PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-5

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2014 Fisheries Management Survey Report

Lake Corpus Christi

Prepared by:

Greg Binion, Assistant District Management Supervisor
and
John Findeisen, 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 Corpus Christi were surveyed in 2014 using hoop nets, electrofishing and trap netting and in 2015 using gill netting. Anglers were surveyed from June 2014 through May 2015 with a creel survey. Historical data are presented with the 2014-2015 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 Corpus Christi 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. 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 White and Black crappie. Recent management efforts focused on increasing FLMB introgression through stockings in 2014 and 2015, compiling baseline catch and harvest statistics on important sport fish species, and evaluating the use of baited tandem hoop nets as a sampling gear for Channel Catfish. Further, staff monitored expansion of nuisance vegetation during routine fisheries surveys and with a vegetation survey conducted in 2014. No vegetation control activities were needed during the survey period. Angler harvest of all sport fishes has been regulated according to statewide size and bag limits.

- **Fish Community**
  - **Prey species:** Gizzard and Threadfin shad formed the reservoirs forage base. Bluegill provided additional forage for sport fish. Population size structure of prey species was suitable to support sport fish populations.

  - **Catfishes:** Although Channel Catfish were present, the catfish community was dominated by Blue Catfish. Blue Catfish size structure comprised a wide size-range of fish. Several quality-sized Blue Catfish were collected. Directed fishing effort for catfishes was high.

  - **White Bass:** White Bass relative abundance increased substantially since previous surveys in 2012 and 2014. The majority of fish collected were available to anglers for harvest.

  - **Largemouth Bass:** Largemouth Bass abundance has steadily increased since 2008. Few fish above legal size limit were collected during the 2014 electrofishing survey. Body condition was excellent and fish attained legal size (14 inches) in 1.0 years.

  - **Crappie:** White and Black crappie continued to be present in the reservoir; however, few legal size fish were collected.

- **Management Strategies:** Continue to manage sport fish under existing regulations. Request Florida Largemouth Bass stocking to enhance production of large fish (≥ 8 pounds) in the population. Conduct creel survey to collect fisheries dependent data (i.e., angler effort, catch, and harvest). Evaluate use of baited tandem hoop nets for collection of Channel Catfish. Monitor expansion of nuisance vegetation.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Corpus Christi in 2014-2015. 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 2014-2015 data for comparison.

Reservoir Description

Lake Corpus Christi is an 18,256-acre reservoir 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 Corpus Christi and other local communities. Water level in the reservoir can fluctuate 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 reaching approximately one foot below conservation pool. Boat access is dependent on water level, and shoreline and handicap 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 yet to negatively impact recreational use. No vegetation control activities were needed over the current study period. Other descriptive characteristics for Lake Corpus Christi are in Table 1.

Angler Access

Lake Corpus Christi 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. A construction project for an extended fishing pier is underway at Lake Corpus Christi State Park and completion is scheduled for July 2015.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Binion and Findeisen 2011) included:

1. Request Florida Largemouth Bass (FLMB) for stockings in 2012 and 2013.

   Action: FLMB were stocked in 2014 (460,205) and 2015 (205,500). Low water level prevented stockings in previous years.

2. Collect fisheries dependent data such as angler effort, catch, and harvest.

   Action: A roving creel was conducted 1 June 2014 through 31 May 2015.

3. Determine utility of baited tandem hoop nets for collecting relative abundance information on Channel Catfish.

   Action: Baited hoop nets were deployed in the summer of 2014. Catch rates increased from historical values of ~ 1.0/nn to 6.6/fish tandem net series.

4. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir. Contact and educate marina owners about invasive species, and provide them with

posters, literature, etc… so that they can in turn educate their customers. Educate the public about invasive species through the use of media and the internet. Make a speaking point about invasive species when presenting to constituent and user groups. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses. Monitor water hyacinth and other exotic nuisance vegetation through vegetation surveys. Revisit the water hyacinth control program and continue to cooperate with the city of Corpus Christi on all vegetation control activities.

Action: Invasive vegetation was monitored through routine fisheries surveys and a vegetation survey conducted in 2014. Maintained working relationship with the City of Corpus Christi and advised on all vegetation control activities. Vegetation control activities were limited as non-native vegetation abundance declined as water level continued to recede.

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

Stocking history: Florida Largemouth Bass fingerlings were last stocked in the reservoir in 2014 (460,205) and 2015 (205,500). Prior to 2014, the most recent stocking of Florida Largemouth Bass occurred in 2009. The reservoir received a stocking of Channel Catfish fingerlings (257,364) in 2014. Palmetto and Striped Bass have been stocked at Lake Corpus Christi in the past; the most recent stockings occurred in 1995 and 1990, respectively. 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, another non-native floating plant, was also present in the reservoir but has yet to restrict recreational use. The City of Corpus Christi with guidance from district staff has controlled all nuisance vegetation with herbicides. Abundance of nuisance vegetation has decreased substantially with declining water level and has not been problematic over the current survey period.

Water Transfer: Lake Corpus Christi is primarily 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. There are currently three permanent pumping stations on the reservoir transferring water to other locations. Untreated water is diverted to the cities of Beeville, Alice, and Mathis for use as municipal water supply. Lake Corpus Christi also periodically receives auxiliary water from upstream Choke Canyon Reservoir. There are currently no proposals to install additional pumping stations on the reservoir. No inter-basin transfers are known to exist.

METHODS

Fishes were collected by electrofishing (2.0 hours at 24, 5-minute stations), trap netting (15 net nights at 15 stations), tandem hoop netting (16 net series, 2-night soak), and gill netting (15 net nights at 15 stations). Standard electrofishing surveys were conducted during night time and sample station selection was random for all gear types as prescribed by the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour of actual electrofishing (fish/h), tandem hoop nets as fish/tandem hoop net series, and gill, and trap nets as the number of fish caught in one net set overnight (fish/nn).

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Size Distribution (PSD) for various length categories, as defined by Guy et el. (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 according to DiCenzo et al. (1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all catch statistics and standard error (SE) was calculated for structural indices and IOV. Ages for Largemouth Bass were determined using 15 fish between 13 - 15 inches total length in 2014. Ages for White Bass were determined using 77 fish. Fish collected for age and growth analysis were aged using otoliths.

An annual access-point creel survey was conducted from June 2014 through May 2015. Angler interviews were conducted on 5 weekend days and 4 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 2014).

A structural habitat survey was last conducted in August 2006 (Neahr and Findeisen 2007). An aquatic vegetation survey was conducted in 2014. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2014).

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014). Micro-satellite analysis was used to determine genotype of individual fish in 2008, 2010, and 2014 and by electrophoresis for previous years. Micro-satellite DNA analysis was not conducted in 2006 due to low sample size.

Source for water level data was the United States Geological Survey (2015).

RESULTS AND DISCUSSION

Habitat: Littoral habitat consisted primarily of natural shoreline, rocky gravel banks, standing timber and flooded terrestrial vegetation (Table 5). In 2014, no non-native vegetation was detected, compared to 2,186 acres (12%) in 2010. The reservoir supported limited stands of native submersed (water stargrass) vegetation in 2014 (0.71 acres; <1% coverage), Flooded terrestrial vegetation provided the majority of fish habitat and occurred in 8,018 acres (44%) of the reservoir (Table 6).

Creel: Directed fishing effort by anglers in 2014 – 2015 was highest for all catfish species (52.2%), followed by anglers with no species preference (21.5%), Blue Catfish (14.2%), Alligator Gar (6.6%), and White Crappie (3.8%); (Table 7). Directed effort for Largemouth Bass was low (1.3%). Total fishing effort for all species was 60,716 h and anglers spent an estimated $274,296 on direct expenditures in 2014 – 2015 (Table 8). Anglers traveled up to 1,000 miles to fish at the reservoir; however, the majority (66.9%) of anglers resided in counties within 30 miles (Appendix E).

Prey species: Shad abundance remained high and was consistent with previous surveys. In 2014, electrofishing catch rates of Gizzard and Threadfin shad were 209.5/h and 418.0/h, respectively (Figure 2; Appendix A). Population size structure of Gizzard Shad was consistent among years (IOV range: 94 – 99); and indicated the majority of Gizzard Shad collected were available as prey to predator fishes. Bluegill catches have trended down since 2008; however, Bluegill were still present in good numbers. Electrofishing catch rates were 153.5/h in 2014, compared to 294.5/h in 2008 and 212.5/h in 2010 (Figure 3). The majority of Bluegill collected were <6 in total length and thus should provide excellent forage to predator species. 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: The 2015 Blue Catfish gill net catch rate was 17.7/nn, lower than 2012 (27.3/nn), but more than double the rate in 2014 (8.2/nn) (Figure 4). Proportional size distribution was improved in 2015 (PSD = 12), and indicated a more balanced size structure than in previous years (Figure 4). Roughly 44% of the fish sampled were ≥12 in and available for angler harvest. Several (n = 14) quality-sized (≥20 in) individuals were collected in 2015. Condition of fish greater than 12 in total length was improved since 2012 and relative weight values in 2015 tended to increase with increasing length (Figure 4).

Blue catfish represented a popular fishery at the reservoir. Directed effort in 2014/2015 was 8,599 h and angler catch rate (#/h) was 0.73/h (Table 9). Anglers harvested a total of 15,671 Blue Catfish in 2014/2015. Angler compliance was excellent and harvested fish ranged in length between 12 – 27 in with the majority of harvest occurring in the 14 – 18 in range (Figure 5).

Channel Catfish: Gill net catch rate for Channel Catfish in 2015 was low and consistent with previous surveys (CPUE range: 0.1/nn – 1.1/nn; Figure 6). Baited tandem hoop nets set in summer 2014 yielded a larger sample in comparison to those obtained by historical gill net surveys. The tandem hoop net sample had improved representation of the size distribution (CPUE = 6.6/fish tandem net series, CPUE-12 = 2.3/fish tandem net series; Figure 7). In 2014, Relative weight values ranged from 83 – 96 and no patterns were evident based on size (Figure 7).

Total harvest for Channel Catfish was 486 fish in 2014/2015 (Table 10). Harvested fish ranged in length between 11 – 18 in (Figure 8).

White Bass: White Bass abundance increased substantially over the survey period. Relative abundance of White Bass was 11.7/nn in 2015, compared to 0.3/nn in both 2013 and 2014 (Figure 9). Catch rates of legal-size (≥10 in) fish was excellent as indicated by CPUE-10 (7.8/nn). Size structure was dominated by larger individuals (PSD = 81). Relative weight values exceeded 93 for all size classes (W_r range: 94 – 111) and increased with length (Figure 9). Mean age at legal length (10 inches) was 1.03 years (N = 35; range = 1 – 2; Figure 10).

