

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-1

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2010 Survey Report

Leon Reservoir

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July 31, 2011

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Leon Reservoir were surveyed in 2004-2011 using electrofishing, gill nets, and trap 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 level was 6 to 8 feet below conservation level during October to March sampling period. Habitat features during sampling period consisted of standing timber, open water, rocks, and boat docks. Hydrilla was found for the first time during the 2010 habitat survey. One public boat ramp was usable and bank-fishing access was limited to boat-ramp areas and LaMancha resort.
- **Management History:** In the late 1970s palmetto bass and tiger musky were stocked in Leon Reservoir. Threadfin shad were introduced in 1984. Florida largemouth bass were last stocked in 2008. Sport fish have always been managed with statewide regulations.
- **Fish Community**
 - **Prey species:** Numbers and size range of gizzard shad, bluegill, and threadfin shad should be good enough to support existing sport fishes.
 - **Catfishes:** Numbers and size range of channel catfish improved. Channel catfish should provide excellent fishing opportunities. Flathead catfish were present.
 - **White bass:** Fewer white bass were collected in 2011 compared to previous surveys. However, the 2011 catch was more likely related to sampling variability than to an actual decline in white bass abundance.
 - **Largemouth bass:** Adult largemouth bass were abundant. Size distribution indicated that few larger fish (≥ 14 inches in length) were present relative to smaller fish, but there has been improvement in recent years. Body condition was below what was expected for largemouth bass in this reservoir.
 - **Crappie:** Crappie size distribution, based on a 2008 survey, indicated that few crappie of legal size were available to anglers. However, growth and condition of crappie were favorable. Fishing reports in winter of 2010/2011 indicated that catch of legal-size crappie (black and white) was excellent.
- **Management Strategies:** Closely monitor hydrilla distribution and inform controlling authority of the presence of hydrilla and control options. Continue long-term monitoring of largemouth bass, forage, and crappie populations. Cooperate with controlling authority to improve boat ramps.

INTRODUCTION

This document is a summary of fisheries data collected from Leon Reservoir in 2004-2011. 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 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.

Water level was 6-8 feet below conservation level and habitat consisted mainly of rock, standing timber, and featureless, soft-bottom substrate during 2010-2011 fish population assessment surveys. Water level steadily dropped from April 2005 to February 2007, reached full capacity in March 2007, and has been declining since summer 2007 (Figure 1). Prior to 1998, water level at Leon Reservoir was at or near conservation level and stable for 13 years.

Leon Reservoir was eutrophic based on Carlson's Trophic State Index for Chlorophyll-a (TSI Chl-a) with a mean TSI chl-a of 50.14 and a trend that indicated a decrease in algal content (Texas Commission on Environmental Quality 2008). Boat access consisted of two public boat ramps, but the boat ramp at the dam is unusable when the reservoir is approximately 6 foot or more below conservation level. Bank fishing access was restricted to the area around boat ramps and a pay-for-fishing dock. Other descriptive characteristics for Leon Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Dumont and Farooqi 2007) included:

1. Study what segment of a largemouth bass population to use for determining genetic composition.

Action: Largemouth bass genetics data from Leon Reservoir, and other reservoirs around the state, were used to make changes in sampling procedures for the collection of genetics data. One notable change to TPWD protocol was that samples of any-size largemouth bass can now be used to determine largemouth bass genetic composition rather than using only age-0 fish.
2. Conduct additional monitoring and collect an age and growth sample of white crappie to determine if the population improved following a period with higher water levels.

Action: A trap net survey in 2008 showed no improvement in white crappie size structure. However, growth of white crappie was excellent in 2008.

Harvest regulation history: All sport fish in Leon Reservoir have always been managed with statewide harvest regulations (Table 2).

Stocking history: Florida largemouth bass were introduced in 1975 and were most recently stocked in

2008. Palmetto bass were stocked in the late 1970s. There was an experimental stocking of tiger musky in 1976. Threadfin shad were introduced in 1984. The complete stocking history is in Table 3.

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

Water Transfer: There are currently no permanent pumping stations on the reservoir which transfer water to other locations.

METHODS

Fishes were collected by electrofishing (1.0 hour at 12 5-min stations), gill netting (five net nights at five stations), and trap netting (10 net nights at 10 stations in 2008). 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 and trap nets, as the number of fish per net night (fish/nn). Microsatellite DNA analysis was used to determine largemouth bass genetic composition. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). Habitat composition was determined by assessing habitat at 63 random nearshore points and 72 random points distributed throughout the reservoir. Substrate was categorized using the Wentworth scale as soft (sand, silt, and clays), pebble (particle size < 2.5-in diameter), cobble (particle size 2.5-10-in diameter), or boulder (> 10-in diameter) (Wentworth 1922). Water level at time of habitat sampling was 5 ft. below conservation level. Presence or absence was determined for each habitat type at each point. Percent occurrence was determined for each habitat type and 95% confidence intervals were calculated with 1,000 resamples of the original data (with replacement) by the percentile method.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and condition indices [relative weight (W_r)] were calculated for some target fishes according to Anderson and Neumann (1996). Ninety-five percent confidence intervals were calculated for relative weight estimates with 1,000 resamples of the original data (with replacement) by the percentile method. Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error ($RSE = 100 \times SE \text{ of the estimate/estimate}$) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. District averages were determined from 14 area reservoirs in a nine county district. Source for water level data was the United States Geological Survey website: (<http://waterdata.usgs.gov/tx/nwis/>)

RESULTS AND DISCUSSION

Habitat: The most prevalent nearshore habitat types were open water, standing timber, and boat docks (Figure 2). Aquatic vegetation occurred in approximately 25% of nearshore sites and was comprised primarily of Illinois pondweed, water willow, and bulrush (Figure 2). One small clump of hydrilla was found and removed at the LaMancha fishing/boat dock area during the vegetation survey. A closer inspection of the shoreline revealed several other small clumps east of LaMancha, one of which was too large to remove mechanically. Substrate consisted primarily of rock, but a clay/silt/sand composite was also common (Figure 2). Open water and standing timber were the predominant offshore habitat types (Figure 3).

