

H-4 Reservoir

2019 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

Prepared by:

Dusty McDonald, Assistant District Management Supervisor
and
Greg Binion, District Management Supervisor

Inland Fisheries Division
Corpus Christi District, Mathis, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

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Survey and Management Summary

Fish populations in H-4 Reservoir were surveyed in 2019 using electrofishing, trap netting, and hoop netting and in 2020 using gill netting. Historical data are presented with the 2019-2020 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: H-4 is a 696-acre reservoir on the Guadalupe River in Gonzales County and is controlled by the Guadalupe-Blanco River Authority (GBRA). The reservoir was impounded in 1931 to provide water for hydroelectric generation and recreation. The substrate was primarily silt, sand, clay with some gravel and rock. Angler and public boat access are limited to one pay-to-use boat ramp and there are no handicap-specific facilities. Primary habitat is composed of boat docks and piers, timber, native floating-leaved and submersed vegetation, hydrilla, and water hyacinth.

Management History: Important sport fish species include Channel Catfish, Largemouth Bass, and crappie. Anglers have reported catching White Bass, Palmetto Bass, and Striped Bass from this reservoir, but these species have not been collected in any survey. Blue Catfish were stocked historically, but relative abundance remains low. The 2016 management plan focused on utilizing additional fishing gear methods to better assess declines in sport fish populations and continuing to assist GBRA with nuisance vegetation control.

Fish Community

- **Prey species:** Bluegill and other sunfishes formed the forage base for H-4 Reservoir. Bluegill catch rates have increased relative to 2017 with much of the population being smaller. Some Redear Sunfish did reach 8-inches and might provide decent angling opportunities. While Gizzard Shad are present, their catch rate has decreased and there are few available for predators within the reservoir.
- **Catfishes:** Channel Catfish catch rate increased since the last survey and the size composition was dominated by larger individuals with fish up to 29-inches collected. Blue and Flathead Catfish were present in low abundance. Flathead Catfish abundance has increased since previous surveys with fish reaching up to 30-inches with our survey.
- **Largemouth Bass:** Largemouth Bass fall electrofishing catch rate increased since 2017. Size composition was balanced and comprised of both juvenile and adult fish. One fish over 9 pounds was collected.
- **Crappies:** White Crappie catch rates have decreased since 2013 and abundance has remained low since. Black Crappie are present in the reservoir; however White Crappie is the predominant species.

Management Strategies: Continue managing fish populations under current regulations. Continue to work with GBRA on controlling water hyacinth and hydrilla. Monitor the spread and expansion of water lettuce and East Indian hygrophylla. Continue electrofishing, trap netting and gill netting to monitor population abundance of Largemouth Bass, crappies, and catfishes, respectively. Conduct a low-frequency electrofishing survey with appropriate settings to target Flathead Catfish to better assess population abundance and size composition.

Introduction

This document is a summary of fisheries data collected from H-4 Reservoir in 2019-2020. 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 species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2019-2020 data for comparison. Management strategies are included to address existing problems and/or opportunities.

Reservoir Description

H-4 Reservoir is a 696-acre mainstream reservoir on the Guadalupe River in Gonzales County and is controlled by GBRA. It is part of the Guadalupe River Chain Reservoirs that also include Dunlap, McQueeney, Placid, Meadow and Wood Reservoirs. The reservoir was impounded in 1931 for hydropower generation and recreation. The substrate is composed primarily of silt, sand, clay, and some gravel and rock. The reservoir is relatively shallow with a mean depth of 3 - 4 ft except for the river channel. Secchi disk measurements of water clarity ranged from 28 - 107 centimeters. Littoral habitat consisted of native aquatic vegetation including duckweed, spatterdock, and American lotus along with areas of timber, piers, and boat docks. Non-native vegetation (hydrilla and water hyacinth) was also present in the reservoir and consequently do provide some habitat. The GBRA lowered reservoir water level during extended periods of freezing temperatures and hired a private contractor to conduct herbicide treatments to control water hyacinth as needed. Other descriptive characteristics for H-4 Reservoir are in Table 1.

Angler Access

H-4 Reservoir boat access is limited to a single pay-use ramp with no handicap-specific facilities available at this ramp. There are several private boat ramps around H-4 Reservoir. Additional boat ramp characteristics are in Table 2. Shoreline access is very limited and only accessible at the public boat ramp area.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Binion 2016) included:

1. Investigate low frequency electrofishing and baited tandem hoop nets as a more efficient means to assess catfish populations.

Action: Low-frequency electrofishing was conducted in 2016 and included 20, 3-minute stations with poor results for Flathead Catfish (3.0/h) and Blue Catfish (11.0/h). Hoop netting for Channel Catfish was also pursued in 2019, unfortunately catch rates were poor (0.2/series).

2. Monitor presence, distribution, and the spread of invasive aquatic vegetation and implement control measures, as needed. Monitor for presence of zebra mussels.

Action: The spread of zebra mussels in the river basin was monitored through settlement samplers at upstream reservoirs. Zebra mussels have been detected at several upstream reservoirs, but as of yet have not been detected in H-4 Reservoir. Invasive species signage was provided to GBRA and posted at boater access points throughout the Guadalupe Chain Reservoirs.

Harvest regulation history: Sport fish in H-4 Reservoir are managed with statewide harvest regulations (Table 3).

Stocking history: Historically Blue Catfish and Channel Catfish, Striped Bass, and Florida Largemouth Bass have been stocked in H-4 Reservoir. Radio-tagged Grass Carp were stocked in the mid-90s as part of a research project based on their movement within the reservoir. No stockings occurred during the current study period. A complete stocking history is in Table 4.

Vegetation/habitat management history: Water hyacinth, water lettuce, and hydrilla are present in H-4 Reservoir. Water hyacinth has been a problematic vegetative species for years. Prior to 1998, TPWD controlled water hyacinth on the reservoir through herbicide applications. Beginning in 2001, the GBRA began herbicide treatments through a contractor to treat specific problematic sections of the reservoir. However, herbicide applications proved ineffective as water hyacinth expanded to the entire reservoir. More recent chemical control efforts, in conjunction with selective winter drawdowns, have been effective in control of water hyacinth. During this report period, GBRA treated 101 acres of water hyacinth in 2018 and 20 acres in 2019. Water hyacinth weevils have been released in the past but provided little control. Water lettuce is also present on the reservoir but has not been as problematic and widely distributed as water hyacinth. While water lettuce weevils were introduced in 1997 and 1998, the reservoir experienced a 100-yr flood in 1998, flushing most of the water lettuce downstream. Hydrilla has historically been present around the boat ramp but had yet to create access problems. In 2014, coverage of hydrilla expanded throughout the reservoir and was controlled with herbicides. Grass Carp were also stocked in an upstream section of the Guadalupe River and may have provided additional control. East Indian hygrophila was once well-established around the boat ramp but has since been replaced by native submersed aquatic vegetation.

Water transfer: H-4 Reservoir is currently being used for hydroelectric generation, recreation, and flood control. As of June 2020, there are no plans to build a pump station on this reservoir and no inter-basin transfers are known to exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for H-4 Reservoir (Binion 2016). Primary components of the OBS plan are listed in Table 5. Trap net survey stations were biologist selected, all other survey sites were randomly selected (less trap netting) and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Electrofishing - Largemouth Bass, sunfishes, and Gizzard Shad were collected by electrofishing (1 hour at 12, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Trap netting - Crappie were collected using trap nets (7 net nights at 7 stations) at biologist selected stations. CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting - Channel, Flathead, and Blue Catfish were collected by gill netting (7 net nights at 7 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Low-frequency electrofishing - Blue and Flathead Catfish were collected by low-frequency electrofishing (1 hour at 20, 3-minute stations). CPUE for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Tandem hoop nets - Channel Catfish were collected using 5 tandem hoop-net series at 5 stations. Nets were baited with soap and deployed for 2-night soak durations. CPUE for tandem hoop netting was recorded as the number of fish caught per tandem hoop net series (fish/series).

Angler opinion survey - An angler opinion survey was developed to gauge and assess angler preferences about which reservoir they use most often, targeted fish species, and general satisfaction with the current regulations within the Guadalupe Chain Reservoirs system (Dunlap Reservoir, McQueeney Reservoir, Placid Reservoir, Meadow Reservoir, H-4 Reservoir, and Wood Reservoir). This survey was conducted in conjunction with our winter and spring quarter creel surveys of 2019 at Dunlap Reservoir and unexpectedly ended at its dewatering event on May 14, 2019. Ninety-six anglers participated with the multiple-choice opinion survey. Angler opinion survey questions and results are included in Appendix D.

Statistics - Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Index of Vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV.

Habitat - A structural habitat survey was conducted in 2007 and has not significantly changed since. Vegetation surveys were conducted in 2015 and 2019 to monitor expansion of hydrilla, water hyacinth and water lettuce. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Results and Discussion

Habitat: Littoral zone structural habitat consisted primarily of overhanging brush, eroded bank, and piers (Findeisen and Binion 2008). Native vegetation covered 7.5% of the reservoir's surface area compared to 11.5% coverage by non-native vegetation (Table 6). Hydrilla has been steadily expanding in coverage from 2.7 acres in 2015 to 43.4 acres in 2019.

