

Aquilla 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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Contents

Contents	i
Survey and Management Summary	1
Introduction.....	2
Reservoir Description	2
Angler Access.....	2
Management History	2
Methods.....	3
Results and Discussion.....	4
Fisheries Management Plan for Aquilla Reservoir, Texas	6
Objective-Based Sampling Plan and Schedule (2019–2023).....	7
Literature Cited.....	9
Tables and Figures	10
Water Level	10
Reservoir Characteristics	11
Boat Ramp Characteristics.....	12
Harvest Regulations	12
Stocking History.....	13
Objective-Based Sampling Plan for 2018-2019	14
Gizzard Shad.....	15
Bluegill	16
Blue Catfish	17
Channel Catfish	20
White Bass.....	19
Largemouth Bass	20
White Crappie.....	21
Proposed Sampling Schedule	22
APPENDIX A – Catch rates for all species from all gear types	23
APPENDIX B – Historical catch rates for targeted species	24
APPENDIX C – Map of Sampling Locations.....	245

Survey and Management Summary

Fish populations in Aquilla Reservoir were surveyed in 2014 with electrofishing, 2018 with trap netting and in 2019 with gill netting. Historical data are presented with the 2014-2019 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: Aquilla Reservoir is a 3,066-acre impoundment supplied by Hackberry and Aquilla Creeks within the Brazos River Basin, Hill County. Water level fluctuated moderately between July 2015 and April 2019. Mean and maximum water depths are 16 and 60 feet respectively and the reservoir is considered eutrophic. Habitat features consisted of natural shoreline and flooded timber.

Management History: Important sport fish include White Crappie, White Bass, Largemouth Bass and catfishes. An 18-inch minimum length limit was placed on Largemouth Bass in 1994 to provide additional protection of brood stock, improve densities, and maximize trophy potential. The regulation was replaced with the statewide 14-inch minimum length limit in 2012 based on un-changed population indices during the period, and a 2006 creel which showed continued under-sized harvest for the species. Hydrilla was discovered in 2004 and monitored annually through 2013 but is no longer an issue. Efforts to mitigate the loss of important fish habitat from sedimentation and loss of reservoir volume have included native vegetation plantings, transplanting native vegetation from within the reservoir and placement of artificial fish habitats throughout the reservoir. Recent management efforts include maintaining aquatic invasive species (AIS) signage and educating constituents about the threat of AIS, especially Zebra Mussels, whenever possible.

Fish Community: An electrofishing survey was not conducted in fall 2018 due to heavy rains and boat ramp closures, therefore new data on forage species and Largemouth Bass are not in this report. Fall 2014 electrofishing data are the most recent available.

- **Prey species:** Gizzard Shad and Threadfin Shad were the dominant forage species present in 2014 and most Gizzard Shad were available as prey to sport fish. Other forage species included Bluegill, Longear, Warmouth and Green Sunfish.
- **Catfishes:** Blue and Channel Catfish catch rates in 2019 were similar to historical averages. Flathead Catfish were not observed.
- **Largemouth Bass:** Largemouth Bass were abundant and collected in numbers well above the historical average in 2014. Few legal-sized fish were available to anglers.
- **White Crappie:** The 2018 White Crappie catch rates were similar to the historical average and good numbers of legal-sized fish were available to anglers.

Management Strategies: Continue managing sport fishes at Aquilla Reservoir with statewide regulations. Inform the public about the negative impacts of AIS and maintain appropriate signage at both access points. Conduct angler access, vegetation, electrofishing and trap netting surveys in 2022 and a gill netting survey in 2023. An additional fall electrofishing survey will be conducted during 2020.

Introduction

This document is a summary of fisheries data collected from Aquilla Reservoir in 2014-2019. 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 species of 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

Aquilla Reservoir is a 3,066-acre reservoir located in Hill County, Texas. The reservoir was constructed in 1982 by the United States Army Corps of Engineers (USACE) to serve as a source of municipal water and for flood control. The reservoir is in the Blackland Prairie Ecological Area and land use around the reservoir is primarily agricultural. The reservoir has a conservation pool of 537.5 feet above mean sea level, a mean and maximum depth of 16 and 60 feet and is eutrophic with a mean chl-*a* of 52.4 (Texas Commission on Environmental Quality 2008). Habitat at time of sampling consisted of natural shoreline, with expansive stands of flooded timber. Water level rose to 10' or more above conservation pool frequently between summer 2015 and summer 2018 – and peaked during October 2018, preventing an electrofishing survey from being completed as scheduled. Water level was within 2' of conservation pool during December 2018 trap netting and March 2019 gill netting surveys. Other descriptive characteristics for Aquilla Reservoir are in Table 1.

Angler Access

Aquilla Reservoir has three public boat ramps (Dairy Hill, Old School and Hackberry) and no private boat ramps (Table 2). The Hackberry ramp is shallow due to sedimentation issues and is seldom used for launching anything other than small water craft. Dairy Hill and Old School ramp are available to anglers at reservoir levels above 532 feet above mean seas level. Much of Aquilla's shoreline is accessible to anglers through United States Army Corps of Engineers (USACE) property; however convenient shoreline access is limited to the public boat ramp areas.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Tibbs and Baird 2015) included:

1. Re-classify the presence of hydrilla in Aquilla Reservoir as a tier III infestation, monitor the reservoir for hydrilla and other noxious vegetation every four years and share coverage information with the USACE and constituents upon request.
Action: An aquatic vegetation survey was completed during summer 2018 as part of the four-year monitoring plan. No requests for aquatic vegetation surveys have been made by USACE or other parties, and no significant findings exist from the 2018 survey concerning noxious species, as hydrilla was only observed in trace amounts.
2. Maintain partnerships with USACE and constituent groups to introduce native vegetation into Aquilla. Request appropriate species of native vegetation from the Texas Freshwater Fisheries Center (TFFC) aquatic plant nursery, or culture them in the Waco Wetlands Aquatic Plant Nursery, and plant when appropriate. Monitor the spread/growth of native vegetation plantings annually pending observations; review the program at the next report writing and make recommendations.

Action: Multiple efforts were made to introduce or promote the spread of native aquatic vegetation on Aquilla Reservoir including plantings and transplanting in 2012, 2014 and 2017. These efforts are detailed in the vegetation/habitat management history section of this report. Recommendations follow in the Management Strategies.

3. Cooperate with the USACE to maintain appropriate AIS signage, educate the public about AIS, make a speaking point about AIS when presenting to constituent and user groups and keep track of all inter-basin water transfer routes to facilitate potential AIS responses.

Action: Invasive species signage was posted at Aquilla Reservoir during summer 2013 and has been maintained since that time. District biologists have continued to educate constituents about AIS in presentations, conversations and Facebook posts since the last report writing. Inter-basin water transfers are a permanent fixture in this report and will be updated as needed.

Harvest regulation history: Sport fishes were managed with statewide regulations until 1994. From 1994 to 2012, Largemouth Bass were managed with an 18-inch minimum length limit, five fish daily bag, to provide additional protection of brood stock, improve densities, and maximize trophy potential. This regulation was removed in September 2012 and replaced with the current statewide 14-inch minimum length limit, five fish daily bag regulation. The current regulations are found in Table 3.

Stocking history: Blue Catfish, Florida Largemouth Bass and Coppernose Bluegill were stocked in the early to mid-1980s; no new stockings have occurred since 1985. The complete stocking history is in Table 4.

