

# White River Reservoir

## 2018 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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## Survey and Management Summary

Fish populations in White River Reservoir were surveyed in 2018 using electrofishing, and in 2019 using gill netting. Anglers were surveyed from 1 April 2016 through 30 June 2016 with a creel survey. Historical data are presented with the 2018-2019 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:** At conservation pool (2,372.2 feet MSL), White River Reservoir is a 2,020-acre impoundment constructed in 1963 on the White River, a tributary of the Salt Fork of the Brazos River. The reservoir is located in Crosby County approximately 55 miles east of Lubbock, Texas. From 1992 to 2014, White River Reservoir experienced a declining trend in lake levels. A record low was set in May 2014 when the reservoir dropped to an elevation of 2336.7 feet MSL and a surface area of 239 acres. During sampling, the reservoir maintained an elevation near 2,348 feet MSL and 878 acres. Habitat features consisted of natural non-descript shoreline, rocks, and standing timber. White River Reservoir is owned and operated by the White River Municipal Water District as a municipal water supply and for recreational purposes. The reservoir has three boat ramps; during extremely low water levels there is a temporary launch site in place. There are no facilities for physically challenged anglers.

**Management History:** Sport fish in the reservoir included Walleye, White Bass, Largemouth Bass, White Crappie, and catfishes. Past surveys have shown that White Crappie were overabundant in the reservoir and exhibited poor growth. Walleye stockings have been utilized in part to mitigate overabundance of White Crappie. Florida Largemouth Bass were stocked in 1982, 2000, 2003, 2009, 2012, and 2016 in order to maintain a trophy Largemouth Bass fishery.

### Fish Community

- **Prey species:** Gizzard Shad and Bluegill served as the primary prey species in the reservoir. The 2018 electrofishing catch rate of Gizzard Shad declined, but still showed a good number available as prey to most sport fish. Electrofishing catch of Bluegill was low, but all Bluegill were small enough to be consumed by predators.
- **Catfishes:** Gill net catch rate for Channel Catfish has increased slightly and indicate several legal-sized fish available to anglers. Blue Catfish and Flathead Catfish were also present in the reservoir.
- **White Bass:** White Bass were present in the reservoir. All surveyed White Bass measured between 10 and 17 inches, and receive very little fishing pressure.
- **Largemouth Bass:** Electrofishing catch rate in 2018 for Largemouth Bass has declined since 2016. Approximately half of the surveyed fish were legal-size. Florida Largemouth Bass genetic influence increased from 17% in 2014 to 25% in 2018.
- **White Crappie:** White Crappie were moderately abundant with legal-size fish available to anglers. Some crappie reached legal size within two years.
- **Walleye:** Gill net catch rates of Walleye have increased, and all Walleye sampled were 18 to 25 inches with most measuring 23 inches and larger.

**Management Strategies:** Continue stocking Walleye and Florida Largemouth Bass. Inform the public about the negative impacts of aquatic invasive species. Conduct additional electrofishing surveys in 2020, gill net survey in 2020, trap net survey with Age and Growth analysis in 2021, and general monitoring surveys with baited hoop nets, gill nets, and electrofishing surveys in 2022-2023. Access and vegetation surveys will be conducted in 2022.

## Introduction

This document is a summary of fisheries data collected from White River Reservoir in 2018-2019. 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 2018-2019 data for comparison.

## Reservoir Description

At conservation pool (2,372.2 feet MSL), White River Reservoir is a 2,020-acre impoundment constructed in 1963 on the White River, a tributary of the Salt Fork of the Brazos River. The reservoir is located in Crosby County approximately 55 miles east of Lubbock, Texas. Since 1992 White River Reservoir experienced a general decline in lake levels (Figure 1). Heavy rain events in September 2008 and July 2010 resulted in a substantial increase in lake level elevation (2,356.9 feet MSL) and surface area (930 acres); however, extreme drought resulted in continued water level decline. A record low was set in May 2014 when the lake dropped to an elevation of 2,336.7 feet MSL and a surface area of 239 acres. During sampling the reservoir maintained an elevation near 2,348 feet MSL. White River Reservoir is owned and operated by the White River Municipal Water District as a municipal water supply and for recreational purposes. The reservoir has three boat ramps and one low water ramp, during sampling only the low water ramp was usable. There are no facilities for physically challenged anglers. Other descriptive characteristics for White River Reservoir are presented in Table 1.

## Angler Access

White River Reservoir has three public boat ramps and one low water ramp. The boat ramp at White River Marina was unavailable to anglers in 2018-2019, and one of the public boat ramps at River Crest Road was available to anglers in 2018-2019 while the second ramp was unavailable because the end of the boat ramp was above the waterline. Extension of the ramps is not feasible. The low water ramp was also usable. Additional boat ramp characteristics are in Table 2. There is abundant shoreline access around several areas of the reservoir.

## Management History

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Clayton and Munger 2015) included:

1. Maintain the Walleye fishery through biennial stockings of 3,000 fry/acre.
 

**Action:** Due to difficulties in acquiring adequate numbers of fertilized Walleye eggs to meet all district stocking requests, Walleye stockings have been sporadic. Walleye were stocked in 2015 and 2019.
2. Monitor White Crappie population with additional trap net survey in 2015 and 2017, and conduct age and growth analysis for White Crappie in 2015 and 2017.
 

**Action:** Trap net surveys were conducted in 2015 and 2017. Age and growth analysis was conducted in 2017.
3. Monitor Largemouth Bass population with electrofishing to determine impact of drought and previous stockings. Conduct genetic analysis to determine genetic influence of 2009 and 2012 Florida Largemouth stockings. Conduct age and growth analysis of Largemouth Bass. Stock Florida Largemouth Bass at a rate of 100/acre in 2016, and promote improved conditions at the reservoir.
 

**Action:** Electrofishing was conducted in 2016 and 2018. Genetic samples were collected in 2018. Length at age analysis was conducted in 2018. Florida Largemouth

Bass were stocked in 2016, and interviews with local media and posts were made on the district Facebook page concerning conditions and fish populations at the reservoir.

4. Cooperate with the White River Municipal Water District to post appropriate signage at access points around the reservoir; contact and educate marina owners about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their customers; educate the public about invasive species through the use of media and the internet; and make a speaking point about invasive species when presenting to constituents and user groups. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

**Action:** Presentations have been given to the Region O water planning group and various area civic groups and school groups. Interviews and new releases concerning invasive species have been done for area and statewide media. Stories and posts have been added to the district Facebook page. Signage has been sent to the controlling authority that also operates the marina.

**Harvest regulation history:** Sport fishes in White River Reservoir are currently managed with statewide regulations (Table 3). From 1993 to 2001, Smallmouth Bass were managed with an 18-inch minimum length limit and 3-fish daily bag limit in an effort to increase relative abundance and improve size structure. In 2001, harvest regulations for Smallmouth Bass were changed to the statewide 14-inch minimum length limit and 5-fish bag as no discernable change in the population was observed. Regulations on harvest of Walleye changed from 16-inch minimum and 5-fish bag, to a 5-fish bag with no more than 2 Walleye under 16 inches on September 1, 1999. Current regulations are found in Table 3.

**Stocking history:** White River Reservoir has been stocked with multiple species since impoundment in 1963. In 2019 there were 20,596 Florida Largemouth Bass fingerlings stocked. There were 618,025 Walleye fry stocked in 2015 and 594,060 were stocked in 2019. The complete stocking history is available in Table 4.

**Vegetation/habitat management history:** White River Reservoir has no vegetation/ habitat management history.

**Water transfer:** White River Reservoir is primarily used for municipal water supply and recreation. The reservoir currently supplies water to the Cities of Crosbyton, Post, Ralls, and Spur in a rural region located approximately 65 miles southeast of Lubbock. There is one permanent pumping station on the reservoir that pumps water to the White River Municipal Water District's water treatment plant to be distributed to the 4 member cities. Recent proposals include negotiations with the City of Lubbock to purchase the water rights in the reservoir. If purchased, water management strategies could include the use of reclaimed effluent from the City of Lubbock being pumped to the reservoir. Other strategies include the possible transfer of water to and from Alan Henry Reservoir and the proposed Post Reservoir.

## Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for White River Reservoir (TPWD unpublished). 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, 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. Ages for Largemouth Bass were determined using otoliths from all 5 fish ranging from 304 mm to 370 mm.

**Trap netting** – Crappie were collected using trap nets (5 net nights at 5 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Ages for White Crappie were determined by using otoliths from 19 randomly-selected fish (range 128 mm to 305 mm).

**Gill netting** – Channel Catfish, Walleye, and White Bass were collected by gill netting (6 net nights at 6 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). Ages for Walleye were determined by using otoliths from the 5 largest and 5 smallest fish surveyed.

**Genetics** – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Micro-satellite DNA analysis was used to determine genetic composition of individual fish.

**Statistics** – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight ( $W_r$ )] were calculated for target fishes according to Anderson and Neumann (1996). Index of Vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

**Creel survey** – A spring quarter roving creel survey was conducted in 2016. The creel period was April 1 through June 30. Angler interviews were conducted on 7 weekend days and 6 weekdays to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

**Habitat** – A structural habitat survey was conducted in 2014 and a vegetation survey was conducted in 2018. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

**Water level** – Source for water level data was the United States Geological Survey (USGS 2019).

## Results and Discussion

**Habitat:** No man-made changes have occurred at the reservoir since 2006; a habitat survey was last conducted in 2014 (Clayton and Munger 2015). Habitat was typified by natural shoreline (eroded bank, clay, silt, or sand) with scattered areas of gravel (rock <4 in) and rocky shoreline (rock >4 in). Vegetation in the reservoir consisted of native emergent vegetation (Smartweed) and flooded timber (Table 6).

**Creel:** Directed fishing effort by anglers in spring of 2016 was highest for White Crappie (31.2%), followed by anglers fishing for Channel Catfish (24.3%), anything (23.0%), and Largemouth Bass (15.7%) (Table 7). Total fishing effort for all species and direct expenditures at White River Reservoir during the 2016 spring quarter were 17,566.5 hours and \$118,621 (Table 8).

**Prey species:** Electrofishing catch rates (CPUE) of Gizzard Shad and Bluegill were 285.0/h and 20.0/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad was good, indicating that 87% of Gizzard

Shad were available to existing predators; this was similar IOV estimates in previous years (Figure 2). Total CPUE of Gizzard Shad in 2018 was considerably lower than total CPUE in 2016 but higher than 2014 (Figure 2). Total CPUE of Bluegill in 2018 was lower than total CPUE in 2016 but similar to 2014, and size structure continued to be dominated by small individuals (Figure 3). The higher CPUEs in 2016 are most likely attributed to flooded spawning habitat due to significant lake level increases experienced in 2015. Gizzard Shad objectives were met; however, an unusually low CPUE resulted in unmet objectives for Bluegill.

**Blue Catfish:** Blue Catfish in White River Reservoir are historically a low-density fishery that receives very little directed angling effort. Although, the 2019 gill net survey had a total CPUE of 4.5/nn the lower CPUEs of previous surveys are more typical (Figure 4). During the 2016 creel survey Blue Catfish received only 119.50 hours of directed angler effort, and no harvested Blue Catfish were observed during the creel survey (Table 9). Blue Catfish are considered a low-density fishery and no survey objectives were established.

**Channel Catfish:** The gill net CPUE of Channel Catfish was 12.5/nn in 2019 which is higher than previous surveys (Figure 5). Although total CPUE was higher, the Channel Catfish population is dominated by smaller individuals (PSD = 17) with an increase in the number of sub-stock fish in 2019 compared to the 2017 and 2015 surveys (Figure 5). Although Channel Catfish are the second most sought-after species in the reservoir based on directed fishing effort (4,266.91 h), catch rate (0.03) and total harvest (115 fish) showed a minimal catfish fishery (Table 10). Channel Catfish were a harvest-oriented fish as 0% of the legal-sized fish were released. Observed harvest during the 2016 creel survey showed good angler compliance, and the two encountered fish measured 18 and 24 inches (Figure 6).

