Hubbard Creek Reservoir

2019 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

Prepared by:

Natalie Goldstrohm, Assistant District Management Supervisor
and
Michael D. Homer Jr., District Management Supervisor

Inland Fisheries Division
Abilene District, Abilene, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

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Survey and Management Summary

Fish populations in Hubbard Creek Reservoir were surveyed by electrofishing in 2017 and 2019 and by low-frequency electrofishing, tandem hoop netting, and trap netting in 2019. Historical data are presented with the 2016-2020 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

Reservoir Description: Hubbard Creek Reservoir is a 15,250-acre impoundment constructed in 1962 on Sandy Creek and Hubbard Creek, in the Brazos River Basin. The reservoir is used for municipal water supply, flood control, and recreation. The reservoir is controlled by the West Central Texas Municipal Water District and has a history of extreme water level fluctuations. Hubbard Creek was nearly full in 2008 but dropped to record low water level in May 2015 before refilling in 2016. Fish habitat consisted of hydrilla, flooded terrestrial vegetation, pondweed, standing timber, common button bush, cattail, and salt cedar. As of April 2016, all boat ramps were useable. Bank-fishing access was limited to the boat ramp areas as well as near the U.S. Highway 180 Bridge.

Management History: Important sport fish include Largemouth Bass, White Bass, White Crappie, and catfishes. Sport fishes are regulated by statewide harvest regulations. Threadfin Shad were introduced in 1984. Channel Catfish were introduced in 1970 and Blue Catfish were stocked in 2016. Florida Largemouth Bass were introduced in 1979 and they were last stocked in 2020.

Fish Community

- **Prey species:** Gizzard Shad and sunfish were the predominant sources of prey. There was a decrease in the percentage of Gizzard Shad available for sportfish. Relative abundance of sunfish species was good with many available as prey. Number of prey should not be limiting sport fish growth.
- **Catfish:** Gill netting was not conducted because of travel restrictions during the COVID-19 pandemic. Blue Catfish were surveyed with low-frequency electrofishing and were present in moderate relative abundance. Legal-length Blue Catfish were present and had fair (W_r <90) to optimal (W_r≥100) body condition. The time it took for Blue Catfish to reach legal length in Hubbard Creek Reservoir was similar to Blue Catfish growth in other West Texas reservoirs. Flathead and Channel catfishes were present in the reservoir. Tandem hoop nets were not effective at sampling Channel Catfish at Hubbard Creek Reservoir. Of the few Channel Catfish that were captured using tandem hoop nets, none were legal length.
- **White Bass:** White Bass were present in the reservoir but were not sampled during this report period because of travel restrictions during the COVID-19 pandemic.
- **Largemouth Bass:** Largemouth Bass were present in moderate numbers and had a balanced population. Mean relative weights were optimal (W_r >90). No pure Florida Largemouth Bass were sampled. Largemouth Bass reached legal length in 2.5 years.
- **White Crappie:** Catch rates of White Crappie were fair and PSD indicated that there was a balanced population. Mean relative weights were fair (W_r <90) to optimal (W_r >90). White Crappie growth rates remained similar since the last survey.

Management Strategies: Largemouth Bass and prey items will be surveyed in fall 2021 and 2023 with electrofishing. Trap netting for crappie and gill netting for catfish and White Bass will be conducted in 2023-2024. Discontinue hoop netting and low-frequency electrofishing surveys. An access creel survey will be conducted from summer 2020 through spring 2021 to get baseline data for the reservoir. Hydrilla surveys will be conducted annually to determine location, density, and acreage of hydrilla. Access and habitat surveys will be conducted in summer 2023. Discuss access improvement with controlling authority. Inform the public of the threat and negative impacts of invasive species.

Introduction

This document is a summary of fisheries data collected from Hubbard Creek Reservoir in 2016-2020. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2016-2020 data for comparison.

Reservoir Description

Hubbard Creek Reservoir is a 15,250-acre impoundment constructed in 1962 on Sandy Creek and Hubbard Creek, in the Brazos River Basin. Hubbard Creek Reservoir is located in Stephens County approximately 55 miles northeast of Abilene, Texas and is controlled by the West Central Texas Municipal Water District. The reservoir was built primarily for municipal water supply but also provided flood control and recreation. Hubbard Creek Reservoir experienced long periods of reduced water level. A historic low water level occurred in May 2015 when water level was approximately 31.0 feet below conservation pool (CP). As of June 2016, Hubbard Creek Reservoir was full and remained full through July 2017. Water level declined to about 6.0 feet below CP before refilling in October 2018. Water level has remained within 3.0 feet of CP since (Figure 1). Other descriptive characteristics for Hubbard Creek Reservoir are in Table 1.

Angler Access

Hubbard Creek Reservoir boat access consisted of four public boat ramps that were usable during the sampling period. Bank-fishing access was limited to the boat ramp area and the area by the U.S. Highway 180 Bridge. Additional boat ramp characteristics are in Table 2.

Management History

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

1. Continue to monitor Gizzard Shad, Bluegill, and Largemouth Bass to determine trends in relative abundance, size structure, and body condition by conducting biennial electrofishing surveys.

   Action: Electrofishing surveys were conducted in fall 2017 and 2019. Length was collected on all target species and weight was collected on all Largemouth Bass sampled.

2. Continue to monitor White Crappie to determine trends in relative abundance, size structure, and body condition by conducting a trap netting survey.

   Action: White Crappie were sampled with trap nets in fall 2019. Length and weight were collected on White Crappie.

3. Stock Florida Largemouth Bass when suitable habitat is available.

   Action: Florida Largemouth Bass were stocked in 2016, 2017, 2018, and 2020.

4. Monitor Florida Largemouth Bass genetic introgression for bass ≤ 8 inches to determine stocking success by collecting samples during the 2017 electrofishing survey.

   Action: In 2017, fin clips of Largemouth Bass ≤ 8 inches were collected for genetic testing.

5. Continue to monitor Florida Largemouth Bass genetic introgression by collecting genetic samples from Largemouth Bass.

Action: In 2019, fin clips of randomly selected Largemouth Bass were collected for genetic testing.

6. Investigate ways to improve fish habitat at low water level that would increase relative abundance of centrarchid species.

   Action: Since water level increased significantly, there was abundant habitat for centrarchid species.

7. Meet with the West Central Texas Municipal Water District to discuss the potential of ramp improvement projects during periods of low water, specifically the extension of the Peeler Park Ramp.

   Action: No ramp improvements have been made at this time. Water level has been within 6.0 feet of CP and was not optimal for ramp extension. Hydrilla treatment at boat ramps is planned for summer 2020 to improve boater access.

8. Meet with the West Central Texas Municipal Water District and consult Texas Parks and Wildlife Department invasive species experts to discuss salt cedar establishment, potential management efforts, and possible control strategies.

   Action: There were multiple discussions with the West Central Texas Municipal Water District and Texas Parks and Wildlife Department invasive species experts regarding salt cedar establishments and possible control strategies. No salt cedar management has occurred at this time. However, much of the salt cedar has been inundated since the survey and coverage has likely been reduced as a result.

9. Collect periodic water samples during the winter months to monitor water quality, golden alga cell densities, and golden alga toxicity.

   Action: No water samples were collected to monitor for golden alga cell densities or toxicity during this sample period. The increase in water level resulted in better water quality (ex. a decrease in conductivity) and golden alga bloom was less likely to occur.

10. Educate the public about the threats of invasive species.

    Action: The West Central Texas Municipal Water District has been notified about the threat of invasive species. There were signs that were posted and maintained that educate about the threat of invasive species. Media and internet post have been made about invasive species. Invasive species was a talking point when presenting to constituents.

Harvest regulation history: All sport fish are regulated with statewide harvest regulations (Table 3).

Stocking history: Threadfin Shad were introduced in 1984. Channel Catfish were introduced in 1970. Florida Largemouth Bass were first stocked in 1979 and were most recently stocked in 2020. Blue Catfish were stocked in 2016 to improve recruitment and the quality of the Blue Catfish fishery at the reservoir. The complete stocking history is displayed in Table 4.

Vegetation/habitat management history: Hydrilla was first documented in Hubbard Creek Reservoir in 1998. The estimated coverage in 1999 was 25 acres. The next hydrilla survey was conducted in 2003, and no hydrilla was found. Hydrilla was found in surveys between 2008-2012, during which coverage substantially declined nearly each year. No hydrilla was found from 2012-2015. Since 2016, there has been increasing coverage of hydrilla. There have been no attempts to control hydrilla at Hubbard Creek Reservoir.

Water transfer: There is one permanent pumping station on the reservoir which can transfer water to Fort Phantom Hill Reservoir. No interbasin water transfers exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Hubbard Creek Reservoir (Goldstrohm and Homer 2016). 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 2017).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (2 hours at 24, 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 3 Largemouth Bass in 2017 and 8 Largemouth Bass in 2019 (range 13.0 to 14.9 inches).