Prey species: Bluegill and Redear sunfish make up most of the prey available for predators in H-4 Reservoir. Gizzard Shad were also present in the electrofishing survey, however, catch rates were

considerably lower in 2019 (53.0/h) compared to the 2013 and 2017 surveys (98.0/h and 77.0/h, respectively). Additionally, the Index of Vulnerability (IOV) for Gizzard Shad in 2019 was also poor, with only 11% of Gizzard Shad available to existing predators (Figure 1). Bluegill catch rate has increased in 2019 (115.0/h) compared to the previous survey in 2017 (62.0/h) and all samples indicated Bluegill size structure continued to be dominated by small individuals (Figure 2). Redear Sunfish continually have the third highest catch rate for prey species in H-4 reservoir (40.0/h). Redear Sunfish were collected up to 8-inches providing added recreational value to anglers (Figure 3).

Channel Catfish: The total gill net catch rate indicated a moderately abundant Channel Catfish population in 2020 (3.9/nn) and total CPUE improved slightly from the 2016 survey (2.2/nn; Figure 4). Size structure was dominated by larger individuals evidenced by PSD (83) and CPUE-12 (3.3/nn). Quality-sized (≥ 16 in) fish comprised 70% of the sample, indicating excellent opportunity for anglers to catch quality-sized fish. Body condition was good with many larger size groups having excellent condition (relative weights ≥ 100). Hoop net sampling conducted in 2019 resulted in poor catch rates with only one fish caught (0.2/nn; Figure 5). In the Guadalupe Chain Reservoir angler opinion survey, catfish ranked as the third most sought species, behind Largemouth Bass and all Black Basses (Appendix D).

Blue Catfish: Gill net catch rates have historically been low for Blue Catfish, CPUE range 0.0 - 0.7/nn across survey periods with the 2020 survey reporting the highest ever recorded (0.7/nn; Figure 6). Of the previous annual gill net survey periods ($n = 10$) only six surveys have reported any presence of Blue Catfish. In the 2020 gill net survey we collected our largest fish at 26 inches with a moderate relative weight of 85. Experimental low-frequency electrofishing conducted in 2016 resulted in a fair catch rate (11.0/h; Figure 7). While all catfish species were identified as an important recreational species within the Guadalupe Chain Reservoirs, the percentage of anglers specifically targeting Blue Catfish was low (Appendix D).

Flathead Catfish: Historically, gill net catches of Flathead Catfish have been low. However, the 2020 gill net catch rates were the highest recorded (1.3/nn; Figure 8). Size structure was dominated by larger individuals with all fish ≥ 20 inches in total length. Body condition was good and most relative weights averaged > 90 . Experimental low-frequency electrofishing conducted in 2016 resulted in poor catch rates (3.0/h; Figure 9). While all catfish species were identified as an important recreational species within the Guadalupe Chain Reservoirs, the percentage of anglers specifically targeting Flathead Catfish was low (Appendix D).

Largemouth Bass: The 2019 fall electrofishing catch rate was 35.0/h, similar to the 2013 catch rate (37.0/h) and higher than the catch rate in 2017 (7.0/h; Figure 10). Size structure indices in 2019 indicated a balanced population (PSD = 56) and 71% of the fish collected were stock-size or greater (≥ 8 -in). Body condition of legal fish (≥ 14 -in) was excellent (relative weight > 95) and generally increased with fish length. The angler opinion survey indicated Largemouth Bass and all Black Bass species were the most sought sport fish species (84%) in the Guadalupe River Chain Reservoirs (Appendix D).

Crappie: Both White and Black Crappie are present in the reservoir, but White Crappie continues to be the more dominant crappie species. White Crappie abundance has remained low in the last two surveys (3.0/nn in 2017 and 3.1/nn in 2019; Figure 11). Size structure was similar (PSD range: 76 - 100) across years. While catch rates are low there are still legal-sized fish (10-in) available for angler harvest. Body condition was poor to adequate (range: 52 - 94) depending on size class. The Guadalupe River Chain Reservoir angler opinion survey designated that, compared to all black bass and catfish, crappies were less preferred (Appendix D).

Fisheries Management Plan for H-4 Reservoir, Texas

Prepared - July 2020

ISSUE 1: Two Guadalupe River Chain Reservoirs dewatered because of dam failures in 2016 (Wood Reservoir) and 2019 (Dunlap Reservoir). Guadalupe-Blanco River Authority (GBRA) has expressed concern for public safety on the remaining reservoirs. Plans were initiated to dewater the four other reservoirs currently managed and controlled by the GBRA (including: H-4 Reservoir, Placid Reservoir, Meadow Reservoir, and McQueeney Reservoir) on September 16, 2019. However, a temporary injunction postponed plans to dewater the reservoirs with a reevaluation in October 2020. In the meantime, an independent panel was assembled to identify safe zones for the public, GBRA created access restriction maps for the Guadalupe Chain Reservoirs, including H-4 Reservoir (Appendix E). Further, GBRA and TPWD have expressed concerns for aquatic species if a dewatering event were to occur.

MANAGEMENT STRATEGY

1. TPWD will provide technical guidance and assist GBRA in the development and review of an Aquatic Resources Relocation Plan (ARRP). Further, TPWD will provide available resources (manpower, boats) to assist the GBRA implement a relocation plan to minimize loss of fish, mussels, and other threatened and endangered species.

ISSUE 2: Hydrilla has substantially increased in total coverage within H-4 Reservoir. In, 2019 hydrilla expanded to 43.4 acres of surface coverage from the last survey (2015; 2.7 acres). This expansion has restricted recreational access to certain areas of the reservoir (Appendix C).

MANAGEMENT STRATEGY

1. Coordinate with GBRA and TPWD Aquatic Habitat Enhancement on the best approach for hydrilla management in areas where recreational boating and angling is restricted.
2. Conduct annual surveys to monitor hydrilla coverage.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) 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 (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state. Zebra mussels were detected at several upstream reservoirs in 2018 - 2019.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through the use of media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups.
4. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.
5. Continue to assist GBRA to acquire cost-share funding for invasive species control initiatives.

Objective-Based Sampling Plan and Schedule (2020-2024)

Sport fish, forage fish, and other important fishes

Sport fish in H-4 Reservoir include Largemouth Bass, White Crappie, Black Crappie, Blue Catfish, Channel Catfish, and Flathead Catfish. Important forage species include Gizzard Shad, Bluegill and Redear Sunfish. Proposed sampling schedule to meet the following OBS Plan can be found in Table 7.

Low-density fisheries

Blue Catfish: Blue Catfish are present, but their abundance is relatively low compared to Channel Catfish, the predominant catfish species. Since 1988, the mean gill net catch rate was 0.3/nn with many surveys reporting zero catches. A low-frequency electrofishing survey was conducted in the fall of 2016 aimed to collect Blue Catfish, however only 11 fish were collected in 20 stations (CPUE: 11/hr). Blue Catfish presence/absence will be monitored via gill net surveys.

Flathead Catfish: Flathead Catfish are also present in the reservoir in low abundance. Since 1988, the mean gillnet catch rate was 0.6/nn, suggesting a higher abundance of Flathead Catfish compared to Blue Catfish. While low-frequency electrofishing was used in 2016, the attempt was not specifically targeting Flathead Catfish, but rather, settings were generalized to capture Blue Catfish. An exploratory, low-frequency electrofishing survey is warranted with settings calibrated to target Flathead Catfish in order to evaluate its utility as an alternative sampling gear for Flathead Catfish. Also, Flathead Catfish presence/absence will continue to be monitored via gill net surveys.

Survey objectives, fisheries metrics, and sampling objectives

Channel Catfish: Channel Catfish are the predominant catfish species in H-4 Reservoir and catfishes are a popular target species in the Guadalupe River Chain Reservoirs. Channel Catfish have been surveyed using gill nets once every 3 - 4 years from 1988 - 2020. Past gill net catch rates were good with a mean catch rate of 7.2/nn. The last ten surveys have rarely met objectives for variance or sample size to accurately monitor major changes in size structure, age/growth, or body condition of Channel Catfish. The relative standard error (RSE) values of catch rate (CPUE) have never been ≤ 25 and only one survey has yielded more than 50 stock-size Channel Catfish. A hoop net survey was attempted in the summer of 2019, but only a single fish was collected with five tandem hoop net series. Decent gill net catch rates the following spring suggest that fish were likely present in H-4 Reservoir during the hoop net survey suggesting that this gear type wasn't successful. Gill nets will continue to be our primary catfish fishing gear used to monitor trends in population abundance. A minimum of seven gill nets set at randomly

selected stations will be used to survey Channel Catfish in spring 2024 to monitor species presence/absence and continue collection of historically comparable trend data.

Largemouth Bass: Largemouth Bass and other black basses are the most popular sport fish in the Guadalupe River Chain Reservoirs. Trend data for Largemouth Bass catch rate, size structure, and body condition was collected every 3 - 5 years since 1988 and at biennially every year since 1999. Historical catch rates of Largemouth Bass have varied and is likely attributed to the availability of suitable habitat (i.e., submersed aquatic vegetation). The mean catch rate (CPUE) for Largemouth Bass from 1988 to present was 36.5/h (N = 13, standard deviation = 20.9, range: 4.0 - 69.0/h). Mean stock size catch rate for the same time frame was 19.9/h (N = 13, standard deviation = 13.4, range: 4.0 - 42.0/h). The population appears to have adequate reproduction and recruitment when water hyacinth is treated and the submersed aquatic vegetation can flourish. Biennial collection of trend data with fall electrofishing will be sufficient to determine presence/absence and potentially detect large-scale changes in population dynamics (relative abundance, size structure, body condition, and age and growth) that may warrant further investigation and more intensive sampling. A minimum of 12 randomly-selected electrofishing sites will be sampled in 2021 and 2023 to monitor for presence/absence. The mean age at which fish become legal to harvest will be determined by examining sagittal otoliths of a minimum of 13 fish sized from 13.0 - 14.9 from each survey.

