

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-32

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

Leon Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Leon Reservoir were surveyed in 2006 using electrofishing and trap nets and in 2007 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Leon Reservoir is a 1,590-acre impoundment located on the Leon River in the Brazos River Basin approximately seven miles south of Eastland. Water was six to seven feet below conservation level during October to March sampling period, but it filled in late March. Habitat features during sampling period consisted of standing timber, rocks, and boat docks. There were two public boat ramps and limited bank-fishing access.
- **Management History:** In the late 1970s palmetto bass and tiger muskies were stocked in Leon Reservoir. Threadfin shad were introduced in 1984. Florida largemouth bass were last stocked in 1994. Sport fish have always been managed with statewide regulations.
- **Fish Community**
 - **Prey species:** Threadfin shad were present in the reservoir. Electrofishing catch of gizzard shad was low, but bluegill catch was high.
 - **Catfishes:** Over 80% of the channel catfish in the 2007 survey were legal length (12 inches) or longer. Flathead catfish were present in the reservoir.
 - **Temperate basses:** The white bass population was excellent, with many fish in the 12- to 15-inch size range available to anglers.
 - **Largemouth bass:** Reproduction and recruitment of fish to adult size has been very good the last few years. The largemouth bass population showed signs of improvement from the drought years of 1998-2002.
 - **White crappie:** White crappie abundance was good in 2006 and has increased since 1998. However, only about one in ten crappie were legal size.
- **Management Strategies:** Conduct intensive electrofishing survey in 2007 as part of special project to evaluate genetic monitoring program for largemouth bass. Conduct additional trap net survey in 2007 to determine if significant increase in water levels translated to improved crappie size structure.

2 INTRODUCTION

This document is a summary of fisheries data collected from Leon Reservoir in 2006-2007. 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 2006-2007 data for comparison.

Reservoir Description

Leon Reservoir is a 1,590-acre impoundment constructed in 1954 on the Leon River. It is located in Eastland County approximately seven miles south of Eastland and is operated and controlled by the Eastland County Water Supply District. The reservoir provides municipal and industrial water supply for the city of Eastland and is used for flood control and recreation. Land use around the reservoir includes residential and agriculture.

At time of sampling, habitat consisted mainly of rocky structure, standing timber, and featureless, soft-bottom substrate. Water level, at time of sampling, was 6 to 8 feet below the spillway. Water level steadily dropped from 2005 until it filled in March 2007 (Figure 1). A similar trend occurred several years ago—beginning in the late 1990s—when water level dropped for over two years (Figure 1). Prior to 1998, water level at Leon Reservoir was high and stable for 14 years and, consequently, good fishing, particularly for largemouth bass, marked this period.

Leon Reservoir was mesotrophic based on Carlson's Trophic State Index for Chlorophyll-a (TSI Chl-a) with a mean TSI chl-a of 44.63 and a trend that indicated an increase in algal content (Texas Commission on Environmental Quality 2005). Boat access consisted of two public boat ramps. Bank fishing access was restricted to the area around the boat ramps and a pay-for-fishing dock. Other descriptive characteristics for Leon Reservoir are in Table 1. Contour mapping of the reservoir began in 2005 and will be completed in 2007 by district staff.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Jons and Dumont 2003) included:

1. Maintain contact with Eastland County Water Supply District and provide assistance and technical guidance regarding user conflicts over bass fishing tournament restrictions.
Action: No user conflicts occurred since last survey report. This issue has been tabled and has not been discussed in several years. No action or guidance from our office was necessary on this issue.
2. Stock Florida largemouth bass if Florida alleles drop below 20%.
Action: Florida largemouth bass alleles are above 20%; no stocking was necessary.

Harvest regulation history: Sport fishes in Leon Reservoir have always been managed with statewide regulations (Table 2).

Stocking history: Florida largemouth bass were introduced in 1975, and the most recent stocking was in 1994. Palmetto bass were stocked in the late 1970s and, in 1976, there was an experimental stocking of tiger musky. Threadfin shad were introduced in 1984. The complete stocking history is in Table 3.

Vegetation/habitat history: Leon Reservoir has no significant vegetation/habitat management history.

3 METHODS

Fishes were collected by electrofishing (1.5 hour at 18 5-min stations), gill netting (five net nights at five stations), and trap netting (six net nights at six 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). Microsatellite DNA analysis was used in 2006 and electrophoresis was used prior to 2006 to determine largemouth bass genetics. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (W_r)] were calculated for some 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 SE was calculated for structural indices and IOV. Ages of largemouth bass were determined using otoliths. Source for water level data was the United States Geological Survey website.

RESULTS AND DISCUSSION

Habitat: A habitat survey was last conducted in 1998 (Dumont and Jons 1999).

Prey species: Electrofishing catch rate of gizzard shad, threadfin shad, and bluegill was 180.7/h, 39.3/h, and 371.3/h, respectively. The IOV for gizzard shad was 91%. This was much higher than the IOV estimate in 2004 and nearly identical to the IOV in 2002 (Figure 2). Total CPUE of gizzard shad was high in 1998 and 2000, declined in 2002 and 2004, and leveled off at a relatively low catch rate in 2006 (Figure 3). At the same time there has been an increasing trend in gizzard shad PSD (Figure 3). Current size structure and relative abundance estimates for gizzard shad are unusual for Leon Reservoir. Perhaps an influx of water and nutrients will alter the dynamics of the shad population, but the current trend has continued despite a significant water inflow in 2002 and a relatively stable water level for over three years thereafter. Threadfin shad relative abundance, since 2000, has followed the same trend as gizzard shad relative abundance (Figure 4), providing further evidence that conditions have not favored shad populations in Leon Reservoir in recent years. Size structure of bluegill was typical of the district; a population dominated by small individuals with a low PSD (Figure 5). Total CPUE of bluegill has fluctuated since 1998, and no apparent trend was evident (Figure 6).

Channel catfish: The gill net catch rate of channel catfish was 3.6/nn in 2007 and was similar to catch rates in previous years (Figure 7). Size structure was adequate as 83% of the channel catfish caught in 2007 were legal size (at least 12 inches long), and PSD ranged from 24-32 since 1998.

White bass: The gill net catch rate of white bass was 42.8/nn in 2007 which represents the highest catch rate ever recorded from any district 1-B reservoir. White bass relative abundance has made steady and large increases since 1998 (Figure 8). Size structure of white bass was excellent in 2007; the modal length was 12 inches, and fish from 7 to 15 inches were collected. A similar length frequency was present in 2003, while white bass collected in 1998 were somewhat larger (Figure 8).