Low-frequency Electrofishing – Blue Catfish and Flathead Catfish were collected by low-frequency electrofishing (1.1 hours at 21, 3-min stations). Catch per unit effort (CPUE) for low-frequency electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Blue Catfish were determined using otoliths from 9 randomly selected fish (range 11.0 to 12.9 inches).

Trap netting – Crappie were collected using trap nets (15 net nights at 15 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Ages for crappie were determined using otoliths from 9 White Crappie (range 9.0 to 10.9 inches).

Tandem hoop nets – Channel Catfish were collected using 6 tandem hoop-net series at 6 stations. Nets were baited with soap and deployed for 2-night soak durations. CPUE for tandem hoop netting was recorded as the number of fish caught per tandem hoop net series (fish/series).

Genetics – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017). Micro-satellite DNA analysis was used to determine genetic composition of individual fish since 2005. Electrophoresis analysis was used prior to 2005.

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to 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.

Habitat – In July through August 2019, a structural habitat survey was conducted using the random point method using 460 random stations distributed along the shoreline. Vegetation data were also collected at these 460 sites. A total of 139 stations could not be sampled and were omitted from analysis. Additionally, a habitat survey was conducted during the same time at 350 random stations distributed throughout the reservoir. Some stations (N=24) could not be sampled and were omitted from analysis. Habitat types and vegetation were identified at or below the waterline and marked as “1” for present or “0” for absent. Percent occurrence (% = [# stations present / total stations sampled] X 100) and associated 95% confidence intervals were calculated (AusVet 2020) for structural habitat and habitat.

Hydrilla – In July through August 2019, the water body perimeter was circumnavigated, and hydrilla coverage and density were documented throughout the reservoir. Shapefiles were developed then overlaid on the reservoir outline using Global Information Systems (GIS) software. Hydrilla coverage was calculated in GIS software.

Water level – Source for water level data was the United States Geological Survey (USGS 2020).

Results and Discussion

Habitat: Structural habitat was primarily natural/featureless shoreline (63.9%) followed by rocky shoreline (25.9%). Rock bluff (4.7%), bulkhead (3.1%), and gravel (2.5%) represented a small percentage of shoreline (Table 6). During the vegetation survey, 63.9% of the reservoir area was open water, 22.7% was hydrilla, 15.9% was flooded terrestrial vegetation, 9.5% was pondweed, and 7.1% was standing timber. All other vegetation throughout the reservoir represented less than 5% coverage (Table 7). Nearly 85% of the shoreline had flooded terrestrial vegetation present, 48.9% had buttonbush, 44.9% had pondweed, and 38.9% had hydrilla. Between 10-20% of the shoreline had salt cedar, cattail, *Chara* spp., standing timber, or logs present. Bulrush, water primrose, naiad, lotus, and spike rush comprised 5-10% of the shoreline while all other vegetation was less than 5%. Water level at the time of the habitat survey was between CP and 0.5 feet below CP.

No hydrilla had been found in the reservoir from 2012-2015. In 2016, 16.0 acres of hydrilla was found. From 2017-2019, hydrilla coverage has increased by approximately 1,000 acres annually (Appendix C). In 2017, there was 1,101.5 acres of hydrilla in the reservoir, 2,088.6 acres in 2018, and 3,110.3 acres in 2019 (Table 8). In 2018 and 2019, approximately 75% of the hydrilla coverage was categorized as dense coverage. No hydrilla treatment has been conducted at Hubbard Creek Reservoir, however there is a plan for hydrilla management at the reservoir for summer 2020.

Prey species: The prey base primarily consisted of Gizzard Shad and Bluegill. Electrofishing catch rate of Gizzard Shad was 198.5/h in 2019 and increased from 91.0/h in 2017. In 2019, IOV was 38 and was similar to 2017 (36; Figure 2), indicating that the majority of Gizzard Shad were not available as prey for sport fish. In 2015, IOV was 91, indicating that almost all the Gizzard Shad were available as prey for existing predators. Bluegill CPUE in 2019 (90.5/h) increased from previous surveys conducted in 2017 (68.0/h) and 2015 (36.0/h). Size structure of Bluegill consisted primarily of fish 2-5 inches (Figure 3). Bluegill PSD remained low throughout the sample period ranging from 8-15. Most Bluegill in the sample were of adequate prey size for sport fish. Other prey items such as Threadfin Shad, Longear Sunfish, and Redear Sunfish were of adequate size for most sport fish. Availability of prey should not be a limiting factor to the growth and condition of sport fish in the reservoir.

Blue Catfish: Blue Catfish have been sampled with gill netting in the past and most recently with low-frequency electrofishing. Gill net sampling was not conducted because of travel restrictions associated with the COVID-19 pandemic. Historically, Blue Catfish were the most relatively abundant of the catfishes sampled with gill nets with total catch rate ranging from 2.4-3.8/nn and CPUE-12 ranging from 1.9/nn-3.7/nn. There was a balanced population with legal-length fish available for anglers (Goldstrohm and Homer 2016). During low-frequency electrofishing in 2019, catch rate was 14.3/h and CPUE-12 catch rate was 11.4/h. Proportional Size Distribution was 8 with few larger Blue Catfish sampled (Figure 4). However, most fish sampled were of legal length and had fair (W_r <90) to optimal (W_r >90) relative weights. Only 9 fish between 11.0-12.9 inches were collected to determine age at legal length in 2019. Mean age at legal length was 3.2 years (N = 9; range = 3-4 years) which was similar to the growth of Blue Catfish in other West Texas reservoirs.

Flathead Catfish: Flathead Catfish have been sampled with gill nets in the past and most recently with low-frequency electrofishing. Gill net sampling was not conducted because of travel restrictions associated with the COVID-19 pandemic. Flathead Catfish were present in historical gill netting surveys with low catch rates (Goldstrohm and Homer 2016). Flathead Catfish catch rate with low-frequency electrofishing was 1.9/h in 2019 and only two fish were sampled (Figure 5).

Channel Catfish: Channel Catfish have been sampled with gill nets and most recently with tandem hoop nets. Gill net sampling was not conducted because of travel restrictions associated with the COVID-19 pandemic. Historically, Channel Catfish catch rate in the gill netting surveys remained low from 2008-2016 and size structure was mostly legal-length fish (Goldstrohm and Homer 2016). Catch rate in tandem hoop nets in 2019 was 1.3/series and no legal-length fish were sampled. Proportional Size Distribution was 0 indicating that no quality-length fish were sampled using hoop nets, however, only eight fish were sampled (Figure 6).

White Bass: Gill net sampling was not conducted because of travel restrictions associated with the COVID-19 pandemic. White Bass catch rates in gill net surveys were variable from 2008-2016 and ranged from 2.1/nn-8.0/nn and CPUE-10 ranged from 1.2/nn-6.5/nn. Legal-length fish were available and PSD value was indicative of a balanced population (Goldstrohm and Homer 2016).

Largemouth Bass: Electrofishing catch rate for Largemouth Bass have been variable. Catch rate was 43.0/h in 2019, 90.5/h in 2017 and 21.5/h in 2015. The 2019 CPUE-Stock catch rate was 25.0/h and had decreased from 71.5/h in 2017 but increased from 4.5/h in 2015 (Figure 7). The Largemouth Bass population was nearly balanced with a PSD value of 42 in 2019. Condition was optimal (W_r >90) for most inch classes indicating prey species were not a limiting factor to growth. In 2019, 30 fin clips were collected during sampling, however three were not viable and were omitted from the analysis. In 2019, no pure Florida Largemouth Bass were sampled and 22.2% of the fish sampled were pure Northern Largemouth Bass (Table 9). One pure Florida Largemouth Bass was sampled during the 2017 and 2015 electrofishing surveys. Nearly all the other Largemouth Bass collected in those surveys were second or higher generation hybrid between a Florida Largemouth Bass and a Northern Largemouth Bass. The percent Florida Largemouth Bass alleles decreased to 37.0% in 2019 despite stockings of Florida Largemouth Bass in 2016, 2017, and 2018. Only 8 fish between 13.0-14.9 inches were collected to determine age at legal length in 2019. Mean age at legal length was 2.5 years (N = 8; range = 2-3 years), 1.7 years in 2017 (N = 3; range 1-2 years), 2.2 years in 2007 (N = 6; range = 2-3 years), and 2.5 years in 2003 (N = 8; range 2-6 years).

White Crappie: White Crappie CPUE in the trap net surveys has been variable. Catch rate was 4.1/nn in 2019 and increased from 1.9/nn in 2015 but decreased from 6.8/nn in 2011. Stock-length White Crappie followed a similar pattern with catch rate of 3.5/nn in 2019, 1.7/nn in 2015, and 6.0/nn in 2011 (Figure 8). White Crappie PSD was similar in 2019 and 2015, 60 and 54 respectively, which was a decrease from 88 in 2011. In the 2019 and 2015 surveys, legal-length White Crappie had low relative abundance. Condition was fair (W_r <90) to optimal (W_r >90) for most inch classes. Only 9 fish between 9.0-10.9 inches were collected to determine age at legal length in 2019. Similar to previous surveys, mean age at legal length was 1.4 years (N = 9; range = 1-3 years) in 2019.

