

Granbury Reservoir

2021 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 Granbury Reservoir were surveyed in 2021 using electrofishing and in 2022 using gill netting. Historical data are presented with the 2021-2022 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

Reservoir Description: Granbury Reservoir is an 8,700-acre impoundment located near the City of Granbury, Hood County, Texas and is operated by the Brazos River Authority (BRA). Primary water uses include storage of flood and storm waters, municipal water supply, power plant cooling, and recreation. Fish habitat at the time of sampling consisted mainly of bulk heading, natural shoreline, boat docks and piers and emergent aquatic vegetation (Giant reed, Cattail and American water willow). Water level averaged one foot below conservation pool during the 2021-2022 vegetation, electrofishing, and gill netting surveys (Figure 2).

Management History: Important sport fish include Largemouth Bass, Channel Catfish, White Bass and Striped Bass. Sport fishes in Granbury Reservoir are currently managed with statewide regulations. In 2013, management efforts began focusing on supporting the statewide public relations campaign “Clean. Drain. Dry” and posting appropriate aquatic invasive species (AIS) signage at access points to try and prevent the spread of zebra mussels into the reservoir. In 2016, the BRA funded a cooperative effort to build and deploy fish attracting structures (i.e., 28 crappie condos and 16 Mossback Safe Haven structures) near mid-reservoir, to begin to enhance fish habitat reservoir wide. The 16-inch minimum length limit on Largemouth Bass was changed back to the statewide, 14-inch minimum length regulation on September 1, 2018, during a statewide effort to simplify Texas Largemouth Bass regulations. Recent management efforts include aquatic vegetation and boater access surveys conducted during summer 2021 and gill netting during spring 2022.

Fish Community

- **Prey species:** Forage species including Threadfin and Gizzard Shad, Bluegill, Longear Sunfish and Redear Sunfish, were present in the reservoir in low to moderate abundance. Nearly half of the Gizzard Shad were available as prey to predators.
- **Catfishes:** Channel Catfish were abundant and body condition improved with increasing size; most were of legal length. Blue Catfish and Flathead Catfish were present in low numbers.
- **Temperate basses:** White Bass were available and body condition was good across length classes; most were of legal length. Striped Bass catch improved and body condition across all length classes was excellent. Most of the Striped Bass observed were of legal length also.
- **Largemouth Bass:** Largemouth Bass were collected in below average numbers and body condition varied greatly among length classes. Good percentages of legal fish were still available to anglers yet young of the year fish made up a large proportion of the population.
- **White Crappie:** White Crappie were available and most collected fish were of legal length. Body condition was excellent.

Management Strategies: Continue managing Granbury Reservoir with existing regulations. Conduct monitoring surveys with fall electrofishing in 2025 and spring trap netting and gill netting surveys in 2026 (Table 8). Conduct aquatic vegetation and access surveys in late summer 2025 (Table 8). Continue efforts to educate the public about AIS issues and protect the reservoir from zebra mussel introductions. Continue stocking Striped Bass annually and coordinate with the BRA on future artificial habitat projects pending funding and reservoir priorities.

Introduction

This document is a summary of fisheries data collected from Granbury Reservoir in 2021-2022. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2021-2022 data for comparison.

Reservoir Description

Granbury Reservoir is an 8,700-acre impoundment located near the City of Granbury, Hood County, Texas and is operated by the Brazos River Authority (BRA). Primary water uses include storage of flood and storm waters, municipal water supply, power plant cooling, and recreation. Granbury Reservoir is eutrophic with a mean and maximum depth of 18.0 and 75.0 feet respectively. Descriptive characteristics for Granbury Reservoir can be found in Table 1. Fish habitat at the time of sampling consisted mainly of bulk heading, natural shoreline, boat docks and piers and emergent aquatic vegetation. Littoral vegetation was dominated by stands of giant reed (*Arundo donax*), cattail (*typha spp.*), and American water-willow (*Justicia americana*). Conservation pool elevation is 693 feet above mean sea level [MSL]. Water level remains nearly constant and has been within one foot of conservation since summer 2018 (Figure 1). Water level averaged one foot below conservation pool during the 2021-2022 vegetation, electrofishing and gill netting surveys (Figure 2).

Angler Access

Boat access on Granbury Reservoir was adequate and consisted of five public boat ramps and many private ramps. Recent BRA efforts to extend and widen public boat ramps have greatly improved public access during drought periods however, four of the five public boat ramps still aren't useable when the reservoir level drops to 10 feet below conservation pool. Four fishing piers were available to bank anglers: Hunter Park, Hewlett Park, Rough Creek Park and DeCordova Bend Park. See Table 2 for additional boat ramp characteristics.

Management History

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

1. Using trap nets to sample White Crappie on Granbury during 2022 and compare the data with winter trap netting and spring gill netting data sets.

Action: This comparison was devised during the last Granbury report writing, however identical comparisons in two other district reservoirs have been completed since 2018, bringing the total to three district reservoirs (Granbury in 2017/2018, Fort Parker State Park Lake in 2018/2019, and Limestone Reservoir in 2020/2021) where crappie collecting gear types and seasons were compared. Because data have already been collected for this comparison on three different reservoirs, trap netting comparisons scheduled for Granbury during 2021 and 2022 were not performed. The decision to use spring trap netting for all future district crappie surveys has already been made.

2. Collecting a category 3 age and growth sample for Striped Bass in 2022.

Action: This category 3 age and growth sample was not completed in 2022 but will be re-scheduled for 2024.

3. Working with the BRA to use dedicated habitat funding to install new artificial fish reefs throughout the reservoir

Action: The BRA has dedicated funds for another artificial habitat project on Granbury which will happen in late summer or fall 2022. This project will be a partnership with the

TPWD Wildlife Division, Inland Fisheries and BRA, and will benefit prey and sport fishes alike as well as the Brazos River Water Snake.

4. Cooperating with the BRA to maintain appropriate AIS signage at access points around the reservoir and ensure that USACE staff and marina owners are aware of the AIS threats and have information to provide to their customers.

Action: New AIS signage was posted at Granbury Reservoir boat ramps during 2013 to remind constituents of the dangers of AIS, and signage has been maintained ever since. District staff have made a speaking point about AIS and zebra mussels, how to prevent their spread, and potential effects on other Texas Reservoirs while speaking to constituents during conversations and presentations also.

Harvest regulation history: Sport fishes in Granbury Reservoir are currently managed with statewide regulations. The 16-inch minimum length limit on Largemouth Bass was changed back to the statewide, 14-inch minimum length regulation on September 1, 2018, during a statewide effort to simplify Texas Largemouth Bass regulations. Also, the statewide catfish regulation, 25 fish bag (Channel and Blue Catfish, in any combination), 12-inch minimum length limit, was replaced on September 1, 2021, with a 25 fish bag (Channel and Blue Catfish, in any combination – only 10 can be 20 inches or greater in length), and no minimum length limit. Current regulations are found in Table 3.

Stocking history: Striped Bass fingerlings have been stocked nearly annually at 5 to 15/acre since 1972. Contemporary stockings of this species have used fry to supplement fingerling stockings, based on recent Palmetto Bass research comparing fry and fingerling stocking success in Belton Reservoir (Tibbs and Baird 2015). Florida Largemouth Bass were stocked in 2008, 2017 and 2018 to mitigate cumulative losses from fish kills associated with golden algae and to increase Florida genetics in the population. The complete stocking history is in Table 4.

Water transfer: Granbury Reservoir is primarily used for storage of flood and storm waters, municipal water supply, power plant cooling, and recreation. There are currently two major pumping stations on the reservoir which transfer water to other sites. The first is operated by Luminant, which uses untreated water from Granbury for nuclear power plant operations on Squaw Creek Reservoir. The other is operated by the Authority's Lake Granbury Surface Water and Treatment System (SWATS), which supplies treated water to several municipalities in Hood and Johnson Counties. No additional diversions are known at this time.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Granbury Reservoir (Baird and Tibbs 2018). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad and Threadfin Shad were collected by daytime electrofishing (1.25 h at 15, 5-min stations). The 2021 survey is the second daytime electrofishing survey completed on Granbury Reservoir. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Gill netting – Catfishes, White Bass, Striped Bass and White Crappie were collected by gill netting (10 net nights at 10 stations). 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 not conducted during this survey period; refer to Baird and Tibbs (2018) for the most recent genetics information collected.

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_t)] 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.

