Lake Texana 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

Prepared by:

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

Inland Fisheries Division
Corpus Christi District, Mathis, Texas

Carter Smith
Executive Director

Craig Bonds
Director, Inland Fisheries

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Survey and Management Summary

Fish populations in Lake Texana Reservoir were surveyed in 2018 using electrofishing and in 2019 using gill netting and tandem hoop netting. Historical data are presented with the 2018-2019 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

Reservoir Description: Lake Texana Reservoir is a 9,727-acre reservoir, controlled by the Lavaca-Navidad River Authority (LNRA), located on the Navidad River in the Lavaca River Basin, approximately 20 miles east of Victoria, Texas. It receives water from the Navidad River, Sandy Creek, and Mustang Creek and is used for water supply and recreation. Water level typically fluctuates 2-4 feet annually but has fluctuated as much as 12 feet.

Management History: Important sport fish species include Blue and Channel catfish, White Bass, Largemouth Bass, and crappie. Management strategies from the 2014 management plan focused on promoting the fisheries and assisting LNRA with vegetation control, marking navigational channels, and informing the public about non-native species in the reservoir. Water hyacinth and giant salvinia herbicide applications have been conducted through hired contractors with treatments in 2016 (1,302 acres), 2017 (548 acres), and 2018 (345 acres). The Texas Parks and Wildlife Department (TPWD) assisted as consultants for vegetation control and provided cost share for herbicide treatments.

Fish Community

- **Prey species:** Threadfin Shad were abundant in the reservoir. Electrofishing catch of Gizzard Shad was the highest on record and the majority were available as prey to sport fish. Electrofishing catch of Bluegill was high and very few Bluegill were over 6-inches long.
- **Catfishes:** Blue, Channel and Flathead catfishes were present in the reservoir with Blue Catfish being the predominant species. Blue Catfish abundance and size structure was good and provided good angling opportunity. Channel Catfish were present in low abundance. Anecdotal reports from a local catfish tournament suggest some large Flathead Catfish are present in the reservoir.
- **White bass:** Gill net catches of White Bass were low over the survey period, but fish collected with electrofishing gear suggested availability in moderate abundance. Additionally, anglers reported White Bass were numerous during the annual spawning run into the Navidad River and Mustang Creek with fish often exceeding 12-inches in length.
- **Largemouth Bass:** Largemouth Bass abundance was lower than previous surveys. However, 2018 electrofishing catches were higher than the historical average catch rate. The population had a good balance of size classes. Largemouth Bass collected above stock-size were in good condition.
- **Crappies:** Both Black and White crappies were present in the reservoir and anecdotal angler reports suggest a popular fishery exists.

Management Strategies: Continue to manage fisheries under current regulations. Continue to work with the LNRA on invasive aquatic vegetation control and fabricate and install artificial habitat structures.

Introduction

This document is a summary of fisheries data collected from Lake Texana Reservoir in 2018-2019. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2018-2019 data for comparison.

Reservoir Description

Lake Texana Reservoir is a 9,727-acre reservoir used primarily for water supply and recreation. This reservoir is controlled by the Lavaca-Navidad River Authority (LNRA), located on the Navidad River in the Lavaca River Basin, approximately 20 miles east of Victoria. It receives water from the Navidad River, Sandy and Mustang creeks, and is used for water supply and recreation. Water level typically fluctuates 2-4 feet annually but has fluctuated as much as 12 feet (Figure 1). Substrate was composed primarily of clays, deep loams, and saline soils. Littoral habitat consisted of several native aquatic vegetation species (American pondweed, coontail, water stargrass, American lotus, cattail, and bulrush), non-native vegetation, and standing timber. Exotic aquatic vegetation species present included hydrilla, water hyacinth, giant salvinia, and alligatorweed. The lake is windswept and generally turbid throughout the year; however, clear water can be found in coves with dense stands of submersed vegetation. Other reservoir characteristics for Lake Texana Reservoir can be found in Table 1.

Angler Access

Lake Texana Reservoir has ten public ramps and no private boat ramps. Additional boat ramp characteristics are in Table 2. Shoreline access is excellent and available at all public boat ramp sites. Additionally, one fishing pier was available to shoreline anglers at Texana Park. Access for the physically challenged was adequate with ample shoreline access and the one fishing pier.

Management History

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

1. Continue to assist LNRA with the control of water hyacinth and giant salvinia on the reservoir.

   Action: District staff annually reviewed and provided comment on vegetation treatment proposals submitted for the chemical treatment of water hyacinth and giant salvinia. In addition, 11,939 salvinia weevils were released in 2016 to help limit nuisance vegetation growth.

2. District staff proposed to write and distribute press releases regarding the population increases of most regulated fishes of Lake Texana Reservoir.

   Action: Populations of Largemouth Bass and Blue Catfish have been low since this strategy was generated, therefore press releases distributed in 2019 focused on habitat enhancement rather than population increases.

3. Work with LNRA on the construction and implementation of artificial structure in Lake Texana Reservoir.

   Action: We assisted the construction and deployment of 24 Georgia structures within the lower half of Lake Texana Reservoir. We then published a georeferenced map for anglers identifying locations of these artificial structures and disseminated to media outlets.

4. Work closely with LNRA staff on educating the public about the non-native aquatic plant species found in Lake Texana Reservoir. These plants include hydrilla, water hyacinth, alligatorweed, and giant salvinia.

    Action: District staff continued to provide LNRA staff with signs to post at boat ramps and provided LNRA staff with electronic copies of brochures to be printed and posted at local bait stores and gas stations.

Harvest regulation history: Sport fish in Lake Texana Reservoir are currently managed with statewide regulations (Table 3).

Stocking history: Florida Largemouth Bass were stocked in Lake Texana Reservoir in 2016. A complete stocking history is in Table 4.

Vegetation/habitat management history: Water hyacinth and giant salvinia are problematic species and can be found throughout the reservoir. Both water hyacinth and giant salvinia are treated annually with herbicides. LNRA hired contractors and sprayed in 2016 (1,302 acres), 2017 (548 acres), and 2018 (345 acres). Several hundred salvinia weevils were released by TPWD between 2002 and 2005 as part of a cooperative research project with the United States Department of Agriculture. An additional 11,939 weevils were released by TPWD in 2016. Hydrilla and several native aquatic vegetation species have continued to expand in the reservoir as a result of vegetation control efforts on water hyacinth and giant salvinia. Historically, hydrilla has been present in the reservoir but was only problematic shortly after the reservoir filled. At that time grass carp were released in the reservoir for hydrilla control. Additionally, approximately 700,000 hydrilla flies were released by TPWD in 2005 to control hydrilla around the Navidad River boat ramp.

Water transfer: Currently, there are two permanent pumping stations on the reservoir that transfer water to other locations. Both stations are operated by the LNRA. One pumping station provides water to the local municipal and industrial water users and the other pumping station provides water to the city of Corpus Christi via the Mary Rhodes Pipeline. Annual inter-basin transfer of 41,840 acre-feet water occurs through the Mary Rhodes Pipeline to O.N. Stevens water treatment plant in Corpus Christi. The city of Corpus Christi may make two additional requests for water, the first for 4,500 acre-feet and the second for 7,500 acre-feet. These additional requests will only be granted if several criteria are met including the city of Corpus Christi having storage capacity for the water and Lake Texana Reservoir is at or above 43 feet above mean sea level (one foot below conservation pool).

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Lake Texana Reservoir (Findeisen and Binion 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 electrofishing (1.5 hour at 18, 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 13 randomly-selected fish (range 13.0 to 14.9 inches).

Gill netting – Catfishes and White Bass were collected by gill netting (10 net nights at 10 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Tandem hoop nets – 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 – A structural habitat survey was conducted in 2006. Vegetation surveys were conducted in 2010–2018 to monitor abundance and distribution of both native and non-native aquatic vegetation. Habitat was assessed with the digital shapefile method in 2018 (TPWD, Inland Fisheries Division, unpublished manual revised 2017). All vegetation control activities were conducted by LNRA in coordination with TPWD.

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

Results and Discussion

Habitat: Shoreline habitat consisted of natural shoreline, concrete, cut bank, and gravel (Table 6). Standing timber comprised 795.0 acres, roughly 8.2% of reservoir surface area. Native vegetation covered 1.3% of the reservoir's surface area compared to 7.4% coverage by non-native vegetation (Table 7). Native vegetation has decreased since 2014 (9.7%) whereas, non-native coverage (34.4%) has increased.