Vegetation/habitat management history: Loss of fish habitat has been attributed to sedimentation issues in the watershed and aging flooded timber in the reservoir (Tibbs and Baird 2015). In 2012, efforts were made to begin improving fish habitat by planting aquatic vegetation (pickerel weed, water willow and bulrush, reared at the Waco Wetlands aquatic vegetation nursery) at appropriate sites in the reservoir. Unfortunately, drought conditions over the next two years killed all the aquatic vegetation that was planted. Water willow and bulrush were transplanted from existing stands on the reservoir to appropriate shoreline sites in 2014 and 2017. Additionally, fish attractors (bamboo crappie condos and Fishiding structures) were placed at strategic areas around the reservoir to concentrate sport fishes for anglers. Locations of fish attractors and GPS coordinates can be found on the TPWD website under the freshwater links. Future management plans include additional artificial habitat additions.

Water transfer: There are currently two permanent pumping stations that utilize a common intake structure and transfer water to other sites. The first is operated by the City of Cleburne and transfers untreated water to Lake Pat Cleburne to be used for municipal water supply. The other is operated by the Aquilla Water Supply Corporation, which provides water supply to a large rural area.

Reservoir capacity: Aquilla was impounded in 1983. Original plans calculated the reservoir's capacity at conservation pool (537.5 feet above mean sea level) to be 52,400 acre-feet. Recent reservoir capacity comparisons conducted by the Texas Water Development Board (TWDB) found the 2008 capacity to be 44,566 acre-feet. Further research indicates 84 to 218 acre-feet of reservoir volume is lost annually due to erosion and sedimentation from its watershed. See Tibbs and Baird (2015) for additional information.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Aquilla 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: Electrofishing was not conducted in fall 2018 due to heavy rains and boat ramp closures, therefore new data on forage species and Largemouth Bass are not in this report. Fall 2014 electrofishing data are the most recent available.

Trap netting – White Crappie were collected by winter trap netting (10 net nights at 10 stations). Catch per unit effort for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting – White Bass, White Crappie and catfishes were collected by gill netting (8 net nights at 8 stations). Catch per unit effort for gill netting was recorded as the number of fish caught per net night (fish/nn).

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). The PSD for Channel Catfish was defined as the percentage of 11-inch and longer individuals which were also 16-inches and longer. The PSD for White Bass was defined as the proportion of 6-inch and longer individuals which were also 9-inches and longer. The PSD for White Crappie was defined as the proportion of 5-inch and longer individuals which are also 8-inches and longer. Index of Vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error ($RSE = 100 \times SE \text{ of the estimate/estimate}$) was calculated for all CPUE and creel statistics.

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

Results and Discussion

Habitat: The last structural habitat survey estimated 48.1 miles (98.9%) of natural shoreline, trace amounts of rock and bulk headed shorelines and 245 acres of standing timber (Tibbs and Baird 2011). Littoral zone habitat in summer 2018 was dominated by natural shoreline (100% or 36 of 36 randomly selected shoreline points). Structural habitat was dominated by flooded timber and submerged vegetation was nonexistent. Fragments of hydrilla were observed in shallow water near the Dairy Hill boat ramp.

Creel: An angler creel survey was last conducted in 2006 and 2007 (Tibbs and Baird 2007).

Prey species: Threadfin Shad and Gizzard Shad were collected with night-time electrofishing at 881.0 fish/h and 456.0 fish/h respectively in 2014, and these catch rates were above historical averages (Figure 2 and Appendices A and B). The Index of vulnerability (IOV) for Gizzard Shad was good, and 82% of individuals were available to existing predators as forage (Figure 2). The Bluegill catch rate (54 fish/h) was below the historical average (87.3 fish/h; Figure 3 and Appendices A and B). Other forage species collected were Longear Sunfish (48/h), Warmouth (2/h), and Green Sunfish (2/h; Appendices A and B).

Catfishes: Blue and Channel Catfish were collected with gill netting at rates of 5.0 fish/nn and 2.1 fish/nn respectively in 2019 (Figures 4 and 5; Appendices A and B). Both catch rates were below the historical average (Appendix B). The OBS goal for Blue Catfish abundance (CPUE – Stock; $RSE \leq 25$) was achieved with an RSE of 18 while that for size structure (PSD and length-frequency; $N \geq 50$) fell short ($N = 29$ individuals; Figure 4). Neither goal was achieved for Channel Catfish ($RSE = 33$; $N = 11$; Figure 5). Both species showed balanced populations, good to excellent body condition and good numbers of legal-sized fish for anglers (Figures 4 and 5).

White Bass: White Bass were collected with gill netting at rates of 5.0 fish/nn in 2019 (Figure 6; Appendices A and B). This catch rate was similar to both previous surveys and the historical average. The OBS goal for White Bass abundance (CPUE – Total; $RSE \leq 25$) was not achieved ($RSE = 40$) and that for size structure (PSD and length-frequency; $N \geq 50$) also fell short ($N = 40$ individuals; Figure 6). Proportional size distribution (PSD) and PSD-10 values remained high; this is likely indicative of low recruitment, fast growth or some combination thereof, and is similar to previous surveys. All individuals had good to excellent body condition (Figures 4 and 5).

Largemouth Bass: Largemouth Bass were collected with night-time electrofishing at a rate of 245.0 fish/h in 2014; this catch rate equated to 245 collected individuals and was higher than the previous survey (2010) and historical average for the reservoir (Figure 7 and Appendices A and B). Proportional size distribution remained poor (16) and was lower than the PSD of 27 in 2010. This is likely indicative of inconsistent recruitment and a strong spawn in 2014 resulting in large numbers of small fish. Few legal-

sized bass were present in the sample. Body condition was generally excellent, ranging from approximately 87 to 110 (Figure 7). Largemouth Bass genetics analyzed in 2014 showed good Florida influence (50%; Tibbs and Baird 2015).

White Crappie: White Crappie were collected with winter trap netting and spring gill netting at a rate of 12.8 fish/nn and 4.1 fish/nn respectively (Figure 8; Appendices A and B). The OBS goal for the standard survey (winter trap netting), general monitoring to collect abundance (CPUE – Stock; RSE \leq 25) and size structure (PSD and length-frequency; $N \geq 50$) data, was achieved with 73 individuals and an RSE of 16 (Figure 8). Body condition was good to excellent but decreased with increasing size – consistent with the previous survey. Although CPUE was lower than 2014, good numbers of legal-sized fish were available for anglers and there was evidence of a good spawn in 2018.

Fisheries Management Plan for Aquilla Reservoir, Texas

Prepared – July 2019

ISSUE 1: Multiple efforts have been made to introduce or promote the spread of native aquatic vegetation on Aquilla Reservoir to improve fish habitat including plantings and transplanting native species in 2012, 2014 and 2017. Unfortunately, these efforts have consistently failed due to fluctuating water conditions. Other means of improving habitat for fish are more efficient and popular with anglers.

MANAGEMENT STRATEGIES

1. Discontinue native vegetation plantings on Aquilla Reservoir.
2. Build artificial habitat structures and deploy in complexes (i.e., freshwater reefs) throughout the reservoir.
3. Update the TPWD website with freshwater reef locations and GPS coordinates so that interested anglers can find and fish them.

ISSUE 2: Electrofishing was not conducted in fall 2018 due to heavy rains and boat ramp closures, therefore, current data on forage species and Largemouth Bass were not available for this report.

MANAGEMENT STRATEGY

1. Perform an additional daytime electrofishing survey in fall 2020.

ISSUE 3: Many AIS threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*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 AIS to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the USACE to maintain appropriate signage at access points around the reservoir.
2. Provide technical support and informational materials to interested constituents describing the agencies' "Clean, Drain, Dry" initiative.
3. 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)

Important sport and forage fishes

Abundant and/or important sport fishes in Aquilla Reservoir include White Crappie, White Bass, Channel Catfish, Blue Catfish and Largemouth Bass. Important forage fishes include Gizzard Shad, Threadfin Shad, Bluegill and Longear Sunfish.

