Lake Corpus Christi Reservoir

2018 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in Lake Corpus Christi Reservoir were surveyed in 2018 using electrofishing, and in 2019 using spring electrofishing, gill netting, and tandem hoop netting to assess population trends for important sport fishes. White Bass were assessed in upstream Nueces River in 2019 with winter electrofishing. Historical data are presented with the 2018-2019 data for comparison. This report summarizes the survey results and contains a management plan for the reservoir based on those findings.

Reservoir Description: Lake Corpus Christi Reservoir is an 18,256-acre impoundment located on the Nueces River approximately 20 miles northwest of Corpus Christi, Texas. The reservoir was built by the Lower Nueces Water Supply District in 1958 to provide water for the city of Corpus Christi and other coastal bend communities and is under the authority of the City of Corpus Christi. Boat access is correlated with water level. Shoreline and handicap access are limited to a few public areas around the lake. Water is typically turbid but clears during summer in the lower reservoir and small creek arms. The substrate is composed primarily of silt, sand, clay, and some gravel/rock. Littoral habitat consisted of flooded live and dead terrestrial vegetation, standing timber, and seasonally abundant water hyacinth.

Management History: Important sport fish species include Blue and Channel Catfish, White Bass, Largemouth Bass, Alligator Gar, and crappie. Recent management efforts focused on increasing Florida Largemouth Bass (FLMB) introgression through stockings (2015, 2017, and 2018), developing and implementing a sampling protocol to track population trends of White Bass in the upstream Nueces River, and evaluating the use of baited tandem hoop nets as a sampling gear for Channel Catfish. Further, staff monitored expansion of nuisance vegetation with a vegetation survey conducted annually. Water hyacinth was treated in 2016 (202 acres), 2017 (1,752 acres), and 2018 (102 acres) by either private contractors or City staff. Angler harvest of all sport fishes has been regulated according to statewide size and bag limits.

Fish Community

- **Prey species:** Threadfin and Gizzard Shad formed the reservoirs forage base. Bluegill provided additional forage for sport fish, yet relative abundance has decreased in recent years. Population size structure of prey species was suitable to support sport fish populations.
- **Catfishes:** Blue Catfish abundance remained high and size structure comprised a wide size range of fish. Channel and Flathead Catfish were present in the reservoir in low abundance.
  White Bass: White Bass were available in moderate abundance and 83% of fish collected were available for angler harvest. White Bass support a popular fishery in the upstream Nueces River.
- **Largemouth Bass:** Largemouth Bass abundance declined substantially. Few legal-size fish were available to anglers. Fish attained legal length (14 inches) in 2.2 years.

Management Strategies: Continue to manage sport fish under existing regulations. Request Florida Largemouth Bass stocking to enhance production of trophy fish (≥ 8 pounds). Conduct a creel survey to collect fisheries dependent data (i.e., angler effort, catch, and harvest). Identify and explore partnerships and grant opportunities to conduct a fisheries habitat enhancement project. Monitor expansion of nuisance vegetation.

Introduction

This document is a summary of fisheries data collected from Lake Corpus Christi 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 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

Lake Corpus Christi Reservoir is an 18,256-acre reservoir located on the Nueces River approximately 20 miles northwest of Corpus Christi, Texas. The reservoir was constructed in 1958 by the Lower Nueces Water Supply District to provide water for Corpus Christi and other local communities. Lake Corpus Christi Reservoir was eutrophic with a mean TSI chl-*a* of 60.0 (Texas Commission on Environmental Quality 2018). Water level in the reservoir fluctuates 1-15 feet annually (Figure 1). Water level was the lowest in twenty years between 2012 and 2013 reaching 16 feet below conservation pool. The lake level increased in the fall of 2013 to approximately one foot below conservation pool. Since 2016, water level has fluctuated annually, yet remained within 4 – 5 foot of conservation elevation. Boat access is dependent on water level, and shoreline and physically disabled access were limited to a few public areas around the lake. Water is typically turbid but clears during summer in the lower reservoir and small creek arms. The substrate is composed primarily of silt, sand, clay, and some gravel/rock. Littoral habitat over the survey period was composed primarily of flooded live and dead terrestrial vegetation and standing timber. Seasonally abundant water hyacinth provided additional habitat. Historically, water hyacinth has become so abundant that it inhibited boating, fishing and shoreline access. Water lettuce and alligatorweed have also been present in the reservoir but have not negatively impacted recreational use. Herbicide treatments for water hyacinth control occurred in 2016, 2017, and 2018. Other descriptive characteristics for Lake Corpus Christi Reservoir are in Table 1.

Angler Access

Lake Corpus Christi Reservoir has six public boat ramps and several private boat ramps. Additional boat ramp characteristics can be found in Table 2. Shoreline access is limited to the public boat ramp areas and two fishing piers located within Lake Corpus Christi Reservoir State Park. A construction project for a new extended fishing pier was completed at Lake Corpus Christi Reservoir State Park in 2015.

Management History

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

1. Request Florida Largemouth Bass (FLMB) for stocking to maintain Florida genetics and maximize trophy production potential.

    Action: FLMB were stocked in 2015, 2017, and 2018 at a rate of roughly 1,000/km shoreline.

2. Collect fisheries dependent data to quantify and identify trends in angler effort, catch, and harvest.

    Action: A creel survey was not implemented. Creel survey efforts were redistributed to other district waterbodies.

3. Continue to explore the use of baited tandem hoops nets as an alternative sampling gear for Channel Catfish.

    Action: Baited tandem hoop nets were deployed in 2019. Catches were low (0.2/fish per net series).

4. Monitor presence, distribution, and spread of invasive aquatic vegetation through annual vegetation surveys.

> **Action:** Invasive vegetation was monitored annually with pre- and post-treatment vegetation surveys. District staff coordinated with the Aquatic Habitat Enhancement (AHE) team, the City of Corpus Christi, and private contractors to manage and control water hyacinth and other problematic vegetation on the reservoir.

Harvest regulation history: Sport fishes in Lake Corpus Christi Reservoir have always been managed with statewide regulations (Table 3).

Stocking history: Florida Largemouth Bass fingerlings have been periodically stocked in the reservoir, most recently in 2015 (205,500), 2017 (213,230) and 2018 (203,036). The reservoir was stocked with Channel Catfish fingerlings (257,364) in 2014. Palmetto and Striped Bass have been stocked at Lake Corpus Christi Reservoir in the past; yet neither population persists. Since 1993, Rainbow Trout have been stocked annually into a confined cove as part of a youth fishing event. The complete stocking history can be found in Table 4.

Vegetation/habitat management history: Historically, water hyacinth, a non-native floating plant, has been problematic in the upper end of the reservoir, reducing access and negatively impacting fish and wildlife habitat. Water lettuce and alligatorweed have also been present but have yet to restrict recreational use. Historically, City of Corpus Christi staff treated water hyacinth with herbicides as needed. Abundance of nuisance vegetation, particularly water hyacinth, increased substantially with increasing water level and created access issues over the current survey period. Starting in 2016, water hyacinth control was conducted through private contractors with coordination and oversight by TPWD and the City of Corpus Christi. This included treatments in 2016 (202 acres), 2017 (1,752 acres), and 2018 (102 acres).

Water transfer: Lake Corpus Christi Reservoir is used for municipal/industrial water supply, recreation, and to a lesser extent, flood control. There are three water diversion categories managed by the City of Corpus Christi which include; municipal, industrial and irrigation/livestock. Three permanent pumping stations transfer untreated water to the cities of Beeville, Alice, and Mathis for use as municipal water supply. Lake Corpus Christi Reservoir also periodically receives auxiliary water from upstream Choke Canyon Reservoir. There are currently no proposals to install additional pumping stations. No inter-basin transfers exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Corpus Christi Reservoir (Binion and Findeisen 2015). 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 fall electrofishing (2 hour at 24, 5-min stations). An additional bass-only spring electrofishing survey (1.1 hour at 13, 5-minute stations) was conducted in 2019. 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 8 fish (range 13.0 to 14.9 inches).

White Bass were collected with electrofishing (1.3 hour at 8, 10-min stations) in the upper stretches of the Nueces River during the annual spawning run (Jan – Feb) to assess and track population metrics.

Gill netting – Blue and Channel Catfish were collected by gill netting (15 net nights at 15 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Tandem hoop netting – Channel Catfish were collected by baited tandem hoop netting (5 tandem hoop net series, 2-night soak; ZOTE® soap). CPUE for was recorded as the number of fish caught per series (fish/series).

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 statistics.

Habitat –Vegetation surveys were conducted in 2015 – 2019 to monitor expansion of water hyacinth. Vegetative habitat was assessed with the digital shapefile method in 2018 (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

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

Results and Discussion

Habitat: Littoral structural habitat consisted primarily of rocky gravel banks, standing timber, flooded terrestrial vegetation, and natural shoreline (Table 6). Both native and non-native vegetation were limited in 2018 and comprised < 1.0% of the total surface area (Table 7). Water hyacinth (45.8 acres) and water lettuce (23.9 acres) were the most abundant aquatic vegetation. Flooded terrestrial vegetation provided the majority of fish habitat; attributed to a water level rise in the fall of 2018. Additionally, 56 MossBack® artificial fish attractors were installed directly below the Lake Corpus Christi State Park extended fishing pier.