No directed fishing effort or harvest was observed during the creel period. However, a popular fishery does exist up river (outside the upper creel boundary) during the annual spawning runs (author's personal observation).

Largemouth Bass: Relative abundance of Largemouth Bass substantially increased over the study period and was coincident with a water level rise in 2013, producing a strong year class in 2014. The electrofishing catch rate was 196.5/h in 2014, compared to 50.0/h (2008) and 114.0/h (2010) (Figure 11). Compared to 2010, catch rate of legal-size and larger fish declined. Population size structure in 2014 was poor and was dominated by smaller individuals; PSD = 10 (Figure 11). Body conditions improved over the survey period; mean relative weight values were ≥ 97 for all size classes in 2014 (Figure 11). No trends in body condition were evident based on size. Mean age at legal length was 1.0 year (N = 15; Table 11) in 2014. Growth rates were considered excellent and have increased since 2010. Introgression of FLMB genetics in the population remained high and was consistent with previous years. In 2014, 27% of the sampled fish were pure Florida Largemouth Bass (Table 12).

Directed fishing effort for Largemouth Bass was 794 h and comprised only 1.3% of total directed effort (Table 13). Average angler catch rate was low (0.06/h). No fish were harvested during the creel period and all legal fish caught were released (Table 13).

White Crappie: The trap net catch rate for White Crappie in 2014 was 0.7/nn, considerably lower than prior surveys in 2008 (7.1/nn) and 2010 (10.5/nn) (Figure 12). Catch rates of legal-size (≥ 10 in) fish also decreased over the survey period. Proportional size distribution values have remained consistent and indicated a balanced population (2014; PSD = 38). Body condition of stock size (5 inches) or larger White Crappie was excellent; all 2014 relative weight values exceeded 110 (Figure 12).

White Crappie support a popular fishery at the reservoir and comprised 3.8% of total directed fishing effort (2,298 h) in 2014/2015 (Table 7). However, no harvest was reported over the creel period.

Black Crappie: Relative abundance of Black Crappie increased in 2014 (9.8/nn), compared to 2008 (1.1/nn) and 2010 (2.9/nn) (Figure 13). However, the 2014 sample was dominated by smaller individuals as indicated by PSD = 4. Only one legal-size (≥ 10 inches) Black Crappie was collected. All relative weight values exceeded 100 (Figure 13).

Fisheries management plan for Lake Corpus Christi, Texas

Prepared – July 2015.

ISSUE 1: The reservoir is capable of producing trophy-sized (≥ 8 pounds) Largemouth Bass. Catch records (water body record = 13.5 pounds) and anecdotal reports indicate the reservoir does produce large fish. Abundant forage populations exist to support the growth and production of these larger fishes.

MANAGEMENT STRATEGY

1. Request Florida Largemouth Bass for stockings in 2016 and 2017 at a rate of 1,000/kilometer.

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 and reduced boater access.

MANAGEMENT STRATEGY

1. Conduct a roving creel survey during high water period (i.e., within 4 ft of conservation pool elevation). Target dates will be 1 January 2018 through 31 May 2018.

ISSUE 3: Historical and recent gill net catch data have indicated low relative abundance of Channel Catfish suggesting a minimal Channel Catfish population and/or poor sampling gear efficiency. Baited tandem hoop nets were used as an alternative collection gear for Channel Catfish in 2014 and resulted in a six-fold increase in catch rates relative to historical rates. Further, tandem hoop net sets indicated a decent Channel Catfish population with good numbers of fish available for angler harvest.

MANAGEMENT STRATEGIES

1. Continue to evaluate the utility of baited hoop nets deployed during summer for use as an alternative collection gear for Channel Catfish.
2. Promote the Channel Catfish angling opportunities by disseminating press releases to local and statewide media outlets.

ISSUE 4: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, 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. Exotic plants such as water hyacinth, water lettuce and alligatorweed have historically been a severe problem in the upper end and tributaries of the reservoir. These exotic plants restrict recreational use and negatively 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 exotic nuisance vegetation through periodic vegetation surveys.
7. Revisit the water hyacinth control program and continue to serve as advisors to the City of Corpus Christi on all vegetation control activities.

SAMPLING SCHEDULE JUSTIFICATION:
The proposed sampling schedule includes biennial electrofishing and gill netting and mandatory monitoring in 2018/2019. Additional electrofishing and gill netting is necessary to maintain consistent trend data on Largemouth Bass, prey species, and catfish populations. Tandem hoop nets will be utilized as an alternative sampling gear for Channel Catfish in 2018. A creel survey will be conducted in 2018 to monitor catch and harvest of important sport fish species. A Federal Aid report will be prepared in 2019 (Table 14).

LITERATURE CITED

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, second edition. American Fisheries Society, Bethesda, Maryland.

Binion, G. R., and J. A. Findeisen. 2011. Statewide freshwater fisheries monitoring and management program survey report for Lake Corpus Christi, 2010. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin

DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relationships between reservoir trophic state and Gizzard Shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution: A further refinement of population size structure index terminology. Fisheries 32: 348.

Neahr, T. and J. Findeisen. 2007. Statewide freshwater fisheries monitoring and management program survey report for Lake Corpus Christi, 2006. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

United States Geological Society (USGS). 2015. National water information system: Web interface. Available: http://waterdata.usgs.gov/tx/nwis (July 2015).

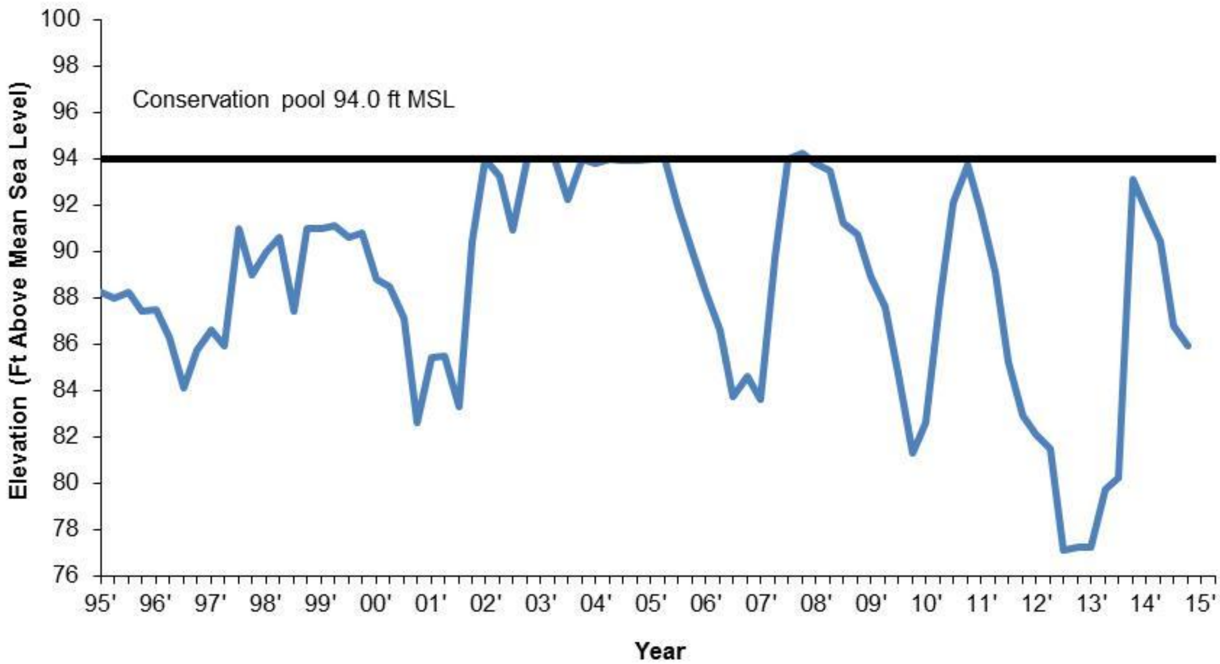


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Corpus Christi, Texas.

Table 1. Characteristics of Lake Corpus Christi, Texas.

Characteristics	Description
Year constructed	1958
Controlling authority	City of Corpus Christi
Counties	San Patricio, Jim Wells and Live Oak
Reservoir type	Main stream
Shoreline Development Index (SDI)	6.00
Conductivity	380 ųmhos/cm

Table 2. Boat ramp characteristics for Lake Corpus Christi, Texas, May, 2015. Reservoir elevation at time of survey was 91.5 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 State Park North	28.067379° -97.880610°	Y	12	UNK	Excellent, no access issues
Lake Corpus Christi State Park South	28.063070° -97.879892°	Y	6	UNK	Excellent, no access issues
Sunrise Beach	28.050944° -97.871290°	Y	6	UNK	Excellent, no access issues
Fiesta Marina	28.064281° -97.907068°	Y	10	UNK	Excellent, no access issues
Webers Landing	28.068117° -97.913546°	Y	6	UNK	Excellent, no access issues
Mustang Hollow (KOA)	28.201611° -97.902574°	Y	6	UNK	Excellent, no access issues

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

Species	Bag Limit	Length Limit
Alligator Gar	1	none
Catfish: Channel and Blue, 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, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Lake Corpus Christi, Texas. Size categories are: UNK = unknown, FRY = fry, FGL = fingerling, and 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
	Total	2,738,648	
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
	Total	34,476	

*Stocked behind a block net for annual fishing clinic.

Table 5. Survey of structural habitat types, Corpus Christi, 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
Rip rap	0.4	0.4
Rocky/gravel	12.3	11.4

Table 6. Survey of aquatic vegetation, Lake Corpus Christi, Texas, 2010 and 2014. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2010	2014
Native submersed	0.3 (<0.01)	0.71 (<0.01)
Native floating-leaved	9.5 (0.05)	0.0 (0)
Native emergent	114.3 (0.63)	0.0 (0)
Flooded terrestrial	UKN	8,017.9 (43.9)
Non-native		
Alligatorweed (Tier III)*	985.4 (5.40)	0.0 (0)
Water hyacinth (Tier III)*	1,066.9 (5.84)	0.0 (0)
Water Lettuce (Tier III)*	134.1 (0.73)	0.0 (0)

*Tier III is Watch Status

Table 7. Percent directed angling effort by species at Lake Corpus Christi, Texas, 2014/2015. Survey periods were from 1 June through 31 May.