Largemouth bass: The electrofishing catch rate of stock-length largemouth bass has steadily increased since 2002 and was 153.3/h in 2006 (Figure 9). Reproduction, based on CPUE of sub-stock fish, has been good since 2002 (Figure 9). Size structure of largemouth bass was fair; PSD gradually increased from 33 in 2002 to 44 in 2006, but RSD-14 and RSD-P, despite improving slightly in 2006, were too low (Figure 9). Effects of the 1998-2002 drought are shown in Figure 10; 1998 represents a relatively stable largemouth bass population resulting from 14 years of stable water levels and, as the drought progressed, catch rates declined, reaching a low in 2002, followed by higher catch rates in 2004 and 2006. Mean W_r for stock to quality largemouth bass and for preferred and larger largemouth bass was adequate in 2006

(Figure 11). For quality to preferred largemouth bass, mean *Wr* was below 90 and has declined since 2002 (Figure 11). Mean age of 10 in largemouth bass has been similar since 1998 and better than the district mean (Table 4). Growth rates of larger fish, based on mean age at 12 inches and 14 inches, declined considerably from 2004 to 2006 and, for 14 inch largemouth bass, mean age was older than the district mean (Table 4). Florida largemouth bass allele frequency was similar between adult (≥ 10 inches long) and age-0 largemouth bass in 2006 and was 31% for age-0 fish and 29% for adult fish. The age-0 Florida allele frequency has ranged from 21% to 34% since 1995 (Table 5). Classification of the Florida genotype, using genetic analysis, is based on 0.95 or higher Florida influence on a given fish, which didn't occur in Leon Reservoir in 2006. In addition, only eight of 394 fish in the sample had a Florida influence greater than 0.75, representing a mere 2% of the population.

White crappie: The trap net catch rate of white crappie has increased in each survey since 1998 and was 43.0/nn in 2006. The catch rate of legal-size fish followed a similar trend (Figure 12). The PSD has been highly variable and without trend since 1998 (Figure 12). The large number of 5-7-inch crappie collected in 2006 drastically reduced the PSD. The percentage of legal-size fish (RSD-10) has slowly, but steadily, declined from 15 in 1998 to 11 in 2006. Ideally, RSD-10 should be 25 or higher.

Fisheries management plan for Leon Reservoir, Texas

Prepared – July 2007.

ISSUE 1: Leon Reservoir was selected as a study site for an evaluation of the largemouth bass genetics monitoring program. Prior to 2005, electrophoresis of age-0 or age-1 largemouth bass was used to determine genetic composition. Beginning in 2006, microsatellite DNA analysis was adopted as the technique to determine genetic composition. This technique does not require fish to be sacrificed to obtain a sample and it provides a much more accurate description of the genetic makeup of an individual fish and, therefore, the population. The study will evaluate our current largemouth bass genetics monitoring program to ensure that fish are collected in such a manner that genetics of a population are estimated with acceptable levels of accuracy and precision, particularly in regards to sampling YOY or adult fish.

MANAGEMENT STRATEGY

1. Intensively electrofish in 2006 and 2007 to evaluate the genetic analysis monitoring program.

ISSUE 2: Crappie size structure remains poor as relatively few adult crappie attain legal size.

MANAGEMENT STRATEGY

1. An increase in water level, and consequent increase in productivity and forage fish abundance, may provide the necessary boost to the large number of sub-legal fish that are currently present in the reservoir. Monitoring in 2007 and 2008, including an age and growth sample in 2007, will be necessary following the water level increase to determine status of crappie population.

SAMPLING SCHEDULE JUSTIFICATION:

Electrofishing in 2007 is part of approved research project. A trap net survey in 2007 and 2008 is needed to determine status of the crappie population following a major rain event in March 2007 that filled the reservoir. A four-year rotation is adequate to monitor channel catfish and white bass populations.

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, 2nd 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.
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- Jons, G., and S. Dumont. 2003. Statewide freshwater fisheries monitoring and management program survey report for Leon Reservoir, 2002. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- Texas Commission on Environmental Quality. 2005. Trophic classification of Texas reservoirs; 2004 water quality inventory and 303(d) list (May 13, 2005). 15 pp.

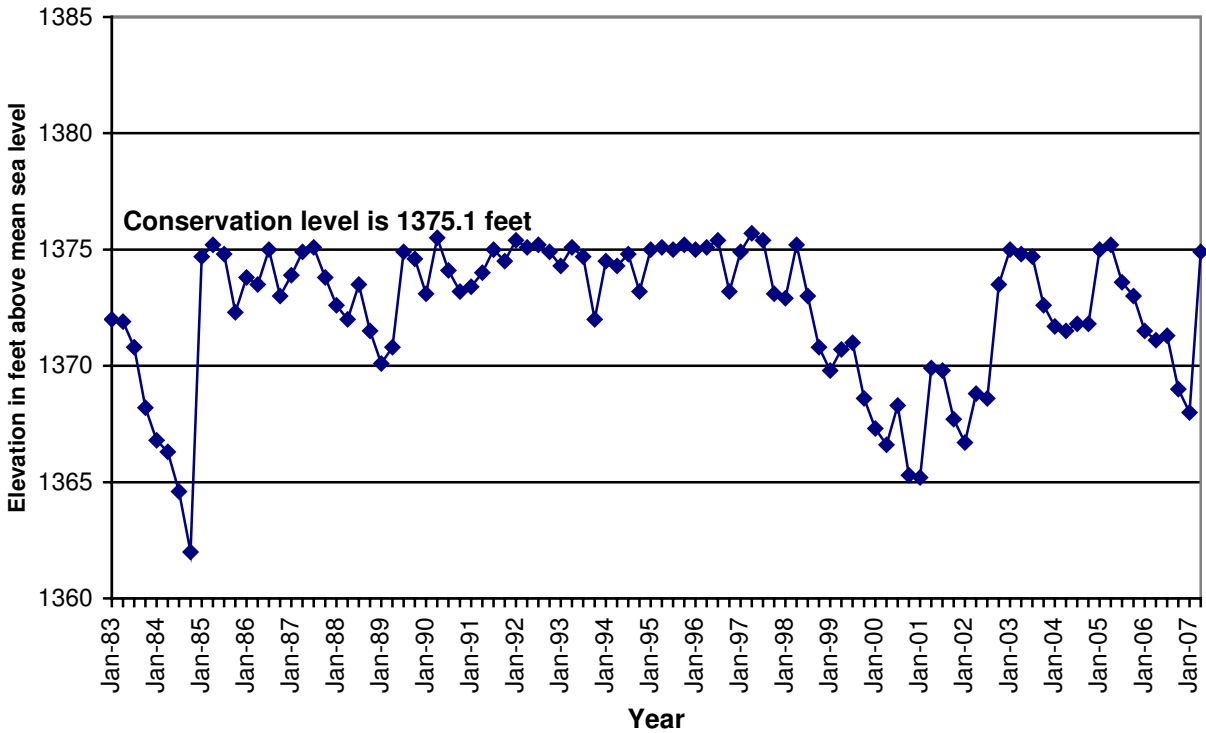


Figure 1. Quarterly water level elevations in feet above mean sea level for Leon Reservoir, Texas.