Prey species: Threadfin and Gizzard Shad formed the reservoirs primary forage base; catch rates were 221.0/h and 75.5/h, respectively (Figure 2; Appendix A). Population size structure of Gizzard Shad was consistent among years (IOV range: 95 – 99) and indicated the majority of Gizzard Shad collected were available as prey to predator fishes. Bluegill catches have trended down since 2014; however, Bluegill still contributed to the prey base and most individuals collected were < 6 in total length (Figure 3). Survey results indicated ample prey base for sport fish and that availability of prey should not be a limiting factor to the growth and condition of sport fish in the reservoir.

Blue Catfish: Blue Catfish gill net catch rates remained high, were similar across years (range: 16.9/nn – 21.8/nn; Figure 4), and consistent with the mean historical catch rate (20.9/nn; N = 21 surveys, 1988 – 2019). Size structure declined over the survey period as indicated by PSD (2019 PSD = 4); yet 46% of the fish collected were of harvestable size (12 in) and many size classes were abundant. Condition of fish greater than 12 inches remained consistent across years for most size classes and tended to increase with increased length (Figure 4). Blue Catfish represent an important component to the overall sport fishery at the reservoir.

Channel Catfish: The gill net catch rate for Channel Catfish in 2019 was low and consistent with previous surveys (CPUE range: 0.5/nn – 1.7/nn; Figure 5). No legal-size fish were collected with gill nets in 2019 (Figure 5). Baited tandem hoop nets were deployed in 2014 and 2019 in an effort to evaluate the use of hoop nets as an alternative sampling gear for Channel Catfish. Baited tandem hoop nets set in summer 2014 yielded a four-fold increase in the number of fish collected (N = 105 fish; 6.6/series) relative to mean catches obtained by historical gill net surveys (N = 27 fish; 1.8/nn) and collected several legal-size fish (CPUE-12 = 2.3/series; Figure 6). However, the 2019 tandem hoop net collection yielded only one fish (0.2/series).

White Bass: The winter electrofishing catch rate of White Bass was 78.8/h in 2019, similar to 2018 (71.0/h), yet slightly reduced from 2017 (93.5/h) and the mean electrofishing CPUE (92.3/h; N = 4 surveys, 2016 – 2019). Catch rate of legal-size (≥10 in) fish was excellent (CPUE-10 = 65.3/h) and size structure was dominated by larger individuals (PSD = 95; Figure 7); indicating ample angling opportunity. White Bass in the reservoir continue to support a very popular fishery during the annual spring run into upstream Nueces River.

Largemouth Bass: Largemouth Bass relative abundance declined substantially. The 2018 electrofishing catch rate was 10.0/h, compared to 70.5/h in 2016 and 196.5/h in 2014 (Figure 8). Size structure improved in 2018 (PSD = 57) relative to previous years, but was based on a small sample size. Catches of legal-size fish were poor (CPUE-14 = 2.0/h). Body condition in 2018 was high (relative weight > 90) for nearly all size classes and no trends in body condition were evident based on size (Figure 8). Mean age at legal length (14 in) was 2.2 years (N = 8; range: 1 – 3 years; Table 8) and considered a good growth rate; however, growth to the minimum length limit has slowed since 2014. Introgression of FLMB genetics in the population has remained high (Binion and Findeisen 2015). Due to reduced catches in the fall 2018 collection and also attributed to OBS plan objectives not achieved (minimum 50 stock-size fish and RSE < 25; N = 14 stock-size collected and RSE = 49), we initiated a spring bass-only electrofishing survey in 2019 and observed a catch rate of 24.9/h (Figure 9). Reservoir conditions changed with a 5-foot water level rise flooding substantial terrestrial habitat just prior to the electrofishing sample conducted in 2018 and remained above conservation pool into the spring 2019 collection. These

changes in available habitat may have reduced sampling effectiveness and contributed to the observed decline in catches.

Fisheries Management Plan for Lake Corpus Christi Reservoir, Texas

Prepared – July 2019

ISSUE 1:   Lake Corpus Christi Reservoir is capable of producing trophy-size (≥ 8 pounds) Largemouth Bass. Catch records (water body record = 13.5 pounds) and anecdotal reports continue to demonstrate the reservoirs trophy potential. Abundant forage populations exist to support the growth and production of these larger fishes.

MANAGEMENT STRATEGY

1. Request FLMB fingerlings annually for stocking to maximize production of trophy fish.

ISSUE 2:   Baseline fisheries dependent data such as angler effort, catch, and harvest of sport fishes has only been collected once (2014/2015) on the reservoir and occurred during a period of extended low water level. Baseline creel data may have been negatively impacted due to low water level conditions and reduced boater access.

MANAGEMENT STRATEGIES

1. Conduct a roving creel survey during high water period (i.e., within 4 ft. of conservation pool elevation). Target dates include 1 January 2023 through 30 June 2023.

ISSUE 3:   Frequent water level fluctuation and lack of establishment by desirable aquatic vegetation can result in periods of reduced littoral habitat.

MANAGEMENT STRATEGY

1. Develop and foster local partnerships to initiate and implement a reservoir-wide habitat enhancement project to supplement fisheries habitat.
2. Apply for grant funding opportunities and seek in-kind or monetary support from project partners.

ISSUE 4:   Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. The financial costs of controlling and/or eradicating 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. Exotic plants such as water hyacinth and water lettuce have historically been a severe problem, primarily in the upper end and tributaries of the reservoir. These exotic plants restrict recreational use and can impact the quality of fish and wildlife habitat restricting growth and colonization of native vegetation.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority 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.

6. Monitor water hyacinth and other invasive nuisance vegetation through annual vegetation surveys.

7. Continually evaluate the water hyacinth control program and serve as advisors to the City of Corpus Christi on all vegetation control activities.

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

Sport fish, forage fish, and other important fishes

Sport and/or recreationally important fish in Lake Corpus Christi Reservoir include Alligator Gar, Blue, Channel, and Flathead Catfish, White Bass, Largemouth Bass, and crappie. Important forage species include Gizzard and Threadfin Shad, and Bluegill.

Low-density fisheries

Flathead Catfish: Flathead Catfish are present in the reservoir in low abundance. Since 1988, the mean gill net CPUE is 0.3/nn. Directed fishing effort was 0.0% in 2014/2015 and only one fish was harvested during the creel period. Presence/absence will be noted in standard gill net sampling.

Channel Catfish: Channel Catfish are present in Lake Corpus Christi Reservoir but abundance appears to be low (average gill net CPUE = 1.8/nn; N = 20; standard deviation = 1.8; range: 0.0 – 6.9/nn). During the 2014/2015 creel period no directed fishing effort was reported and angler harvest was estimated at 486 fish. Presence/absence will be noted in standard gill net sampling.

Survey objectives, fisheries metrics, and sampling objectives

Alligator Gar: Alligator Gar represent an important component to the overall sport fishery at the reservoir; 6.6% of total directed fishing effort in 2014/2015. Directed effort, angler catch, and angler harvest will be monitored with a creel survey conducted in 2023 to assess large-scale changes in Alligator Gar fishing effort, catch, and harvest; lending important insight into population dynamics.

Blue Catfish: Blue Catfish are present in Lake Corpus Christi Reservoir in high abundance and represent a popular recreational fishery. Annual gill net total CPUE since 1988 has averaged 20.9/nn (N = 21; standard deviation = 8.1; range: 8.2 – 40.1/nn) and mean stock-size CPUE is 9.0/nn (N = 21; standard deviation = 3.3; range: 5.1 – 13.9/nn). Further, Blue Catfish were the most popular sport fish sought by anglers in the 2014/2015 creel survey and anglers harvested 15,671 fish during this time period. Trend data on CPUE, size structure, and body condition have been collected at a minimum biennially since 1991 with spring gill netting. Currently, the population appears to be in good shape, and anglers are anecdotally satisfied with the fishing. Ongoing collection of biennial trend data with spring gill netting will allow for determination of large-scale changes in population dynamics that may warrant further investigation and more intensive sampling. A minimum of 15 randomly-selected gill net sites will be sampled in 2021 and 2023. Sampling will continue at additional random sites until 50 stock-size fish are collected and the RSE of CPUE-S is ≤ 25. Directed effort, angler catch, and angler harvest will be monitored with a creel survey conducted in 2023 to assess large-scale changes in angler catch and harvest.

White Bass: White Bass are present in the reservoir, but population metrics and relative abundance are highly variable from sample to sample and likely is dependent on timing of sampling. The mean historical catch rate for White Bass is 5.2/nn (N = 12; standard deviation = 8.0; range = 0.2 – 28.4/nn). However, the average catch rate when sampled during the months of January and February is 12.3/nn (N = 4; range: 3.3 – 28.4/nn) compared to 1.7/nn (N = 8; range: 0.2 – 5.7/nn) when collected March – May. White Bass were not directly targeted (directed effort = 0.0%) during the 2014/2015 creel period and all White Bass caught were released. A popular harvest-oriented White Bass fishery does exist in the upstream portion of the Nueces River, but quantitative data do not exist for this stretch of river. Minimal conclusions regarding the trend data on CPUE, size structure, and body condition of White Bass can be made due to high variability in the gill net catch data. To obtain more precise and consistent measures of population metrics such as size structure indices, an electrofishing sampling protocol was established in 2016. Starting in 2016, White Bass were sampled in the upstream Nueces River January – February with a minimum of 6, 10-minute fixed site stations and monitored annually thereafter. This has resulted in greater number of fish collected and lower RSE values relative to gill nets. Average electrofishing CPUE was 92.3/h (N = 4; standard deviation = 24.3; range: 71.0/h – 126.0/h). Survey results have indicated electrofishing White Bass in the upper stretch of the Nueces River during late winter should provide more consistent and reliable data that will allow biologists to detect large-scale changes in population dynamics that may warrant further investigation. A minimum of 6, 10-minute fixed site electrofishing stations will be conducted annually. Sampling will continue at additional fixed sites until 50 stock-size fish are collected. Directed effort, angler catch, and angler harvest will be monitored with a creel survey conducted in 2023 and potential inclusion of an additional up-river creel section will be explored.

