

Limestone Reservoir

2024 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-5

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in Limestone Reservoir were surveyed in 2024 using electrofishing, and in 2025 using trap netting and gill netting. Historical data are presented with the 2024-2025 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: Limestone Reservoir is a 12,486-acre reservoir within the Navasota River system in Limestone, Robertson, and Leon Counties, Texas. Water level was 1-2 feet below conservation pool (363 feet above mean sea) level during vegetation, electrofishing, trap netting and gill net surveys. Habitat features mainly consisted of natural shorelines, bulk-headed shorelines, boat docks and piers and emergent aquatic vegetation.

Management History: Important sport fishes include catfishes, White Bass, White Crappie and Largemouth Bass. The 2012 management plan included sharing information about the reservoir's loss of volume with Texas Parks and Wildlife Department's habitat branch and others who could potentially take-on the issue on a larger scale. Noxious vegetation is monitored annually and occasionally requires control measures from the Aquatic Habitat and Enhancement crew; water hyacinth was treated by the AHE during 2021 and 2022. Efforts are ongoing to maintain and post appropriate aquatic invasive species signage at access points and to provide technical support and informational materials to partners for the ongoing "Clean, Drain and Dry" campaign. In 2019, the Brazos River Authority funded a cooperative effort to build and deploy fish attracting structures near Limestone Lake Park on the lower end of the reservoir, and five new freshwater reefs were created and placed at that location at the time. The statewide regulation for Blue and Channel Catfish changed on September 1, 2021; the current regulations are in this report. A recent evaluation of trap netting, gill netting and three different sampling seasons (fall, late winter and early spring) determined late winter trap netting was the best option for collecting crappies on Limestone Reservoir; late winter trap netting is now the standard for Limestone Reservoir.

Fish Community

- **Prey species:** Collected prey species included Gizzard Shad, Threadfin Shad, Bluegill, Longear Sunfish, Green Sunfish, and Warmouth. Catch rates for Threadfin Shad and Bluegill were below historical averages. Ninety percent of all Gizzard Shad were available as prey to sport fish.
- **Catfishes:** Blue Catfish catch rates were above the historical average while Channel Catfish catch rates were below. Both species maintained good to excellent mean relative weight. Flathead Catfish were collected in low numbers.
- **White Bass:** White Bass were observed in historically low numbers, yet body condition was excellent for all length classes.
- **Black Bass:** Largemouth Bass were collected in lower numbers than the previous two surveys, yet the catch rate and proportion of legal-length fish doubled from the previous survey. Mean relative weight was excellent and Florida Largemouth Bass influence decreased from 31% to 28%.
- **Crappie:** White Crappie catch rates were the highest on record, mean relative weight was excellent, and a good proportion of legal-length fish were available to anglers. Black Crappie were also collected in relatively high numbers.

Management Strategies: The sport fishes in Limestone Reservoir will continue to be managed with statewide regulations and we will continue all aquatic invasive species efforts. Access, vegetation, and electrofishing surveys will be conducted in summer and fall 2028 and trap netting and gill netting surveys will be conducted in 2029. Lonestar Bass will be requested for two years prior to the next report. We will also continue to coordinate with the Brazos River Authority on habitat projects pending future funding and reservoir priorities.

Introduction

This document is a summary of fisheries data collected from Limestone Reservoir from 2024-2025. 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 2024-2025 data for comparison.

Reservoir Description

Limestone Reservoir is a 12,486-acre reservoir within the Navasota River system in Limestone, Robertson, and Leon Counties, Texas. The reservoir was created in 1978 and is operated by the Brazos River Authority (BRA). Water uses include power plant cooling and recreation. Primary land use surrounding Limestone's 117 miles of shoreline is agriculture. The reservoir is eutrophic with a TSI chl-a of 62.62 (Texas Commission on Environmental Quality, 2024), water transparency ranging from 1 to 2 feet, and average and maximum depths of 16.5 and 43 feet respectively. Habitat at time of sampling consisted mainly of natural shoreline and bulk heading. Littoral vegetation is dominated by rice cutgrass, common buttonbush and cattail. Conservation pool elevation is 363 feet above mean sea level [MSL]. Water level dropped to 3 feet below conservation pool on three occasions since April 2021 (Figure 1a). Water level was one to two feet below conservation pool during 2024-2025 surveys (Figure 1b). Other descriptive characteristics for Limestone Reservoir are in Table 1.

Angler Access

Bank and boat access on Limestone Reservoir are adequate when the reservoir is near full pool. Bank fishing is limited to a few day-use areas on the reservoir, one of which has a fishing pier and several short, wheelchair accessible piers. Boat access consists of six public ramps. Three of the six boat ramps were still usable during the late 2022-2023 low water period according to prior analysis (Tibbs and Baird 2012). No public boating access is available at water levels below 356 feet MSL. 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 2021) included:

1. Changing the trap netting season for crappies from late fall to late-winter and the continued collection of crappie data from gill netting.

Action: Crappies were collected by trap netting during late winter 2025. These data are included in this report.

2. Cooperating with the BRA to maintain appropriate aquatic invasive species (AIS) signage at access points around the reservoir and ensure that marina owners are aware of the AIS threat and have information to provide to their customers.

Action: Invasive species signage was posted at Limestone Reservoir access points during summer 2013 and have been maintained as needed. District staff have made a speaking point about AIS, how to prevent their spread, and potential effects on Limestone Reservoir while speaking to anglers over the past several years.

3. Working with the BRA to use dedicated habitat funding to install new freshwater reefs throughout the reservoir and take advantage of other funding sources to purchase materials for fish habitat when available.

Action: Five freshwater reefs were created in 2019 near Limestone Lake Park and each reef is comprised of five separate Georgia structures placed close together. BRA funding is

prioritized annually based on need and reservoir status; no new fish habitat has been placed into the reservoir since 2019.

4. Communicating with the aquatic habitat enhancement (AHE) staff to ensure water hyacinth stands are treated effectively and keeping the BRA informed of treatment schedules and details.

Action: The results of vegetation surveys that found noxious species have been reported to the AHE crew, which then developed treatment proposals and conducted the treatments. Water hyacinth treatments were performed in July and August, 2021 and again in June 2022. The BRA and concerned agencies/constituents were informed of all treatments. These data are included in this report.

Harvest regulation history: All sport fishes are currently managed with statewide regulations. The statewide regulation for Blue and Channel Catfish changed on September 1, 2021, and now the regulation is no minimum length limit; daily bag of 25 (in any combination – only 10 can be 20 inches or greater in length). The current harvest regulations are listed in Table 3.

Stocking history: Limestone Reservoir was last stocked with 158,879 Florida Largemouth Bass in 2015. The complete stocking history is in Table 4.

Vegetation/habitat management history: A summary of the aquatic vegetation management history through 2016 can be found in Baird and Tibbs (2016). The aquatic vegetation survey conducted in August 2020 found alligator weed at 4 of 135 random shoreline points (3.0%) and water hyacinth at 12 of 135 shoreline points (9.0%). Alligator weed was absent from the 2024 survey and water hyacinth coverage decreased substantially (Table 7).

In 2019, the BRA funded a cooperative effort to build and deploy artificial fish attracting structures (i.e., 25 Georgia-style structures; five each in five freshwater reef locations) near Limestone Lake Park on the lower-end of the reservoir. Freshwater reef locations and coordinates were added to the Texas Parks and Wildlife Department (TPWD) website within the Limestone Reservoir link.

Water transfer: There are no interbasin transfers within Limestone Reservoir.

Reservoir capacity: Limestone Reservoir was impounded in 1978. Original plans calculated the reservoir's capacity at conservation pool (363 feet above mean sea level) to be 225,400 acre-feet with a surface area of 14,200 acres. Three volumetric surveys have been conducted by the Texas Water Development Board (TWDB) on Limestone since impoundment: 1993, 2002 and 2012. The 2012 survey found a volume of 203,780 acre-feet and a surface area of 12,486 acres at conservation pool elevation. According to the TWDB estimates, the reservoir has lost between 481 and 636 acre-feet of capacity annually since impoundment due to sedimentation (TWDB, 2012).

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Limestone Reservoir (Tibbs and Baird 2020). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, and all electrofishing and gill netting surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2022). Trap netting surveys were conducted in late winter, outside the normal procedural time period.

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

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad and Threadfin Shad were collected by daytime electrofishing (1.3 hours at 15, 5-min stations in fall). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Electrofishing in 2024 was conducted using a Smith-Root Apex electrofisher, while previous surveys used a GPP 7.5 electrofisher.