Habitat – A structural habitat survey was not conducted during this survey period; refer to Baird and Tibbs (2010) for the most recent structural habitat information collected. Vegetation surveys were conducted using an adaptation of the point method in 2017 and 2021 (TPWD, Inland Fisheries Division, unpublished manual revised 2015). One hundred and sixty-eight 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. Refer to Baird and Tibbs (2014) for prior vegetation coverage.

Water level – Source for water level data was the United States Geological Survey (USGS 2022).

Results and Discussion

Habitat: Littoral zone structural habitat consisted primarily of bulk heading, natural shoreline, boat docks and piers and emergent aquatic vegetation. Cattail was found in 13% of random points sampled, followed by giant reed (11%), American water willow (7%) and Lotus (<1%; Table 6). No problematic species of aquatic vegetation currently exists in the reservoir. Habitat management work began in October 2016 when 28 crappie condos and 16 Mossback Safe Haven structures, funded by BRA, were placed at four sites near mid-reservoir to enhance fish habitat in the reservoir. Maps, additional information, and GPS coordinates can be found on the TPWD website; Fishing>Fisheries Management>Habitat projects>Granbury.

Prey species: Threadfin and Gizzard Shad were collected with daytime electrofishing at 170.4 fish/h and 320.8 fish/h respectively in 2021 (Figure 3; Appendix A). An estimated 47% of the Gizzard Shad population was available to existing predators as forage which was intermediate to the previous two IOV estimates (Figure 3). The catch rate of Bluegill, Longear Sunfish and Redear Sunfish was 37.6 fish/h, 17.6 fish/h and 2.4 fish/h respectively, and these catch rates were on the low side for these prey species (Figure 4; Appendix A). Large panfish were seldom observed.

Catfishes: Channel Catfish were collected with gill nets at a rate of 5.7 fish/nn in 2022 (Figure 5; Appendix A). This is nearly half the previous catch rate, yet the OBS goal for this species, general monitoring to collect abundance (CPUE – Total; RSE ≤ 25) and size structure data (PSD and length-

frequency; $N \geq 50$), was still achieved with 57 individuals and an RSE of 22. The PSD (71) slightly decreased from 2018 (80; Figure 5). Individual body condition was good to excellent and improved with increasing length.

Blue Catfish were collected at a rate (2.1 fish/nn) similar to the previous survey (1.5 fish/nn), and Flathead Catfish were collected at an identical rate from both surveys (0.4 fish/nn (Appendix A).

Temperate Basses: White Bass were collected with gill nets at a rate of 2.2 fish/nn in 2022. This was the same catch rate as in 2018 (Figure 6). No abundance (CPUE – Total; $RSE \leq 25$) or size structure (PSD and length-frequency; $N \geq 50$) objectives were set for this species due to historically low catch rates and only 22 individuals were collected with an $RSE = 32$. Most of the sampled individuals were legal length. Individual body condition was good (Figure 6).

The gill net catch rate of Striped Bass was 3.4 fish/nn in 2022, up from 2.3 fish/nn in 2018 (Figure 7; Appendix A). No abundance (CPUE – Total; $RSE \leq 25$) or size structure (PSD and length-frequency; $N \geq 50$) objectives were set for this species due to historically low catch rates however 34 total individuals were collected with an $RSE = 29$ (Figure 7; Appendix A). Additional gill netting to collect a category 3 age and growth sample for Striped Bass was not completed. This work has been rescheduled to occur in 2024. The population was dominated by individuals in the quality to preferred size classes, and body condition was excellent (Figure 6).

Largemouth Bass: Largemouth Bass were collected by daytime electrofishing at a rate of 31.2 fish/h in 2021. This is lower than both the previous daytime catch rate (52.4 fish/h) and the historical average for the reservoir (Figure 8; Appendix A; Baird and Tibbs 2014). The OBS goal for abundance (CPUE – Stock; $RSE \leq 25$) was achieved with an RSE of 22 however, the size structure goal (PSD and length-frequency; $N \geq 50$) was not achieved because only 18 individuals of stock-length or greater were collected. The current PSD (83) is higher than that of the previous survey (74), and the current population size structure is dominated by fish spawned in 2021. Individual body condition varied greatly among length classes.

The legal length limit for Largemouth Bass reverted to the statewide 14 inch minimum on September 1, 2018. This was part of a larger statewide effort to simplify Largemouth Bass regulations and remove those which had not demonstrated an effect on the population. No issues with the Largemouth Bass population have been documented since this change. No concerns have been raised by anglers either.

Based on the past five genetic evaluations (2003-2017) and associated stocking efforts during that period, it appears that about 50% introgression of Florida alleles is the best that can be expected for the reservoir. See Baird and Tibbs 2018 for genetic information collected during that time period.

White Crappie: White Crappie were collected with gill nets at a rate of 2.3 fish/nn in 2022 (Figure 9; Appendix A). Because data had previously been collected for a crappie gear/season comparison on three different reservoirs (Granbury in 2017/2018, Fort Parker State Park Lake in 2018/2019, and Limestone Reservoir in 2020/2021), trap netting comparisons scheduled for Granbury during 2021 and 2022 were not performed. All future crappie surveys will be conducted by spring trap netting.

The OBS goal for the gill net survey, general monitoring to collect abundance (CPUE – Stock; $RSE \leq 25$) and size structure (PSD and length-frequency; $N \geq 50$) data, was not achieved as only 23 individuals were collected; $RSE = 32$. High percentages of legal length fish were observed, and body condition was excellent.

Black Crappie are still present in the reservoir but were not collected in 2022 gill netting.

Fisheries Management Plan for Granbury Reservoir, Texas

Prepared – July 2022

ISSUE 1: Striped Bass have been a part of the fishery at Granbury Reservoir since the early 1970s, but the most recent age and growth data available for the species was collected in 2002. In addition, the 2018 and 2020 stockings consisted of only fry, and determining the success of that stocking is important to future Striped Bass stocking strategies in the reservoir. This evaluation was not conducted in 2022.

MANAGEMENT STRATEGY

1. Collect a category 3 age and growth sample for Striped Bass in 2024.

ISSUE 2: There has not been a recent angler survey completed on Granbury Reservoir. Quantifying effort for the Largemouth Bass, Catfish, Crappie, and Striped Bass fisheries would yield important information useful to managing the reservoir.

MANAGEMENT STRATEGY

1. Complete a creel survey in spring and fall, 2024.

ISSUE 3: Many AIS threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of AIS are significant. Additionally, the potential for AIS 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 BRA to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about AIS, and provide them with posters, literature, etc... so that they can in turn educate their customers.
3. Educate the public about AIS through the use of media and the internet.
4. Make a speaking point about AIS 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 (2022–2026)

Important sport and forage fishes: Abundant and/or important sport fishes in Granbury Reservoir include Largemouth Bass, catfishes, White Crappie, White Bass and Striped Bass. Important forage species include Gizzard Shad, Threadfin Shad, Bluegill and Longear Sunfish.

Fishes with low-density populations: Flathead Catfish and Black Crappie occur in low abundance in Granbury Reservoir and are generally caught incidentally to targeted species. We will continue collecting and reporting data for these species and upgrade their status if appropriate.

Survey objectives, fisheries metrics, and sampling objectives

Fall Electrofishing: This survey will be used to evaluate Largemouth Bass and primary forage species (Gizzard Shad, Bluegill Sunfish and Longear Sunfish). Largemouth Bass are one of the predominant sport fish in the reservoir, and their popularity justifies sampling time and effort. The most recent catch rate of Largemouth Bass was 31.2 fish/h, and the previous two surveys produced similar catch rates with good precision estimates. Therefore, a minimum of 15, random five-minute daytime electrofishing stations will be sampled in fall 2025. The goals of the Largemouth Bass survey will be general monitoring (using CPUE, size structure and relative weight as metrics) to characterize the Largemouth Bass population and make comparisons with historical and future, daytime electrofishing data. Catch per unit effort target precision will be an RSE < 25. Target sample size will be an $N \geq 50$ stock-size fish to determine population size structure, allowing us to calculate proportional size distribution with 80% confidence. Mean relative weight will be determined by measuring and weighing at least 5 fish per represented inch group \geq stock-length. If sampling objectives aren't achieved with the initial 15 stations and if catch rates indicate collecting our size structure target is reasonable, sampling will continue at random stations until that target is reached.

