PERFORMANCE REPORT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2013 Fisheries Management Survey Report

Georgetown Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Georgetown Reservoir were surveyed in 2013 using electrofishing and in 2014 using gill netting. Historical data are presented with the 2013-2014 data for comparison. This report summarizes results of the surveys and contains a fisheries management plan for the reservoir based on those findings.

- **Reservoir Description:** Georgetown Reservoir is a 1,297-acre impoundment of the North San Gabriel River located in Williamson County, Texas. The dam was constructed in 1980 by the U.S. Army Corp of Engineers for purposes of flood control, municipal water supply and recreation.

- **Management History:** Important sport fish included White Bass, Largemouth Bass, Smallmouth Bass, catfish species and Palmetto Bass. Palmetto Bass were stocked annually starting in 2003, with the exception of 2010, 2012, and 2014. Sunshine Bass were stocked instead of Palmetto Bass in 2014. Smallmouth Bass were stocked from 2006 through 2008, and from 2010 to 2011, but stocking was terminated once it was determined that the population could not support a fishery. Stockings of Blue Catfish were made in 2000 and 2001 in an attempt to establish a fishery for this species. Florida Largemouth Bass were stocked in 1986. Largemouth Bass have been managed since 1993 with a 14- to 18-inch slot-length limit. An analysis of that length limit change suggested it had been successful in increasing density and angler catch rate of bass greater than 14 inches in length. Angler harvest of sub-slot bass was not sufficient to improve growth under the slot length limit.

- **Fish Community**
  - **Prey species:** Gizzard Shad, Redbreast Sunfish and Bluegill were the predominant prey species available. Threadfin Shad, Longear Sunfish, Green Sunfish, Warmouth, and Redear Sunfish were also available as forage. The forage base was adequate to support sport fish.

  - **Catfishes:** Blue and Channel Catfish were present in low densities, but Channel Catfish were the dominant catfish species present. Flathead Catfish were not present but were recorded in previous surveys in low densities.

  - **Temperate Basses:** White Bass abundance increased since the previous survey; fish up to 15 inches in length were present. On average, White Bass growth to harvestable size was average for this species. The gill net catch rate of Palmetto Bass in 2014 was higher than in 2010 and was composed of sub-legal size fish, the majority of which were age-1.

  - **Largemouth Bass:** Largemouth Bass abundance in 2013 was moderate to low. The population was dominated by individuals less than 14 inches in length, while the largest fish caught was 20 inches in length. Body condition was adequate. Growth was below average.

  - **Smallmouth Bass:** Smallmouth Bass were present in low numbers. Only two were collected in the 2013 electrofishing survey. Similar numbers were recorded in the previous standard survey (2009). In 2011, an additional survey targeting Smallmouth Bass also resulted in similar catch rates.

- **Management Strategies:** Based on current information, the reservoir should continue to be managed with existing regulations. Subject to availability, Palmetto Bass or Sunshine Bass (collectively known as Hybrid Striped Bass) should continue to be stocked until the viability of this fishery has been determined. The status of the Hybrid Striped Bass population should be documented with an additional gill net survey in 2016. Fish attractor sites should continue to be replenished with brush as needed.

INTRODUCTION

This document is a summary of fisheries data collected from Georgetown Reservoir in 2013 - 2014. 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 2013-2014 data for comparison.

Reservoir Description

Georgetown Reservoir is a 1,297-acre impoundment of the North San Gabriel River, a tributary of the Brazos River, located in Williamson County, Texas. The dam was constructed in 1980 by the United States Army Corp of Engineers (USACE) for purposes of flood control, municipal water supply and recreation. Georgetown Reservoir has a drainage area of approximately 246 square miles, a shoreline length of 21.6 miles, and a shoreline development index of 4.9. The basin is steep-sided with relatively few shallow coves and shoal areas. The reservoir lies within the Edwards Plateau ecological area. Georgetown Reservoir is oligotrophic with a mean TSI chl-*a* of 34.58, and a 10-year change of -2.48 (Texas Commission on Environmental Quality 2011). Water level varies widely (Figure 1), and is replenished via an inter-basin transfer from Stillhouse Hollow Reservoir. Other descriptive characteristics for Georgetown Reservoir are in Table 1.

Angler Access

Boat access consisted of three public boat ramps which were in good condition. Bank fishing access was good as the entire shoreline was USACE property. Three of the four public fishing piers were usable at the time of the 2013 survey. In 2012, lake levels dropped below operative ramp levels, closing boat access for a prolonged period. The upper end of the reservoir has a hiking trail (The Good Water Trail) and primitive camping area (Camp Tejas) which has historically allowed White Bass anglers access to the upper end of the reservoir during the spring spawning migration. Bank access was excellent along the USACE parks; however drought conditions have rendered the recently refurbished public fishing piers unusable. Additional boat ramp characteristics are in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Magnelia and De Jesus 2010) included:

1. New fish attractor sites should be added as needed and existing fish attractors should be refurbished at least once every three years.
   Action: Attractor installation and/or maintenance was conducted from 2010 to 2013.
2. Age Blue Catfish taken from gill net surveys to further document natural reproduction.
   Action: No sampling could be conducted in 2012 since all boat ramps were closed due to drought conditions. Only six Blue Catfish were captured in 2014 the smallest of which was 17 inches in length. Based on length-at-age data from the 2010 survey, this fish is likely to be from natural reproduction since Blue Catfish were documented as reaching 15 inches by age 2 (Magnelia and De Jesus 2010) and none have been stocked since 2001.
3. Continue requesting stockings of Palmetto Bass at 5 per acre. Conduct an additional gill net survey in spring 2012 to further determine the status of the Palmetto Bass population and promote the Palmetto Bass fishery through appropriate media outlets.
   Action: Palmetto Bass were stocked at 5 per acre in 2011 and 15 per acre in 2013. No sampling could be conducted in 2012 since all boat ramps were closed due to drought conditions.
4. Continue to request stocking of Smallmouth Bass each year. If greater numbers of Smallmouth Bass are not collected in the next two electrofishing surveys or angler catches are not documented consideration should be made to stop stocking this species.
   Action: An electrofishing survey was conducted in 2011 to document Smallmouth Bass abundance (CPUE = 1.1/h). Smallmouth Bass stocking requests were cancelled in 2012

when it became evident that poor recruitment hindered the potential to develop a fishery.

Harvest regulation history: From 1986 to 1993, Largemouth Bass were managed with a 14-inch minimum length limit. A 14- to 18-inch slot length limit was implemented on September 1, 1993 to: increase abundance of bass greater than 14 inches in length; increase angler catches of bass greater than 14 inches in length; and, re-direct harvest at individuals less than 14 inches in length. White Bass were managed under an experimental 12-inch minimum length limit from September 1, 1995 to September 1, 2004 in an attempt to increase density, help stabilize year-to-year fluctuations in year class strength and increase angler yield. An analysis of this regulation change suggested reservoir inflows during spawning periods were probably more influential in determining White Bass density than angler harvest. This regulation was rescinded in favor of the statewide 10-inch minimum length limit. Current regulations are found in Table 3.

Stocking history: Florida Largemouth Bass, Blue Catfish, Palmetto Bass and Smallmouth Bass have been important species stocked in the reservoir. Georgetown Reservoir has been stocked with Palmetto Bass (female Striped Bass X male White Bass hybrid) nearly every year since 2003 with the exception of 2010, 2012, and 2014 when the request could not be met due to production issues. However, Sunshine Bass (male Striped Bass X female White Bass hybrid) were available and stocked in place of Palmetto Bass in 2014 to maintain the Hybrid Striped Bass fishery. Smallmouth Bass were stocked nearly every year from 2006 to 2011 (with the exception of 2009). Stocking requests for Smallmouth Bass were cancelled in 2012. The complete stocking history is in Table 4.

Vegetation/habitat management history: Georgetown Reservoir has never been reported to support aquatic vegetation; probably due to the widely fluctuating water level and rocky substrate. Structural shoreline habitat consisted primarily of rocky shoreline and gravel shoreline. Some standing timber was available in main lake coves and the upper reaches of the reservoir. Artificial fish attractors have been installed and maintained around the reservoir to provide concentrating habitat for cover-seeking species and to help improve angler success.

Water Transfer: Georgetown Reservoir is primarily used for flood control, municipal water supply, and recreation. An inter-basin pipeline from Stillhouse Hollow Reservoir is used to replenish water supply for the growing cities of Georgetown and Round Rock, supplied by Georgetown Reservoir.

METHODS

Fishes were collected by electrofishing (1.0 hour at 12, 5-min stations) and gill netting (15 net nights at 15 stations). Gill net effort was tripled in an effort to better determine if Palmetto Bass stockings have been successful and document any further expansion of the population. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and for gill nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures Manual (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

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). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). 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. Ages were determined using otoliths for Largemouth Bass (n=11), Palmetto Bass (n=16) and White Bass (n=61) (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Micro-satellite DNA analysis was

used to determine genetic composition of individual fish from 2005 through 2012 and by electrophoresis for previous years.

Source for water level data was the United States Geological Survey (USGS 2014).

RESULTS AND DISCUSSION

Habitat: In 2013, littoral habitat consisted primarily of rocky shoreline (42.0%) and gravel shoreline (22.0%) (Table 5). Standing timber provided some cover. Stands of aquatic vegetation have never been documented.

In 2012, the Brazos River Authority (BRA), in negotiations with Texas Parks and Wildlife Department, asked for a fishery assessment to be provided for all eleven BRA jurisdictional reservoirs. These assessments would be taken into consideration for a multi-year system operating plan for the Brazos River Basin. Assessments for Georgetown Reservoir included habitat availability and access at various lake levels. Based on these multiple assessments, threshold recommendations were provided to decrease potential impacts to the fishery during future basin-wide water level manipulations. Georgetown Reservoir has a relatively uniform depth, but is steep sided (Appendix C). Littoral habitat availability at all reaches of the reservoir declines significantly with a relatively small drop in lake level (Appendix D). Overall, littoral areas are significantly compromised below 787 ft.-msl (Appendix E). A less pronounced trend is seen for woody habitat in this reservoir (Appendix F). Recreational access is also affected by reduced lake levels. Of three public ramps on Georgetown Reservoir, two remain functional below 772 ft.-msl, and access is completely lost below 769 ft.-msl, which is 22 feet below conservation pool (Appendix G). Based on these assessments and lake characteristics, the Georgetown Reservoir management threshold recommendation was 787 ft.-msl, i.e., 4 ft. below top of conservation (TOC) or conservation pool (Appendix H). Future water level models under predicted BRA management potential scenarios show that duration of low-water periods reaching the critical threshold will be minimal and not significantly greater than what it is today (Appendix I).

In partnership with Sun City Hunting and Fishing Club 10 fish attractor sites were refurbished with ashe juniper brush piles (Appendix J and K). These structures will provide habitat for cover-seeking species and can be targeted by anglers.

Prey species: Gizzard Shad, Bluegill, and Redbreast Sunfish were the predominant prey species. Threadfin Shad, Longear Sunfish, Green Sunfish, Warmouth, and Redear Sunfish were also available as forage. The IOV for Gizzard Shad was 29, indicating that 29.0% of Gizzard Shad were ≤ 8 inches in length, thereby making them susceptible to most predators. The IOV was lower than in the 2011 survey (50), but higher than in 2005 (17). In 2013, total CPUE for Gizzard Shad (99.0/h) was higher than in the 2011 (67.3/h) and 2005 (47.3/h) surveys (Figure 2). Threadfin Shad were collected at the rate of 8.0/h in 2013, which is much lower than in the 2009 (126.7/h) and 2005 (19.3/h) surveys. Total CPUE of Redbreast Sunfish in 2013 (112.0/h) was much higher than in 2009 (12.0/h) and 2005 (42/h). A greater abundance of larger fish (6 to 7 inches in length) could provide for better fishing opportunities for panfish anglers, especially on light tackle (Figure 3). Bluegill total electrofishing CPUE was 57.0/h in 2013 which was higher than in 2009 (10.7/h). Nevertheless Bluegill CPUE is typically relatively low for this reservoir (2005 = 96.7/h, 2001 = 63.0/h). In 2013, the majority of Bluegill were in the 2 to 4-inch size class (Figure 4).