Prey species: Electrofishing CPUE was 731.0/h for gizzard shad, 364.0/h for bluegill, and 223.0/h for threadfin shad. There was a substantial increase in gizzard shad less than 7 in TL compared to 2004 and 2006 (Figure 4). The IOV has been relatively stable since 1998 and ranged from the upper 70s to low 90s, with the exception of 2004 when it was only 51 (Figure 5). High relative abundance and IOV estimates indicated that gizzard shad should be an important component of the forage base for predator fishes. As forage, bluegill size structure in 2004, 2006, and 2010 was similar. However, there was a higher catch of 6 in bluegill in 2010 and a resultant increase in PSD from 2 or less to 11 (Figure 6), indicating some potential as a sport fish. Historically, electrofishing CPUE of bluegill has been stable,

excluding a pronounced decrease in 2000 (Figure 7). Above average relative abundance (area reservoir average was 226/h) and a size structure dominated by 2-6-in fish indicated that bluegill should be beneficial forage for largemouth bass.

Channel catfish: Gill net CPUE of channel catfish was 9.0/nn in 2011 and was greater than catch rates in 2007 and 2003 (Figure 8). The PSD of channel catfish improved from the low 30s in 2003 and 2007 to 65 in 2011. Numbers and sizes of channel catfish available to anglers appeared to be excellent.

White bass: Gill net CPUE of white bass was 5.4/nn in 2011 and was much lower compared to previous years (Figure 9). Inherent variation in gill net catch of *Morone* species makes any inference to relative abundance difficult. However, anecdotal evidence from anglers indicated that white bass were abundant. Size structure of collected fish was similar to previous years.

Largemouth bass: Electrofishing CPUE of all largemouth bass (166.0/h) and stock-size largemouth bass (110.0/h) in 2010 were lower than catch rates in 2006 but similar to catch rates in 2004 (Figure 10). Catch rate of stock-size largemouth bass has generally centered around 100 fish/h since 1998 with a greater catch in 2006 and a smaller catch in 2002 (Figure 11). The PSD-14 and PSD-P continued to be poor (Figure 10). There has been an increasing trend in PSD since 2002 and in PSD-14 since 2004 (Figure 12). However, both trends fall short of pre-drought estimates from 1998 (Figure 12). Additionally, PSD-14 and PSD-P have been below the district average (17 and 11, respectively) since 2002. Relative weights of 8.0-14.9 in TL largemouth bass have generally declined since 2002, have been below 95 since 2002, and were in the mid 80s in 2010 (Figure 13). Mean W_r of ≥ 15 in fish reached a 12-year low in 2010, and none of these fish attained a W_r of 95 or higher (Figure 13). Poor size structure and body condition was likely reflective of recent water level history (1998-2010) marked by long periods with dropping water level. This is in sharp contrast to the stable water level years of 1985 to 1997 (Figure 1).

Crappie: Trap net CPUE of white crappie was 24.3/nn in 2008. White crappie catch rates have been high since 2002 (Figure 14). Size structure was similar in 2002 and 2006, but PSD and PSD-P estimates were far below the district average of 55 and 26, respectively (Figure 14). Mean W_r slightly decreased for all size classes from 2002 to 2008 (Table 4). However, only small white crappie (5.0-7.9 in TL) had a mean W_r below 95 in 2008 (Table 4). Growth of white crappie in 2008 was exceptional: mean age of 7.0-8.9 in TL fish was 1.0 (N=22), 9.0-10.9 in TL was 1.2 (N=14), and 11.0-12.9 in TL was 2.0 (N=14). Black crappie were present in low abundance (CPUE 0.5 in 2006 and 0.4 in 2008). Fishing reports from the LaMancha Resort fishing dock suggested that a popular winter fishery existed for legal-sized crappie.

Fisheries management plan for Leon Reservoir, Texas

Prepared – July 2011.

ISSUE 1: The largemouth bass population continues to have undesirable size structure and body condition which may result from prolonged periods of dropping water level.

MANAGEMENT STRATEGY

1. Conduct biennial electrofishing surveys to further monitor the relationship between water level and population characteristics of largemouth bass.
2. Determine age and growth characteristics (Category 2) of largemouth bass to determine if stunting is occurring.

ISSUE 2: Hydrilla was discovered during the August habitat survey in the lower end of the reservoir.

MANAGEMENT STRATEGY

1. Determine extent of hydrilla coverage in 2011 by circumnavigation of the perimeter and analysis using the digital shapefile method .
2. Contact Eastland County Municipal Water District regarding the presence of hydrilla

ISSUE 3: Fish populations in Leon Reservoir have been affected by dynamic water levels.

MANAGEMENT STRATEGY

1. Create watershed map for Leon Reservoir and determine if watershed characteristics influence water collection and water quality in the reservoir.
2. Make watershed-level management recommendations to improve water collection in Leon Reservoir.

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.

MANAGEMENT STRATEGIES

1. Contact and educate marina owners and controlling authority about invasive species, and provide them with posters, literature, etc. so that they can in turn educate their customers and post appropriate signage at access points around the reservoir if necessary.
2. Educate the public about invasive species through the use of media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups.
4. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

ISSUE 5: Boat ramps are in need of repair and extension for use during drought periods.