Table 1. Characteristics of Leon Reservoir, Texas.

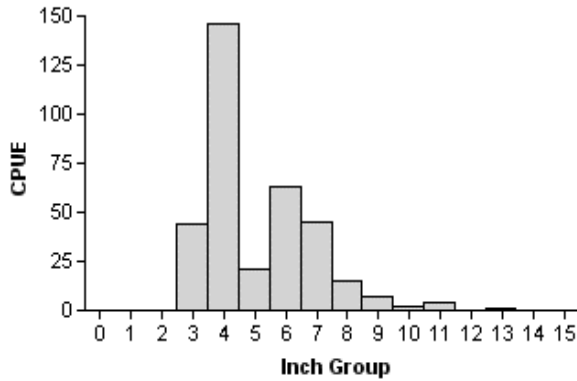
Characteristic	Description
Year constructed	1954
Controlling authority	Eastland County Water Supply District
County	Eastland
Reservoir type	Main stream, Brazos River Basin
Shoreline Development Index	2.82
Conductivity	526 umhos/cm

Table 2. Harvest regulations for Leon Reservoir, Texas

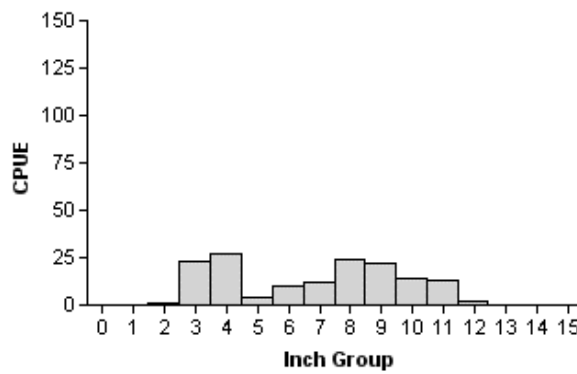
Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No Limit
Catfish, flathead	5	18 - No Limit
Bass, white	25	10 - No Limit
Bass, largemouth	5	14 - No Limit
Crappie: white and black crappie, their hybrids and subspecies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

Table 3. Stocking history of Leon Reservoir, Texas. Size categories are: FGL = 1-3 inches and ADL = adults.

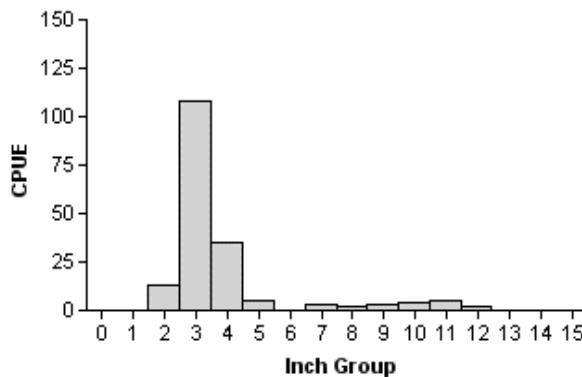
Species	Year	Number	Size
Florida largemouth bass	1975	40,500	FGL
	1975	40,000	FGL
	1977	80,000	FGL
	1986	75,500	FGL
	1994	79,500	FGL
	Total	315,500	
Largemouth bass	1969	146,000	FGL
	1970	50,000	FGL
	Total	196,000	
Northern pike x muskellunge	1976	1,500	
Palmetto bass (striped X white bass hybrid)	1976	15,763	FGL
	1978	15,875	FGL
	1980	16,000	FGL
	Total	47,638	
Threadfin shad	1984	1,000	ADL

Gizzard Shad**2002**

Effort = 1.0
 Total CPUE = 348.0 (24; 348)
 Stock CPUE = 74.0 (26; 74)
 PSD = 7 (4)
 IOV = 92 (3)

2004

Effort = 1.0
 Total CPUE = 152.0 (19; 152)
 Stock CPUE = 87.0 (17; 87)
 PSD = 17 (4)
 IOV = 51 (11)

2006

Effort = 1.5
 Total CPUE = 180.7 (23; 271)
 Stock CPUE = 18.7 (23; 28)
 PSD = 36 (10)
 IOV = 91 (3)

Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for PSD and IOV are in parentheses) for fall electrofishing surveys, Leon Reservoir, Texas, 2002, 2004, and 2006.