Catfishes: The total gill net catch rate of Blue Catfish was 0.4/nn in 2014 which was similar to that in 2010 (0.3/nn) and lower than the catch rate of 1.0/nn in 2006 (Figure 5). Blue Catfish were most recently stocked in 2000 and 2001. In 2014, all Blue Catfish were above harvestable size with the largest fish measuring 28 inches in length. A new water body record (rod and reel) for Blue Catfish was established in 2012 (34.5 pounds, 39.0 inches). Body condition (W_r) for most of the specimens collected in 2014 was adequate. Gill netting catch rate for Channel Catfish was 1.0/nn in 2014 which is higher than in 2010 (0.4/nn) and lower than in 2006 (1.8/nn) (Figure 6). In 2014, all Channel Catfish were above harvestable

size with the largest fish measuring 28 inches in length. Body condition for most of the specimens collected in 2014 was good. Flathead Catfish were not captured in the 2014 survey, but were present in relatively low numbers in previous surveys; total CPUE was 0.3/nn in 2010, 0.2/nn in 2006, and 0.4/nn in 2002.

White Bass: The total gill net catch rate of White Bass was 7.1/nn in 2014. This was higher than that recorded in 2010 (1.6/nn) and 2006 (4.0/nn) (Figure 7). The gillnet CPUE of harvestable size White Bass (≥ 10 inches) increased in 2013 (7.1/nn) compared to surveys in 2010 (1.6/nn) and 2006 (3.8/nn); the largest fish was 15 inches in length. Body condition (W_r) for most fish was adequate. On average, White Bass reached harvestable size (10 inches) between age 1 and 2 (Figure 8). A strong year class of age-2 fish coincides with a significant increase in water level in 2012 (Figure 1). White Bass are known to congregate in large numbers along windblown gravel shorelines to spawn in spring which may help conserve the population during periods of drought when flowing water is restricted. Public access along the upper reaches of the reservoir via Camp Tejas and the Good Water Trail made this one of Central Texas' most accessible White Bass fisheries for bank anglers. Magnelia and De Jesus (2006) found that during the spring creel quarter White Bass angling accounted for 37.9% of the angling effort.

Palmetto Bass: The gill net catch rate of Palmetto Bass in 2014 was 1.1/nn which is higher than in 2010 (0.3/nn), but lower than in 2006 (4.0/nn) (Figure 9). However, in both 2014 and 2010 no harvestable size fish were captured even though gill net effort was tripled in 2010 and 2014 in an effort to better determine if stockings had been successful and document further expansion of the population. Individuals collected in 2014 ranged from 9- to 13-inches in length and the majority of fish were age-1 (Figure 10) i.e., from the 2013 stocking. Stocking requests for 2010 and 2012 were not fulfilled due to production issues and these missing year classes have likely had a significant impact on the production of harvestable-size fish now and in the future.

Largemouth Bass: The total catch rate of Largemouth Bass was 53.0/h in 2013 compared to catch rates of 41.3/h in 2009, and 222.7/h in 2007 (Figure 11). The high catch rate in 2007 was an anomaly due to a strong year class sustained by flooded lake conditions, where flooded terrestrial vegetation served as habitat. In 2013, the electrofishing catch rate of Largemouth Bass greater than 14 inches (CPUE14 = 5.0/h) was much lower than in 2007 (12.7/h), but greater than in 2009 (1.3/h). The CPUE14 for the 2013 and 2009 surveys was much lower than the post-slot length limit mean CPUE14 of 10.8/hour (Magnelia and De Jesus 2010). The CPUE18 was relatively low in 2013 (1.0/h), 2009 (0.0/h), and 2007 (2.0/h). Body condition for most fish was adequate. On average, Largemouth Bass in Georgetown Reservoir reached 14 inches by age-3 (Figure 12). When compared to values for the Edwards Plateau ecological area (Prentice 1987), this growth rate was below average. The reservoir was stocked with Florida Largemouth Bass in 1986. Florida Largemouth Bass influence in 2013 was 59.4% (Table 6). Angler catch rates for Largemouth Bass on this reservoir have historically been low. The lack of aquatic vegetation habitat and chronically low and highly fluctuating water levels on this reservoir (Figure 1) most likely have a negative effect on Largemouth Bass spawning success and recruitment.

Smallmouth Bass: Smallmouth Bass were present in low numbers in 2013 (CPUE = 2.0/h), 2011 (CPUE = 1.1/h), and 2009 (0.7/h) despite annual stockings in 2006, 2007, 2008, 2010, and 2011. Similar to the situation with Largemouth Bass, fluctuating water levels throughout the year caused by high water demands from growing Austin suburbs, make it difficult for Smallmouth Bass to recruit and establish a sustainable fishery. Furthermore, the confirmation of a pure Guadalupe Bass population in the South San Gabriel River is enough to halt further Smallmouth Bass stocking attempts. In other parts of the region, hybridization between these two species has been shown to be detrimental to the integrity and sustainability of pure Guadalupe Bass populations.

Fisheries management plan for Georgetown Reservoir, Texas

Prepared – July 2014.

ISSUE 1: Angler catch rates for Largemouth Bass on this reservoir have historically been low, due in part to a lack of suitable habitat.

MANAGEMENT STRATEGY

1. The fish attractor program on this reservoir has been popular with anglers and should increase angler catch rates. New fish attractor sites should be added as needed and existing fish attractors should be refurbished at least once every three years in partnership with Sun City Hunting and Fishing Club.

ISSUE 2: Palmetto Bass were annually stocked in this reservoir from 2003 to 2009 and in 2011 and 2013. Despite triple the gill netting sampling effort (15 net nights) in 2014 and 2010 relatively few individuals were caught and none were above harvestable size.

MANAGEMENT STRATEGY

1. Request annual Palmetto Bass stockings at 15 per acre.

2. Conduct an additional gill net survey in spring 2016 to monitor the status of the Hybrid Striped Bass population and determine whether future stocking efforts should continue.

ISSUE 3: Smallmouth Bass have been stocked nearly every year from 2006 to 2011 (with the exception of 2009) in an effort to establish a viable fishery. However, Smallmouth Bass recruitment, revealed by poor catch rates, has been hindered by poor habitat resulting from significant water level fluctuations. These water level fluctuations will most-likely become a regular occurrence with future water management authority plans.

MANAGEMENT STRATEGY

1. Based on the failure of successive stocking efforts to establish a population of Smallmouth Bass sufficient to support a fishery, the further stocking of Smallmouth Bass in Georgetown Reservoir has been terminated.

ISSUE 4: 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**.** The threat of zebra mussel infestation in Georgetown Reservoir has been elevated due to their recent establishment in a reservoir within the Brazos River watershed. Belton Reservoir has been confirmed to have zebra mussels and poses a significant threat to nearby Stillhouse Hollow Reservoir which supplies water to Georgetown Reservoir.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Visually inspect rocks along the shoreline of the reservoir to confirm presence or absence of

zebra mussels.
3. Establish a zebra mussel monitoring program to target adults and veligers.
4. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers.
5. Educate the public about invasive species through the use of media and the internet.
6. Make a speaking point about invasive species when presenting to constituent and user groups.
7. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes mandatory monitoring in 2017/2018 (Table 7). Additional electrofishing in 2015 is necessary to continue monitoring recruitment success of Largemouth Bass. Additional gill netting in 2016 is necessary to determine the status of the Hybrid Striped Bass population. Trap net sampling for White Crappie has been cancelled on this reservoir because of low historical trap net catches and low directed angler effort for this species.

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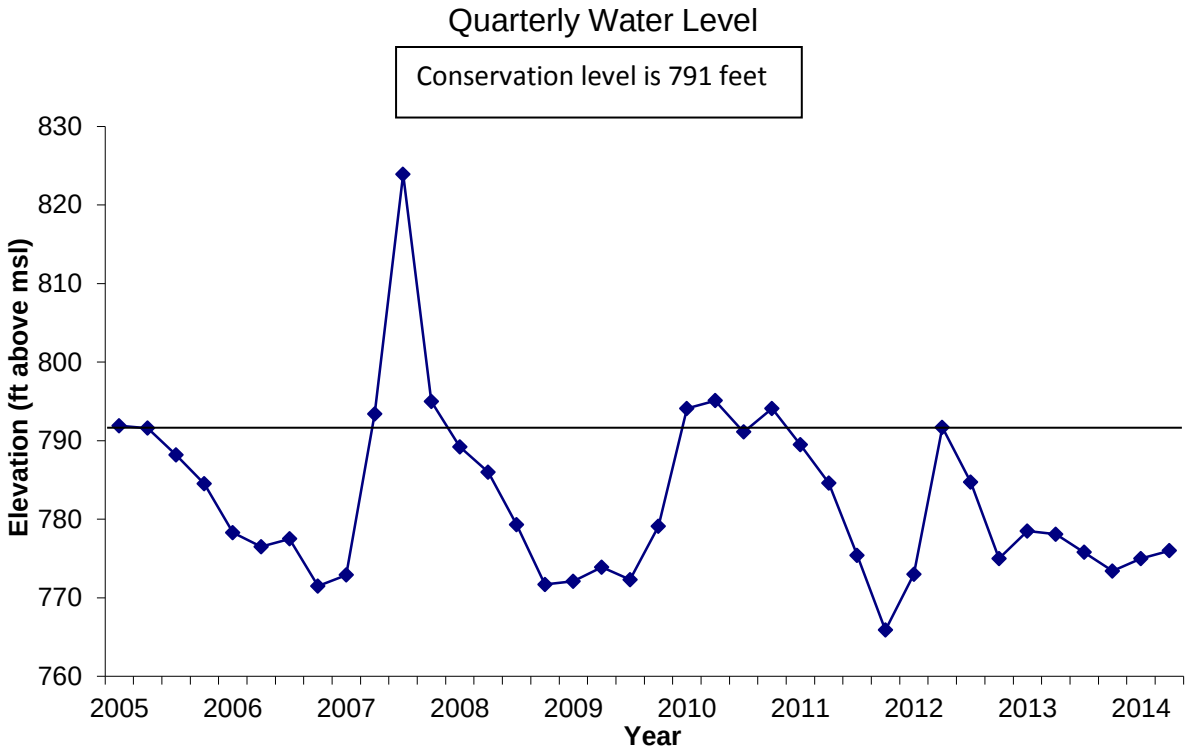


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Georgetown Reservoir, Texas 2005-2014.

Table 1. Characteristics of Georgetown Reservoir, Texas.

Characteristic	Description
Year constructed	1980
Controlling authority	United States Army Corps of Engineers
County	Williamson
Reservoir type	Mainstream: North San Gabriel River
Shoreline Development Index	4.9
Conductivity	405.3 µS/cm

Table 2. Boat ramp characteristics for Georgetown Reservoir, Texas, August, 2013. Reservoir elevation at time of survey was 774 feet above mean sea level (conservation level is 791 feet).

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft.)	Condition
Jim Hogg Park	30.681022 -97.742858	Y	39	NA	Good
Cedar Breaks	30.672817 -97.734861	Y	39	NA	Good
Russell Park	30.675514 -97.754189	Y	39	NA	Good

Table 3. Harvest regulations for Georgetown Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Palmetto	5	18-inch minimum
Bass, Smallmouth	5[a]	14-inch minimum
Bass, Largemouth	5[a]	14- to 18-inch slot
Bass: Spotted and Guadalupe	5[a]	None
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

[a] Daily bag for Smallmouth Bass, Largemouth Bass, Spotted Bass, and Guadalupe Bass = 5 fish in any combination.