Fisheries Management Plan for Hubbard Creek Reservoir, Texas

Prepared – July 2020

ISSUE 1: Largemouth Bass support a popular fishery at Hubbard Creek Reservoir. However, Largemouth Bass population fluctuates in response to changes in water level and habitat coverage; thus, additional monitoring is required.

MANAGEMENT STRATEGIES

1. Continue to monitor Largemouth Bass and prey populations to determine trends in relative abundance, size structure, and body condition by conducting electrofishing survey for prey species and Largemouth Bass.
2. Continue to monitor Florida Largemouth Bass genetic introgression by collecting genetic samples from Largemouth Bass in 2023.

ISSUE 2: Hydrilla is present in Hubbard Creek Reservoir in water < 20 feet deep. Hydrilla coverage and density has increased, and it may cause issues with lake access around docks, public boat ramps, and public swim beaches. Some navigational hazards for boats can exist for personal watercraft and other vessels when traveling around the islands near main lake.

MANAGEMENT STRATEGIES

1. Continue to monitor hydrilla coverage and density annually and calculate coverage.
2. Continue discussions with the West Central Texas Municipal Water District regarding annual findings of hydrilla survey.
3. Texas Parks and Wildlife Department and West Central Texas Municipal Water District will treat hydrilla with ProcellaCOR SC in the summer of 2020 at the four public boat ramps, swim beach, and provide boating lanes near the islands in main lake.

ISSUE 3: Anecdotal evidence indicates a growing interest in a Blue Catfish fishery at Hubbard Creek Reservoir; thus, additional monitoring is required.

MANAGEMENT STRATEGIES

1. Continue to monitor Blue Catfish population to determine trends in relative abundance, size structure, and body condition by conducting gill netting.
2. Determine the angler interest and harvest in the Blue Catfish fishery by conducting a yearlong creel survey that began in June 2020.

ISSUE 4: During periods of low water conditions, three of the four public boat ramps become unusable.

MANAGEMENT STRATEGY

1. Meet with the West Central Texas Municipal Water District to discuss the potential of ramp improvement projects during periods of low water and possible application to the Texas Parks and Wildlife Department boating access grant program.

ISSUE 5: 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 controlling authority to post and maintain appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through the use of media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups.
4. Keep track of (i.e., map) future inter-basin water transfers to facilitate potential invasive species responses.

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

Sport fish, prey fish, and other important fishes: Main prey species in Hubbard Creek Reservoir include Gizzard Shad and Bluegill. Sport fish present in the reservoir include Blue Catfish, Channel Catfish, Flathead Catfish, White Bass, Largemouth Bass, and White Crappie.

Low-density fisheries: Flathead Catfish are present in Hubbard Creek Reservoir and have been managed with the 18-inch MLL and 5-fish daily bag limit. Flathead Catfish will be monitored for presence/absence during other monitoring because of very poor catch of Flathead Catfish using gill nets and low-frequency electrofishing.

Survey objectives, fisheries metrics, and sampling objectives

Prey species: Gizzard Shad and Bluegill comprise the majority of the prey species community in the reservoir. Prey populations have been traditionally monitored by biennial fall electrofishing surveys conducted at 24, 5-minute random stations (2 hours total). The biennial electrofishing schedule has been appropriate for monitoring prey species, and sampling will resume in fall 2021 and fall 2023 (Table 10) to collect data that will allow for monitoring large-scale changes to relative abundance and size structure. A target RSE ≤ 25 will be attempted during sampling for relative abundance data (i.e., CPUE-Total) for Gizzard Shad and Bluegill. IOV and PSD will be estimated for Gizzard Shad and Bluegill by collecting ≥ 50 fish of each species. No additional sampling effort will be conducted if objectives are not met during designated Largemouth Bass sampling. Instead, Largemouth Bass body condition can provide information on prey vulnerability to predation and prey relative abundance.

Blue Catfish: Blue Catfish are managed by the statewide 12-inch minimum length limit (MLL) and 25-fish (in combination with Channel Catfish) daily bag limit. Anecdotal evidence suggests that Blue Catfish are a popular sport fish at Hubbard Creek Reservoir. Gill netting has been used to monitor the population, which previous surveys have indicated Blue Catfish were slightly more abundant in the reservoir than Channel Catfish, but catches were low for both species. Blue Catfish have been sampled once every four years in conjunction with Channel Catfish and White Bass sampling. Gill netting will be conducted in spring 2024 (Table 10) to maintain trend data for relative abundance and size structure. Gill netting will be conducted at a minimum of 15 random stations. A target RSE ≤ 25 will be attempted for relative abundance data (CPUE-Total and CPUE-12) and a target of 50 fish ≥ stock-length (≥ 12 inches) will be collected to determine size structure (PSD). At least 5 fish per represented inch group ≥ stock-length will be measured and weighed for estimating body condition. A category III age sample will be attempted to assess long-term growth and average age at legal length. If these objectives are not achieved, 15 additional random sampling stations may be added if deemed feasible.

Channel Catfish: Channel Catfish are present in the reservoir and have been managed with the statewide 12-inch MLL and 25-fish (in combination with Blue Catfish) daily bag limit. Traditionally, Channel Catfish have been sampled by gill nets (with varying effort; 10-20 stations) and have had low relative abundance in the reservoir. Continuation of gill netting surveys once every four years is necessary to monitor trends in relative abundance and size structure. Gill netting will be conducted during spring 2024 (Table 10) at 15 random stations to maintain trend data for relative abundance. A target RSE ≤ 25 will not be attempted for relative abundance data. Due to the high number of stations needed to achieve a RSE ≤ 25 for CPUE-Total or CPUE-Stock (an estimated 36 net nights) all sampling for Channel Catfish will be exploratory until catch rates and abundance increases. Due to the high number of net nights needed to achieve a target sample size of 50 fish ≥ stock-length (85 net nights; net night estimations were calculated using the 2016 gill net data), size structure will not be a survey objective. Catch rates using tandem hoop nets have yielded very poor catch of Channel Catfish and will not be used to sample Channel Catfish.

White Bass: White Bass are managed with the statewide 10-inch MLL and 25-fish daily bag limit. Traditionally, White Bass have been sampled by gill net surveys with varying effort (10-20 stations).

Continuation of gill netting surveys once every four years is necessary to monitor trends of White Bass relative abundance and size structure. Gill netting will be conducted during spring 2024 (Table 10) at 15 random stations. A target RSE ≤ 25 will not be attempted for relative abundance data. Due to the high number of net nights needed to achieve a RSE ≤ 25 for CPUE-Total or CPUE-Stock (an estimated 42 net nights) all sampling for White Bass will be exploratory until the population increases in abundance. (All net night estimations were calculated using 2016 gill net data.) A target sample size of 50 fish ≥ stock-length (≥ 6 inches) will be collected to determine size structure (PSD). At least 5 fish per represented inch group ≥ stock-length will be measured and weighed for estimating body condition. If these objectives for PSD and body condition are not achieved, additional sampling will not be conducted. Should we capture 13 fish 9.0-10.9 inches during gill netting, their otoliths will be used for estimating average age at legal length.

Largemouth Bass: Largemouth Bass have been sampled with electrofishing with varying effort 1.5-2.0 h (18-24, 5-minute stations). Continuation of biennial electrofishing is necessary to monitor trends of Largemouth Bass relative abundance and size structure. Electrofishing will be conducted in fall 2023 for 2 hours at 24 random 5-minute stations to assess relative abundance (i.e., CPUE-Total and CPUE-Stock). Sampling during fall may be challenging because of dense hydrilla coverage. A bass-only survey may be conducted during spring 2024 if sampling is hindered by extensive, dense hydrilla coverage. A target sample size of 50 fish ≥ stock-length (≥ 8 inches) will be collected to determine size structure (PSD). At least 5 fish per represented inch group ≥ stock-length will be measured and weighed for estimating body condition. Fin clips from 30 random fish of any size will be collected for microsatellite DNA analysis to determine genetic introgression of Florida Largemouth Bass in 2023. During sampling, 13 fish, 13.0-14.9 inches will be collected, and their otoliths will be used to estimate average age at legal length. If objectives are not achieved, up to 6 additional random 5-minute stations may be added if deemed feasible.