**Flathead Catfish:** Flathead Catfish are present in the reservoir in low abundance. The gill net CPUE for 2019 was 0.5/nn, which is consistent with previous surveys (Figure 7). The 2016 creel survey showed no directed angler effort specifically targeting Flathead Catfish. Flathead Catfish are considered a low-density fishery and no survey objectives were established.

**White Bass:** The gill net CPUE of White Bass was 12.5/nn in 2019; this is much higher than 2015 (4.4/nn) and 2017 (2.4/nn) (Figure 8). Although the 2019 CPUE was higher, low directed fishing effort (55.47 h), low catch rate (0.0), and low total harvest (377 fish) for White Bass (Table 11) combined with average historical low gill net CPUE (TPWD, unpublished) indicate that White Bass are typically present in the reservoir in low numbers (Figure 8). White Bass were a harvest-oriented fish as 0% of the legal-sized fish were released. Observed harvest in 2016 showed good angler compliance, and harvested fish ranged in length from 12 to 14 inches (Figure 9). White Bass are considered a low-density fishery.

**Largemouth Bass:** The electrofishing CPUE of stock-length Largemouth Bass was 22.0/h in 2018, much lower than the 89.0/h in 2016 but much higher than the 2.0/h in 2014 (Figure 10). Size structure in 2018 was good as PSD was 64 and fish surveyed ranged from 5 to 21 inches in length (Figure 10). Body condition in 2018 was good (relative weight greater than 90) for nearly all size classes of fish and was similar to body condition in previous surveys (Figure 10). Directed fishing effort and catch rate for Largemouth Bass was 2,761 h and 0.11 fish/h, respectively, from 1 April 2016 through 30 June 2016 (Table 12). No Largemouth Bass harvest was documented during the creel period (Table 12). Florida Largemouth Bass influence has remained relatively constant as Florida alleles have ranged from 17 to 25% (Table 13). Category 2 Age and Growth was not possible due to low CPUE of fish between 330 mm and 381 mm; only 5 fish between 304 mm and 370 mm were collected for Age and Growth analysis; all 5 fish showed 3 years of age. Due to lower than expected CPUE, Largemouth Bass objectives for abundance, size structure, and age and growth were not met, and only 24 of the targeted 30 fish for genetic analysis were collected.

**White Crappie:** Typically, trap net CPUE and size structure for White Crappie in White River Reservoir have been highly variable as evidenced by the 2014, 2015 and 2017 trap net surveys (Figure 11). Little more information about the population can be determined other than abundance and presence/absence of the species in the reservoir. Presence/absence was determined through the electrofishing survey in 2019 and gill net survey in 2019. Electrofishing in 2018 surveyed 13 White Crappie that ranged from 3 to



11 inches with the majority measuring 7 inches or smaller (Figure 12). The 2019 gill net survey collected an additional 27 White Crappie that measured between 6 and 15 inches (Figure 13). Age and Growth analysis showed slow, variable growth as all otoliths analyzed were 2 years of age regardless of length (Figure 14). While some fish reach legal size by age 2, the majority of age 2 fish were between 5 and 8 inches in length (Figure 14). According to the 2016 creel survey, White Crappie were the most sought-after species by anglers with a directed effort of 5,481.82 hours, and estimated total harvest of 1,017 fish (Table 14). White Crappie were a harvest-oriented fish as only 7% of legal sized fish were released (Table 14). Size of harvested White Crappie in 2016 ranged from 11 to 16 inches in total length (Figure 15). Due to highly variable survey data, White Crappie objectives were changed to presence/absence.

**Walleye:** As natural recruitment in the reservoir is limited, the fishery is maintained by stocking. Declining water levels, between 2001 and 2014, and loss of viable habitat have impacted nearly all species in the reservoir including Walleye. In 2015 water level increases improved conditions at the reservoir, and limited Walleye stocking was resumed. Gill net CPUE has increased from 1.6/nn in 2015 to 11.7/nn in 2019; however the population is dominated by larger individuals showing little to no natural reproduction in the reservoir (Figure 16). The five largest and five smallest Walleye were collected for Age and Growth analysis to determine if these fish were from the 2015 stocking; all fish showed 4 years of age (2015 year class), and most likely from the 2015 stocking.

## Fisheries Management Plan for White River Reservoir, Texas

Prepared – July 2019

**ISSUE 1:** The Walleye fishery was developed in White River Reservoir through a stocking program beginning in the early 1970s. Due to higher than optimal water temperatures during the winter, natural recruitment in the reservoir is limited, and the population needs to be maintained by supplemental stockings.

### MANAGEMENT STRATEGIES

1. Maintain the Walleye fishery through biennial stockings of 3,000 fry/acre.
2. Conduct age and growth analysis during 2023 gill net survey to determine success of fry stockings.
3. Promote the Walleye fishery through local media outlets and on the district Facebook page.

**ISSUE 2:** Historically, the reservoir has had an overabundant White Crappie population with poor size structure and growth. Age and growth data for White Crappie in the reservoir showed that growth slowed from a mean length of 13 inches at age 5 in 1999 (Hutt 2003) to 7 inches at age 5 in 2006 (Henegar and Munger 2007). While the 2014 survey showed a favorable size structure, it is possible that low relative abundance of predatory fish may result in a rapid increase of White Crappie allowing them to become overly abundant and stunting growth.

### MANAGEMENT STRATEGIES

1. Monitor White Crappie population with various survey techniques; electrofishing in fall 2020 and 2022; gill netting in spring 2021 and 2023; and trap netting in spring 2022.
2. Conduct a category 2 age and growth analysis for White Crappie in 2021.

**ISSUE 3:** The Largemouth Bass fishery in White River Reservoir has suffered from poor recruitment for several years due to low water level.

#### MANAGEMENT STRATEGIES

1. Monitor Largemouth Bass population with additional electrofishing in 2020 and standard electrofishing 2022 to evaluate impact of lake level.
2. Stock Florida Largemouth Bass at a rate of 1,000/km of shoreline in 2020 and 2021 to increase Florida Bass alleles, collect genetic samples in 2022.

**ISSUE 4:** 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.

#### MANAGEMENT STRATEGIES

1. Cooperate with the White River Municipal Water District to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

## Objective-Based Sampling Plan and Schedule (2019–2023)

### Sport fish, forage fish, and other important fishes

Sport fishes in White River Reservoir include Blue Catfish, Channel Catfish, Largemouth Bass, White Crappie, White Bass, and Walleye. Known important forage species include Bluegill and Gizzard Shad.

#### Low-density fisheries

**Blue Catfish:** Blue Catfish are present in White River Reservoir, but population abundance is low. Gill net surveys in 2015, 2017, and 2019 sampled an average of 2.8 fish per net night. The 2016 spring-quarter creel also showed less than 1% of directed angler effort targeting Blue Catfish. Sampling Blue Catfish is not necessary during the 2019-2023 survey period.

**White Bass:** White Bass are present in White River Reservoir, but population abundance is typically low due to extended periods of low and declining water levels and probable high predation. Ten gill net surveys from 1999-2019 showed CPUE of White Bass ranged from 0.4 to 12.5 fish/nn. Five of the nine years (1999, 2003, 2007, 2011, and 2013) showed a CPUE below 1.5 fish/nn. The 2019 survey showed the highest, and only, CPUE over 4.4 fish /nn (2019 CPUE=12.5/nn). This higher CPUE is most likely

attributed to the unusual amount of rain fall that occurred on the watershed in 2014 and 2015 providing increased lake levels and spawning habitat during for 2016 and 2017. Spring-quarter 2016 Creel survey showed less than 0.5% directed effort. Sampling White Bass is not necessary during the 2019-2023 survey period.

**Walleye:** Recent data indicates that Walleye are a negligible fishery with no direct angler effort (spring-quarter 2016). While 2019 CPUE showed a much higher relative abundance, previous surveys showed low relative abundance (CPUE = 2.0/nn in 2017). Previous drought conditions resulted in infrequent stocking from 2008 to present. The previous low relative abundance has likely resulted in few anglers targeting Walleye; however, anecdotal evidence suggests that some anglers are still targeting Walleye. While attempting to promote the Walleye fishery, sampling efforts will be exploratory until consistent biennial stockings can be established. Walleye sampling will follow suggested sampling techniques for Largemouth Bass electrofishing and Channel Catfish gill netting.

### Survey objectives, fisheries metrics, and sampling objectives

**Channel Catfish:** Channel Catfish are the second most sought-after species in White River Reservoir (24.3 % directed effort – spring-quarter creel 2016). Trend data on relative abundance and size structure of Channel Catfish has been collected biennially since 1999 with spring gill netting. Continuation of trend data with spring gill netting will allow for general monitoring of any large-scale changes in the Channel Catfish population that may spur further investigation. Analysis of past sampling indicates that it would require a minimum of 5 gill net sites to achieve a CPUE-S  $RSE \leq 25$ , and a size structure estimation (PSD; 50 fish minimum with 80% confidence) would require a minimum of 10 sites. Six random gill net sites will be sampled during spring 2021 and 2023 (Table 15); if objectives are not met an additional 6 random gill net sites will be sampled. Five random sites will be sampled with baited tandem hoop nets summer of 2023. Objectives will be exploratory to evaluate the effectiveness of hoop nets in White River Reservoir.

**Largemouth Bass:** The Largemouth Bass fishery in White River Reservoir has suffered from poor recruitment for several years due to low lake levels. According to a 2016 spring-quarter creel survey, Largemouth Bass were the fourth most popular sport fish in White River Reservoir with an estimated angler effort of 15.7%. Trend data on relative abundance and size structure of Largemouth Bass has been collected biennially since 2000 with fall, nighttime electrofishing. Continuation of trend with night time electrofishing in the fall will allow for general monitoring of any large-scale changes in the Largemouth Bass population that may spur further investigation. Analysis of past sampling indicates that it would require a minimum of 10 electrofishing sites to achieve a CPUE-S  $RSE \leq 25$  and size structure estimation (PSD; 50 fish minimum with 80% confidence). Twelve random electrofishing stations will be sampled during the 2020 and 2022 nighttime electrofishing seasons (Table 15). Age and growth will be evaluated with a Category 2 analysis in fall 2022. Fin clips will be collected from a minimum of 30 Largemouth Bass for genetic analysis in fall 2022.

**White Crappie:** Historically White Crappie have been very abundant in White River Reservoir; however they have typically exhibited stunted growth. A 2016 spring-quarter creel survey indicated White Crappie are the most popular fish in the reservoir with an angling effort of 31.2%. Prior trap netting CPUE averaged 39.9/nn during the last 3 surveys, providing an average of 95 stock-size and larger fish per survey. It is anticipated that setting a minimum of 4 trap nets will achieve a sampling objective of 50 white crappies >5 inches, and 13 between 9 and 11 inches for aging. Since CPUE of trap nets in White River Reservoir is highly variable resulting in some years sampling no legal-sized fish, a trap net survey scheduled in 2021 will use ten trap nets in an attempt to collect enough White Crappie for Category 2 age and growth (Table 15). White Crappie length and weight data will also be collected and evaluated during 2020 and 2022 electrofishing surveys and 2021 and 2023 gill net surveys to determine if other sampling techniques can provide a better understanding of the population.

**Bluegill and Gizzard Shad:** Bluegill and Gizzard Shad are the primary forage at White River Reservoir. Like Largemouth Bass, trend data on CPUE and size structure of Bluegill and Gizzard Shad have been collected biennially since 2000. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in Bluegill and Gizzard Shad relative abundance and size structure.

Sampling effort based on achieving sampling objectives for Largemouth Bass should result in sufficient numbers of Bluegill and Gizzard Shad for size structure estimation (PSD and IOV; 50 fish minimum at 5 stations with 80% confidence) and for relative abundance estimates ( $RSE \leq 25$  of CPUE-Total; anticipated effort is 5 stations). At the sampling effort needed to achieve sampling objectives for Largemouth Bass, the expected RSE for CPUE-T is 13 for Bluegill and 15 for Gizzard Shad. Largemouth Bass body condition can also provide information on forage abundance, vulnerability, or both relative to predator density. Relative weight of Largemouth Bass  $\geq 8$ " TL will be determined from their length/weight data (maximum of 10 fish weighed and measured per inch class).