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

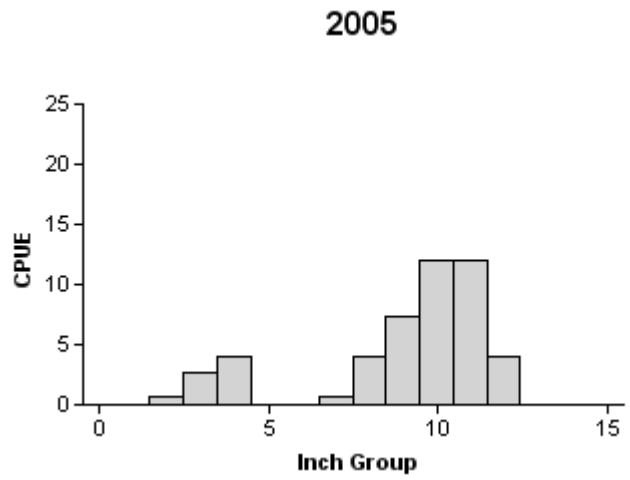
Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1989	13,240	FGL	2.4
	2000	167,173	FGL	2.2
	2001	4,030	AFGL	10.6
	2001	131,019	FGL	2.1
	Total	315,462		
Channel Catfish	1978	14,900	AFGL	7.9
	1978	98	UNK	UNK
	1979	40,000	AFGL	7.9
	Total	54,998		
Florida Largemouth Bass	1986	3,000	FGL	2.0
	Total	3,000		
Largemouth Bass	1981	10,020	UNK	UNK
	Total	10,020		
Palmetto Bass (Striped Bass X White Bass hybrid)	1980	13,000	UNK	UNK
	1982	13,179	UNK	UNK
	2003	6,485	FGL	1.5
	2004	6,494	FGL	1.6
	2005	6,475	FGL	1.5
	2006	6,487	FGL	1.8
	2007	5,495	FGL	1.7
	2008	6,734	FGL	1.5
	2009	7,595	FGL	1.5
	2011	6,764	FGL	1.5
	2013	19,745	FGL	1.8
	Total	98,453		
Smallmouth Bass	1978	30,000	UNK	UNK
	1979	100,000	UNK	UNK
	1980	100,552	UNK	UNK
	1981	107,264	UNK	UNK
	1992	32,774	FGL	1.3
	1995	32,721	FRY	0.9
	2006	11,764	FGL	2.0
	2007	29,795	FGL	2.0
	2008	32,457	FGL	1.4
	2010	35,438	FGL	1.4
	2011	10,535	FGL	1.7
	Total	523,300		

Species	Year	Number	Life Stage	Mean TL (in)
Sunshine Bass (White Bass X Striped Bass hybrid)	2014	6,611	FGL	1.5
	Total	6,611		
Walleye	1981	2,000,000	FRY	0.2
	1983	2,514,729	FRY	0.2
	Total	4,514,729		

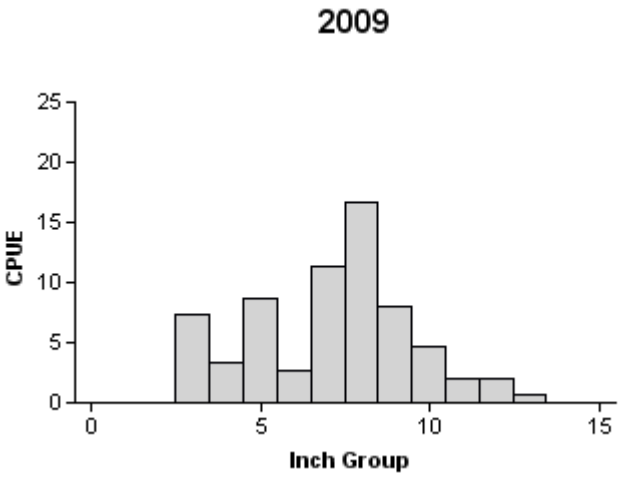
Table 5. Survey of structural habitat types, Georgetown Reservoir, Texas, 2013. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Gravel Shoreline	4.1 miles	22.0
Natural Shoreline	3.2 miles	18.0
Rocky Bluff	3.2 miles	18.0
Rocky Shoreline	7.6 miles	42.0
Standing timber	103.0 acres	11.0

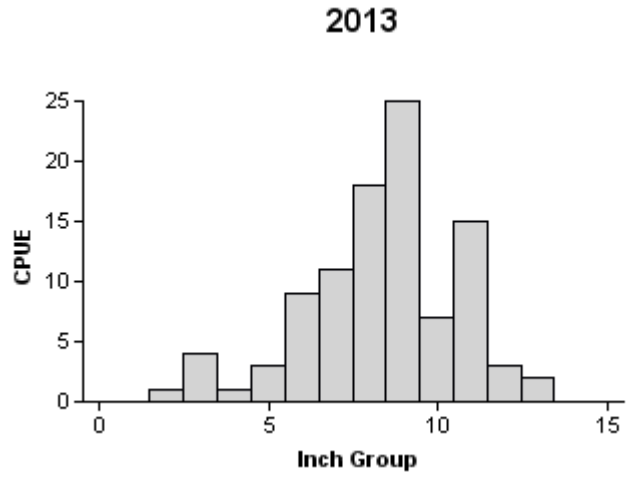
Gizzard Shad



Effort = 1.5
Total CPUE = 47.3 (44; 71)
IOV = 17 (10.9)



Effort = 1.5
Total CPUE = 67.3 (28; 101)
IOV = 50 (8.3)

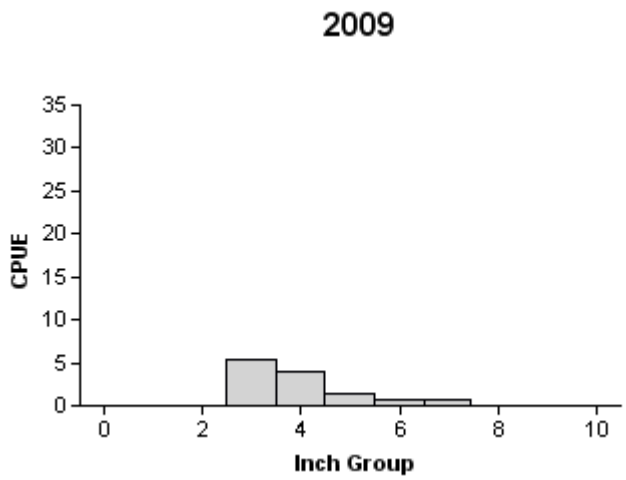


Effort = 1.0
Total CPUE = 99.0 (37; 99)
IOV = 29 (11.7)

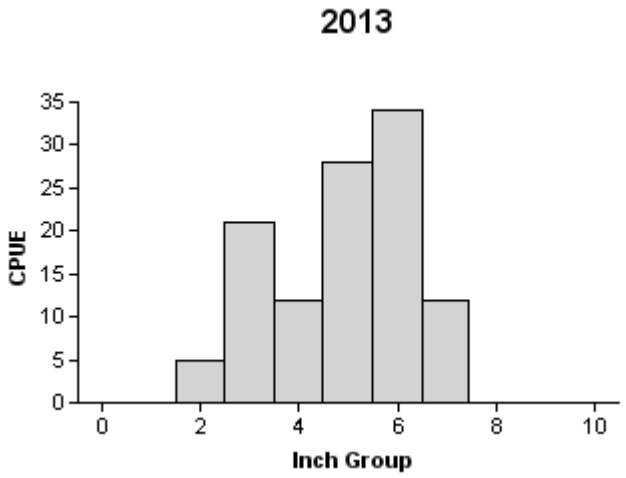
Figure 2. Number of Gizzard Shad caught per hour (CPUE) population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Georgetown Reservoir, Texas, 2005, 2009 and 2013.

Redbreast Sunfish

Effort = 1.5
Total CPUE = 42.0 (22; 63)
PSD = 25 (6.4)



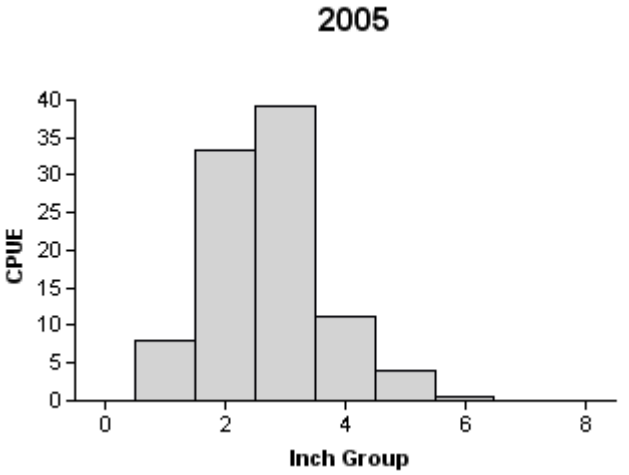
Effort = 1.5
Total CPUE = 12.0 (34; 18)
PSD = 11 (7.6)



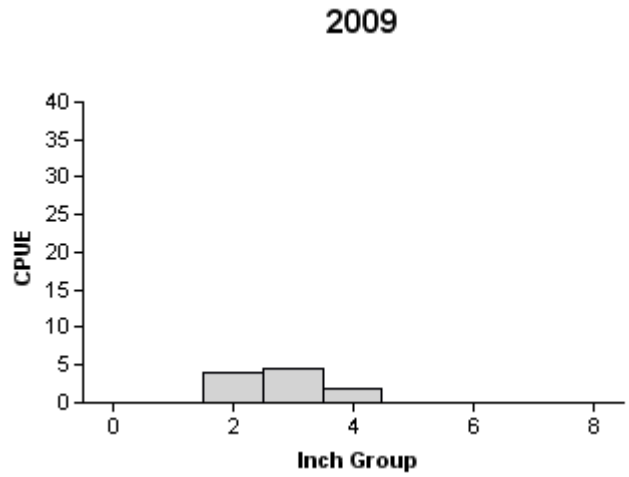
Effort = 1.0
Total CPUE = 112.0 (33; 112)
PSD = 43 (4.8)

Figure 3. Number of Redbreast Sunfish caught per hour (CPUE) population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Georgetown Reservoir, Texas, 2005, 2009 and 2013.

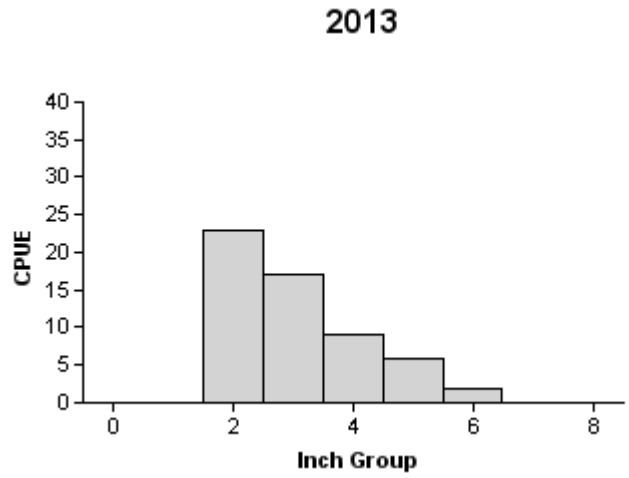
Bluegill



Effort = 1.5
Total CPUE = 96.7 (25; 145)
PSD = 1 (1.3)



Effort = 1.5
Total CPUE = 10.7 (27; 16)
PSD = 0 (58.2)



Effort = 1.0
Total CPUE = 57.0 (34; 57)
PSD = 6 (4.2)

Figure 4. Number of bluegill caught per hour (CPUE) population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Georgetown Reservoir, Texas, 2005, 2009 and 2013.