White Crappie: White Crappie have been sampled with fall trap netting with varying effort from (10-20 stations). Continuation of trap netting every four years is necessary to monitor trends in White Crappie relative abundance, size structure (PSD), and body condition (mean relative weight). Trap netting will be conducted in fall 2023 (Table 10) at a minimum of 15 random stations. A target RSE ≤ 25 will not be attempted for relative abundance data. Due to the high numbers of stations needed to achieve a RSE ≤ 25 for CPUE-Total or CPUE-Stock (an estimated 70+ net nights) all sampling for White Crappie will be exploratory. (Estimations were calculated using 2019 trap net data.) A target sample size of 50 fish ≥ stock-length (≥ 5 inches) will be collected to determine size structure (PSD). At least 5 fish per represented inch group ≥ stock-length will be measured and weighed for estimating body condition. During sampling, 13 fish, 9.0-10.9 inches will be collected, and their otoliths will be used to estimate average age at legal length. If these objectives are not achieved, up to 10 additional random sampling stations may be added if deemed feasible.

Creel Survey: A creel survey has not been conducted at Hubbard Creek Reservoir. A creel survey is necessary to gather current information regarding the popularity of fisheries, angler harvests/releases, expenditures, and anglers' demographics to prioritize management needs. A yearlong access creel survey will be conducted from 1 June 2020 – 31 May 2021 to collect data for directed angler hours, angler harvests/releases, expenditures, and demographics. The creel survey will be conducted for a minimum of five weekend days and four weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

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Tables and Figures

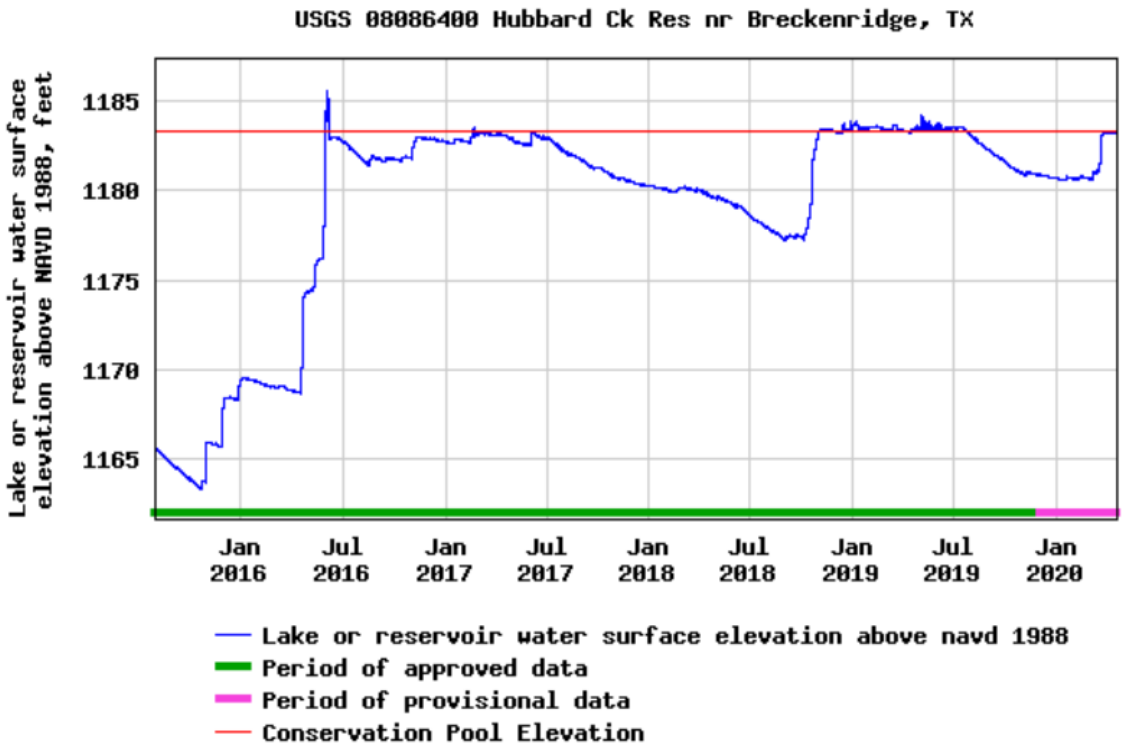


Figure 1. Daily water data for Hubbard Creek Reservoir, Texas, August 2015 - June 2020 (USGS 2020). NGVD 1988 refers to the National Geodetic Vertical Datum of 1988.

Table 1. Characteristics of Hubbard Creek Reservoir, Texas.

Characteristic	Description
Year constructed	1962
Conservation pool	1,183 feet above mean sea level
Maximum depth	1,115 feet above mean sea level
Controlling authority	West Central Texas Municipal Water District
County	Stephens
Reservoir type	Tributary
River basin	Brazos River Basin
Shoreline Development Index	8.60
USGS 8-Digit HUC Watershed	12060105 (Hubbard)
Conductivity	509-710 µS/cm

Table 2. Boat ramp characteristics for Hubbard Creek Reservoir, Texas, May, 2020. Reservoir elevation at time of survey was between 1,183.0-1,182.5 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Hwy 180/ Bob Clark Landing	32.747802 -99.014456	Y	40	1,169	Accessible
Dam/ Paul Prater Landing	32.817885 -98.954127	Y	30	1,155	Accessible
Game Warden Slough/ Corley Ramp	32.836155 -99.976140	Y	20	1,170	Accessible
Peeler Park	32.768639 -99.073083	Y	20	1,170	Accessible

Table 3. Harvest regulations for Hubbard Creek Reservoir, Texas.

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

Table 4. Stocking history of Hubbard Creek Reservoir, Texas. FRY = fry; FGL = fingerling; ADL = adults; UNK = unknown.

Species	Year	Number	Size
Threadfin Shad	1984	1,500	ADL
Blue Catfish	2016	140,242	FGL
Channel Catfish	1970	100,000	UNK
Palmetto Bass	1979	132,450	UNK
	1984	3,090,000	FRY
	Total	3,222,450	
Largemouth Bass	1967	18,000	UNK
	1968	200,000	UNK
	1971	100,000	UNK
	Total	318,000	
Florida Largemouth Bass	1979	80,425	FGL
	1986	135,500	FGL
	1990	157,265	FRY
	1990	225,834	FGL
	1991	382,989	FGL
	2003	355,520	FGL
	2011	373,397	FGL
	2012	377,199	FGL
	2016	86,842	FGL
	2017	215,748	FGL
	2018	122,066	FGL
	2020	112,148	FGL
	Total	2,624,933	

Table 5. Objective-based sampling plan components for Hubbard Creek Reservoir, Texas 2019–2020.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE – Total	RSE-Total ≤ 25
	Abundance	CPUE – Stock	RSE-Stock ≤ 25
	Genetics	% FLMB	N = 30, any age
Gizzard Shad[a]	Abundance	CPUE – Total	RSE-Total ≤ 25
	Prey availability	IOV	N ≥ 50
Bluegill[a]	Abundance	CPUE – Total	RSE-Total ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Trap netting			
White Crappie	Abundance	CPUE – Total	Exploratory
	Size structure	PSD, length frequency	Exploratory
	Condition	W_r	5 fish/inch group (max)
	Age-and-growth	Age at 10 inches	N = 13, 9.0-10.9 inches
Low-Frequency Electrofishing			
Blue Catfish	Abundance	CPUE – Total	Exploratory
	Abundance	CPUE – 12	Exploratory
	Size structure	PSD, length frequency	Exploratory
	Condition	W_r	Exploratory
	Age-and-growth	Age at 12 inches	N = 13, 11.0-12.9 inches
Flathead Catfish	Abundance	CPUE – Total	Exploratory
	Size structure	PSD, length frequency	Exploratory
	Condition	W_r	Exploratory
Tandem hoop netting			
Channel Catfish	Abundance	CPUE – Total	Exploratory
	Abundance	CPUE – 12	Exploratory
	Size structure	PSD, length frequency	Exploratory
	Condition	W_r	Exploratory

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

Table 6. Survey of structural habitat types, Hubbard Creek Reservoir, Texas, July-August, 2019. Percent occurrence with lower and upper 95% confidence limits (CL) of shoreline structural habitat at 321 random sites. Water level at the beginning of survey was at conservation pool and dropped to 0.5 feet below conservation pool elevation.

Structural habitat type	Percent occurrence	Lower CL	Upper CL
Natural Shoreline	63.9	58.5	68.9
Rocky Shoreline	25.9	21.4	30.9
Rock Bluff	4.7	2.9	7.6
Bulkhead	3.1	1.7	5.6
Gravel	2.5	1.3	4.8
Docks	10.3	7.4	14.1

Table 7. Percent occurrence with lower and upper 95% confidence limits (CL) of aquatic vegetation at 150 random sites throughout the reservoir and 326 sites along the shoreline in Hubbard Creek Reservoir, Texas, July-August, 2019. Water level at the beginning of survey was at conservation pool and dropped to 0.5 feet below conservation pool elevation. Tier I is immediate response, Tier II is maintenance, and Tier III is watch status.