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## Tables and Figures

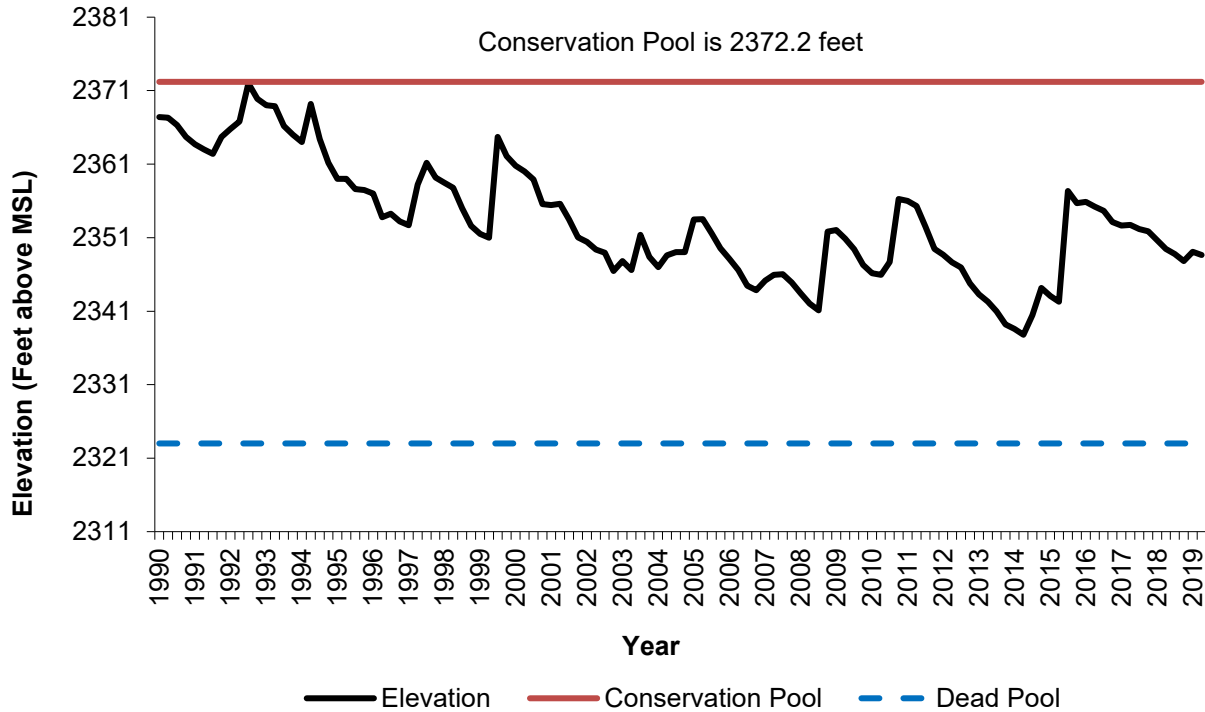


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for White River Reservoir, Texas.

Table 1. Characteristics of White River Reservoir, Texas.

| Characteristic                            | Description                          |
|---|--------------------------------------|
| Year constructed                          | 1963                                 |
| Controlling authority                     | White River Municipal Water District |
| County                                    | Crosby                               |
| Reservoir type                            | Main stem                            |
| Mean depth (ft)                           | 11                                   |
| Maximum depth (ft)                        | 65                                   |
| Watershed (mi <sup>2</sup> )              | 3,069                                |
| Contributing Watershed (mi <sup>2</sup> ) | 689                                  |
| Shoreline Development Index (SDI)         | 4.87                                 |
| Conductivity                              | 1,156 $\mu$ mhos/cm                  |

Table 2. Boat ramp characteristics for White River Reservoir, Texas, August, 2018. Reservoir elevation at time of survey was 2,350 feet above mean sea level.

| Boat ramp                     | Latitude<br>Longitude<br>(dd) | Public | Parking<br>capacity<br>(N) | Elevation at<br>end of boat<br>ramp (ft) | Condition  |
|-------------------------------|-------------------------------|--------|----------------------------|--|--|
| White River Marina            | 32.46014<br>-101.09301        | Y      | 30                         | UNK                                      | Out of water. Extension is not feasible                |
| River Crest Road<br>(2 ramps) | 33.46090<br>-101.08558        | Y      | 20                         | UNK                                      | One of the ramps was usable. Extension is not feasible |
| Low Water                     | 33.45996<br>-101.08340        | Y      | 5                          | 2340                                     | Usable. Extension is not feasible.                     |

Table 3. Harvest regulations for White River Reservoir, Texas

| Species   | Bag limit                  | Length limit                        |
|---|----------------------------|-------------------------------------|
| Catfish: Channel and Blue, their hybrids and subspecies | 25<br>(in any combination) | 12-inch minimum                     |
| Catfish, Flathead                                       | 5                          | 18-inch minimum                     |
| Bass, White   | 25                         | 10-inch minimum                     |
| Bass: Smallmouth  | 5 <sup>a</sup>             | 14-inch minimum                     |
| Bass: Largemouth  | 5 <sup>a</sup>             | 14-inch minimum                     |
| Crappie: White and Black hybrids and subspecies         | 25<br>(in any combination) | 10-inch minimum                     |
| Walleye   | 5                          | Only 2 fish allowed under 16 inches |

<sup>a</sup>Bag limit of Largemouth and Smallmouth Bass is 5 fish in any combination.

Table 43. Stocking history of White River Reservoir, Texas. FGL = fingerling; FRY = fry; UNK = unknown.

| Year          | Number                        | Size | Year          | Number                         | Size |
|---------------|-------------------------------|------|---------------|--------------------------------|------|
|               | <u>Blue Catfish</u>           |      |               | <u>Florida Largemouth Bass</u> |      |
| 1970          | 5,000                         | UNK  | 1982          | 105,000                        | FGL  |
| 1975          | <u>9,300</u>                  | UNK  | 2000          | 200,000                        | FGL  |
| Total         | 14,300                        |      | 2003          | 19,105                         | FGL  |
|               |                               |      | 2009          | 143,705                        | FGL  |
|               |                               |      | 2012          | 37,067                         | FGL  |
|               |                               |      | 2016          | 99,067                         | FGL  |
|               |                               |      | 2019          | <u>20,596</u>                  |      |
|               |                               |      | Species Total | 625,071                        |      |
|               | <u>Channel Catfish</u>        |      |               | <u>Walleye</u>                 |      |
| 1967          | 30,000                        | FGL  | 1975          | 500,000                        | FRY  |
| 1970          | 9,000                         | FGL  | 1976          | 500,000                        | FRY  |
| 1972          | 21,000                        | FGL  | 1979          | 2,456,250                      | FRY  |
| 1973          | 25,000                        | FGL  | 1980          | 5,478,500                      | FRY  |
| 1974          | <u>10,000</u>                 | FGL  | 1983          | 5,800,004                      | FRY  |
| Species Total | 95,000                        |      | 1988          | 1,515,488                      | FRY  |
|               |                               |      | 1989          | 3,989,200                      | FRY  |
|               |                               |      | 1990          | 3,762,064                      | FRY  |
|               |                               |      | 1991          | 5,000,000                      | FRY  |
|               |                               |      | 1994          | 4,100,000                      | FRY  |
|               |                               |      | 2000          | 58,000                         | FGL  |
|               |                               |      | 2005          | 2,385,745                      | FRY  |
|               |                               |      | 2007          | 2,145,000                      | FRY  |
|               |                               |      | 2010          | 2,958,150                      | FRY  |
|               |                               |      | 2012          | 1,620,000                      | FRY  |
|               |                               |      | 2015          | 618,025                        | FRY  |
|               |                               |      | 2019          | <u>594,060</u>                 | FRY  |
|               |                               |      | Species Total | 43,480,486                     |      |
|               | <u>Flathead Catfish</u>       |      |               | <u>Yellow Perch</u>            |      |
| 1971          | 1,500                         | UNK  | 1994          | 200,000                        | UNK  |
| 1972          | 1,500                         | UNK  | 1996          | 116,700                        | UNK  |
| 1973          | <u>1,500</u>                  | UNK  | 1997          | <u>3,745</u>                   | UNK  |
| Total         | 4,500                         |      | Species Total | 320,645                        |      |
|               |                               |      |               |                                |      |
|               | <u>Green X Redear Sunfish</u> |      |               | <u>Red Drum</u>                |      |
| 1969          | 3,000                         | UNK  | 1975          | 14,415                         | UNK  |
| 1970          | 7,500                         | UNK  |               |                                |      |
| 1971          | 7,500                         | UNK  |               |                                |      |
| 1972          | <u>1,000</u>                  | UNK  |               |                                |      |
| Species Total | 19,000                        |      |               |                                |      |
|               |                               |      |               |                                |      |
|               | <u>Smallmouth Bass</u>        |      |               |                                |      |
| 1979          | 15,654                        | UNK  |               |                                |      |
| 1980          | 5,212                         | UNK  |               |                                |      |
| 1981          | <u>50,300</u>                 | UNK  |               |                                |      |
| Species Total | 71,166                        |      |               |                                |      |
|               |                               |      |               |                                |      |
|               | <u>Largemouth Bass</u>        |      |               |                                |      |
| 1964          | 100,000                       | UNK  |               |                                |      |
| 1972          | <u>15,000</u>                 | UNK  |               |                                |      |
| Species Total | 115,000                       |      |               |                                |      |



Table 4. Objective-based sampling plan components for White River Reservoir, Texas 2018-2019.

| 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            |
|                           | Age-and-growth    | Age at 14 inches      | $N = 13, 13.0 - 14.9$ inches |
|                           | Genetics          | % FLMB                | $N = 30$ , any age           |
| Bluegill <sup>a</sup>     | Abundance         | CPUE–Total            | $RSE \leq 25$                |
|                           | Size structure    | PSD, length frequency | $N \geq 50$                  |
| Gizzard Shad <sup>a</sup> | Abundance         | CPUE–Total            | $RSE \leq 25$                |
|                           | Size structure    | PSD, length frequency | $N \geq 50$                  |
|                           | Prey availability | IOV                   | $N \geq 50$                  |
| White Crappie             | Exploratory       | Presence/Absence      | Trend Data                   |
| <i>Gill netting</i>       |                   |                       |                              |
| Channel Catfish           | Abundance         | CPUE–stock            | RSE-Stock $\leq 25$          |
|                           | Size structure    |                       | $N \geq 50$ stock            |

<sup>a</sup> 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, White River Reservoir, Texas, 2014 and 2018. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

| Vegetation                  | 2014         | 2018        |
|-----------------------------|--------------|-------------|
| Native emergent (Smartweed) | 142.2 (29.4) | 21.3 (<0.1) |

Table 7. Percent directed angler effort by species for White River Reservoir, Texas. Survey period was from 1 April 2016 through 30 June 2016.

| Species            | Percent |
|--------------------|---------|
| Blue Catfish       | 0.7     |
| Channel Catfish    | 24.3    |
| White Bass         | 0.3     |
| Largemouth Bass    | 15.7    |
| White Crappie      | 31.2    |
| Anything           | 23.0    |
| Catfish – combined | 4.0     |
| Panfish – combined | 0.8     |