Prey species: Electrofishing catch rates of Gizzard Shad and Bluegill were 223.3/h and 106.0/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad was high, indicating that 95% of Gizzard Shad were available to existing predators; this has been similar to IOV estimates in previous years (Figure 2). Total CPUE of Gizzard Shad was similar to that of 2014 and higher than what was reported in the 2010 survey (Figure 2). Threadfin Shad numbers were similar to Gizzard Shad in 2018 and provided additional prey to predator species (Figure 3). Total CPUE of Bluegill in 2018 was higher than total CPUE from the 2014 survey but lower than the historical high of 142.0/h reported in 2010. Size structure of Bluegill continued to be dominated by small individuals (Figure 4).

Blue Catfish: The gill net catch rate of Blue Catfish has trended down through time and was 8.7/nn in 2019, slightly lower than the historical average of 11.0/nn. Stock-sized Blue Catfish relative abundance remained high (46%) but was down slightly from the 2015 survey (59%; Figure 5).

Channel Catfish: No Channel Catfish were collected in the 2019 gill net survey. Historically, gill net CPUEs of Channel Catfish have been near or below 1.0/nn (Figure 6). The 2019 hoop net CPUE was

0.8/nn (Figure 7). The historically low abundance using gill nets and low catches in hoop nets are indicative of a low-density Channel Catfish population.

White Bass: The 2019 gill net CPUE for White Bass was low (0.1/nn); similar to what was caught in 2015 and substantially reduced from 2011 (7.5/nn) (Figure 8). However, White Bass catches from the 2018 electrofishing sample indicated moderate abundance (46.0/h; Appendix A). An alternative sampling strategy will be explored with winter electrofishing in the river and creek arms during the annual spawning run. Historically, White Bass grow fast and reach legal size (>10-inches) by age 1 (Findeisen and Binion 2011).

Largemouth Bass: The 2018 electrofishing CPUE for Largemouth Bass was 17.3/h, lower than 2014 (52.7/h) and 2010 (40.0/h) (Figure 9). Even though 2018 catches appear low, they are similar to the historic average (19.9/h) since 1987. Mean relative weights for Largemouth Bass were excellent; averaging ≥ 100 for all length classes, indicating forage was readily available. The 2018 CPUE of legal-size Largemouth Bass (CPUE-14; 6.7/h) was lower than in 2014 (9.3/h) but higher than 2010 (3.3/h). Insufficient numbers of Largemouth Bass of the appropriate size class (i.e., 13 – 14.9 inches) were collected in 2018 preventing age and growth analysis. The PSD values in 2014 (64), and 2018 (59) indicated a balanced population. Florida Largemouth Bass influence has remained relatively constant (Findeisen and Binion 2015). Genetic analyses from Lake Texana Reservoir has shown in a previous report that alleles have ranged from 57 to 63% and Florida genotype has ranged from 3 to 17.9%, data most recently evaluated in 2014 (Table 8).

Fisheries Management Plan for Lake Texana Reservoir, Texas

Prepared – July 2019

ISSUE 1: Water hyacinth and giant salvinia continue to create access problems on Lake Texana Reservoir and prohibit the colonization and growth of more desirable submersed aquatic vegetation. LNRA has conducted herbicide treatments on the reservoir resulting in the colonization and growth of submersed aquatic vegetation in a few areas.

MANAGEMENT STRATEGIES

1. Continue to provide support for LNRA on control of water hyacinth and giant salvinia.
2. Monitor hydrilla for expansion and colonization in new areas which could limit recreational use.

ISSUE 2: White Bass abundance data has been low during the previous two sampling gill net surveys. Gill net sampling may be ineffective at sampling this species since they migrate to spawn during the winter season. Electroshocking in rivers during White Bass spawns has been an effective means in locating and determining population abundance in other locations.

MANAGEMENT STRATEGY

1. Survey the Navidad River and Mustang Creek in the winter season with electrofishing to evaluate its utility to determine and track White Bass population trends.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

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.

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

Sport fish, forage fish, and other important fishes

Sport fish in Lake Texana Reservoir include Blue, Channel, and Flathead Catfish, White Bass, Largemouth Bass, and crappie. Important forage species include Gizzard and Threadfin Shad, and Bluegill (Table 9).

Low Density or Underutilized Fisheries

Channel Catfish: Channel Catfish are present in Lake Texana Reservoir, but abundance has remained low. Since 1987, the mean gill net CPUE was 0.4/nn. An exploratory baited tandem hoop net survey was attempted in spring of 2019 and yielded a catch rate of 0.8 fish per net series with a high SE (100). Previously, Channel Catfish have been surveyed using gill nets, however catches were too low to make any conclusions regarding the trend data on CPUE, size structure, and body condition. Due to low catches with gill netting and hoop netting, we will proceed with presence/absence data collections in future standard gill net samples. Based on historically low catches with gill netting and our exploratory hoop netting the population does not justify expending additional sampling effort.

Flathead Catfish: Flathead Catfish are present in the reservoir in low abundance. Since 1987, the mean CPUE is 0.2/nn (N = 12; standard deviation = 0.17; range: 0.0/nn – 0.6/nn). Due to low catches, the population does not warrant expending additional sampling effort.

Survey objectives, fisheries metrics, and sampling objectives

Blue Catfish: Blue Catfish are the dominant catfish species in the reservoir and are in good numbers. Annual gill net total CPUE since 1987 has averaged 10.8/nn (N = 12; standard deviation = 5.9; range: 2.7 – 23.1/nn) and mean stock size CPUE is 4.8/nn (N = 12; standard deviation = 2.4; range: 1.7 – 8.1/nn). Further, the reservoir typically produces good numbers of quality-size (≥ 20 in) fish available to anglers. Trend data on CPUE, size structure, and body condition were collected at least biennially from 1993 – 2003 and every four years since with spring gill netting. The population has decreased in recent surveys similar to Largemouth Bass, however anecdotal reports of the fishery suggests the population is doing well. Collection of trend data with spring gill netting every four years will allow for determination of large-scale changes in population dynamics that may warrant further investigation and more intensive sampling. A minimum of 10 randomly-selected gill net sites will be sampled in 2019. Additional sampling will be conducted in sets of five gill nets at random sites until 50 stock-size fish are collected and the RSE of CPUE-S is ≤ 25.

Largemouth Bass: Historically, relative abundance of Largemouth Bass has been low, however they have been present in the reservoir in moderate abundance in recent years. The mean historical total CPUE for Largemouth Bass is 19.9/h (N = 10; standard deviation = 16.2; range: 2.0 – 52.7/h) and mean stock-size CPUE is 10.4/h (N = 10; standard deviation = 7.9; range: 0.5 – 29.3/h). Largemouth Bass have always been managed with the statewide 14-inch minimum length limit and 5 fish daily bag. Trend data on CPUE, size structure, and body condition has been collected at a minimum every four years since 1993 with fall electrofishing with the last survey occurring in 2018. The 2018 catch rate (17.3/h) has dropped since the last two surveys (40.0/h in 2010 and 52.7/h in 2014). However, the total CPUE for Largemouth Bass in Lake Texana Reservoir is highly variable and the 2018 survey is more representative of the mean historical average. Collection of trend data with fall electrofishing every four years will allow for determination of large-scale changes in population dynamics that may warrant further investigation and more intensive sampling. A minimum of 18 randomly selected electrofishing sites will be sampled in 2022.

Crappies: White and Black Crappie were not surveyed in the 2018 fall sampling season. Collection of trend data with fall trap netting every four years will allow for determination of large-scale changes in population dynamics that may warrant further investigation and more intensive sampling. A minimum of 10 randomly-selected sites will be sampled in fall of 2019. Additional sampling will be conducted in sets of five trap nets at random sites until 50 stock-size fish are collected. Achieving a reasonable RSE (<25) will likely be unattainable with practical sampling effort. Therefore, only large changes in relative abundance can be documented with CPUE.