Species	2014/2015
Alligator Gar	6.6
All catfish species	52.2
Blue Catfish only	14.2
Largemouth Bass	1.3
White Crappie	3.8
Freshwater Drum	0.4
Anything	21.5

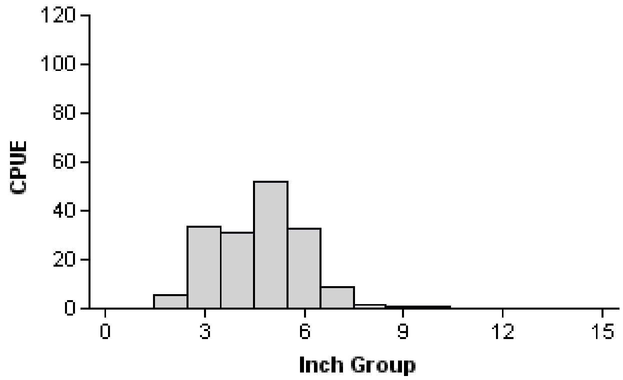
Table 8. Total angling effort (h) for all species and total directed expenditures for Lake Corpus Christi, Texas, 2014/2015. Survey periods were from 1 June through 31 May. Relative standard error is in parentheses.

Creel Statistic	2014/2015
Total Fishing Effort	60,716 (25)
Total Direct Expenditures	$274,296 (51)

Gizzard Shad

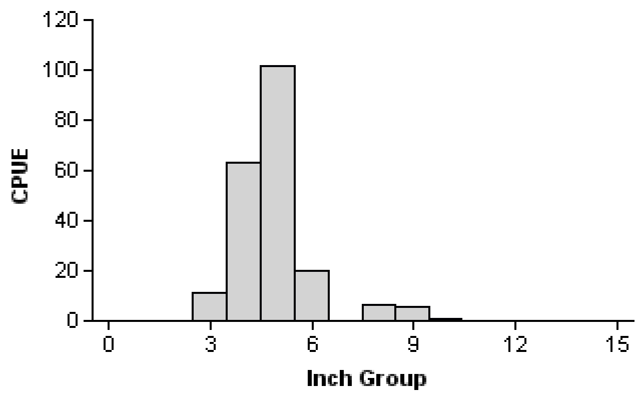
2008

Effort = 2.0
Total CPUE = 167.5 (24; 335)
IOV = 99 (1)



2010

Effort = 2.0
Total CPUE = 210.0 (12; 420)
IOV = 94 (2)



2014

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

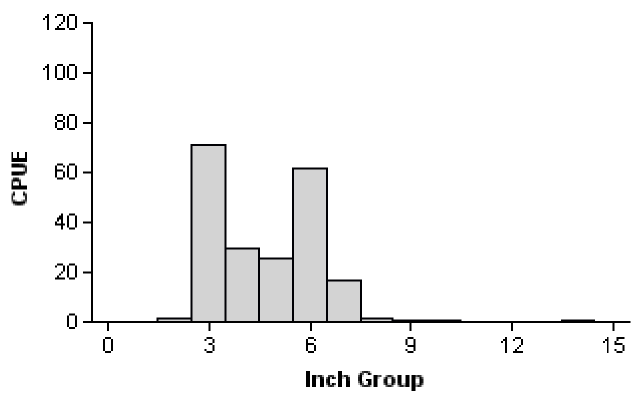
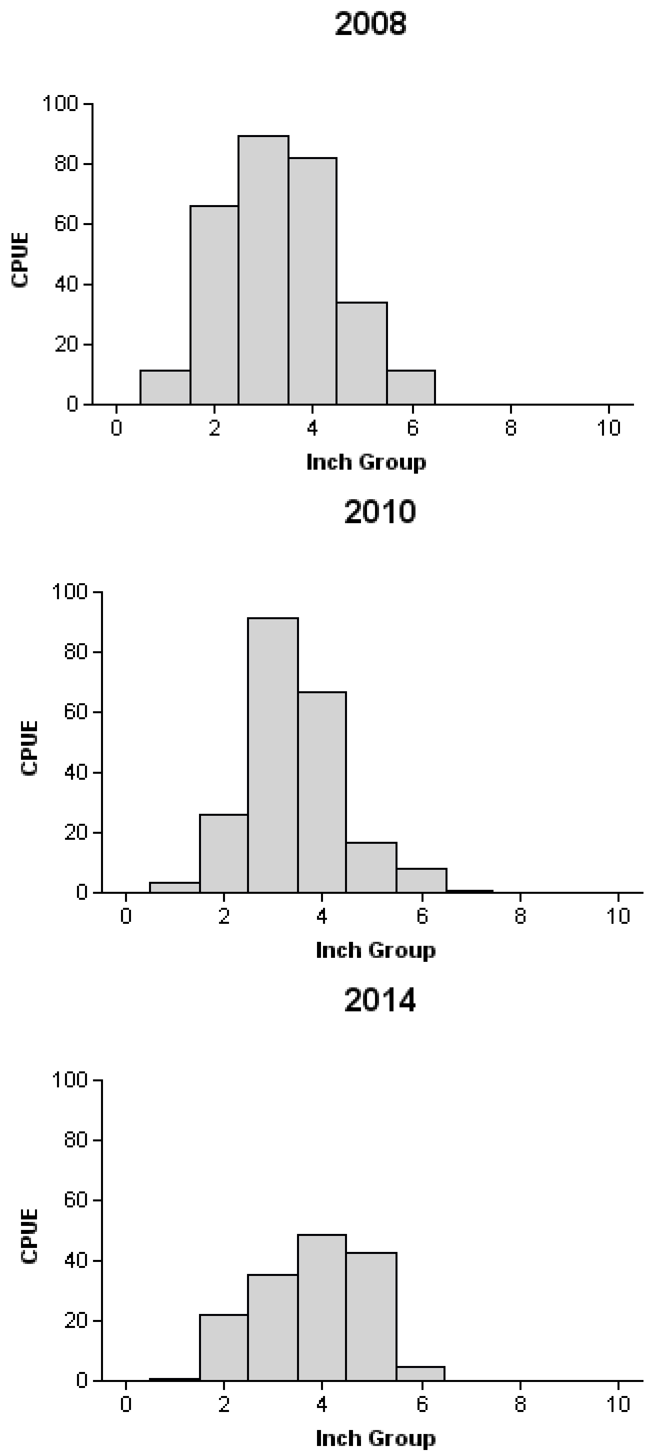


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Corpus Christi, Texas 2008, 2010, and 2014.

Bluegill



2008

Effort =	2.0
Total CPUE =	294.5 (20; 589)
Stock CPUE =	217.0 (19; 434)
CPUE-6 =	11.5 (47; 23)
PSD =	5 (2)

2010

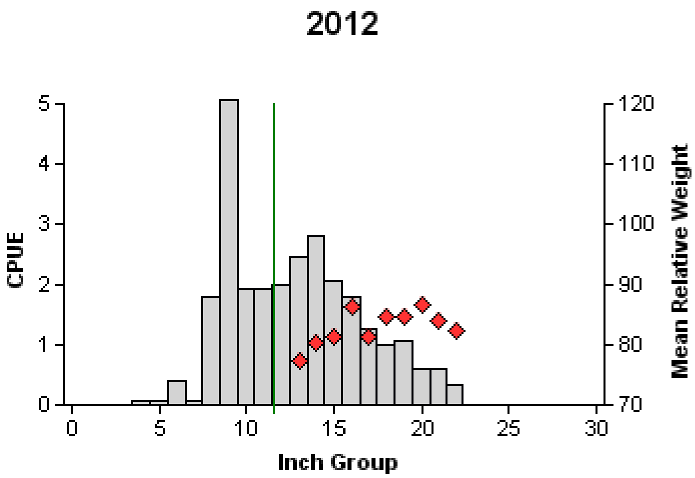
Effort =	2.0
Total CPUE =	212.5 (21; 425)
Stock CPUE =	183.0 (20; 366)
CPUE-6 =	8.5 (37; 17)
PSD =	5 (2)

2014

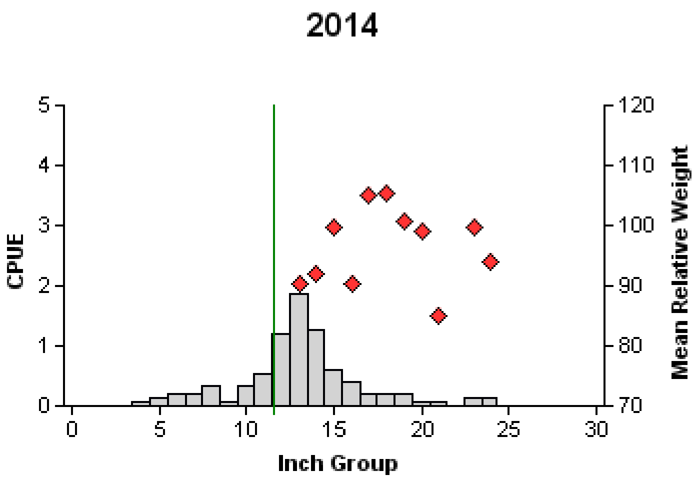
Effort =	2.0
Total CPUE =	153.5 (27; 307)
Stock CPUE =	131.0 (29; 262)
CPUE-6 =	4.5 (48; 9)
PSD =	3 (1)

Figure 3. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parenthesis) for fall electrofishing surveys, Lake Corpus Christi, Texas, 2008, 2010, and 2014.

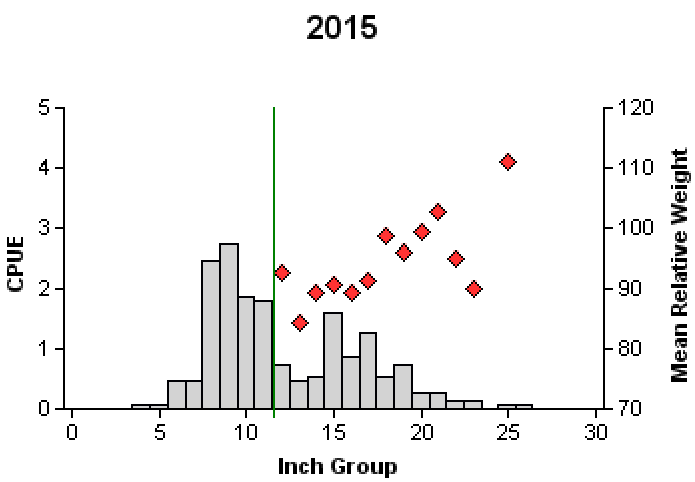
Blue Catfish



Effort = 15.0
Total CPUE = 27.3 (17; 410)
Stock CPUE = 16.0 (18; 240)
CPUE-20 = 1.5 (41; 23)
PSD = 10 (3)



Effort = 15.0
Total CPUE = 8.2 (18; 123)
Stock CPUE = 6.3 (19; 95)
CPUE-20 = 0.4 (41; 6)
PSD = 6 (2)



Effort = 15.0
Total CPUE = 17.7 (16; 265)
Stock CPUE = 7.7 (13; 115)
CPUE-20 = 0.9 (38; 14)
PSD = 12 (4)

Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Corpus Christi, Texas 2012, 2014, and 2015. Vertical line denotes 12 inch minimum length limit.