Sport fishes with low-density populations

Flathead Catfish and Black Crappie occur in low abundance in Aquilla Reservoir and are generally caught incidentally to targeted species. We will continue collecting and reporting data for these species and upgrade their status as appropriate.

Survey objectives, fisheries metrics, and sampling objectives

Fall Electrofishing: Dumont and Dennis (1997) reported catch of bass greater than 14.9 inches was not statistically different between fall day-time and night-time samples. They also reported increased catch of smaller bass during night-time sampling. Day-time versus night-time electrofishing data collected by the Waco District on five major reservoirs from 2004 to 2008 show mixed results for several popular fishery metrics, but support findings by Dumont and Dennis overall. For example, while Total and Stock CPUE values were typically higher for night-time surveys, nearly all CPUE categories for legal sized bass (11, 14 and 18) were higher for day-time surveys. Further evaluation of these data documented improved RSE values for day-time electrofishing CPUE estimates as well (Dumont, Pers. Comm.). The additional advantages of day-time electrofishing include enhanced safety, improved sampling logistics, reduced labor requirements, and increased visibility to the public. Aquilla Reservoir will be sampled with day-time electrofishing from now on unless otherwise noted.

A minimum of 9, random five-minute day-time electrofishing stations will be sampled in both fall 2020 and 2022 as outlined in the 2018 OBS plan. These surveys will be used to evaluate Largemouth Bass and primary forage species (Gizzard Shad, Threadfin Shad, Bluegill and Longear Sunfish) by general monitoring (using CPUE, size structure and relative weight as metrics) to characterize the Largemouth Bass population and make comparisons with future data sets. Catch per unit effort target precision will be an RSE < 25. Target sample size will be $N \geq 50$ stock-sized fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence. Genetics will be collected on 30 Largemouth Bass if collected. No additional sampling effort will be conducted.

The forage species goals will also be general monitoring (using CPUE and size structure as metrics) to characterize Gizzard Shad, Threadfin Shad, Bluegill and Longear Sunfish populations and make comparisons with future data sets. Catch per unit effort target precision will be an RSE < 25. Target sample size will be $N \geq 50$ stock-sized fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence. Index of vulnerability (IOV) will also be calculated for Gizzard Shad to assess the relative proportion of individuals in the population suitable as prey for sport fish.

Winter Trap Netting: A minimum of 10, random trap netting stations will be sampled in winter 2022. This survey will be used to evaluate White Crappie, the dominant crappie species by general monitoring (using CPUE, size structure and relative weight as metrics) to characterize White Crappie populations and make comparisons with historical and future data sets. Catch per unit effort target precision will be an RSE < 25. Target sample size will be an $N \geq 50$ stock-sized fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence. No additional sampling effort will be conducted.

Spring Gill Netting: A minimum of 8 random gill netting stations will be sampled over-night in spring 2023. This survey will be used to evaluate Blue Catfish, Channel Catfish and White Bass by general monitoring (using CPUE, size structure and relative weight as metrics) to characterize populations and make comparisons with historical and future data sets. Catch per unit effort target precision will be an $RSE < 25$. Target sample size will be an $N \geq 50$ stock-sized fish to determine population size structure, allowing us to calculate proportional size distributions with 80% confidence. No additional sampling effort will be conducted.

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Tables and Figures

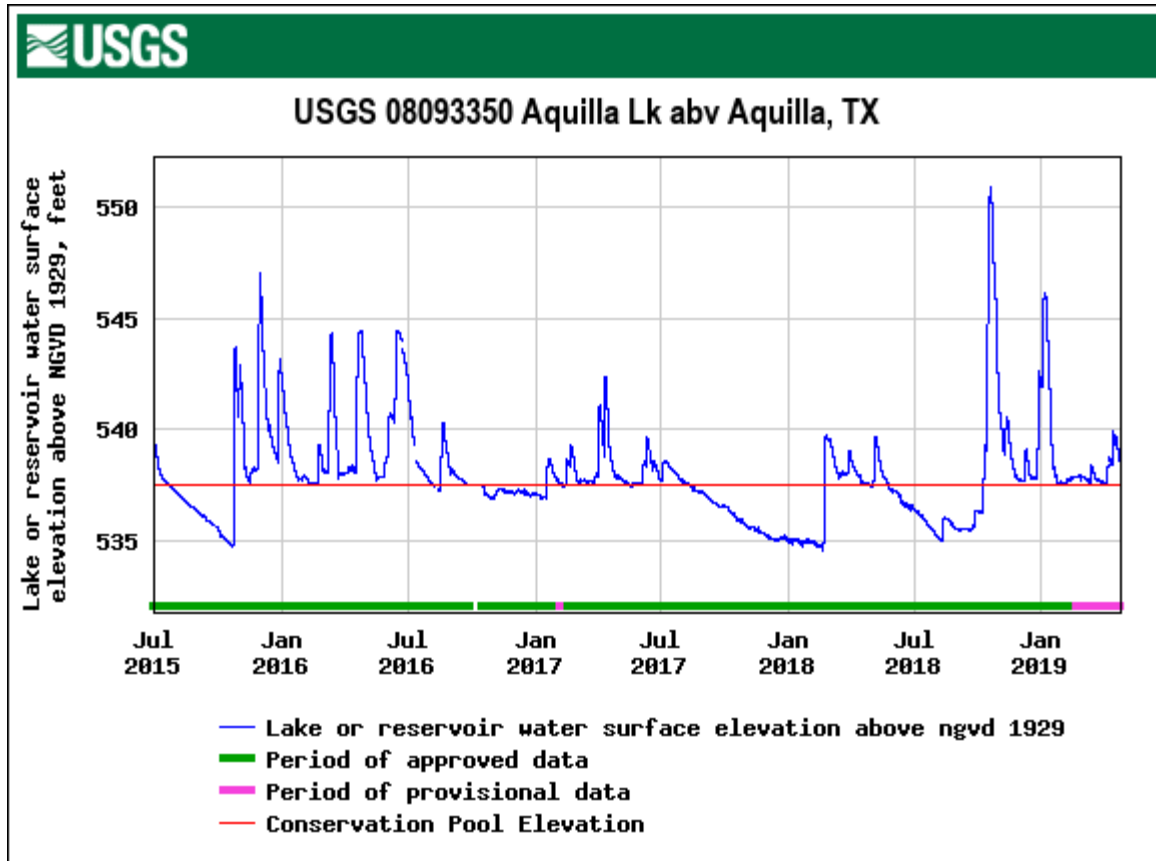


Figure 1a. Daily mean water level elevations in feet above mean sea level (MSL) recorded for Aquilla Reservoir, Texas, July 1, 2015 through April 2019. NGVD 1929 refers to the National Geodetic Vertical Datum of 1929. The red line indicates Conservation pool (537.5).