	Throughout the Reservoir			Shoreline		
Habitat	Percent Occurrence	Lower CL	Upper CL	Percent Occurrence	Lower CL	Upper CL
Open Water	63.2	57.8	68.2	3.4	1.9	6.0
Hydrilla (Tier II)	22.7	18.5	27.5	38.9	33.8	44.4
Flooded Terrestrial Brush	15.6	12.1	20.0	84.4	80.1	88.0
Pondweed	9.5	6.8	13.2	44.9	39.5	50.3
Standing Timber	7.1	4.7	10.4	11.8	8.7	15.8
Coontail	2.8	1.5	5.2	1.6	0.7	3.6
Common Buttonbush	2.5	1.2	4.8	48.9	43.5	54.4
Bulrush	2.1	1.0	4.4	8.1	5.6	11.6
Cattail	1.8	0.8	4.0	20.6	16.5	25.3
Salt Cedar	1.2	0.5	3.1	22.7	18.5	27.6
Lotus	0.9	0.3	2.7	6.2	4.1	9.4
Chara spp.	0.6	0.2	2.2	14.3	10.9	18.6
Sago	0.6	0.2	2.2	0.3	0.1	1.7
Black Willow	0.3	0.1	1.7	4.0	2.4	6.8
Naiad	0.3	0.1	1.7	6.9	4.6	10.2
Logs	0.0	0.0	0.0	10.9	7.9	14.8
Water Primrose	0.0	0.0	0.0	7.2	4.8	10.5
Spikerush	0.0	0.0	0.0	5.0	3.1	7.9
Fence	0.0	0.0	0.0	0.6	0.2	2.2
Arrowhead	0.0	0.0	0.0	0.3	0.1	1.7
Arundo	0.0	0.0	0.0	0.3	0.1	1.7
Flatsedge	0.0	0.0	0.0	0.3	0.1	1.7

Table 8. Hydrilla coverage, Hubbard Creek Reservoir, Texas, summer 2016, 2017, 2018, and 2019. Water level at the time of the survey was near conservation pool in 2016, 2017, and 2019. Water level during the 2018 sampling was approximately 5.5 feet below conservation pool.

Survey Year	Hydrilla Density Coverage (acres)			Total Coverage (acres)
	Low Density	Moderate Density	High Density	
2016	16.0	0.0	0.0	16.0
2017	279.9	403.7	417.9	1,101.5
2018	146.2	369.9	1,572.5	2,088.6
2019	256.5	416.8	2,437.0	3,110.3

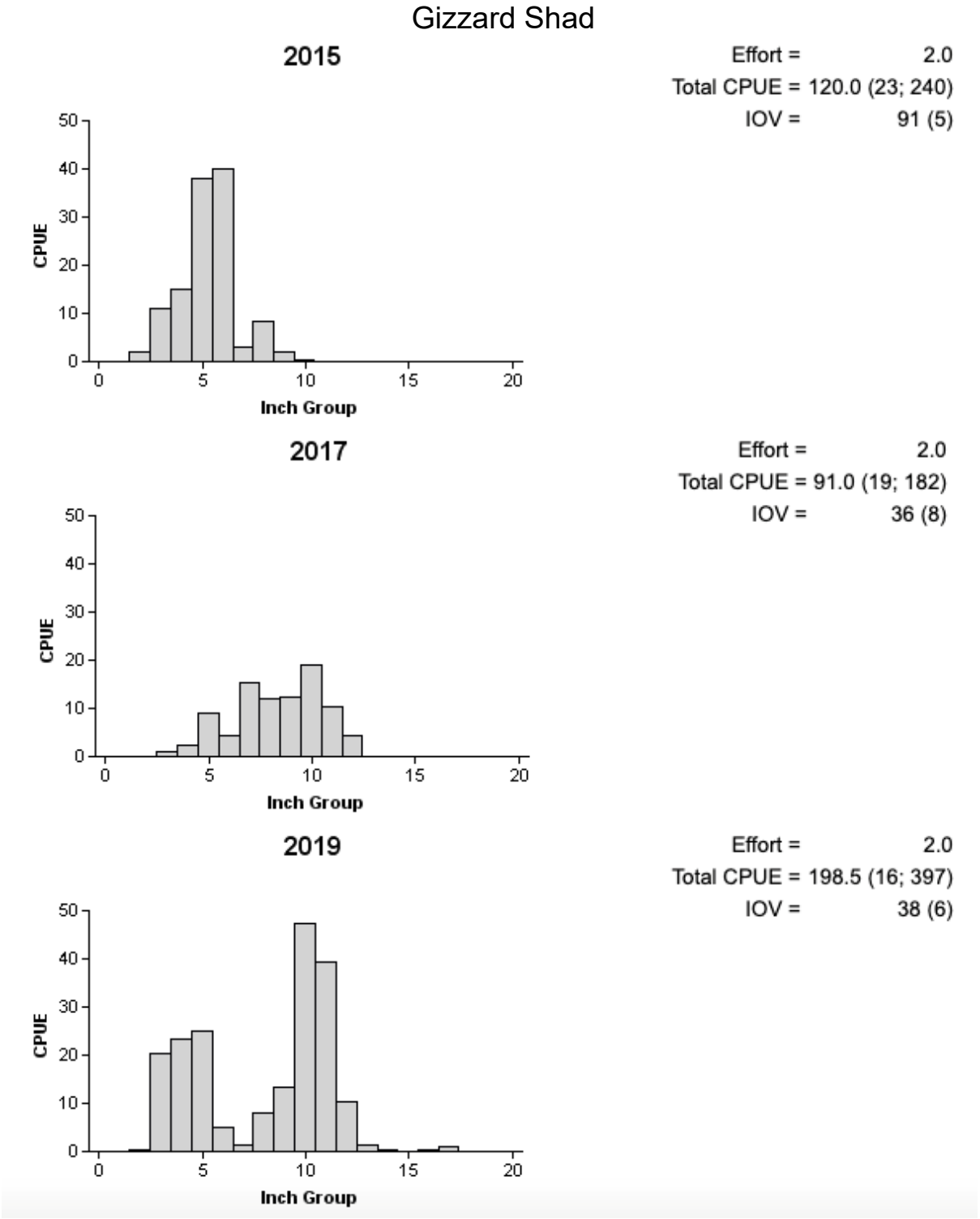


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Hubbard Creek Reservoir, Texas, 2015, 2017, and 2019.

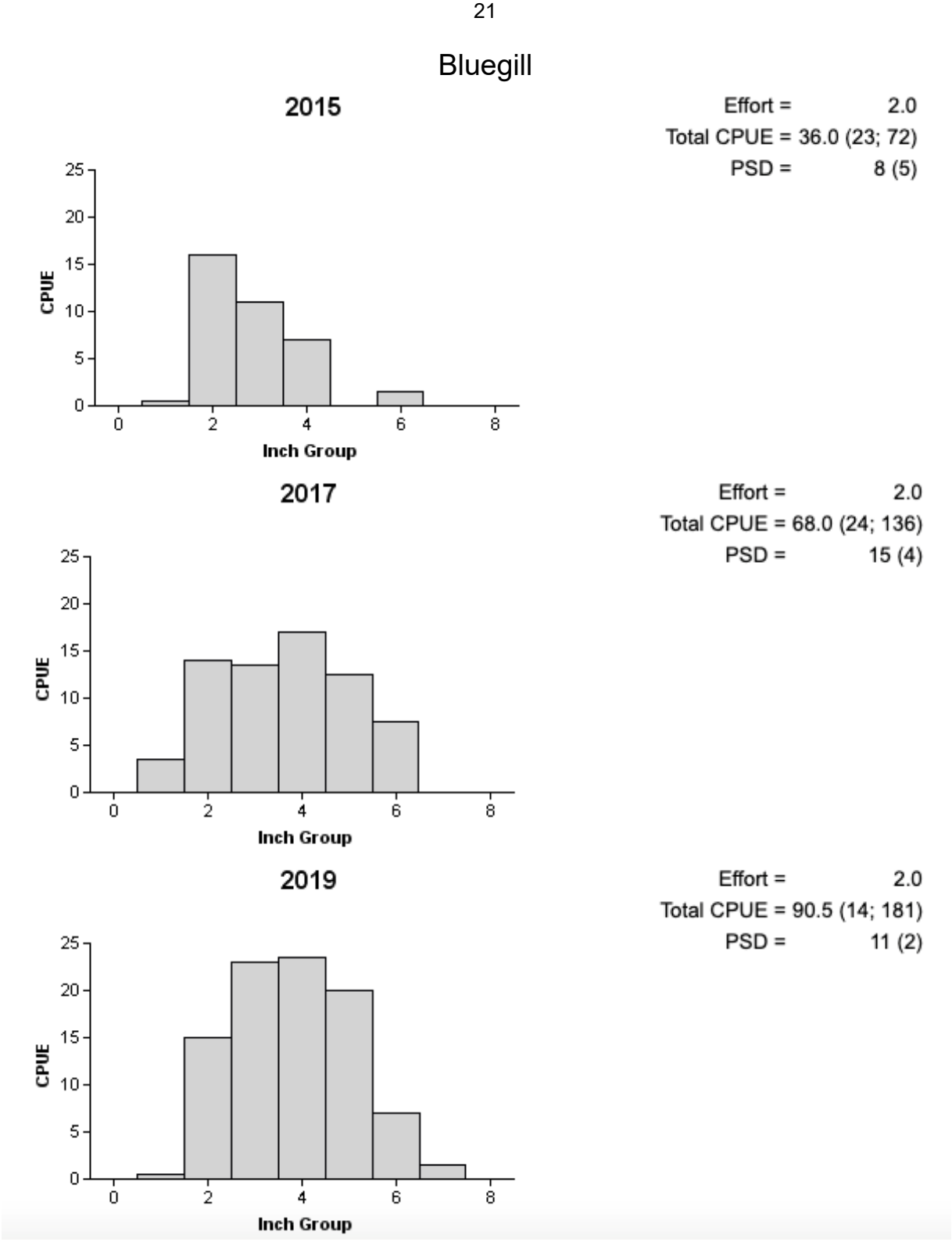


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Hubbard Creek Reservoir, Texas, 2015, 2017, and 2019.