Blue Catfish

Table 9. Creel survey statistics for Blue Catfish at Lake Corpus Christi, Texas from June 2014 through May 2015. Total catch per hour represents anglers targeting Blue Catfish and total harvest is estimated number of Blue Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	2014/2015
Surface area (acres)	14,867
Directed effort (h)	8,599 (35)
Directed effort/acre	0.58 (35)
Average angler catch rate (#/h)	0.73 (55)
Total harvest	15,671 (35)
Harvest/acre	1.05 (35)

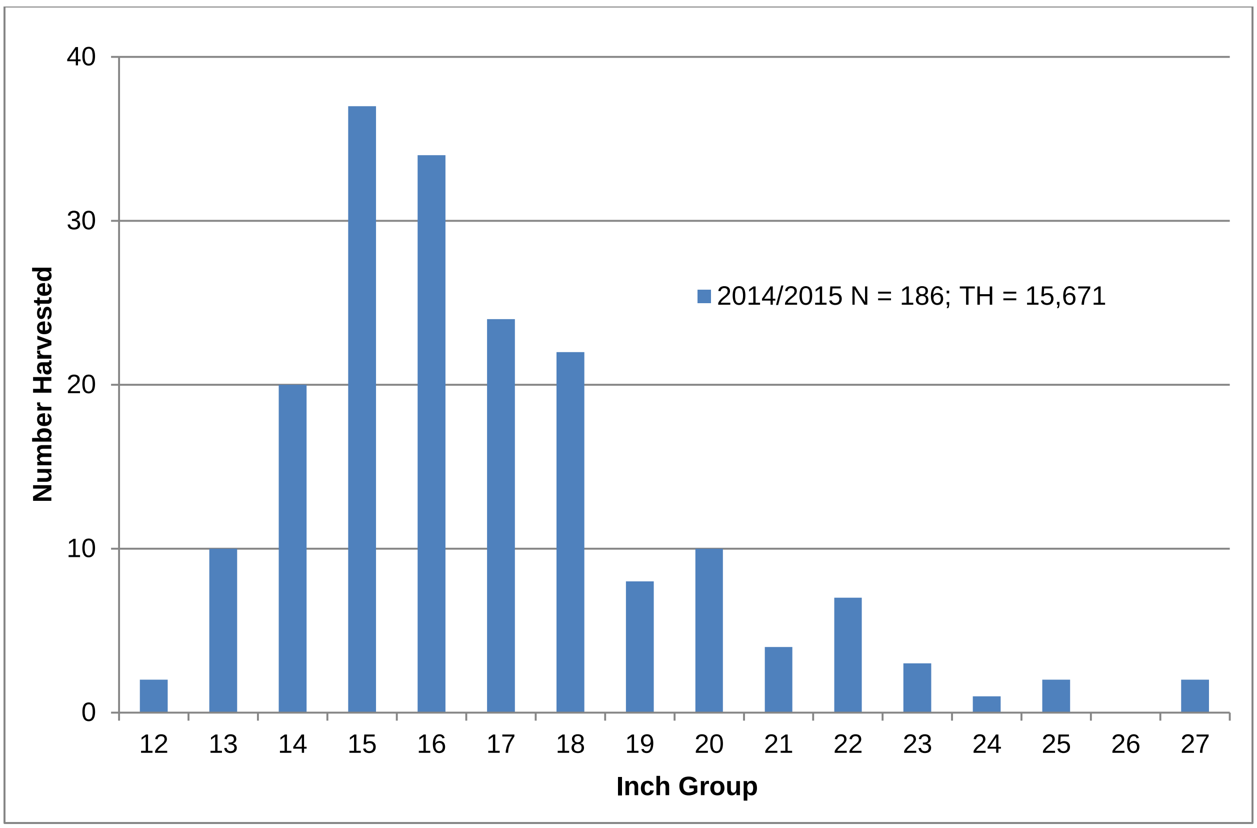
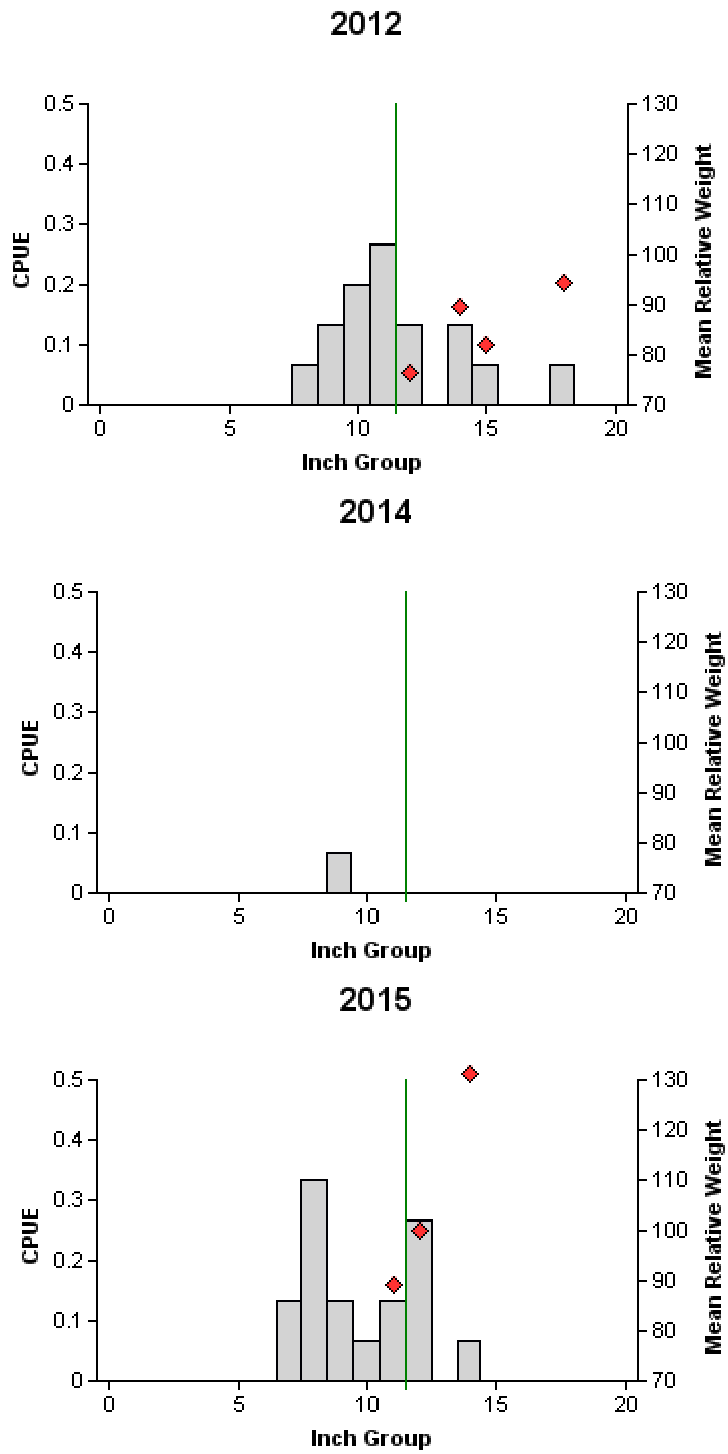


Figure 5. Length frequency of harvested Blue Catfish observed during creel surveys at Lake Corpus Christi, Texas, June 2014 through May 2015, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys and TH is the total estimated harvest for the creel period.

Channel Catfish



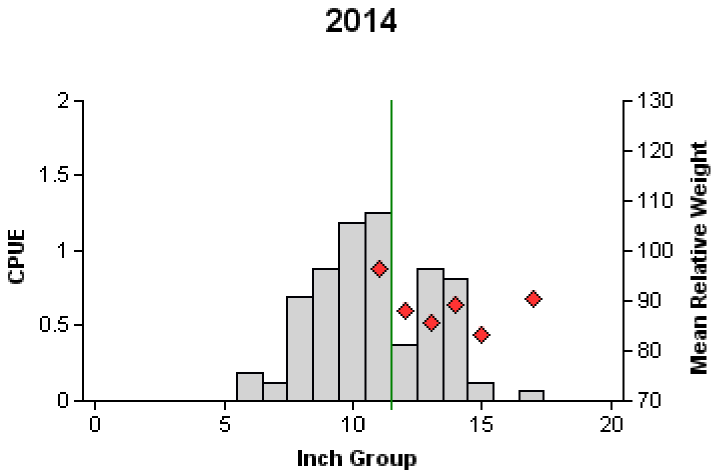
Effort =	15.0
Total CPUE =	1.1 (27; 16)
Stock CPUE =	0.7 (38; 10)
PSD =	10 (8)

Effort =	15.0
Total CPUE =	0.1 (100; 1)
Stock CPUE =	0.0 (0; 0)
PSD =	0 (0)

Effort =	15.0
Total CPUE =	1.1 (43; 17)
Stock CPUE =	0.5 (55; 7)
PSD =	0 (123)

Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Lake Corpus Christi, Texas 2012, 2014, and 2015. Vertical line denotes 12 inch minimum length limit.

Channel Catfish



Effort =	16.0
Total CPUE =	6.6 (51; 105)
Stock CPUE =	3.5 (78; 56)
PSD =	2 (1)

Figure 7. Number of Channel Catfish caught per tandem hoop net series (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for summer tandem hoop net survey, Lake Corpus Christi, Texas 2014. Vertical line denotes 12 inch minimum length limit.