Blue Catfish

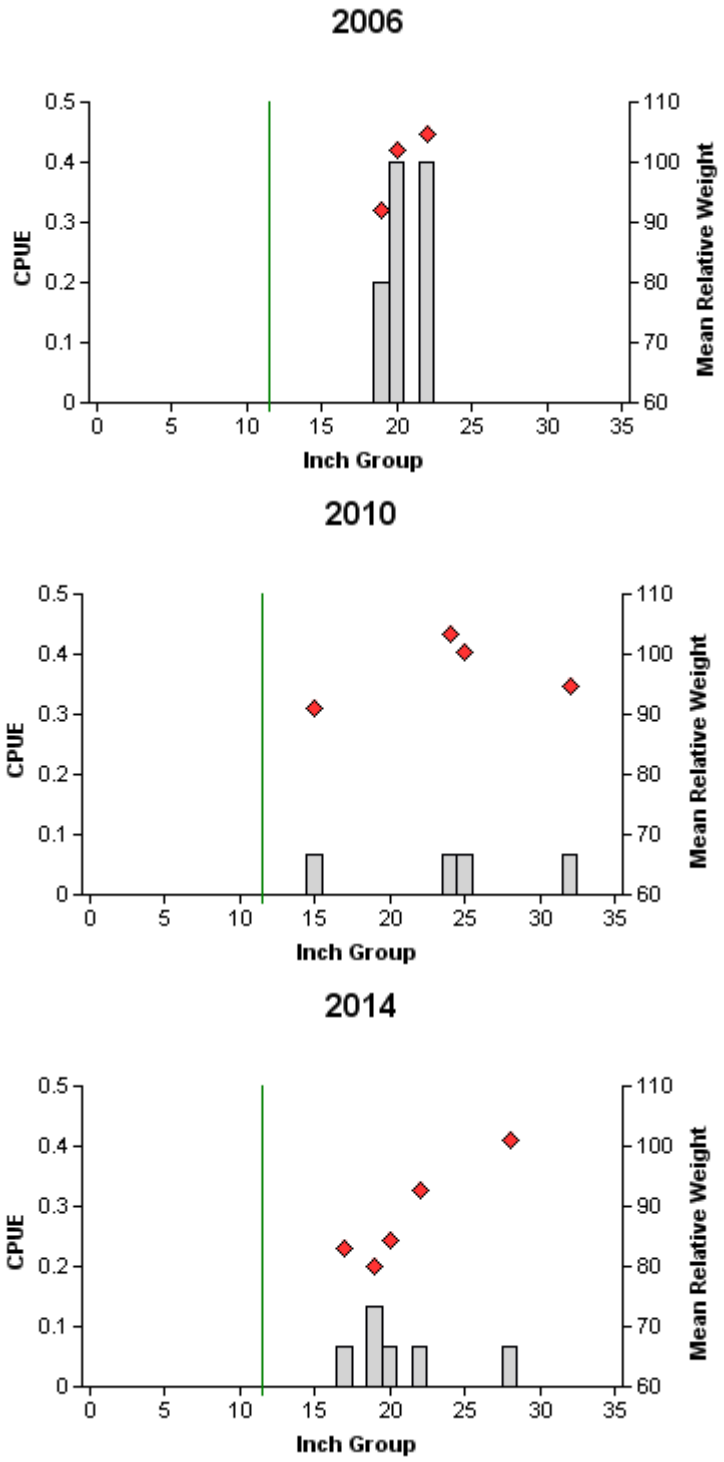
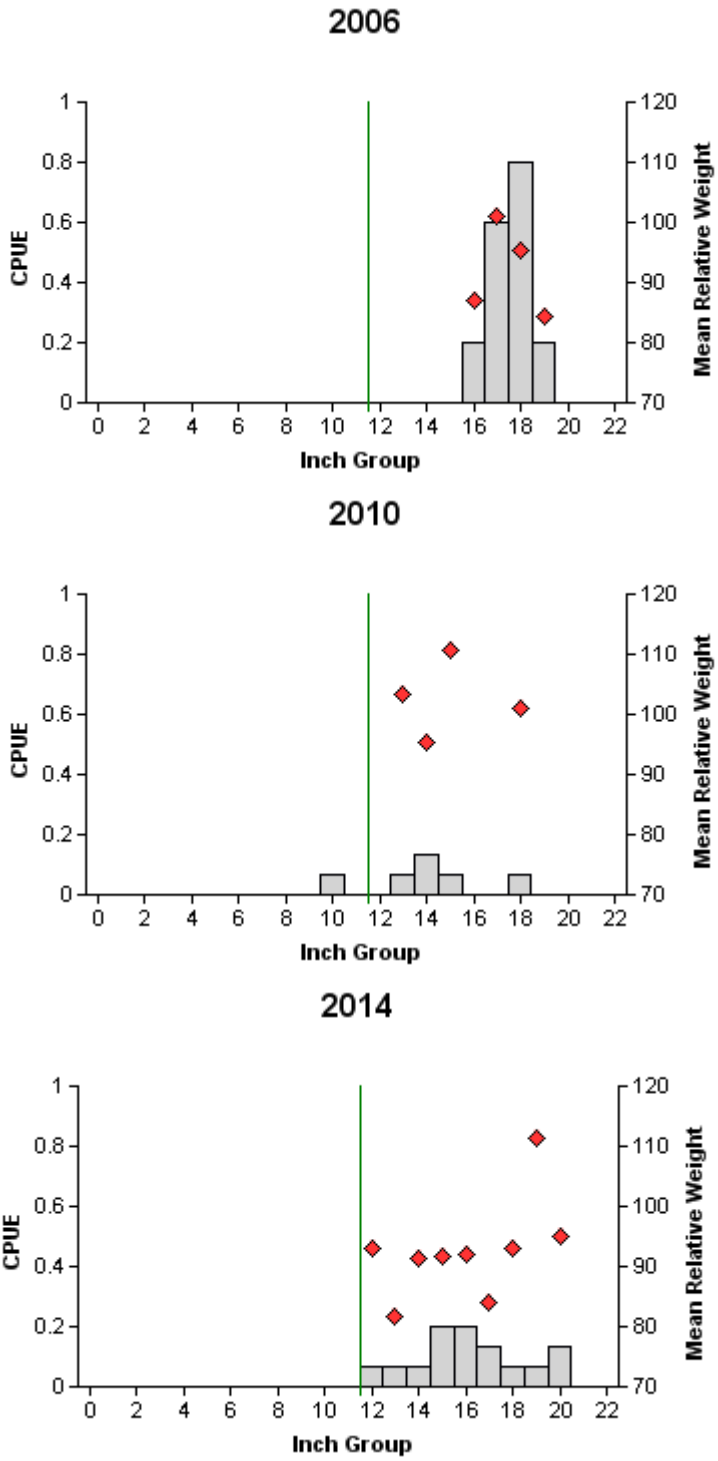


Figure 5. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Georgetown Reservoir, Texas, 2006, 2010 and 2014. Vertical line represents minimum length limit at the time of sampling.

Channel Catfish



Effort = 5.0
Total CPUE = 1.8 (32; 9)
Stock CPUE = 1.8 (32; 9)
CPUE-12 = 1.8 (32; 9)
PSD = 100 (0)

Effort = 15.0
Total CPUE = 0.4 (41; 6)
Stock CPUE = 0.3 (48; 5)
CPUE-12 = 0.3 (48; 5)
PSD = 20 (14.3)

Effort = 15.0
Total CPUE = 1.0 (20; 15)
Stock CPUE = 1.0 (20; 15)
CPUE-12 = 1.0 (20; 15)
PSD = 60 (13.2)

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 are in parentheses) for spring gill net surveys, Georgetown Reservoir, Texas, 2006, 2010 and 2014. Vertical line represents minimum length limit at the time of sampling.

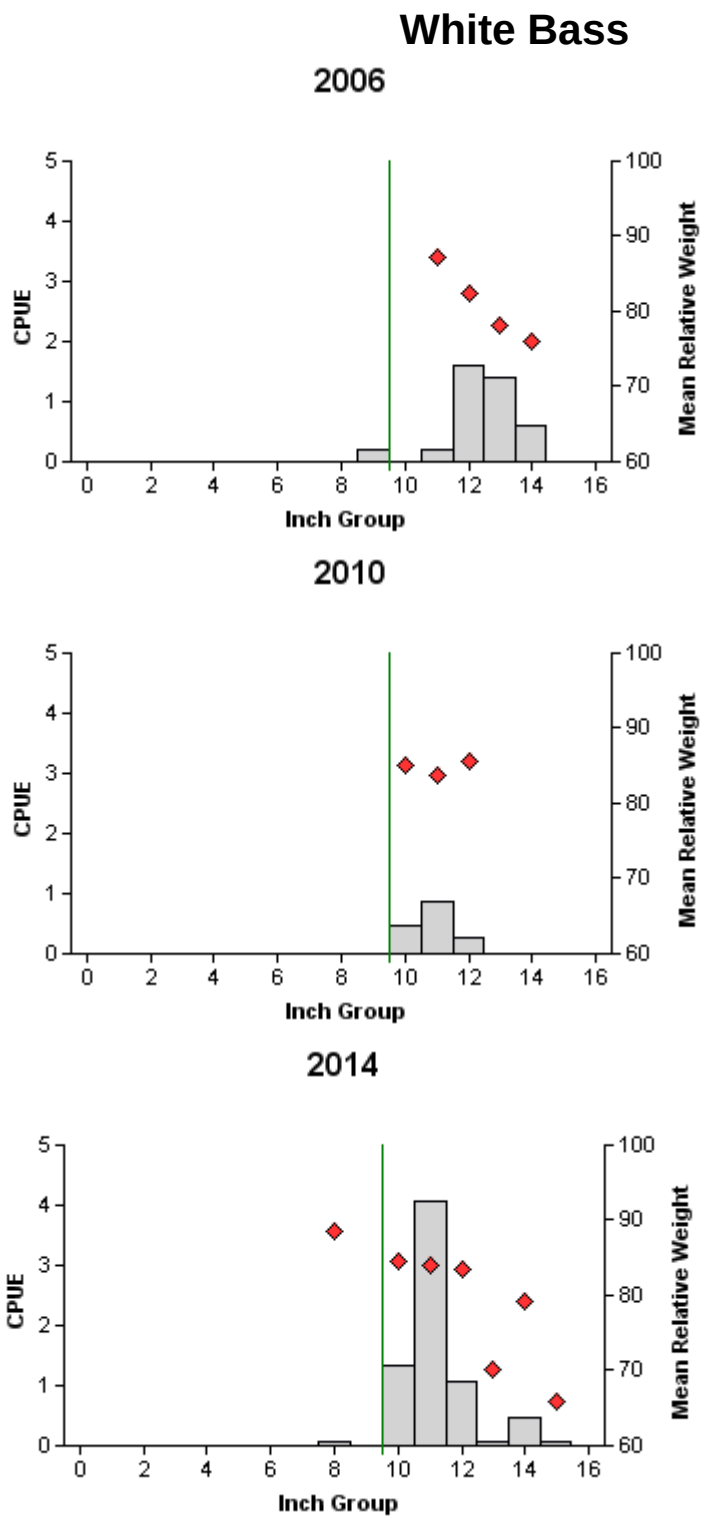


Figure 7. Number of White Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Georgetown Reservoir, Texas, 2006, 2010 and 2014. Vertical lines represent minimum length limit at the time of sampling.