Crappies: White Crappie and Black Crappie are both present in the reservoir with White Crappie being the predominant species. Catch rate, size structure, and body condition trend data was collected every 2 - 3 years from 1988 - 1999, and then every other year since. Mean total CPUE of White Crappie from trap nets at random stations across sampling periods was 10.7/nn (N = 8, SD = 6.5), much lower than the biologist-selected stations 21.8/nn (N = 7, SD = 21.8). Collection of trend data biennially will allow for determination of large-scale changes in population dynamics (relative abundance, size structure, and body condition). A minimum of seven biologist selected sites will be sampled in 2022 and 2024 with a sampling objective of 50 stock-size crappies which has historically been attained. Additional trap net sampling will be conducted if the target sample size is not reached. Achieving a reasonable RSE (< 25) for stock-size CPUE will likely be unattainable with practical sampling effort.

Gizzard Shad and Bluegill: Gizzard Shad and Bluegill are the primary forage at H-4. Like Largemouth Bass, trend data on CPUE and size structure of Gizzard Shad and Bluegill have been collected at a minimum every 3 - 5 years from 1988 - 1999 and every other year since. Continuation of sampling, as per Largemouth Bass above, will allow monitoring of large-scale changes in Gizzard Shad and Bluegill relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers for size structure estimation (Gizzard Shad IOV; 50 fish minimum and Bluegill PSD; 50 stock size fish minimum at 12 randomly selected 5-minute stations) and relative abundance estimates (Bluegill CPUE-Total; RSE < 25, anticipated effort is 12 stations based on historical data). The objective of attaining an RSE \leq 25 will only be set for Bluegill as Gizzard Shad CPUE-Total RSE's fluctuate substantially.

Literature Cited

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Tables and Figures

Table 1. Characteristics of H-4 Reservoir, Texas.

Characteristic	Description
Year constructed	1931
Controlling authority	Guadalupe-Blanco River Authority
County	Gonzales
Reservoir type	Mainstem
Shoreline Development Index	2.91
Conductivity	450 μ S/cm

Table 2. Boat ramp characteristics for H-4 Reservoir, Texas, August 2019. Reservoir elevation at time of survey was 343 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Hill Shade Ramp	29.50518 -97.64340	Y	5	339	Excellent, no access issues

Table 3. Harvest regulations for H-4 Reservoir, Texas.

Species	Bag limit	Length limit
Gar, Alligator	1 ^a	None
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5 ^b	14-inch minimum
Bass: Spotted and Guadalupe	5 ^b	None
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

^a Mandatory harvest reporting required for all harvested Alligator Gar (reporting available through the My Texas Hunt Harvest app or at <https://apps.tpwd.state.tx.us/huntharvest/home.faces>)

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

Table 4. Stocking history of H-4 Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults.

Year	Number	Size
<u>Blue Catfish</u>		
1985	7,040	FGL
1986	7,000	FGL
1988	16	ADL
1994	114,199	FGL
1995	69,602	FGL
<u>1997</u>	<u>69,600</u>	FGL
Species Total	267,457	
<u>Channel Catfish</u>		
1972	53,000	FGL
<u>1991</u>	<u>77</u>	ADL
Species Total	53,077	
<u>Striped Bass</u>		
<u>1978</u>	<u>6,650</u>	FGL
Species Total	6,650	
<u>Florida Largemouth Bass</u>		
1978	27,900	FGL
1990	69,754	FGL
<u>1991</u>	<u>69,722</u>	FGL
Species Total	167,376	
<u>Triploid Grass Carp</u>		
1995*	25	ADL
1996**	5	ADL
<u>1997**</u>	<u>6</u>	ADL
Species Total	36	

*Radio-tagged fish

**Replace dead radio-tagged fish

Table 5. Objective-based sampling plan components for H-4 Reservoir, Texas 2019-2020.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Abundance	CPUE-Stock	
	Size structure	PSD, length frequency	
	Condition	W_r	10 fish/inch group (max)
	Age and Growth	Age at 14 inches	N = 13, 13.0-14.9 inches
Bluegill ^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
<i>Gill netting</i>			
Channel Catfish	Abundance	CPUE— Total	
	Size structure	PSD, length frequency	
<i>Trap netting</i>			
Crappie	Size structure	PSD, length frequency	N = 50
<i>Tandem hoop netting</i>			
Channel Catfish	Exploratory Use		

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

Table 6. Survey of aquatic vegetation, H-4 Reservoir, Texas, 2011-2019. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2011	2015	2019
Native submersed	30.9 (4.4)	43.0 (6.2)	3.9 (0.6)
Native floating-leaved	132.4 (19.0)	106.9 (15.4)	43.4 (6.2)
Native emergent	0.8 (< 1.0)		4.6 (0.7)
Non-native			
Hydrilla (Tier II) *	0.8 (< 1.0)	2.7 (< 1.0)	43.4 (6.2)
Water hyacinth (Tier II) *	3.1 (< 1.0)	52.2 (7.5)	37.0 (5.3)
Water lettuce (Tier III) *		1.5 (< 1.0)	

*Tier II is Maintenance Status, Tier III is Watch Status

Gizzard Shad

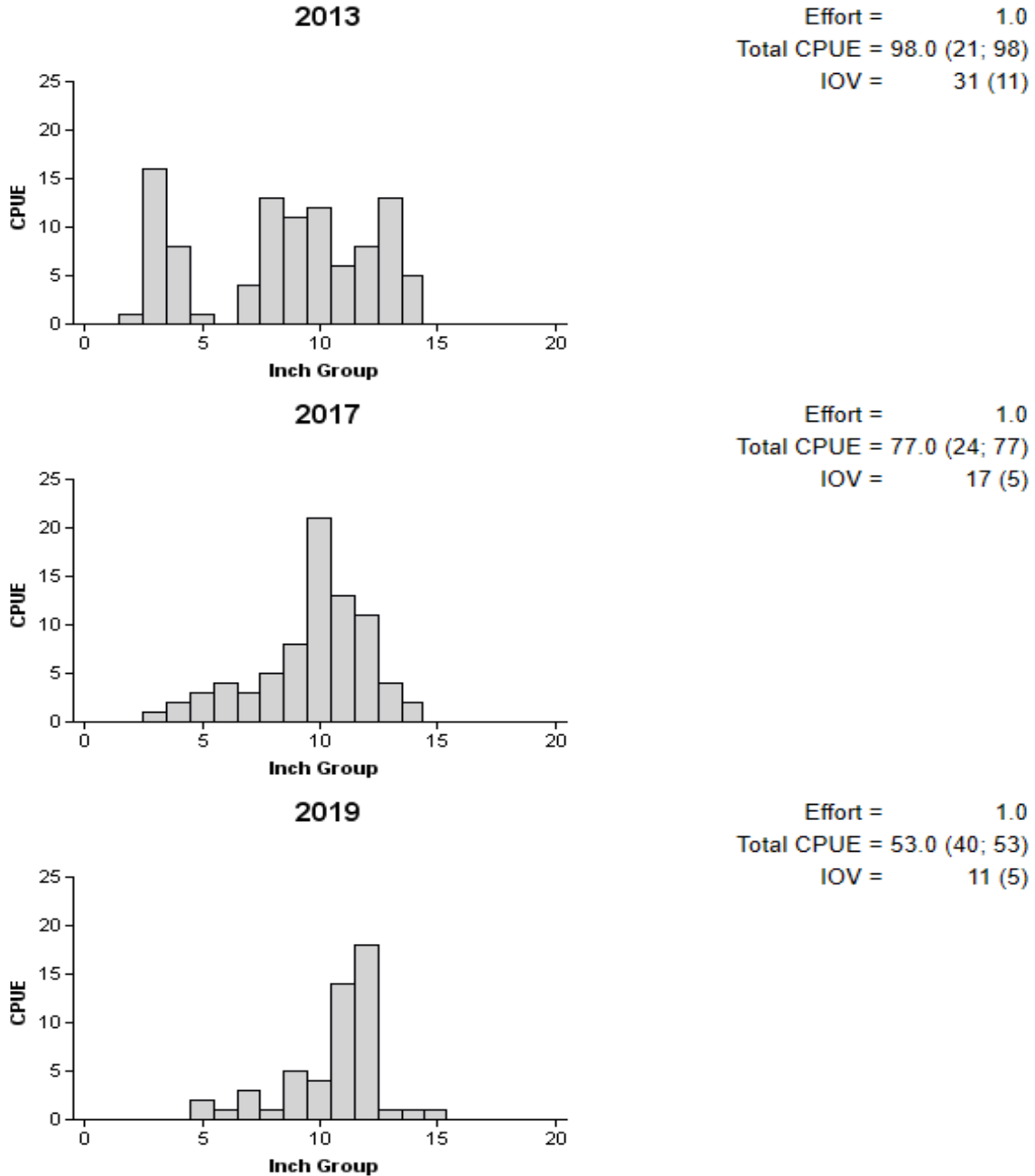
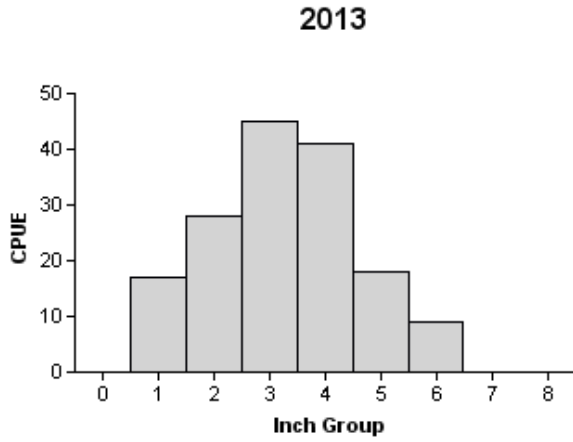
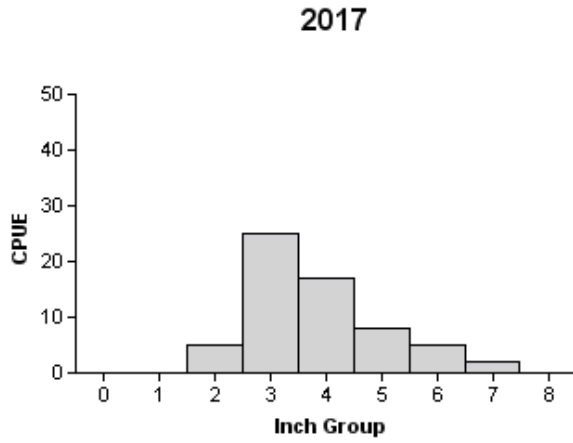


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, H-4 Reservoir, Texas, 2013, 2017, and 2019.

