

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-34

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

**Lake Brazos Reservoir**

Prepared by:

Michael S. Baird and John E. Tibbs  
Inland Fisheries Division  
District 2B, Waco, Texas



Carter Smith  
Executive Director

Phil Durocher  
Director, Inland Fisheries

July 31, 2009

## TABLE OF CONTENTS

Survey and management summary .....	2
Introduction.....	3
Reservoir description.....	3
Management history.....	3
Methods.....	3
Results and discussion.....	4
Fisheries management plan.....	5
Literature cited.....	6
Figures and tables.....	7-22
Reservoir characteristics (Table 1) .....	7
Harvest regulations (Table 2).....	7
Stocking history (Table 3).....	8
Habitat survey (Table 4) .....	9
Gizzard shad (Figure 1).....	10
Bluegill (Figure 2) .....	11
Longear sunfish (Figure 3) .....	12
Redear sunfish (Figure 4) .....	13
Blue catfish (Figure 5) .....	14
Channel catfish (Figure 6) .....	15
White bass (Figure 7).....	16
Striped bass (Figure 8).....	17
Spotted bass (Figure 9).....	18
Largemouth bass (Figure 10; Table 5).....	19
White crappie (Figure 11) .....	20
Proposed sampling schedule (Table 6).....	21
Appendix A	
Catch rates for all species from all gear types .....	22
Appendix B	
Map of 2008-2009 sampling locations .....	23

## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Brazos were surveyed in 2008 using electrofishing and trap nets and in 2009 using gill nets. This report summarizes survey results and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Brazos is a 523-acre impoundment of the Brazos River located in downtown Waco, McLennan County, Texas. Shoreline fish habitat consisted mainly of emergent aquatic vegetation (e.g., water willow *Justicia americana*, bulrush *Scirpus sp.*, cattail *Typha sp.*, and giant cane *Arundinaria gigantea*) and overhanging riparian brush and trees. Bank and boat access on the reservoir are good, and include handicap-friendly facilities such as walkways, picnic shelters, and fishing piers.
- **Management history:** Important sport fish include blue catfish, channel catfish, white bass, striped bass, largemouth bass, and white crappie. No previous management strategies or actions exist - as *this* report represents the first fishery survey to be conducted on Lake Brazos. Fish populations from upper, middle, and lower Brazos River sections were surveyed in the early 90s, but Lake Brazos is only mentioned briefly (Sellers, K. 1994).

The original Lake Brazos dam was completed in 1970, however it never functioned properly. Improvements were made to the structure in 1985 which provided a mechanism to properly control the water level in Lake Brazos, but these modifications were also fraught with problems, and required annual maintenance thereafter. The newly constructed Lake Brazos dam, completed in 2007, should alleviate annual maintenance and de-watering concerns while providing a stable elevation reservoir for fisheries.

- **Fish Community**
  - **Prey species:** Forage species present included gizzard shad, bluegill, longear sunfish, threadfin shad, redear sunfish, and green sunfish in order of decreasing abundance. Catch rates were low for all collected forage species.
  - **Catfishes:** Blue and channel catfish were present in fair numbers and condition during spring 2009. No flathead catfish were observed.
  - **Temperate basses:** Both white and striped bass were present in low numbers during the spring 2009 survey and currently offer limited fishing opportunities.
  - **Black basses:** Largemouth and spotted bass were collected in fall 2008; however smallmouth bass are common in the Brazos River upstream of Lake Brazos. Current catch rates for largemouth bass are among the lowest in the district.
  - **White crappie:** White crappie were collected in fair numbers and condition during winter 2008.
- **Management Strategies:** Continue managing Lake Brazos with statewide regulations as this fishery becomes established. Conduct standard monitoring with electrofisher and trap nets in 2012 and gill nets in 2013. Management strategies should include habitat enhancement around bank fishing piers and the eradication of exotic giant cane by 2013.

## INTRODUCTION

This document is a summary of fisheries data collected from Lake Brazos in 2008-2009. The purpose of the document is to provide fisheries information and make management recommendations to establish, 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. No age and growth work was done on game species and no historical data are available for comparison.

### *Reservoir Description*

Lake Brazos is a 523-acre impoundment of the Brazos River located in downtown Waco, McLennan County, Texas (Table 1). The reservoir is eutrophic with an average reservoir depth of 12.3 feet, and water transparencies typically ranging from 1 to 3 feet. The reservoir was constructed by the City of Waco in 1965 to serve as a municipal water source and to stimulate economic development in the downtown area. Other water uses include recreation. Fish habitat at the time of sampling consisted mainly of emergent aquatic vegetation (e.g., water willow *Justicia Americana*, bulrush *Scirpus sp.*, cattail *Typha sp.*, and giant cane *Arundinaria gigantea*) and over-hanging riparian brush and trees. Construction of a new labyrinth weir dam was completed in 2007, which improved consistency of the water level within the reservoir. The City of Waco is updating and expanding recreational features along the lower end of the reservoir with handicap-friendly facilities such as walkways, picnic shelters, and fishing piers. Bank access is excellent at the lower end, however much of the riparian habitat along the upper end is privately owned. Boat access is adequate with four public ramps: two at Cameron Park East, one at the McLennan Community College (MCC) campus, and one at Baylor University. Further information about Lake Brazos and its facilities can be obtained by visiting the Waco Water Utility Services web site at <http://www.wacowater.com/lakebrazosdam.html>.