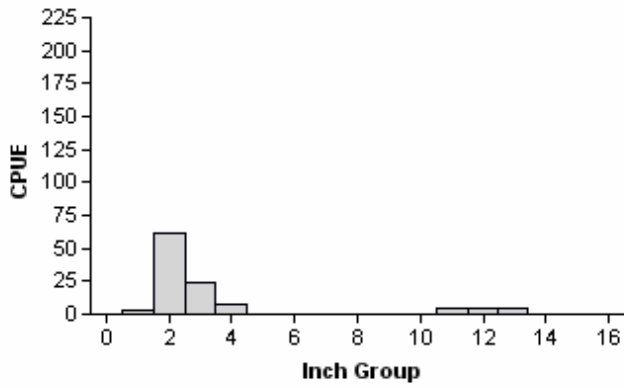
Table 8. Total fishing effort (h) for all species and total directed expenditures at White River Reservoir, Texas, 2016. Survey period was from 1 April through 30 June. Relative standard error is in parentheses.

| Creel statistic             | 2016           |
|-----------------------------|----------------|
| Total fishing effort        | 17,566.5 (24)  |
| Total directed expenditures | \$118,621 (55) |

## Gizzard Shad

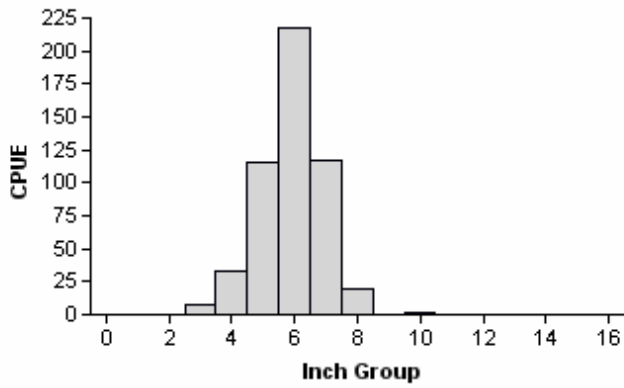
**2014**

Effort = 1.0  
 Total CPUE = 109.0 (38; 109)  
 IOV = 88 (7)



**2016**

Effort = 1.0  
 Total CPUE = 510.0 (41; 510)  
 IOV = 96 (2)



**2018**

Effort = 1.0  
 Total CPUE = 285.0 (34; 285)  
 IOV = 87 (5)

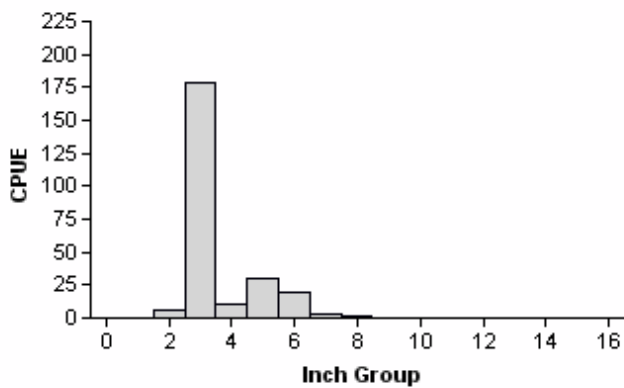


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, White River Reservoir, Texas, 2014, 2016, and 2018.

## Bluegill

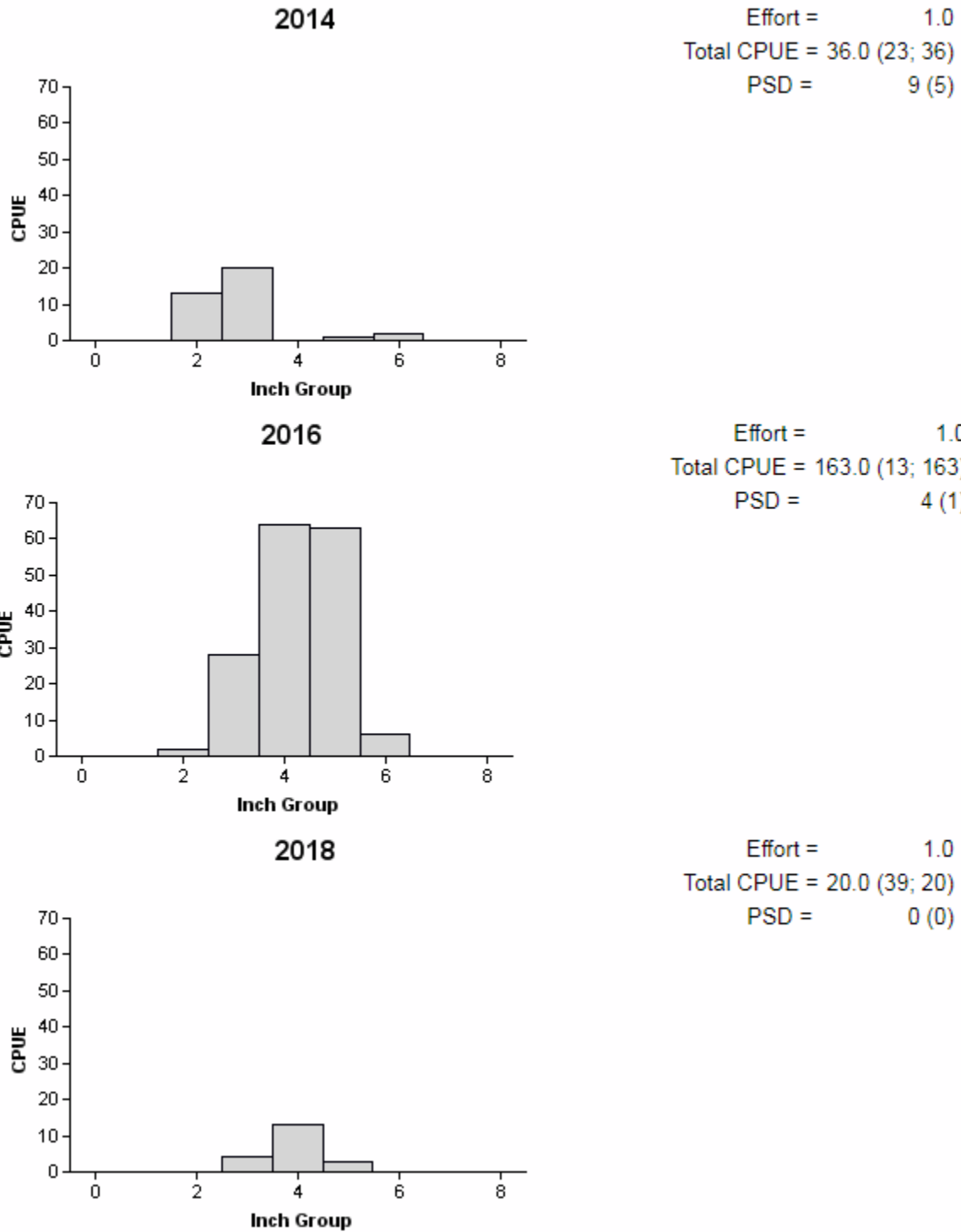


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, White River Reservoir, Texas, 2014, 2016, and 2018.

## Blue Catfish

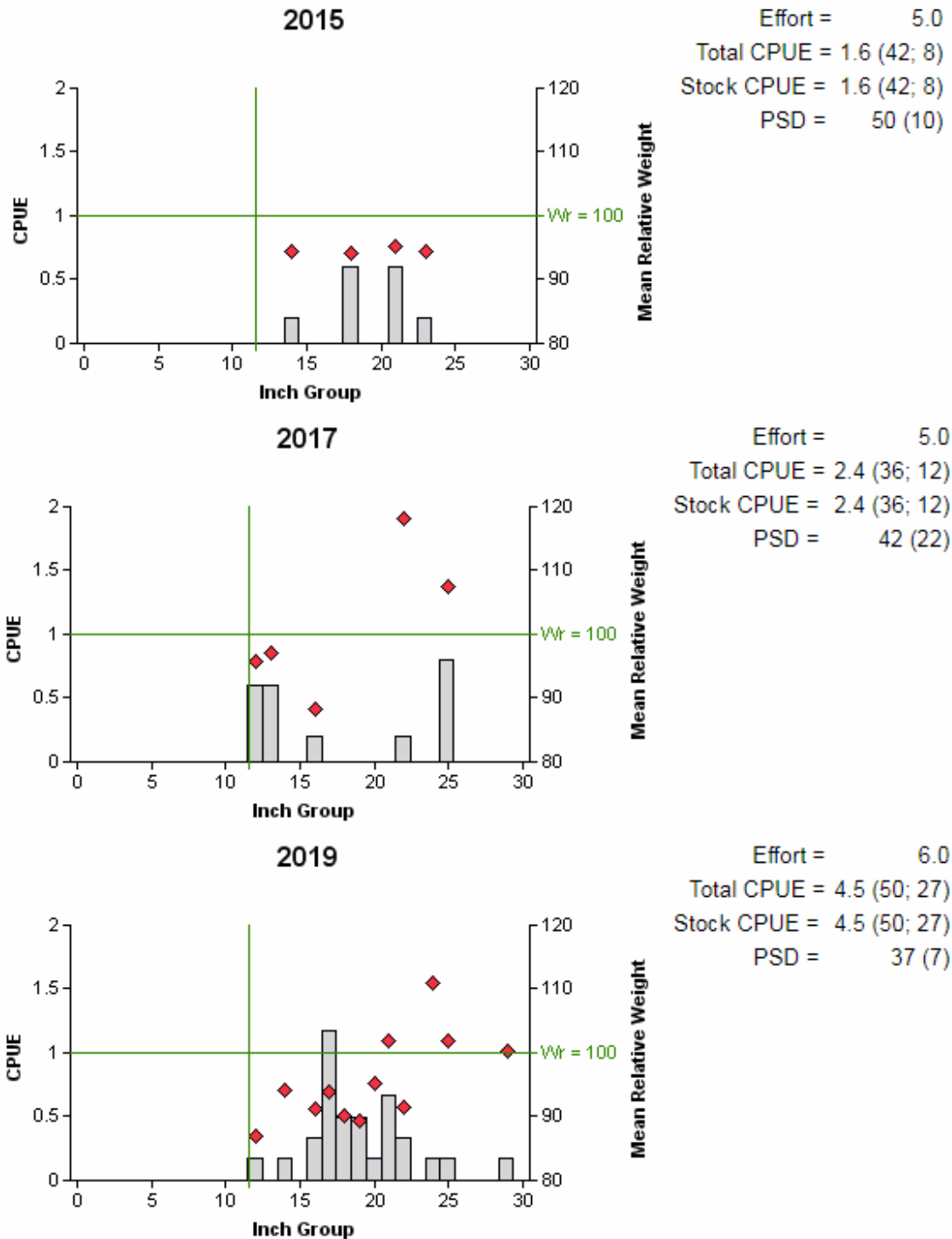


Figure 4. Number of Blue Catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, White River Reservoir, Texas, 2015, 2017, and 2019. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

Table 9. Creel survey statistics for Blue Catfish at White River Reservoir, Texas, from 1 April 2016 through 30 June 2016. Catch rate is for anglers targeting Blue Catfish and total harvest is the estimated number of Blue Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel survey statistic | 2016         |
|------------------------|--------------|
| Surface area (acres)   | 878          |
| Directed effort (h)    | 119.50 (140) |
| Directed effort/acre   | 0.14 (140)   |
| Catch rate (number/h)  | 0 (0)        |
| Total harvest          | 0 (0)        |
| Harvest/acre           | 0 (0)        |
| Percent legal released | 0            |