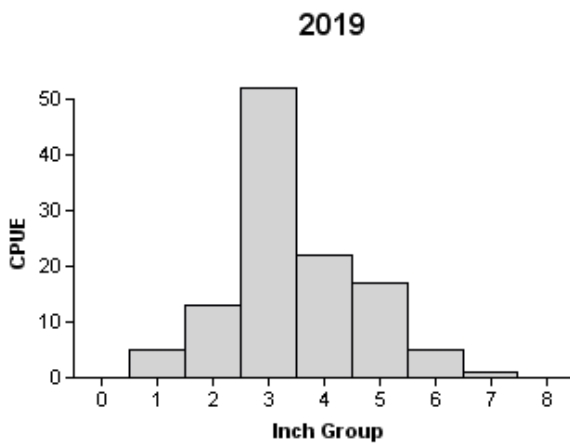
Bluegill



Effort = 1.0
 Total CPUE = 158.0 (23; 158)
 PSD = 8 (3)



Effort = 1.0
 Total CPUE = 62.0 (27; 62)
 PSD = 12 (4)



Effort = 1.0
 Total CPUE = 115.0 (19; 115)
 PSD = 6 (4)

Figure 2. 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, H-4 Reservoir, Texas, 2013, 2017, and 2019.

Redear Sunfish

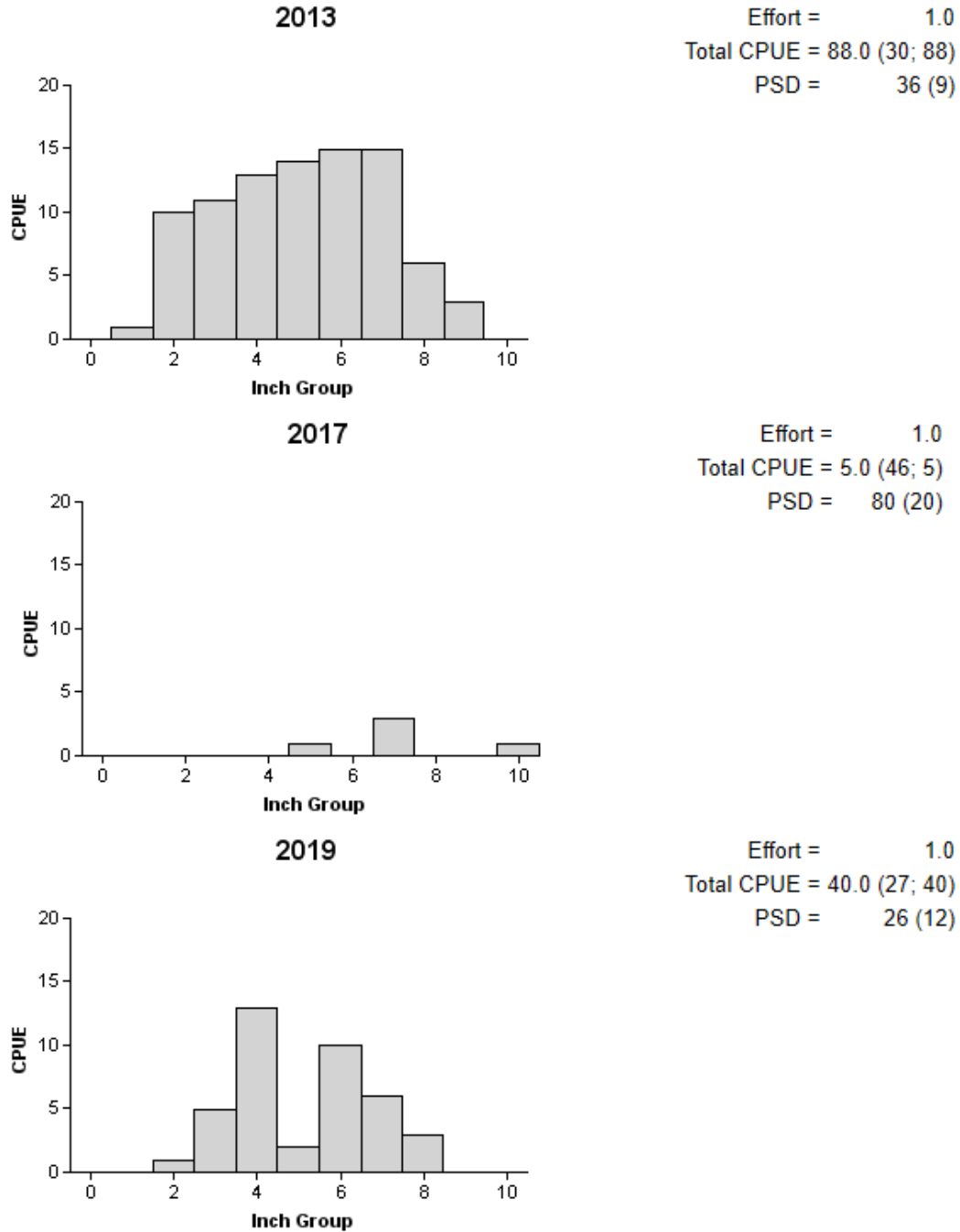


Figure 3. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, H-4 Reservoir, Texas, 2013, 2017, and 2019.

Channel Catfish

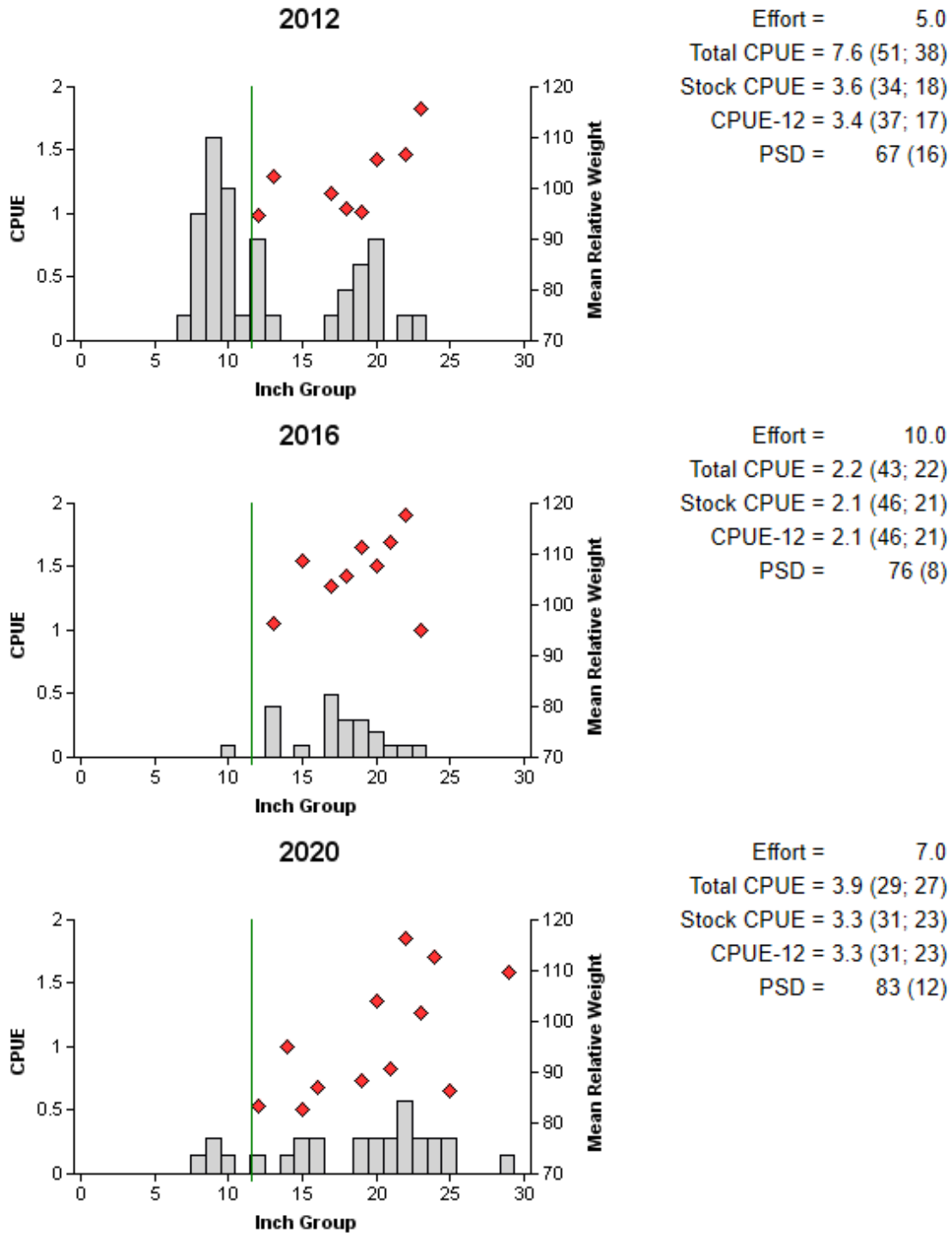


Figure 4. Number of Channel Catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, H-4 Reservoir, Texas, 2012, 2016, and 2020. Vertical lines indicate minimum length limit.