The goals of the forage species surveys will be general monitoring (using CPUE and size structure as metrics) to characterize Gizzard Shad, Bluegill Sunfish and Longear Sunfish populations and make comparisons with historical and future data. Since trend data show large variations in catch of forage species, no catch per unit effort target precision, target sample sizes or relative weights will be assigned. Index of Vulnerability (IOV) will be calculated for Gizzard Shad to assess the relative proportion of individuals in the population suitable as prey for sport fish.

Spring Trap Netting: This survey will be used to evaluate White Crappie. White Crappie were last sampled with winter trap netting in 2017 (2.9 fish/nn), spring trap netting in 2018 (5.5 fish/nn), and spring gill netting in 2018 (2.3 fish/nn) to determine gear and season differences in catch rates and to determine which gear/season combination produces the best sampling results for the species. Fall trap nets appeared to reflect the young-of-year class strength of White Crappie since length classes from 2 to 6-inches were well represented in that sample. Spring gill nets showed the highest percentage of legal-length fish, but no recent recruitment. Spring trap nets collected more individuals than the other two surveys combined, showed a high percentage of legal-length fish, and evidence of recent recruitment. Based on the population structures presented by these surveys, spring trap nets seem to show the most promise for future sampling of White Crappie on Granbury Reservoir. Therefore, a minimum of 15 random trap netting stations will be sampled in spring 2026. The goal of the White Crappie survey will be general monitoring (using CPUE, size structure and relative weight as metrics) to characterize the White Crappie population 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-size fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence. Mean relative weight will be determined by measuring and weighing at least 5 fish per represented inch group \geq stock-length. If sampling objectives aren't met and if catch rates from the first fifteen nets indicate collecting our size structure target is reasonable, sampling will continue at random stations until that target is reached.

Spring Gill Netting: The gill net survey will be used to evaluate catfishes, White Bass and Striped Bass. The Category 3 age and growth sample to evaluate fry recruitment from the 2018 stocking was not

completed. Therefore, this sample will be completed in spring 2024 using as much effort as needed to document recruitment (or not) of that year class. A minimum of 10 random gill netting stations will be sampled in spring 2026. The goal of the 2026 gill netting survey will be general monitoring (using CPUE, size structure and relative weight as metrics) to characterize Channel Catfish and Striped Bass populations and make comparisons with historical and future data. Catch per unit effort target precision will be an RSE < 25. Target sample size will be an $N \geq 50$ stock-size fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence. Mean relative weight will be determined by measuring and weighing at least 5 fish per represented inch group \geq stock-length. White Bass and Blue Catfish catch rates have historically been too low to expect to collect data with sufficient precision with this level of effort so no catch per unit effort target precision, target sample sizes or relative weights will be assigned for these species unless sufficient precision is achieved. Additionally, all gill netting will take place in late winter, which has been shown to increase catch rates of Morone species.

Angler Creel: This survey will be used to evaluate angler effort, success, preferences, and economic impact in spring and fall, 2024. The purpose would be to document angler response to the improved Striped Bass fishery as well as other popular fisheries such as Largemouth Bass. This will help determine the direction of future efforts including possible regulation changes.

Literature Cited

- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. *Fisheries techniques*, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Baird, M. S., and J. Tibbs. 2010. Statewide freshwater fisheries monitoring and management program survey report for Granbury Reservoir, 2009. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-33, Austin.
- Baird, M. S., and J. Tibbs. 2014. Statewide freshwater fisheries monitoring and management program survey report for Granbury Reservoir, 2013. Texas Parks and Wildlife Department, Federal Aid Report F-221-M-4, Austin.
- Baird, M. S., and J. Tibbs. 2018. Statewide freshwater fisheries monitoring and management program survey report for Granbury Reservoir, 2017. Texas Parks and Wildlife Department, Federal Aid Report F-221-M-3, Austin.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and Gizzard Shad population characteristics in Alabama reservoirs. *North American Journal of Fisheries Management* 16:888-895.
- Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution (PSD): a further refinement of population size structure index terminology. *Fisheries* 32(7): 348.
- Tibbs, J., and M. S. Baird. 2015. Statewide freshwater fisheries monitoring and management program survey report for Belton Reservoir, 2014. Texas Parks and Wildlife Department, Federal Aid Report F-221-M-5, Austin.
- United States Geological Society (USGS). 2013. National water information system: Web interface. Available: <http://waterdata.usgs.gov/tx/nwis> (July 2022).

Tables and Figures

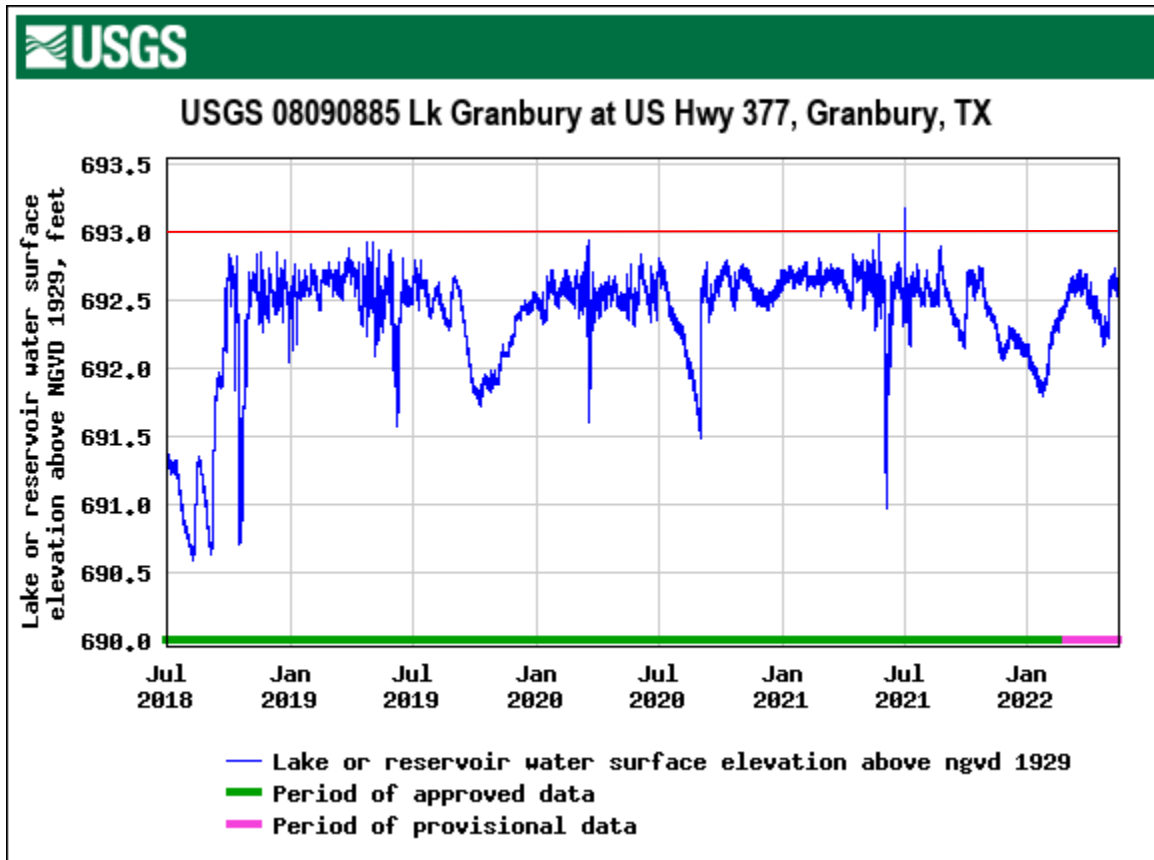


Figure 1. Daily mean water levels for Granbury Reservoir from July 2018 through April 2022. The red line indicates Conservation pool (693 feet msl). Figure from the USGS website (accessed May 2022).