MANAGEMENT STRATEGY

1. Partner with controlling authority to secure Federal dollars for boat ramp repair project.

SAMPLING SCHEDULE JUSTIFICATION:

Conduct additional electrofishing and trap net surveys in 2012 to monitor trends in abundance and size structure of largemouth bass and crappie. A gill net survey every four years is sufficient to monitor channel catfish and white bass populations. Electrofishing and trap net surveys will also be conducted in 2014.

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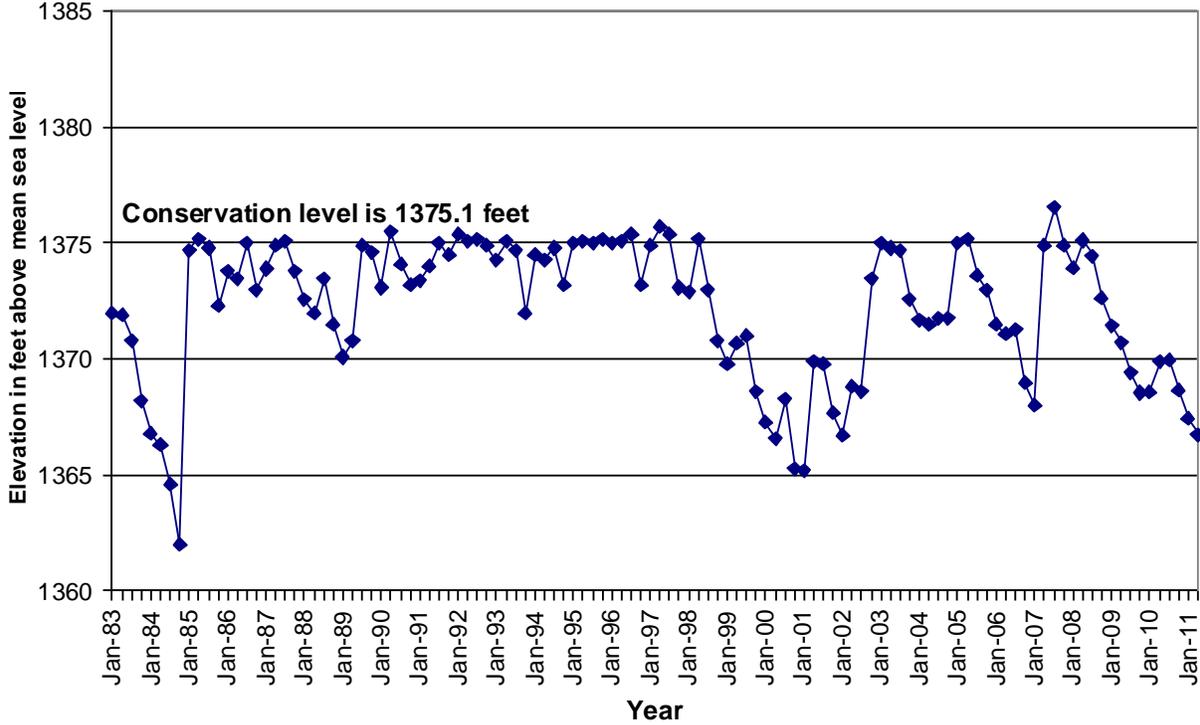


Figure 1. Quarterly water level elevations in feet above mean sea level for Leon Reservoir, Texas.

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	5.42
Watershed area	164,627 acres
Reservoir-to-Watershed percentage	0.94%
Conductivity	526 μ mhos/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
Threadfin shad	1984	1,000	ADL
Florida largemouth bass	1975	40,500	FGL
	1975	40,000	FGL
	1977	80,000	FGL
	1986	75,500	FGL
	1994	79,500	FGL
	2008	152,156	FGL
	Total	476,656	
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	

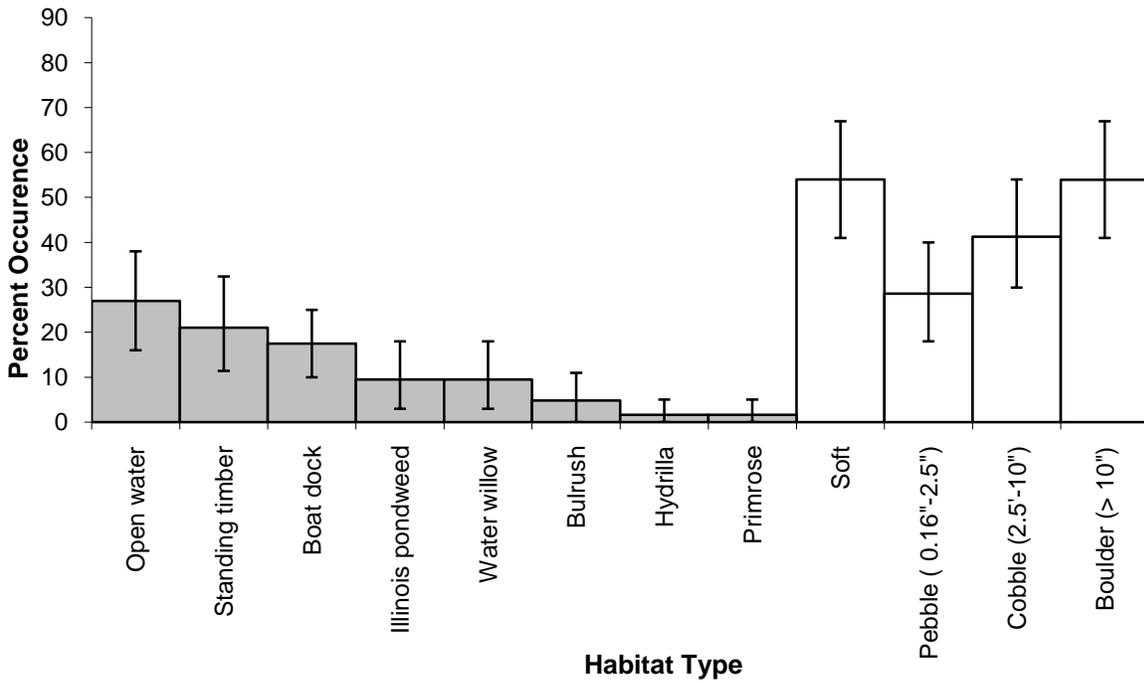


Figure 2. Percent occurrence (\pm 95% C.I., derived from 1,000 resamples, with replacement, of the original data; N=63) of nearshore habitat and substrate types at Leon Reservoir, Texas, 2010.