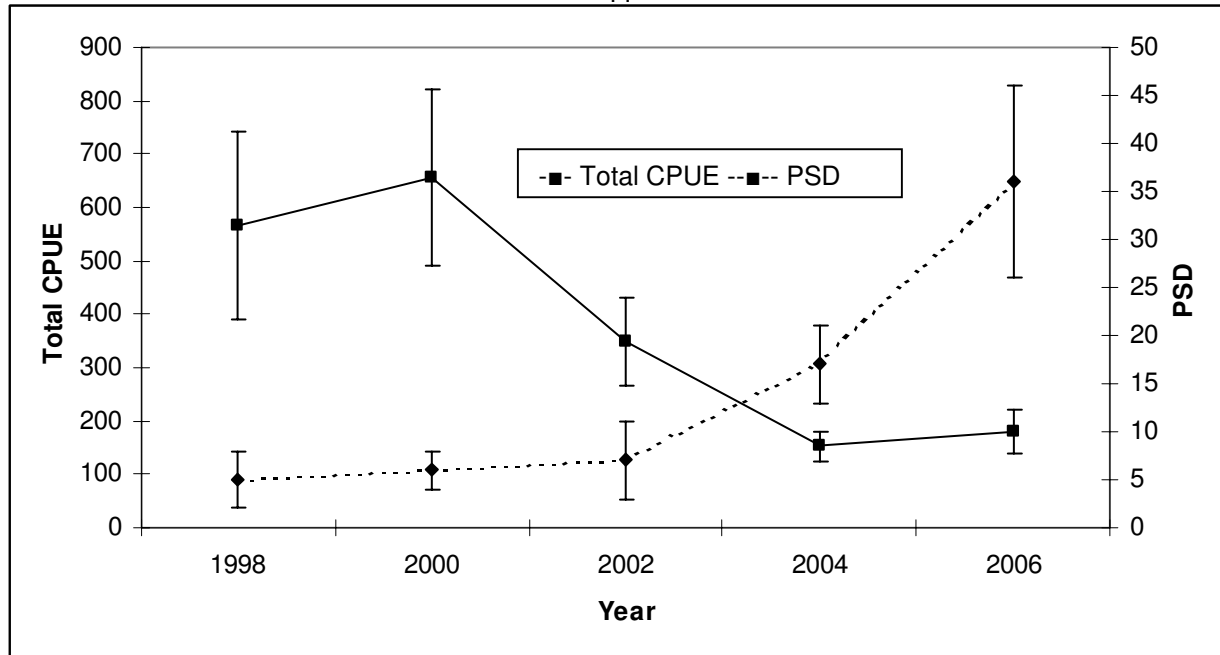


Figure 3. Number of gizzard shad caught per hour (CPUE) (\pm SE) and proportional stock density (PSD) (\pm SE) for fall electrofishing surveys, Leon Reservoir, Texas, 1998-2006.

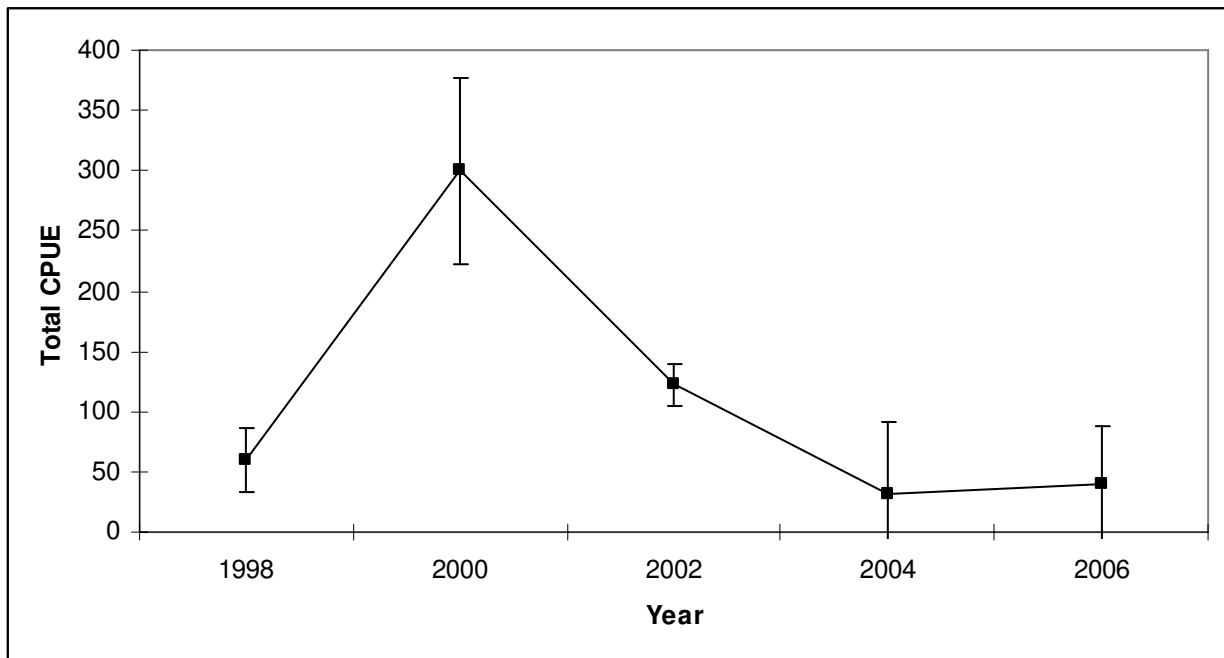
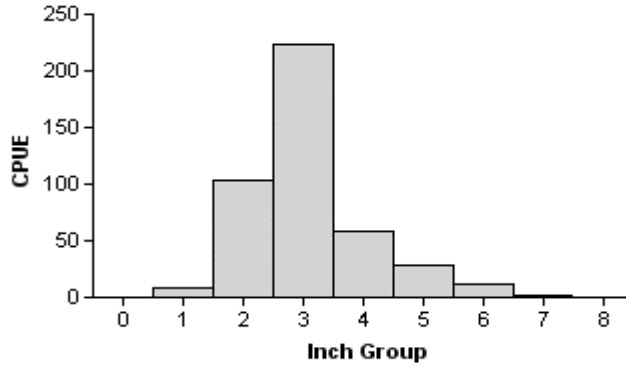


Figure 4. Number of threadfin shad caught per hour (CPUE) (\pm SE) for fall electrofishing surveys, Leon Reservoir, Texas, 1998-2006.

Bluegill

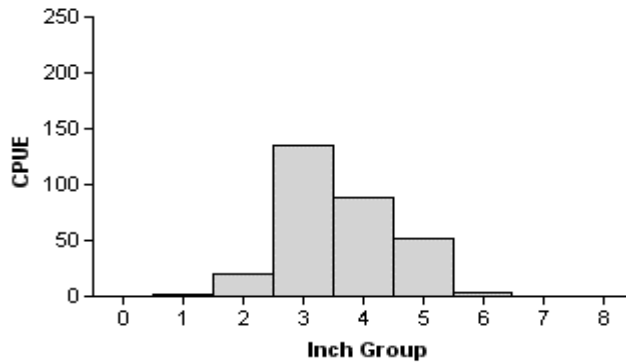
2002

Effort = 1.0
Total CPUE = 435.0 (14; 435)
PSD = 4 (1)



2004

Effort = 1.0
Total CPUE = 300.0 (13; 300)
PSD = 1 (1)



2006

Effort = 1.5
Total CPUE = 371.3 (15; 557)
PSD = 2 (1)

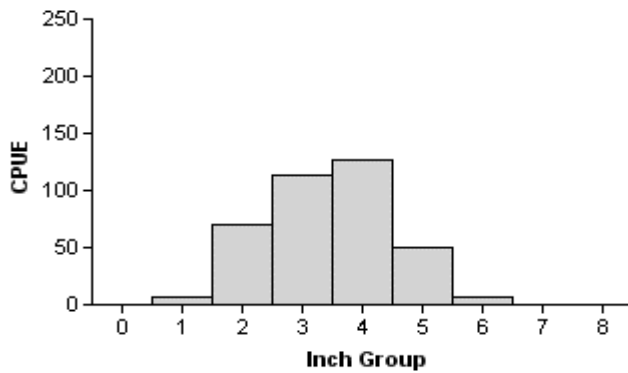


Figure 5. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Leon Reservoir, Texas, 2002, 2004, and 2006.