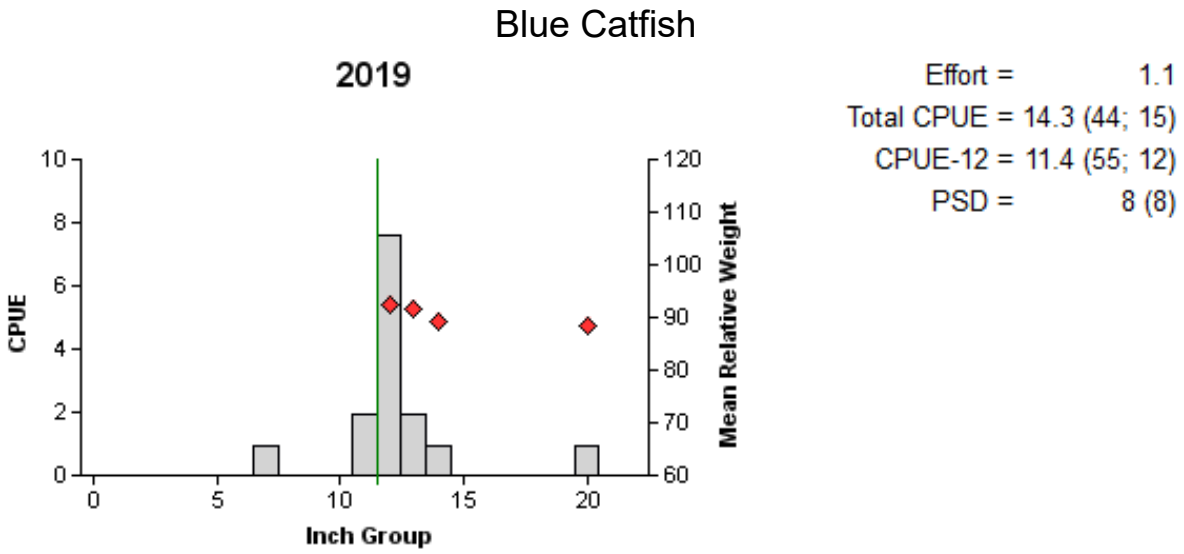


Figure 4. Number of Blue Catfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for low-frequency electrofishing survey, Hubbard Creek Reservoir, Texas 2019. Vertical line indicates minimum length limit.

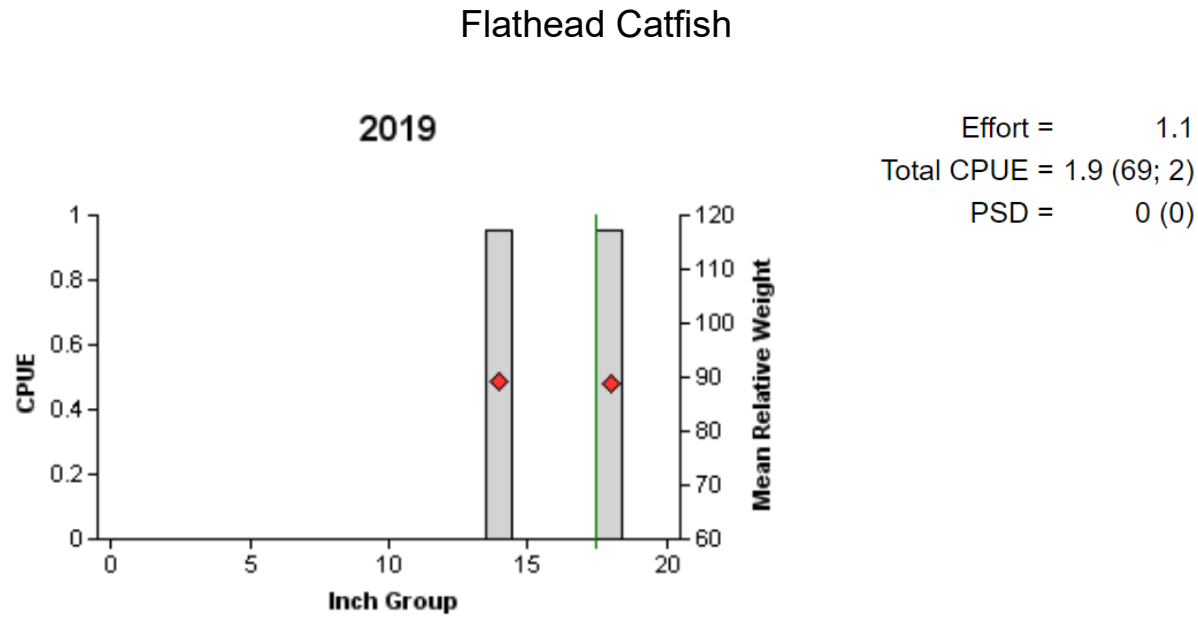


Figure 5. Number of Flathead Catfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for low-frequency electrofishing survey, Hubbard Creek Reservoir, Texas 2019. Vertical line indicates minimum length limit

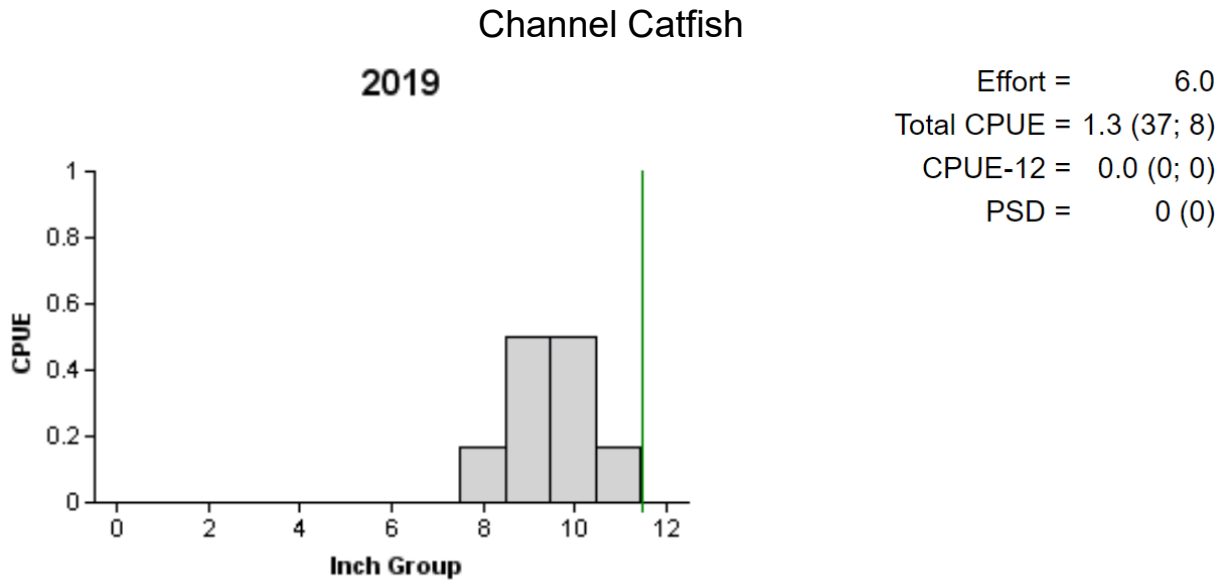


Figure 6. Number of Channel Catfish caught per series (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for tandem hoop net survey, Hubbard Creek Reservoir, Texas 2019. Vertical line indicates minimum length limit.