### Channel Catfish

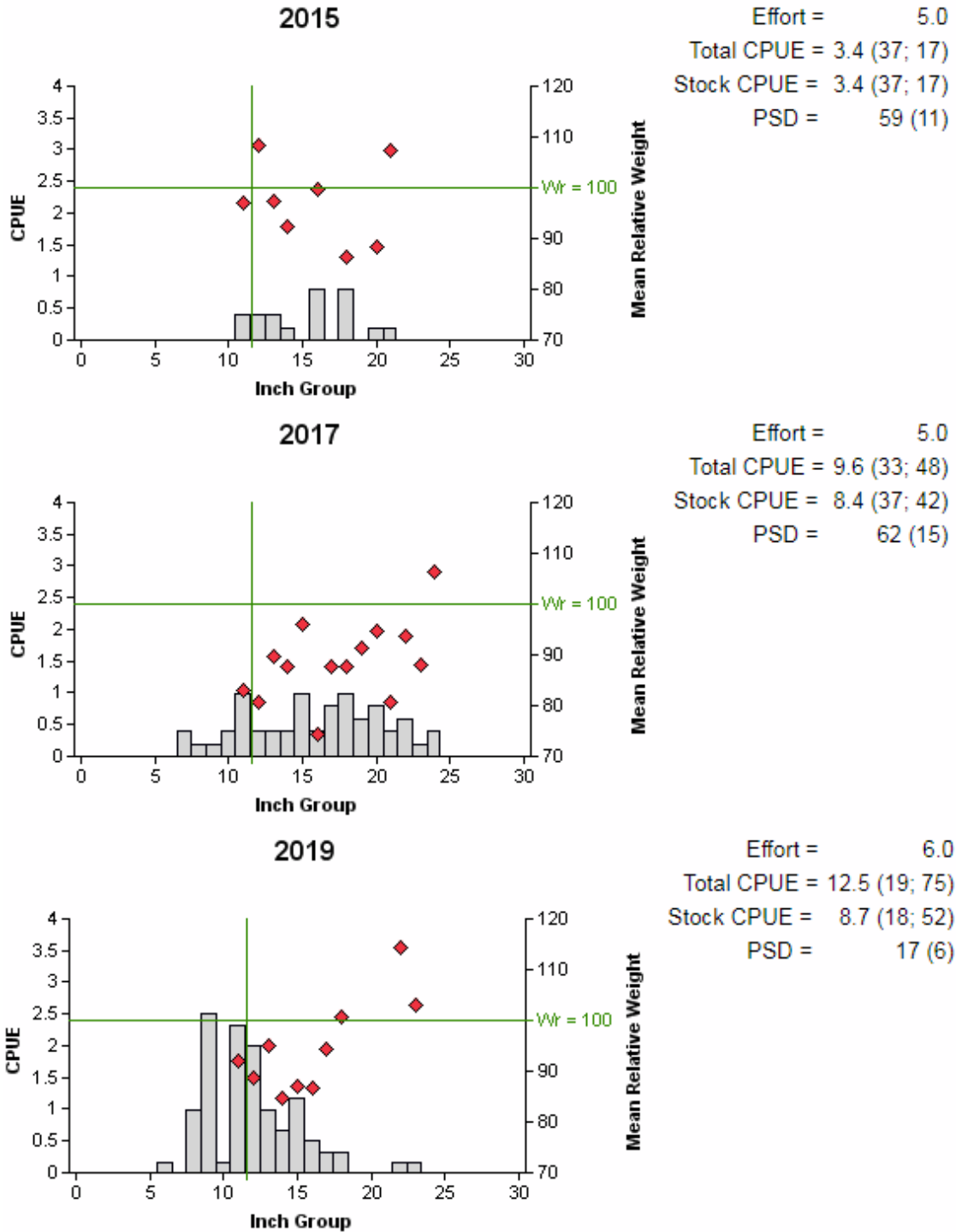


Figure 5. Number of Channel Catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure) for spring gill net surveys, White River Reservoir, Texas, 2015, 2017, and 2019. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

Table 105. Creel survey statistics for Channel Catfish at White River Reservoir, Texas, from 1 April 2016 through 30 June 2016. Catch rate is for anglers targeting Channel Catfish and total harvest is the estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel survey statistic | 2016          |
|------------------------|---------------|
| Surface area (acres)   | 878           |
| Directed effort (h)    | 4,266.91 (29) |
| Directed effort/acre   | 4.85 (29)     |
| Catch rate (number/h)  | 0.03 (105)    |
| Total harvest          | 115 (241)     |
| Harvest/acre           | 0.13 (241)    |
| Percent legal released | 0             |

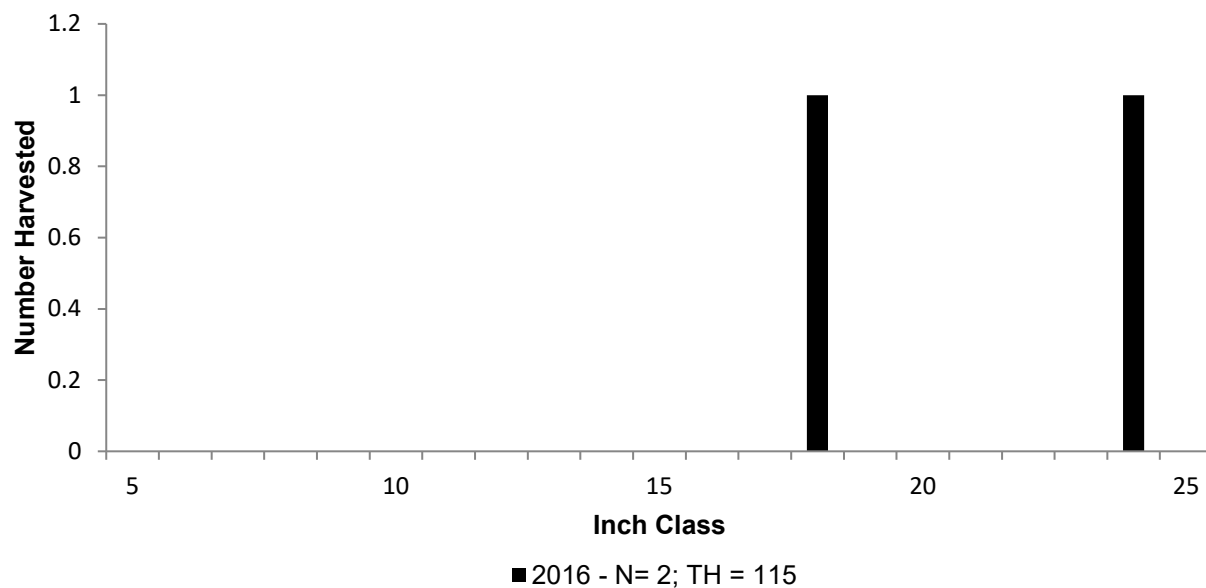


Figure 6. Length frequency of harvested Channel Catfish observed during creel surveys at White River Reservoir, Texas, 1 April 2016 through 30 June 2016, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.



### Flathead Catfish

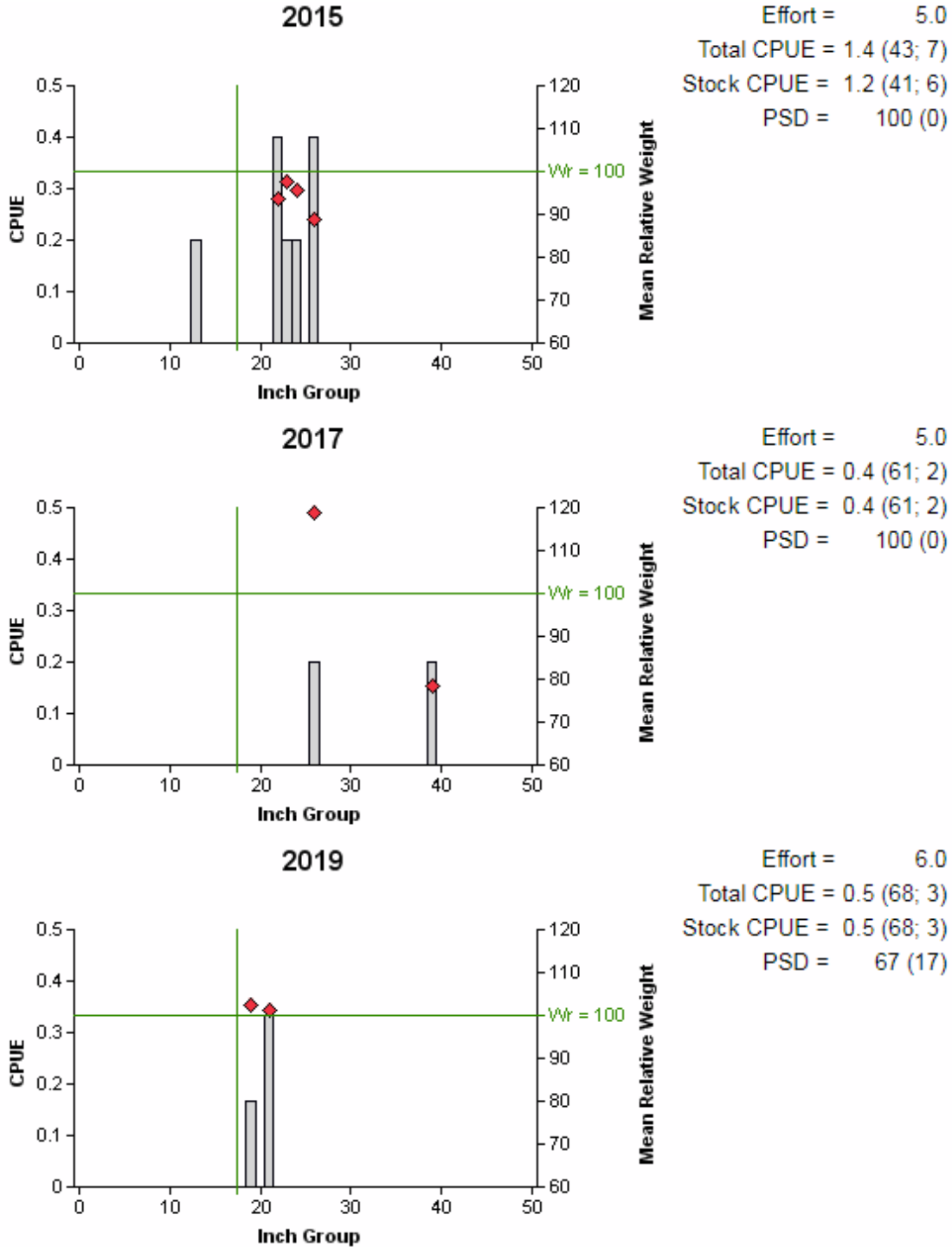


Figure 7. Number of Flathead Catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, White River Reservoir, Texas, 2015, 2017, and 2019. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