Channel Catfish

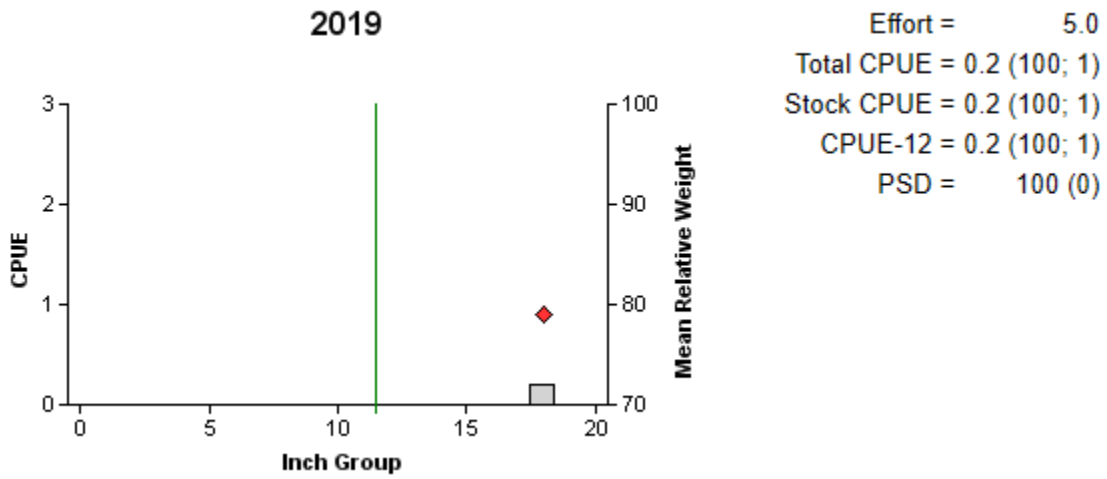


Figure 5. Number of Channel Catfish caught per series (CPUE), mean relative weight (diamond), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for tandem baited hoop net survey, H-4 Reservoir, Texas, 2019. Vertical line indicates minimum length limit.

Blue Catfish

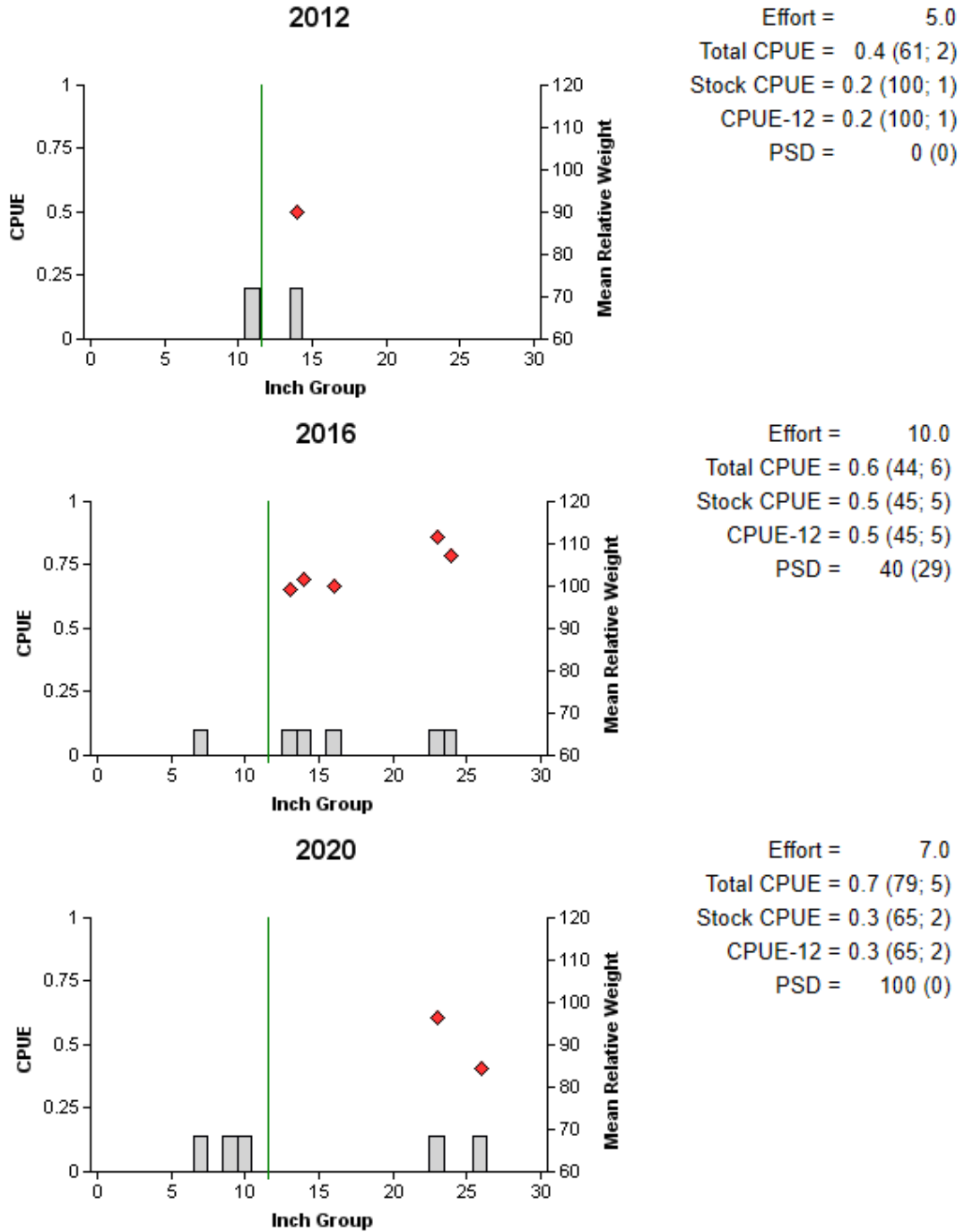


Figure 6. Number of Blue Catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, H-4 Reservoir, Texas, 2012, 2016, and 2020. Vertical lines indicate minimum length limit.

Blue Catfish

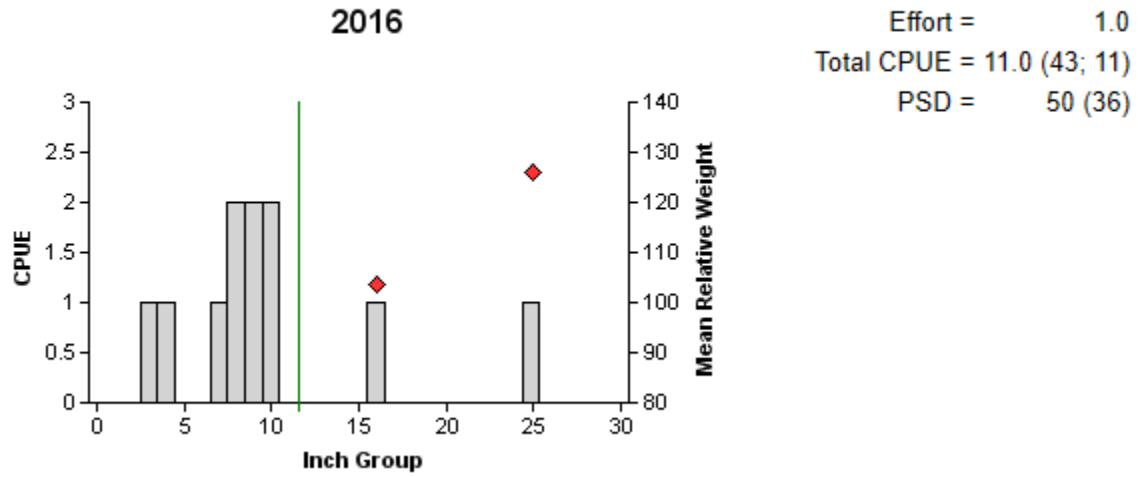


Figure 7. Number of Blue Catfish caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for low-frequency electrofishing survey, H-4 Reservoir, Texas, 2016. Vertical line indicates minimum length limit.