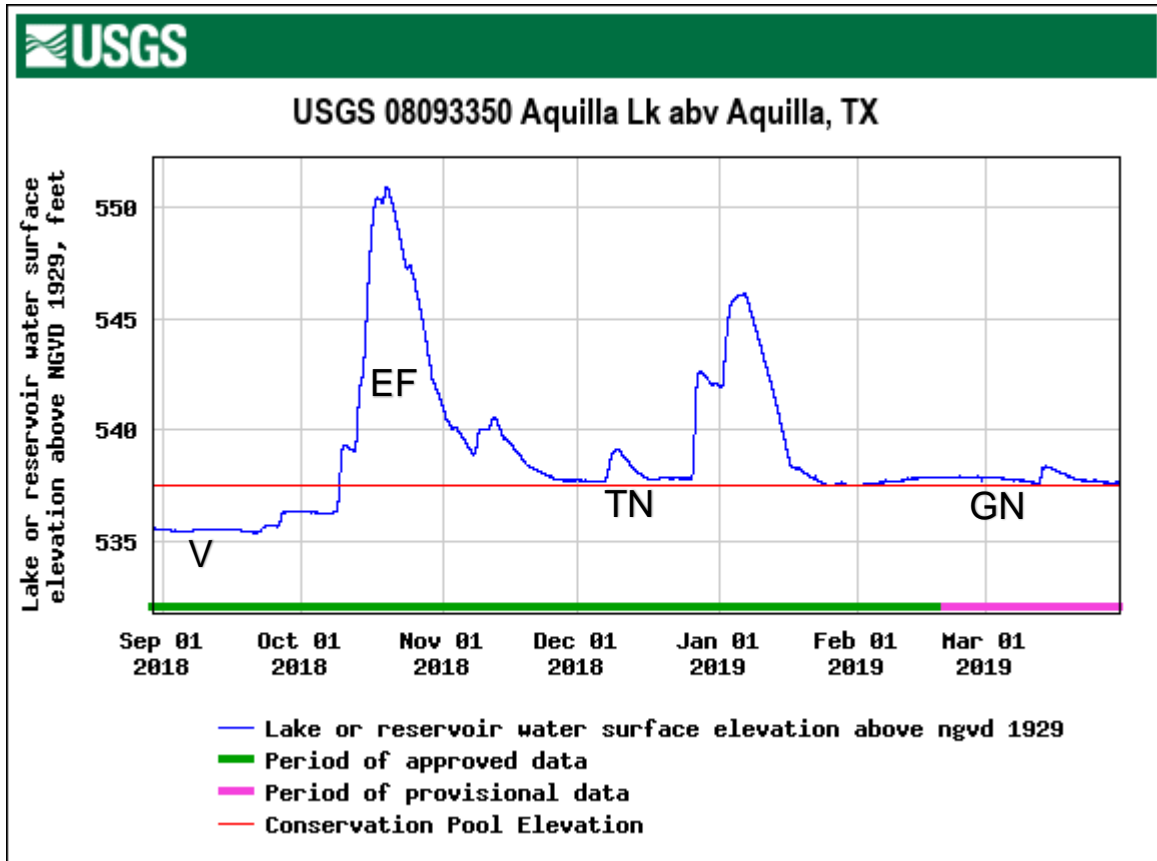


Figure 1b. Daily mean water level elevations in feet above mean sea level (MSL) recorded for Aquilla Reservoir, Texas, August 2018 through March 2019. NGVD 1929 refers to the National Geodetic Vertical Datum of 1929. The red line indicates Conservation pool (537.5) and scheduled surveys are indicated by V (vegetation), EF (electrofishing), TN (trap netting) and GN (gill netting).

Table 1. Characteristics of Aquilla Reservoir, Texas.

Characteristic	Description
Year Constructed	1982
Controlling authority	United States Army Corps of Engineers
County	Hill
Reservoir type	Tributary

Table 2. Boat ramp characteristics for Aquilla Reservoir, Texas, 2018. Reservoir elevation at time of survey was 535.5 feet above mean sea level (2' below conservation pool).

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Condition
Old School	31.9112/-97.22403	Y	40	Single lane; good
Dairy Hill	31.92604/-97.18749	Y	28	Single lane; good
Hackberry	31.93972/-97.17953	Y	10	Single lane; good

Table 3. Harvest regulations for Aquilla Reservoir, Texas 2018.

Species	Bag Limit	Length limit (inches)
Catfish: Channel, Blue, their hybrids and subspecies	25 (any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass: Largemouth, Spotted, their hybrids and subspecies	5 (any combination)	14-inch minimum ^a
Crappie: White, Black, their hybrids and subspecies	25 (any combination)	10-inch minimum

^a Daily bag limit for Largemouth Bass and Spotted Bass = 5 fish in any combination. There is no minimum length limit for Spotted Bass.

Table 4. Stocking history for Aquilla Reservoir, Texas. Life stages for each species are defined as having a mean length that falls within the given length range. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL) and unknown (UNK). For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1983	33,261	UNK	0.0
	Total	33,261		
Coppernose Bluegill	1984	165,000	AFGL	2.0
	Total	165,000		
Florida Largemouth Bass	1982	31,900	FGL	2.0
	1983	164,000	FRY	1.0
	1984	164,753	FGL	2.0
	1985	72,559	FRY	1.0
	Total	433,212		

Table 5. Proposed objective-based sampling plan components for Aquilla Reservoir, Texas 2018 – 2019.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	General monitoring	CPUE, Size structure, Wr	RSE-Stock < 25, N ≥ 50 stock
Bluegill	General monitoring	CPUE, Size structure	none
Longear Sunfish	General monitoring	CPUE, Size structure	none
Gizzard Shad	General monitoring	CPUE, Size structure	none
	Prey availability	IOV	
<i>Trap netting</i>			
White Crappie	General monitoring	CPUE, Size structure, Wr	RSE-Stock < 25, N ≥ 50 stock
<i>Gill netting</i>			
Blue Catfish	General monitoring	CPUE, Size structure, Wr	RSE-Stock < 25, N ≥ 50 stock
Channel Catfish	General monitoring	CPUE, Size structure, Wr	RSE-Stock < 25, N ≥ 50 stock
White Bass	General monitoring	CPUE, Size structure, Wr	RSE-Stock < 25, N ≥ 50 stock

^a No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill, Longear Sunfish, Gizzard Shad and Threadfin 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.