Trap netting – Crappies were collected by trap netting (11 net nights at 11 stations) in late winter. Catch per unit effort (CPUE) for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting – Catfishes, White Bass and crappies were collected by gill netting (11 net nights at 11 stations) in spring. Catch per unit effort (CPUE) 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 has been used to determine genetic composition of individual fish since 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 Neumann et al. (2012). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error ($RSE = 100 \times SE \text{ of the estimate/estimate}$) was calculated for all CPUE statistics.

Habitat – The 2024 structural habitat survey utilized Google Earth images from December 2024 to identify habitat types. These habitats were mapped in ArcGIS Pro to estimate shoreline coverage. Boat docks were counted and multiplied by an estimated average dock width (8 ft) to estimate shoreline coverage. The 2024 vegetation survey was conducted using an adaptation of the point method (TPWD, Inland Fisheries Division, unpublished manual revised 2022). Points were randomly generated on the shoreline and averaged a minimum of one point per shoreline mile. Aquatic vegetation has always been found close to the shore in Limestone Reservoir, so stratifying the random points to exclude deep-water areas increased precision and resulted in better data.

Water level – Source for water level data was the United States Geological Survey (USGS 2025).

Results and Discussion

Habitat: The 2024 structural habitat survey estimated 90.2 miles of natural shoreline, 27.3 miles of bulkheaded shoreline, 9.3 miles of boulder/rip-rap shoreline and 1.6 miles of boat docks/ramps (Table 6). Natural shoreline habitat is steadily diminishing and being replaced by bulkheaded shorelines, which contribute to the loss of rainwater inputs, as well as important fish habitat. Typically, newly-bulkheaded shorelines on Limestone are shallow narrow flats with sterile substrate and little to no usable fish habitat or structure.

The littoral zone vegetation encountered during summer 2024 was dominated by rice cutgrass, common buttonbush and cattail (Table 7). Alligator weed was absent from the 2024 survey while water hyacinth coverage remained similar. The AHE crew has been proactive in treating water hyacinth on Limestone since the last report. Multiple spot treatments were performed between 2021 and 2023, typically in the backs of coves, creek mouths and areas above the 3371 bridge on the upper end of the reservoir. The results from contemporary vegetation surveys are in Table 7.

Prey species: Threadfin and Gizzard Shad were collected by electrofishing at 473.6 fish/h and 288.0 fish/h respectively in 2024 (Figure 2; Appendices A and B). Gizzard Shad catch rate was above the historical average while that of Threadfin Shad was well below (Appendix B). The IOV for Gizzard Shad was very good and 90% of the population was available to existing predators as forage. The Bluegill catch rate of 38.4 fish/h was higher than the previous survey (26.1 fish/h) yet well below the historical average (Figure 3; Appendix B). Other important forage species collected were Longear Sunfish (18.4 fish/h), Green Sunfish (4.0 fish/h) and Warmouth (0.8 fish/h; Appendices A and B). Redear Sunfish were absent from the survey.

Catfishes: Blue and Channel Catfish were collected with gill nets at rates of 11.0 and 4.4 fish/nn respectively in 2025 (Figures 4 and 5; Appendices A and B). Blue Catfish catch rates were above their historical average while Channel Catfish catch rates were below (Appendix B). The size structure objective of collecting a minimum of 50 stock-length fish was easily met for Blue Catfish ($N = 93$) but not for Channel Catfish ($N = 29$). The objective of achieving an $RSE \leq 25$ for $CPUE_{Total}$ and $CPUE_{Stock}$ was not met for either species (Figures 4 and 5). The PSD for Blue Catfish decreased from 14 in 2021 to 8 in 2025 indicating a shift in size structure to smaller individuals, partly due to weaker recruitment of young fish (Figure 4). All length classes of Blue Catfish maintained good to excellent relative weights (Figure 4). Channel Catfish exhibited a more depressed population, with both weaker recruitment of young fish and a lower percentage of quality-length fish. Mean relative weights were fair to good but also lower than previous surveys. Flathead Catfish were collected in low numbers in 2025 and are included in Appendices A and B.

White Bass: The gill net catch rate for White Bass was 2.2 fish/nn in 2025 and is one of the lowest catch rates recorded for the species in the reservoir (Figure 6; Appendices A and B). This catch rate equates to only 22 total fish with a sample RSE of 27, so neither the size structure or abundance objectives were met. Although the population was depressed overall, relative weights were excellent across all length classes (Figure 6).

Largemouth Bass: Largemouth Bass were collected by electrofishing at a rate of 25.6 fish/h in 2024 and this is one of the lowest catch rates observed for the species in two decades (Figure 7; Appendices A and B). The objectives of collecting a minimum of 50 stock-length fish with an RSE equal to or less than 25, and a robust genetic sample, were not achieved because only 20 stock-length individuals were collected. The current PSD of 70 is an improvement and demonstrates a shift in size structure to larger individuals. The percentage of individuals in the preferred-length category (15 inches) also improved from the previous survey but the population remains low. Mean relative weight ranged from good to excellent across length classes (Figure 7). Largemouth Bass genetics analyzed in 2024 showed a decrease in Florida influence (28%) from the 2020 survey (31%), and no pure Florida Largemouth Bass were collected (Table 8).

Crappie: White Crappie were collected with late winter trap netting at a rate of 44.1 fish/nn, which is the highest catch rate on record for the reservoir (Figure 8; Appendices A and B). The OBS size structure goal of collecting a minimum of 50 stock-length fish was easily achieved with 484 stock-length individuals, but the abundance goal of an RSE equal to or less than 25 was not met (Figure 8). The current PSD (90) remains high, demonstrating a population with high numbers of legal-length fish and low recruitment. Mean relative weight was excellent across length classes (Figure 8). Black Crappie were also collected in historically high numbers (3.1 fish/nn; Appendices A and B).

Fisheries Management Plan for Limestone Reservoir, Texas

Prepared – July 2025

ISSUE 1: Largemouth Bass numbers have declined in recent years, from a historical high in 2000 (60.0 fish/h) to one of the lowest (25.6 fish/h) in 2024. Low water and poor sampling conditions have contributed to low catch rates, but anecdotal information from bass anglers seems to confirm the depressed population.

MANAGEMENT STRATEGY

1. Place additional structure (freshwater reefs) in appropriate areas of the reservoir with the help of constituent and angler groups, to improve habitat for black bass.

ISSUE 2: Largemouth Bass were last stocked into Limestone in 2015. Although bass typically spawn very well naturally, Largemouth Bass numbers have declined in recent years in Limestone.

MANAGEMENT STRATEGY

1. Request 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, two additional years before the next report.

ISSUE 3: The Aquatic Habitat and Enhancement (AHE) staff developed treatment proposals and treated Water hyacinth in July and August, 2021 and again in June 2022, but Water hyacinth continues to hamper access for homeowners and anglers in some areas of the reservoir.

MANAGEMENT STRATEGIES

1. Communicate with AHE staff to ensure Water hyacinth stands are treated effectively.
2. Keep BRA staff informed of treatment schedules and details.

ISSUE 4: 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 invasive species 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. Educate the public about AIS through social media and the internet.
3. Make a speaking point about AIS when presenting to constituent and user groups.
4. Keep track of (i.e., map) existing and future interbasin water transfers to facilitate potential AIS responses.

Objective-Based Sampling Plan and Schedule (2025–2029)

Sport fish, forage fish, and other important fishes

Sport fishes in Limestone Reservoir include Blue Catfish, Channel Catfish, White Bass, White Crappie and Largemouth Bass. Important forage fish species include Gizzard Shad, Threadfin Shad, Bluegill, and Longear Sunfish.

Sport fishes with low-density populations

Flathead Catfish and Black Crappie occur in very low abundance in Limestone Reservoir and are generally caught incidentally to other 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 monitor Largemouth Bass and primary forage species (Bluegill, Longear Sunfish, Redear Sunfish, Gizzard Shad and Threadfin Shad). A minimum of 15, random five-minute daytime electrofishing stations will be sampled in fall 2028. The objectives of the electrofishing survey will be general monitoring (i.e., CPUE, size structure and mean relative weight) and prevalence of Northern and Florida Largemouth Bass alleles (i.e., fin clips from 30 random individuals) to characterize the Largemouth Bass population and make comparisons with historical and future data. Abundance target precision will be an $RSE \leq 25$ for $CPUE_{Total}$ and $CPUE_{Stock}$, and target sample size for size structure will be $N \geq 50$ stock, allowing us to calculate PSDs with 80% confidence. Mean relative weight will be determined by measuring and weighing at least 5 fish per represented inch group $\geq$ stock-length. Since the primary forage species objectives are exploratory, no target precision or target sampling sizes will be sought for these species; additional sampling will not be necessary beyond that which is done for Largemouth Bass. 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.