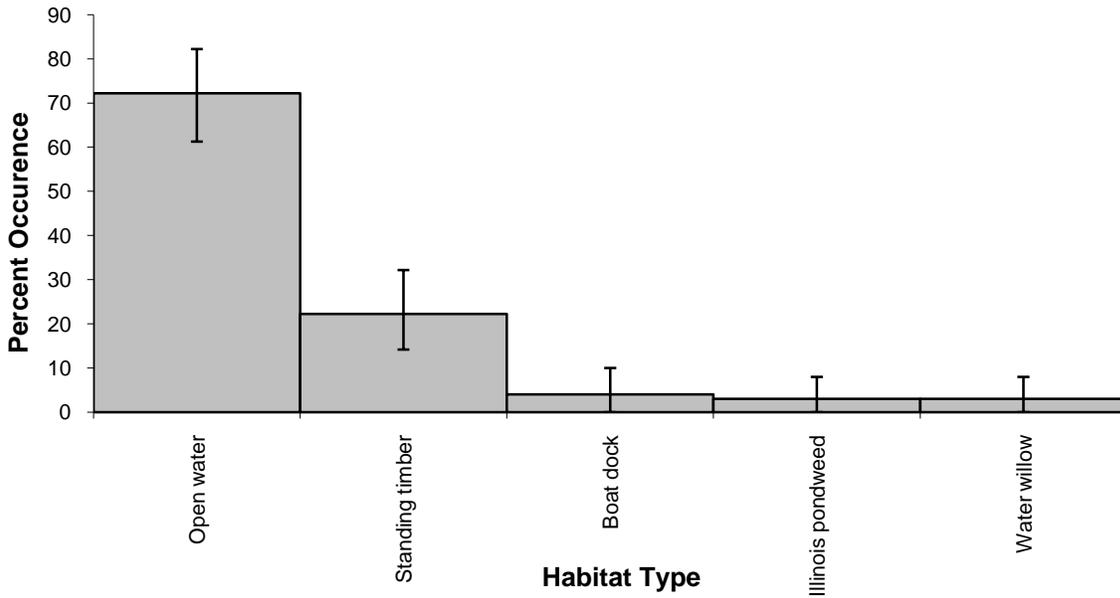
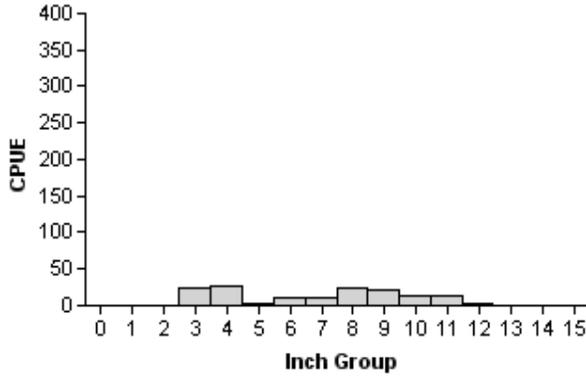


Figure 3. Percent occurrence (\pm 95% C.I., derived from 1,000 resamples, with replacement, of the original data; N=72) of offshore habitat at Leon Reservoir, Texas, 2010.

Gizzard Shad

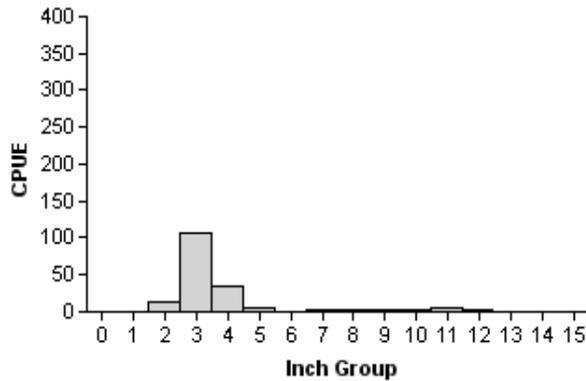
2004

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 = 38 (10)
 IOV = 91 (3)



2010

Effort = 1.0
 Total CPUE = 731.0 (24; 731)
 Stock CPUE = 152.0 (22; 152)
 PSD = 16 (5)
 IOV = 77 (2)

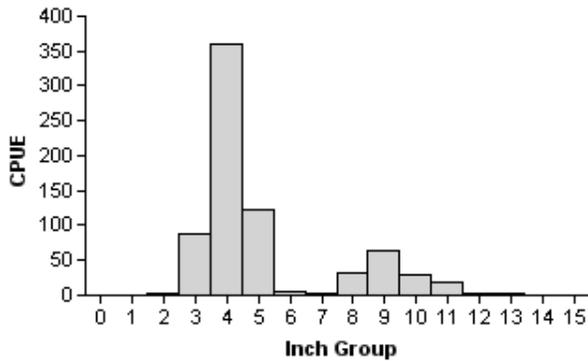


Figure 4. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for PSD and IOV are in parentheses) for fall electrofishing surveys, Leon Reservoir, Texas, 2004, 2006, and 2010.