Largemouth Bass: Largemouth Bass have been present in the reservoir in reduced abundance in recent years. The mean historical total CPUE for Largemouth Bass is 82.5/h (N = 13; standard deviation = 65.4; range: 10.0 – 203.5/h) and mean stock-size CPUE is 40.8/h (N = 13; standard deviation = 27.5; range: 7.0 – 104.0/h). Largemouth Bass represented a small portion of directed fishing effort (1.3%) in 2014/2015; however, anecdotal information indicates the reservoir supported a very popular Largemouth Bass fishing destination in years past. No fish were harvested during the creel period and all legal-size Largemouth Bass were released. Trend data on CPUE, size structure, and body condition was collected biennially since 2000. Based on the most recent survey conducted in 2018, the population appears to be substantially reduced in abundance (10.0/h, record low CPUE). After the sub-par fall sample, an additional electrofishing survey was implemented in spring 2019 and yielded 24.9/h. Note: Reservoir conditions changed with 5-foot water level rise just prior to electrofishing sample conducted in 2018 and remained above conservation pool into the spring 2019 collection. We will track this population closely with continued collection of biennial trend data with fall electrofishing as well as an additional spring collection scheduled for 2020. A minimum of 12 (spring) – 24 (fall) randomly selected electrofishing sites will be sampled in 2020 and 2022 to further assess the decline in population abundance. Further, category 2 age and growth analysis [mean age at legal length (14 in), N = minimum of 13 fish between 13.0 – 14.9 in] will be conducted for fall collections (i.e., biennially) to assess any changes in growth to the minimum length limit. A sub-sample of 30 fish will be collected in 2022 for genetic analysis. Directed effort, angler catch, and angler harvest will be monitored with a creel survey conducted in 2023 to monitor for any large-scale changes in angler catch and harvest and to determine if this fishery is utilized.

White Crappie: White Crappie are present in the reservoir but trap net samples have yielded mixed results and variable catches (historical mean CPUE = 4.5/nn; N = 14; standard deviation = 2.7; range: 0.7 – 10.5/nn). Based on anecdotal reports and the 2014/2015 creel survey, White Crappie represent an important component to the overall sport fishery (directed fishing effort = 3.8%) at the reservoir. Trap net sampling efforts were discontinued and creel survey data will be used to monitor large-scale changes in crappie angler catch, effort, and harvest, lending important insight into overall crappie population dynamics.

Gizzard Shad and Bluegill: Gizzard Shad and Bluegill are the primary forage at Lake Corpus Christi Reservoir. Like Largemouth Bass, trend data on CPUE and size structure of Gizzard Shad and Bluegill have been collected biennially since 2000 with fall electrofishing. Continuation of sampling, as per Largemouth Bass above, will allow for monitoring of large-scale changes in Gizzard Shad and Bluegill

relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers for size structure estimation (Gizzard Shad IOV; 50 fish minimum and Bluegill PSD; 50 fish minimum at 24 randomly selected 5-minute stations with 90% confidence) and relative abundance estimates (Gizzard Shad and Bluegill CPUE-Total; RSE $\leq$ 25, anticipated effort is 24 stations based on historical data). No additional effort will be expended beyond sampling effort conducted for Largemouth Bass data collection.

Habitat: Historically, invasive plants (water hyacinth, water lettuce, alligatorweed) have been problematic at the reservoir; particularly in the upper half and Nueces River. Specifically, water hyacinth poses a potential threat to angler and boater access and enhances other ecologically detrimental processes (i.e., degraded water quality, competition with desirable native vegetative species, water loss through evapotranspiration, etc.). Annual aquatic vegetation monitoring is required to identify potential threats to boating and angling access so control and rapid response efforts can be implemented to reduce or eliminate threats associated with invasive aquatic plants. The reservoir will be circumnavigated annually and invasive species encountered will be georeferenced.

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Tables and Figures
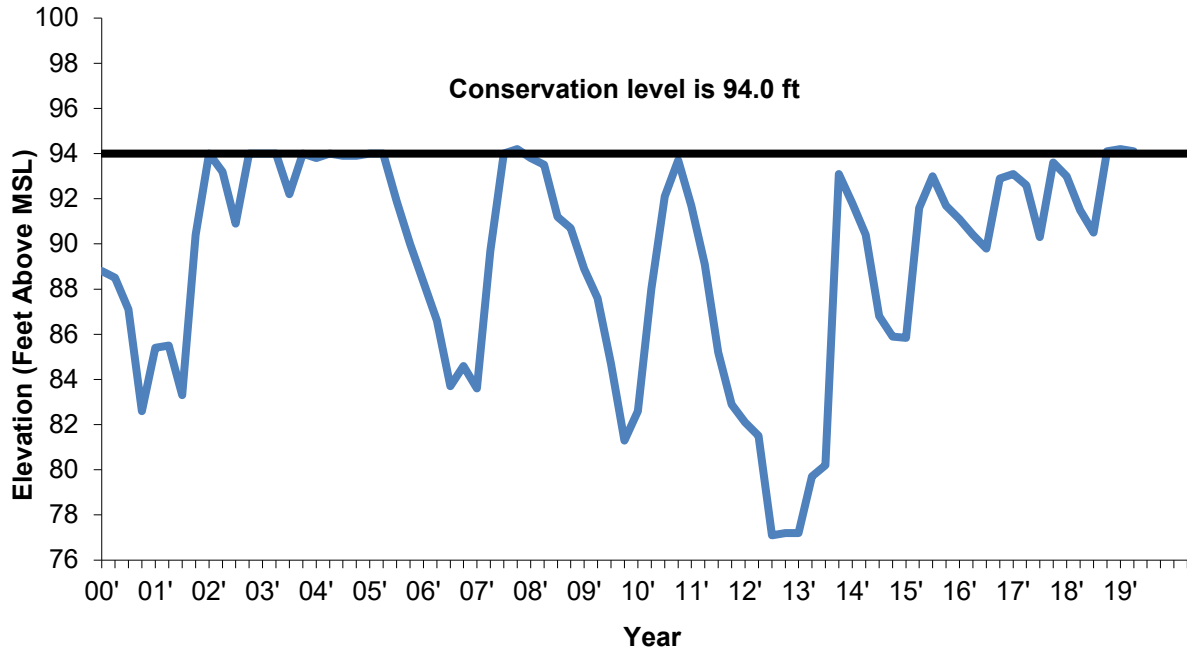
Figure 1. Quarterly mean water level elevations in feet above mean sea level (MSL) recorded for Lake Corpus Christi Reservoir, Texas, January 2000 through April 2019.

Table 1. Characteristics for Lake Corpus Christi Reservoir, Texas.

Characteristic	Description
Year constructed	1958
Controlling authority	City of Corpus Christi
Counties	San Patricio, Jim Wells, and Live Oak
Reservoir type	Mainstem
Shoreline Development Index	6.00
Conductivity	380 µS/cm

Table 2. Boat ramp characteristics for Lake Corpus Christi Reservoir, Texas, May, 2019. Reservoir elevation at time of survey was 94 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Lake Corpus Christi Reservoir State Park North	28.06737 -97.88061	Y	12	UNK	Excellent, no access issues
Lake Corpus Christi Reservoir State Park South	28.06307 -97.87989	Y	6	UNK	Excellent, no access issues
Sunrise Beach	28.05094 -97.87129	Y	6	UNK	Excellent, no access issues
Fiesta Marina	28.06428 -97.90706	Y	10	UNK	Excellent, no access issues
Weber's Landing	28.06811 -97.91354	Y	6	UNK	Excellent, no access issues
Mustang Hollow (KOA)	28.20161 -97.90257	Y	4	UNK	Excellent, no access issues

Table 3. Harvest regulations for Lake Corpus Christi Reservoir, Texas.

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

Table 4. Stocking history of Lake Corpus Christi Reservoir, Texas. UNK = unknown; FGL = fingerling; ADL = adults.