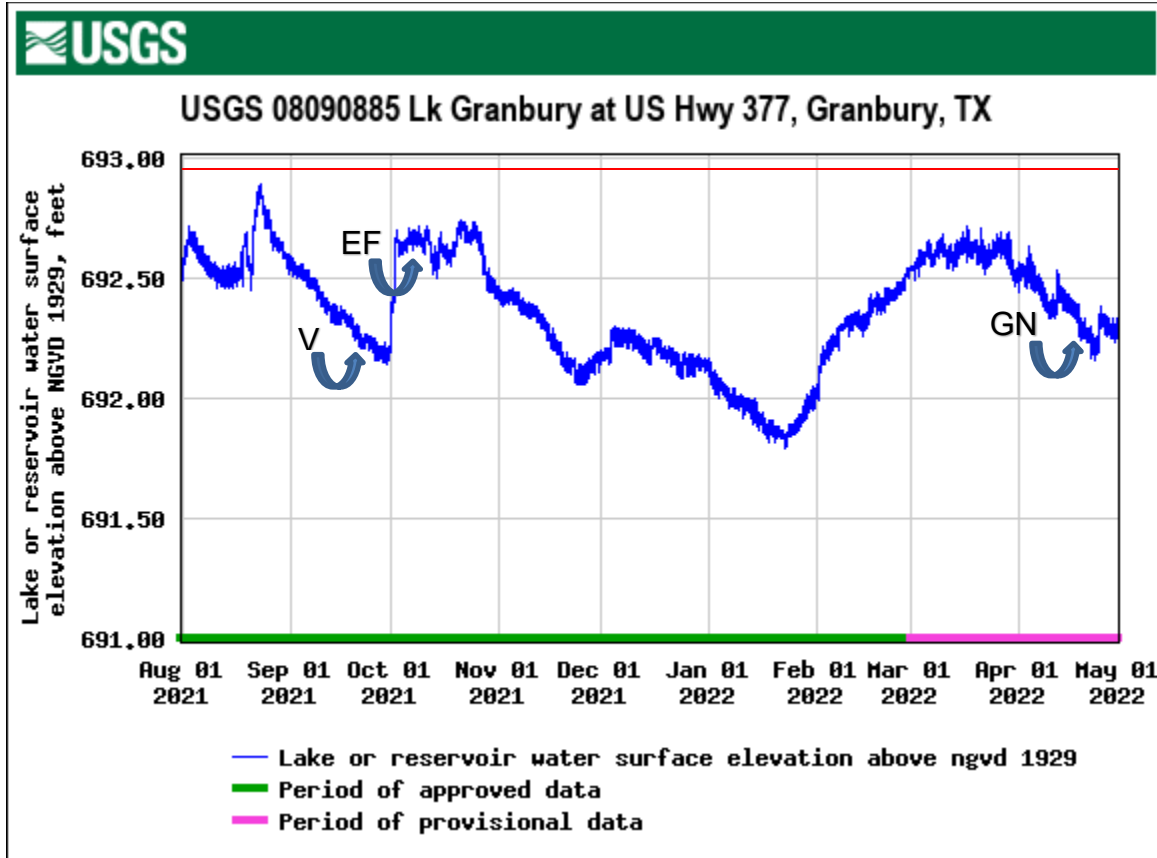


Figure 2. Daily mean water levels for Granbury Reservoir from August 2021 through April 2022. The red line indicates Conservation pool (693 feet msl). Vegetation, electrofishing and gill net surveys are indicated by V, EF and GN. Figure from the USGS website (accessed May 2022).

Table 1. Characteristics of Granbury Reservoir, Texas.

Characteristic	Description
Year constructed	1969
Controlling authority	Brazos River Authority
County	Hood
Reservoir type	Mainstem
Shoreline Development Index	8.4
Conductivity	2,400 $\mu\text{S/cm}$

Table 2. Boat ramp characteristics for Granbury Reservoir, Texas. Water level was about one foot below conservation pool (i.e., 692' above mean sea level) during the 2021 access survey. Latitude and longitude are in decimal degrees.

Boat ramp	Latitude; Longitude	Public?	Parking capacity	Condition
Thorp Spring	32.4734/-97.8148	Y	24	1 lane; good
Hunter Park	32.4778/-97.7954	Y	18	1 lane; good
City Park	32.4439/-97.7710	Y	44	3 lanes; good
Rough Creek	32.4181/-97.7863	Y	27	4 lanes; good
DeCordova Bend	32.3773/-97.6916	Y	24	3 lanes; good

Table 3. Harvest regulations for Granbury Reservoir, Texas.

Species	Bag Limit	Length limit (inches)
Catfish: Channels and Blues	25 ^B	No Limit
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Striped	5	18-inch minimum
Bass: Largemouth and Smallmouth	5 ^A	14-inch minimum
Bass, Spotted	5 ^A	No minimum
Crappie: White and Black	25 (any combination)	10-inch minimum

^A Daily bag limit for Largemouth Bass, Spotted Bass and Smallmouth Bass = 5 fish in any combination.

^B Daily bag for Channels and Blues = 25 in any combination; only 10 can be 20 inches or greater.

Table 4. Stocking history for Granbury Reservoir, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (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.

Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1991	86,343	FGL	2.5
	Total	86,343		
Channel Catfish	1969	374,675	AFGL	7.9
	1993	300	AFGL	4.9
	Total	374,975		
Florida Largemouth Bass	1986	8,178	FRY	0.9
	1989	212,290	FGL	1.3
	1989	212,234	FRY	0.9
	1994	435,331	FGL	1.1
	1995	435,924	FGL	1.4
	2003	425,723	FGL	1.3
	2004	214,164	FGL	1.6
	2008	208,273	FGL	1.5
	2017	176,283	FGL	1.5
	2018	168,336	FGL	1.8
	Total	2,496,736		
Largemouth Bass	1969	126,640	UNK	0.0
	1970	1,700,000	FRY	0.7
	1972	30,160	UNK	0.0
	1993	200	AFGL	4.9
	Total	1,857,000		
Striped Bass	1972	27,250	FGL	1.7
	1973	172,970	FGL	1.7
	1974	85,000	FGL	1.7
	1975	39,998	UNK	0.0
	1976	86,154	UNK	0.0
	1979	85,791	UNK	0.0
	1981	100,502	UNK	0.0
	1983	176,332	UNK	0.0
	1989	87,000	FGL	1.5
	1990	93,315	FGL	1.5
	1994	143,656	FGL	1.2
	1995	43,807	FGL	1.3
	1997	87,068	FGL	1.3
	1998	88,206	FGL	1.3
	1999	88,121	FGL	1.4

Table 4. Stocking history for Granbury Reservoir, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (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.

Species	Year	Number	Life Stage	Mean TL (in)
Striped Bass	2000	44,000	FGL	1.4
	2001	2,100,000	FRY	0.8
	2002	174,657	FGL	1.6
	2003	85,444	FGL	1.5
	2004	43,271	FGL	1.5
	2005	125,155	FGL	1.7
	2006	127,280	FGL	1.6
	2007	125,278	FGL	1.4
	2008	126,079	FGL	1.8
	2009	44,864	FGL	1.8
	2010	46,165	FGL	1.9
	2010	415,763	FRY	0.2
	2013	66,462	FGL	2.1
	2013	400,000	FRY	0.2
	2014	38,186	FGL	1.5
	2015	27,829	FGL	1.9
	2015	375,740	FRY	0.2
	2017	88,896	FGL	2.0
	2018	629,419	FRY	0.2
	2020	501,119	FRY	0.2
	2021	2,033	AFGL	6.3
	2021	91,403	FGL	1.6
	2021	259,432	FRY	0.2
	2022	127,743	FGL	
Total		7,471,388		

Table 5. Objective-based sampling plan components for Granbury Reservoir, Texas 2021–2022. Trap netting was not conducted for White Crappie, and the category 3 age and growth sample was not conducted for Striped Bass.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE–Stock	RSE–Stock \leq 25
	Size structure	PSD, length frequency	$N \geq$ 50 stock
	Condition	W_r	10 fish/inch group (max)
Bluegill ^a	Abundance	CPUE–Total	None
	Size structure	PSD, length frequency	None
Longear Sunfish ^a	Abundance	CPUE–Total	None
	Size structure	PSD, length frequency	None
Gizzard Shad ^a	Abundance	CPUE–Total	None
	Size structure	PSD, length frequency	None
	Prey availability	IOV	$N \geq$ 50
<i>Trap netting</i>			
White Crappie	Abundance	CPUE–Total	RSE \leq 25
	Size structure	PSD, length frequency	$N \geq$ 50
	Condition	W_r	10 fish/inch group (max)
<i>Gill netting</i>			
White Bass	Abundance	CPUE–Total	None
	Size structure	PSD, length frequency	None
	Condition	W_r	None
Striped Bass	Population dynamics	Age, growth, mortality	200 total fish sample
	Abundance	CPUE–Total	RSE \leq 25
	Size structure	PSD, length frequency	$N \geq$ 50
Channel Catfish	Condition	W_r	10 fish/inch group (max)
	Abundance	CPUE–Total	RSE \leq 25
	Size structure	PSD, length frequency	$N \geq$ 50
White Crappie	Condition	W_r	10 fish/inch group (max)
	Abundance	CPUE–Total	RSE \leq 25
	Size structure	PSD, length frequency	$N \geq$ 50
	Condition	W_r	10 fish/inch group (max)

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

Table 6. Survey of aquatic vegetation, Granbury Reservoir, Texas, 2017 and 2021. The data show percentages of randomly selected shoreline points where species occurred. Water level was near full pool during the surveys. There were 168 shoreline points in 2017 and 162 shoreline points in 2021.

