 (23)
Largemouth Bass			70	46.7 (26)
White Crappie	49	2.7 (23)		

APPENDIX B – Map of sampling locations



Location of gill netting sites, Belton Reservoir, Texas. Standard gill netting stations for 2023 are indicated by SGN. Biologist-selected gill netting stations for 2023 are indicated by bsn. Water level was 13 feet below conservation pool at time of sampling.



Location of electrofishing sites, Belton Reservoir, Texas. Standard electrofishing stations for 2022 are indicated by E. Standard electrofishing stations for 2020 are indicated by e. Water level was 13 feet below conservation pool in 2022, whereas water level was near full pool at time of sampling in 2020.

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