Species	Year	Number	Size
Channel Catfish	1972	10,000	UNK
	2014	257,364	FGL
	Total	267,364	
Striped Bass	1981	109,600	UNK
	1983	220,096	UNK
	1988	220,432	FGL
	1989	321,020	FRY
	1989	138,666	FGL
	1990	237,745	FGL
	Total	1,247,559	
Palmetto Bass	1979	88,456	UNK
	1980	219,991	UNK
	1981	85,170	UNK
	1986	220,358	FGL
	1991	220,900	FGL
	1992	319,700	FGL
	1993	166,324	FGL
	1994	533,172	FGL
	1995	330,400	FGL
	Total	2,184,471	
Florida Largemouth Bass	1980	247,909	FGL
	1998	422,269	FGL
	2002	483,220	FGL
	2008	463,176	FGL
	2009	456,349	FGL
	2014	460,205	FGL
	2015	205,500	FGL
	2017	213,230	FGL
	2018	203,036	FGL
	Total	3,154,914	
Walleye	1973	200,000	UNK
	Total	200,000	
Rainbow Trout *	1993	2,002	ADL
	1994	2,005	ADL
	1995	1,929	ADL
	1997	1,008	ADL
	1998	1,010	ADL
	2000	1,500	ADL
	2001	1,381	ADL
	2002	2,511	ADL
	2003	2,583	ADL
	2004	2,079	ADL

	2005	1,500	ADL
	2006	1,509	ADL
	2007	1,502	ADL
	2008	1,500	ADL
	2009	1,504	ADL
Table 4 (continued)			
Rainbow Trout*	2010	1,500	ADL
	2011	1,506	ADL
	2012	1,359	ADL
	2013	1,379	ADL
	2014	1,508	ADL
	2015	1,701	ADL
	2016	1,605	ADL
	2017	2,014	ADL
	2018	2,295	ADL
	2019	2,212	ADL
	Total	42,602	

*Stocked behind a block net for annual youth fishing event.

Table 5. Objective-based sampling plan components for Lake Corpus Christi Reservoir, Texas 2018–2019.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE–Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 14 inches	N = 13, 13.0 – 14.9 inches
	Condition	W_r	10 fish/inch group (max)
Bluegill [a]	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad [a]	Abundance	CPUE–Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50
Gill netting			
Blue Catfish	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N = 50
	Condition	W_r	10 fish/inch group (max)
Tandem hoop netting			
Channel Catfish	Abundance	CPUE	Evaluate exploratory use (increase CPUE and reduce RSE relative to gill netting)
	Size structure	PSD, length frequency	Evaluate exploratory use (increase size range and number of individuals collected)

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

Table 6. Survey of structural habitat types, Lake Corpus Christi Reservoir, Texas, 2006. Shoreline habitat type units are in miles.

Habitat type	Estimate	% of total
Boulder	0.3	0.3
Bulkhead	0.1	0.1
Concrete	0.5	0.4
Cutbank	9.5	8.8
Natural	85.0	78.6
Riprap	0.4	0.4
Rocky/gravel	12.3	11.4

Table 7. Survey of aquatic vegetation, Lake Corpus Christi Reservoir, Texas, 2010, 2014, and 2018. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2010	2014	2018
Native submersed	0.3 (< 0.01)	0.71 (< 0.01)	0.0 (0)
Native floating-leaved	9.5 (0.05)	0.0 (0)	0.0 (0)
Native emergent	114.3 (0.63)	0.0 (0)	2.4 (< 0.1)
Non-native			
Alligatorweed (Tier III)*	985.4 (5.40)	0.0 (0)	15.3 (< 0.1)
Water hyacinth (Tier II)*	1,066.9 (5.84)	0.0 (0)	45.8 (0.3)
Water lettuce (Tier III)*	134.1 (0.73)	0.0 (0)	23.9 (0.1)

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

Gizzard Shad

2014

Effort = 2.0
Total CPUE = 209.5 (21; 419)
IOV = 98 (1)

2016

Effort = 2.0
Total CPUE = 110.5 (35; 221)
IOV = 95 (2)

2018

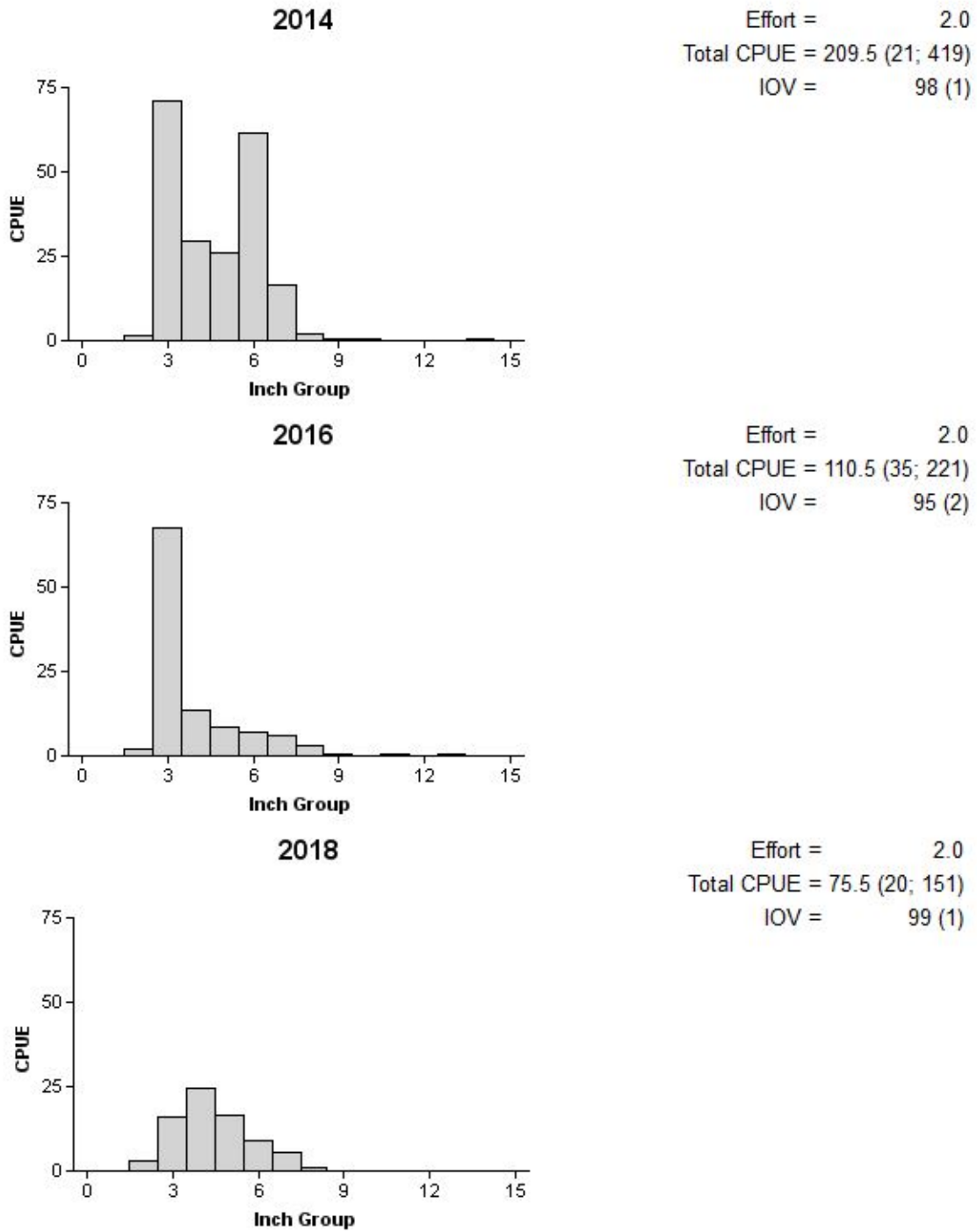Effort = 2.0
Total CPUE = 75.5 (20; 151)
IOV = 99 (1)

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, Lake Corpus Christi Reservoir, Texas, 2014, 2016, and 2018.

Bluegill

2014

Effort = 2.0
Total CPUE = 153.5 (27; 307)
PSD = 3 (1)

2016

Effort = 2.0
Total CPUE = 98.0 (13; 196)
PSD = 4 (1)