White Bass: White Bass are present in the reservoir, but relative abundance estimates are variable from sample to sample and typically are low which may be dependent on sampling sites, timing, or sampling gear. The mean historical catch rate for White Bass is 1.6/nn (N = 12; standard deviation = 2.3; range = 0.1 – 7.5/nn). Anecdotal information suggests a popular harvest-oriented White Bass fishery does exist at the reservoir. White Bass will continue to be sampled with spring gill nets to monitor presence/absence according to objectives described for Blue Catfish. We also intend to conduct an electrofishing survey to correspond with the White Bass spawning migration in the winter of 2020; survey areas will include both the Navidad River and Mustang Creek. Sex determination will also be determined for each fish collected to achieve sex ratio. This information would be important for White Bass fishermen and helping to determine population estimates and sex ratios information.

Shad and Bluegill: Gizzard and Threadfin Shad and Bluegill are the primary forage at Lake Texana Reservoir. Trend data on CPUE and size structure of Gizzard Shad and Bluegill has been collected at a minimum every four years since 1987 with fall electrofishing. Sampling effort based on 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 18 randomly selected 5- minute stations with 90% confidence) and relative abundance estimates (Bluegill CPUE-Total; RSE < 25, anticipated effort is 18 stations based on historical data). The RSE ≤ 25 objective will only be set for Bluegill as Gizzard Shad CPUE-Total RSE's fluctuate substantially from year to year and sampling has achieved RSE ≤ 25 only once in 9 samples.

Habitat: Historically, invasive plants (hydrilla, water hyacinth, giant salvinia) have been present in the reservoir. Most of these exotic plants are in the upper reaches of the reservoir (i.e. Navidad River, Sandy Creek and Mustang Creek). Water hyacinth potentially poses the most threat to angler and boater access and enhances other ecologically detrimental processes (e.g., degraded water quality, competition with desirable native vegetative species, or water loss through evapotranspiration). Periodic aquatic vegetation monitoring is necessary to identify potential threats to boating and angling access so that rapid response or control efforts can be. The next vegetation survey will occur in 2022 and all aquatic vegetation will be georeferenced.

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Tables and Figures

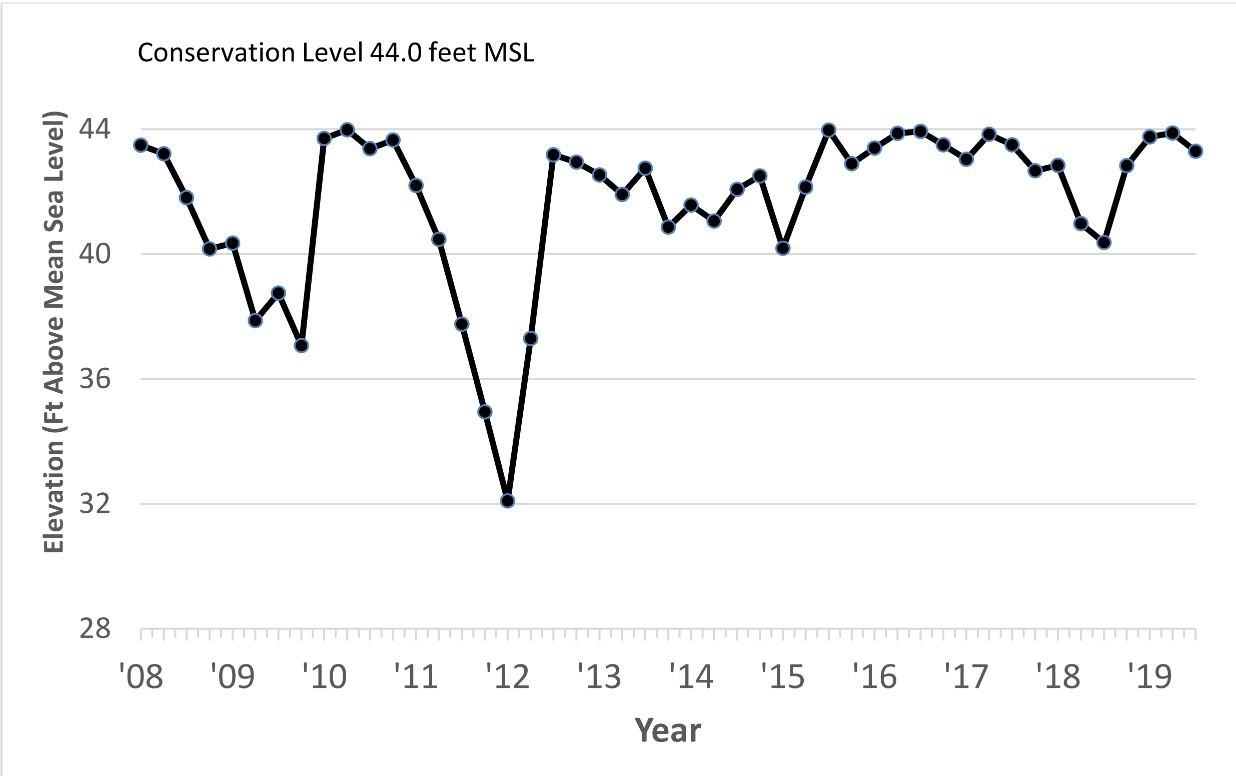


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Texana Reservoir, Texas.

Table 1. Characteristics of Lake Texana Reservoir, Texas.

Characteristic	Description
Year constructed	1980
Controlling authority	Lavaca-Navidad River Authority
County	Jackson
Reservoir type	Mainstem
Shoreline Development Index	8.0
Conductivity	180-300 umhos/cm

Table 2. Boat ramp characteristics for Lake Texana Reservoir, Texas, August 2018. Reservoir elevation at time of survey was 42 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Navidad River	29.021898 -96.569787	Y	20	30.0	Excellent, no access issues
Sandy Creek	29.025246 -96.549257	Y	20	34.0	Excellent, no access issues
Highway 1157	29.043054 -96.468154	Y	10	37.0	Excellent, no access issues
Mustang Creek	29.025507 -96.506774	Y	20	30.0	Excellent, no access issues
Mustang Wilderness	28.999084 -96.529738	Y	20	27.0	Excellent, no access issues
County Rd 237	28.973117 -96.523905	Y	10	35.0	Excellent, no access issues
Texana Park	28.956662 -96.539403	Y	20	32.0	Excellent, no access issues
Highway 111	28.951105 -96.517503	Y	20	33.5	Excellent, no access issues
Brackenridge Park	28.936576 -96.543630	Y	20	31.0	Excellent, no access issues
Simons Rd.	28.914002 -96.568454	Y	20	28.5	Excellent, no access issues

Table 3. Harvest regulations for Lake Texana 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
Gar, Alligator	1	No minimum length
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 Texana Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults.

Year	Number	Size
	Threadfin Shad	
1980	7,900	UNK
	Rainbow Trout	
1993	2,009	ADL
Species Total	2,009	
	Blue Catfish	
1994	300	ADL
	Channel Catfish	
1980	285,646	UNK
1994	500	ADL
2012	106,229	FGL
Species total	392,375	
	Striped Bass	
1981	1,981,000	UNK
1982	1,365,507	UNK
1983	375,000	UNK
1984	1,189,600	FRY
1987	60,050	FGL
1988	700,000	FRY
1989	618,237	FRY
Species total	6,289,394	
	Palmetto Bass	
1996	82,500	FGL
1997	165,081	FGL
1998	165,500	FGL
1999	82,789	FGL
Species total	495,870	

Year	Number	Size
	Florida Largemouth Bass	
1979	5,000	FGL
1980	102,629	FGL
1981	553,678	FGL
1994	245,783	FGL
2006	489,326	FGL
2007	486,494	FGL
2013	485,671	FGL
2014	503,667	FGL
2016	50,641	FGL
Species total	2,922,889	
	Triploid Grass Carp	
1989	15,294	ADL
1990	96	ADL
1991	26	ADL
Species Total	15,416	

Table 5. Objective-based sampling plan components for Lake Texana 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 stock
	Condition	W_r	10 fish/inch group (max)
Tandem hoop netting			
Channel Catfish	Abundance	CPUE–stock	RSE-Stock ≤ 25
	Size structure		N ≥ 50 stock

[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 Texana Reservoir, Texas, 2006. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Boat dock	0.3	0.2
Boulder	<0.1	<0.1
Bulkhead	0.6	0.4
Concrete	2.8	1.8
Natural	148.1	95.0
Rip rap	2.5	1.6
Rocky/gravel	1.9	1.2
Standing timber	795.0	8.2