White Bass

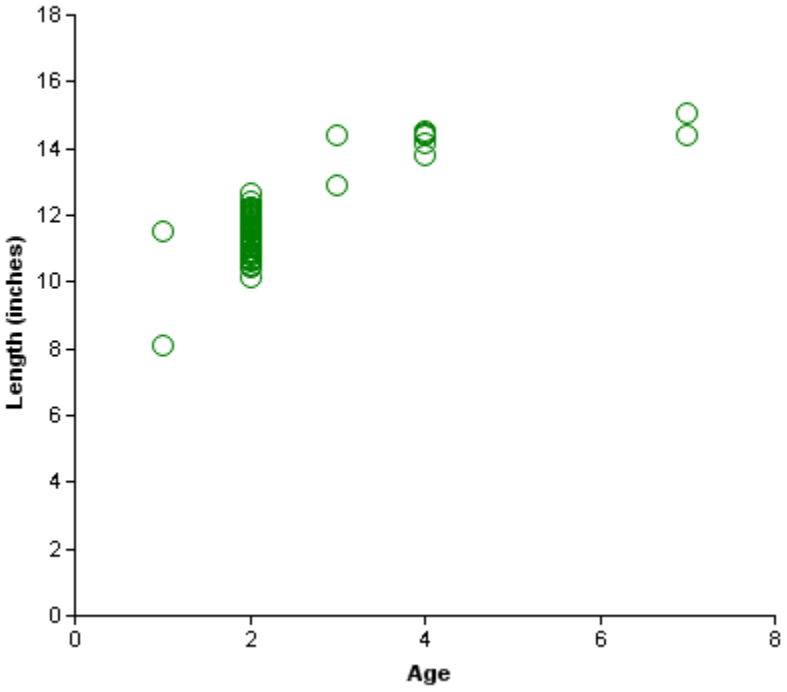
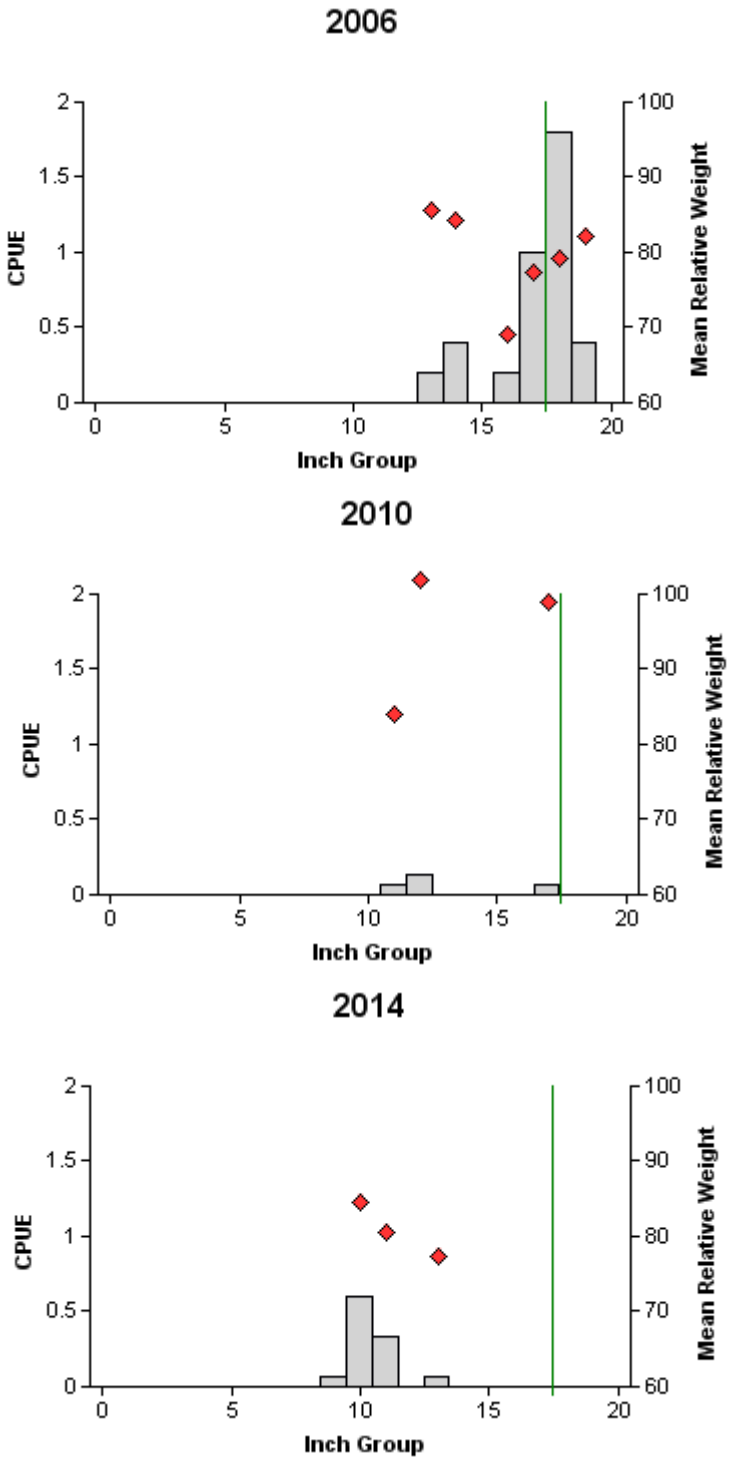


Figure 8. Length at age for White Bass collected from gill nets at Georgetown Reservoir, Texas, March 2014.

Palmetto Bass



Effort = 5.0
Total CPUE = 4.0 (88; 20)
Stock CPUE = 4.0 (88; 20)
CPUE-18 = 2.2 (100; 11)
PSD = 85 (2.1)

Effort = 15.0
Total CPUE = 0.3 (77; 4)
Stock CPUE = 0.3 (77; 4)
CPUE-18 = 0.0 (0; 0)
PSD = 25 (9.2)

Effort = 15.0
Total CPUE = 1.1 (48; 16)
Stock CPUE = 1.0 (48; 15)
CPUE-18 = 0.0 (0; 0)
PSD = 0 (58.6)

Figure 9. Number of Palmetto 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 spring gill net surveys, Georgetown Reservoir, Texas, 2006, 2010 and 2014. Vertical lines represent minimum length limit at the time of sampling.

Palmetto Bass

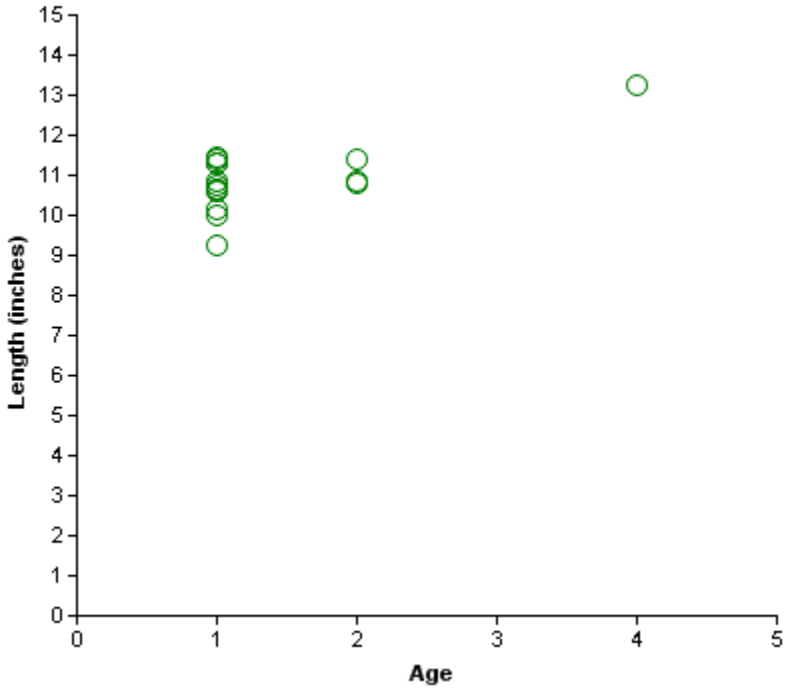
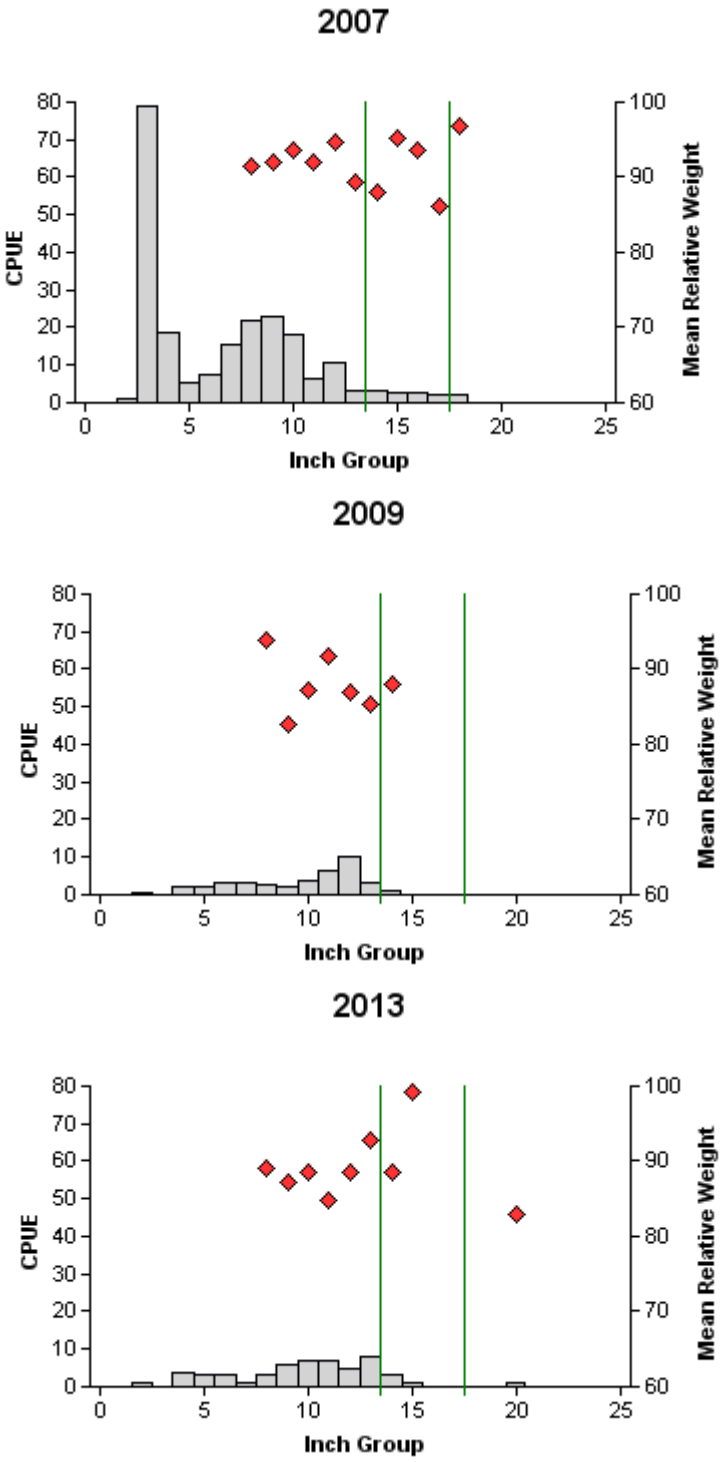


Figure 10. Length at age for Palmetto Bass collected from gill nets at Georgetown Reservoir, Texas, March 2014.