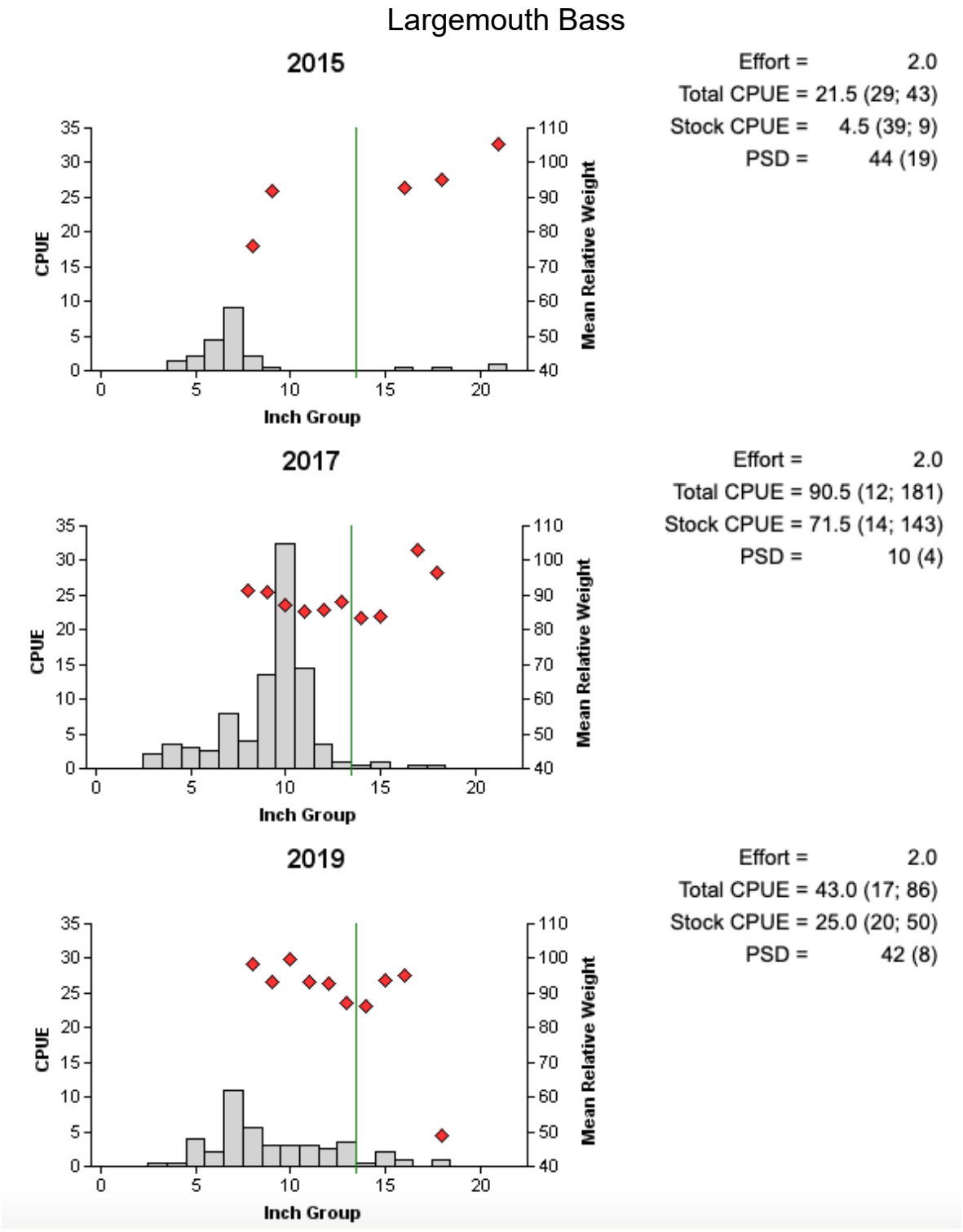


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Hubbard Creek Reservoir, Texas, 2015, 2017, and 2019. Vertical line indicates minimum length limit.

Table 9. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Hubbard Creek Reservoir, Texas, 1993-2019. 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 by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

Year	Sample size	Number of fish				% FLMB alleles	% FLMB
		FLMB	F1	Fx	NLMB		
1993	40	1	NA	25[a]	14	30.6	2.5
1996	29	10	NA	16[a]	3	68.9	34.5
1999	30	4	NA	26[a]	0	59.2	13.3
2005	32	1	NA	28[a]	3	45.5	3.1
2011	40	2	0	37	1	54.4	5.0
2015	36	1	0	35	0	58.0	2.8
2017	29	1	4	24	0	50.9	3.4
2019	27	0	0	21	6	37.0	0.0

[a] Determination of hybrid status not conducted.

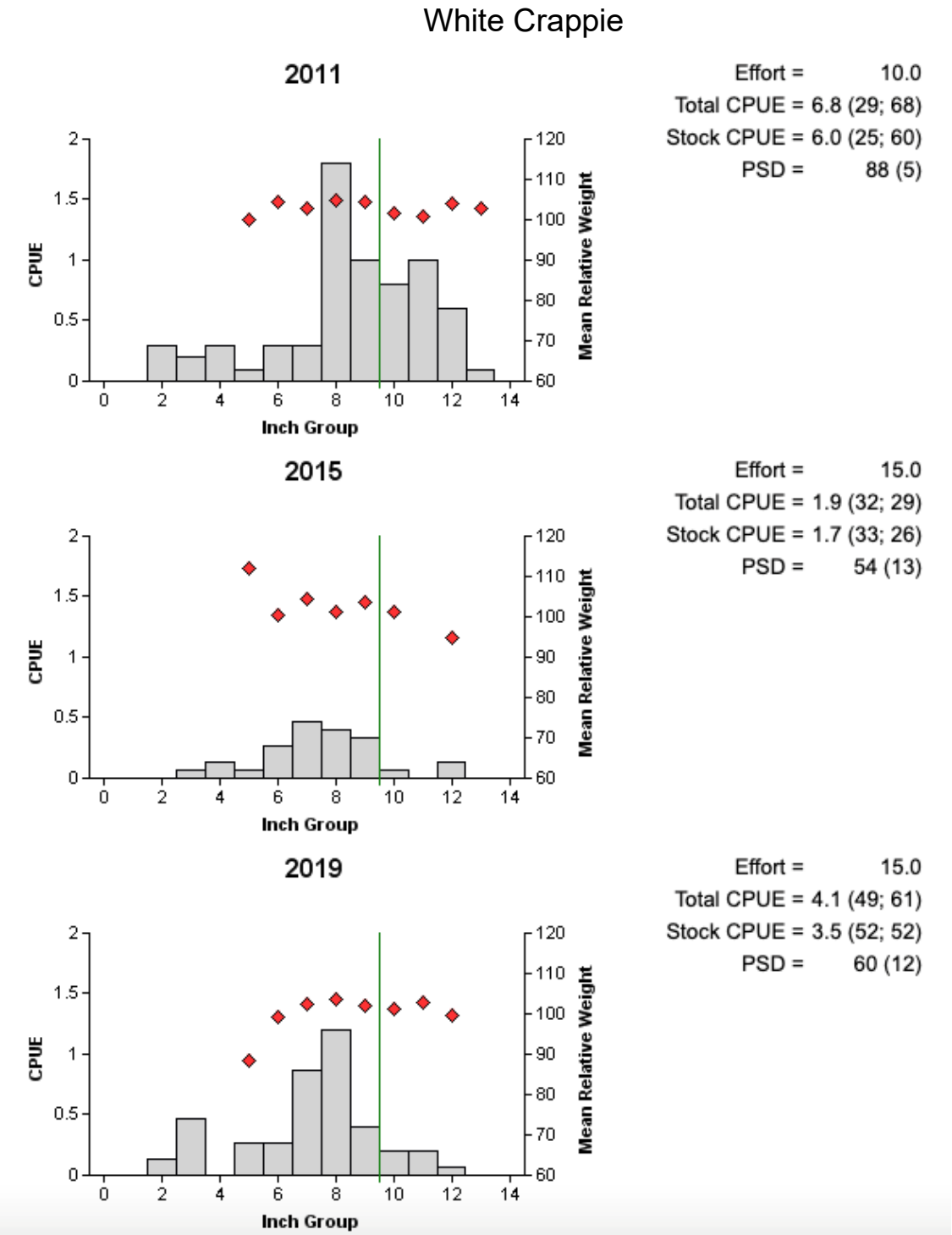


Figure 8. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Hubbard Creek Reservoir, Texas, 2011, 2015, and 2019. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 10. Proposed sampling schedule for Hubbard Creek Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