Table 7. Survey of aquatic vegetation, Lake Texana Reservoir, Texas, 2006–2018. Surface area (acres) is listed with percent of total reservoir surface area in parentheses

Vegetation	2006	2010	2014	2018
Native submersed	57.8 (0.6)	203.3 (2.1)	762.6 (7.8)	92.4 (0.9)
Native floating-leaved	76.6 (0.8)	252.2 (2.6)	185.3 (1.9)	13.1 (0.1)
Native emergent	None	None	None	16.2 (0.2)
Flooded terrestrial vegetation	219.3 (2.3)	None	None	None
Non-native				
Alligatorweed (Tier III) *		394.1 (4.1)	48.3 (0.5)	95.9 (1.0)
Giant salvinia (Tier II) *	768.9 (7.9)	160.9 (1.7)	818.8 (8.4)	10.2 (0.1)
Hydrilla (Tier III) *	609.6 (6.3)	607.3 (6.2)	973.8 (10.0)	231.9 (2.4)
Water hyacinth (Tier II) *	928.9 (9.5)	1169.0 (12.0)	1510.9 (15.5)	380.8 (3.9)

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

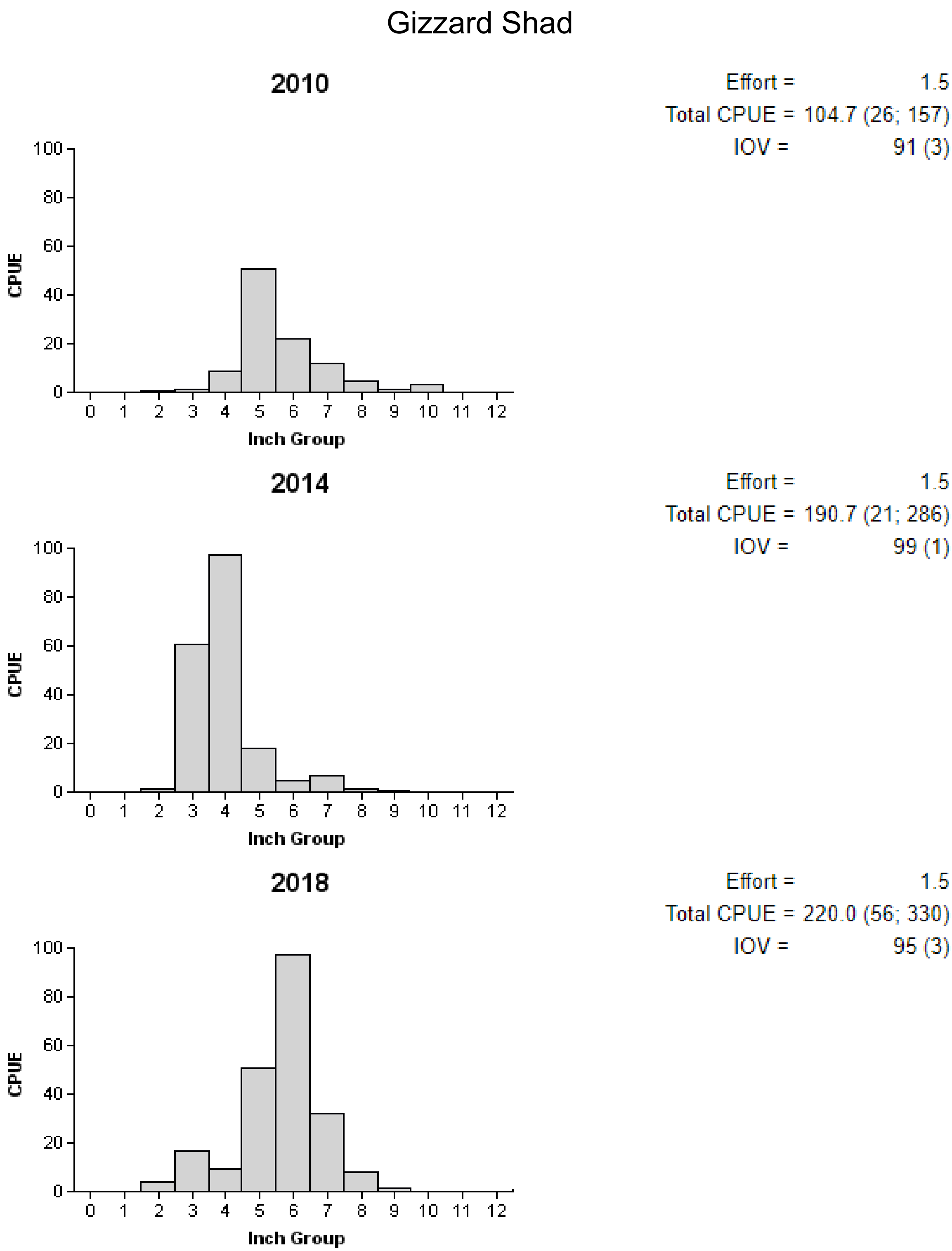


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Texana Reservoir, Texas, 2010, 2014, and 2018.

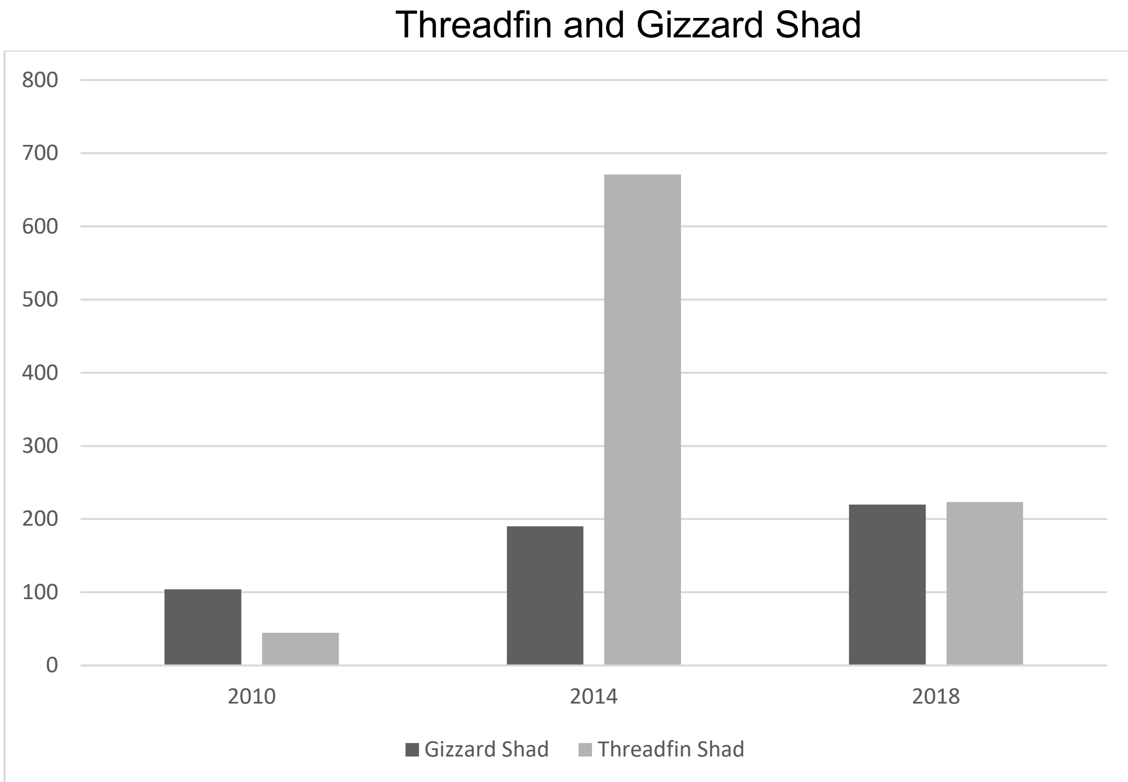
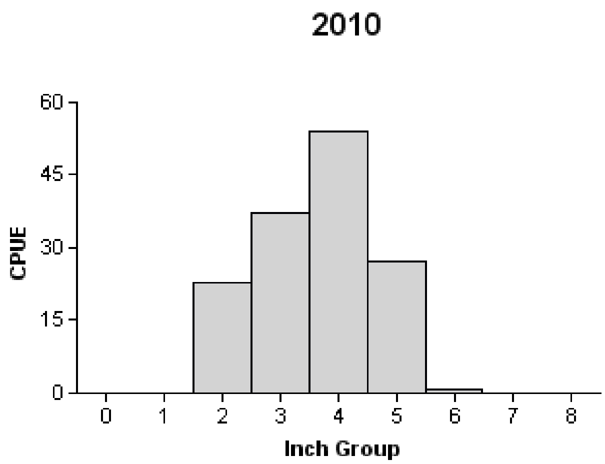
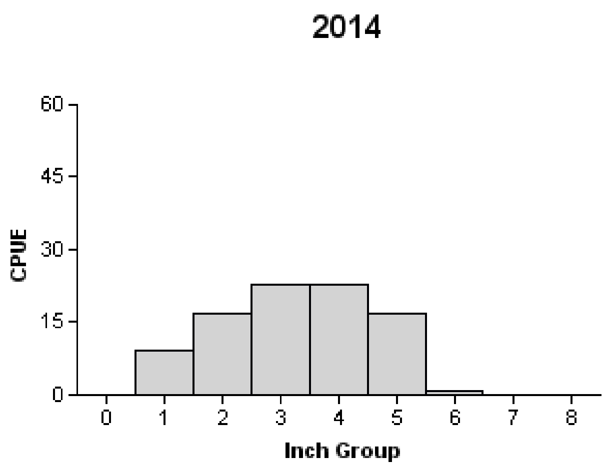