Largemouth Bass



Effort =	1.5
Total CPUE =	222.7 (13; 334)
Stock CPUE =	96.0 (16; 144)
CPUE-14 =	12.7 (24; 19)
CPUE-18 =	2.0 (54; 3)
PSD =	28 (4.1)
PSD-P =	10 (3.2)
PSD-M =	0 (0)

Effort =	1.5
Total CPUE =	41.3 (18; 62)
Stock CPUE =	30.0 (21; 45)
CPUE-14 =	1.3 (69; 2)
CPUE-18 =	0.0 (0; 0)
PSD =	49 (6.4)
PSD-P =	0 (0)
PSD-M =	0 (0)

Effort =	1.0
Total CPUE =	53.0 (26; 53)
Stock CPUE =	41.0 (28; 41)
CPUE-14 =	5.0 (46; 5)
CPUE-18 =	1.0 (100; 1)
PSD =	44 (12.5)
PSD-P =	5 (3.1)
PSD-M =	2 (2.3)

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 parentheses) for fall electrofishing surveys, Georgetown Reservoir, Texas, 2005, 2009, and 2013. Vertical lines represent slot length limit at the time of sampling.

Largemouth Bass

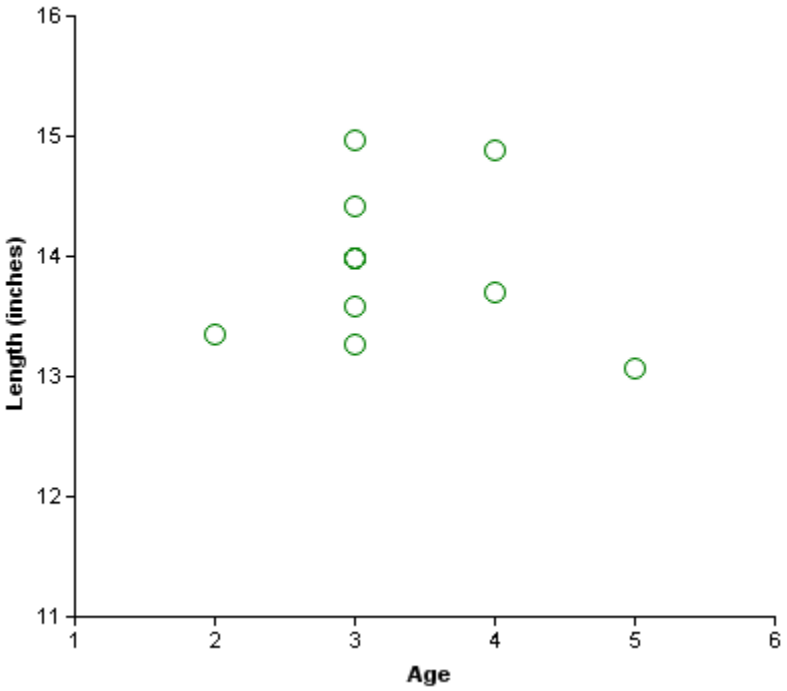


Figure 12. Length at age for Largemouth Bass collected by electrofishing at Georgetown Reservoir, Texas, November 2013.

Table 6. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Georgetown Reservoir, Texas, 2001, 2005, and 2013. 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
2001	29	7	22	0	70.7	24.1
2005	30	3	14	0	59.4	10.0
2013	30	0	30	0	66.0	0.0

Table 7. Proposed sampling schedule for Georgetown Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall (except where noted). Standard survey denoted by S and additional survey denoted by A.

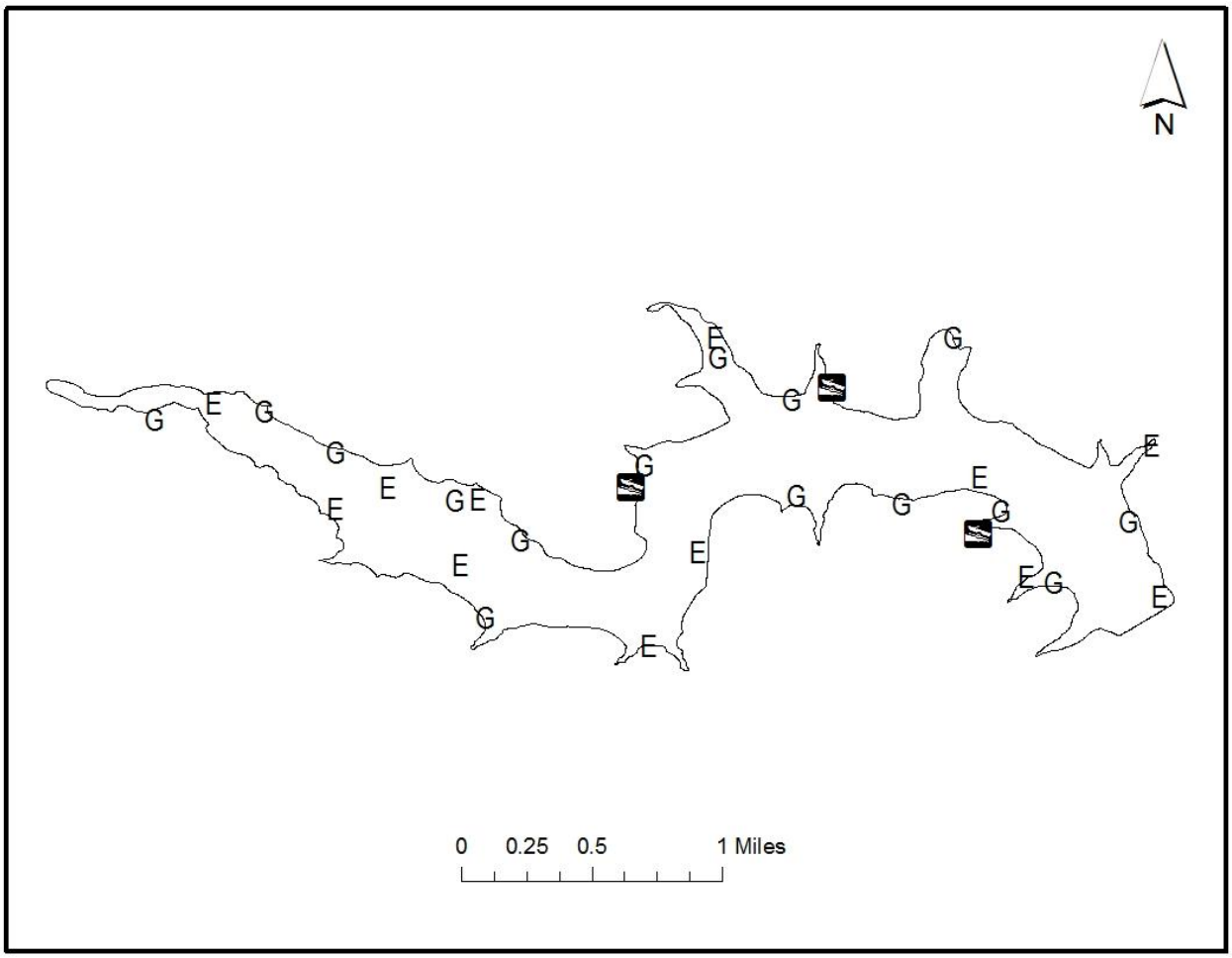
Survey year	Electrofish Fall(Spring)	Trap net	Gill net	Habitat		Access	Creel survey	Report
				Structural	Vegetation			
2014-2015								
2015-2016	A		A					
2016-2017								
2017-2018	S		S			S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Georgetown Reservoir, Texas, 2013-2014. Sampling effort was 15 net nights for gill netting and 1 hour for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			99	99.0
Threadfin Shad			8	8.0
Blue Catfish	6	0.4		
Channel Catfish	15	1.0		
White Bass	107	7.1		
Palmetto Bass	16	1.1		
Redbreast Sunfish			112	112.0
Green Sunfish			17	17.0
Warmouth			1	1.0
Bluegill			57	57.0
Longear Sunfish			3	3.0
Redear Sunfish			9	9.0
Smallmouth Bass			2	2.0
Largemouth Bass			53	53.0
Guadalupe Bass			2	2.0
Logperch			1	1.0

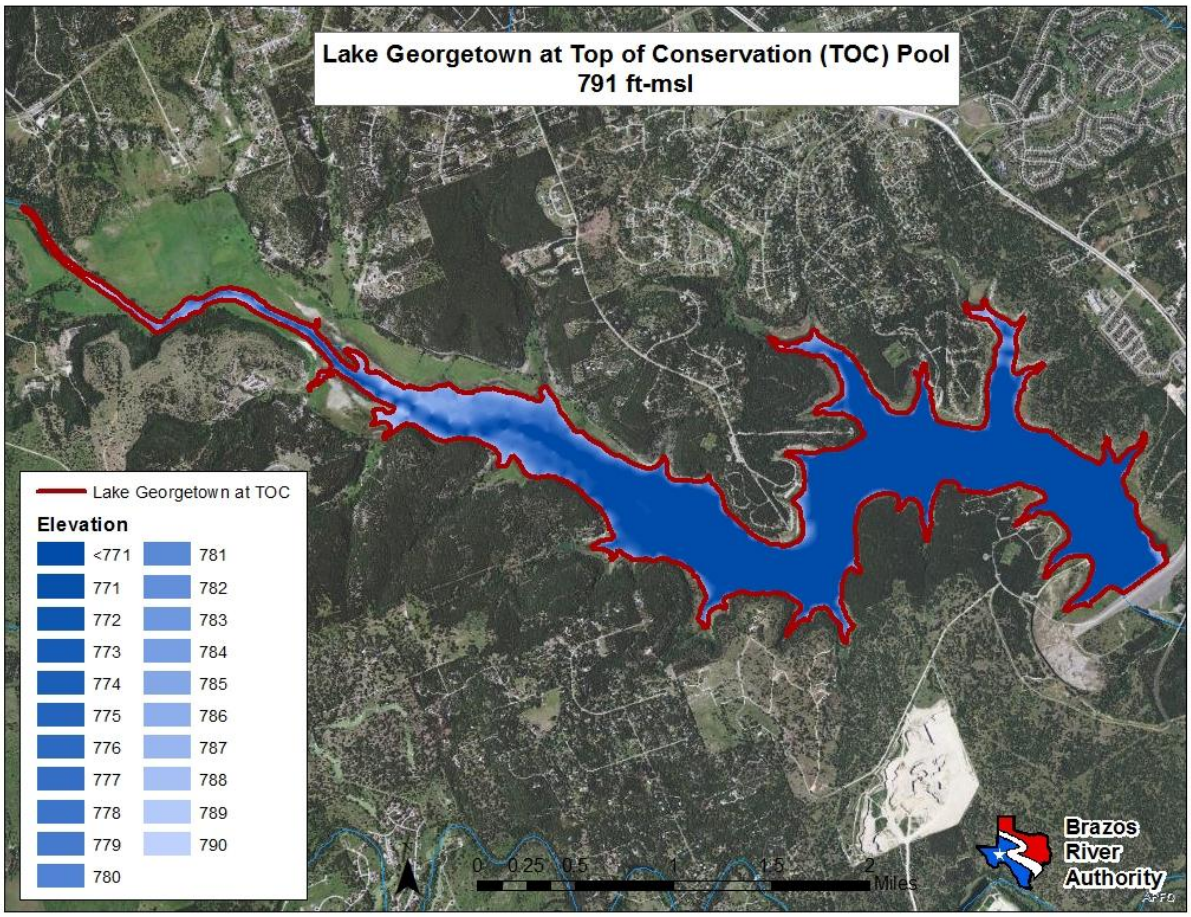
APPENDIX B



Location of sampling sites, Granger Reservoir, Texas, 2012-2013. Trap net, gill net, and electrofishing stations are indicated by T, G, and E respectively. Boat ramps are indicated by the boat ramp symbol (⛴). Water level was 17 ft. below conservation level at the time of sampling.