Flathead Catfish

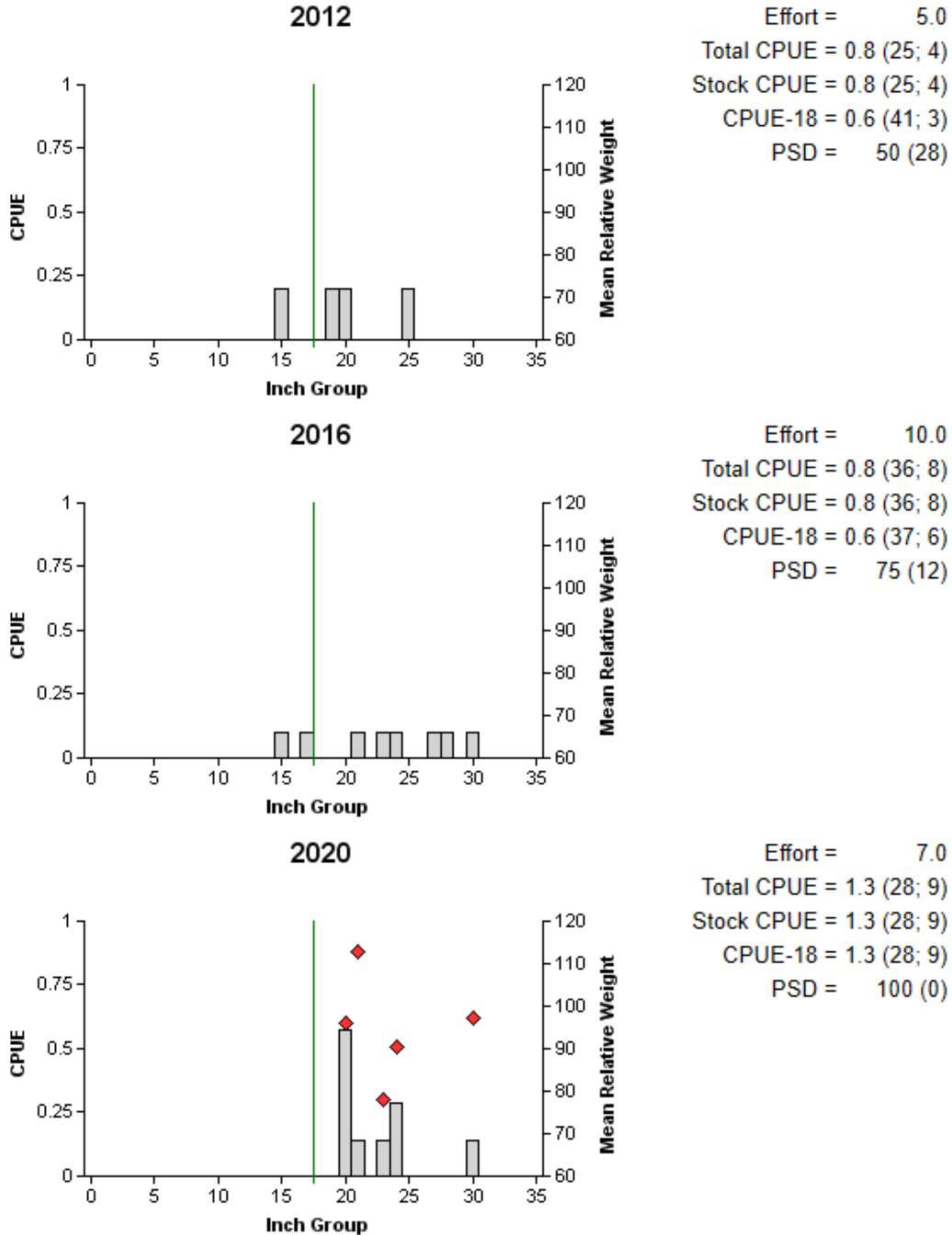


Figure 8. Number of Flathead Catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, H-4 Reservoir, Texas, 2012, 2016, and 2020. Vertical line indicates minimum length limit.

Flathead Catfish

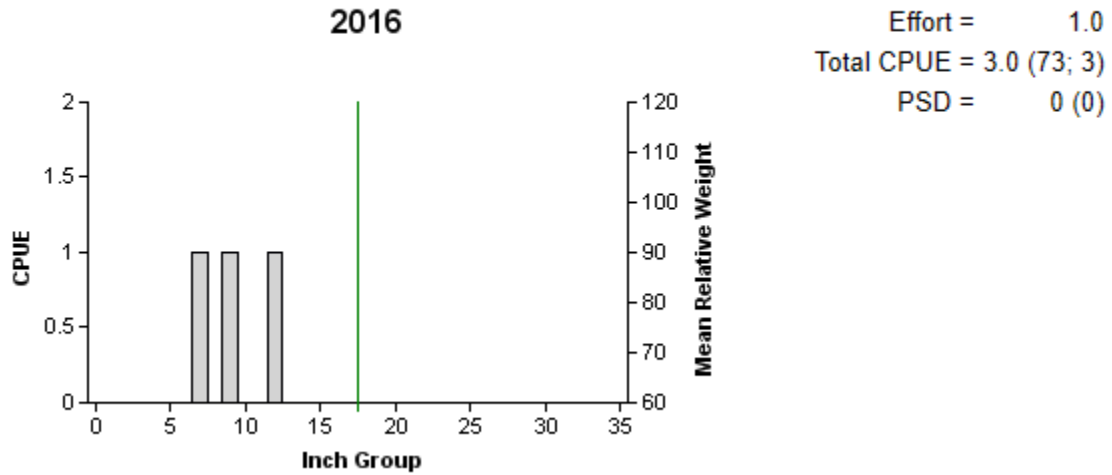


Figure 9. Number of Flathead Catfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for low-frequency electrofishing survey, H-4 Reservoir, Texas, 2016. Vertical line indicates minimum length limit.

Largemouth Bass

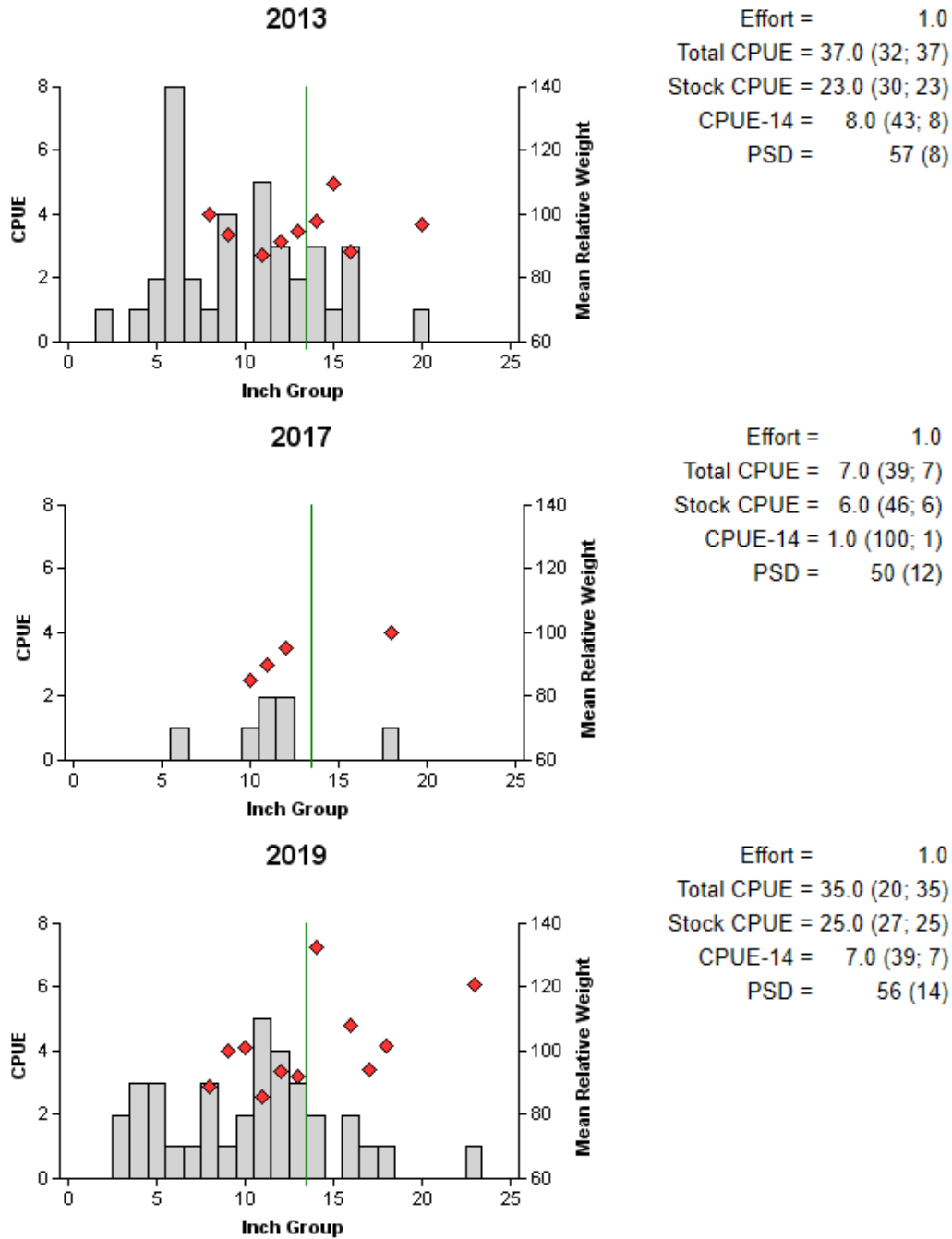


Figure 10. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, H-4 Reservoir, Texas, 2013, 2017, and 2019. Vertical line indicates minimum length limit.