Figure 3. Comparison of total catch per unit effort for Gizzard and Threadfin Shad for fall electrofishing surveys, Lake Texana Reservoir, Texas, 2010, 2014, and 2018. Sampling effort was 18, 5-minute stations for each sampling year reported.

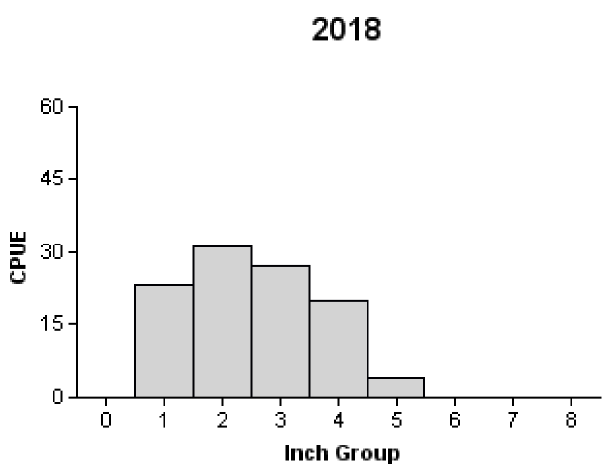
Bluegill



Effort = 1.5
Total CPUE = 142.0 (31; 213)
PSD = 1 (1)



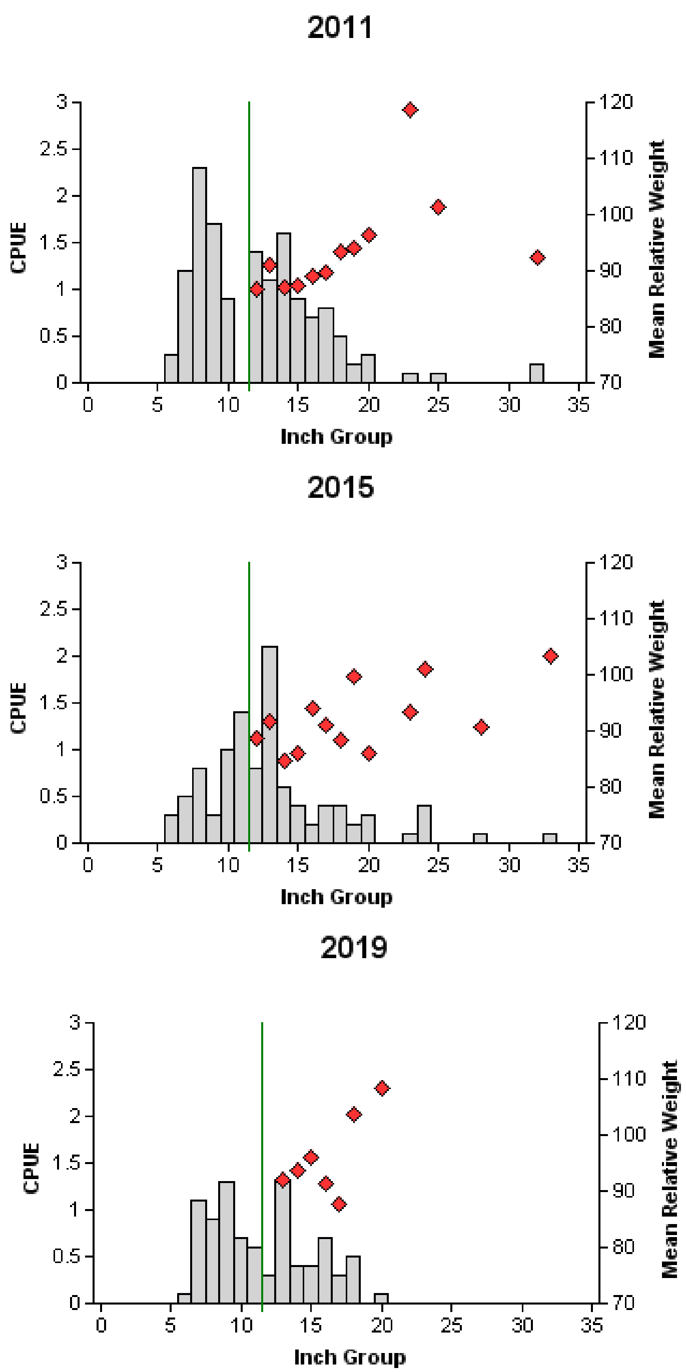
Effort = 1.5
Total CPUE = 88.7 (23; 133)
PSD = 1 (1)



Effort = 1.5
Total CPUE = 106.0 (25; 159)
PSD = 0 (0)

Figure 4. 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 Texana Reservoir, Texas, 2010, 2014, and 2018.

Blue Catfish



2011

Effort =	10.0
Total CPUE =	14.3 (26; 143)
Stock CPUE =	7.9 (20; 79)
CPUE-20 =	0.7 (48; 7)
PSD =	9 (5)

2015

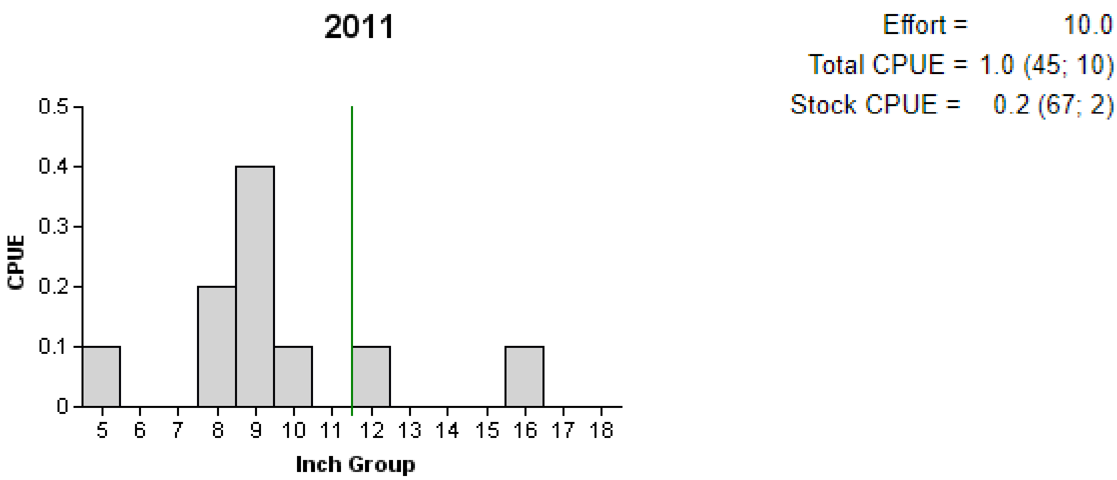
Effort =	10.0
Total CPUE =	10.4 (26; 104)
Stock CPUE =	6.1 (26; 61)
CPUE-20 =	1.0 (33; 10)
PSD =	16 (4)

2019

Effort =	10.0
Total CPUE =	8.7 (24; 87)
Stock CPUE =	4.0 (36; 40)
CPUE-20 =	0.1 (100; 1)
PSD =	2 (2)

Figure 5. 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 Texana Reservoir, Texas, 2011, 2015, and 2019. Vertical line denotes 12-inch minimum length limit.