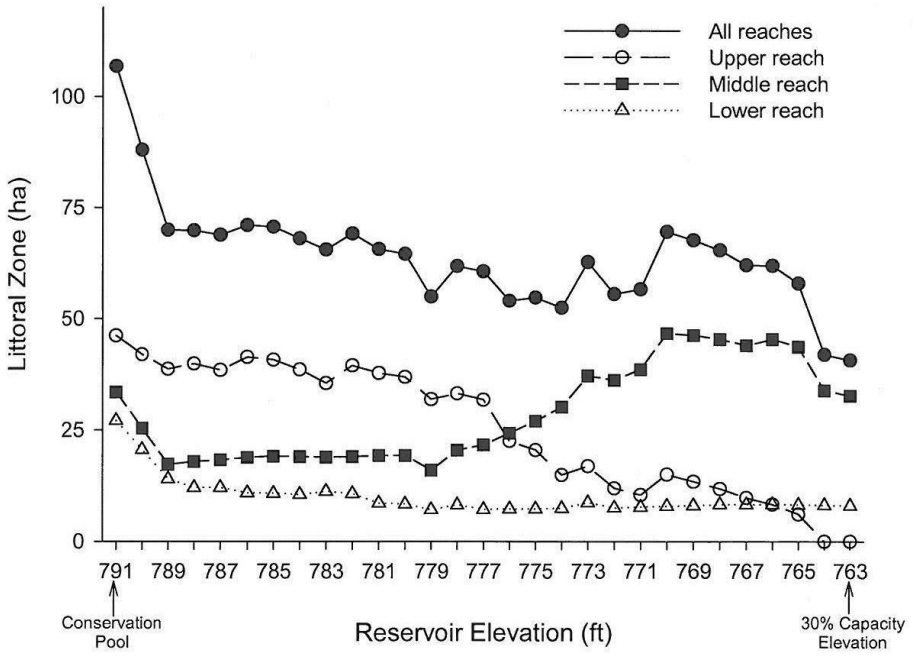
APPENDIX C

Bathymetric map of Georgetown Reservoir, Texas, 2012.



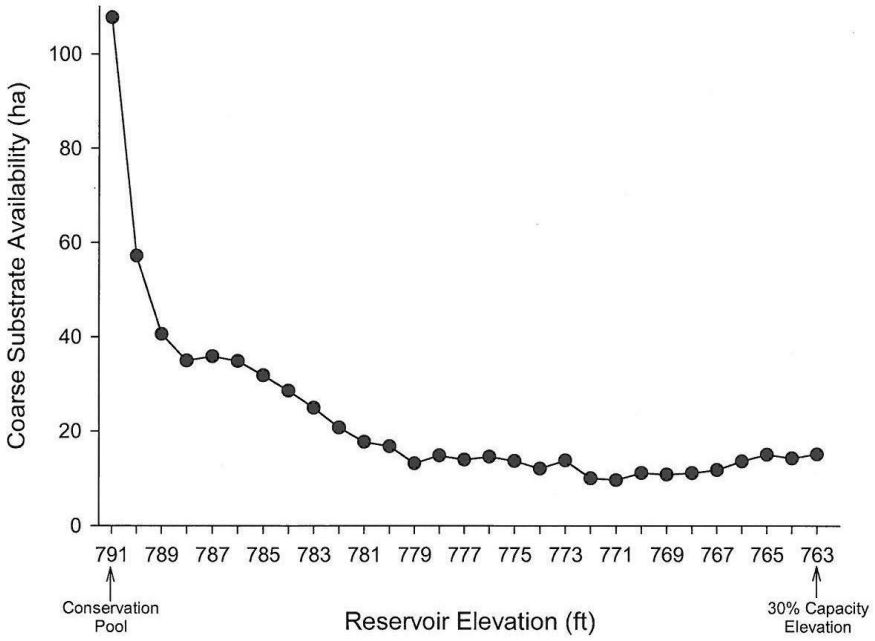
APPENDIX D

Elevation specific littoral zone (< 6 ft. water depth) coverage in Georgetown Reservoir, Texas for upper, middle, and lower reservoir reaches combined.



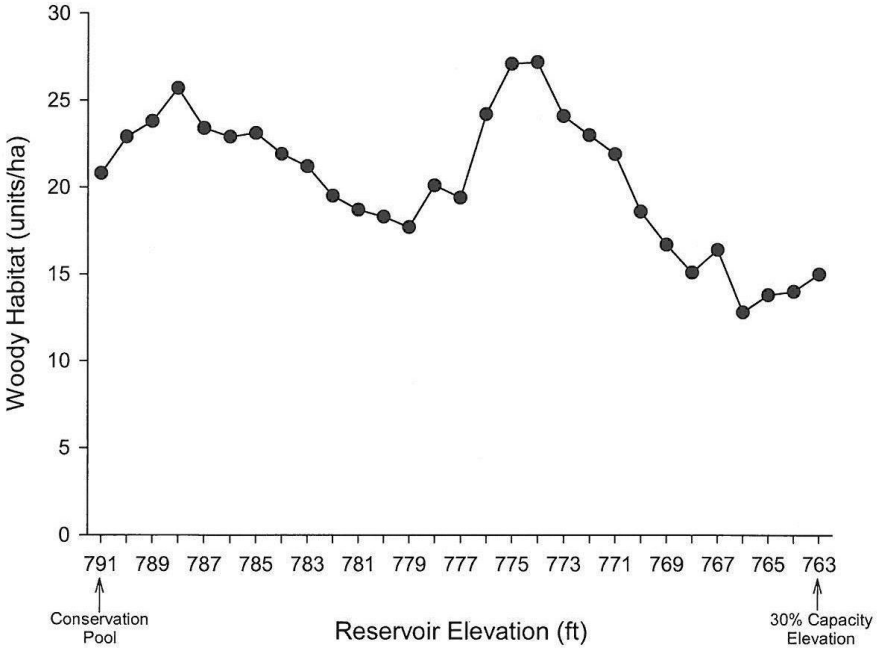
APPENDIX E

Elevation specific littoral zone (< 6 ft. water depth) coarse substrate availability in Georgetown Reservoir, Texas.



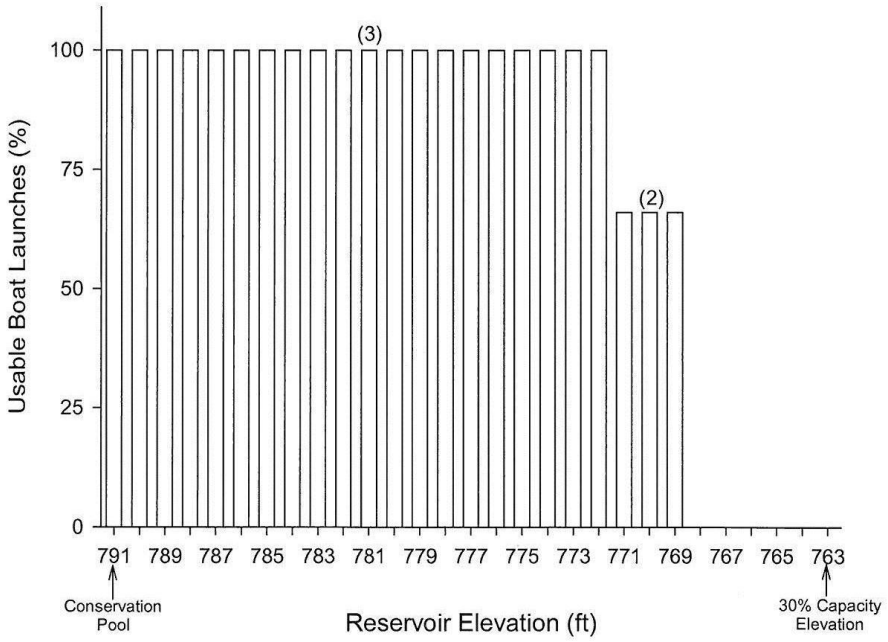
APPENDIX F

Elevation specific littoral zone (< 6 ft. water depth) woody habitat availability in Georgetown Reservoir, Texas. Woody habitat was defined as one inundated standing tree, drowned tree, or brushpile attractor.



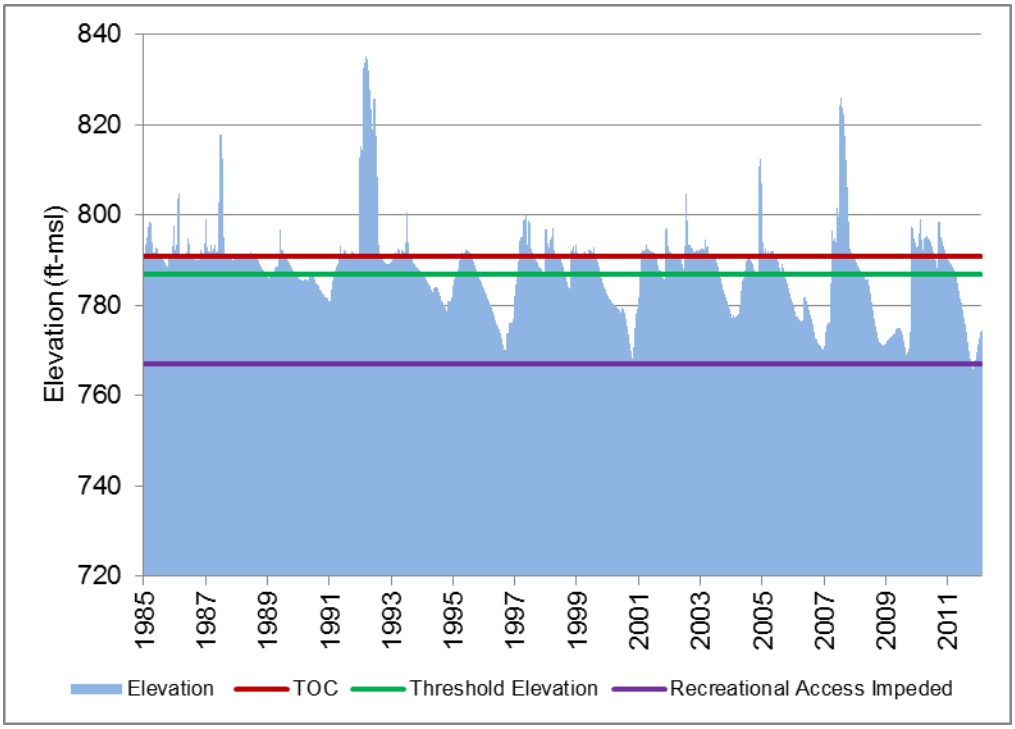
APPENDIX G

Elevation specific boat ramp accessibility in Georgetown Reservoir, Texas. The number of usable boat launches provided above each bar.