### *Management History*

**Previous management strategies and actions:** No previous management strategies or actions exist - as this report represents the first fishery survey conducted on Lake Brazos.

**Harvest regulation history:** Sportfishes in Lake Brazos are currently managed with statewide regulations (Table 2).

**Stocking history:** Lake Brazos was stocked with 47,000 blue catfish, 47,890 bluegill, and 49,860 Florida largemouth bass in 2008. The complete stocking history is in Table 3.

**Vegetation/habitat history:** No previous vegetation/habitat surveys have been conducted. Information provided in this report represents the first vegetation and habitat survey data available for Lake Brazos.

## METHODS

Fishes were collected by electrofishing (5 minutes at 12 stations), trap netting (5 net nights at 5 stations), and gill netting (5 net nights at 5 stations). 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 and trap 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 (TPWD, Inland Fisheries Division, unpublished manual revised 2008). Largemouth bass genetic samples were collected according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (unpublished, revised manual 2008).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV.

## RESULTS AND DISCUSSION

**Habitat:** Littoral zone habitat consisted mainly of natural shoreline, bulk heading, and rocky shoreline (Table 4).

**Creel:** No angler creel surveys have been conducted on Lake Brazos to date.

**Prey species:** The electrofishing catch rates of threadfin and gizzard shad were 21.0/h and 155.0/h (Figure 1 and Appendix A). Index of vulnerability (IOV) for gizzard shad was fair, and 60% of gizzard shad were available to existing predators as forage. Catch rates of other important forage species collected were bluegill (50.0/h), longear sunfish (41.0/h), and redear sunfish (12.0/h) (Figures 2, 3, and 4).

**Catfishes:** A strong blue catfish population exists in Lake Brazos. A gill net catch rate of 5.2/nn was observed in 2009. Body condition or mean relative weight (Wr) varied from 75 to 92 and tended to be better in larger length classes. The proportional stock density (PSD), or percentage of stock-size (12 inch) fish that are also quality-size (20 inch), was 16 (Figure 5). The channel catfish population was more abundant with a gill net catch rate of 7.4/nn. Body condition improved with larger length classes and was excellent for the 20 to 25-inch group classes. The proportional stock density for channel catfish was 43 (range 77 to 105, Figure 6).

**Temperate basses:** The gill net catch rate of white and striped bass was 1.4 and 0.6/nn in 2009, respectively; indicating low density populations of these species in the reservoir (Figures 7 and 8). Few fish are available for angler harvest at this time; however numbers are expected to improve in the future as more individuals immigrate from Whitney Reservoir upstream. Hybrid striped bass will also be stocked into Lake Waco for the next five years, and the possibility exists for immigration of these Palmetto bass into Lake Brazos as well.

**Black basses:** Spotted bass were common in Lake Brazos with 13.0/h being collected in 2008 (Figure 9). The electrofishing catch rate of largemouth bass was 20.0/h in 2008; the lowest in the district. Size structure was poor and only a single legal-sized fish was collected (Figure 10). Fish in the 4 to 5-inch length class dominated the catch. Body condition was fair (relative weights around 90) for all size classes of fish (Figure 10). Florida largemouth bass genetic influence was fair as Florida alleles comprised 33% of the sample in 2008 (Table 5).

**White crappie:** The trap net catch rate of white crappie was 4.2/nn in 2008, representing a moderate population (Figure 12). Relative weights were good to excellent for all size classes (range 92 to 112, Figure 11) however no legal-sized fish were collected.

## Fisheries management plan for Lake Brazos, Texas

Prepared – July 2009.

**ISSUE 1:** Giant cane *Arundinaria gigantea*, an exotic species of vegetation, is currently present in several large stands along the shoreline of Lake Brazos. There is a good chance it will continue to spread, causing access problems and competition for preferred native emergent species in the future. The City of Waco has expressed concerns about the spread of this species as well.

**MANAGEMENT STRATEGIES**

1. Continue monitoring the reservoir for giant cane annually through 2012.
2. Work with the City of Waco to control this species with appropriate means.

**ISSUE 2:** Several fishing piers have been built by the City of Waco to accommodate bank anglers and other user groups, however little habitat is available to attract and keep fish within reach of these structures.

**MANAGEMENT STRATEGIES**

1. Work with the City of Waco to organize the placement of new fish habitat (i.e., brush piles or native vegetation) near fishing piers.