Vegetation	2017	2021
Bulrush	1.2% (0.1 to 4.2)	
Cattail	9% (5.1 to 14.3)	13% (8.2 to 19.1)
American water-willow	6% (2.9 to 10.7)	6.8% (3.4 to 11.8)
Giant reed	12% (7.4 to 17.8)	11% (6.7 to 17.0)
Lotus		0.6% (0.0 to 3.4)

Gizzard Shad

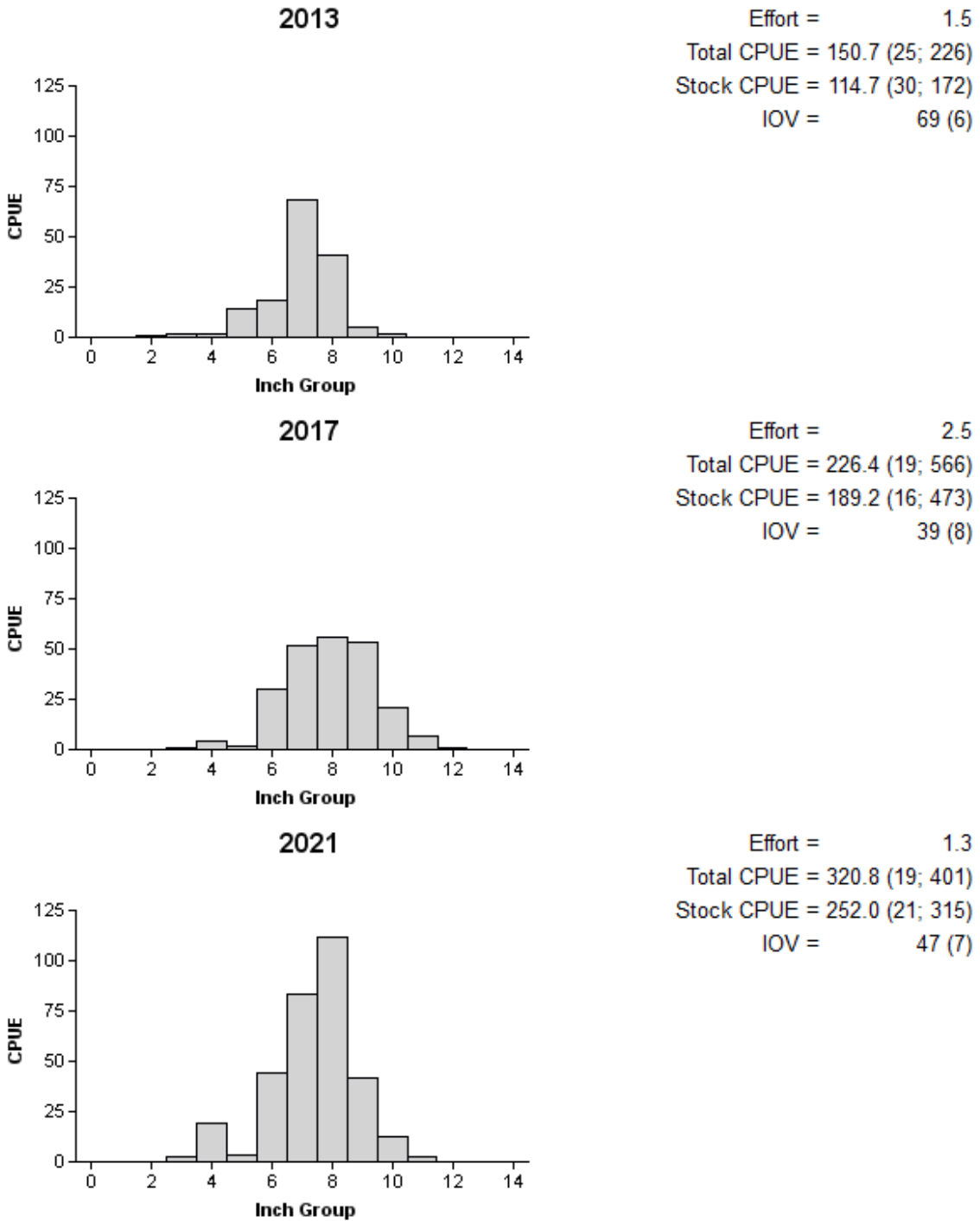
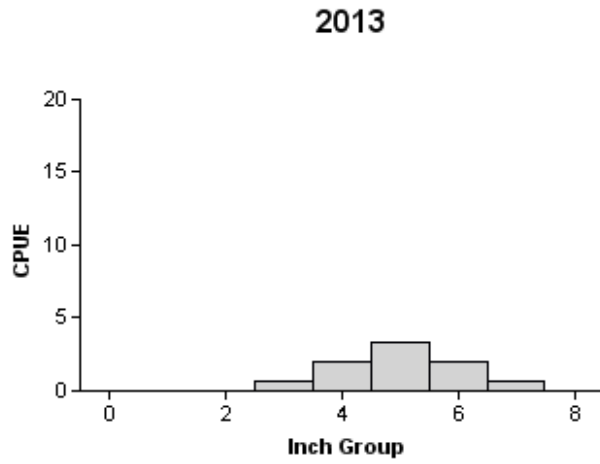
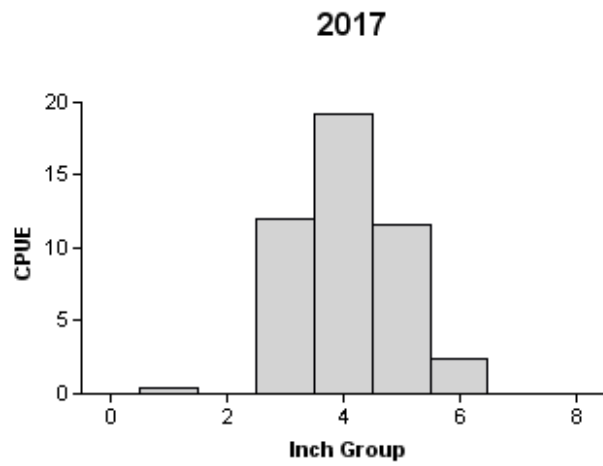


Figure 3. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas, 2013 (nighttime), 2017 (daytime), and 2021 (daytime).

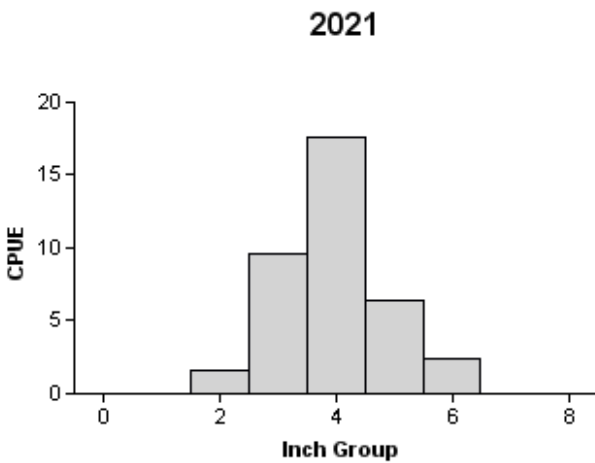
Bluegill



Effort = 1.5
 Total CPUE = 8.7 (37; 13)
 Stock CPUE = 8.7 (37; 13)
 PSD = 31 (13)



Effort = 2.5
 Total CPUE = 45.6 (30; 114)
 Stock CPUE = 45.2 (30; 113)
 PSD = 5 (2)



Effort = 1.3
 Total CPUE = 37.6 (30; 47)
 Stock CPUE = 36.0 (30; 45)
 PSD = 7 (3)

Figure 4. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas, 2013 (nighttime), 2017 (daytime), and 2021 (daytime).