2018

Effort = 2.0
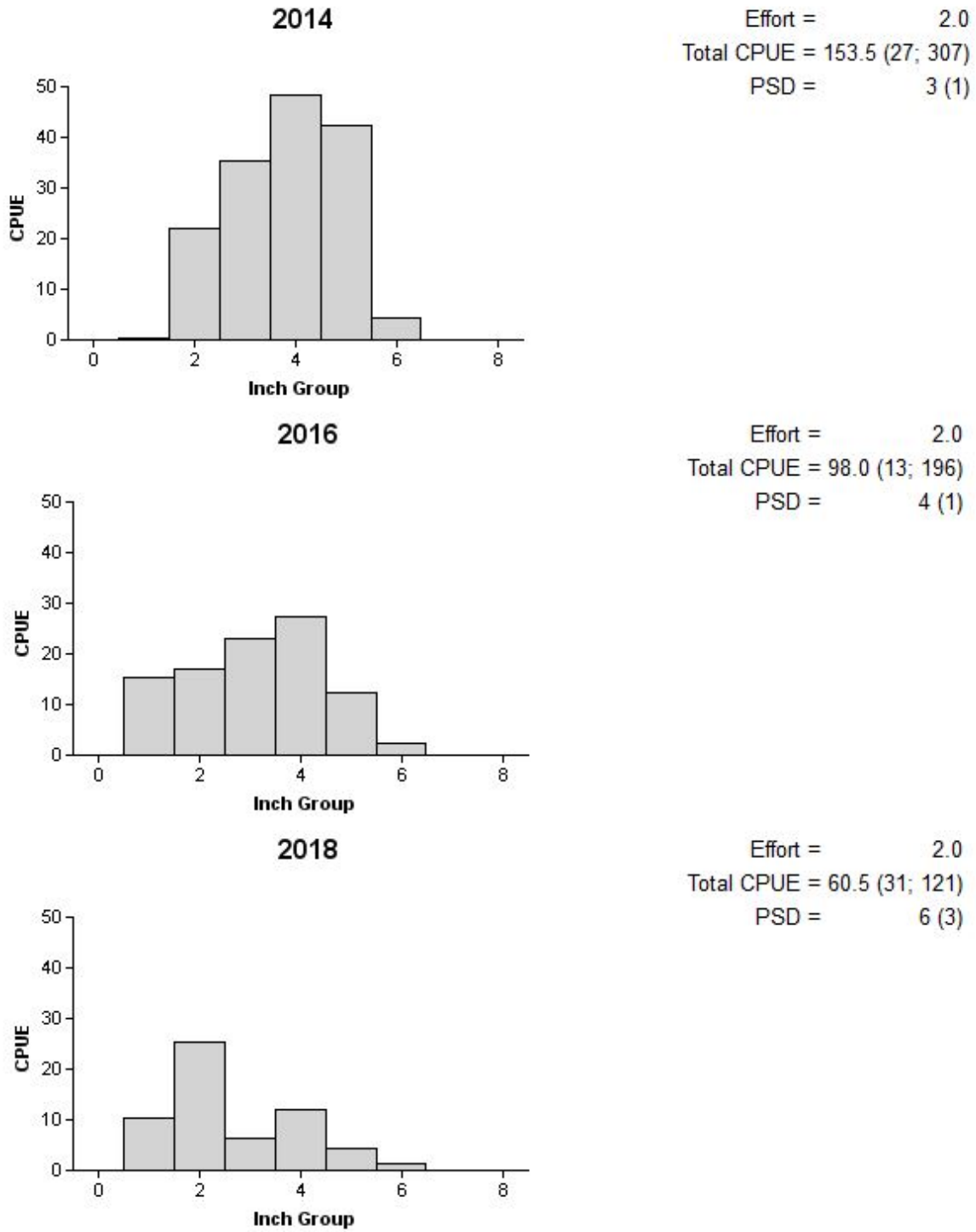Total CPUE = 60.5 (31; 121)
PSD = 6 (3)

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, Lake Corpus Christi Reservoir, Texas, 2014, 2016, and 2018.
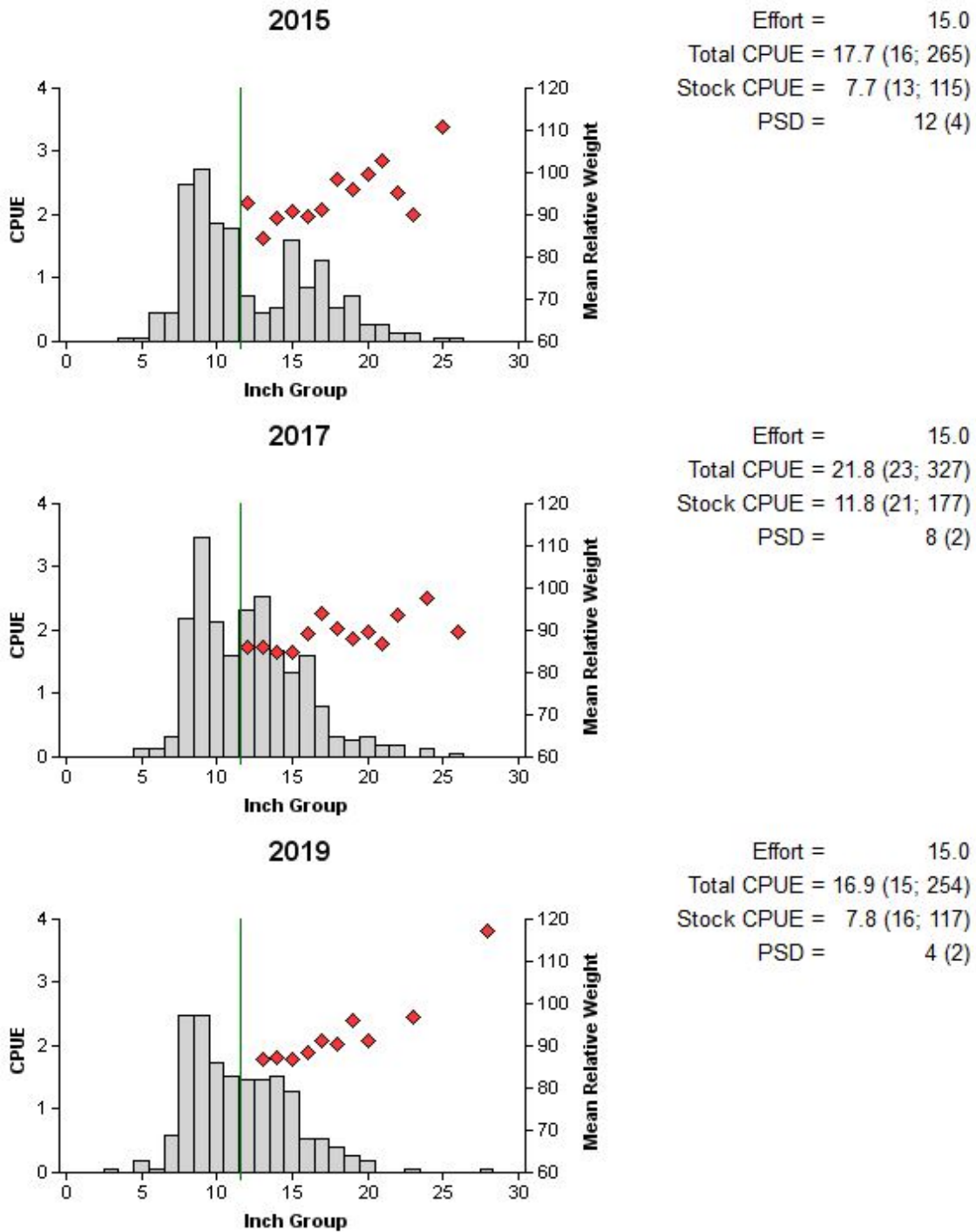
Blue Catfish

2015

Effort =   15.0
Total CPUE = 17.7 (16; 265)
Stock CPUE =   7.7 (13; 115)
PSD =   12 (4)

2017

Effort =   15.0
Total CPUE = 21.8 (23; 327)
Stock CPUE = 11.8 (21; 177)
PSD =   8 (2)

2019

Effort =   15.0
Total CPUE = 16.9 (15; 254)
Stock CPUE =   7.8 (16; 117)
PSD =   4 (2)

Figure 4. Number of Blue Catfish caught per net night (CPUE), mean relative weights (diamonds) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Corpus Christi Reservoir, Texas, 2015, 2017, and 2019. Vertical line denotes 12 inch minimum length limit.

Channel Catfish

2015

Effort = 15.0
Total CPUE = 1.1 (43; 17)
Stock CPUE = 0.5 (55; 7)
PSD = 0 (0)

2017

Effort = 15.0
Total CPUE = 1.7 (40; 25)
Stock CPUE = 0.5 (40; 8)
PSD = 0 (0)

2019

Effort = 15.0
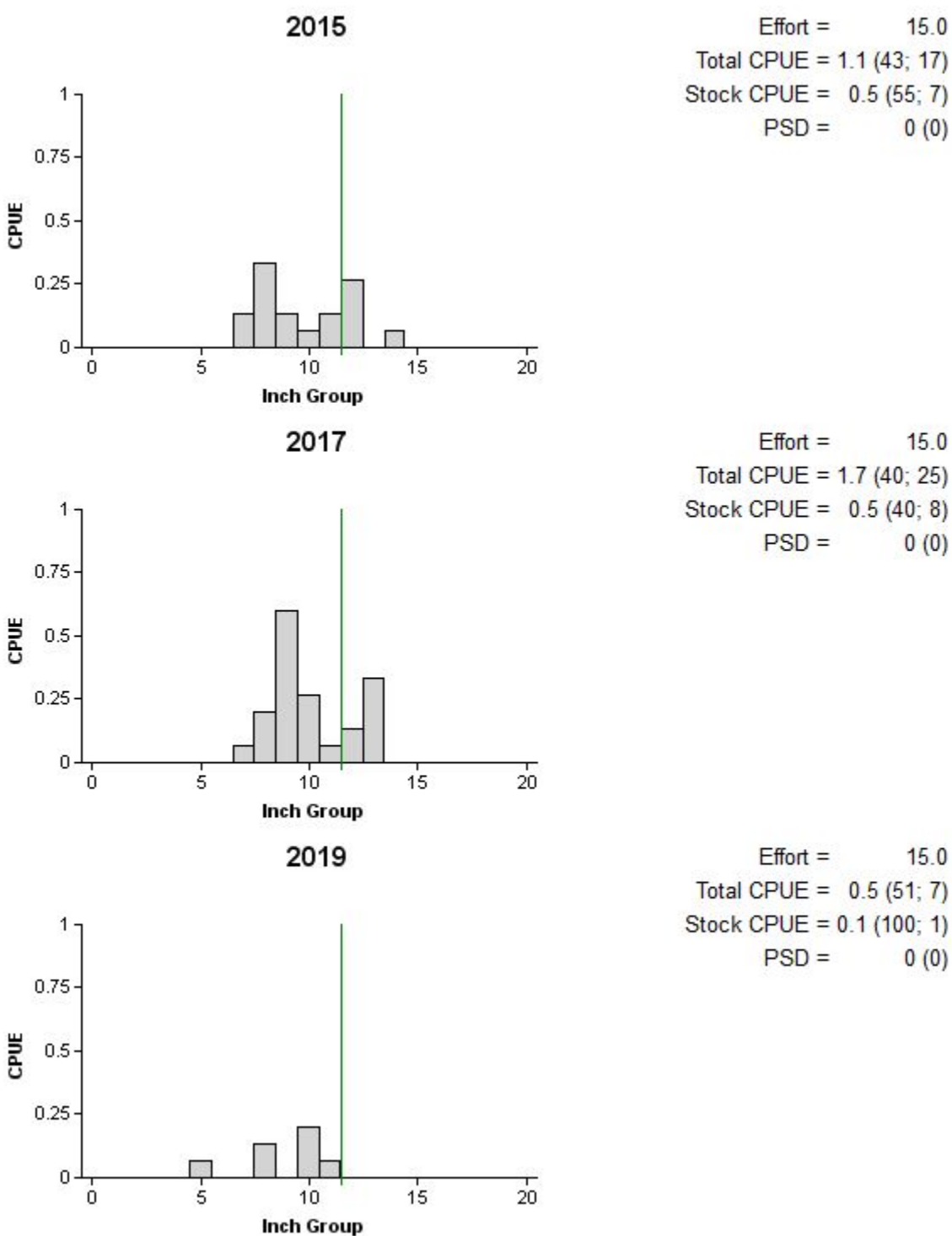Total CPUE = 0.5 (51; 7)
Stock CPUE = 0.1 (100; 1)
PSD = 0 (0)