**ISSUE 3:** Florida largemouth bass were stocked in 2007 (35,640) and 2008 (49,860), however the electrofishing catch rate (20/h) remains the lowest in the district. We believe the 2007 stocking failed due to either: 1) high flows through Lake Brazos during 2007, or 2) the final draw-down of Lake Brazos prior to the dam being replaced later that year.

**MANAGEMENT STRATEGIES**

1. Request stockings of Florida largemouth bass in 2010 at a rate of 100/acre.
2. Request stockings of surplus largemouth bass when available.

**ISSUE 4:** Boat access on Lake Brazos is currently good; however the potential for enhancement is great.

**MANAGEMENT STRATEGIES**

1. Work with the City of Waco to maintain current access points and enhance fishing opportunities by increasing the number and type of access points available. For example, the addition of canoe/kayak access points at several locations along the length of Lake Brazos (i.e., Mammoth Park, downtown) to coincide with existing plans for paddling trails, etc.

**ISSUE 5:** No previous age and growth work exists - as this report represents the first fishery survey conducted on Lake Brazos.

**MANAGEMENT STRATEGIES**

1. Collect appropriate baseline age and growth data on important sport fish species for the 2013 report.

**ISSUE 6:** Lake Brazos is a new fishery, and our surveys showed good catch rates of legal sized channel and blue catfish.

**MANAGEMENT STRATEGIES**

1. Publicize these new angling opportunities via written news releases and local interviews.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes electrofisher and trap net sampling in 2012 and gill net sampling in 2013 (Table 6).

## 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, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- Sellers, K. 1994. Statewide freshwater fisheries monitoring and management program survey report for the Brazos River, 1994. Texas Parks and Wildlife Department , Federal Aid Report F-30-R, Austin.
- Fishery Assessment Procedures. 2008. TPWD, Inland Fisheries Division, unpublished manual revised 2008.

Table 1. Characteristics of Lake Brazos, Texas.

Characteristic	Description
Year Constructed	1965
Controlling authority	City of Waco
County	McLennan
Reservoir type	Mainstem Brazos River
Shoreline Development Index (SDI)	N/A
Conductivity	1200 umhos/cm

Table 2. Harvest regulations for Lake Brazos.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 – No Limit
Catfish, flathead	5	18 – No Limit
Bass, white	25	10 – No Limit
Bass, striped	5	18 – No Limit
Bass, largemouth and smallmouth	5	14 – No Limit
Bass, spotted	5	No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 – No Limit



Table 3. Stocking history of Lake Brazos, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) 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.

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Life Stage</b>	<b>Mean TL (in)</b>
Blue catfish	2008	47,40	FGL	2.0
	Total	47,40		
Bluegill	2007	10,20	AFGL	2.0
	2008	47,89	AFGL	2.1
	Total	58,09		
Channel catfish	1989	2,70	FGL	3.9
	1990	5,45	FGL	2.4
	2006	19,60	AFGL	8.5
	2007	99,09	FGL	2.4
	Total	126,85		
Florida Largemouth bass	2007	35,64	FRY	0.3
	2008	49,86	FGL	1.7
	Total	85,50		
Largemouth bass	2007	12,71	FGL	1.1
	Total	12,71		

Table 4. Survey of littoral zone and physical habitat types, Lake Brazos, Texas, 2009. Linear shoreline distance (miles) and percent of linear shoreline distance was recorded for each habitat type. Surface area (acres) and percent of reservoir area was determined for each type of aquatic vegetation found.

Shoreline habitat type	<u>Shoreline Distance</u>		Acres	<u>Surface Area</u>
	Miles	Percent of total		Percent of surface area
Bulkhead	4.06	11.45		
Gravel shoreline (rocks < 4")	0.10	0.30		
Rocky shoreline (rocks > 4")	3.52	9.91		
Rock bluff	0.95	2.68		
Natural shoreline	26.67	75.20		
Boat docks/Ramps	0.52	1.47		
Giant cane	0.88	2.48		
Native emergents			3.84	<1.0