### White Bass

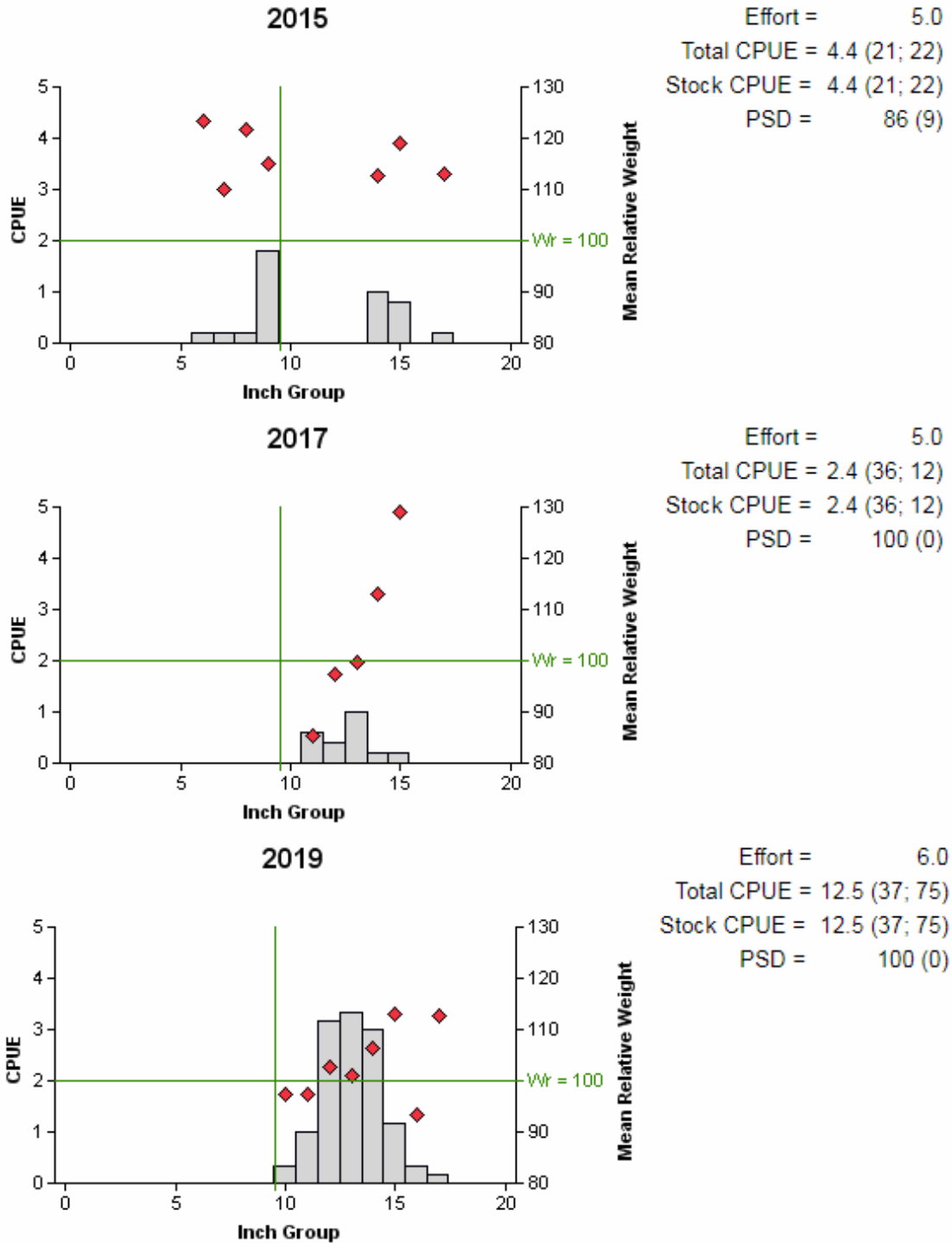


Figure 8. Number of White Bass caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, White River Reservoir, Texas, 2015, 2017, and 2019. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

Table 6. Creel survey statistics for White Bass at White River Reservoir, Texas, from 1 April 2016 through 30 June 2016. Catch rate is for anglers targeting White Bass, and total harvest is the estimated number of White Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel survey statistic | 2016        |
|------------------------|-------------|
| Surface area (acres)   | 878         |
| Directed effort (h)    | 55.47 (166) |
| Directed effort/acre   | 0.06 (166)  |
| Catch rate (number/h)  | 0.00 (0)    |
| Total harvest          | 377 (106)   |
| Harvest/acre           | 0.43 (106)  |
| Percent legal released | 0           |

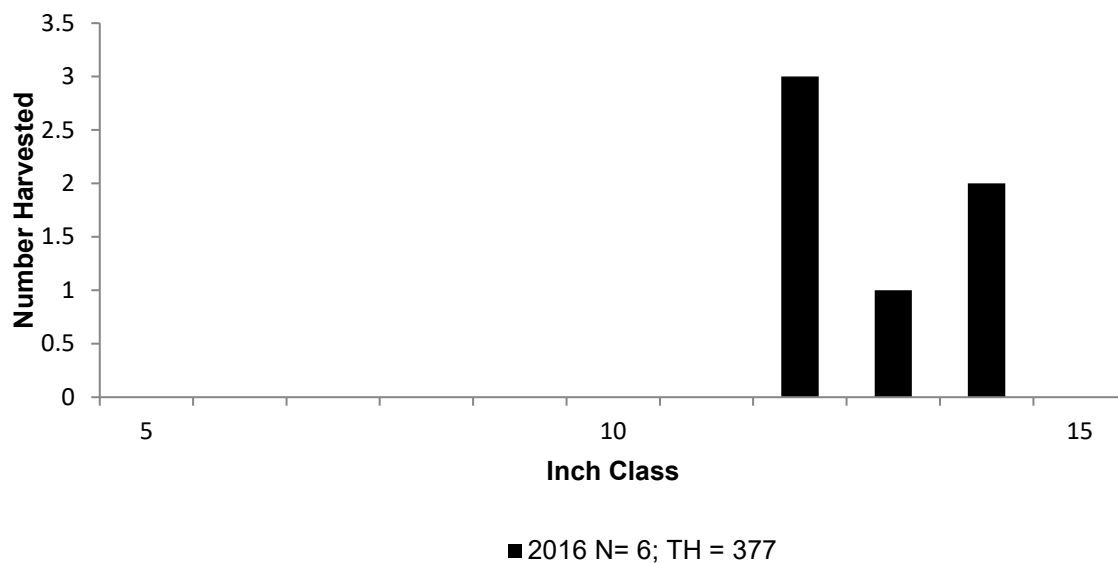


Figure 9. Length frequency of harvested White Bass observed during creel surveys at White River Reservoir, Texas, 1 April 2016 through 30 June 2016, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Largemouth Bass

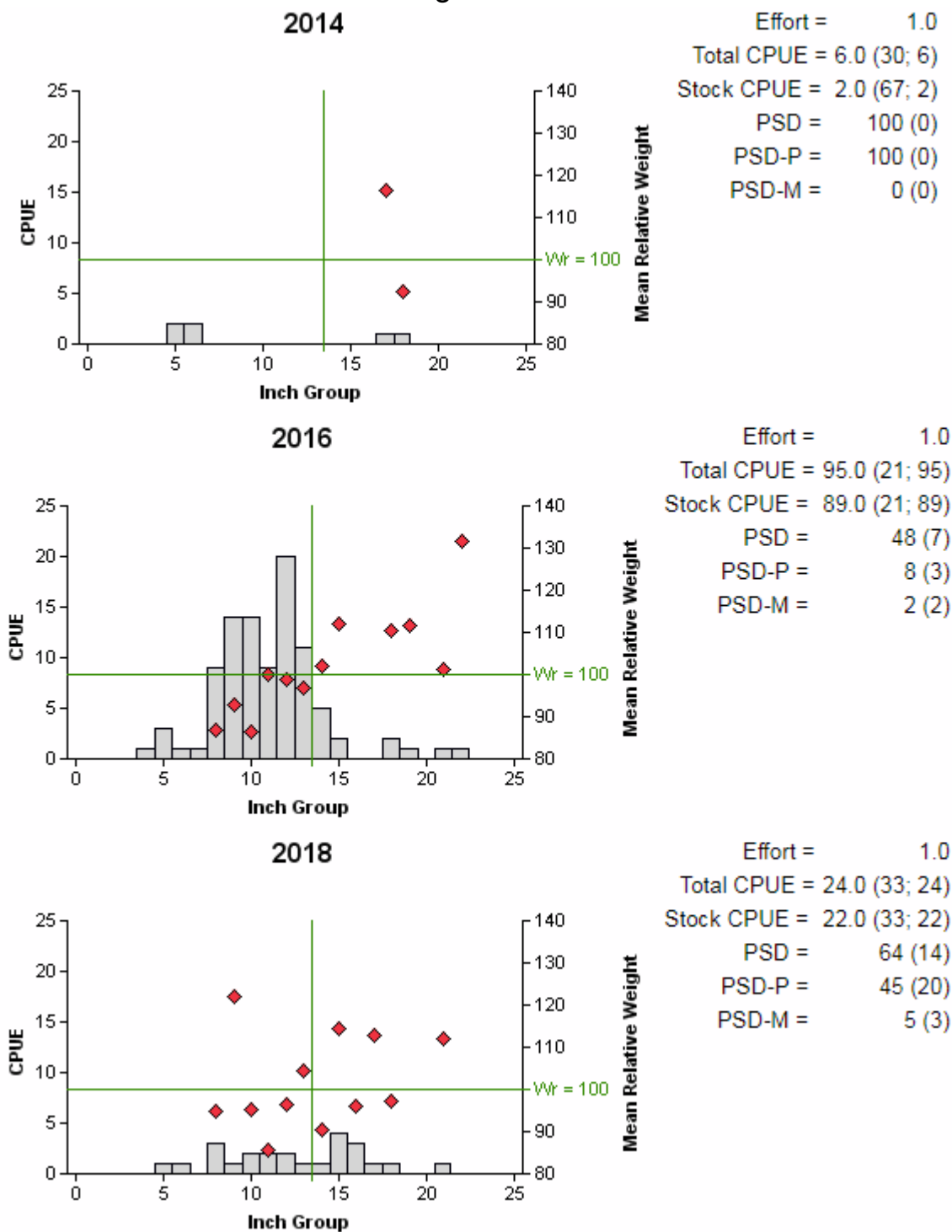


Figure 4. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, White River Reservoir, Texas, 2014, 2016, and 2018. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

Table 7. Creel survey statistics for Largemouth Bass at White River Reservoir, Texas, from 1 April 2016 through 30 June 2016. Catch rate is for all anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

| Statistic                   | 2016          |
|-----------------------------|---------------|
| Surface area (acres)        | 878           |
| Directed angling effort (h) | 2,761.03 (31) |
| Angling effort/acre         | 3.14 (31)     |
| Catch rate (number/h)       | 0.11 (55)     |
| Harvest                     | 0.00 (0)      |
| Percent legal released      | 100           |

Table 13. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, White River Reservoir, Texas. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB. Genetic composition was determined with micro-satellite DNA analysis.

| Year | Sample size | Number of fish |    |    |      | % FLMB alleles | % pure FLMB |
|------|-------------|----------------|----|----|------|----------------|-------------|
|      |             | FLMB           | F1 | Fx | NLMB |                |             |
| 2014 | 6           | 0              | 0  | 5  | 1    | 17             | 0           |
| 2018 | 24          | 0              | 0  | 19 | 5    | 25             | 0           |

## White Crappie

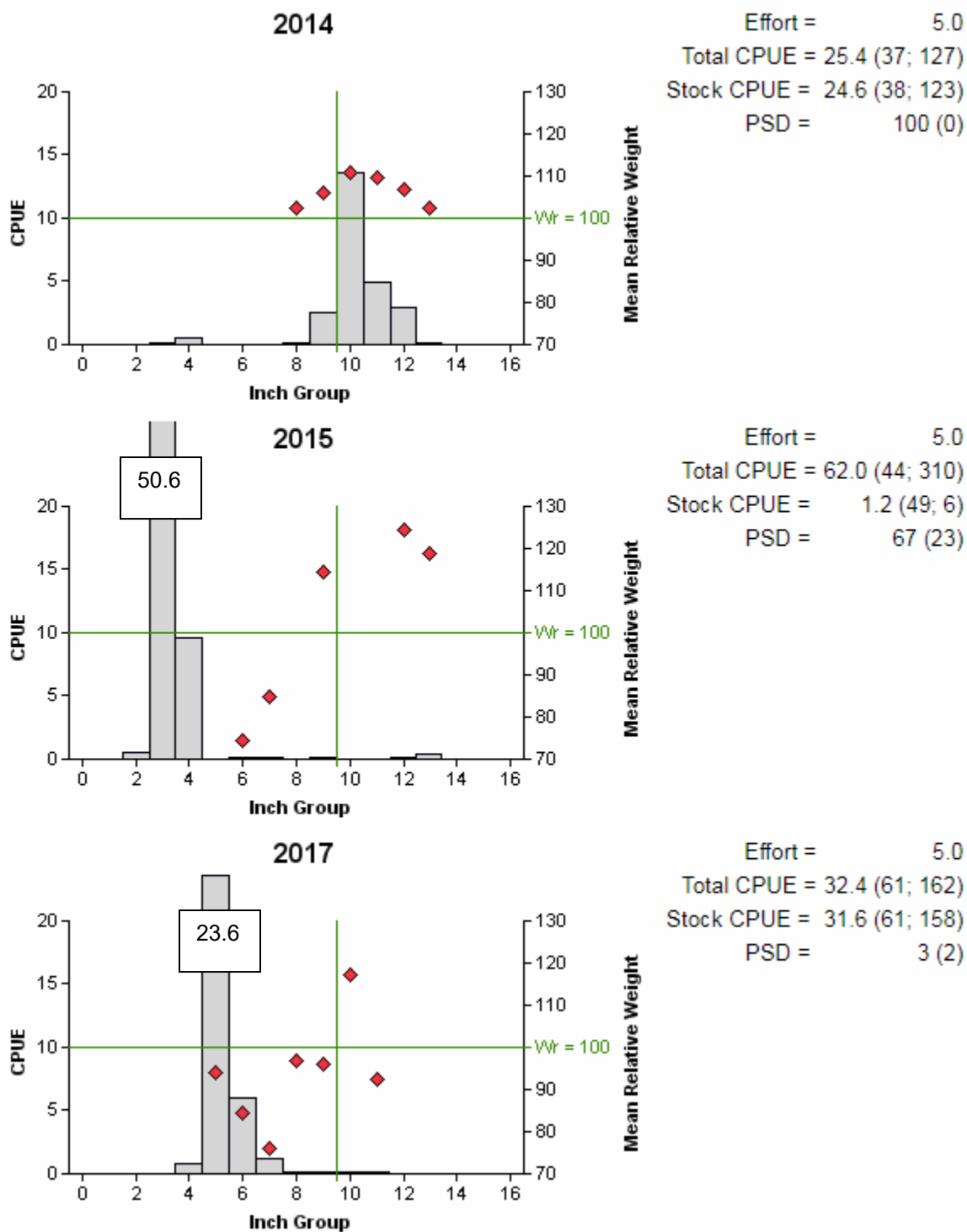


Figure 5. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net survey, White River Reservoir, Texas, 2014, 2015, and 2017. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