Late winter trap netting: This survey will be used to monitor crappie. A minimum of 11 randomly selected trap net stations will be sampled in late winter 2029. The objectives of the late winter trap netting survey will be general monitoring (i.e., CPUE, size structure, and mean relative weight) to characterize White Crappie population and make comparisons with historical and future data. Abundance target precision will be an $RSE \leq 25$ for $CPUE_{Total}$ and $CPUE_{Stock}$, and target sample size for size structure will be $N \geq 50$ stock, allowing us to calculate PSDs 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 objectives are not met in 11 stations, but catch rates indicate they're attainable, sampling will continue at random stations until the objectives are met. The objectives for Black Crappie will be exploratory; no target precision or target sampling sizes will be sought for this species; additional sampling will not be necessary beyond that which is done for White Crappie.

Spring Gill Netting: This survey will be used to monitor Blue Catfish, Channel Catfish and White Bass. A minimum of 11 randomly selected gill net stations will be sampled in spring 2029. The objectives of the spring gill netting survey will be general monitoring (i.e., CPUE, size structure, and mean relative weight) to characterize populations and make comparisons with historical and future data. Abundance target precision will be an $RSE \leq 25$ for $CPUE_{Total}$ and $CPUE_{Stock}$, and target sample size for size structure will be $N \geq 50$ stock, allowing us to calculate PSDs 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 objectives for a given species are not met in 11 stations, but catch rates indicate they're attainable, sampling will continue at random stations until the objectives are met.

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Tables and Figures

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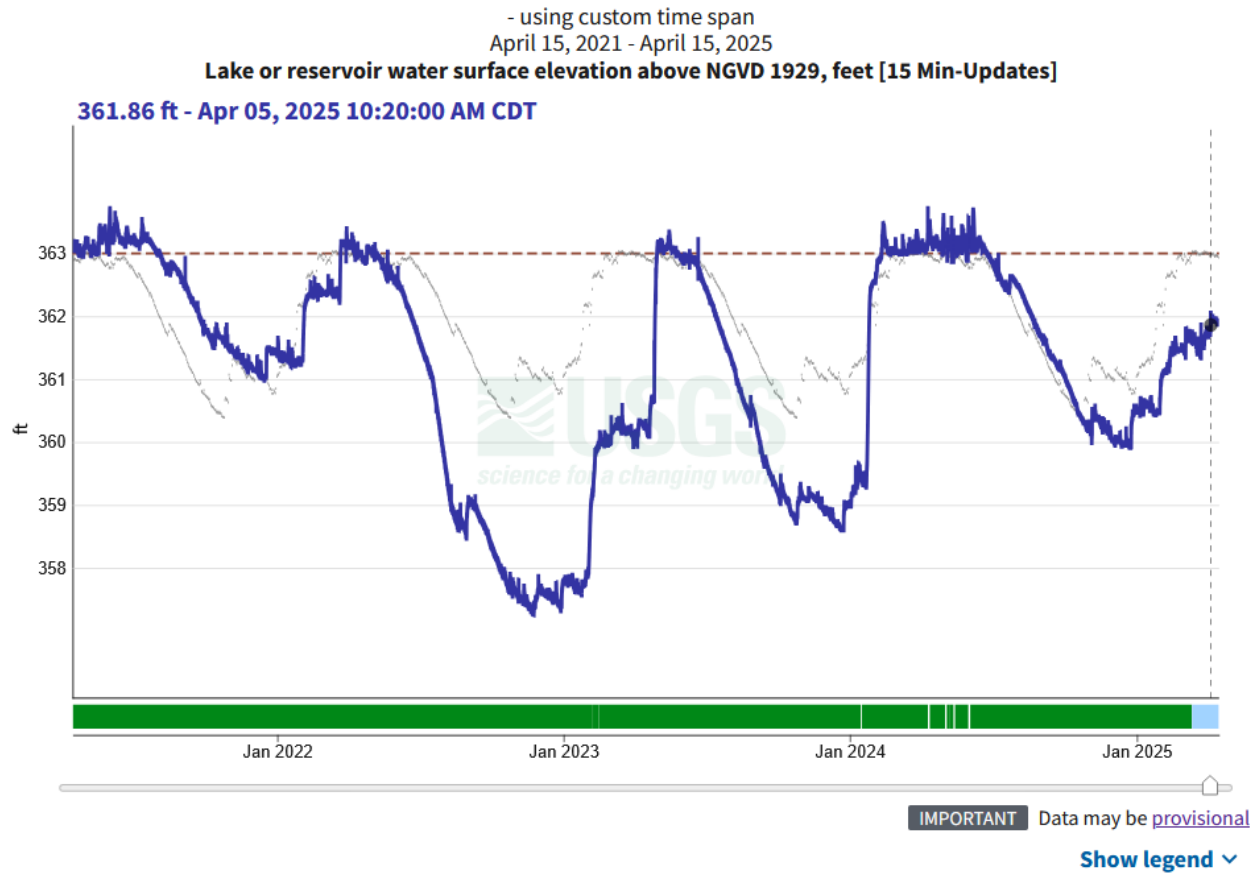


Figure 1a. Daily water level elevations in feet above MSL recorded for Limestone Reservoir, Texas, April 15, 2021, through April 15, 2025. The figure is from the United States Geological Survey (USGS) website. NGVD 1929 refers to the National Geodetic Vertical Datum of 1929. Horizontal dashed line indicates conservation pool (363.0).

Lk Limestone nr Marquez, TX - 08110470

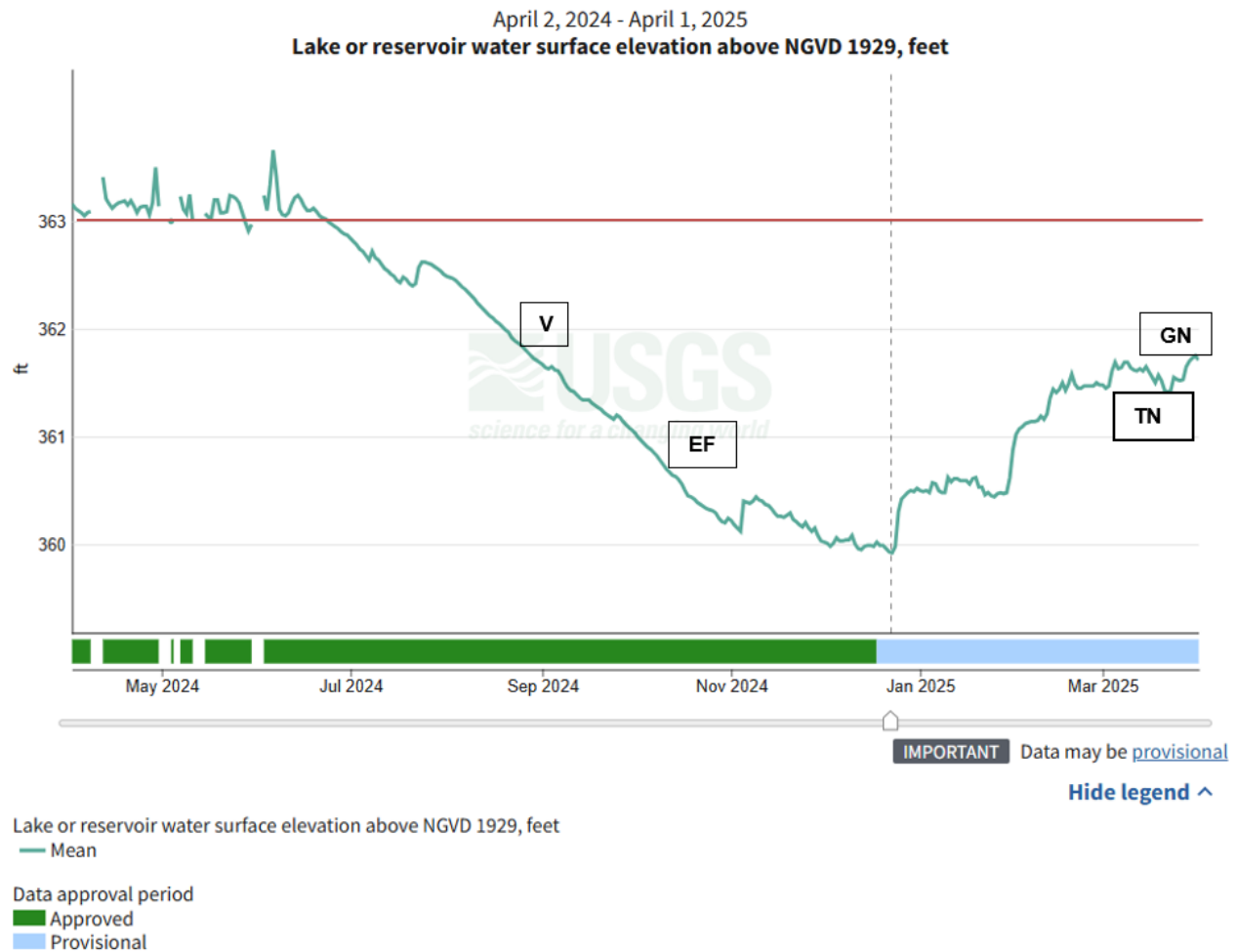


Figure 2b. Daily water level elevations in feet above MSL recorded for Limestone Reservoir, Texas, April 2, 2024, through April 1, 2025. The figure is from the United States Geological Survey (USGS) website. NGVD 1929 refers to the National Geodetic Vertical Datum of 1929. Horizontal red line indicates conservation pool (363.0). The vertical dashed line represents the lowest water elevation during the period (359.92 above MSL). Sampling times for vegetation (V), electrofishing (EF), trap netting (TN) and gill netting (GN) are noted.