Gizzard Shad

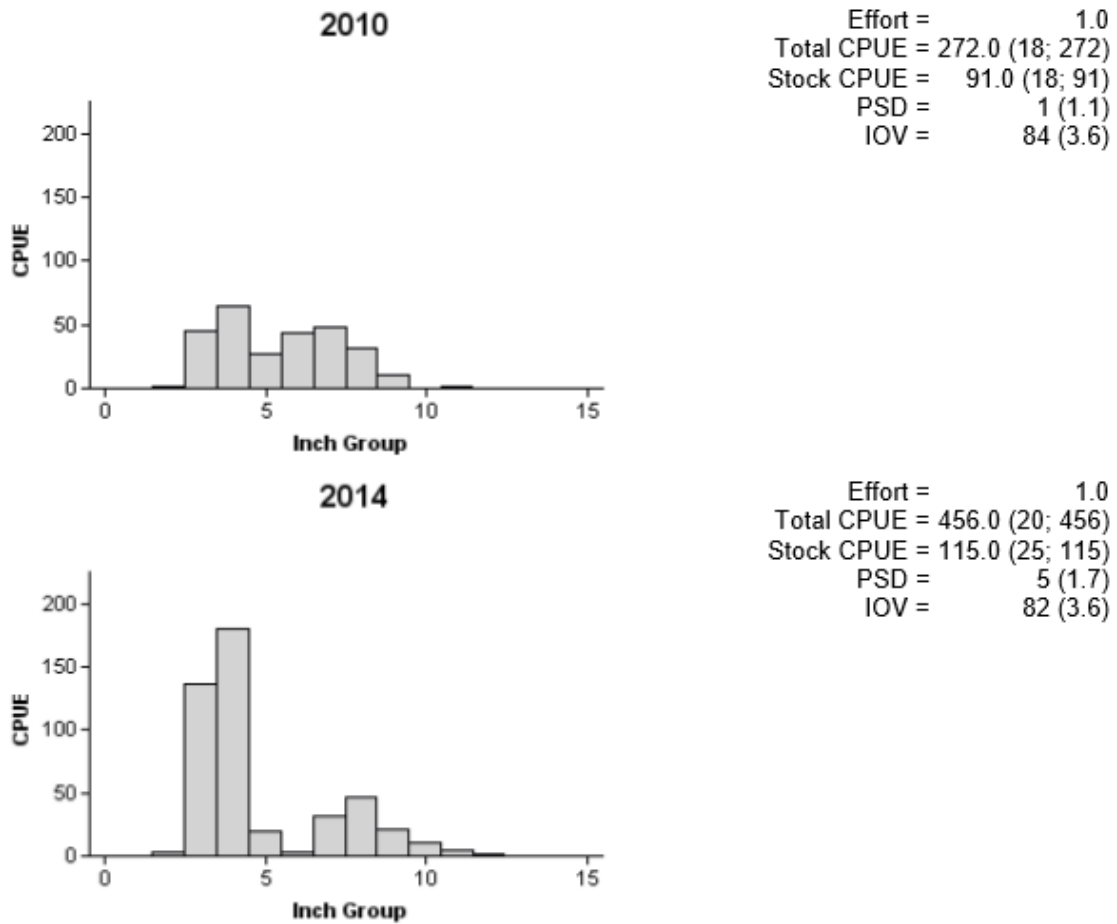


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Aquilla Reservoir, Texas, 2010 and 2014. Electrofishing was not conducted in 2018 due to ramp closures.

Bluegill

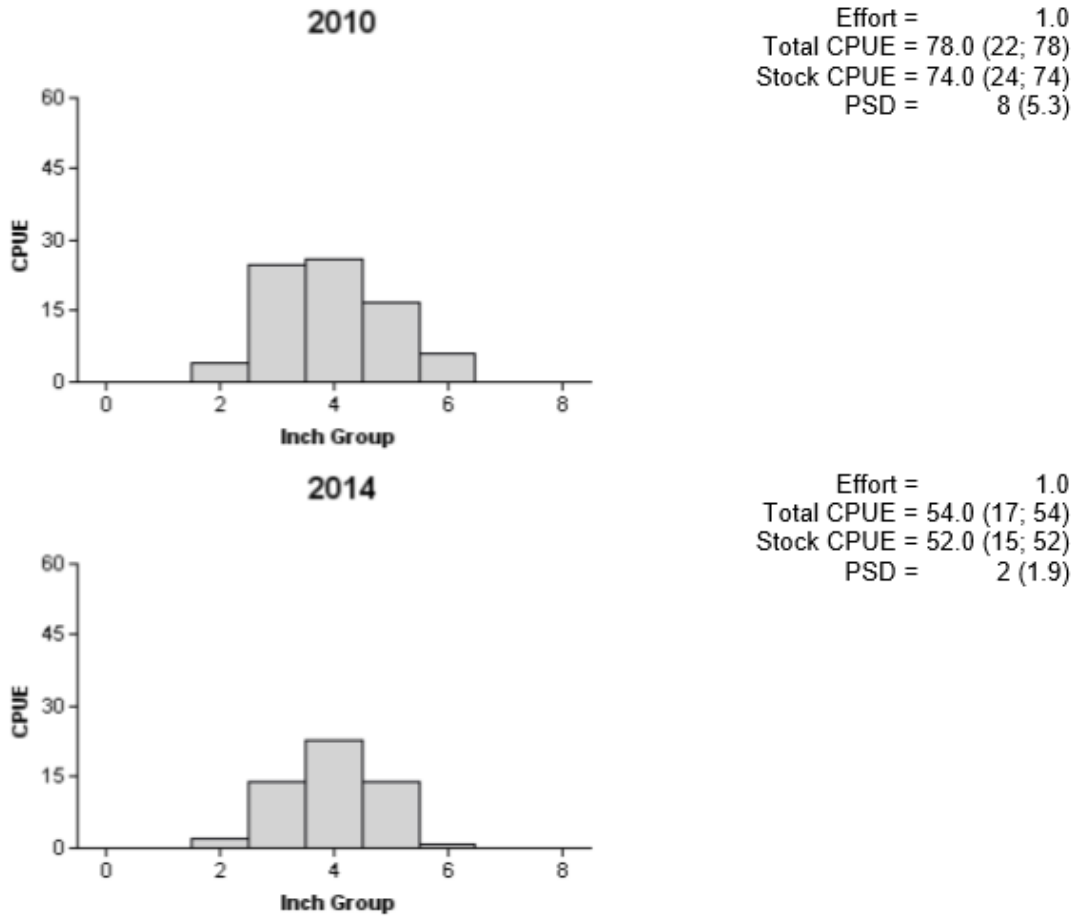


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Aquilla Reservoir, Texas, 2010 and 2014. Electrofishing was not conducted in 2018 due to ramp closures.