White Crappie

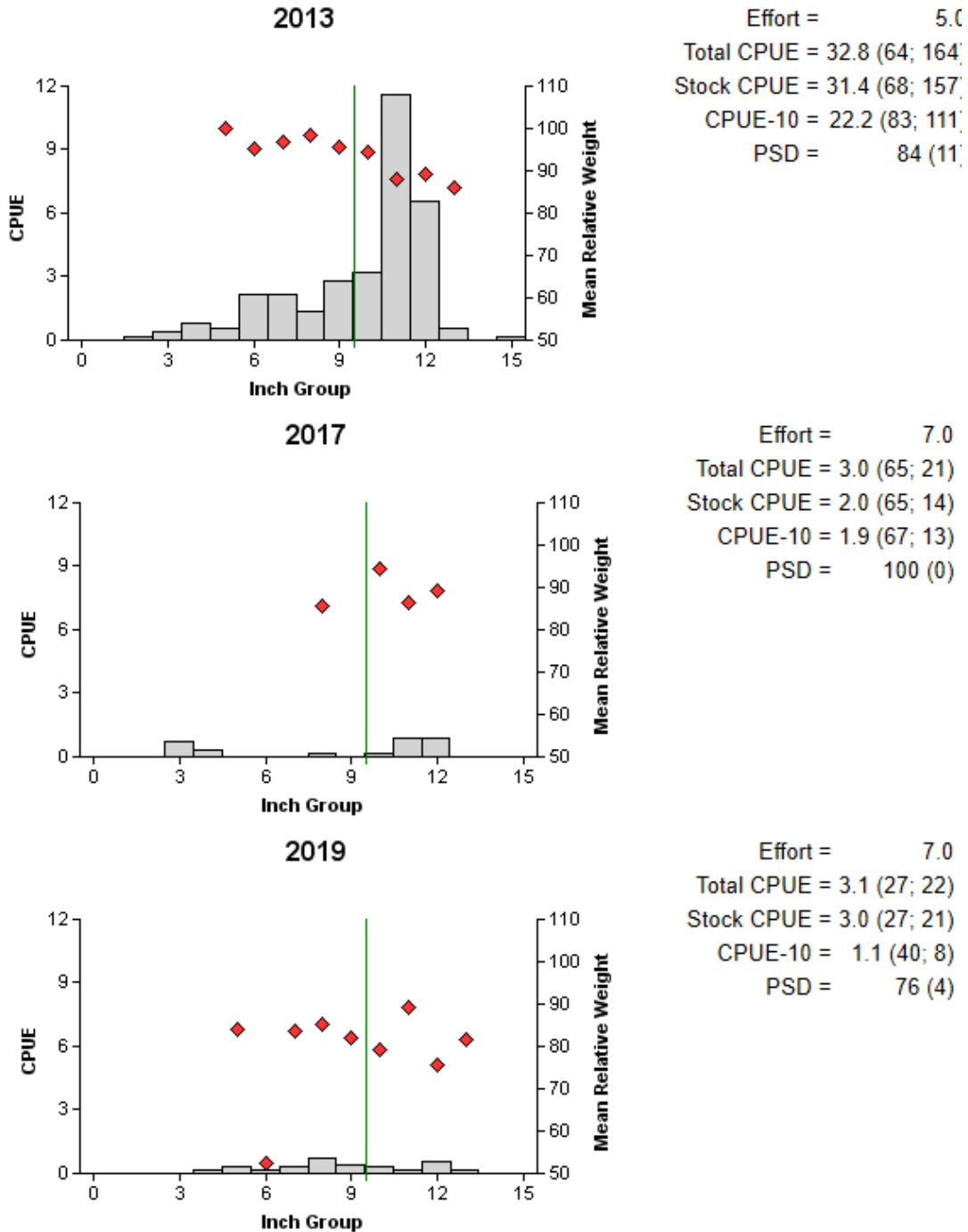


Figure 11. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, H-4 Reservoir, Texas, 2013, 2017, and 2019. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for H-4 Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, low frequency electrofishing surveys are conducted in the summer, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

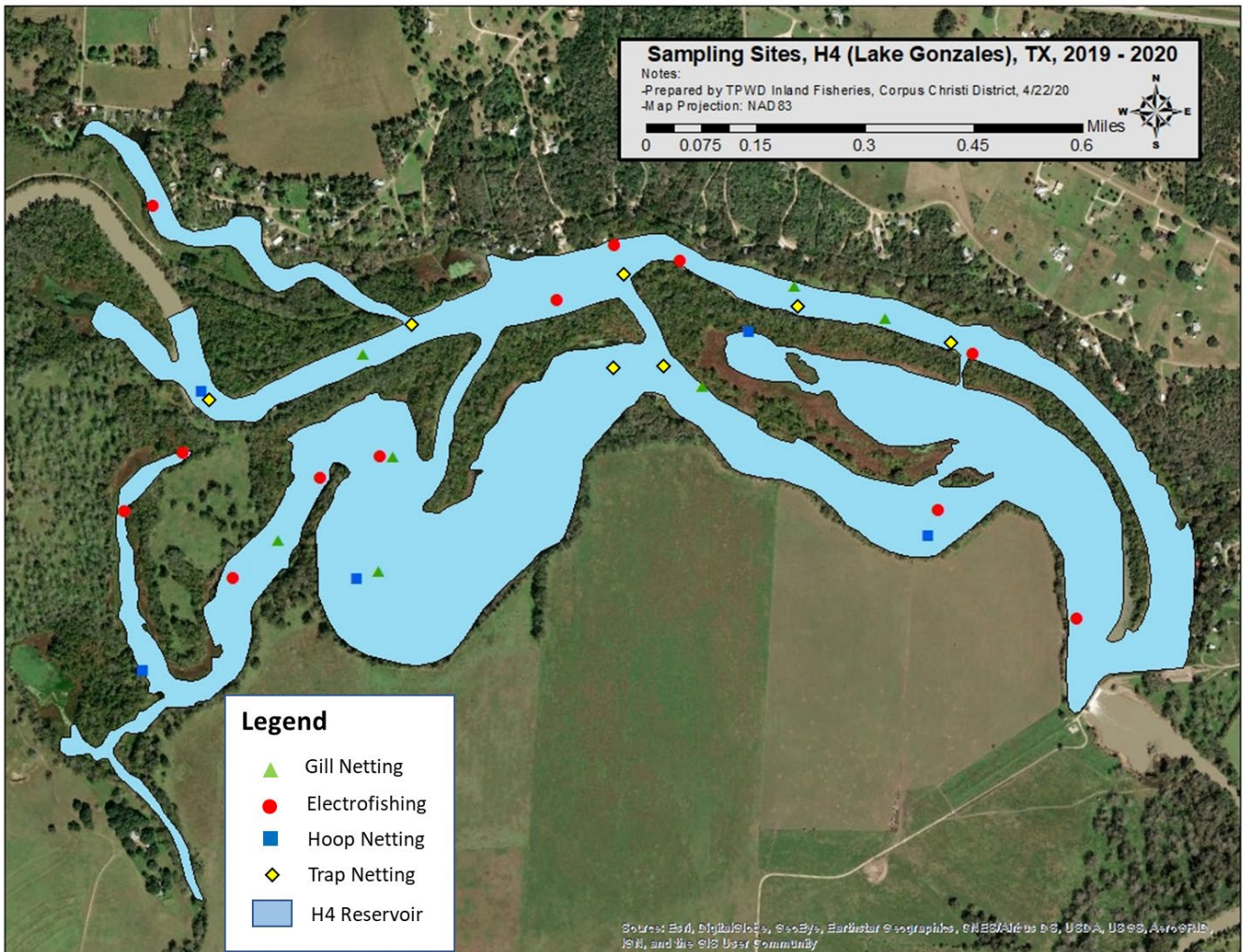
	Survey year			
	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Vegetation	A	A	A	S
Electrofishing - Fall		A		S
Electrofishing - Low frequency			A	
Trap netting		A		S
Gill netting				S
Report				S

APPENDIX A - Catch rates for all species from all gear types

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from H-4 Reservoir, Texas, 2019-2020. Sampling effort was 7 net nights for gill netting, 7 net nights for trap netting, 1 hour for electrofishing, and 5 net series for hoop netting.