Channel Catfish



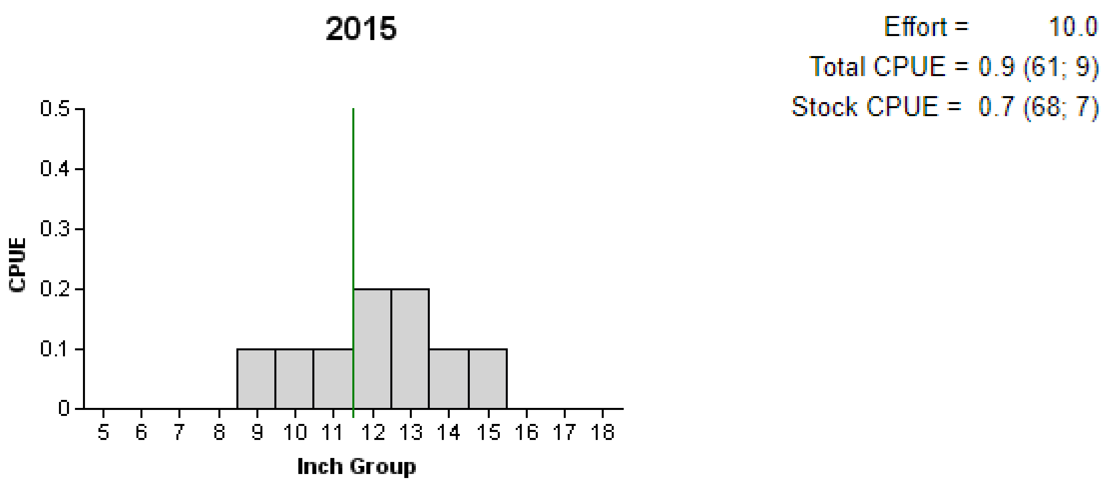
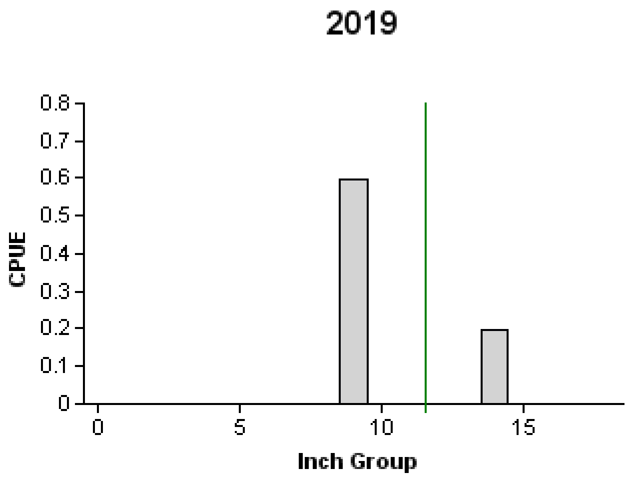


Figure 6. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Texana Reservoir, Texas, 2011, and 2015. No Channel Catfish were captured in 2019. Vertical line denotes 12-inch minimum length limit.

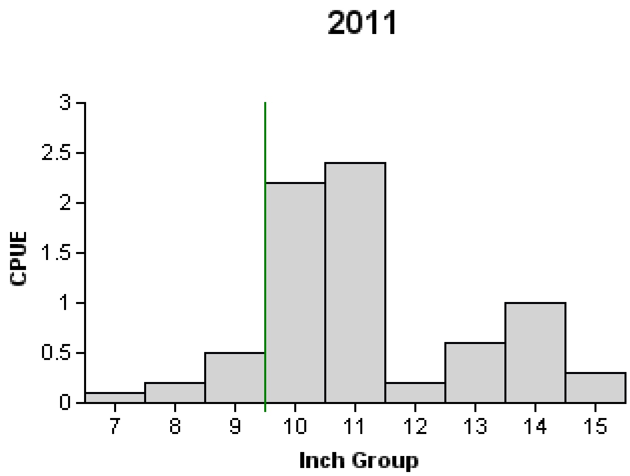
Channel Catfish



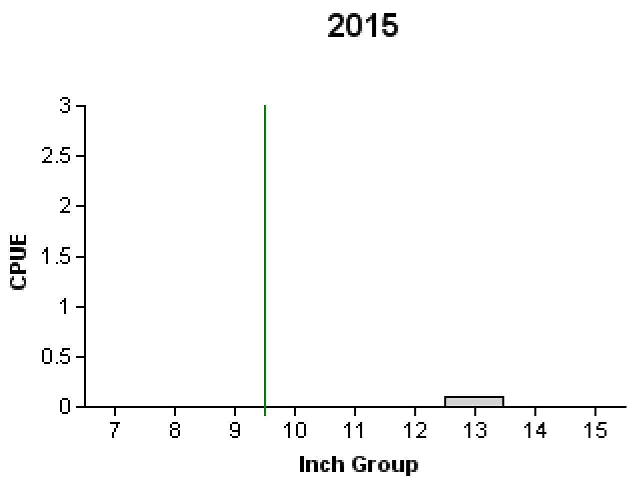
Effort = 5.0
Total CPUE = 0.8 (100; 4)
Stock CPUE = 0.2 (100; 1)

Figure 7. 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 hoop net surveys, Lake Texana Reservoir, Texas, in year 2019. Vertical line denotes 12-inch minimum length limit.

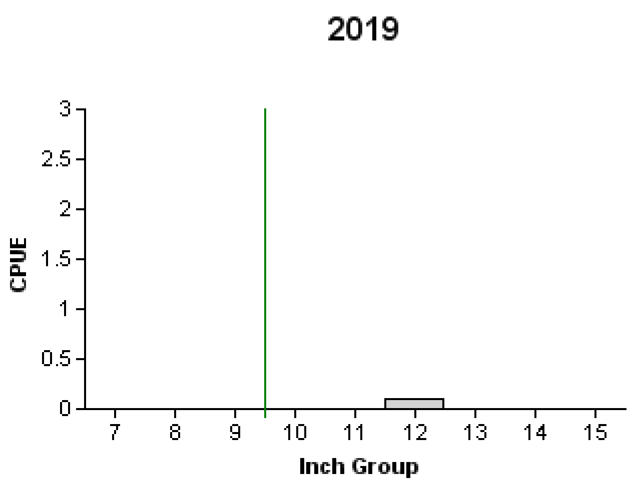
White Bass



Effort = 10.0
Total CPUE = 7.5 (33; 75)
CPUE-10 = 6.7 (37; 67)



Effort = 10.0
Total CPUE = 0.1 (100; 1)
CPUE-10 = 0.1 (100; 1)



Effort = 10.0
Total CPUE = 0.1 (100; 1)
CPUE-10 = 0.1 (100; 1)

Figure 8. Number of White Bass 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 Texana Reservoir, Texas, 2011, 2015, and 2019. Vertical line denotes 10-inch minimum length limit.