Table 1. Characteristics of Limestone Reservoir, Texas.

Characteristic	Description
Year Constructed	1978
Controlling authority	Brazos River Authority
Counties	Limestone, Robertson and Leon
Reservoir type	Tributary
Shoreline Development Index	7.9
Conductivity	168 μ S/cm

Table 2. Boat ramp characteristics for Limestone Reservoir, Texas 2024. Parking capacity numbers are spaces for trucks with boat trailers.

Boat ramp	Latitude Longitude (dd)	Parking capacity (N)	Condition
BRA Park # 1	31.32845/-96.33179	16	Useable at full pool
Leon County Park	31.33895/-96.31066	12	Useable at full pool
Limestone Country #2	31.43429/-96.37516	10	Poor
Limestone Country #3	31.44755/-96.37821	10	Poor
Running Branch Marina	31.34379/-96.36858	8	Useable at full pool
Limestone Marina	31.38628/-96.31771	10	Good

Table 3. Harvest regulations for Limestone Reservoir, Texas.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: Channel Catfish, Blue Catfish their hybrids and subspecies ¹	25 (only 10 $\geq$ 20 inches)	No minimum
Catfish: Flathead	5	18 – inch minimum
Bass: White	25	10 – inch minimum
Bass: Largemouth ²	5 (any combination)	14 – inch minimum
Bass: Spotted,	5 (any combination)	No minimum
Crappie: White, Black and hybrids	25 (any combination)	10 – inch minimum

¹The Blue and Channel Catfish regulation is no minimum length limit; daily bag of 25 (in any combination – no more than 10 can be 20 inches or greater in length).

² Daily bag for Largemouth Bass and Spotted Bass = 5 fish in any combination.

Table 4. Stocking history for Limestone Reservoir, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL) and adults (ADL). 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	1986	135,425	FGL	2.0
	1996	306,470	FGL	1.8
	1998	1,500	AFGL	9.8
	1998	78,575	FGL	2.3
	Total	521,970		
Channel Catfish	1979	338,237	AFGL	7.9
	Total	338,237		
Florida Largemouth Bass	1979	78,758	FGL	2.0
	1979	122,040	FRY	1.0
	1995	127	ADL	12.0
	1995	69,878	FGL	1.0
	1996	43,426	FGL	1.6
	1996	185,281	FRY	1.0
	2014	290,220	FGL	1.5
	2015	158,879	FGL	1.6
	Total	948,609		
Largemouth Bass	1994	151	ADL	11.8
	1996	45	ADL	12.0
	Total	196		
Palmetto Bass (Striped x White hybrid)	1984	274,175	FGL	2.0
	Total	274,175		

Table 5. Objective-based sampling plan components for Limestone Reservoir, Texas 2024–2025.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	5 fish/inch group (min)
	Genetics	% FLMB	$N = 30$, any age
Bluegill ^a	Exploratory	Presence/Absence	Practical effort
Longear ^a	Exploratory	Presence/Absence	Practical effort
Redear ^a	Exploratory	Presence/Absence	Practical effort
Gizzard Shad ^a	Exploratory	Presence/Absence	Practical effort
	Prey availability	IOV	$N \geq 50$
<i>Trap Netting</i>			
White Crappie	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size Structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	5 fish/inch group (min)
<i>Gill netting</i>			
Channel Catfish	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size Structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	5 fish/inch group (min)
Blue Catfish	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size Structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	5 fish/inch group (min)
White Crappie	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size Structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	5 fish/inch group (min)
White Bass	Abundance	CPUE–Stock	RSE–Stock ≤ 25
	Size Structure	PSD, length frequency	$N \geq 50$ stock
	Condition	W_r	5 fish/inch group (min)

^a Since the primary forage species objectives are exploratory, no target precision or target sampling sizes will be sought; additional sampling will not be necessary beyond that which is done for Largemouth Bass.

Table 6. Survey of structural shoreline habitat, Limestone Reservoir, Texas, 2008, 2016, and 2024. Only bulkhead habitat type was surveyed in 2016. Estimates and % of reservoir shoreline are listed. Estimates are in miles.

Habitat type	2008 Estimate	%	2016 Estimate	%	2024 Estimate	%
Bulkhead	18.4	11.7	20.6	13.1	27.3	17.3
Boulder/Riprap	8.6	5.4			9.3	5.9
Natural/Gravel	106.8	67.8			90.2	57.3
Boat Docks	1.4	<1.0			1.6	1.0

Table 7. Survey of aquatic vegetation, Limestone Reservoir, Texas, 2012, 2016, 2020 and 2024. Percent of randomly selected points where species occurred is listed for each survey year. The number of points increased from 2012 to 2016 and again from 2020 to 2024. Water level was one to two feet below conservation pool, respectively, at the time of surveys

Vegetation	2012	2016	2020	2024
<u>Native emergent</u>				
Cattail		12% (16 of 135)	14% (19 of 135)	2% (5 of 202)
Common buttonbush		33% (44 of 135)	7% (9 of 135)	3% (7 of 202)
Water-willow			<1% (1 of 135)	<1% (1 of 202)
Bulrush		2% (3 of 135)	<1% (1 of 135)	<1% (1 of 202)
Rice cutgrass		4% (5 of 135)	0% (0 of 135)	12% (25 of 202)
Square-stemmed spike rush		3% (4 of 135)	0% (0 of 135)	0% (0 of 202)
<u>Native submerged</u>				
American pondweed		22% (29 of 135)	12% (16 of 135)	0% (0 of 202)
<u>Native floating-leaved</u>				
American lotus		7% (10 of 135)	<1% (1 of 135)	0% (0 of 202)
<u>Non-native</u>				
Alligator weed	27% (20 of 75)	2% (3 of 135)	3% (4 of 135)	0% (0 of 202)
Water hyacinth	0% (0 of 75)	<1% (1 of 135)	9% (12 of 135)	2% (5 of 202)
Giant reed		<1% (1 of 135)	1% (2 of 135)	0% (0 of 202)
Calla Lilly			<1% (1 of 135)	0% (0 of 202)