Figure 5. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Corpus Christi Reservoir, Texas, 2015, 2017, and 2019. Vertical line denotes 12 inch minimum length limit.

2014

Effort = 16.0
Total CPUE = 6.6 (51; 105)
Stock CPUE = 3.5 (78; 56)
PSD = 2 (0)

2019

Effort = 5.0
Total CPUE = 0.2 (100; 1)
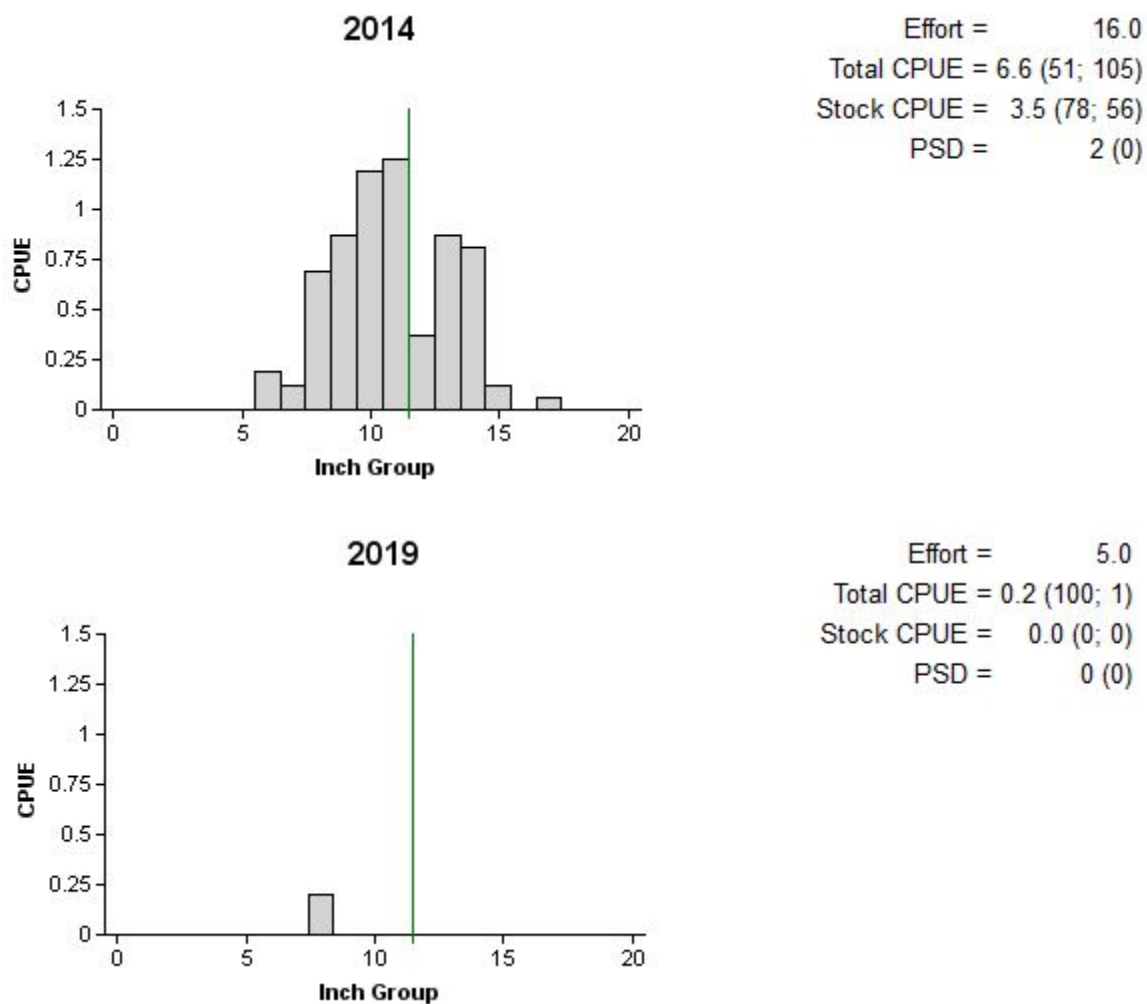Stock CPUE = 0.0 (0; 0)
PSD = 0 (0)

Figure 6. Number of Channel Catfish caught per tandem hoop net series (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure in parentheses) for summer tandem hoop net surveys, Lake Corpus Christi Reservoir, Texas, 2014 and 2019. Vertical line denotes 12 inch minimum length limit.

White Bass

2017

Effort = 2.6
Total CPUE = 93.5 (47; 240)
CPUE-10 = 40.5 (50; 104)
PSD = 96 (2)

2018

Effort = 1.0
Total CPUE = 71.0 (25; 71)
CPUE-10 = 69.0 (24; 69)
PSD = 99 (2)

2019

Effort = 1.3
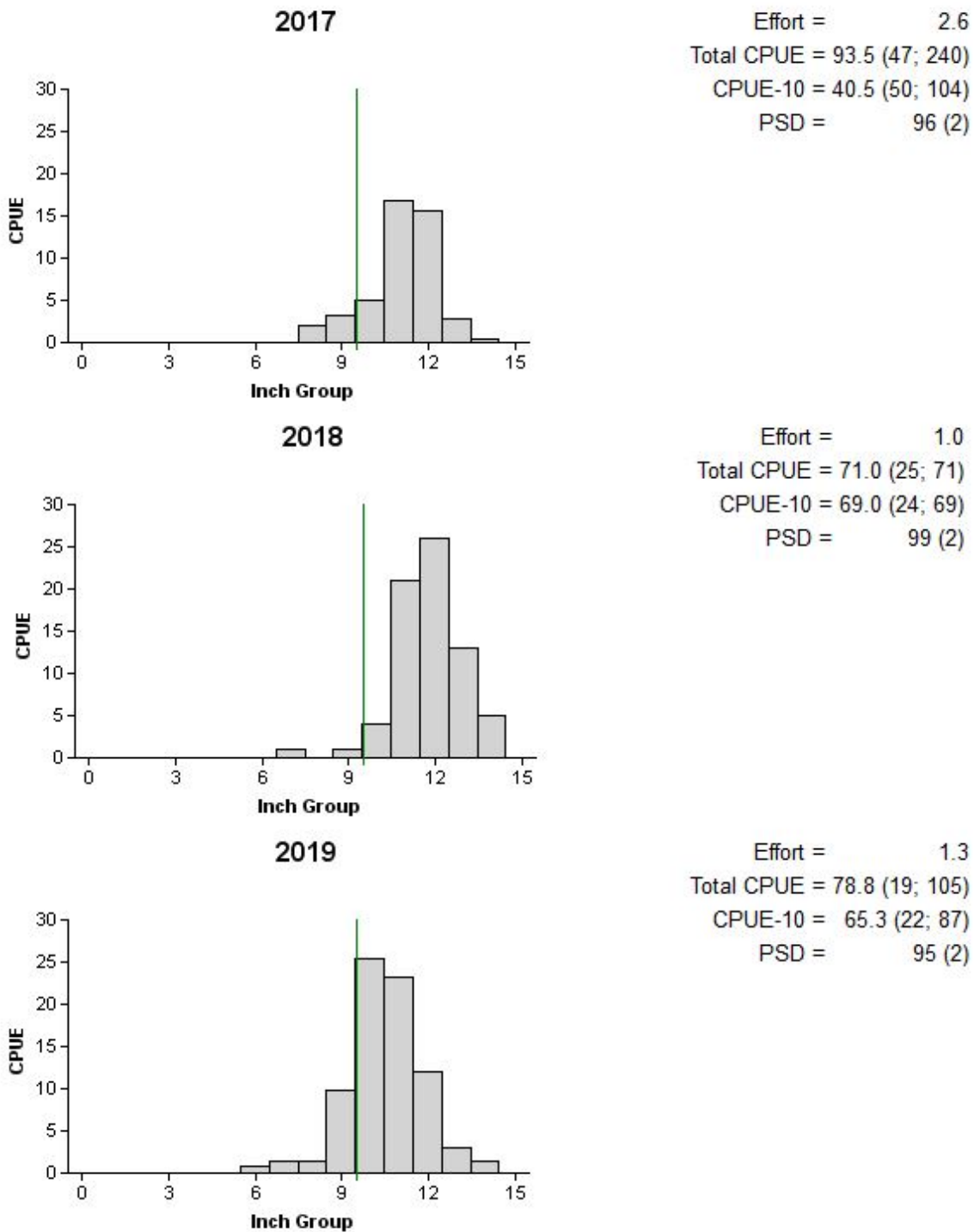Total CPUE = 78.8 (19; 105)
CPUE-10 = 65.3 (22; 87)
PSD = 95 (2)