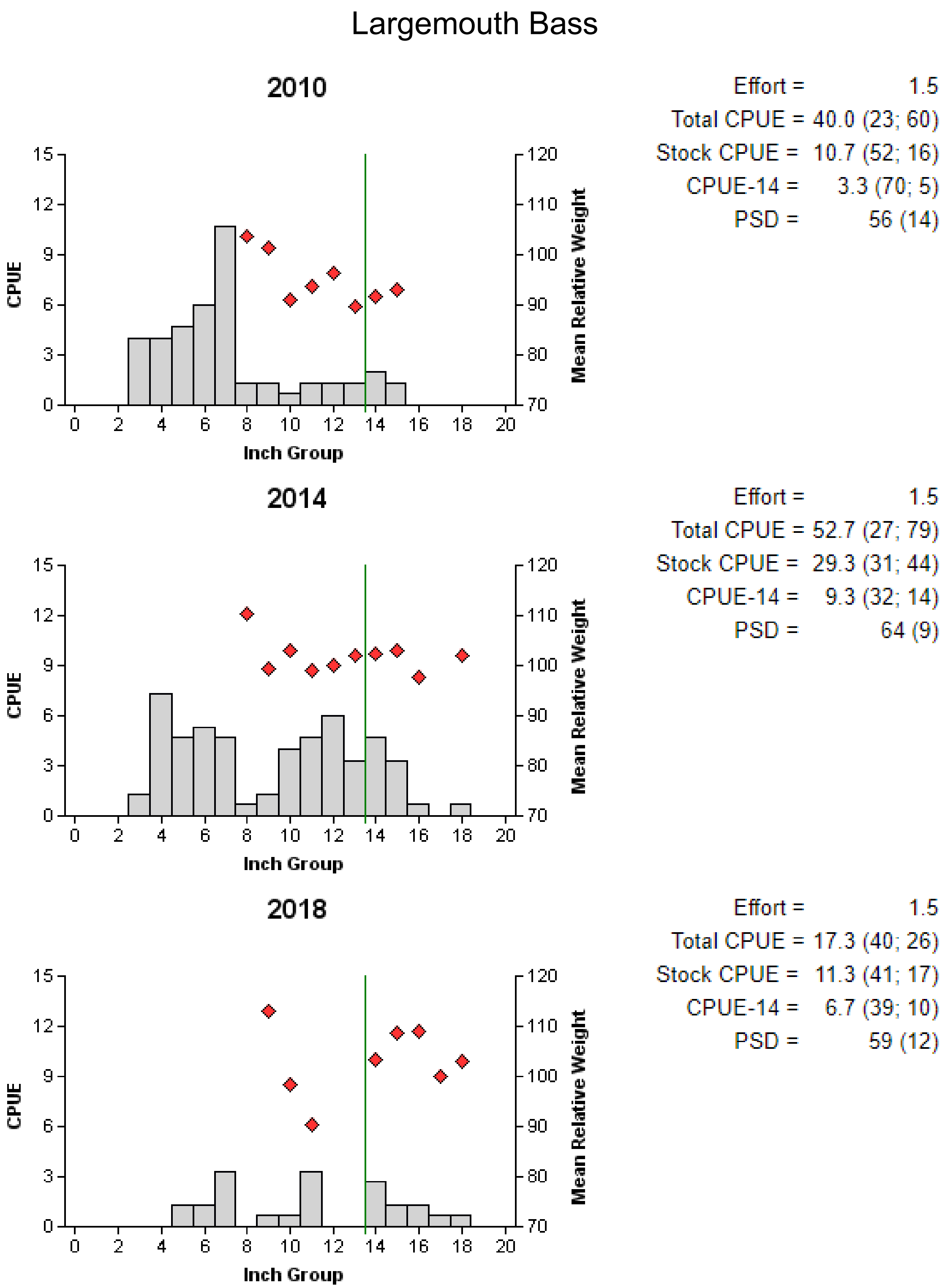


Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Texana Reservoir, Texas, 2010, 2014, and 2018. Vertical line denotes 14-inch minimum length limit.

Table 8. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Texana Reservoir, Texas, 1999, 2010, and 2014. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
1999	28	-	-	-	63	17.9
2010	30	1	29	0	57	3.3
2014	30	2	28	0	61	6.7

Proposed Sampling Schedule

Table 9. Proposed sampling schedule for Lake Texana 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.

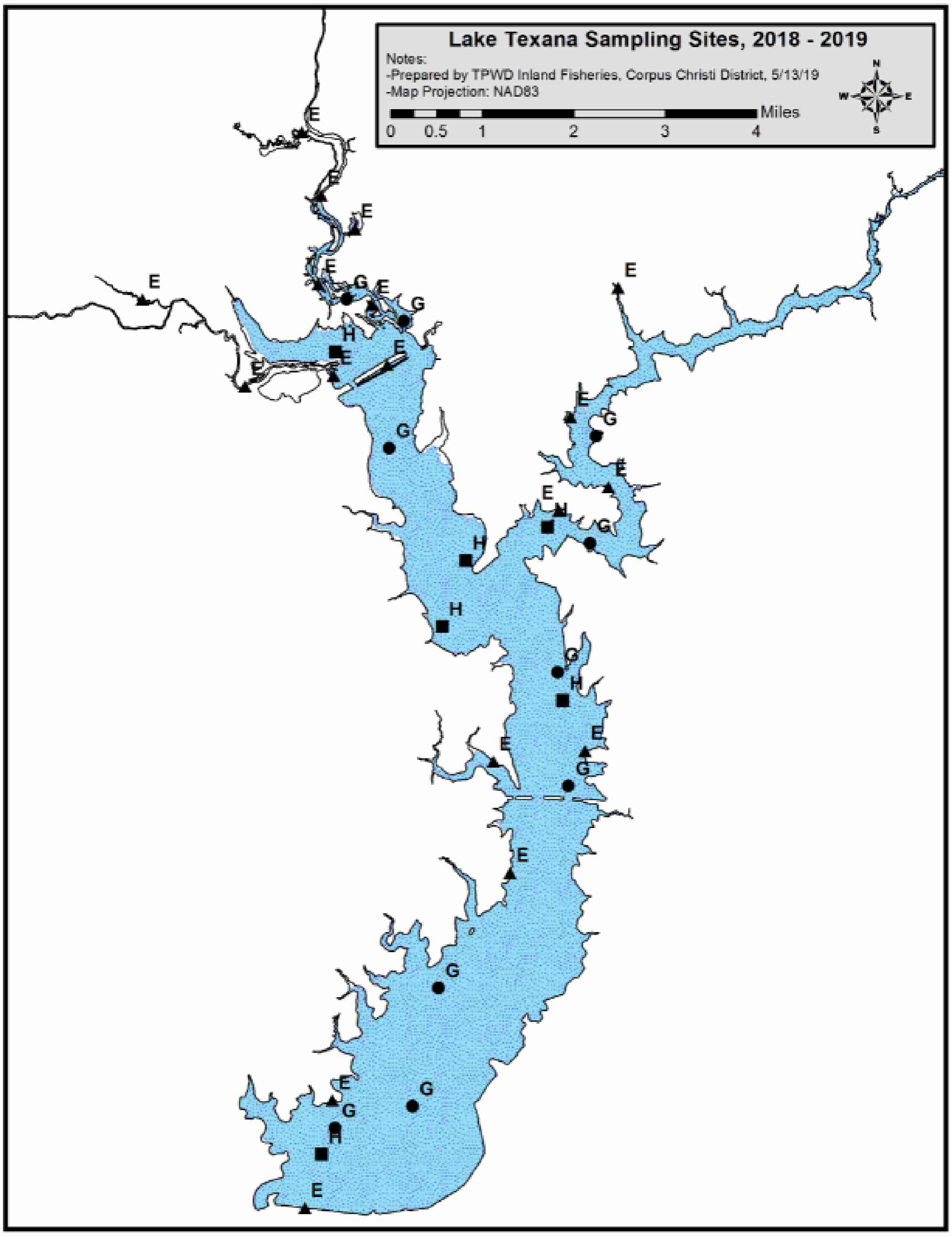
	Survey year			
	2019-2020	2020-2021	2021-2022	2022-2023
Angler Access				S
Vegetation				S
Electrofishing – Fall				S
Electrofishing – White Bass Survey	A			S
Trap netting	A			S
Gill netting				S
Report				S

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

Number (N) and catch rate (CPUE; RSE in parentheses) of all species collected from all gear types from Lake Texana Reservoir, Texas, 2018-2019. Sampling effort was 10 net nights for gill netting, 5 hoop net series (2-day soak) for tandem hoop netting, and 1.5 hour for electrofishing.