Channel Catfish

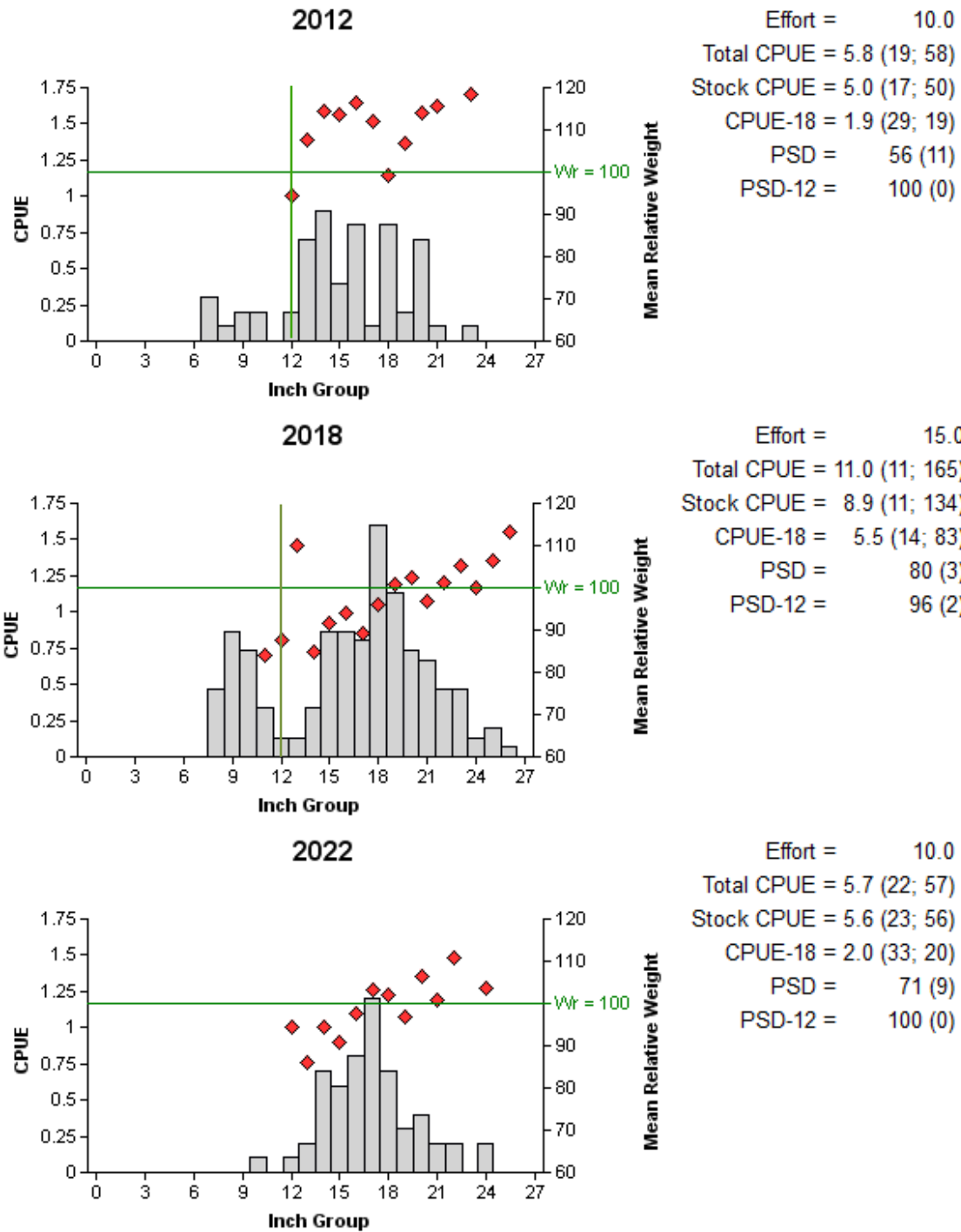


Figure 5. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Granbury Reservoir, Texas, 2012, 2018, and 2022. Vertical line indicates the minimum length limit prior to 2021, while the horizontal line represents optimal condition.

White Bass

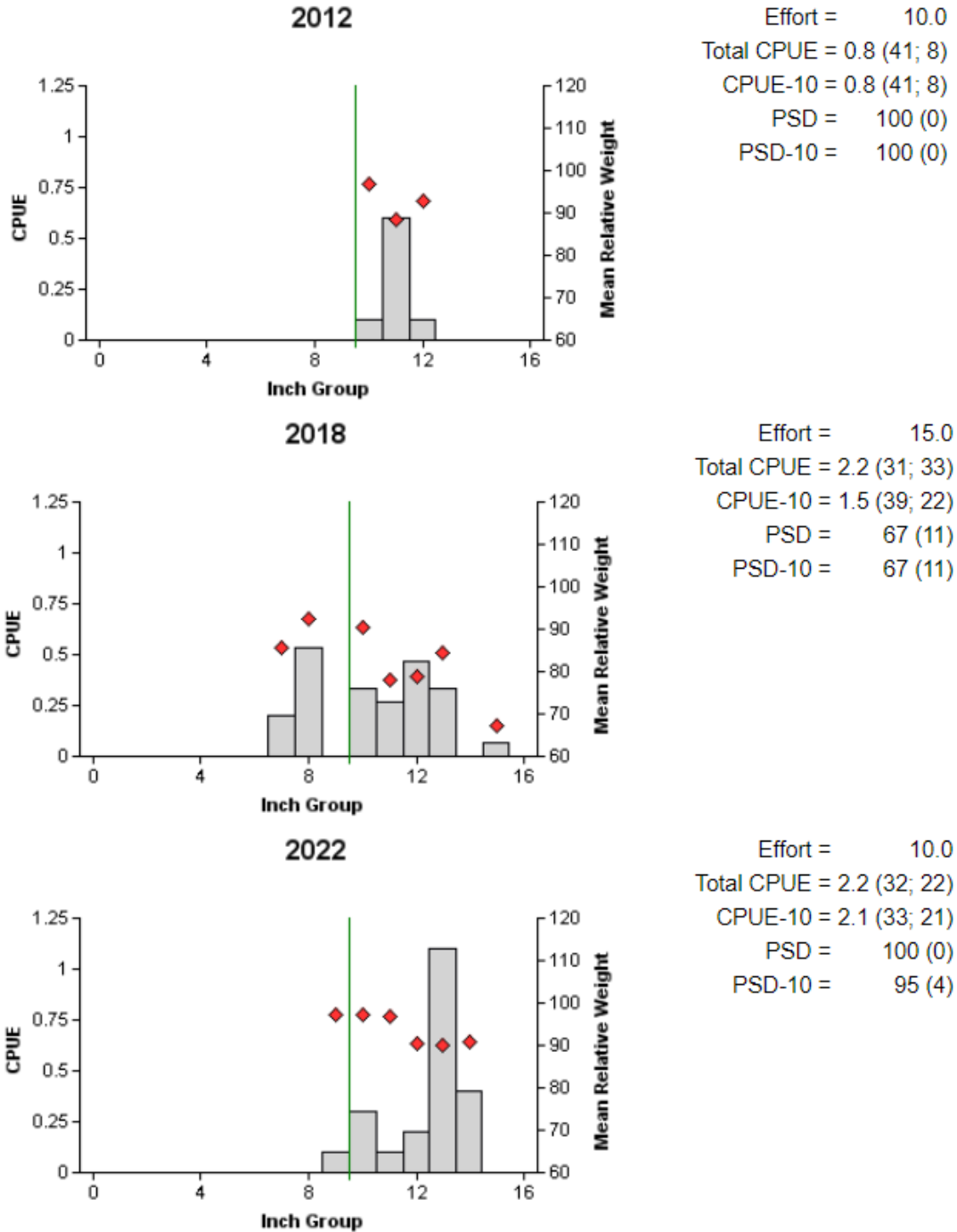


Figure 2. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Granbury Reservoir, Texas, 2012 2018, and 2022. Vertical line indicates the minimum length limit while the horizontal line represents optimal condition.