## White Crappie

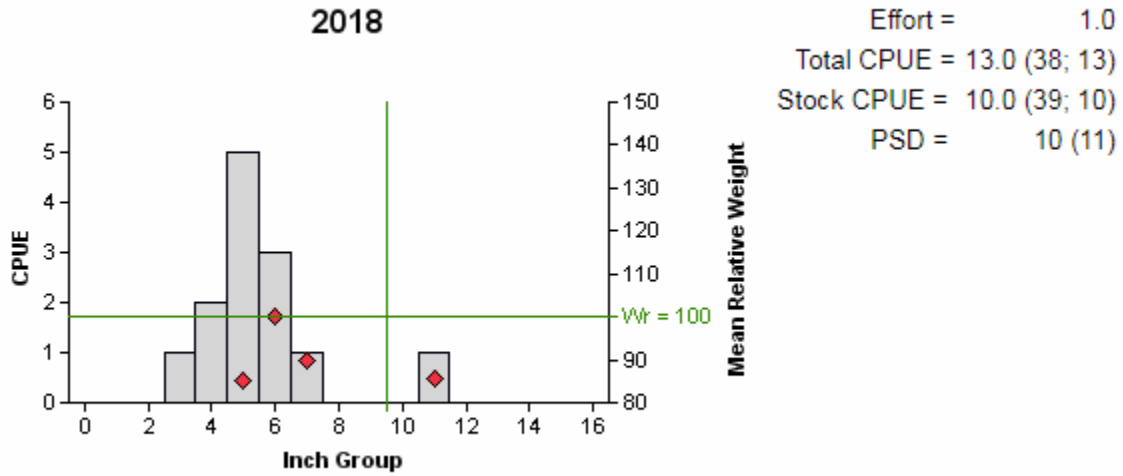


Figure 6. Number of White Crappie caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, White River Reservoir, Texas, 2018. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

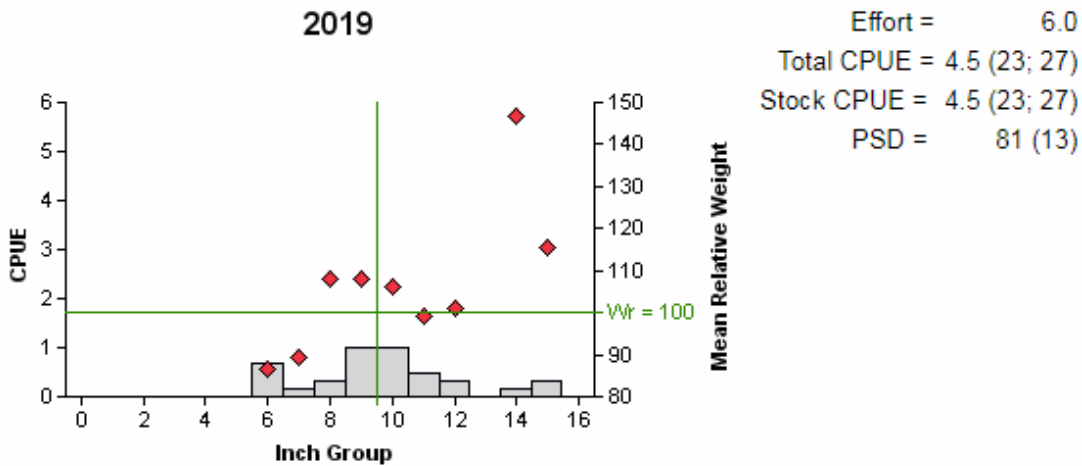


Figure 13. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net survey, White River Reservoir, Texas, 2019. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

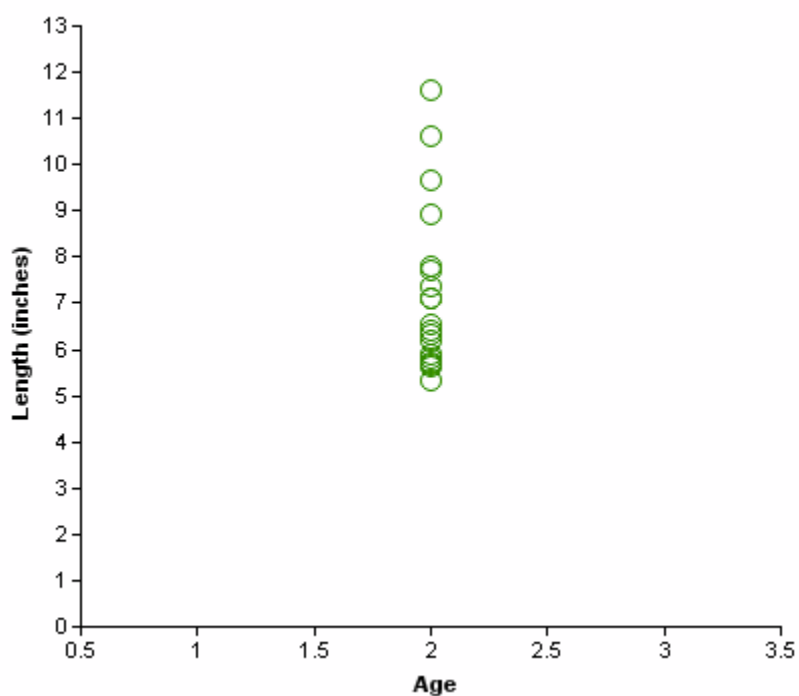


Figure 14. Length at age for White Crappie collected from trap nets at White River Reservoir, Texas, November 2017 (N=19).

Table 8. Creel survey statistics for White Crappie at White River Reservoir, Texas, from 1 April 2016 through 30 June 2016. Catch rate is for anglers targeting White Crappie and total harvest is the estimated number of White Crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

|                        |               |
|------------------------|---------------|
| Creel Survey Statistic | 2106          |
| Surface area (acres)   | 878           |
| Directed effort (h)    | 5,481.82 (28) |
| Directed effort/acre   | 6.24 (28)     |
| Catch rate (number/h)  | 0.32 (38)     |
| Total harvest          | 1,017 (32)    |
| Harvest/acre           | 1.16 (32)     |
| Percent legal released | 7             |



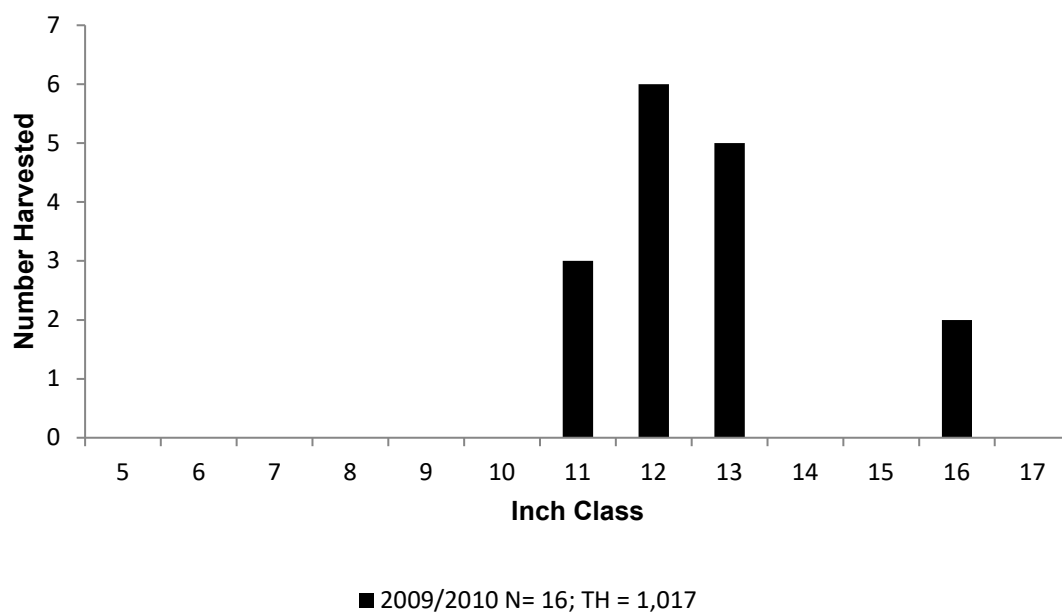


Figure 15. Length frequency of harvested White Crappie observed during creel surveys at White River Reservoir, Texas, 1 April 2016 through 30 June 2016, all anglers combined. N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Walleye