## Gizzard Shad

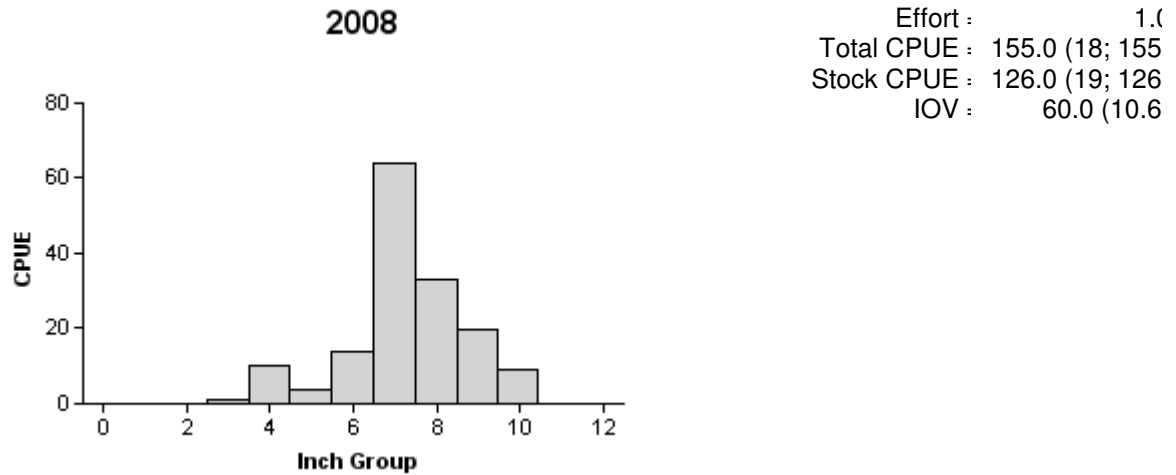


Figure 1. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Brazos, Texas, 2008.

## Bluegill

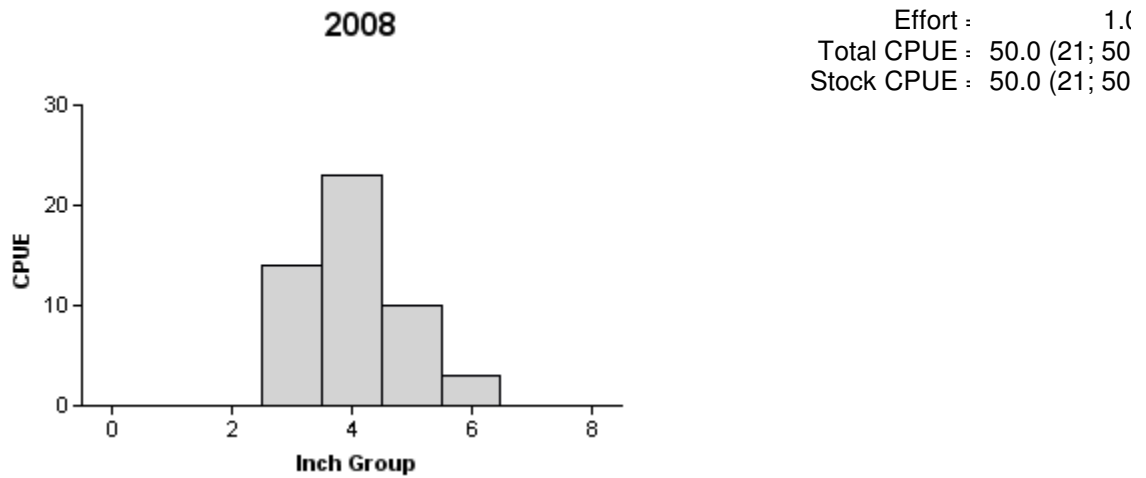


Figure 2. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parenthesis) for fall electrofishing surveys, Lake Brazos, Texas, 2008.

## Longear Sunfish

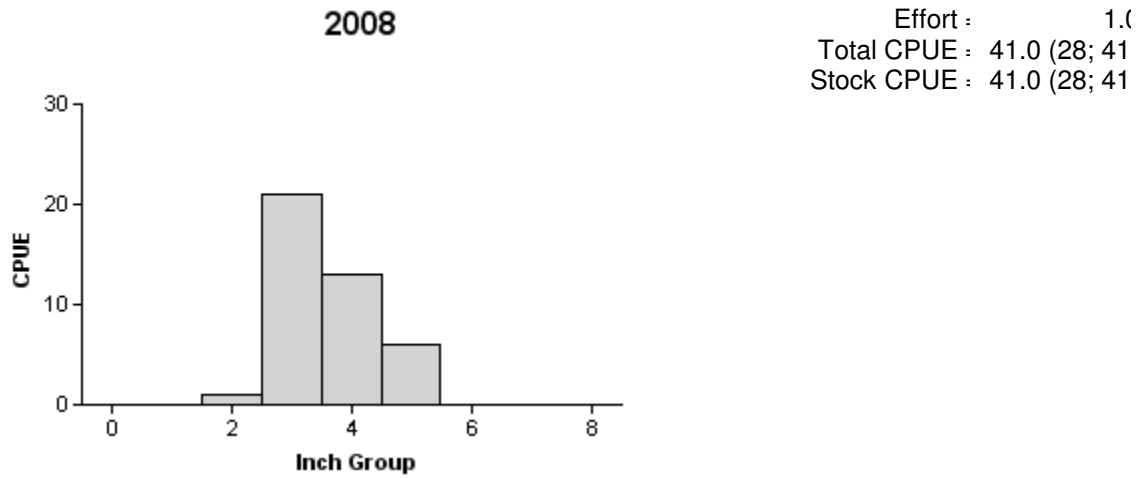


Figure 3. Number of longear sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parenthesis) for fall electrofishing surveys, Lake Brazos, Texas, 2008.