Striped Bass

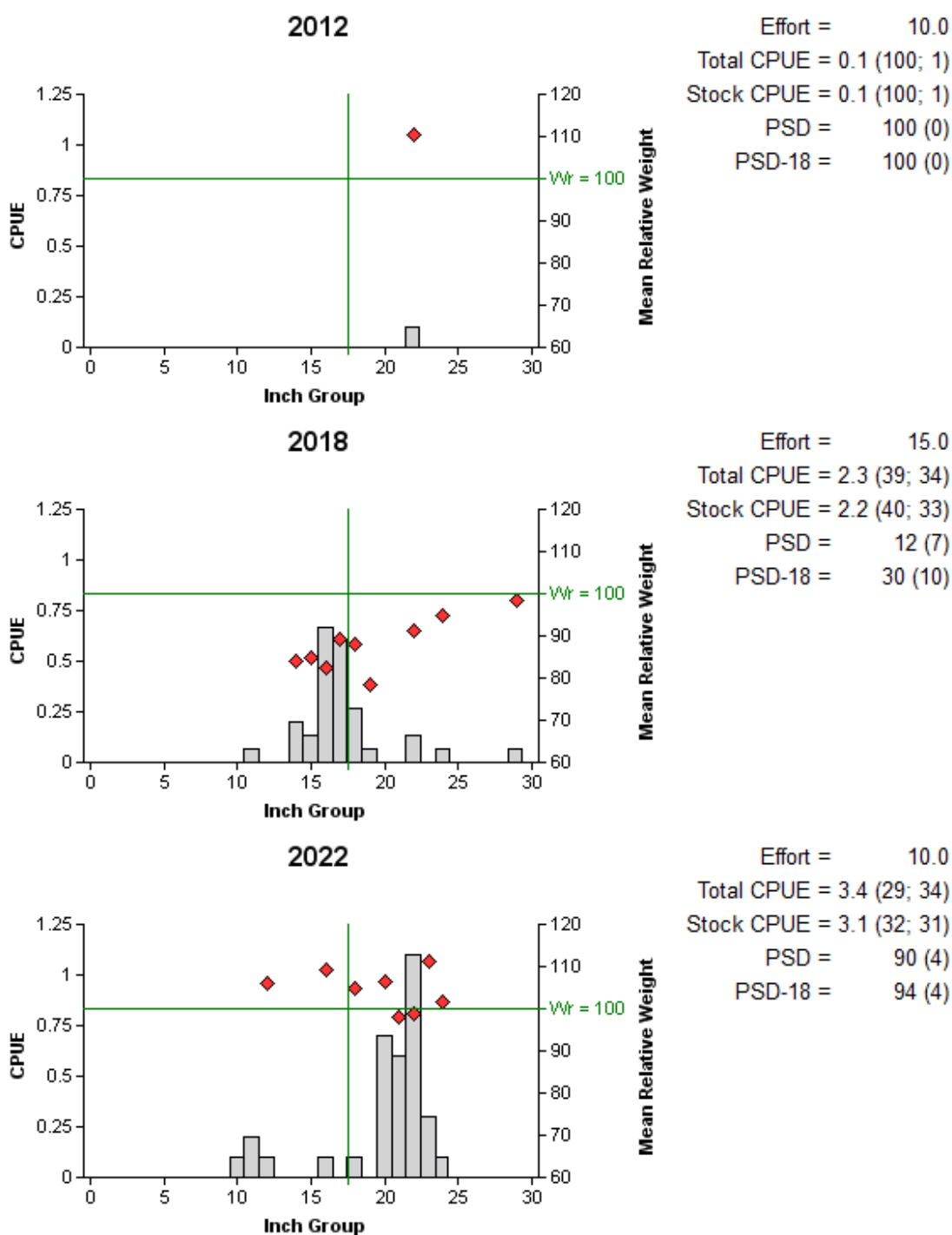


Figure 7. Number of Striped Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Granbury Reservoir, Texas, 2012, 2018, and 2022. Vertical line indicates the minimum length limit while the horizontal line represents optimal condition.

Largemouth Bass

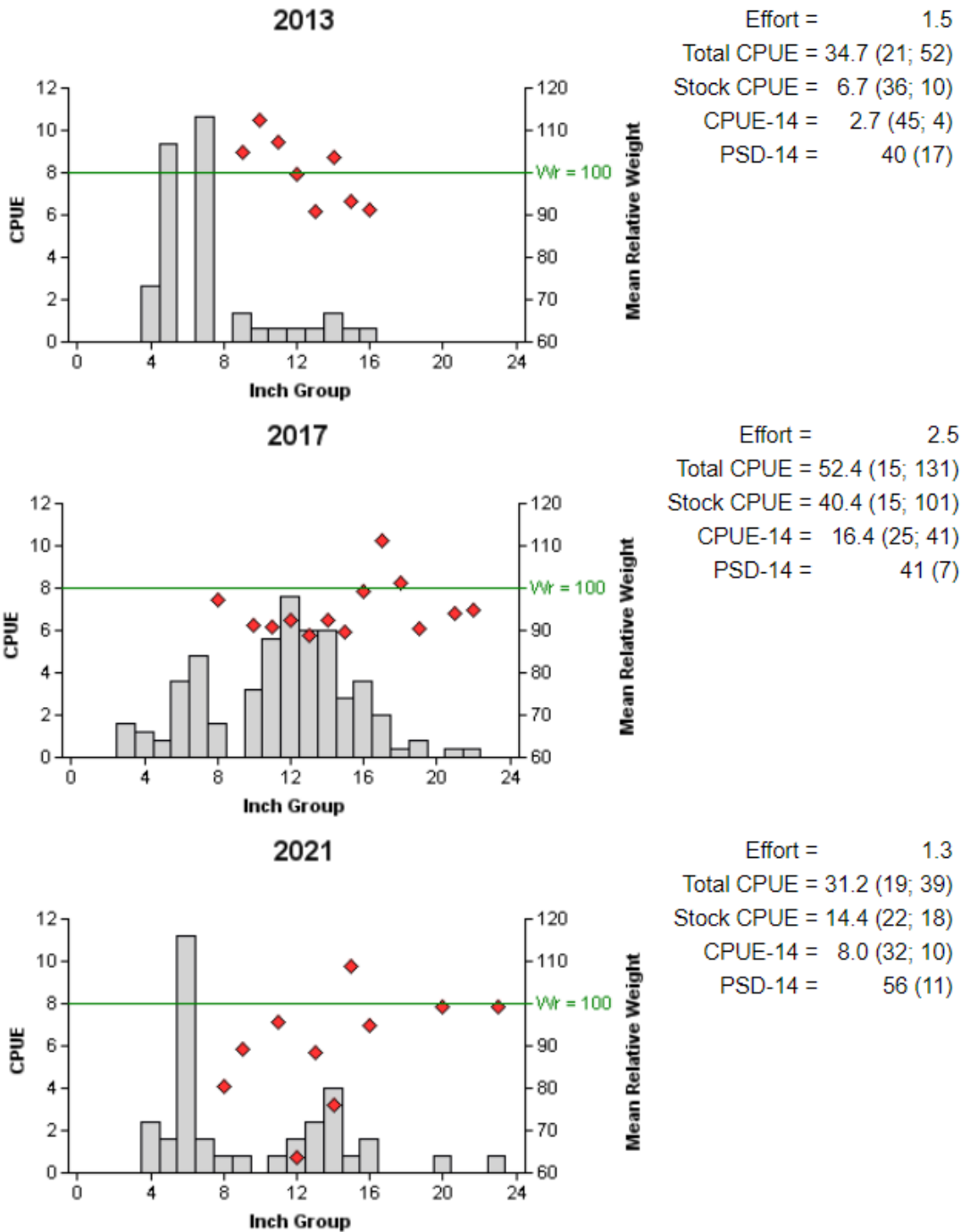


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas, 2013 (nighttime), 2017 (daytime), and 2021 (daytime). The minimum length limit in 2013 and 2017 was 16 inches, whereas it was 14 inches in 2021. The horizontal line represents optimal condition.