Blue Catfish

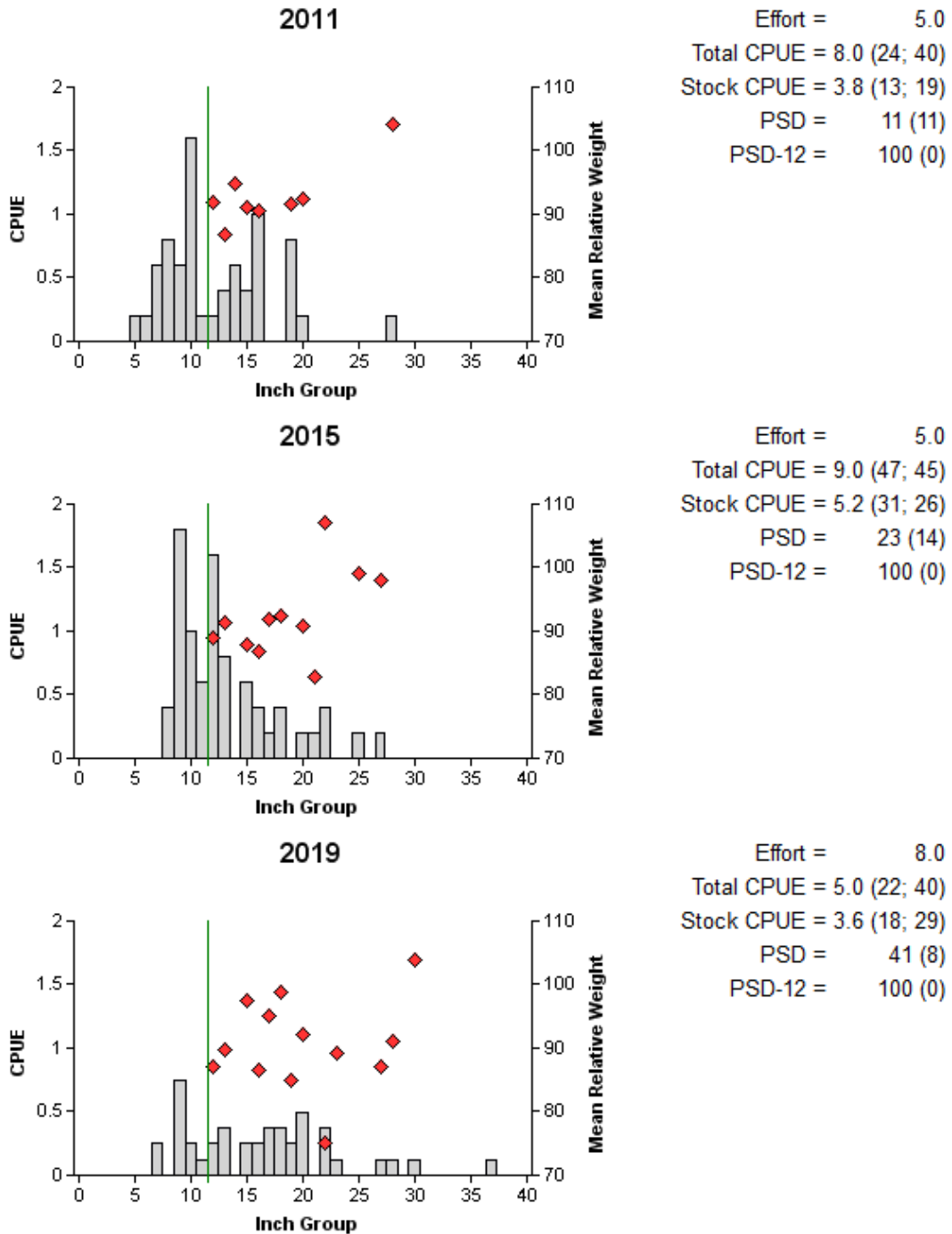


Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Aquilla Reservoir, Texas, 2011, 2015, and 2019. Gill netting effort increased to 8 net nights in 2019. Vertical line indicates minimum length limit.

Channel Catfish

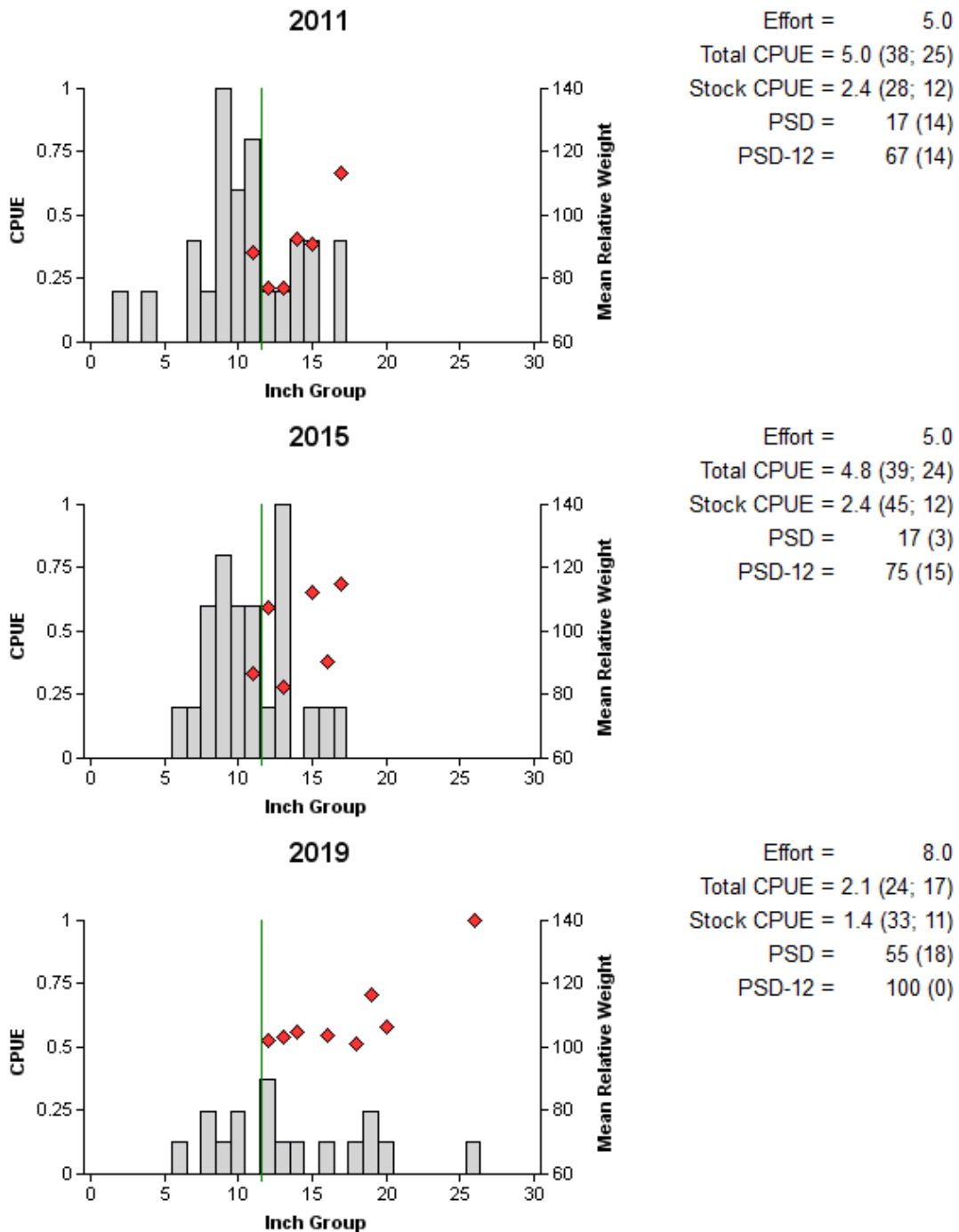


Figure 5. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Aquilla Reservoir, Texas, 2011, 2015, and 2019. Gill netting effort increased to 8 net nights in 2019. Vertical line indicates minimum length limit.