## Redear Sunfish

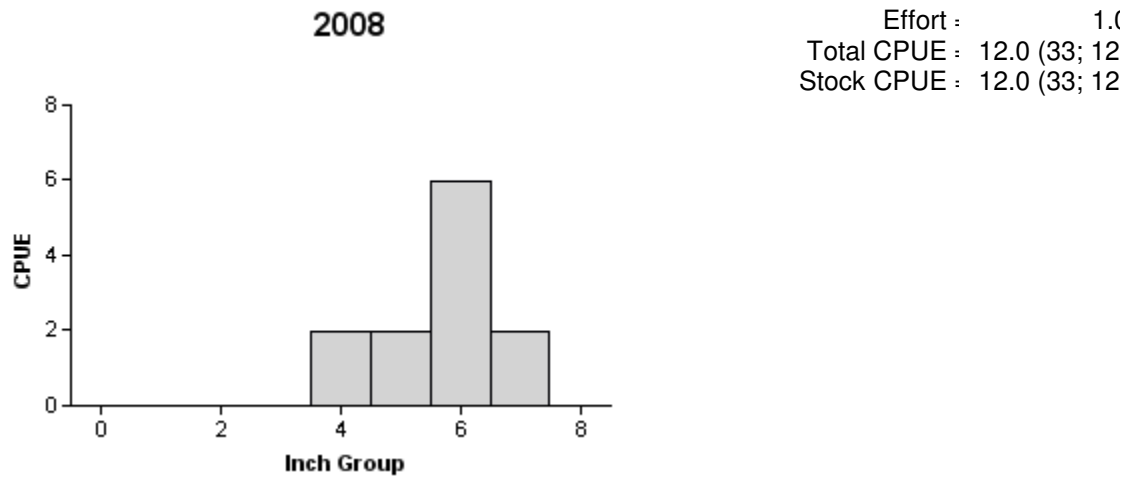


Figure 4. Number of redear sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parenthesis) for fall electrofishing surveys, Lake Brazos, Texas, 2008.

## Blue Catfish

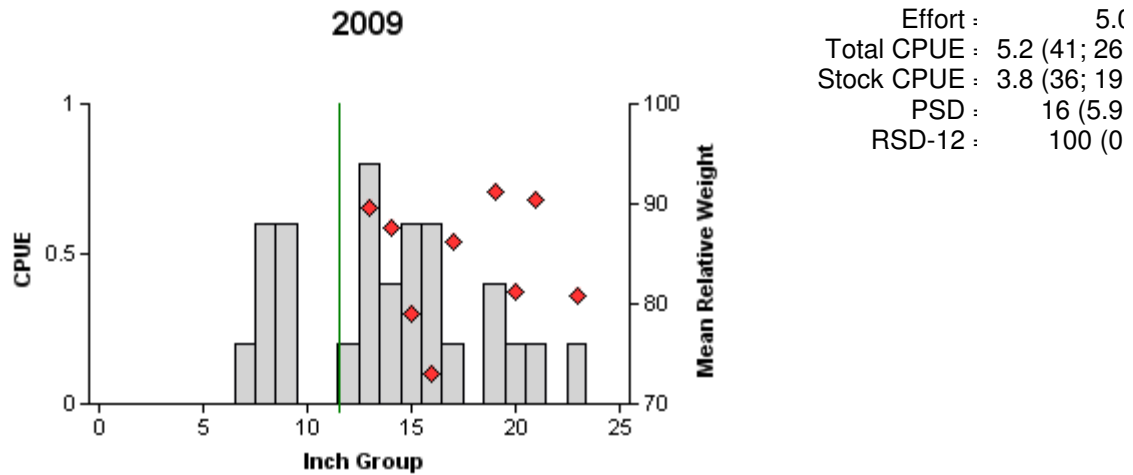


Figure 5. Number of blue catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Brazos, Texas, 2009. Minimum length limit represented by vertical line.

## Channel Catfish

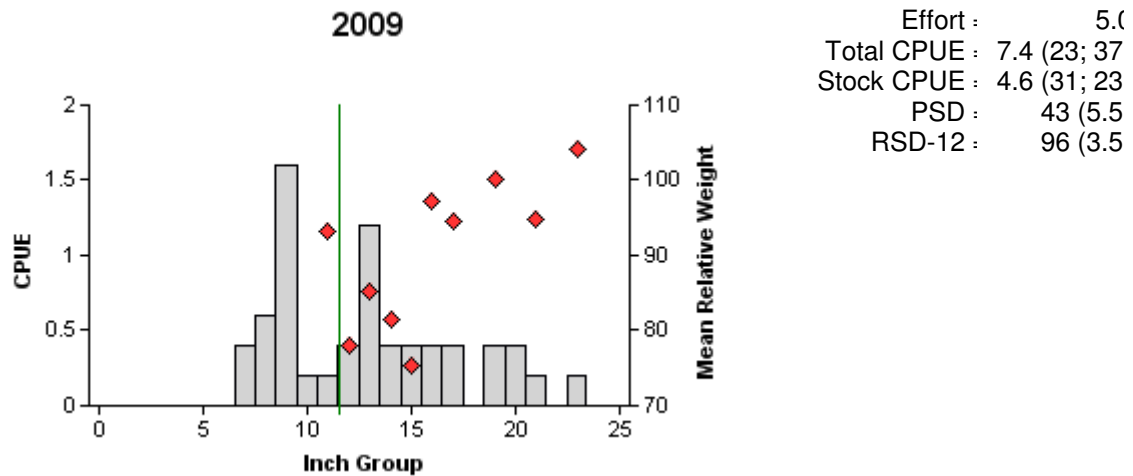


Figure 6. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Brazos, Texas, 2009. Minimum length limit represented by vertical line.