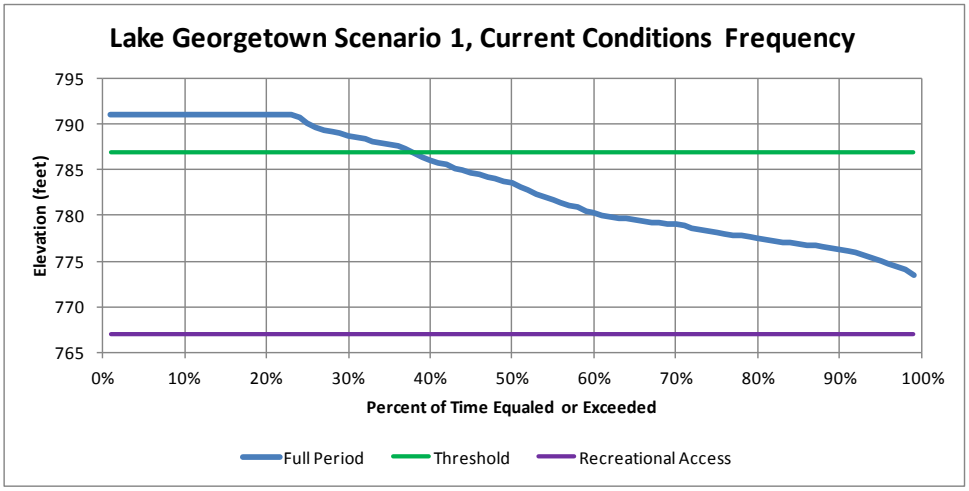
APPENDIX H

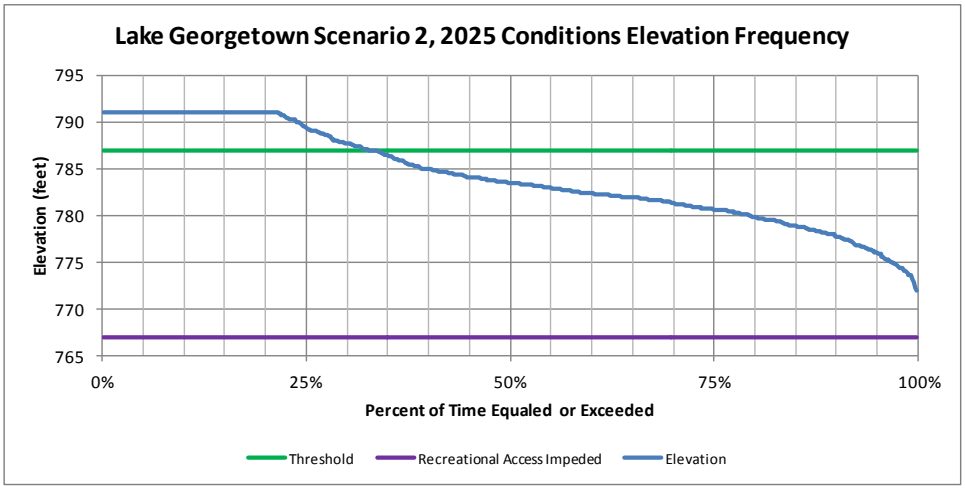
Historical elevation for threshold occurrences at Georgetown Reservoir, Texas. Top of conservation (TOC) is 791 ft. above mean sea level (msl). Thirty percent (30%) capacity elevation is 763 ft. above msl.

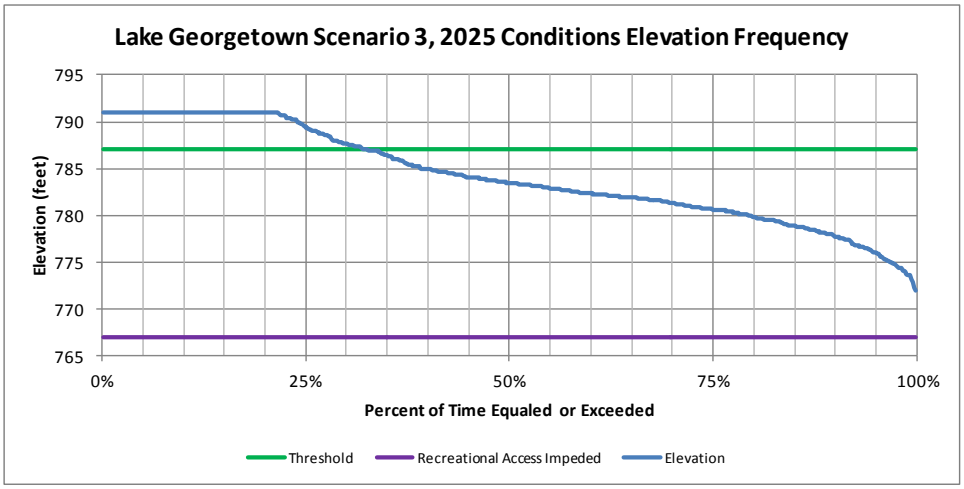


APPENDIX I

Predicted BRA water management models for 2025 for Georgetown Reservoir and their relation to recommended fishery thresholds. Three possible scenarios exist, which include the potential operation of a new power plant within the river basin.

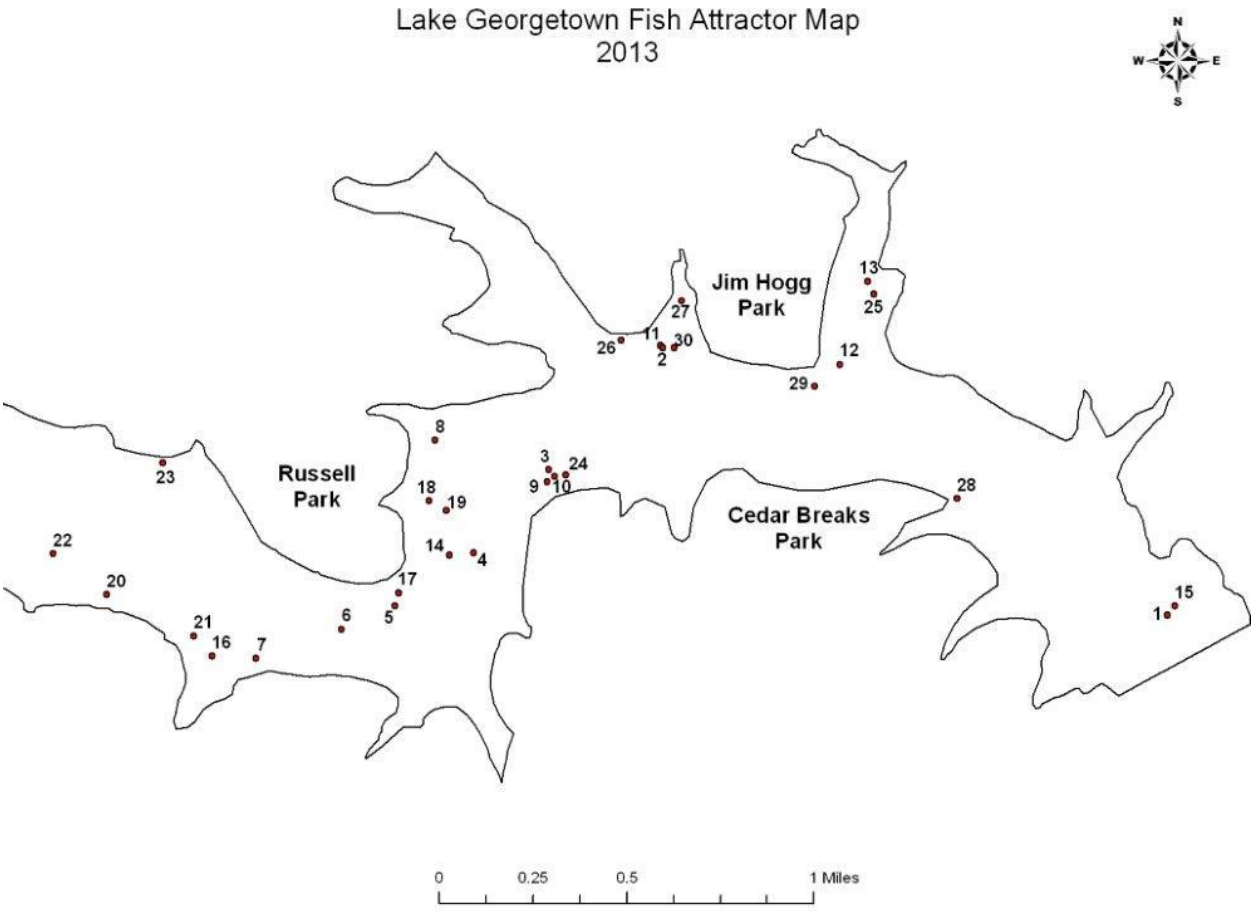






APPENDIX J

Map of Georgetown Reservoir with fish attractor locations (2013). Attractors (N = 30) have been installed and refurbished since 2007. Ashe juniper brush piles were used at the sites.



APPENDIX K

GPS coordinates for Georgetown Reservoir fish attractor locations. Coordinates are in degree decimal minutes. Attractors were installed or refurbished from 2007 to 2013. Ashe Juniper brush piles were used at the sites.

Site #	Lat/Long			Attractor Description	Year Installed	Refurbished
1	N	30 40.196	o	Point in northwest corner of dam	2007	2013
	W	-97 43.503	o			
2	N	30 40.815	o	Ridge next to extremely deep water; across from Jim Hogg boat ramp	2007	2013
	W	-97 44.673	o			
3	N	30 40.532	o	Main lake point next to ledge	2007	2013
	W	-97 44.937	o			
4	N	30 40.339	o	Point at Russell Park	2007	2010
	W	-97 45.111	o			
5	N	30 40.217	o	Flat on south side of Russell Park	2007	2010
	W	-97 45.292	o			
6	N	30 40.162	o	Mid-river high spot next to river channel south of Russell Park	2007	2013
	W	-97 45.417	o			
7	N	30 40.096	o	High spot next to river channel edge	2007	2010
	W	-97 45.614	o			
8	N	30 40.601	o	Drop off at point north of Russell Park Ramp that enters small cove	2008	2013
	W	-97 45.201	o			
9	N	30 40.504	o	Drop off on main river channel ledge	2008	2013
	W	-97 44.941	o			
10	N	30 40.517	o	Main lake point inshore of #9 brushpile	2008	2013
	W	-97 44.923	o			
11	N	30 40.821	o	Ridge close to #2 brushpile	2008	2011
	W	-97 44.678	o			
12	N	30 40.777	o	Ledge on backside of main lake point	2008	2010
	W	-97 44.262	o			
13	N	30 40.969	o	Secondary point near confluence of creek channels	2008	2011
	W	-97 44.198	o			
14	N	30 40.333	o	Flat near beach	2008	2011
	W	-97 45.167	o			
15	N	30 40.216	o	Rocky ledge near dam	2008	2011
	W	-97 43.486	o			
16	N	30 40.101	o	River point near cove mouth	2008	2010
	W	-97 45.717	o			
17	N	30 40.247	o	Rock flat	2008	2009
	W	-97 45.284	o			
18	N	30 40.460	o	Drain in sand flat	2008	2011
	W	-97 45.213	o			
19	N	30 40.438	o	Drain in sand flat	2009	2011
	W	-97 45.174	o			
20	N	30 40.242	o	Channel swing near steep bank	2009	2010
	W	-97 45.961	o			

APPENDIX K (Cont.)

GPS coordinates for Canyon Reservoir fish attractor locations. Coordinates are in degree decimal minutes. Attractors were installed or refurbished from 2007 to 2013. Ashe Juniper brush piles were used at the sites.

Site #	Lat/Long			Attractor Description	Year Installed	Refurbished
21	N	30 40.147	o	Edge of point at river channel drop	2009	2010
	W	-97 45.760	o			
22	N	30 40.338	o	Creek/River channel intersection	2009	2013
	W	-97 46.085	o			
23	N	30 40.519	o	Mainlake point flat	2009	2013
	W	-97 44.896	o			
24	N	30 40.939	o	Main lake point	2009	2013
	W	-97 44.183	o			
25	N	30 40.548	o	Secondary point ledge	2009	2011
	W	-97 45.830	o			
26	N	30 40.832	o	Ledge west of Jim Hogg boat ramp	2010	
	W	-97 44.769	o			
27	N	30 40.923	o	Jim Hogg boat ramp cove on secondary point	2010	2011
	W	-97 44.628	o			
28	N	30 40.465	o	Off main lake point on south side of lake	2011	
	W	-97 43.990	o			
29	N	30 40.726	o	Main lake point ledge at mouth of Jim Hogg Cove	2011	
	W	-97 44.321	o			
30	N	30 40.814	o	Main lake ridge across from Jim Hogg Boat ramp	2011	
	W	-97 44.646	o			