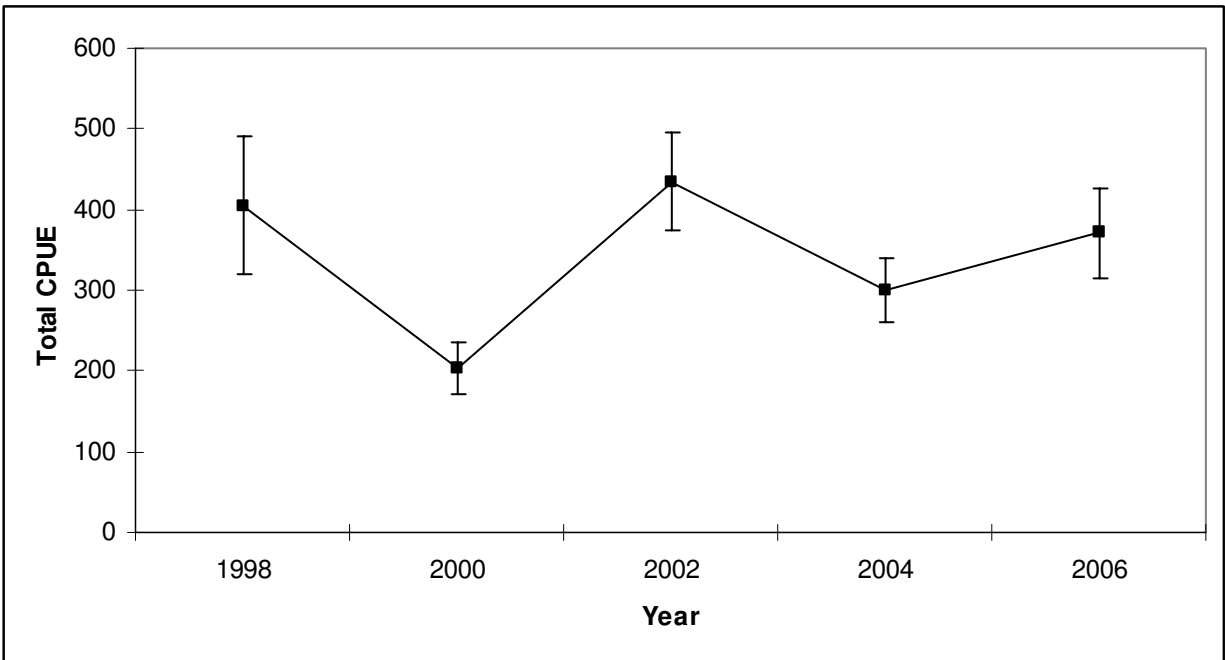
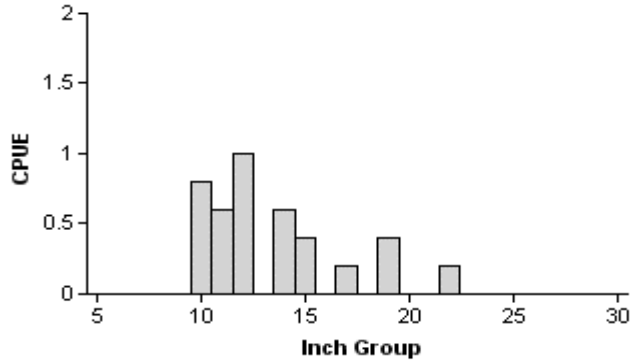


Figure 6. Number of bluegill caught per hour (CPUE) (\pm SE) for fall electrofishing surveys, Leon Reservoir, Texas, 1998-2006.

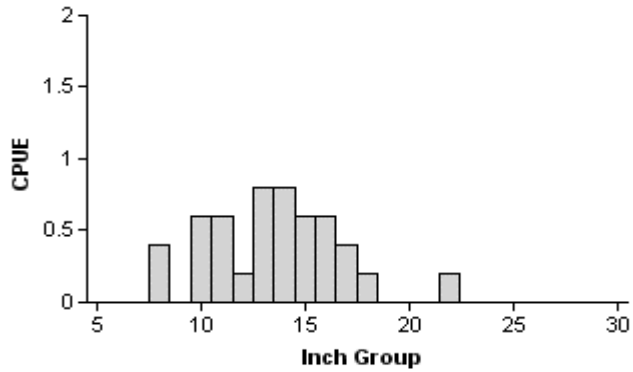
Channel Catfish

1998



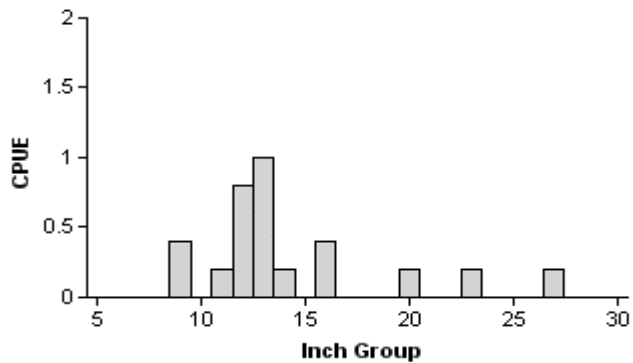
Effort = 5.0
 Total CPUE = 4.2 (25; 21)
 CPUE-12 = 2.8 (13; 14)
 PSD = 24 (12)

2003



Effort = 5.0
 Total CPUE = 5.4 (17; 27)
 CPUE-12 = 3.8 (23; 19)
 PSD = 32 (12)