## White Bass

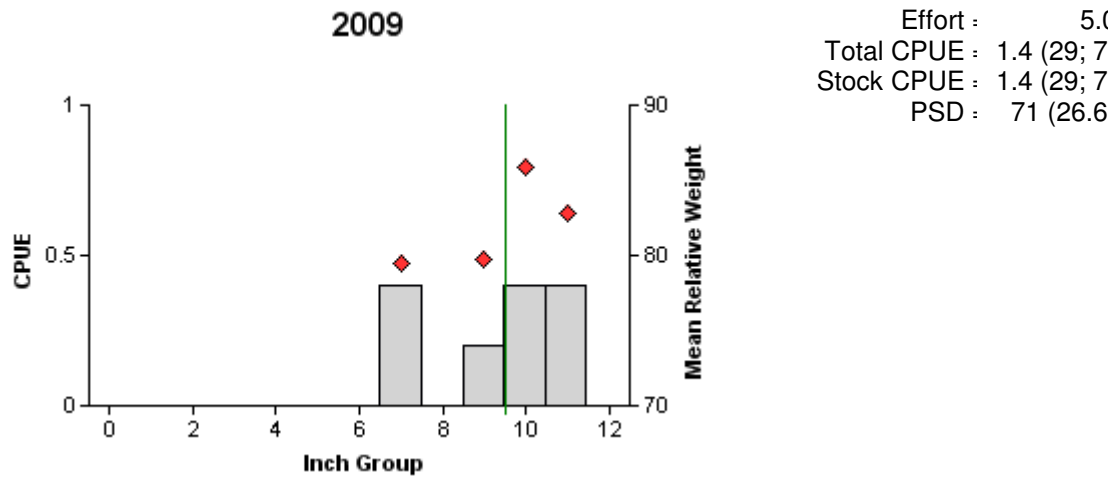


Figure 7. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Brazos, Texas, 2009. Minimum length limit represented by vertical line.

## Striped Bass

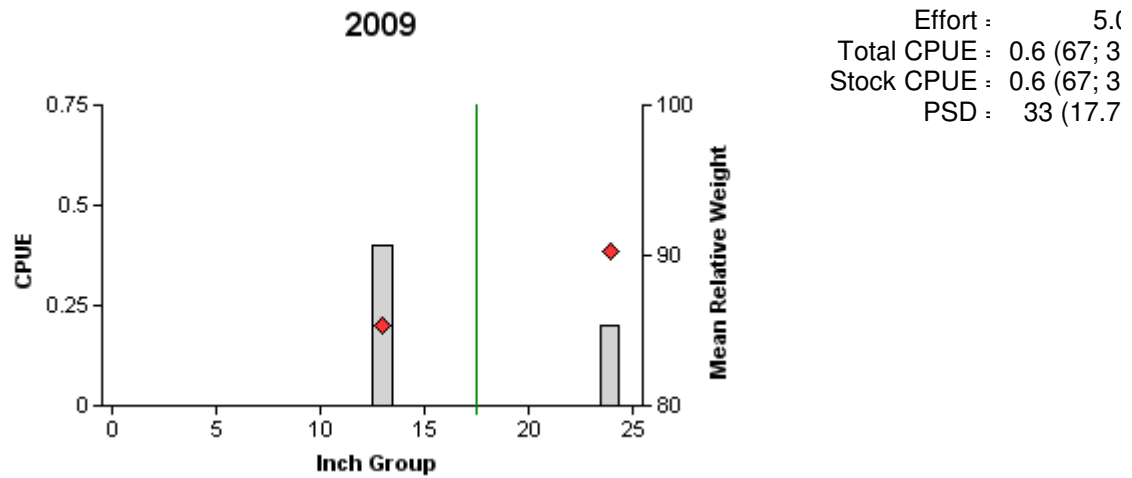


Figure 8. Number of striped bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Brazos, Texas, 2009. Minimum length limit represented by vertical line.