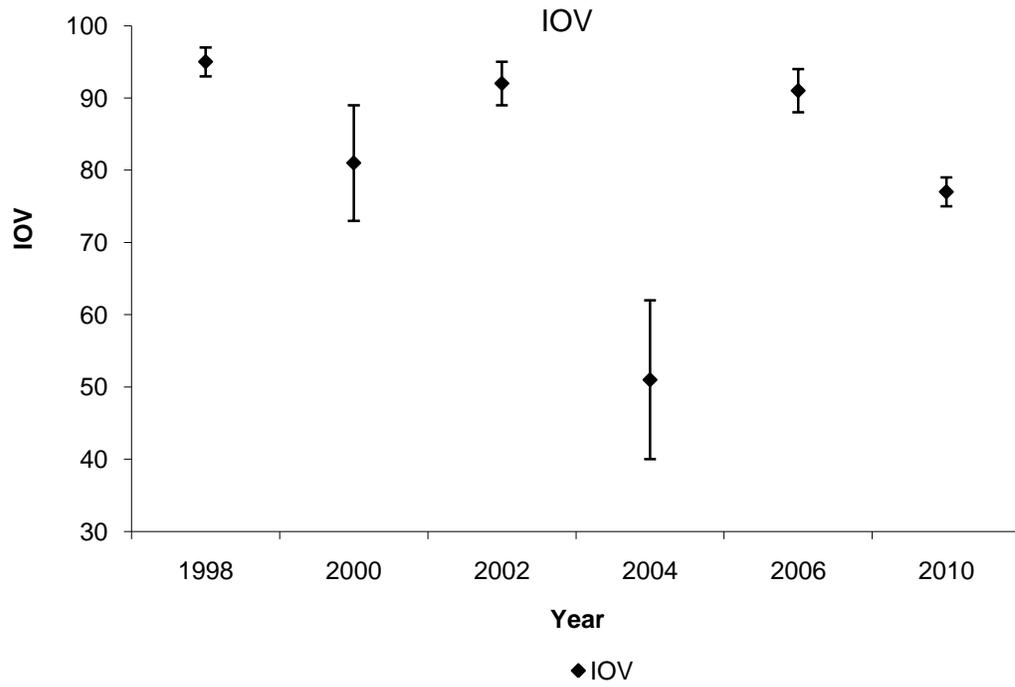
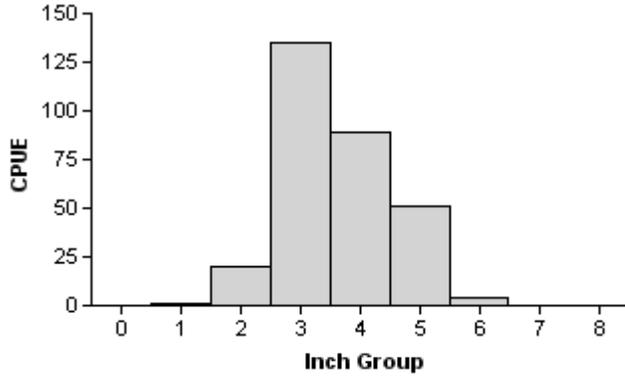


Figure 5. Number of sub-stock gizzard shad caught per hour (CPUE) (\pm SE) and index of vulnerability (IOV) (\pm SE) from fall electrofishing surveys, Leon Reservoir, Texas, 1998-2010.

Bluegill

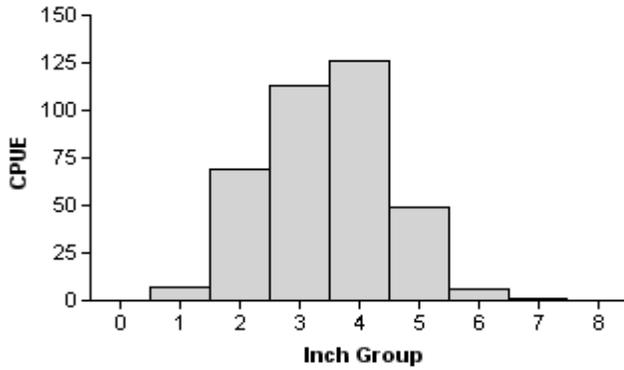
2004

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)



2010

Effort = 1.0
 Total CPUE = 364.0 (21; 364)
 PSD = 11 (3)

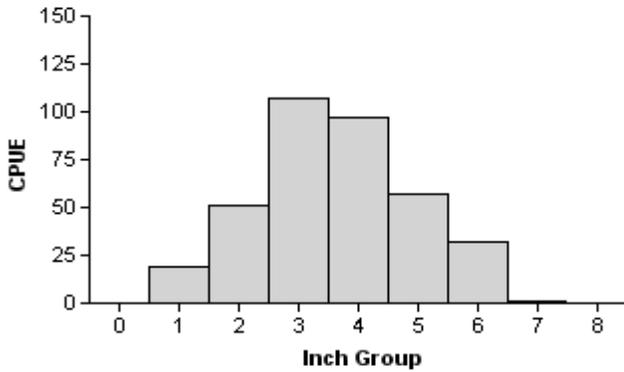


Figure 6. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Leon Reservoir, Texas, 2004, 2006, and 2010.