2007

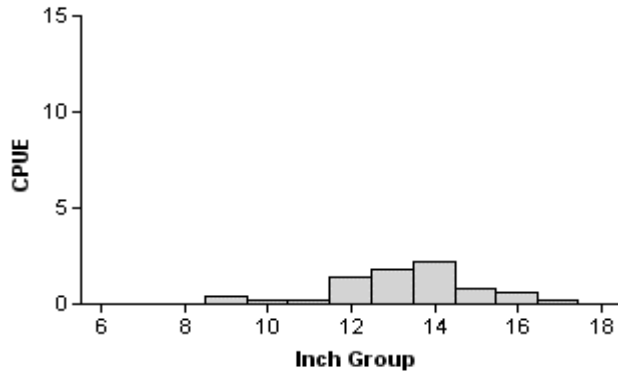


Effort = 5.0
 Total CPUE = 3.6 (26; 18)
 CPUE-12 = 3.0 (26; 15)
 PSD = 31 (12)

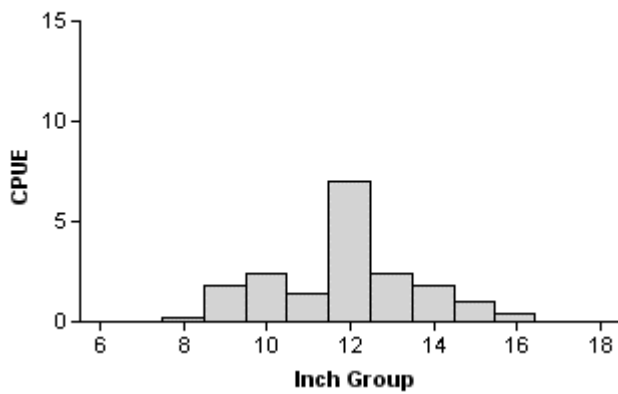
Figure 7. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Leon Reservoir, Texas, 1998, 2003, and 2007.

White Bass**1998**

Effort = 5.0
 Total CPUE = 7.8 (18; 39)
 CPUE-10 = 7.4 (20; 37)

**2003**

Effort = 5.0
 Total CPUE = 18.4 (40; 92)
 CPUE-10 = 16.4 (41; 82)

**2007**

Effort = 5.0
 Total CPUE = 42.8 (33; 214)
 CPUE-10 = 36.0 (35; 180)

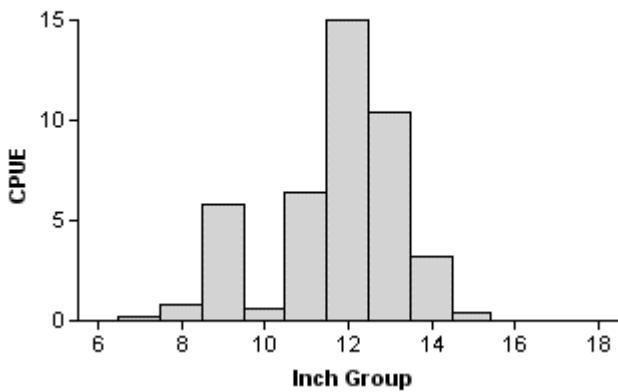
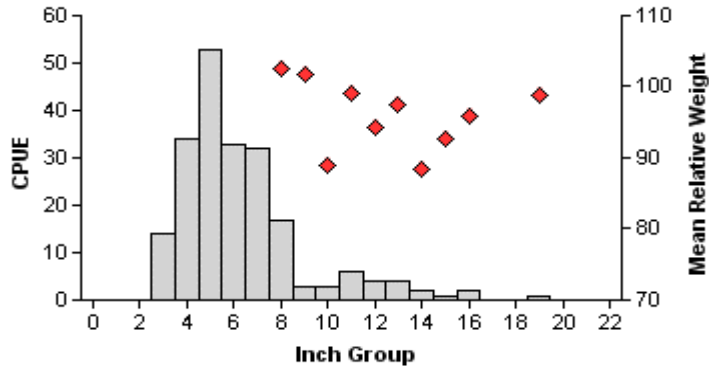


Figure 8. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Leon Reservoir, Texas, 1998, 2003, and 2007.

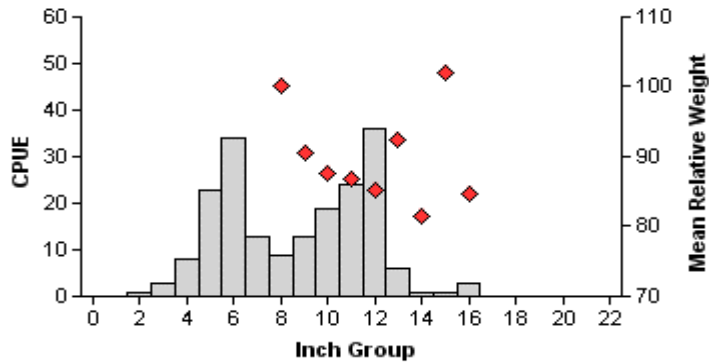
Largemouth Bass

2002



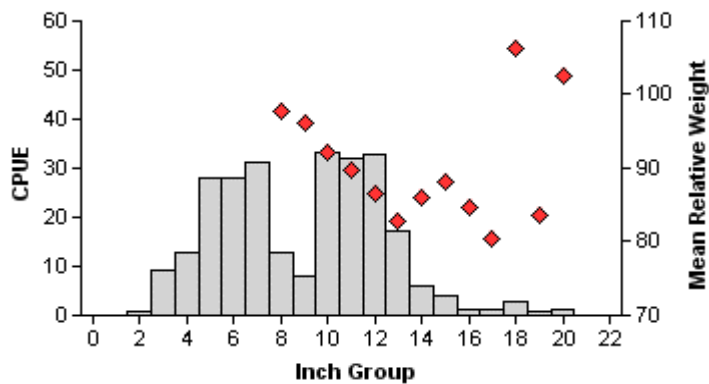
Effort = 1.0
 Total CPUE = 209.0 (17; 209)
 Stock CPUE = 43.0 (22; 43)
 CPUE-14 = 6.0 (46; 6)
 PSD = 33 (7)
 RSD-P = 9 (5)
 RSD-14 = 14 (7)

2004



Effort = 1.0
 Total CPUE = 194.0 (13; 194)
 Stock CPUE = 112.0 (16; 112)
 CPUE-14 = 5.0 (46; 5)
 PSD = 42 (4)
 RSD-P = 4 (2)
 RSD-14 = 4 (2)

2006



Effort = 1.5
 Total CPUE = 263.3 (14; 395)
 Stock CPUE = 153.3 (18; 230)
 CPUE-14 = 17.3 (24; 26)
 PSD = 44 (3)
 RSD-P = 7 (1)
 RSD-14 = 11 (1)

Figure 9. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Leon Reservoir, Texas, 2002, 2004, and 2006.