## Spotted Bass

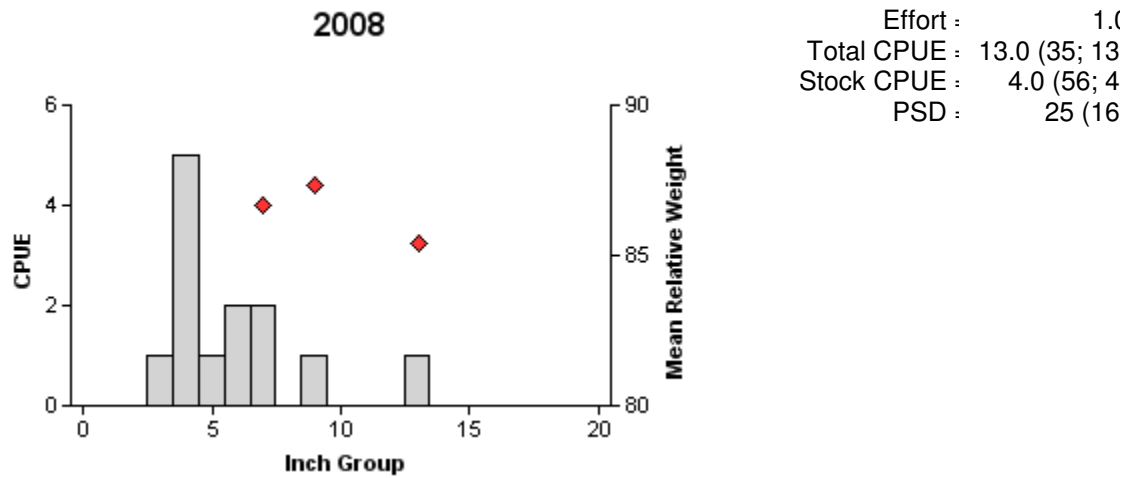


Figure 9. Number of spotted bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Brazos, Texas, 2008. Minimum length limit represented by vertical line.

## Largemouth Bass

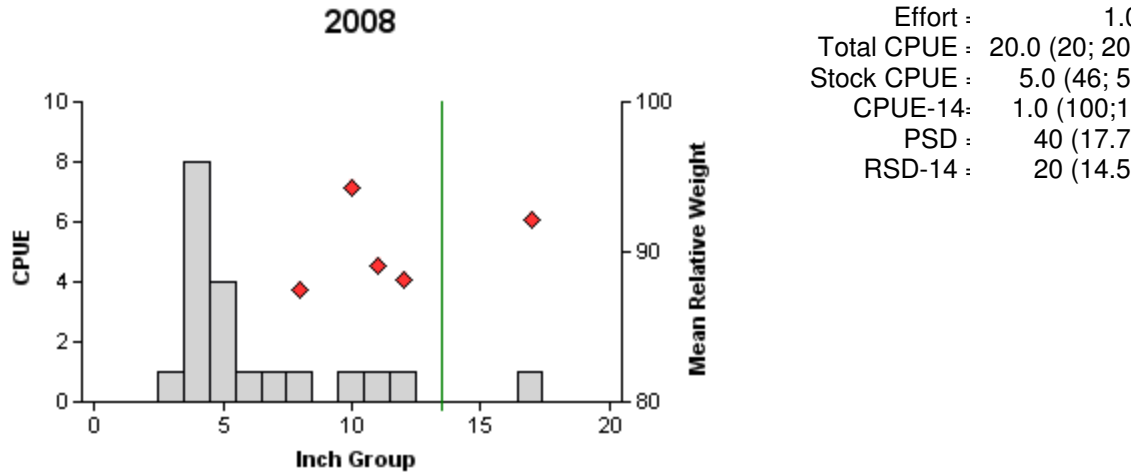


Figure 10. Number of largemouth bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Brazos, Texas, 2008. Minimum length limit represented by vertical line.

Table 5. Results of genetic analysis of largemouth bass collected during fall electrofishing, Lake Brazos, Texas, 2008. N = Northern and F = Florida.

Year	Sample size	Genotype		%FLMB alleles	% pure FLMB
		FLMB	NLMB		
2008	15	0.00	0.13	0.33	0.00