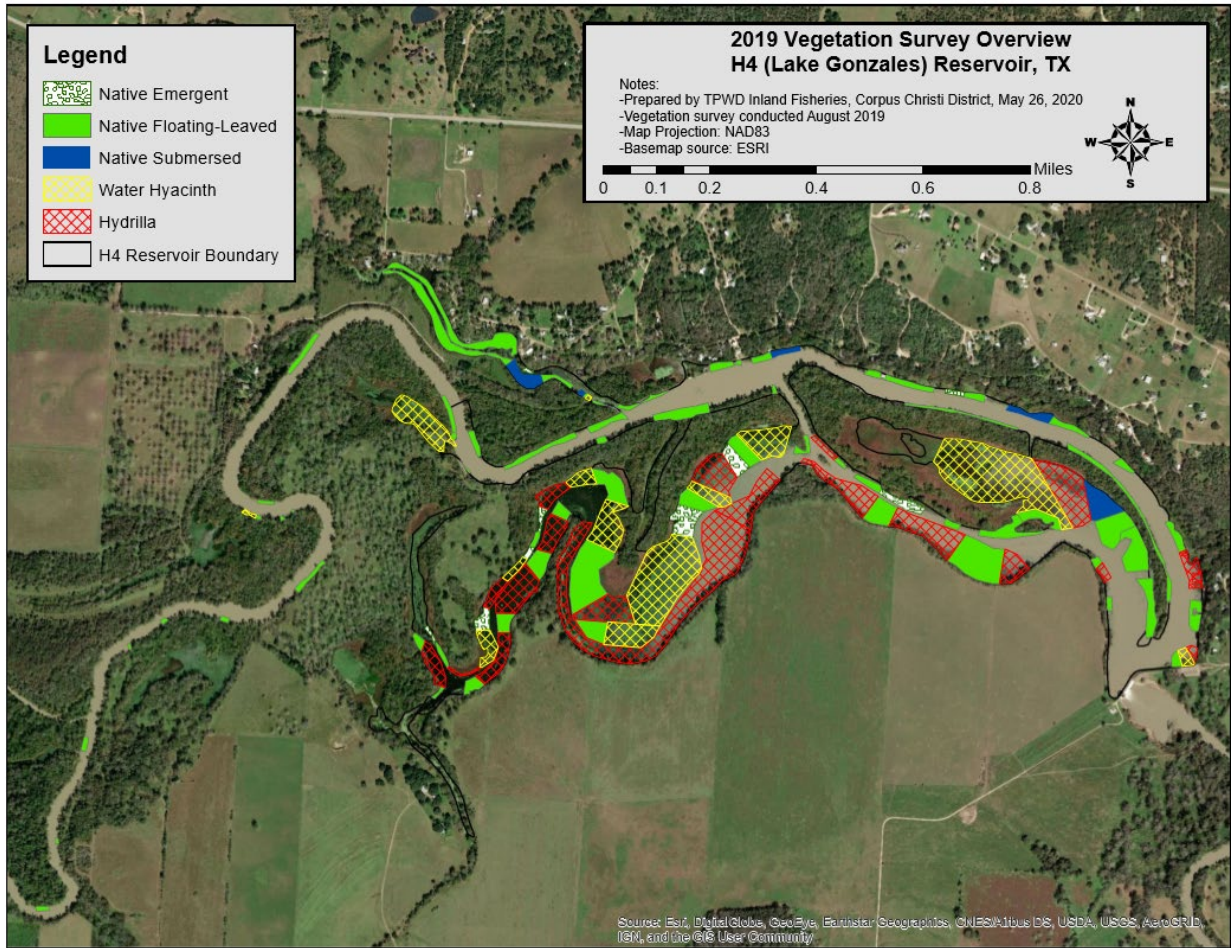
Species	Gill Netting		Trap Netting		Electrofishing		Hoop Netting	
	N	CPUE	N	CPUE	N	CPUE	N	CPUE
Spotted Gar	19	2.71 (47)	2	0.29 (65)			8	1.60 (38)
Longnose Gar	1	0.14 (100)						
Gizzard Shad	246	35.14 (44)	2	0.29 (65)	53	53.00 (38)		
Threadfin Shad			1	0.14 (100)	4	4.00 (100)		
Common Carp	2	0.29 (65)					2	0.40 (100)
Golden Shiner	10	1.43 (57)	1	0.14 (100)	9	9.00 (68)		
Inland Silverside					8	8.00 (62)		
Smallmouth Buffalo	9	1.29 (28)						
Blue Catfish	5	0.71 (79)						
Channel Catfish	27	3.86 (29)					1	0.20 (100)
Flathead Catfish	9	1.29 (28)						
Redbreast Sunfish	4	0.57 (52)						
Warmouth	2	0.29 (65)	1	0.14 (100)	9	9.00 (33)		
Bluegill	2	0.29 (65)	154	22.00 (68)	115	115.00 (19)	30	6.00 (49)
Longear Sunfish	2	0.29 (65)	25	3.57 (76)	16	16.00 (40)		
Redear Sunfish	4	0.57 (75)	29	4.14 (48)	40	40.00 (27)	37	7.40 (40)
Largemouth Bass	7	1.00 (58)			35	35.00 (20)	1	0.20 (100)
White Crappie	6	0.86 (47)	22	3.14 (27)			14	2.80 (24)
Black Crappie	2	0.29 (100)	12	1.71 (62)	2	2.00 (67)	1	0.20 (100)
Rio Grande Cichlid					2	2.00 (67)		
Grass Carp							1	0.20 (100)

APPENDIX B - Map of sampling locations



Location of sampling sites, H-4 Reservoir, Texas, 2019-2020. Gill net, electrofishing, hoop net and trap net sampling site locations are indicated by triangle, circle, square, and diamond respectively. Water level was near full pool at time of sampling.

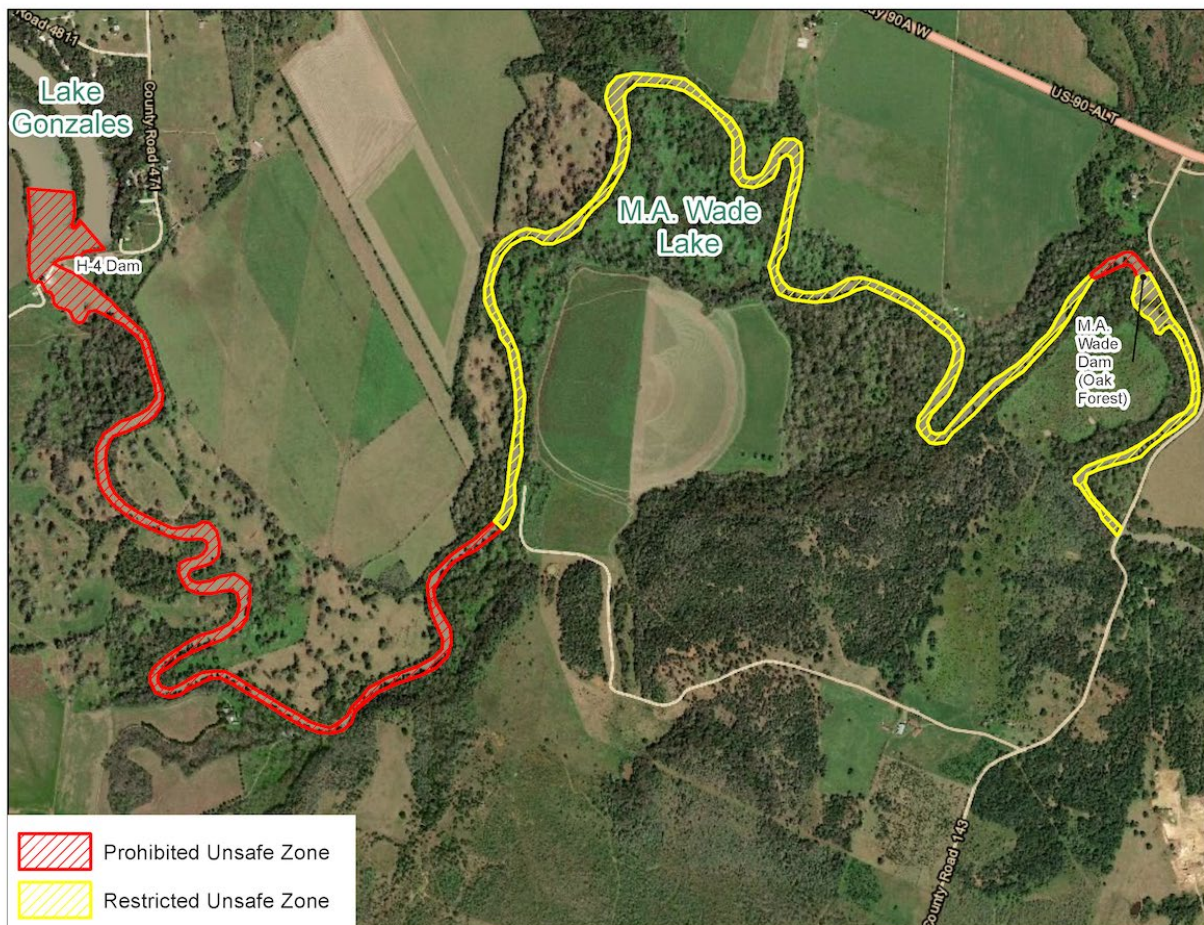
APPENDIX C - 2019 Distribution map of aquatic vegetation



APPENDIX D - 2019 Angler opinion survey results

Question	Answer
<i>Over the past 12 months, which of the following water bodies have you fished?</i>	Dunlap 100.0%
	McQueeney 15.6%
	Placid 33.3%
	Meadow 8.3%
	H-4 9.4%
	H-5 3.1%
<i>Over the past 12 months, which of these waterbodies do you fish most frequently fish?</i>	Dunlap 89.6%
	McQueeney 2.1%
	Placid 4.2%
	Meadow 1.0%
	H-4 2.1%
	H-5 1.0%
<i>During your fishing trips to these waterbodies, what fish species do you fish for?</i>	Top Ranked
	Largemouth Bass 46%
	All Black Bass 38%
	All Catfish 16%
	All Crappie 6%
	All Sunfish 6%
	Temperate Bass 4%
	Carp 3%
	All Gar 2%
<i>During your fishing trips to these waterbodies, what fish species do you most frequently fish for?</i>	Top Ranked
	Largemouth Bass 49%
	All Black Bass 31%
	All Catfish 13%
	All Crappie 2%
	Striped Bass 1%
	Blue Catfish 1%
	Flathead Catfish 1%
	All Sunfish 1%
	Carp 1%
<i>What types of fishing gear do you use when you fish these water bodies?</i>	Top Ranked
	Rod and Reel 100%
	Bow Fishing 2.1%
	Trotline and Jugline 1.0%
<i>Are you satisfied with the current fishing regulations on the above listed waterbodies?</i>	Preference
	Yes 93.7%
	No 6.3%

APPENDIX E - 2020 Current access restrictions issued by GBRA on H-4 Reservoir (Lake Gonzales)



Map produced by the Guadalupe-Blanco River Authority (GBRA) outlining prohibited and restricted unsafe zones to keep the public safe in case there is ever a dewatering event. The prohibited unsafe zone is defined as an area unsafe for ALL activities in the water (boating, canoeing, jet skiing, swimming, wading, tubing, etc.) whereas, the restricted unsafe zone is an area unsafe for activities for public physically in the water (swimming, wading, tubing, etc.).



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