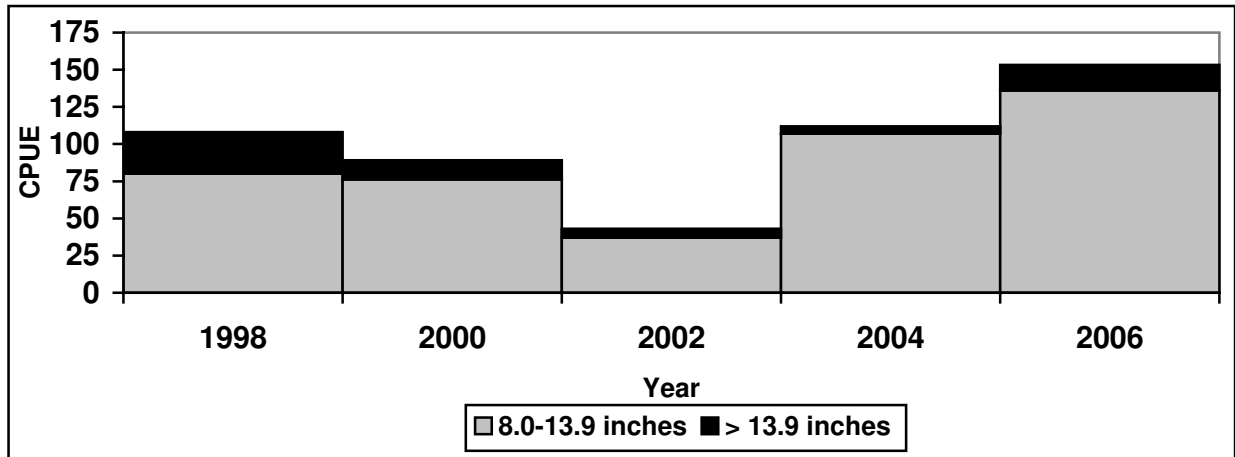


Figure 10. Number of largemouth bass (stock size and larger) caught per hour (CPUE) for fall electrofishing surveys, Leon Reservoir, Texas, 1998-2006.

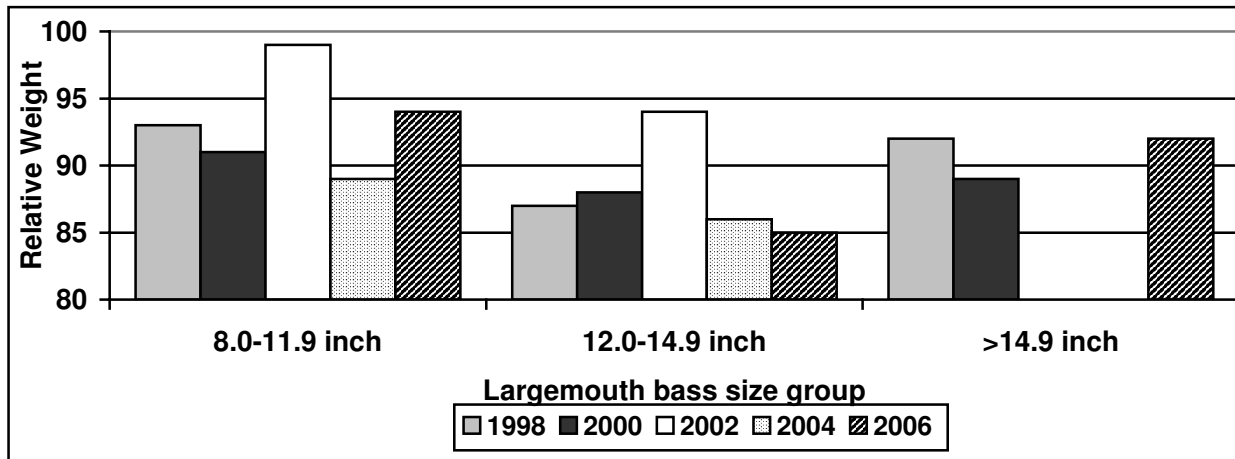


Figure 11. Average relative weight of 8.0-11.9-inch, 12.0-14.9-inch, and > 14.9-inch largemouth bass from 1998 to 2006 at Leon Reservoir. Relative weight was not included if sample size was less than seven fish.

Table 4. Mean age at length of largemouth bass at 10 inches, 12 inches, and 14 inches collected from fall electrofishing surveys in Leon Reservoir in 1998, 2000, 2004, and 2006. Sample size for each estimate is in parentheses.

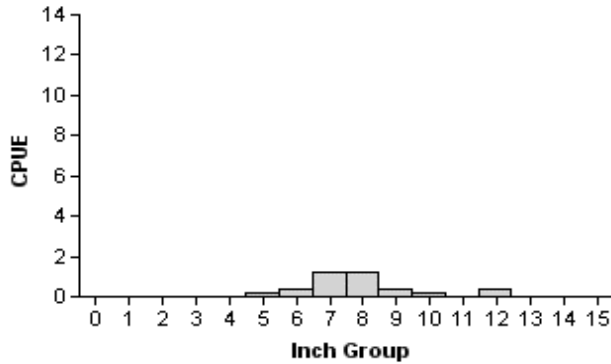
Year	Mean age at length		
	10" (9.0"-10.9")	12" (11.0"-12.9")	14" (13.0"-14.9")
1998	1.00 (9)	1.60 (10)	2.54 (11)
2000	1.10 (10)	1.62 (8)	2.36 (11)
2004	1.07 (15)	1.45 (22)	2.12 (8)
2006	1.05 (62)	1.71 (97)	2.68 (35)
District mean	1.15	1.85	2.55

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Leon Reservoir, Texas, 1995, 2000, 2002, and 2006. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass. Microsatellite DNA analysis was used in 2006, and electrophoresis was used in 1995, 2000, and 2002 to determine largemouth bass genetics.