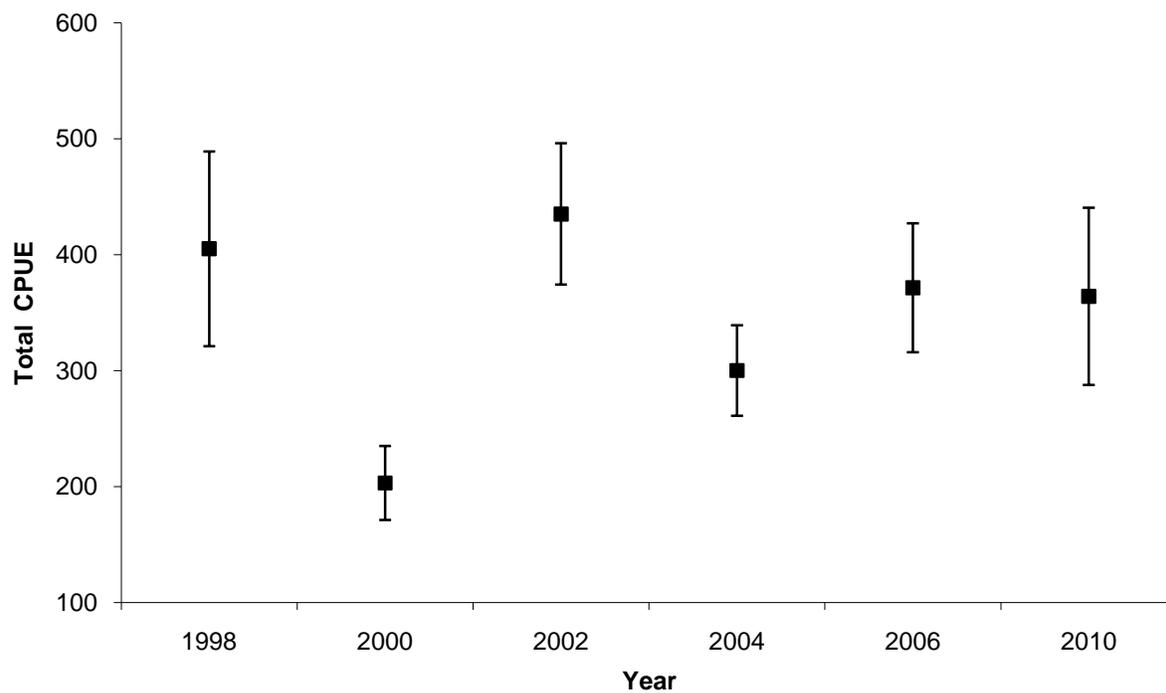
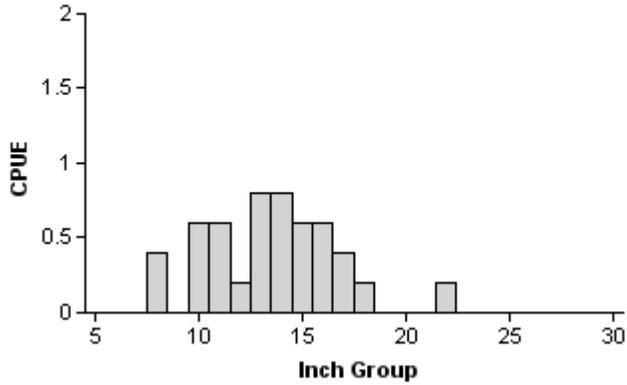


Figure 7. Number of bluegill caught per hour (CPUE) (\pm SE) for fall electrofishing surveys, Leon Reservoir, Texas, 1998-2010.

Channel Catfish

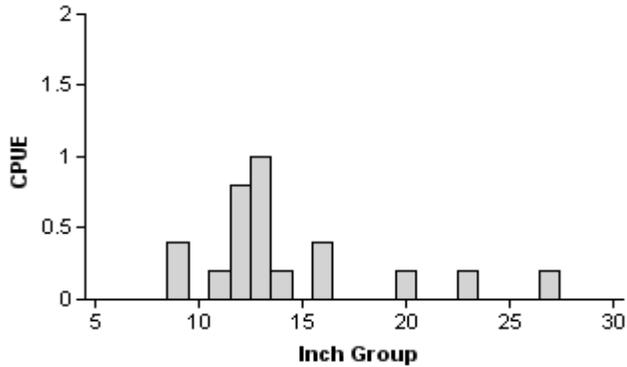
2003

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)



2011

Effort = 5.0
 Total CPUE = 9.0 (22; 45)
 CPUE-12 = 7.4 (20; 37)
 PSD = 65 (14)

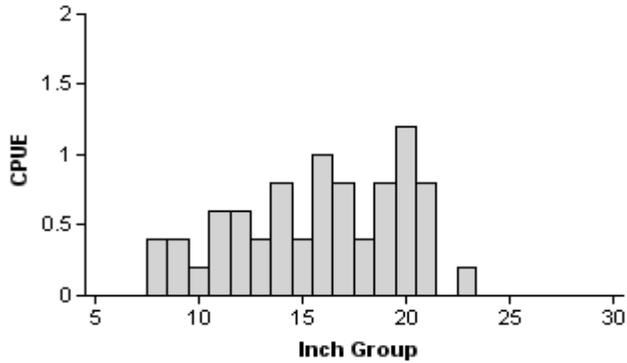
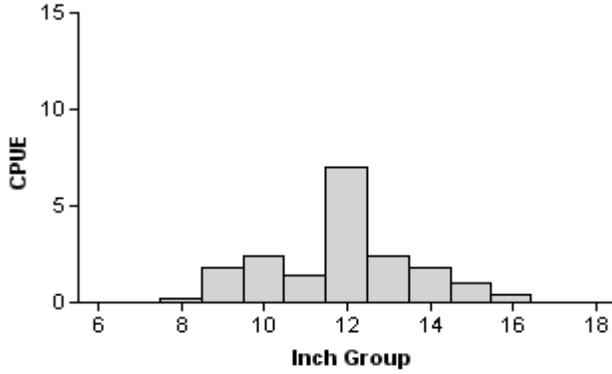


Figure 8. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Leon Reservoir, Texas, 2003, 2007, and 2011.