Gizzard Shad

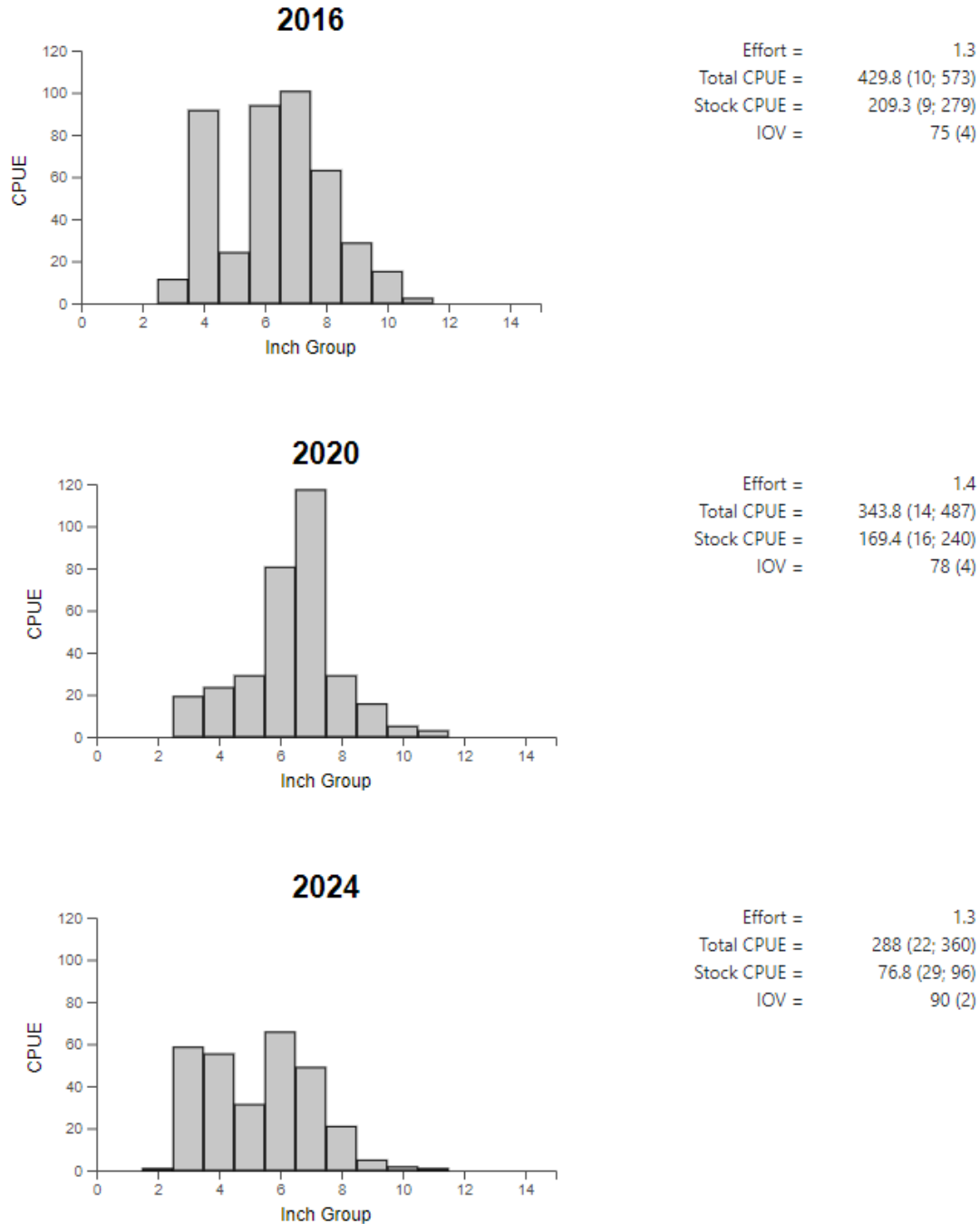


Figure 3. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV in parentheses) for fall electrofishing surveys, Limestone Reservoir, Texas, 2016, 2020, and 2024.

Bluegill

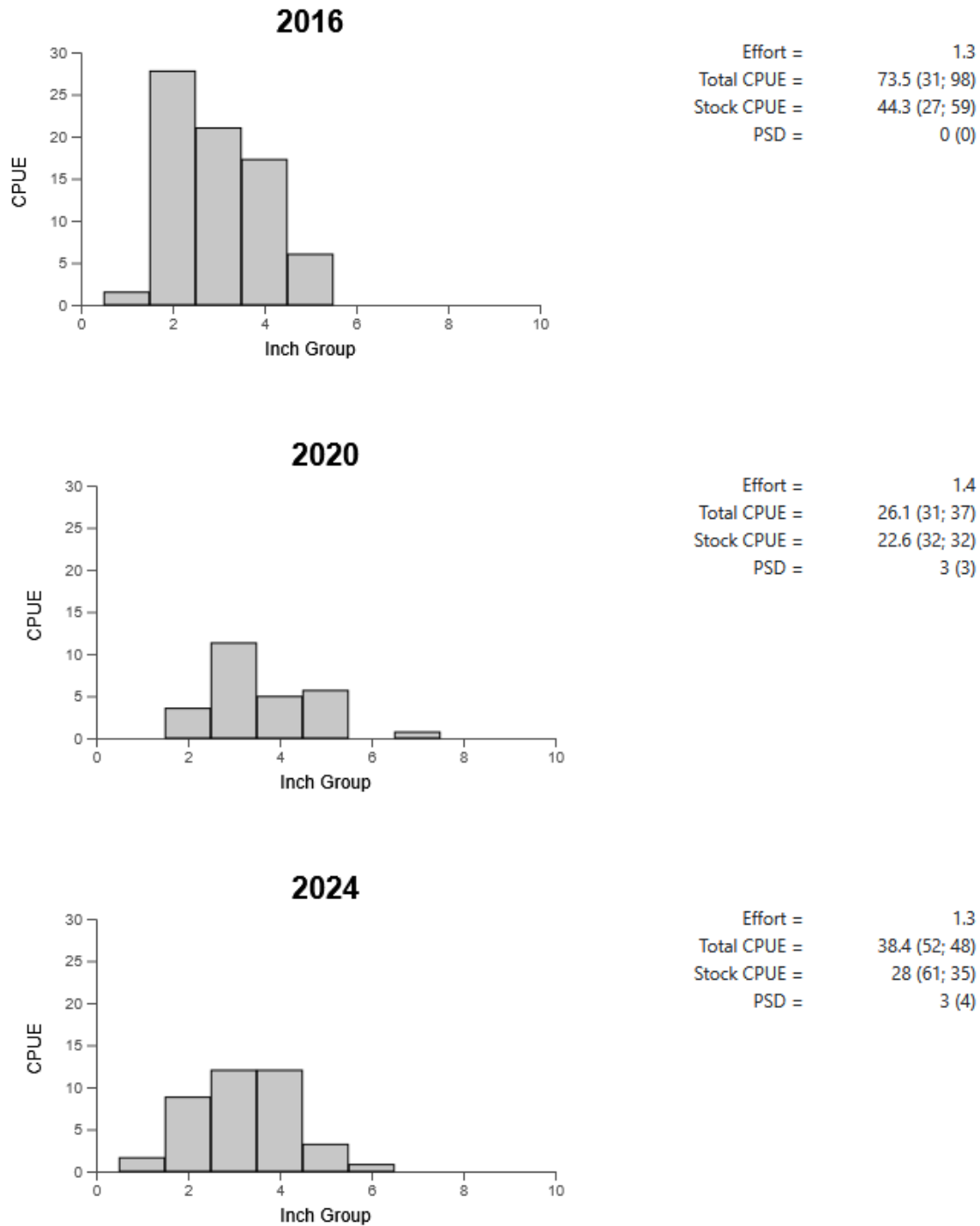


Figure 4. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for fall electrofishing surveys, Limestone Reservoir, Texas, 2016, 2020, and 2024.