Figure 7. Number of White Bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Nueces River (above Lake Corpus Christi Reservoir), Texas, 2017, 2018, and 2019. Vertical line denotes 10 inch minimum length limit.
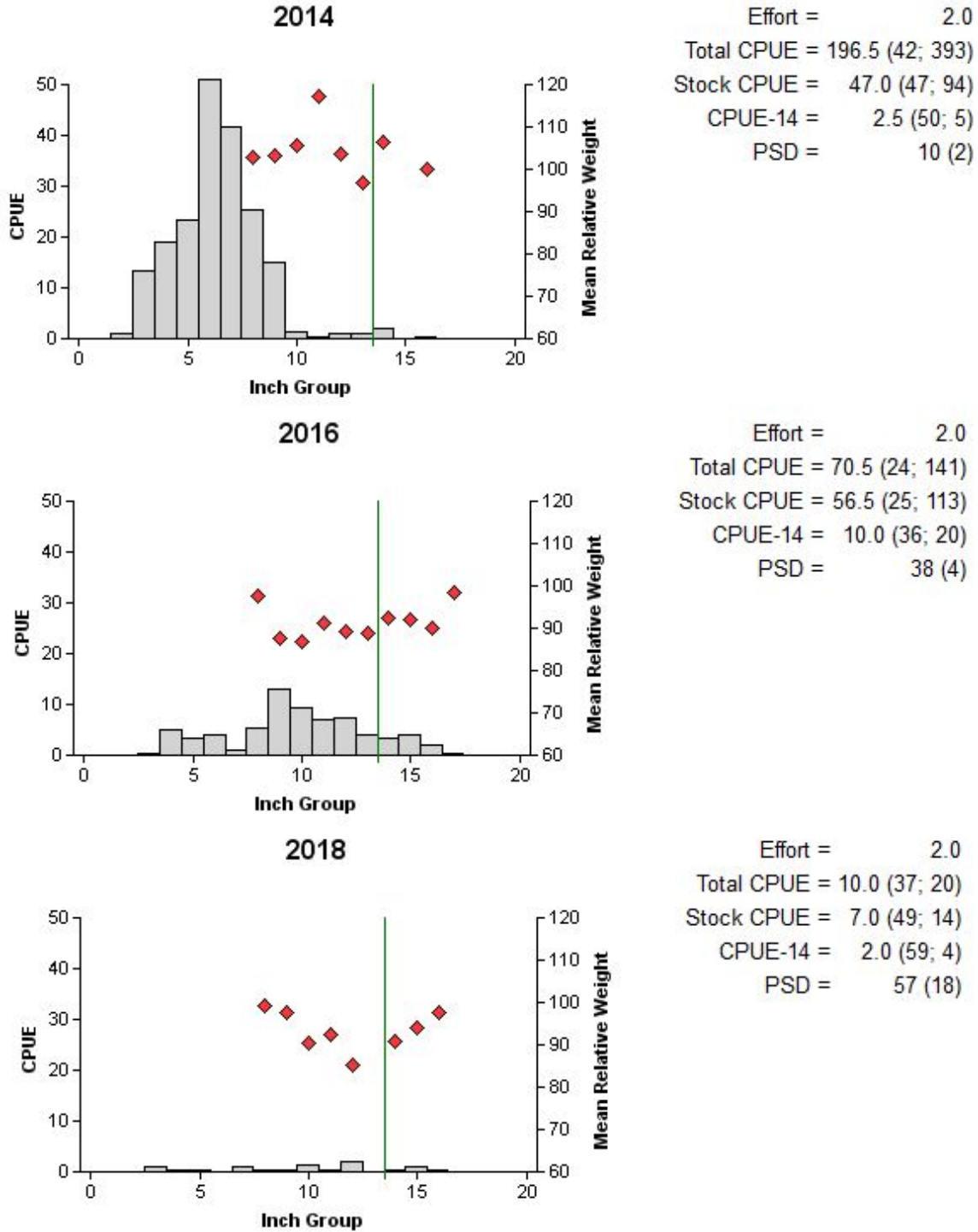
Largemouth Bass

2014

Effort = 2.0
Total CPUE = 196.5 (42; 393)
Stock CPUE = 47.0 (47; 94)
CPUE-14 = 2.5 (50; 5)
PSD = 10 (2)

2016

Effort = 2.0
Total CPUE = 70.5 (24; 141)
Stock CPUE = 56.5 (25; 113)
CPUE-14 = 10.0 (36; 20)
PSD = 38 (4)

2018

Effort = 2.0
Total CPUE = 10.0 (37; 20)
Stock CPUE = 7.0 (49; 14)
CPUE-14 = 2.0 (59; 4)
PSD = 57 (18)

Figure 8. 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, Lake Corpus Christi Reservoir, Texas, 2014, 2016, and 2018. Vertical line denotes 14 inch minimum length limit.

2019

Effort =   1.1
Total CPUE = 24.9 (27; 27)
Stock CPUE = 21.2 (34; 23)
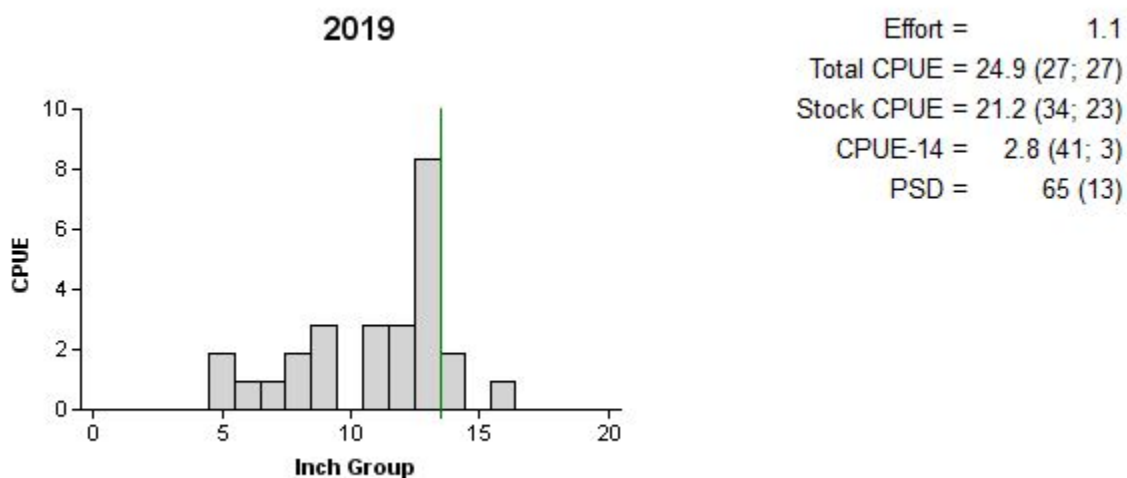CPUE-14 =   2.8 (41; 3)
PSD =   65 (13)

Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing survey, Lake Corpus Christi Reservoir, Texas, 2019. Vertical line denotes 14 inch minimum length limit.

Table 8. Mean age at legal-length (14 in) for Largemouth Bass collected by fall electrofishing, Lake Corpus Christi Reservoir, Texas. Standard deviations are in parenthesis.

Year	N	Age Range	Age-at-Length
2004	13	2 – 3	2.2 (0.38)
2010	15	1 – 3	2.7 (0.62)
2014	15	1 – 1	1.0 (0.00)
2016	14	1 – 2	1.8 (0.43)
2018	8	1 – 3	2.2 (0.71)

Proposed Sampling Schedule

Table 9. Proposed survey schedule for Lake Corpus Christi Reservoir, Texas. Survey period is June through May. Creel surveys are conducted over a 6 month period (1 January – 30 June) with a total of 24 creel days. Electrofishing surveys are conducted in the fall, bass-only electrofishing and gill netting surveys in the spring, while hoop net surveys are conducted in summer. Standard surveys are denoted by S and additional surveys denoted by A.

	Survey year			
	2019-2020	2020-2021	2021-2022	2022-2023
Angler Access				S
Vegetation	A	A	A	S
Electrofishing – Fall		A		S
Electrofishing – Spring	A	A		
Gill netting		A		S
Creel survey				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 species collected from all gear types from Lake Corpus Christi Reservoir, Texas, 2018-2019. Sampling effort was 15 net nights for gill netting, 5 hoop net series (2-day soak) for tandem hoop netting, 2 hour for fall electrofishing, and 1.3 hour for White Bass winter electrofishing (Nueces River).