Channel Catfish

Table 10. Creel survey statistics for Channel Catfish at Lake Corpus Christi, Texas from June 2014 through May 2015. Total catch per hour represents anglers targeting Channel Catfish and total harvest is estimated number of Channel Catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	2014/2015
Surface area (acres)	14,867
Directed effort (h)	0 (0)
Directed effort/acre	0 (0)
Average angler catch rate (#/h)	0 (0)
Total harvest	486 (98)
Harvest/acre	0.03 (98)

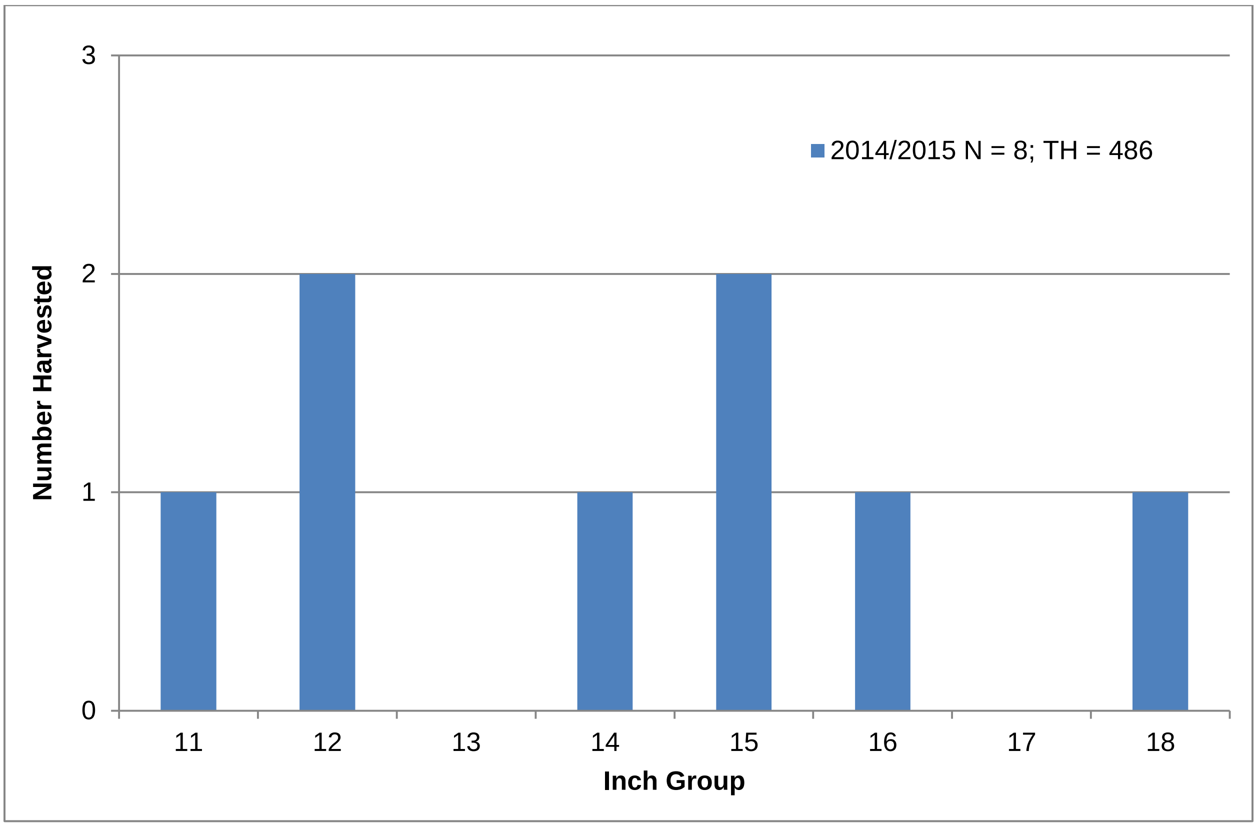
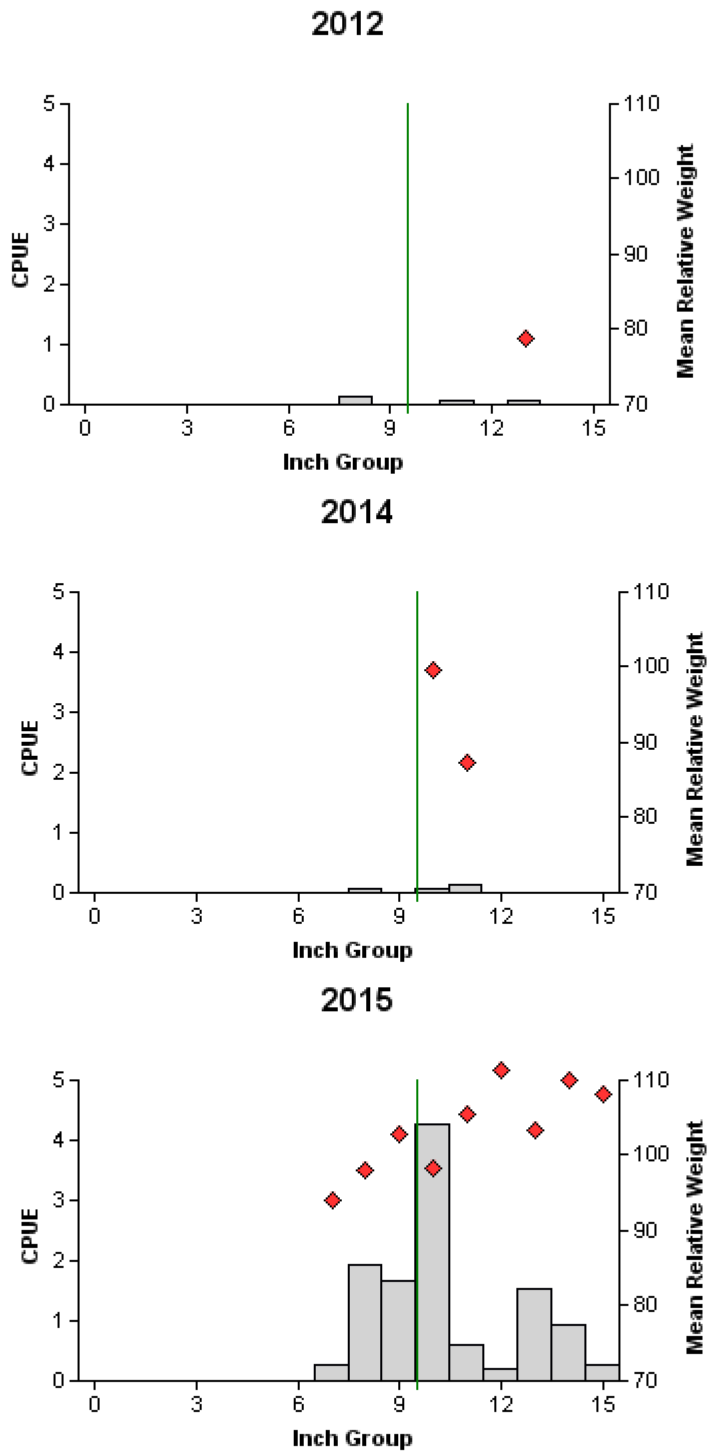


Figure 8. Length frequency of harvested Channel Catfish observed during creel surveys at Lake Corpus Christi, Texas, June 2014 through May 2015, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys and TH is the total estimated harvest for the creel period.

White Bass



2012	
Effort =	15.0
Total CPUE =	0.3 (77; 4)
Stock CPUE =	0.3 (77; 4)
CPUE-10 =	0.1 (68; 2)
PSD =	50 (18)

2014	
Effort =	15.0
Total CPUE =	0.3 (57; 4)
Stock CPUE =	0.3 (57; 4)
CPUE-10 =	0.2 (72; 3)
PSD =	75 (24.2)

2015	
Effort =	15.0
Total CPUE =	11.7 (35; 175)
Stock CPUE =	11.7 (35; 175)
CPUE-10 =	7.8 (33; 117)
PSD =	81 (3.4)

Figure 9. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Lake Corpus Christi, Texas 2012, 2014, and 2015. Vertical line denotes 10 inch minimum length limit.

White Bass

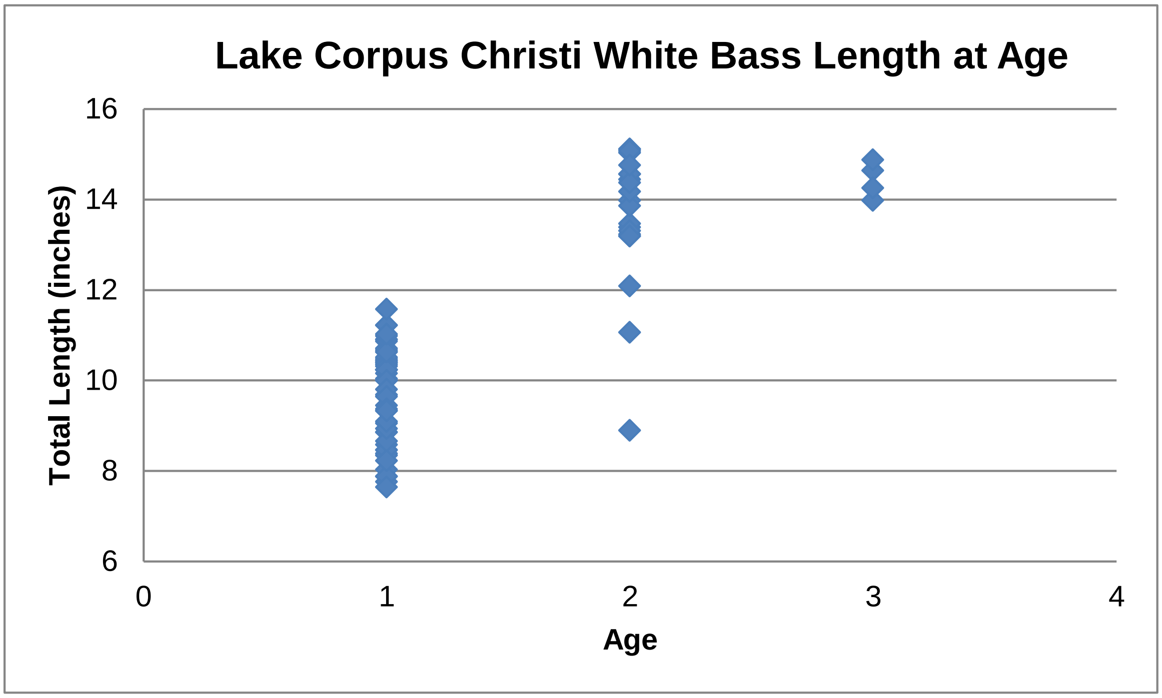
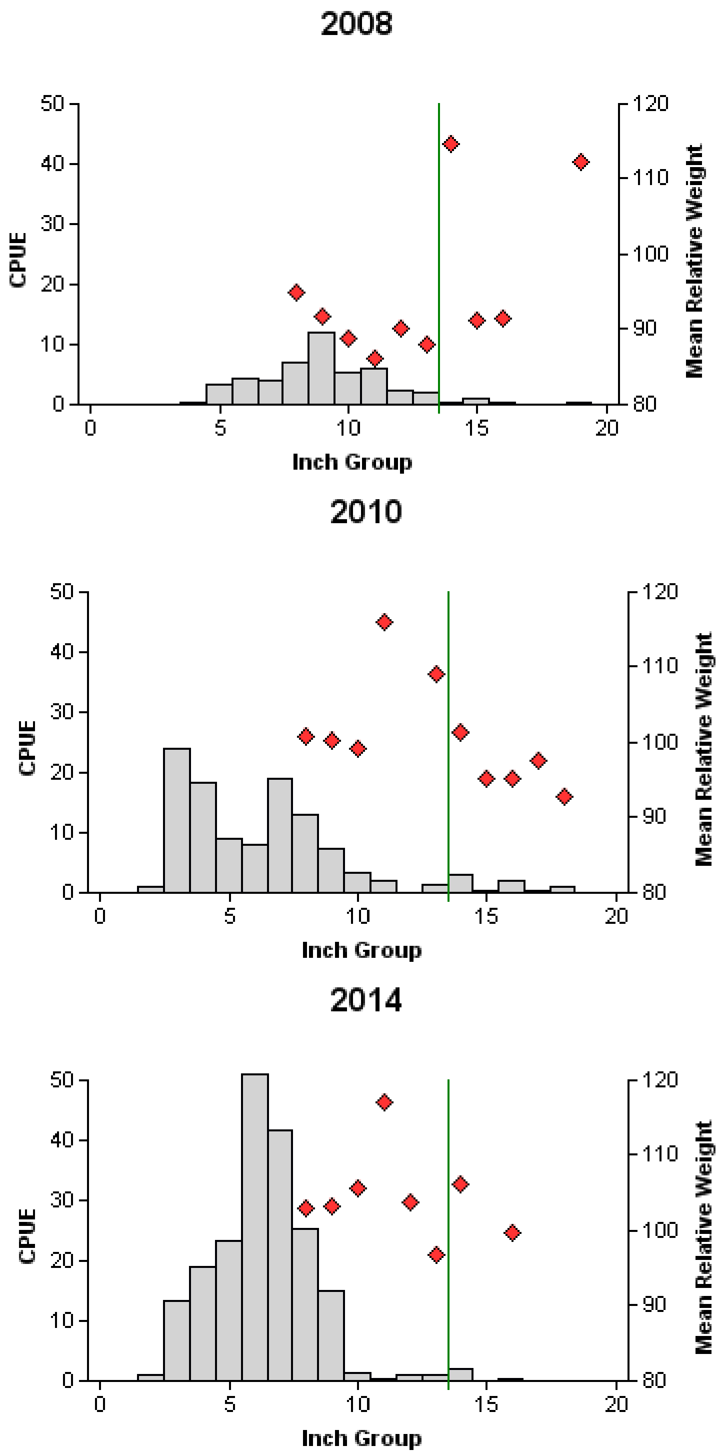