White Bass

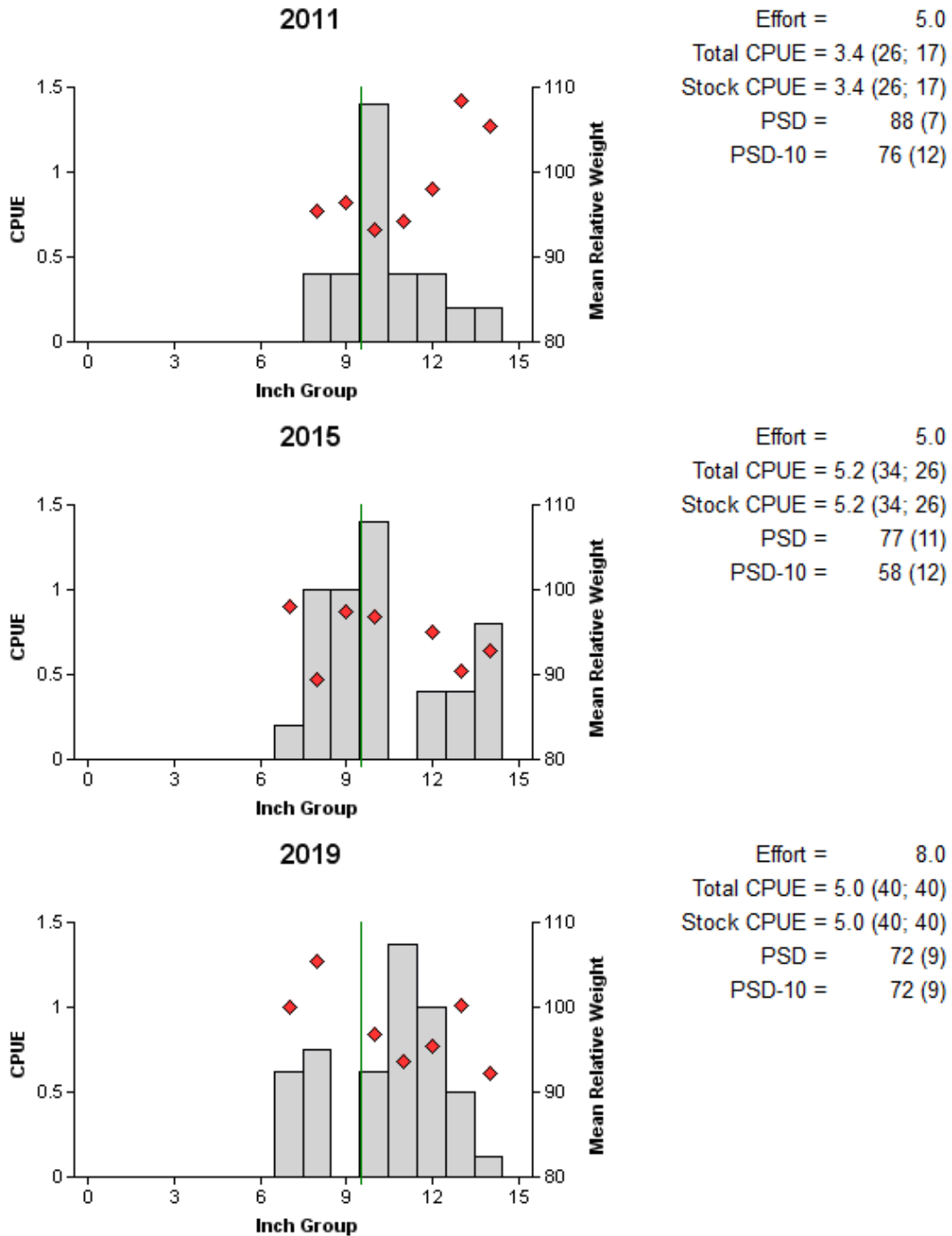


Figure 6. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Aquilla Reservoir, Texas, 2011, 2015, and 2019. Gill netting effort increased to 8 net nights in 2019. Vertical line indicates minimum length limit.

Largemouth Bass

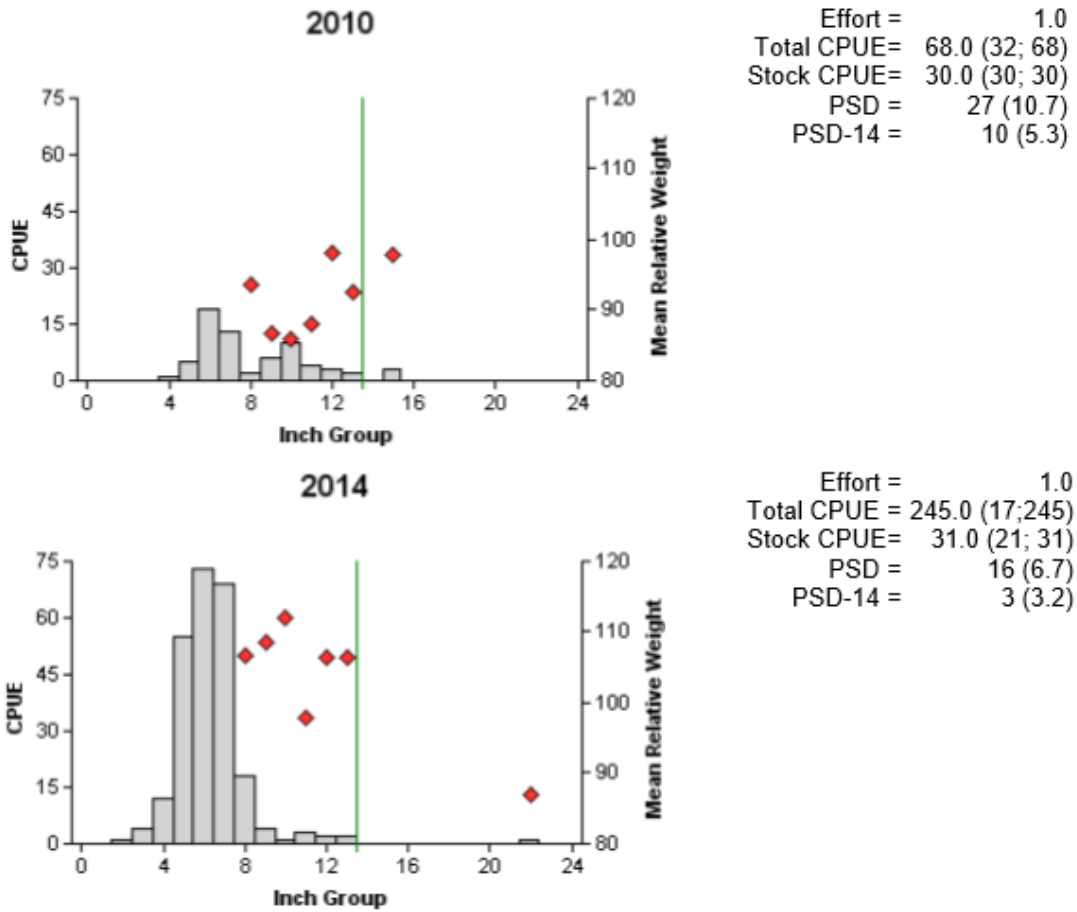


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Aquilla Reservoir, Texas, 2010 and 2014. Electrofishing was not conducted in 2018 due to ramp closures. Vertical line indicates minimum length limit.