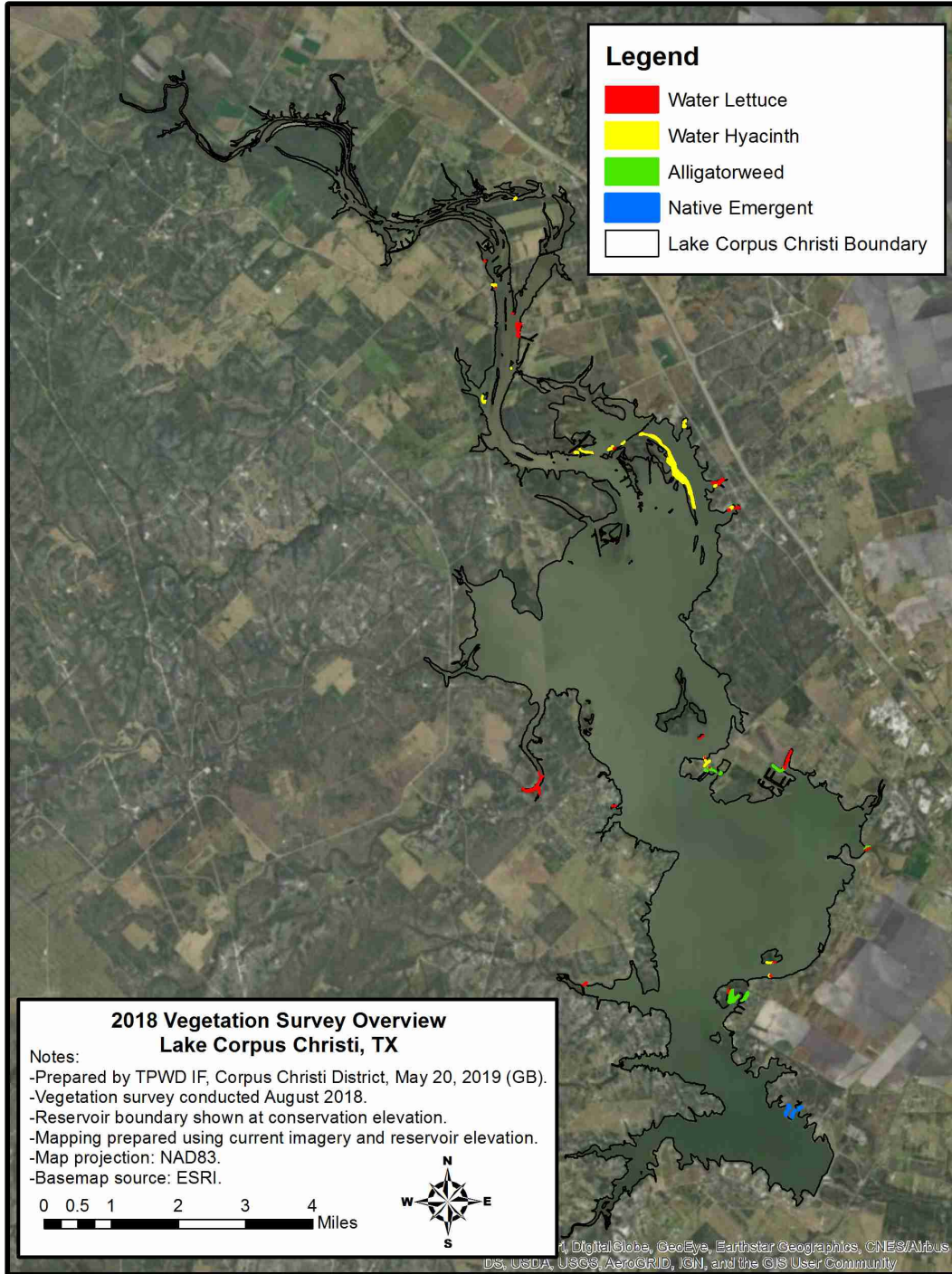| Species	Electrofishing		Gill Netting		Hoop Netting	
	N	CPUE	N	CPUE	N	CPUE
Spotted Gar			27	1.80 (22)		
Longnose Gar			7	0.47 (62)		
Alligator Gar			1	0.07 (100)		
Gizzard Shad	151	75.50 (20)	165	11.00 (13)		
Threadfin Shad	442	221.00 (39)	5			
Common Carp	1	0.50 (100)	5	0.33 (100)		
Bullhead Minnow	96	48.00 (36)				
Smallmouth Buffalo			215	14.33 (12)		
Blue Catfish			254	16.93 (15)	10	2.00 (87)
Channel Catfish			7	0.47 (51)	1	0.20 (100)
Flathead Catfish			2	0.13 (68)		
White Bass*	105	78.80 (19)	41	2.73 (58)		
Warmouth	5	2.50 (50)				
Bluegill	121	60.50 (31)	1	0.07 (100)		
Longear Sunfish	14	7.00 (45)				
Redear Sunfish	17	8.50 (57)				
Largemouth Bass	20	10.00 (37)	4	0.27 (44)		
White Crappie	15	7.50 (56)	7	0.47 (41)	5	1.00 (100)
Black Crappie	7	3.50 (60)	6	0.40 (68)		
Freshwater Drum	1	0.50 (100)	148	9.87 (11)	13	2.60 (52)
Rio Grande Cichlid	1	0.50 (100)				
Blue Tilapia	6	3.00 (36)				

*CPUE statistic from winter electrofishing (Nueces River)

APPENDIX B – Map of sampling locations
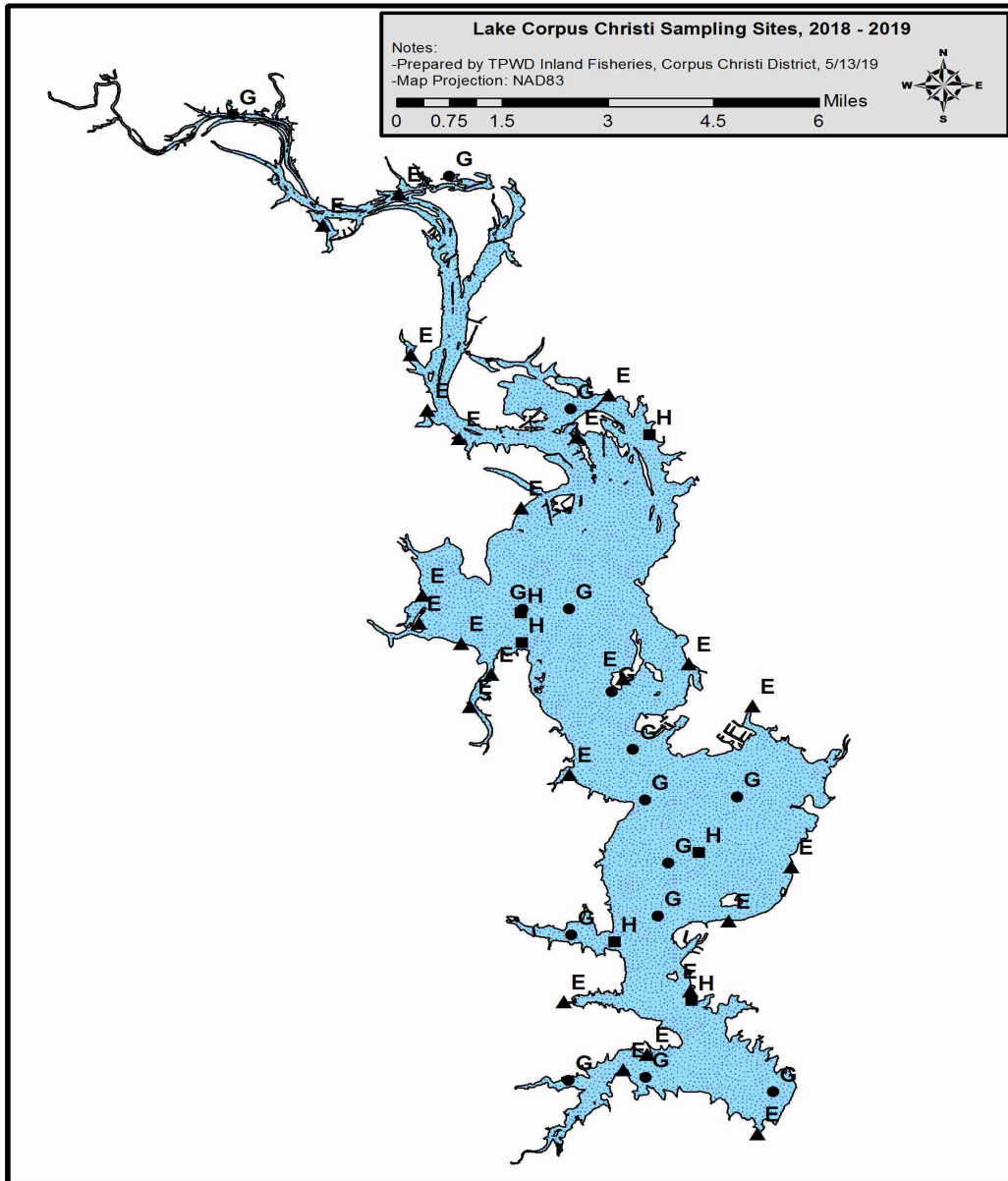
Location of sampling sites, Lake Corpus Christi Reservoir, Texas, 2018-2019. Hoop net, gill net, and electrofishing stations are indicated by H, G, and E, respectively. Water level was at conservation elevation at time of sampling.

APPENDIX C – Distribution map of aquatic vegetation, 2018

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