Figure 10. White Bass length at age, Lake Corpus Christi, Texas, 2015. Ages were determined using otoliths (N = 77).

Largemouth Bass



2008	
Effort =	2.0
Total CPUE =	50.0 (26; 100)
Stock CPUE =	37.5 (29; 75)
CPUE-14 =	2.5 (40; 5)
CPUE-18 =	0.5 (100; 1)
PSD =	19 (5)
PSD-P =	5 (2)

2010	
Effort =	2.0
Total CPUE =	114.0 (22; 228)
Stock CPUE =	34.5 (22; 69)
CPUE-14 =	7.0 (38; 14)
CPUE-18 =	1.0 (69; 2)
PSD =	25 (6)
PSD-P =	12 (5)

2014	
Effort =	2.0
Total CPUE =	196.5 (42; 393)
Stock CPUE =	47.0 (47; 94)
CPUE-14 =	2.5 (50; 5)
CPUE-18 =	0.0 (0; 0)
PSD =	10 (2)
PSD-P =	1 (1)

Figure 11. 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 parenthesis) for fall electrofishing surveys, Lake Corpus Christi, Texas, 2008, 2010, and 2014. Vertical line denotes 14 inch minimum length limit.

Largemouth Bass

Table 11. Mean age-at-legal length (14 in) for Largemouth Bass collected by fall electrofishing, Lake Corpus Christi, 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)

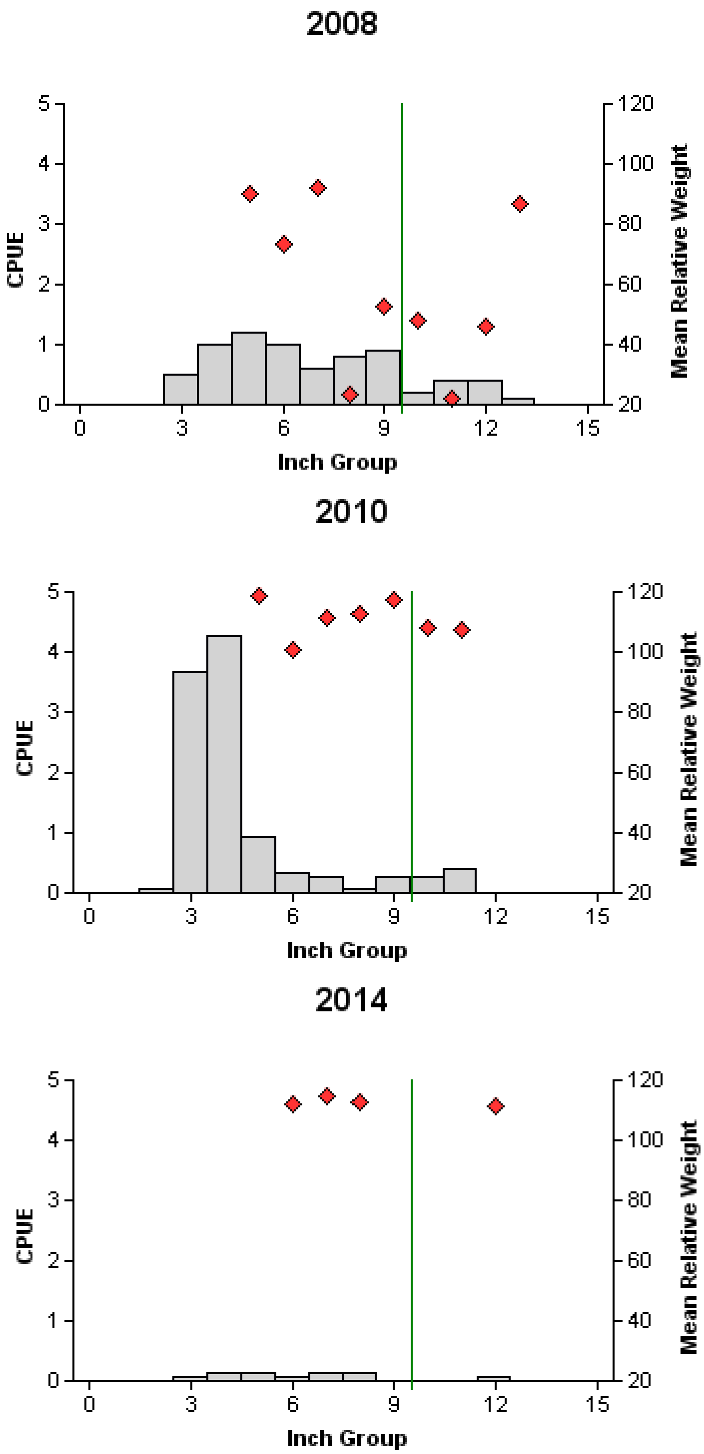
Table 12. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Corpus Christi, Texas 2002, 2004, 2008, 2010 and 2014. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Genotype				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB genotype
2002	45	23	22	0	84.4	51.0
2004	30	15	14	1	82.5	50.0
2008	18	0	18	0	73.0	0
2010	30	4	26	0	73.0	13.0
2014	30	8	22	0	80.0	26.7

Table 13. Creel survey statistics for Largemouth Bass at Lake Corpus Christi, Texas from June 2014 through May 2015. Total catch per hour represents anglers targeting Largemouth Bass and total harvest is estimated number of Largemouth Bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	2014/2015
Surface area (acres)	14,867
Directed effort (h)	794 (85)
Directed effort/acre	0.05 (85)
Average angler catch rate (#/h)	0.06 (270)
Total harvest	0 (0)
Harvest/acre	0 (0)
Percent legal released	100

White Crappie



2008

Effort =	10.0
Total CPUE =	7.1 (31; 71)
Stock CPUE =	5.6 (27; 56)
CPUE-10 =	1.1 (25; 11)
PSD =	50 (13)

2010

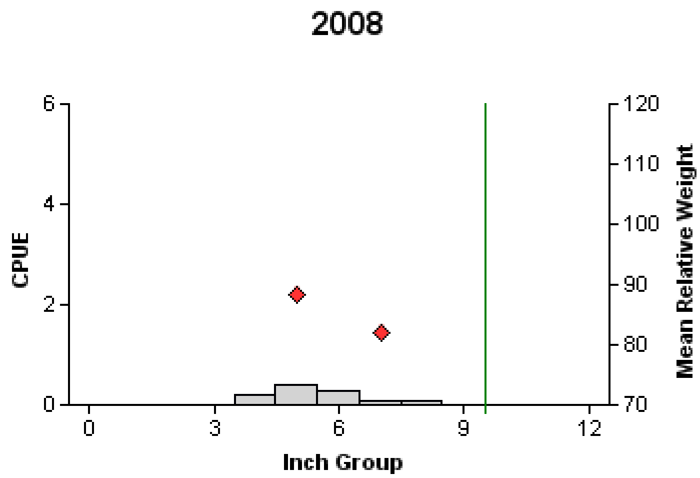
Effort =	15.0
Total CPUE =	10.5 (27; 158)
Stock CPUE =	2.5 (29; 38)
CPUE-10 =	0.7 (35; 10)
PSD =	39 (6)

2014

Effort =	15.0
Total CPUE =	0.7 (36; 11)
Stock CPUE =	0.5 (40; 8)
CPUE-10 =	0.1 (100; 1)
PSD =	38 (17)

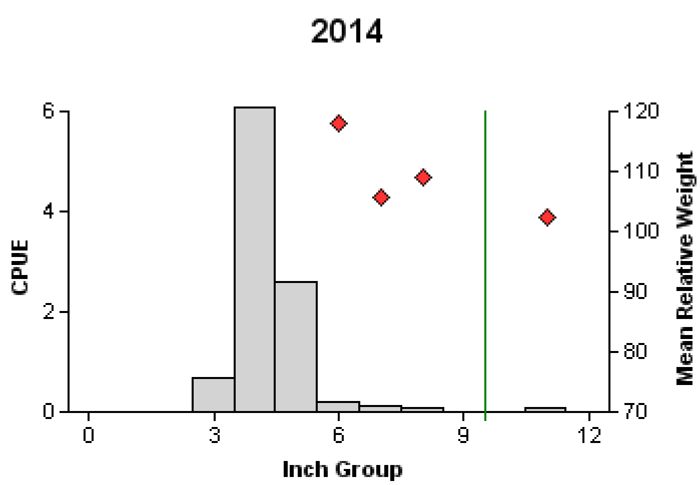
Figure 12. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Corpus Christi, Texas 2008, 2010, and 2014. Vertical line denotes the 10 inch minimum length limit.