White Crappie

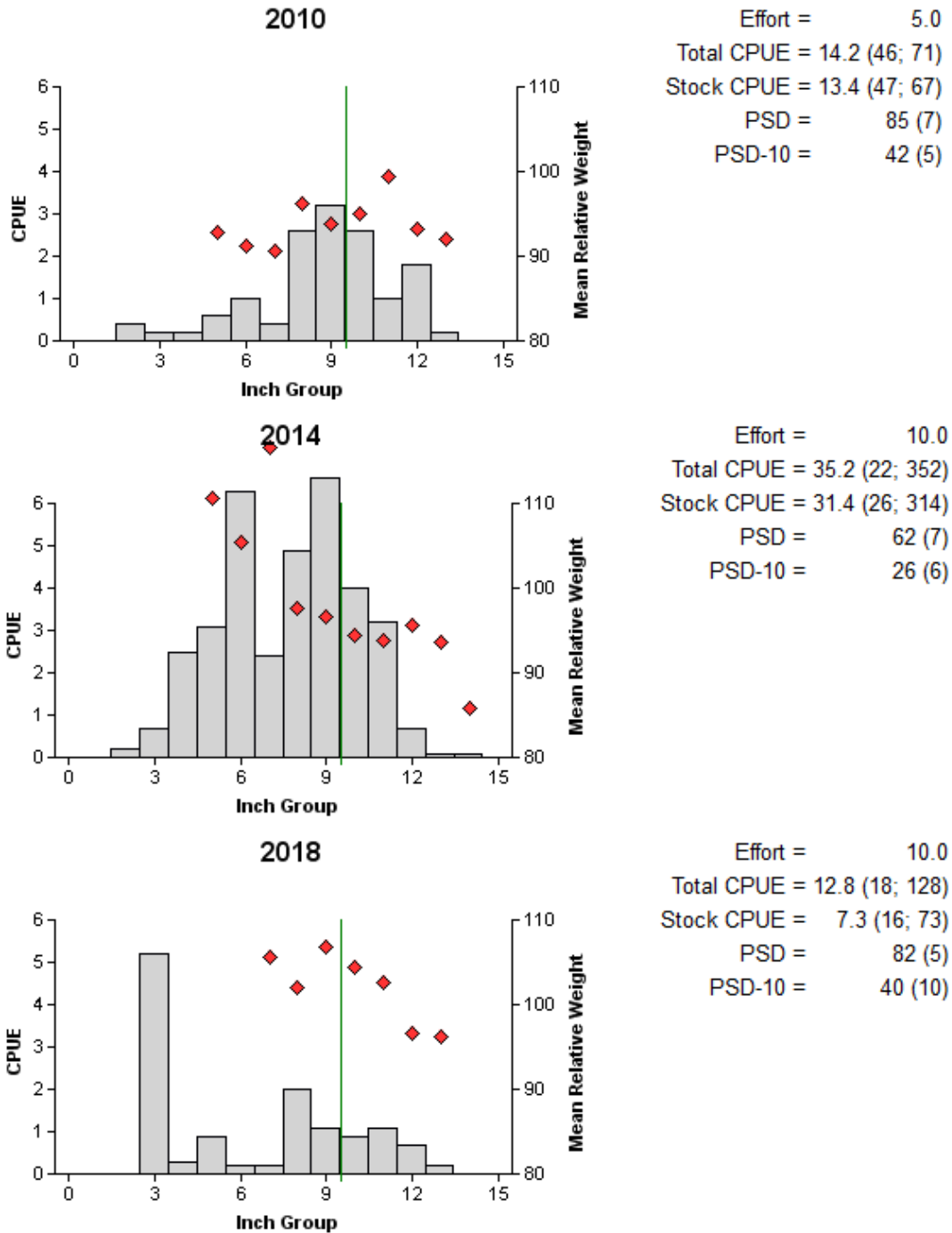


Figure 8. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for winter trap netting surveys, Aquilla Reservoir, Texas, 2010, 2014, and 2018. Gill netting effort was 5 net nights in 2010. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for Aquilla Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted, while in the spring 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
Vegetation				S
Electrofishing – Fall		A		S
Trap netting				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 trap netting and gill netting on Aquilla Reservoir, Texas, 2014-2019. Sampling effort was 10 net nights for trap netting and 8 net nights for gill netting.

Species	Gill Netting		Trap Netting	
	N	CPUE	N	CPUE
Blue Catfish	40	5.0 (22)		
Channel Catfish	17	2.1 (24)		
White Bass	40	5.0 (40)		
White Crappie	33	4.1 (25)	128	12.8 (18)

APPENDIX B – Historical catch rates for targeted species

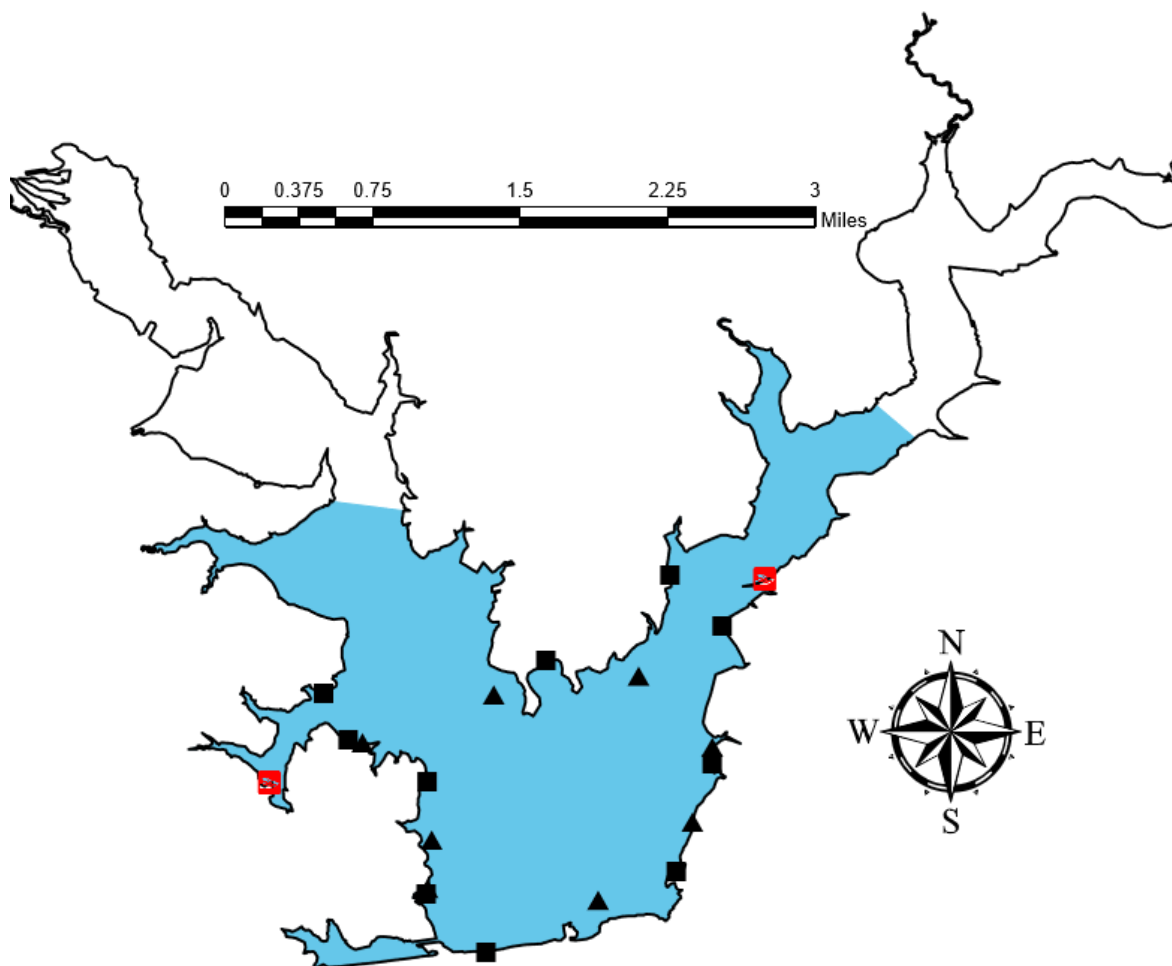
Catch rates (CPUE) of targeted species collected with electrofishing, trap netting and gill netting surveys on Aquilla Reservoir, Texas, 2002 to present. Electrofishing stations were sampled with a 5.0 Smith-Root GPP (Gas Powered Pulsator) until 2010 and a 7.5 Smith-Root GPP thereafter. No electrofishing was conducted in fall 2018. Species averages are in bold. Asterisk denotes a species collected by a non-standard gear. Dashes represent no data available. Species averages are in bold.

	Electrofishing					Average
	2002	2006	2010	2014	2018	
Gizzard Shad	77.0	554.0	272.0	456.0	--	340.0
Threadfin Shad	94.0	91.0	49.0	881.0	--	279.0
Bluegill	110.0	107.0	78.0	54.0	--	87.3
Longear	55.0	33.0	37.0	48.0	--	43.3
Warmouth	2.0	8.0	3.0	2.0	--	3.8
Green	70.0	6.0	3.0	2.0	--	20.3
Largemouth Bass	200.0	95.0	68.0	245.0	--	152.0

	Trap netting					Average
	2002	2006	2010	2014	2018	
White Crappie	8.4	3.6	14.2	35.2	12.8	14.8

	Gill netting					Average
	2003	2007	2011	2015	2019	
Blue Catfish	7.4	2.6	8.0	9.0	5.0	6.4
Channel Catfish	1.4	1.2	5.0	4.8	2.1	2.9
White Bass	2.8	6.6	3.4	5.2	5.0	4.6
White Crappie*	--	--	21.2	--	4.1	12.7

APPENDIX C – Map of sampling locations



Location of sampling sites, Aquilla Reservoir, Texas, 2018-2019. Trap netting and gill netting sites are indicated by squares and triangles respectively. The shaded portion of the reservoir indicates navigable water. Water level was 2' low at time of sampling.



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