## White Crappie

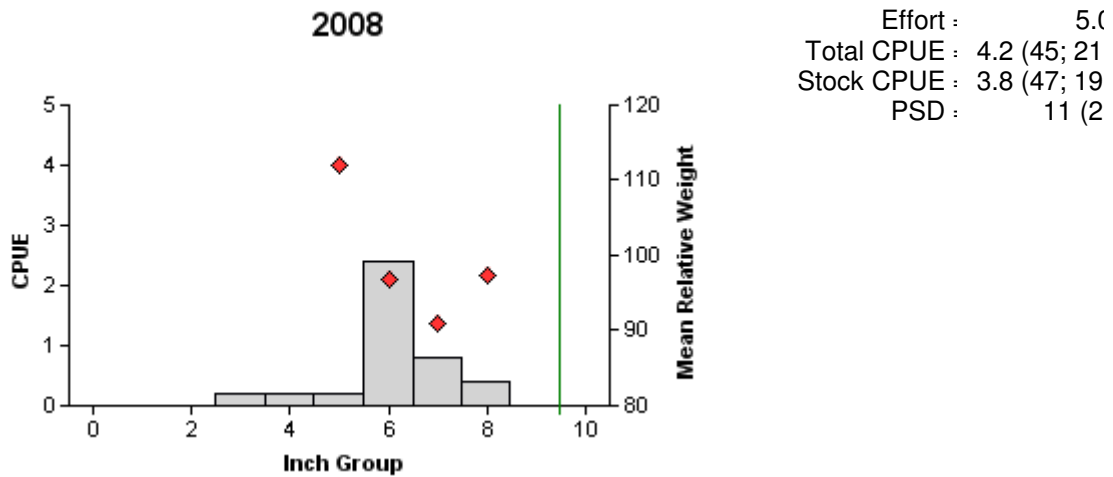


Figure 11. Number of white crappie caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Brazos, Texas, 2008. Minimum length limit represented by vertical line.

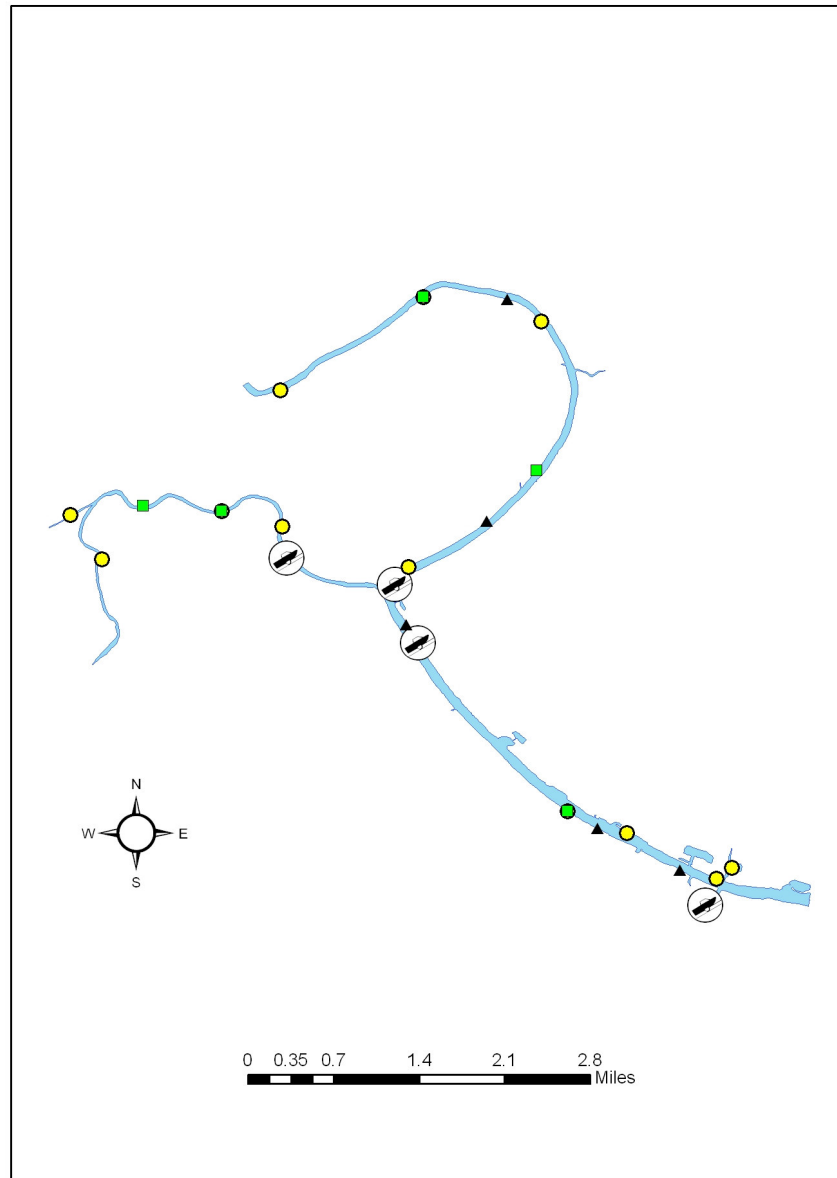
Table 6. Proposed sampling schedule for Lake Brazos, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Report
Fall 2009-Spring 2010					
Fall 2010-Spring 2011					
Fall 2011-Spring 2012					
Fall 2012-Spring 2013	S	S	S		S

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Brazos, Texas, 2008-2009.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					155	155.0
Threadfin shad					21	21.0
Blue catfish	26	5.2				
Channel catfish	37	7.4				
White bass	7	1.4				
Striped bass	3	0.6				
Green sunfish					5	5.0
Bluegill					50	50.0
Longear sunfish					41	41.0
Redear sunfish					12	12.0
Spotted bass					13	13.0
Largemouth bass					20	20.0
White crappie			21	4.2		

**APPENDIX B**

Location of electrofishing (circles), trap netting (squares), gill netting (triangles), and boat ramp sites, Lake Brazos, Texas, 2008 and 2009. Water level was near full pool at time of sampling.