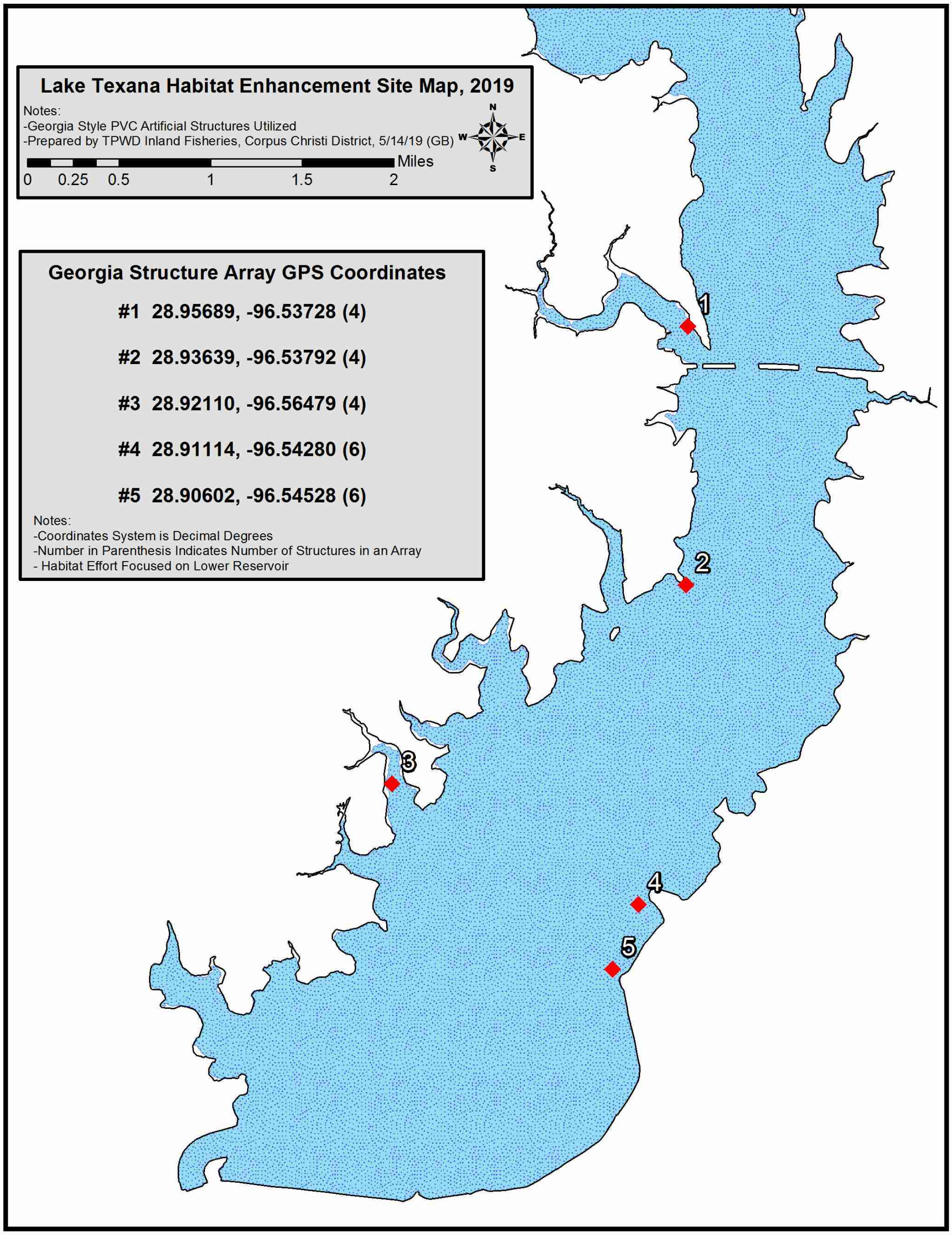
Species	Gill Netting		Hoop Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Spotted Gar	2	0.2 (100)	2	0.4 (100)		
Longnose Gar	7	0.7 (100)				
Gizzard Shad	4	0.4 (76)			330	220.0 (56)
Threadfin Shad					335	223.3 (58)
Channel Catfish			4	0.8 (100)		
Blue Catfish	87	8.7 (24)	25	5.2 (44)		
Flathead Catfish			1	0.2 (100)		
White Bass	1	0.1 (100)			69	46.0 (56)
Redbreast Sunfish					9	6.0 (54)
Green Sunfish					4	2.7 (69)
Warmouth			3	0.6 (100)		
Freshwater Drum	12	1.2 (46)	6	1.2 (49)		
Bluegill			8	1.6 (100)	159	106.0 (25)
Longear Sunfish					8	5.3 (52)
Redear Sunfish					8	5.3 (55)
Largemouth Bass					26	17.3 (40)
Black Crappie	2	0.2 (100)			20	13.3 (54)
White Crappie	3	0.3 (51)	2	0.4 (100)	35	23.3 (51)

APPENDIX B – Map of sampling locations



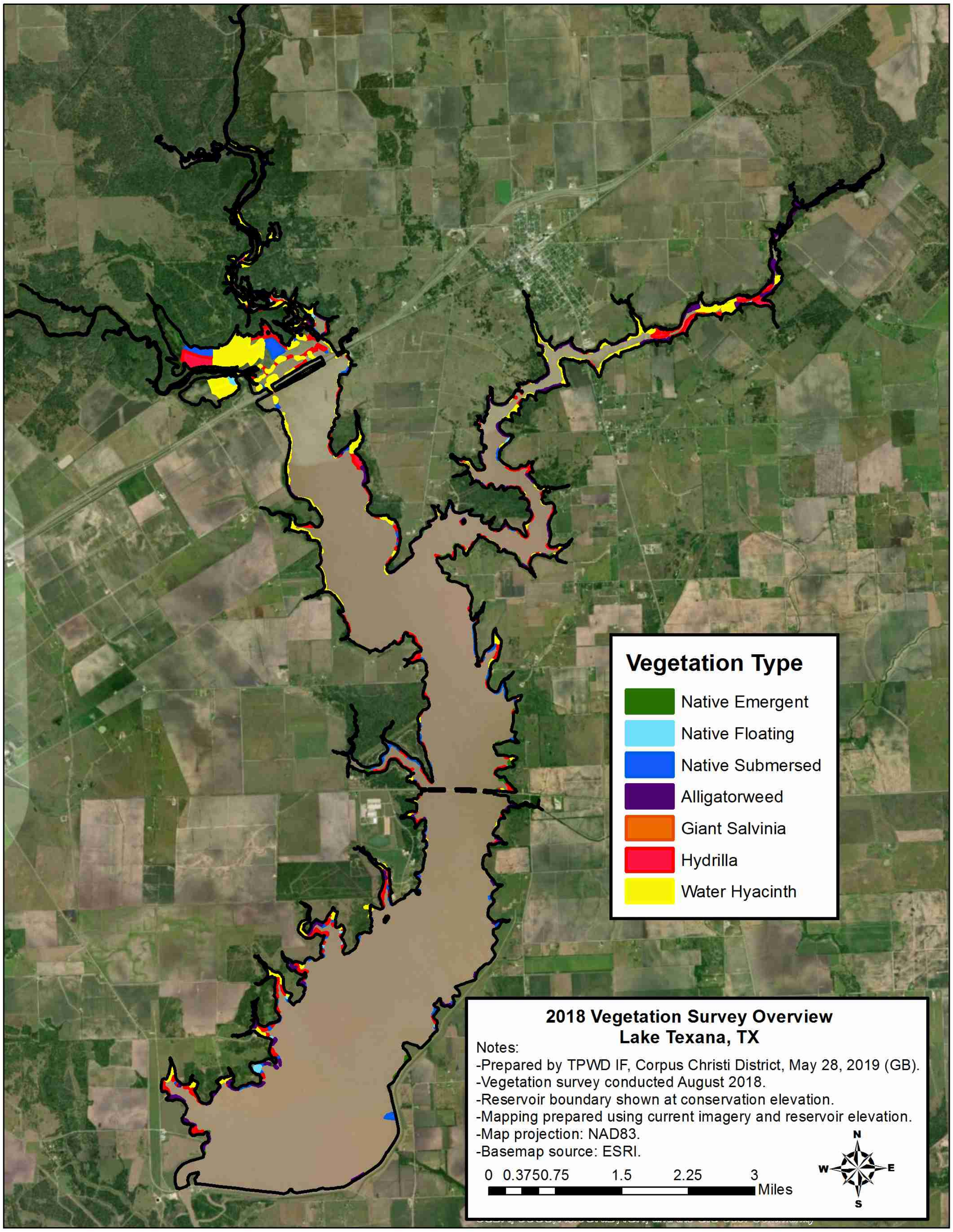
Location of sampling sites, Lake Texana Reservoir, Texas, 2018-2019. Gill net, hoop net and electrofishing stations are indicated by G, H, and E, respectively. Water level was near full pool at time of sampling.

APPENDIX C – Map of artificial structures and coordinates



Location of artificial structure sites, Lake Texana Reservoir, Texas, 2019.

APPENDIX D – Distribution map of aquatic vegetation



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