Black Crappie



Effort = 10.0
Total CPUE = 1.1 (63; 11)
Stock CPUE = 0.9 (56; 9)
CPUE-10 = 0.0 (0; 0)
PSD = 11 (13)

Effort = 15.0
Total CPUE = 2.9 (40; 44)
Stock CPUE = 0.6 (39; 9)
CPUE-10 = 0.1 (100; 1)
PSD = 11 (11)



Effort = 15.0
Total CPUE = 9.8 (32; 147)
Stock CPUE = 3.1 (31; 46)
CPUE-10 = 0.1 (100; 1)
PSD = 4 (5)

Figure 13. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Corpus Christi, Texas 2008, 2010, and 2014. Vertical line denotes the 10 inch minimum length limit.

Table 14. Proposed survey schedule for Lake Corpus Christi, Texas. Survey period is June through May. Creel surveys are conducted over a 12 month period with a total of 36 creel days. Trap netting and electrofishing surveys are conducted in the fall, 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

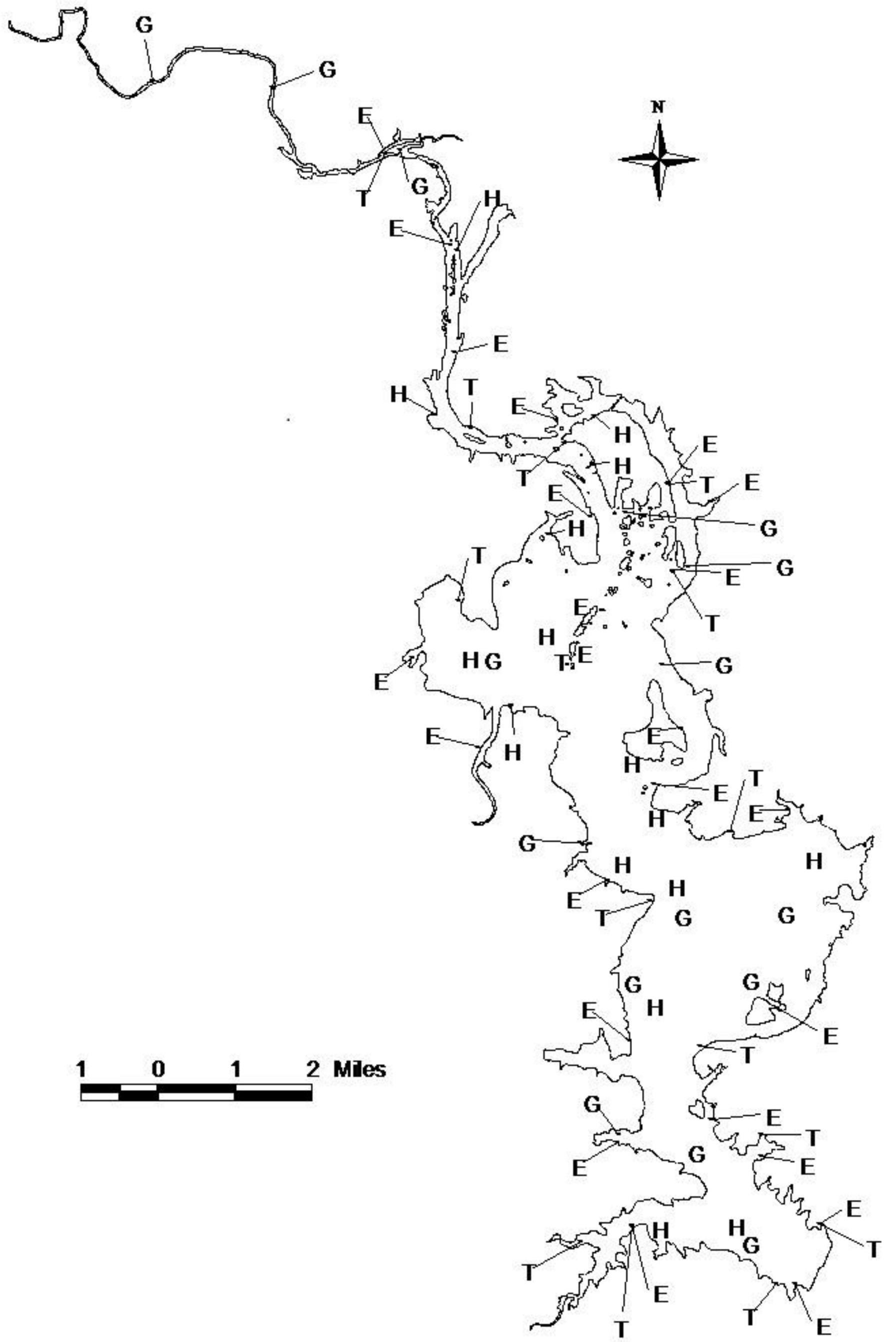
					Habitat				
Survey year	Electrofish Fall(Spring)	Trap net	Gill net	Hoop net	Structural	Vegetation	Access	Creel survey	Report
2015-2016									
2016-2017	A		A						
2017-2018									
2018-2019	S	S	S	A		S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Lake Corpus Christi, Texas, 2014-2015. Sampling effort was 15 net nights for gill netting, 15 net nights for trap netting, and 2 hours for electrofishing.

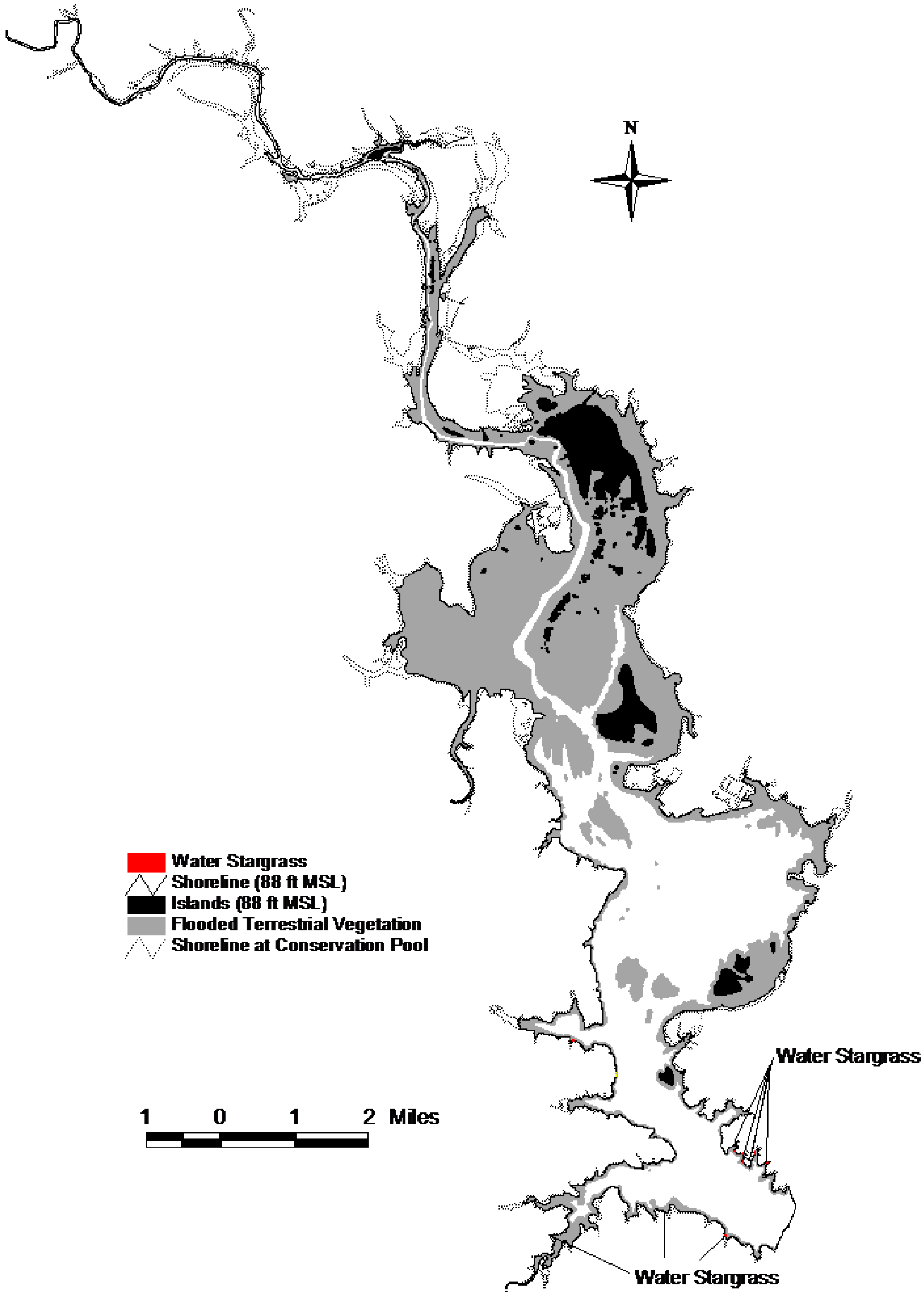
	Electrofishing		Gill Netting		Trap Netting	
Species	N	CPUE	N	CPUE	N	CPUE
Spotted Gar			99	6.60	3	0.20
Longnose Gar			64	4.27	1	0.07
Alligator Gar			1	0.07		
Gizzard Shad	419	209.50	271	18.07	24	1.60
Threadfin Shad	836	418.00			173	11.53
Common Carp			74	4.93	1	0.07
Bullhead Minnow	8	4.00				
Inland Silverside	1	0.50				
Smallmouth Buffalo			119	7.93		
Blue Catfish			265	17.67	13	0.87
Channel Catfish			17	1.13		
Flathead Catfish			1	0.07	1	0.07
White Bass			175	11.67		
Warmouth	7	3.50	2	0.13		
Bluegill	307	153.50	5	0.33	209	13.93
Longear Sunfish	44	22.0			3	0.20
Redear Sunfish	14	7.00				
Largemouth Bass	393	196.50	8	0.53		
White Crappie			72	4.80	11	0.73
Black Crappie			5	0.33	147	9.80
Freshwater Drum			96	6.40	4	0.27
Rio Grande Cichlid	6	3.00				