Year	Sample size	Genotype			% FLMB alleles	% FLMB genotype
		FLMB	Intergrades	NLMB		
1995	30	1	16	13	26.7	3.3
2000	30	1	16	13	20.8	3.3
2002	49	2	36	11	34.7	4.1
2006-age-0	179	0	157	22	30.6	0.0
2006-adults (≥ 10 in)	199	0	164	35	28.6	0.0

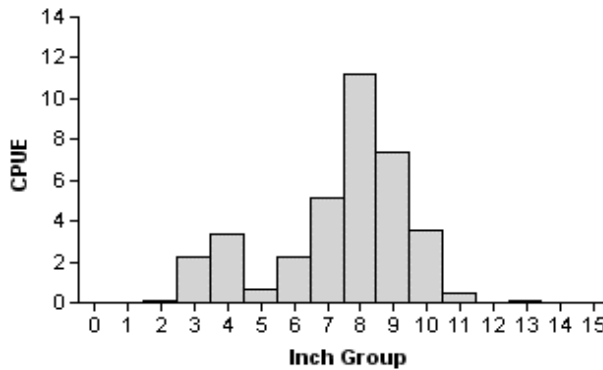
White Crappie

1998



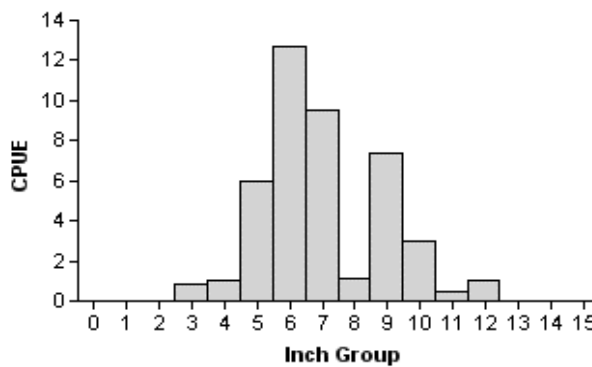
Effort = 5.0
 Total CPUE = 4.0 (60; 20)
 Stock CPUE = 4.0 (60; 20)
 CPUE-10 = 0.6 (100; 3)
 PSD = 55 (15)
 RSD-10 = 15 (17)

2002



Effort = 9.0
 Total CPUE = 36.3 (64; 327)
 Stock CPUE = 30.7 (73; 276)
 CPUE-10 = 4.1 (70; 37)
 PSD = 74 (4)
 RSD-10 = 13 (1)

2006



Effort = 6.0
 Total CPUE = 43.0 (36; 258)
 Stock CPUE = 41.2 (35; 247)
 CPUE-10 = 4.5 (30; 27)
 PSD = 32 (9)
 RSD-10 = 11 (5)

Figure 12. 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, Leon Reservoir, Texas, 1998, 2002, and 2006.

Table 6. Proposed sampling schedule for Leon Reservoir, 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.

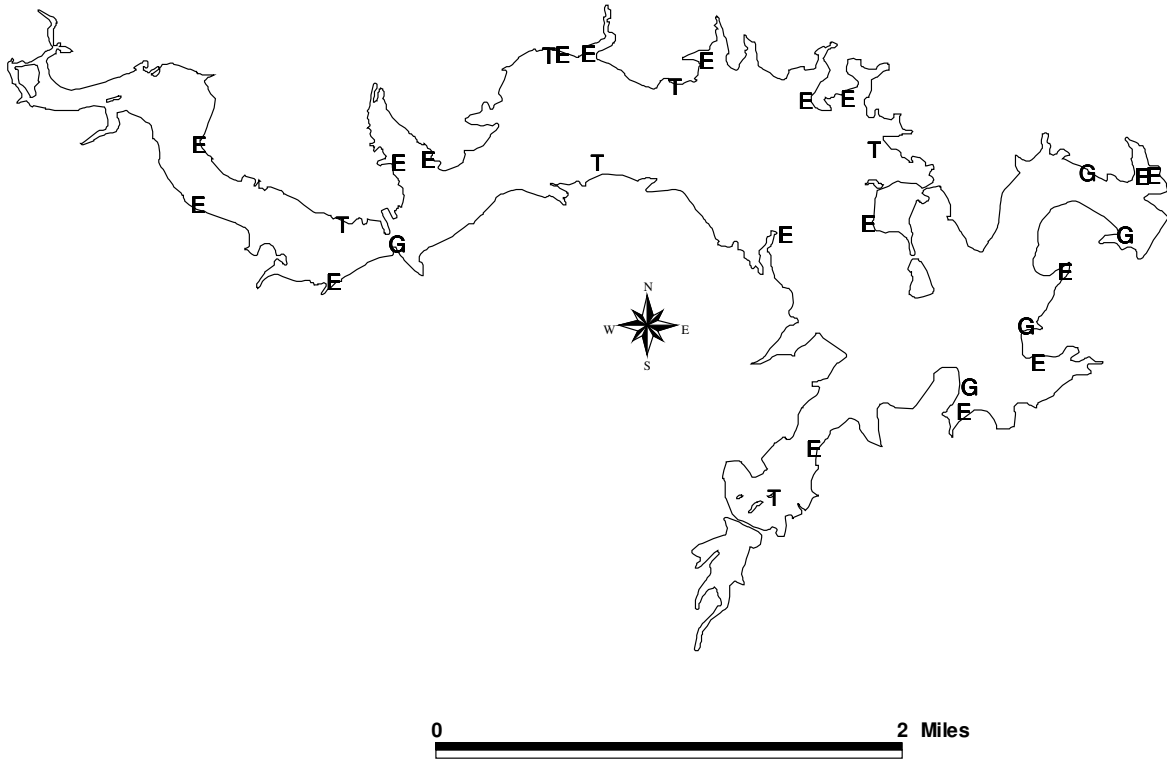
Survey Year	Electrofisher	Trap Net	Gill Net	Report
Fall 2007-Spring 2008	A	A		
Fall 2008-Spring 2009		A		
Fall 2009-Spring 2010				
Fall 2010-Spring 2011	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from Leon Reservoir, Texas, 2006-2007.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					271	180.7
Threadfin shad					59	39.3
Channel catfish	18	3.6				
Flathead catfish	4	0.8				
White bass	215	42.8				
Green sunfish					58	38.7
Warmouth					14	9.3
Orange spotted sunfish					1	0.7
Bluegill					557	371.3
Longear sunfish					279	186.0
Redear sunfish					92	61.3
Largemouth bass					395	263.3
White crappie			258	43.0		
Black crappie			3	0.5		

APPENDIX B



Location of sampling sites, Leon Reservoir, Texas, 2006-2007. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was 6 to 7 feet below conservation level at time of sampling.