Blue Catfish

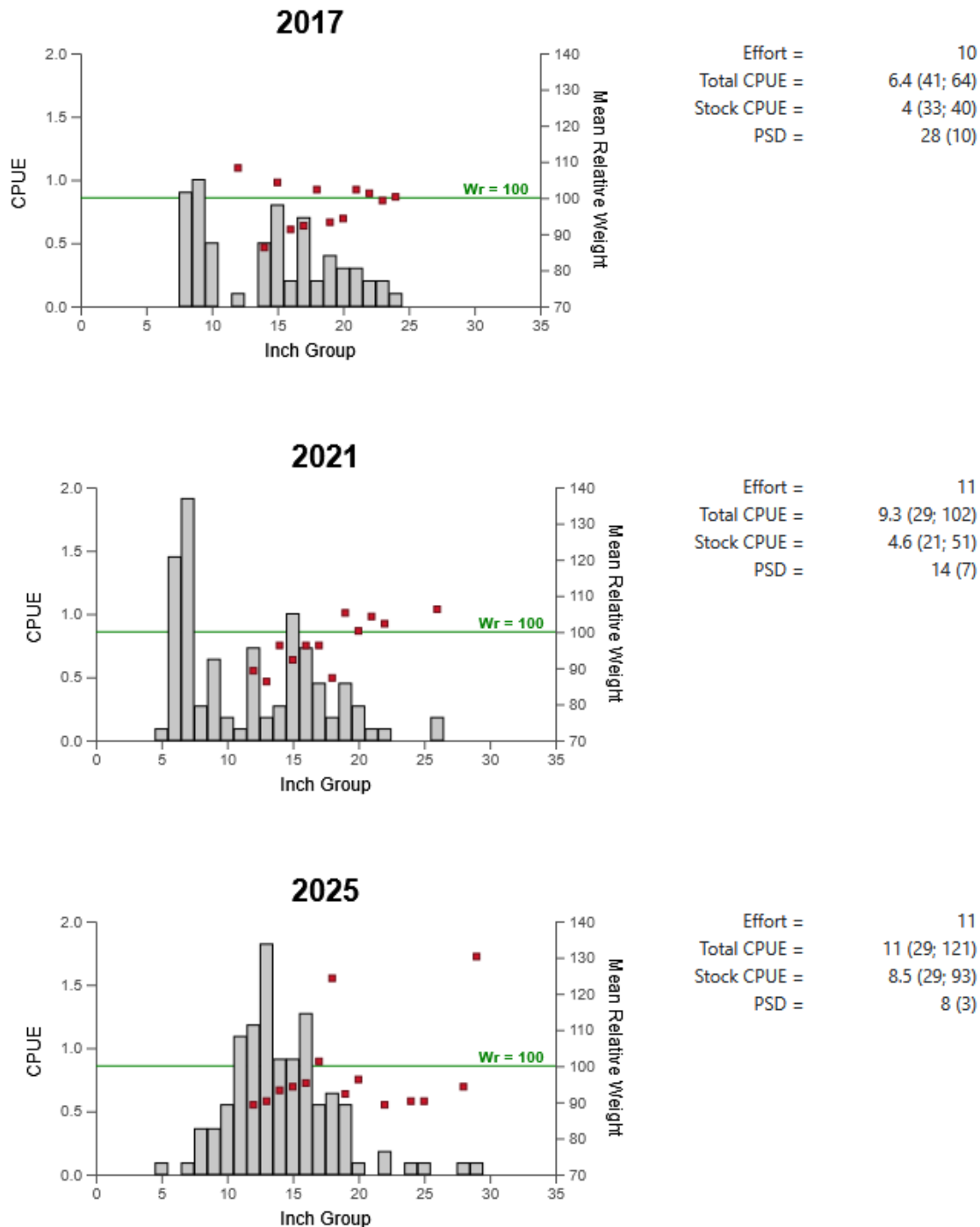


Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weights (squares) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill netting surveys, Limestone Reservoir, Texas, 2017, 2021, and 2025. The horizontal line represents a mean relative weight of 100.

Channel Catfish

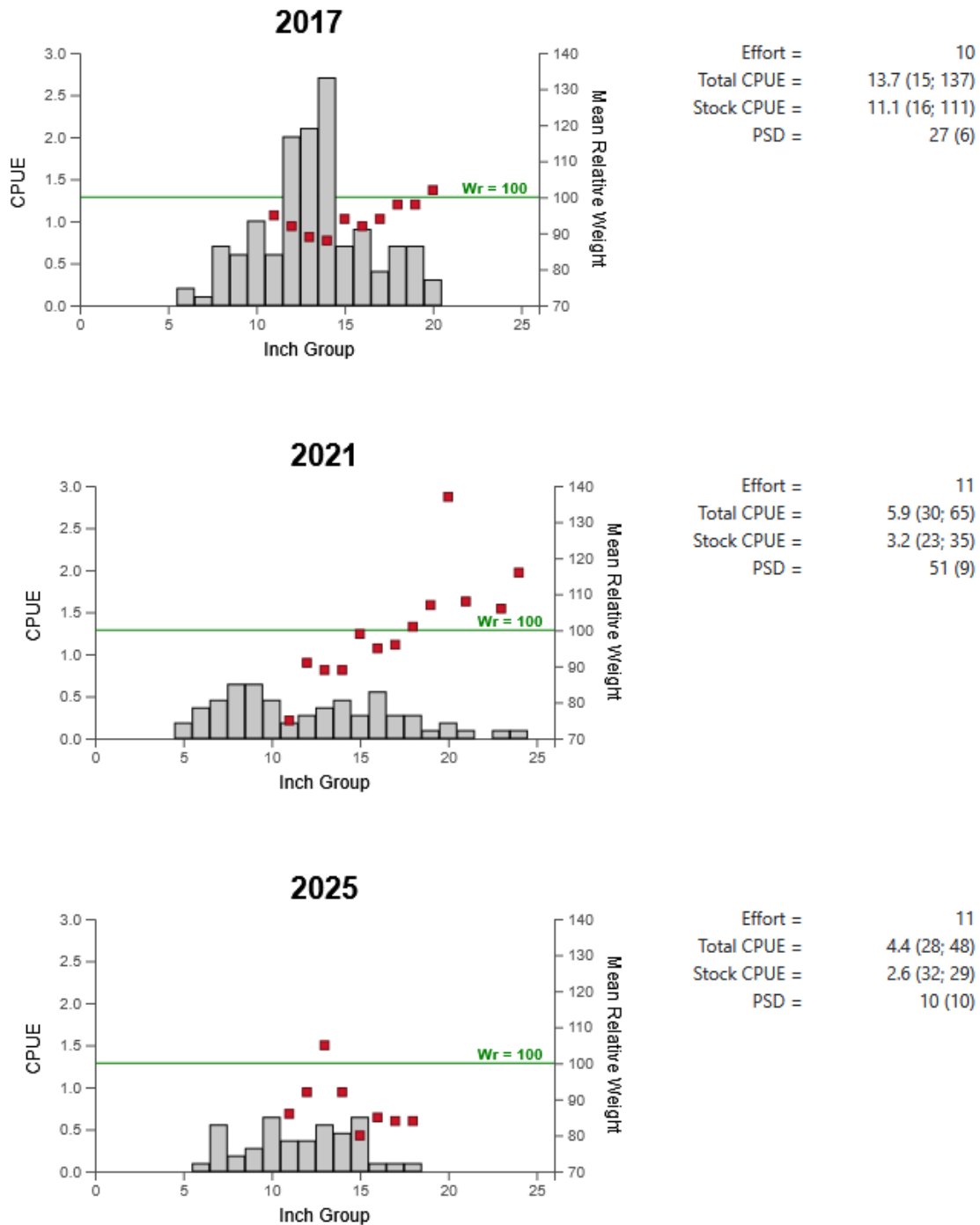


Figure 5. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weights (squares) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill netting surveys, Limestone Reservoir, Texas, 2017, 2021, and 2025. The horizontal line represents a mean relative weight of 100.

White Bass

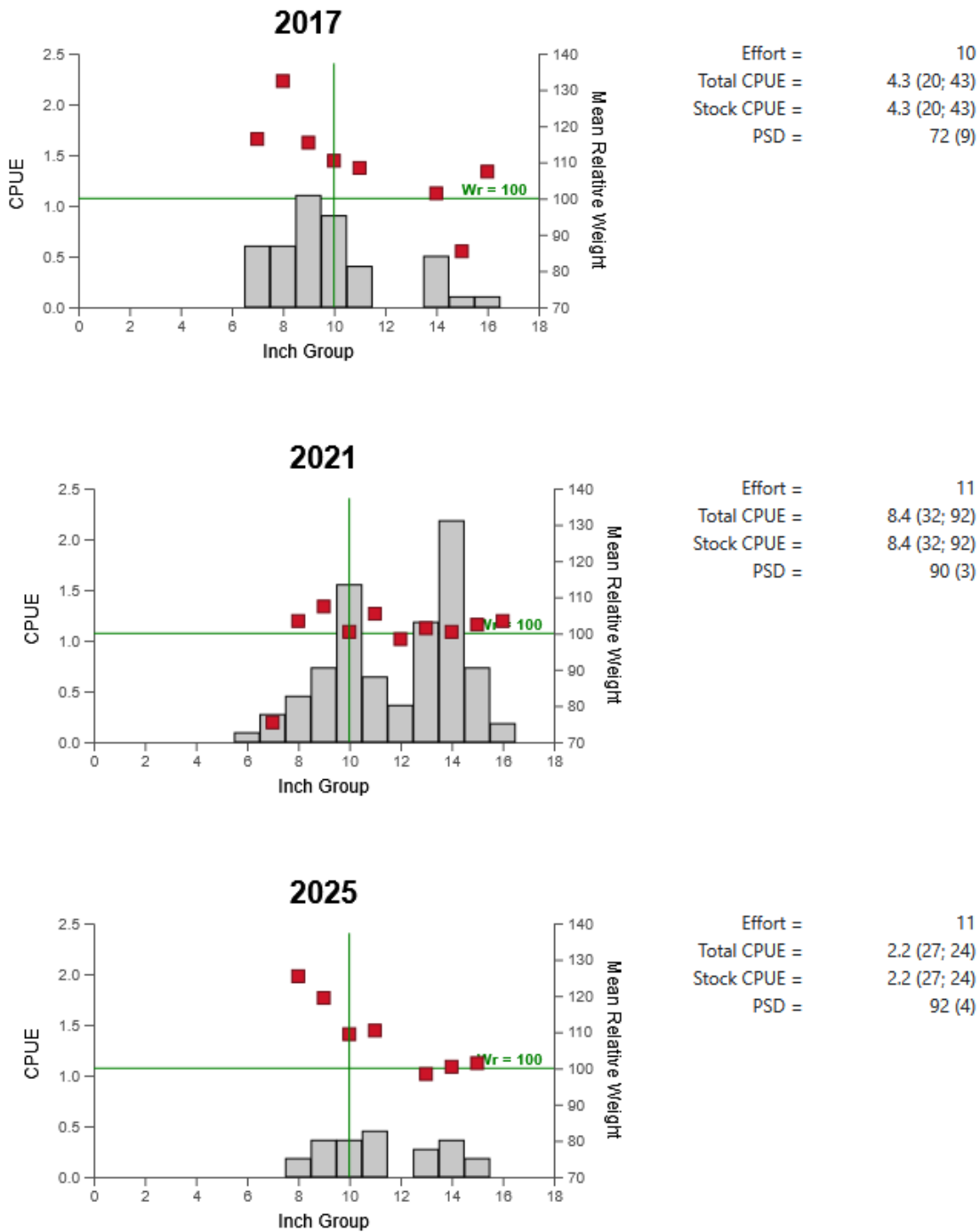


Figure 6. Number of White Bass caught per net night (CPUE, bars), mean relative weight (squares), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill netting surveys, Limestone Reservoir, Texas, 2017, 2021, and 2025. The horizontal line represents a mean relative weight of 100, while the vertical line represents the 10-inch minimum length limit.