White Bass

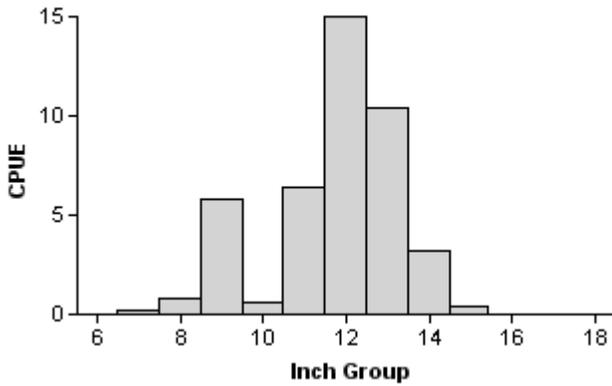
2003

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)



2011

Effort = 5.0
 Total CPUE = 5.4 (41; 27)
 CPUE-10 = 4.8 (47; 24)

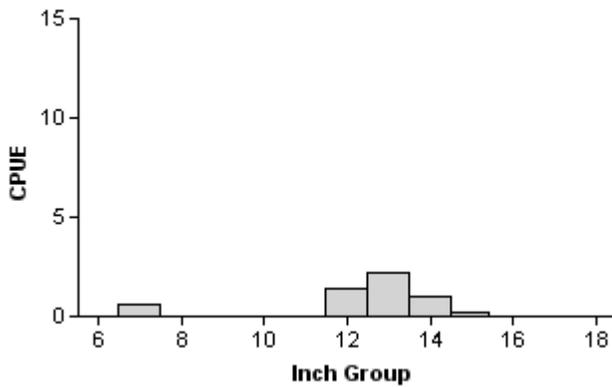


Figure 9. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Leon Reservoir, Texas, 2003, 2007, and 2011.

Largemouth Bass

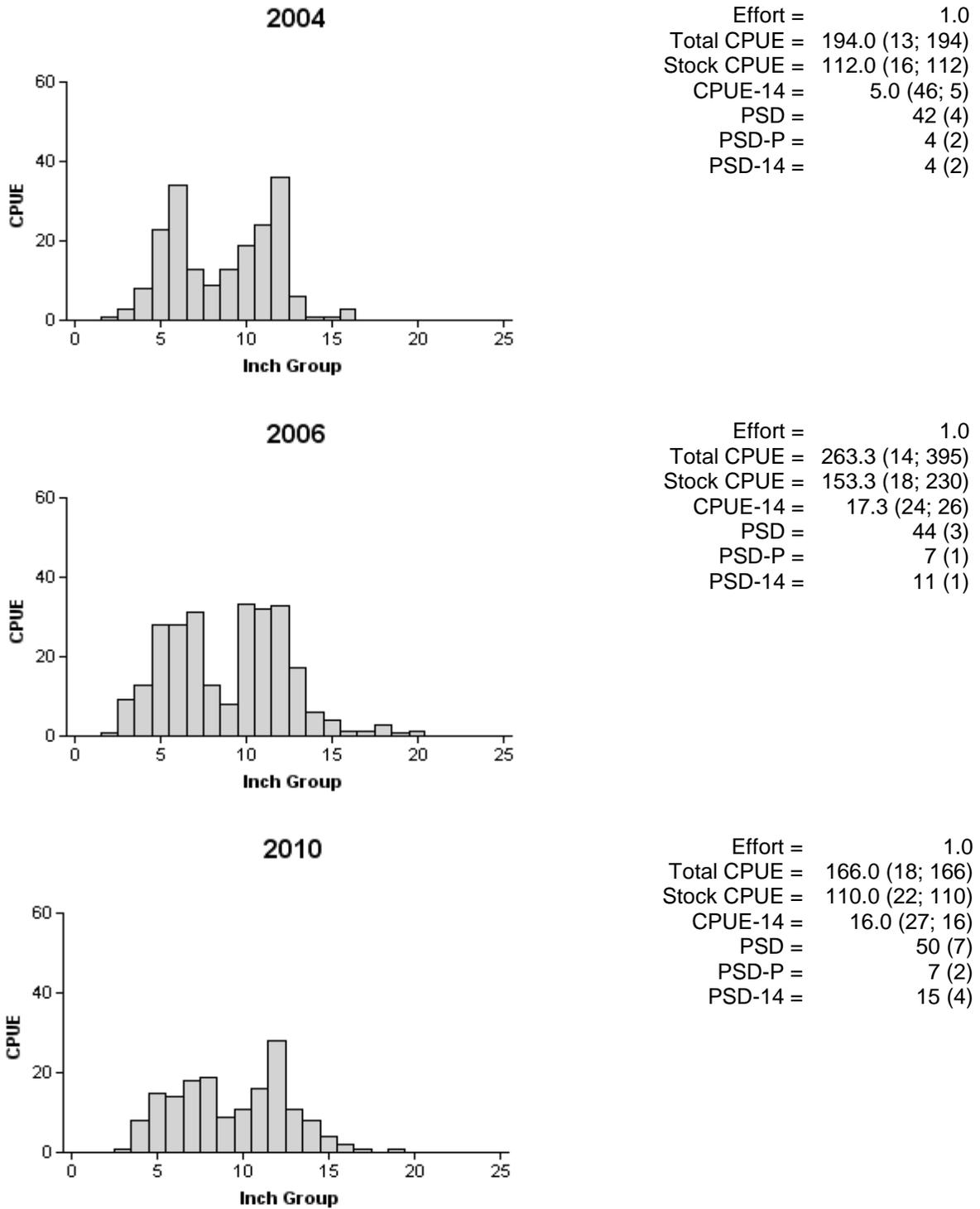


Figure 10. Number of largemouth bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Leon Reservoir, Texas, 2004, 2006, and 2010.