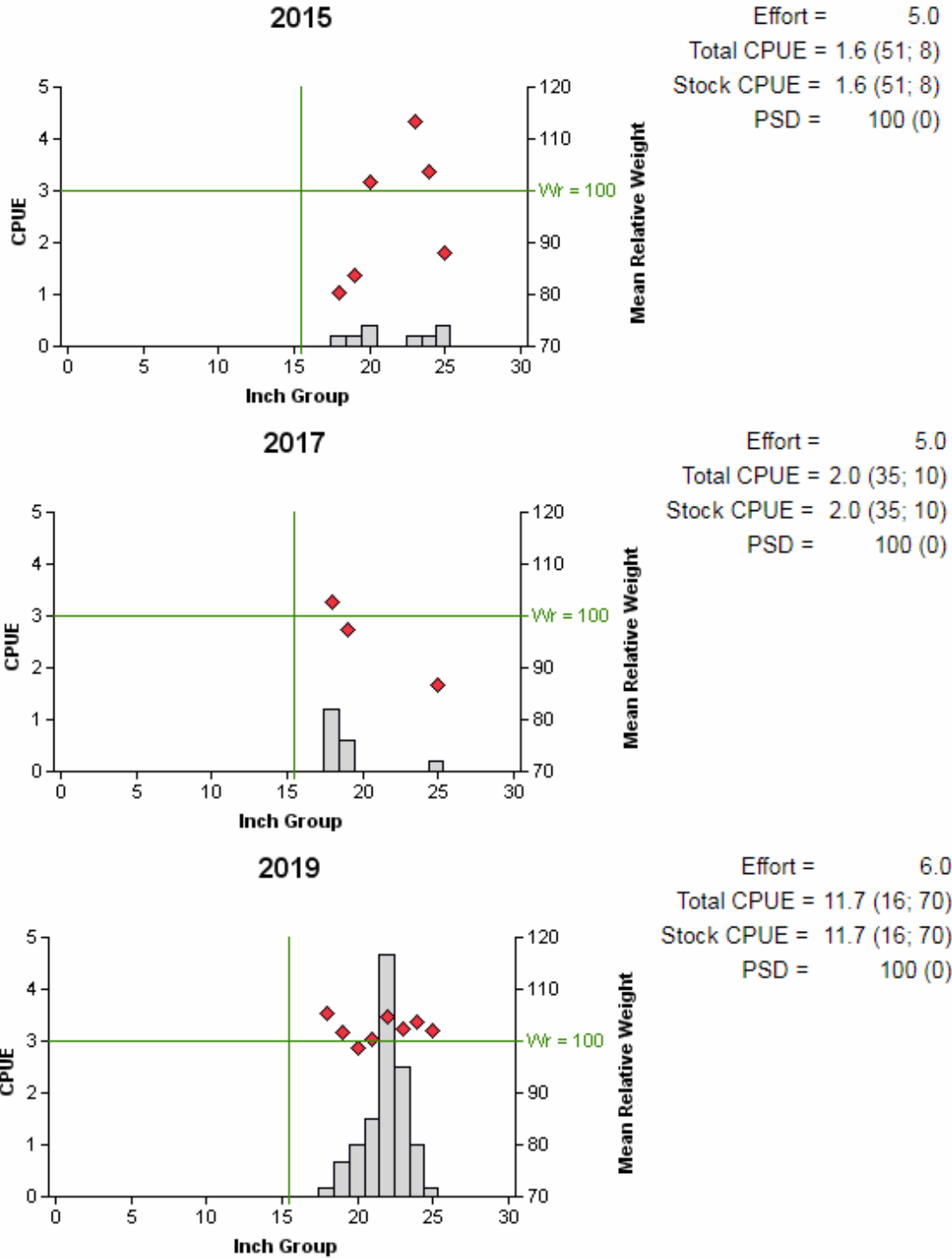


Figure 16. Number of Walleye caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net survey, White River Reservoir, Texas, 2015, 2017, and 2019. Vertical line indicates the minimum length limit, and horizontal line represents relative weight of 100.

## Proposed Sampling Schedule

Table 9. Proposed sampling schedule for White River Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, baited hoop net surveys are conducted in the summer, and electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A

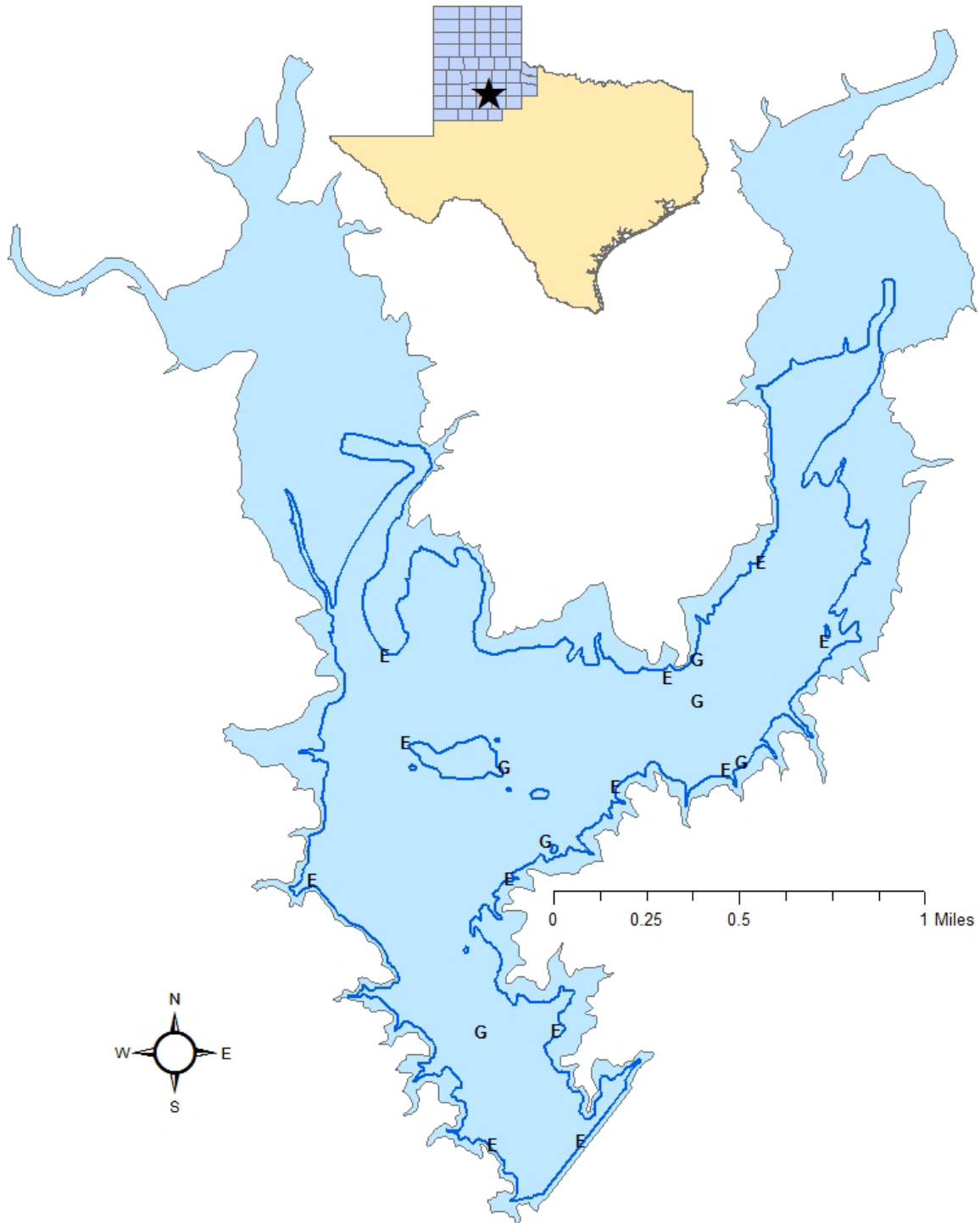
|                            | Survey year |           |           |           |
|----------------------------|-------------|-----------|-----------|-----------|
|                            | 2019-2020   | 2020-2021 | 2021-2022 | 2022-2023 |
| Angler Access              |             |           |           | S         |
| Structural Habitat         |             |           |           | S         |
| Vegetation                 |             |           |           | S         |
| Electrofishing – Fall      |             | A         |           | S         |
| Electrofishing – Spring    |             |           |           |           |
| Trap netting               |             |           | A         |           |
| Gill netting               |             | A         |           | S         |
| Baited tandem hoop netting |             |           | A         |           |
| Creel survey               |             |           |           |           |
| Report                     |             |           |           | S         |

## APPENDIX A

Number (N) and catch rate (CPUE) (RSE in parentheses) of all species collected from all gear types from White River Reservoir, Texas, 2018-2019. Sampling effort was 6 net nights for gill netting and 1 hour for electrofishing.

| Species          | Gill Netting |           | Electrofishing |            |
|------------------|--------------|-----------|----------------|------------|
|                  | N            | CPUE      | N              | CPUE       |
| Gizzard Shad     | 76           | 13.7 (6)  | 285            | 285.0 (29) |
| Common Carp      | 68           | 11.3 (23) | 52             | 52.0 (58)  |
| River Carpsucker | 63           | 10.5 (35) | 10             | 10.0 (39)  |
| Blue Catfish     | 27           | 4.5 (50)  |                |            |
| Channel Catfish  | 75           | 12.5 (19) | 3              | 3.0 (72)   |
| Flathead Catfish | 3            | 0.5 (68)  |                |            |
| White Bass       | 75           | 12.5 (37) | 8              | 8.0 (56)   |
| Bluegill         | 1            | 0.2 (100) | 20             | 20.0 (39)  |
| Longear Sunfish  |              |           | 8              | 8.0 (43)   |
| Largemouth Bass  | 21           | 3.5 (42)  | 24             | 24.0 (33)  |
| White Crappie    | 27           | 4.5 (23)  | 13             | 13.0 (38)  |
| Walleye          | 70           | 11.7 (16) | 3              | 3.0 (52)   |
| Freshwater Drum  | 9            | 1.5 (48)  | 14             | 14.0 (42)  |

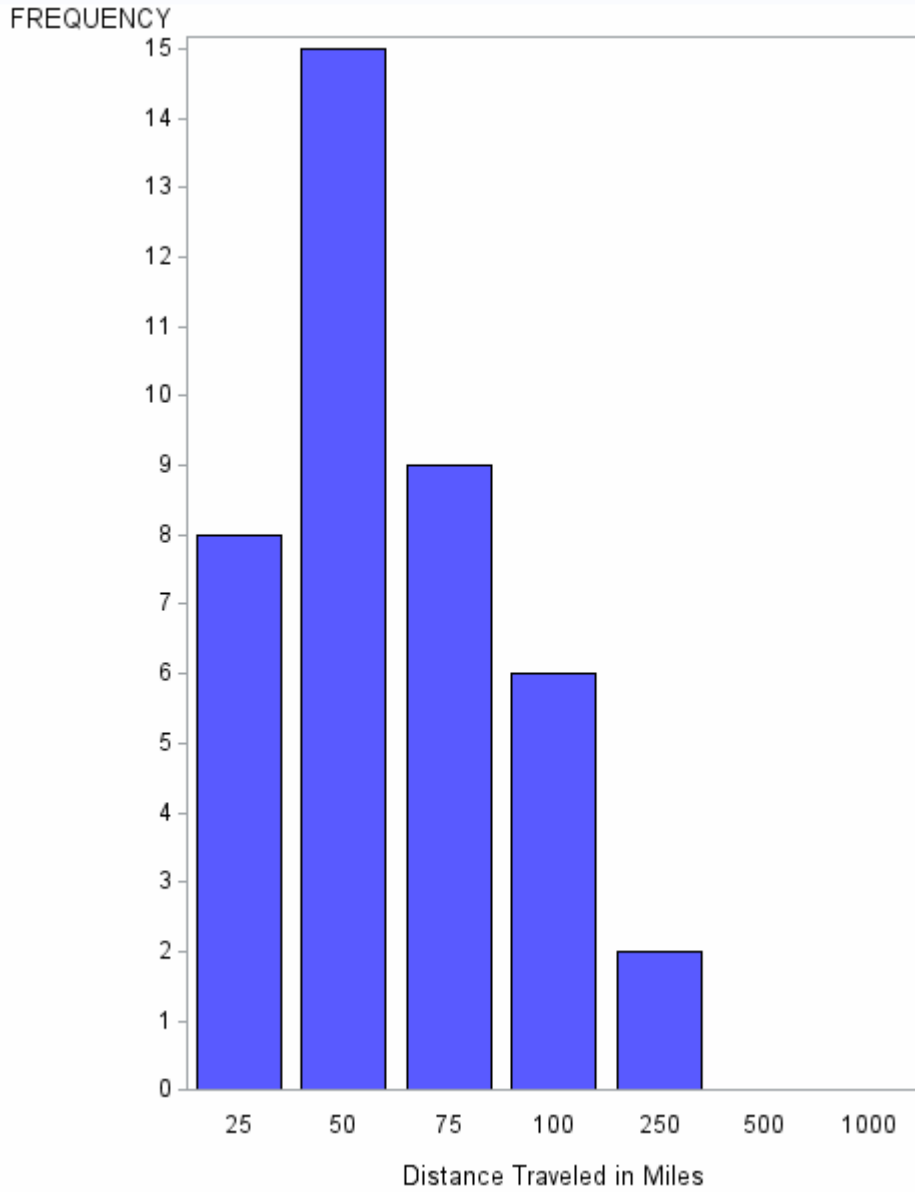
## APPENDIX B



Location of sampling sites, White River Reservoir, Texas, 2018-2019. Gill net and electrofishing stations are indicated by G and E, respectively. Light blue represents full pool (2,370 ft MSL) and dark blue line represents water level at time of sampling (2,350 ft MSL).

APPENDIX C

Reporting of creel ZIP code data



Frequency of anglers that traveled various distances (miles) to White River Reservoir, Texas, as determined from the 1 April 2016 through 30 June 2016 creel survey.



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