Largemouth Bass

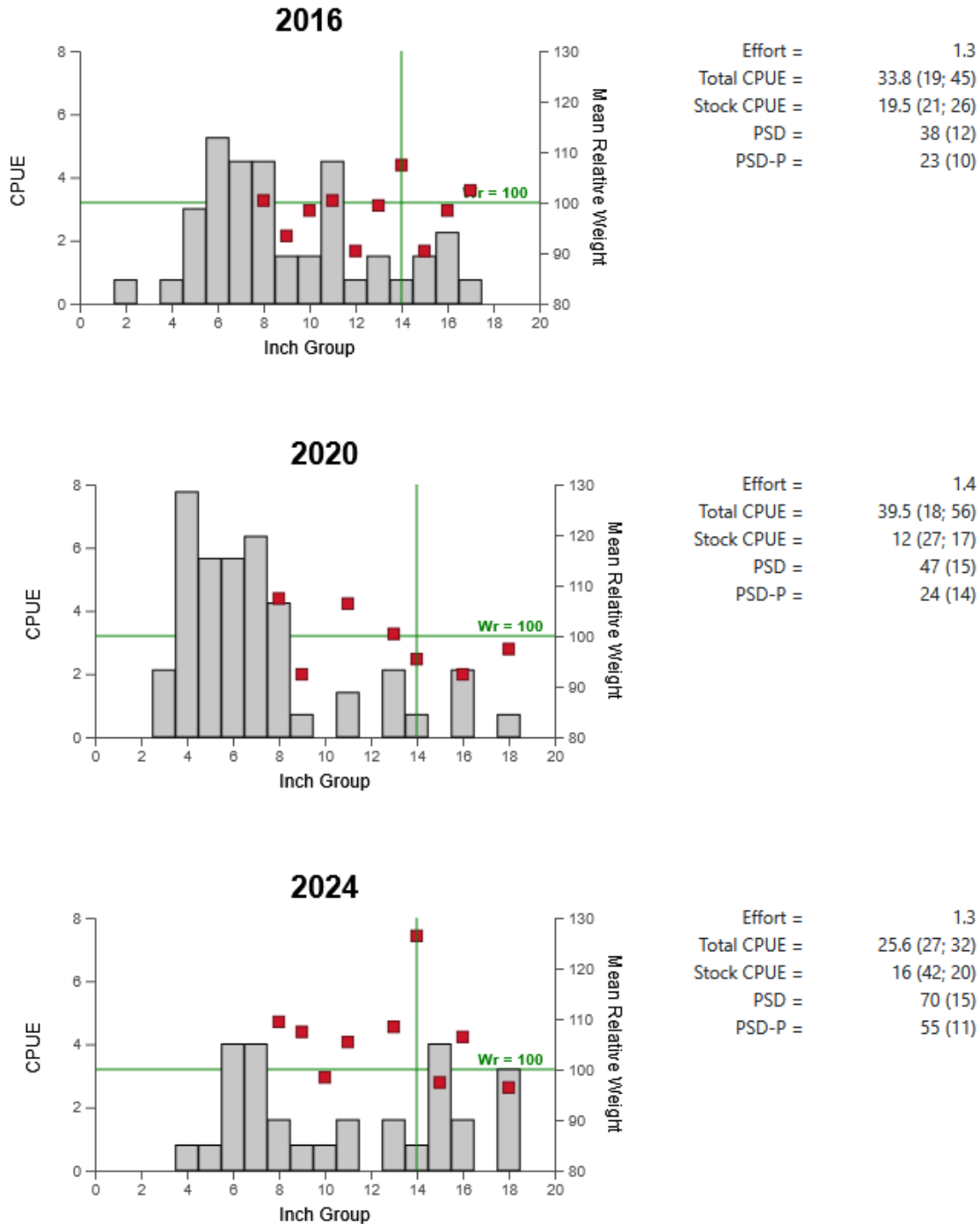


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weights (squares) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for fall electrofishing surveys, Limestone Reservoir, Texas, 2016, 2020, and 2024. The horizontal line represents a mean relative weight of 100, while the vertical line represents the 14-inch minimum length limit.

Table 8. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Limestone Reservoir, Texas, 2012, 2016, 2020 and 2024. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Hybrid = hybrid between a FLMB and a NLMB. Genetic composition was determined with micro-satellite DNA analysis.

Year	Sample size	Number of Fish			% FLMB alleles	% FLMB
		FLMB	Hybrid	NLMB		
2012	28	0	26	2	38	7
2016	30	0	29	1	26	3
2020	29	0	28	1	31	3
2024	22	0	24	3	28	0

White Crappie

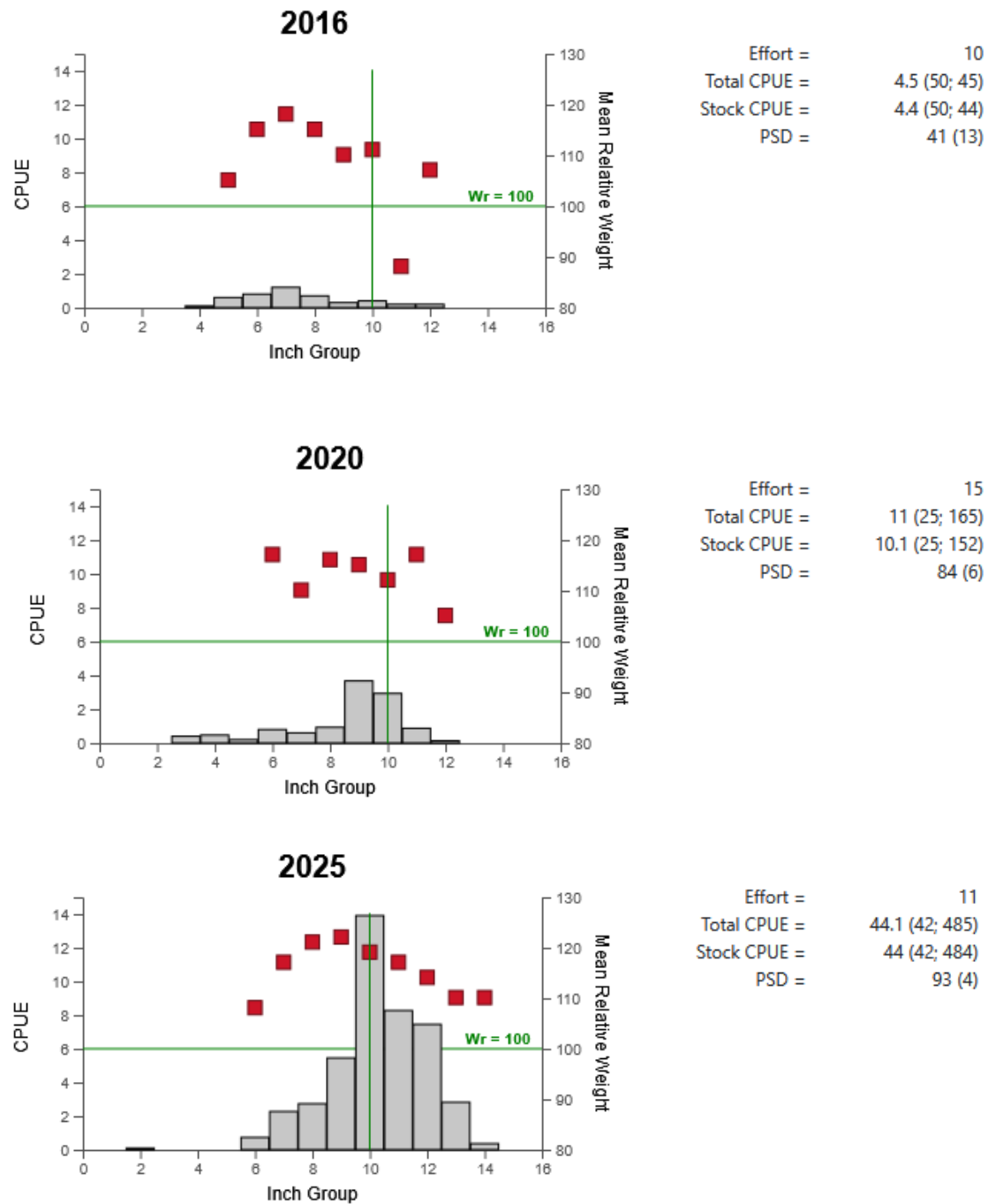


Figure 8. Number of White Crappie caught per net-night (CPUE, bars), mean relative weights (squares) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for fall (2016), fall (2020) and late winter (2025) trap net surveys, Limestone Reservoir, Texas. The horizontal line represents a mean relative weight of 100, while the vertical line represents the 10-inch minimum length limit.