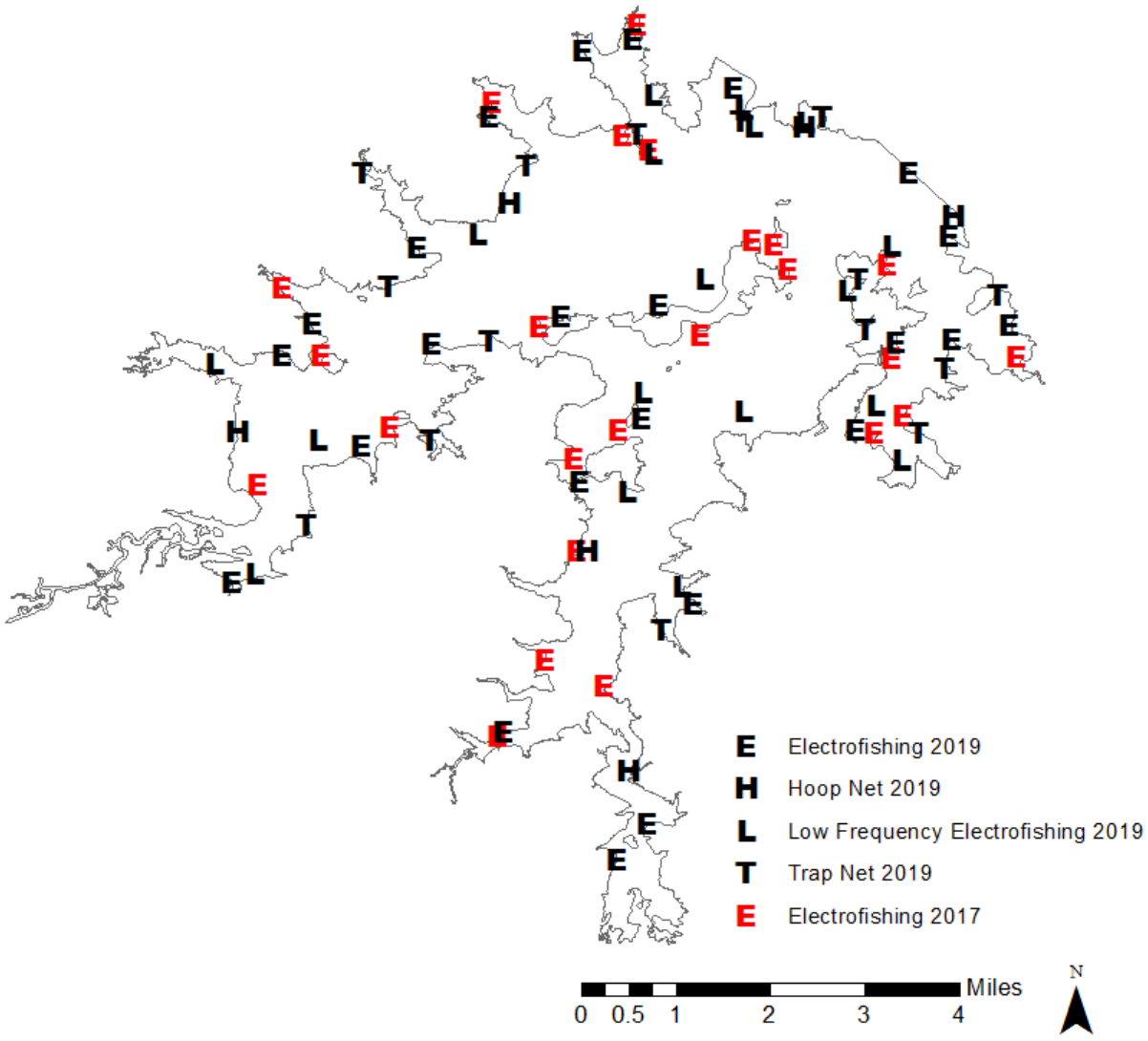
	Survey year			
Survey Type	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Structural Habitat				S
Vegetation	A	A	A	S
Electrofishing – Fall		A		S
Trap Netting				S
Gill Netting				S
Creel Survey	A			
Report				S

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Hubbard Creek Reservoir, Texas, 2019-2020. Sampling effort was 2 hours for electrofishing, 10 net nights for trap netting, 6 series for hoop netting, and 1.1 hours for low-frequency electrofishing.

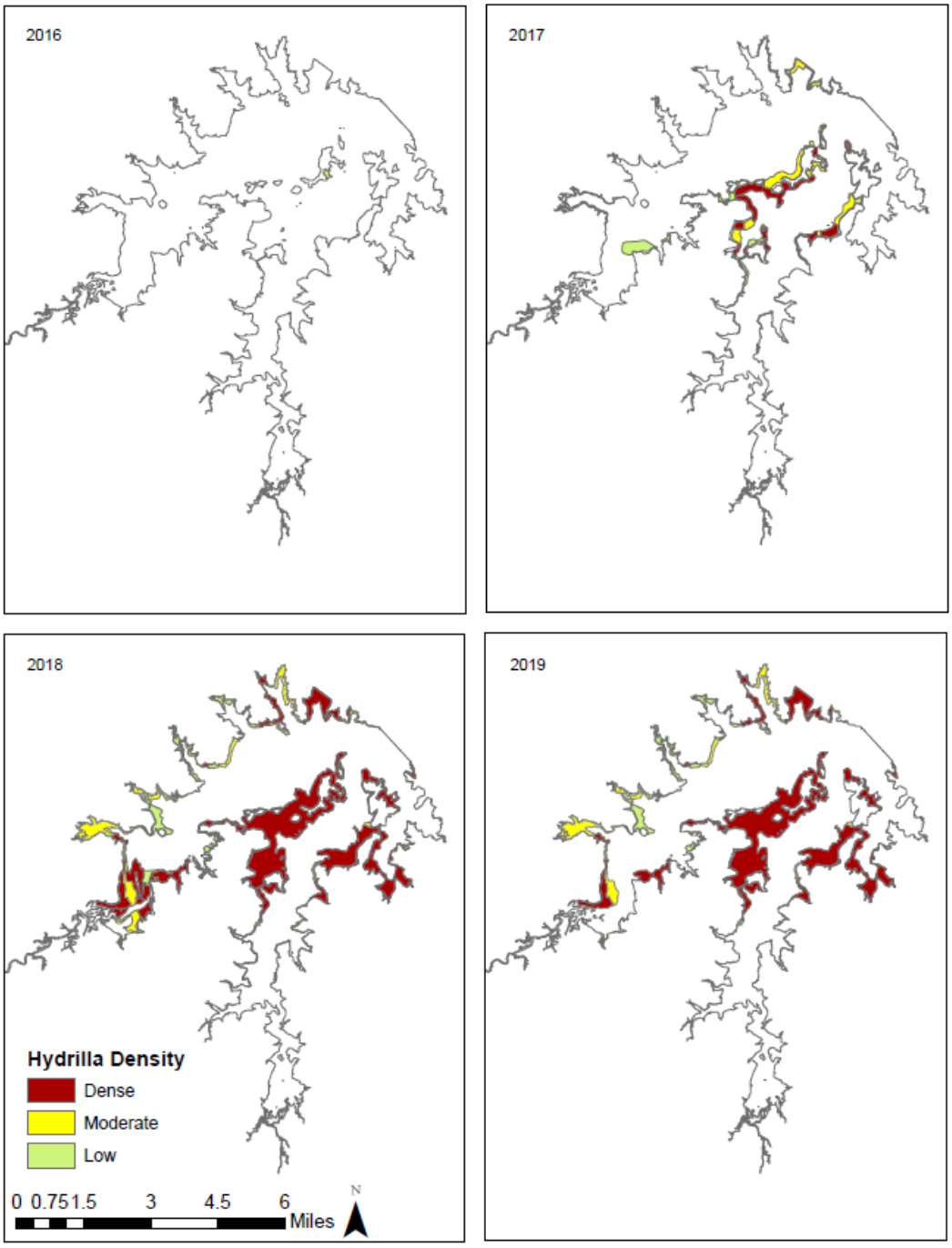
Species	Electrofishing		Trap Netting		Hoop Netting		Low-Frequency Electrofishing	
	N	CPUE(RSE)	N	CPUE(RSE)	N	CPUE(RSE)	N	CPUE(RSE)
Gizzard Shad	197	198.5 (16)						
Threadfin Shad	30	15.0 (43)						
Blue Catfish							15	14.3 (44)
Channel Catfish					8	1.3 (37)		
Flathead Catfish					1	0.2 (100)	2	1.9 (69)
Green Sunfish	89	44.5 (54)						
Warmouth	20	10.0 (36)						
Bluegill	181	90.5 (14)						
Longear Sunfish	57	28.5 (42)						
Redear Sunfish	25	12.5 (32)						
Hybrid Sunfish	3	1.5 (73)						
Largemouth Bass	86	43.0 (17)						
White Crappie			61	4.1 (49)				
Black Crappie			2	0.1 (100)				

APPENDIX B – Map of sampling locations



Location of sampling sites, Hubbard Creek Reservoir, Texas, 2017-2019. Trap netting, hoop netting, low-frequency electrofishing, and electrofishing stations are indicated by T, H, L, and E, respectively. Water level was near full pool at time of sampling during the 2019 hoop netting and low-frequency electrofishing sampling, 2.0 feet below CP during the 2019 electrofishing and trap netting sampling, and 2.1 feet below CP during the 2017 electrofishing sampling.

APPENDIX C – Map of hydrilla coverage



Survey map of the hydrilla coverage and hydrilla density, Hubbard Creek Reservoir, Texas 2016, 2017, 2018, 2019. Water level at the time of the survey was near conservation pool in 2016, 2017, and 2019. Water level during the 2018 sampling was approximately 5.5 feet below conservation pool.

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