White Crappie

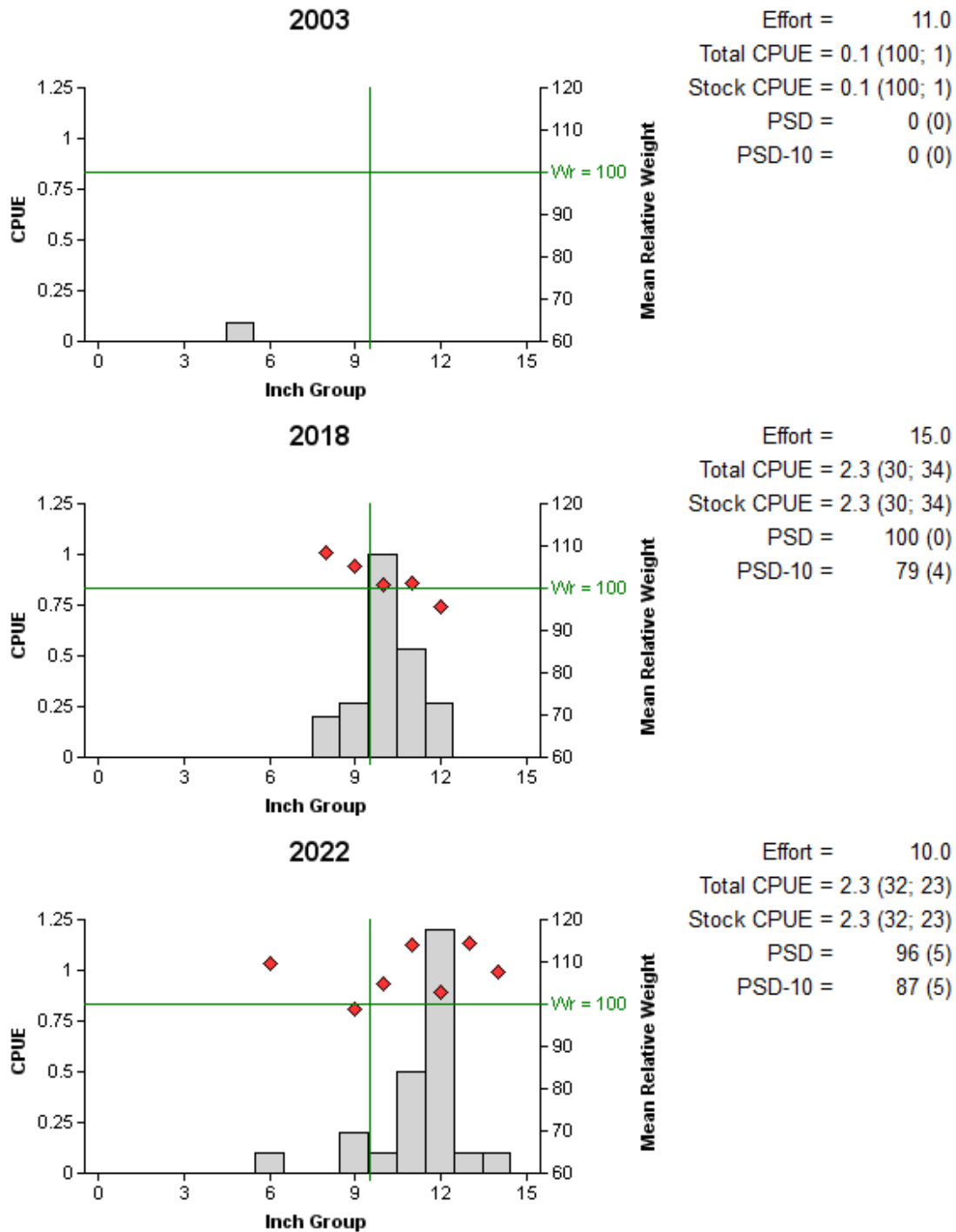


Figure 9. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Granbury, Texas, 2003, 2018 and 2022; crappies weren't counted in 2012. Vertical line indicates the minimum length limit while the horizontal line represents optimal condition.

Proposed Sampling Schedule

Table 6. Proposed sampling schedule for Granbury Reservoir, Texas. Survey period is June through May. Gill netting and trap netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall.

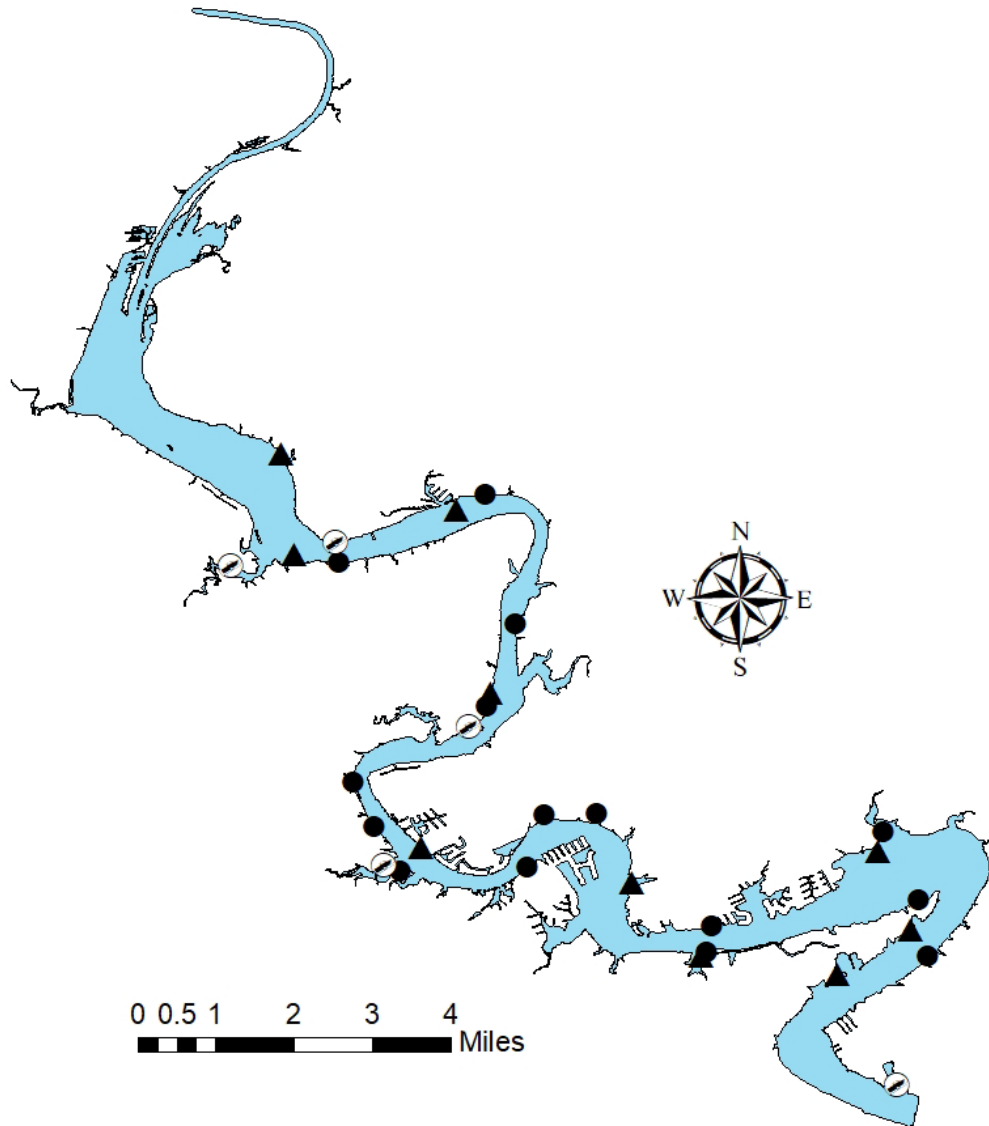
	Survey year			
	2022-2023	2023-2024	2024-2025	2025-2026
Angler Access				X
Vegetation				X
Creel survey		X	X	
Electrofishing – Fall				X
Trap netting				X
Gill netting			X	X
Report				X

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 electrofishing and gill netting surveys on Granbury Reservoir, Texas, 2021-2022. Sampling effort was 1.25 hours for electrofishing (15, 5-minute stations) and 10 net nights for gill netting.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			401	320.8 (19)
Threadfin Shad			213	170.4 (42)
Blue Catfish	21	2.1 (38)		
Channel Catfish	57	5.7 (22)		
Flathead Catfish	4	0.4 (67)		
White Bass	22	2.2 (32)		
Striped Bass	34	3.4 (29)		
Green Sunfish			3	2.4 (53)
Bluegill			47	37.6 (30)
Longear Sunfish			22	17.6 (27)
Redear Sunfish			3	2.4 (53)
Largemouth Bass			39	31.2 (19)
White Crappie	23	2.3 (32)		

APPENDIX B – Map of sampling locations



Location of sampling sites, Granbury Reservoir, Texas, 2021-2022. Electrofishing and gill netting stations are indicated by circles and triangles, respectively. Boat ramps are indicated by a small boat in a circle. Water level was within one foot of conservation pool at time of sampling.



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