Proposed Sampling Schedule

Table 9. Proposed sampling schedule for Limestone Reservoir, Texas. Survey period is June through May. Electrofishing surveys are conducted in fall, trap net surveys are conducted in late winter and gill net surveys are conducted in spring. Scheduled surveys are denoted by X.

	Survey year			
	2025-2026	2026-2027	2027-2028	2028-2029
Angler Access				X
Vegetation	X	X	X	X
Electrofishing – Fall				X
Electrofishing – Spring				
Trap netting – Late Winter				X
Gill netting				X
Creel Survey				
Report				X

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

Number (N), relative standard error (RSE), and catch per unit effort (CPUE) of all target species collected from all gear types from Limestone Reservoir, Texas, 2024-2025. Sampling effort was 11 net nights for gill netting, 11 net nights for trap netting and 1.3 h for electrofishing.

Species	Gill Netting		Electrofishing		Trap Netting	
	N/RSE	CPUE	N/RSE	CPUE	N/RSE	CPUE
Gizzard Shad			360/22	288.0		
Threadfin Shad			592/28	473.6		
Blue Catfish	121/29	11.0				
Channel Catfish	48/28	4.36				
Flathead Catfish	2/67	0.18				
White Bass	24/27	2.18				
Bluegill			48/52	38.4		
Longear Sunfish			23/51	18.4		
Green Sunfish			5/70	4.0		
Warmouth			1/100	0.8		
Largemouth Bass			32/27	25.6		
White Crappie	44/20	4.0			485/42	44.09
Black Crappie	3/71	0.27			34/54	3.09

APPENDIX B – Historical catch rates for targeted species

Catch rates (CPUE) of targeted species by gear type for standard surveys on Limestone Reservoir, Texas, 2000 to present. Surveys utilized randomly selected stations. Electrofishing stations were conducted with a 5.0 Smith-Root GPP (Gas Powered Pulsator) until 2010, a 7.5 Smith-Root GPP from 2010 to 2019, and a Smith-Root Apex unit thereafter.

Electrofishing

	2000	2004	2008	2012	2016	2020	2024	Average
Gizzard Shad	94.0	56.22	190.0	299.5	429.75	343.76	288.0	243.03
Threadfin Shad	180.5	419.61	1302.0	1282.0	1379.25	568.94	473.6	800.84
Bluegill	54.5	14.61	104.0	21.5	73.5	26.12	38.4	47.52
Longear	25.0	5.09	45.33	9.0	16.5	7.76	18.40	18.15
Redear	1.5	0.65	12.67	2.0	1.5	0.71	0.0	2.71
Warmouth	1.5	0.39	0.67	0.0	1.5	0.0	0.8	0.69
Green	9.0	0.0	0.0	0.0	3.75	0.0	4.0	2.39
Largemouth Bass	60.0	46.83	32.0	25.5	33.75	39.53	25.6	37.6
Inland Silverside	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.14

Trap netting

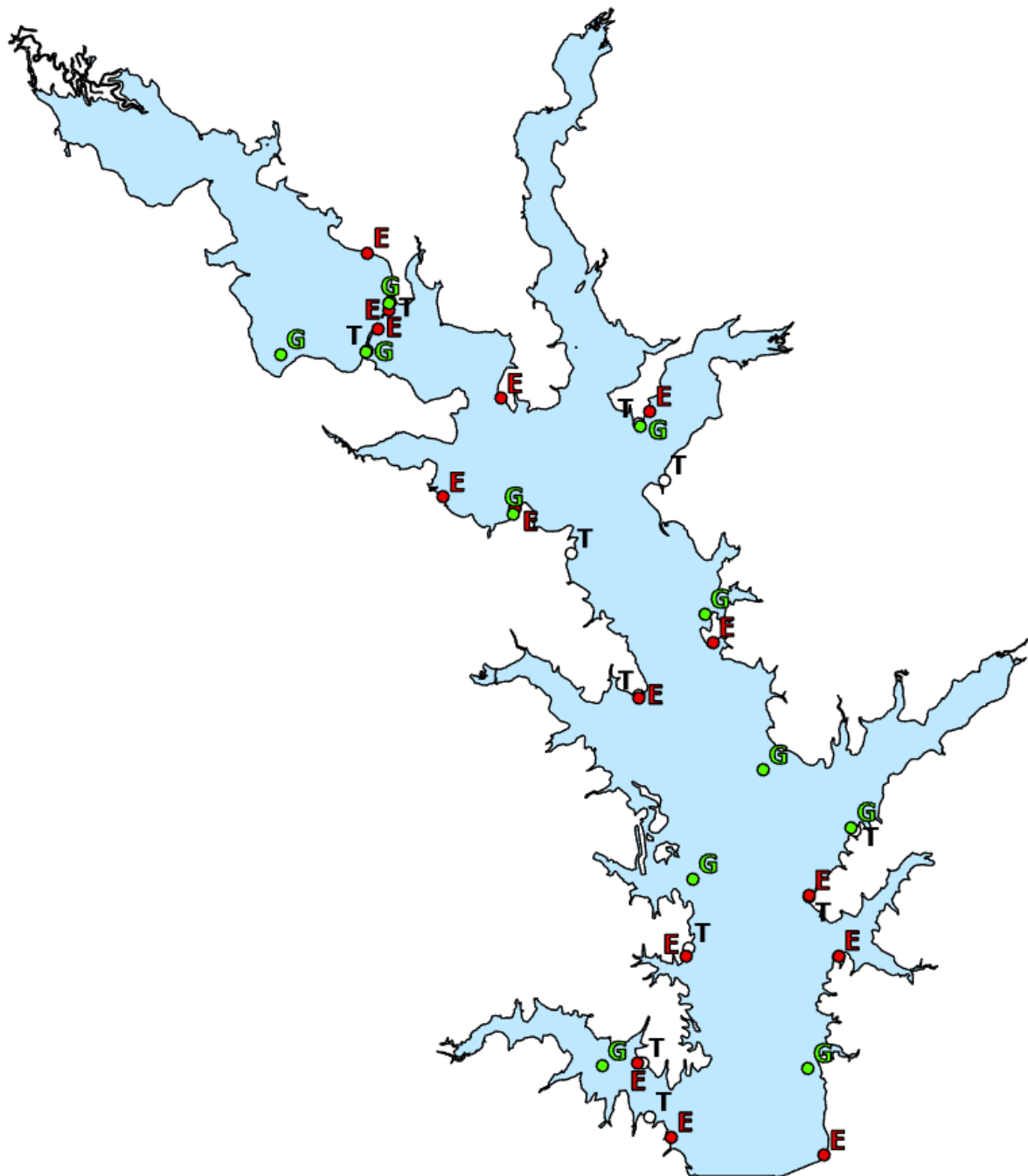
	2000	2004	2008	2016	2020	2025	Average
White Crappie	10.57	5.04	2.9	4.5	11.0	44.1	13.0
Black Crappie	0.43	0.08	0.0	0.6	0.13	3.1	0.7

Gill netting

	2001	2005	2009	2013	2017	2021	2025	Average
Blue Catfish	2.33	2.08	12.6	21.13	6.4	9.27	11.0	9.26
Channel Catfish	3.6	3.3	6.2	14.0	13.7	5.91	4.36	7.3
Flathead Catfish	0.2	0.0	0.0	0.13	0.2	0.18	0.18	0.13
White Bass	4.27	6.15	5.2	4.47	4.3	8.36	2.18	4.99
White Crappie	0.0	0.0	0.0	2.6	4.6	10.55	4.0	3.11
Black Crappie	0.0	0.0	0.0	0.8	0.9	0.82	0.27	0.4

APPENDIX C – Map of sampling locations

Location of sampling sites, Limestone Reservoir, Texas, 2024-2025. Electrofishing, gill netting and trap netting stations are indicated by red E, green G, and black T, respectively. Water level was 2.5' low during the fall 2024 electrofishing survey, and 1-1.5' below conservation pool during trap net and gill net surveys.





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