APPENDIX B



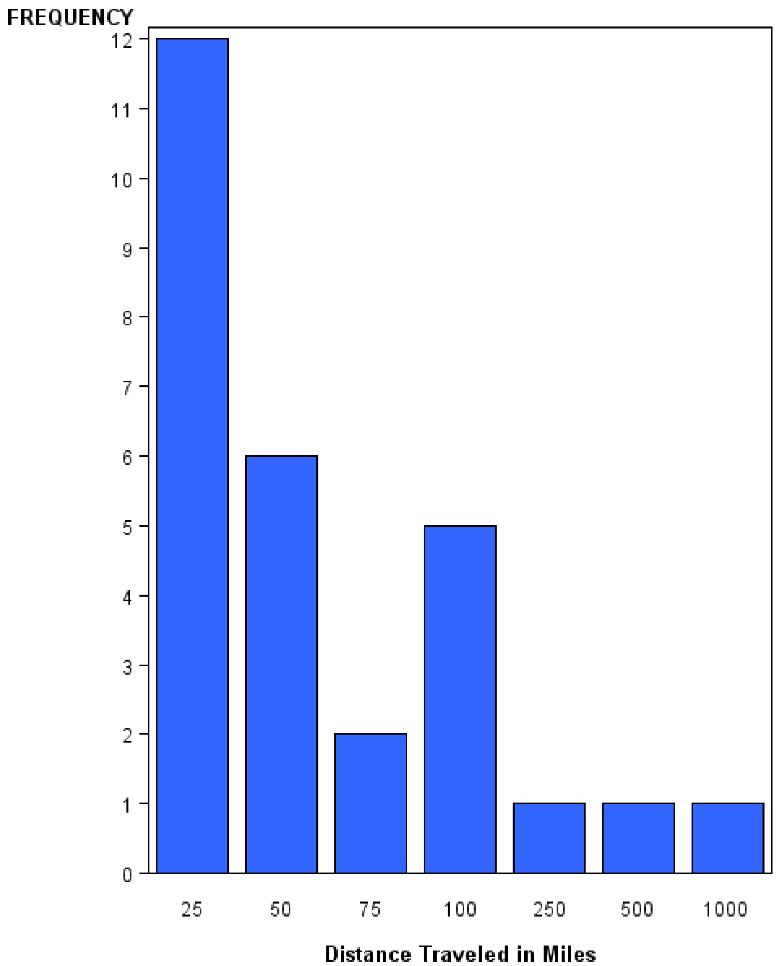
Location of sampling sites, Lake Corpus Christi, Texas, 2014-2015. Trap net, gill net, tandem hoop net, and electrofishing stations are indicated by T, G, H, and E, respectively.

APPENDIX C

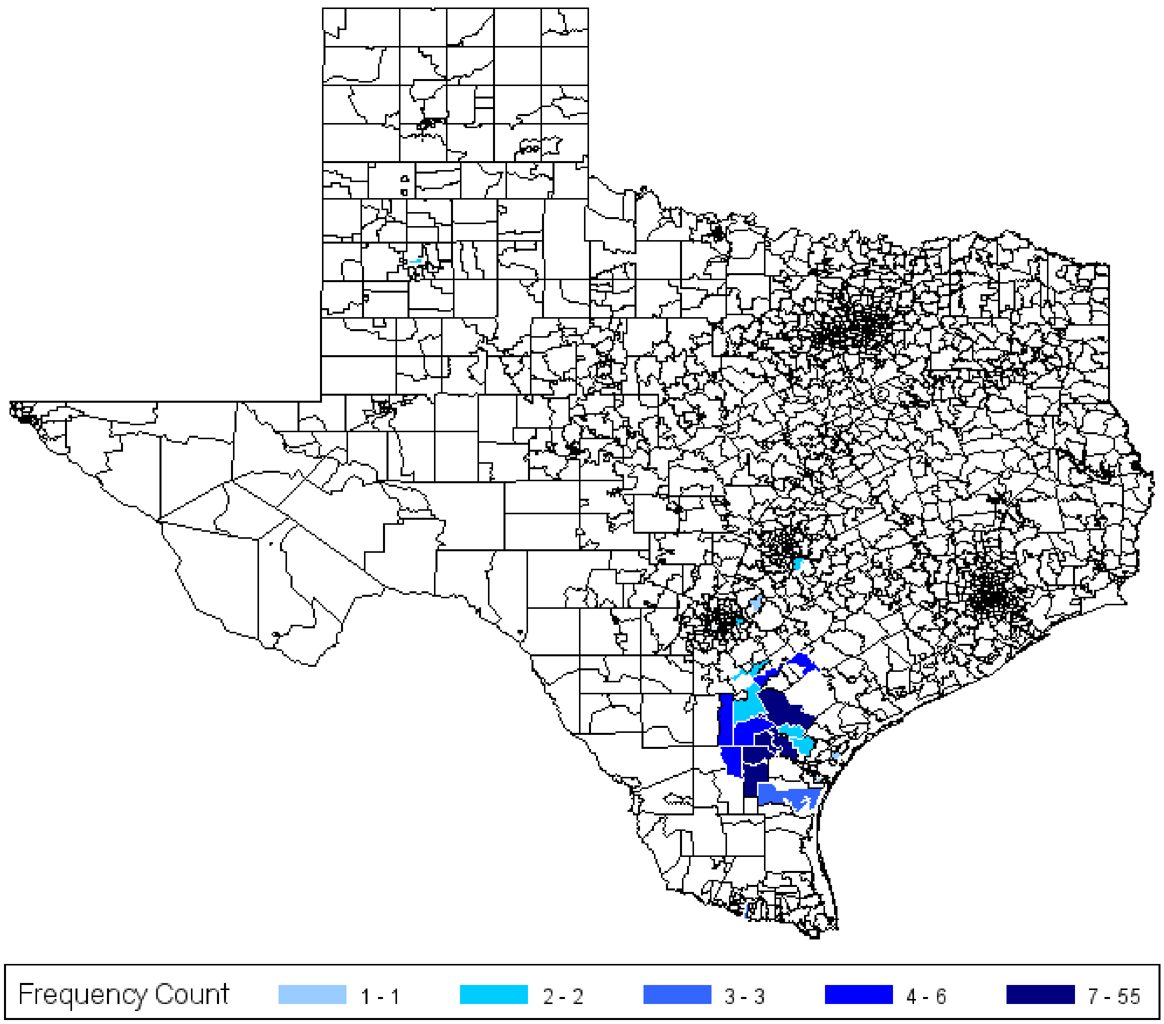


Aquatic vegetation map for Lake Corpus Christi, Texas, 2014.

APPENDIX D



Distance traveled (miles) by frequency to Lake Corpus Christi, Texas, as determined from June 2014 through May 2015 creel survey.



Location, by ZIP code, and frequency of anglers that were interviewed at Lake Corpus Christi, Texas, during June 2014 through May 2015 creel survey.

APPENDIX E

Objective-Based Sampling Plan for Lake Corpus Christi

2016 – 2019

Sport fish, forage fish, and other important fishes

Sport fish in Lake Corpus Christi include Blue, Channel, and Flathead Catfish, White Bass, Largemouth Bass, and Black and White Crappie. Important forage species include Gizzard and Threadfin Shad, and Bluegill.

Negligible Fisheries

Flathead Catfish: Flathead Catfish are present in the reservoir in low abundance. Since 1992, the mean CPUE is 0.2/nn. Directed fishing effort was 0.0% in 2014/2015 and only one fish was harvested during the creel period.

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 2018/2019 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 in high abundance and represent a popular recreational fishery. Annual gill net total CPUE since 1992 have averaged 20.9/nn (N = 12; standard deviation = 8.5; range: 8.2 – 35.3/nn) and mean stock size CPUE is 10.2/nn (N = 12; standard deviation = 3.4; range: 6.2 – 16.0/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. Blue Catfish have always been managed with the statewide 12-inch minimum length limit and 25 fish daily bag. Trend data on CPUE, size structure, and body condition have been collected at a minimum biennially since 1999 with spring gill netting. Currently, the population appears to be in good shape, and anglers are anecdotally satisfied with the fishing. 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 2017 and 2019. Sampling will continue at additional random sites until 100 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 2018/2019 to assess large-scale changes in catch and harvest.

Channel Catfish: Channel Catfish are present in Lake Corpus Christi but abundance appears to be low (average gill net CPUE = 1.1/nn; N = 12; standard deviation = 1.5; range: 0.0 – 5.5/nn). During the 2014/2015 creel period no directed fishing effort was reported and angler harvest was estimated at 486 fish. Channel Catfish have always been managed under the statewide 12-inch MLL and 25 fish daily bag. Channel Catfish have been surveyed using gill nets at least biennially since 1999 and with a creel survey in 2014/2015. However, minimal conclusions regarding the trend data on CPUE, size structure, and body condition of Channel Catfish can be made due to the few fish collected by gill nets and little data collected from creel surveys. Exploratory use of tandem baited hoop nets were deployed in the summer of 2014 and resulted in a total CPUE of 6.6/fish net series and CPUE-S of 3.5/fish net series. Continued use and evaluation of tandem baited hoop nets for Channel Catfish will occur to determine if the Channel Catfish fishery is negligible and also to determine the utility of tandem baited hoop nets for use as an alternative gear for collecting trend data on this species. Sixteen randomly selected stations will be sampled in summer 2018. Evaluation of angler catch, effort, and harvest in 2018/2019 will determine if this fishery is utilized.

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 up 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 catch data. To obtain more precise and consistent measures of population metrics such as size structure indices, White Bass will be sampled on a biennial basis with gill nets during the months of January or February. Sampling during these months should provide more consistent data that will allow biologist to detect large-scale changes in population dynamics that may warrant further investigation. A minimum of 15 randomly selected gill net sites will be sampled in 2017 and 2019. Sampling will continue at random sites until 50 stock-size fish are collected. Directed effort, angler catch, and angler harvest will be monitored with a creel survey conducted in 2018/2019 and inclusion of an additional up-river creel section will be explored.

Largemouth Bass: Largemouth Bass are present in the reservoir in good numbers in recent years. The mean historical total CPUE for Largemouth Bass is 72.7/h (N = 8; standard deviation = 59.9; range: 21.8 – 196.5/h) and mean stock-size CPUE is 34.1/h (N = 8; standard deviation = 20.6; range: 8.0 – 76.0/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. 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 was collected biennially from 2000 – 2012 with fall electrofishing with the last survey occurring in 2014. Based on the most recent surveys in 2010 and 2014, the population appears to be in good shape evidenced by the two highest catch rates of all electrofishing surveys conducted on the reservoir. Collection of biennial trend data with fall electrofishing will allow for determination of large-scale changes in population dynamics that may warrant further investigation and more intensive sampling. A minimum of 24 randomly selected electrofishing sites will be sampled in 2016 and 2018 to collect 50 stock-size fish for PSD indices and relative weight and to obtain an RSE ≤ 25 for CPUE-S. Sampling will continue up to an additional 12 stations until the objectives are attained. Directed effort, angler catch, and angler harvest will be monitored with a creel survey conducted in 2018/2019 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 = 4.8/nn; N = 10; standard deviation = 3.1; 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. While trap net sampling efforts will continue once every four years, 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. Like Largemouth Bass, trend data on CPUE and size structure of Gizzard Shad and Bluegill have been collected biennially from 2000 – 2012 and in 2014 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.