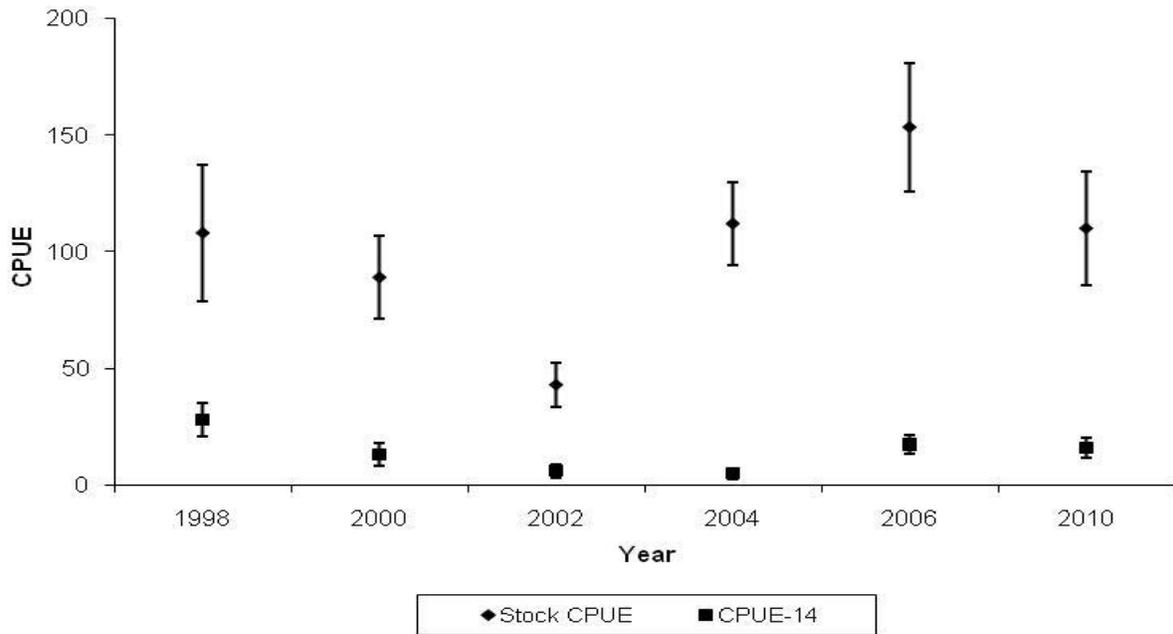


Figure 11. Number of largemouth bass caught per hour (CPUE) for fall electrofishing surveys, Leon Reservoir, Texas, 1998-2010. Error bars represent standard errors.

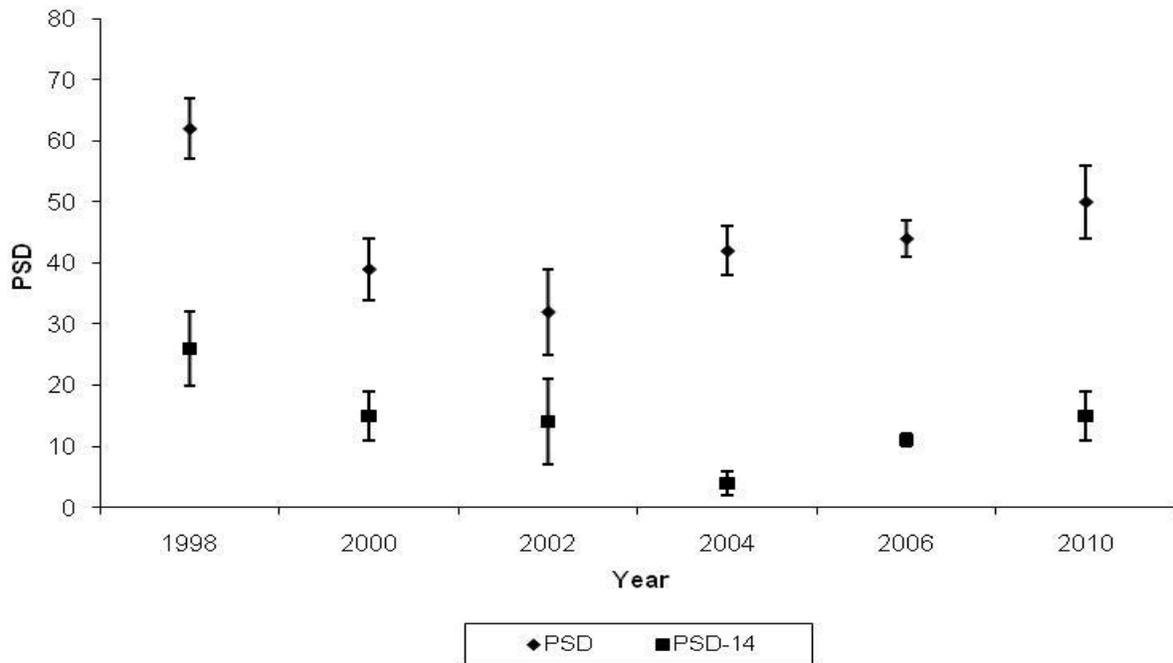


Figure 12. Proportional size distribution indices of largemouth bass for fall electrofishing surveys, Leon Reservoir, Texas, 1998-2010. Error bars represent standard error.

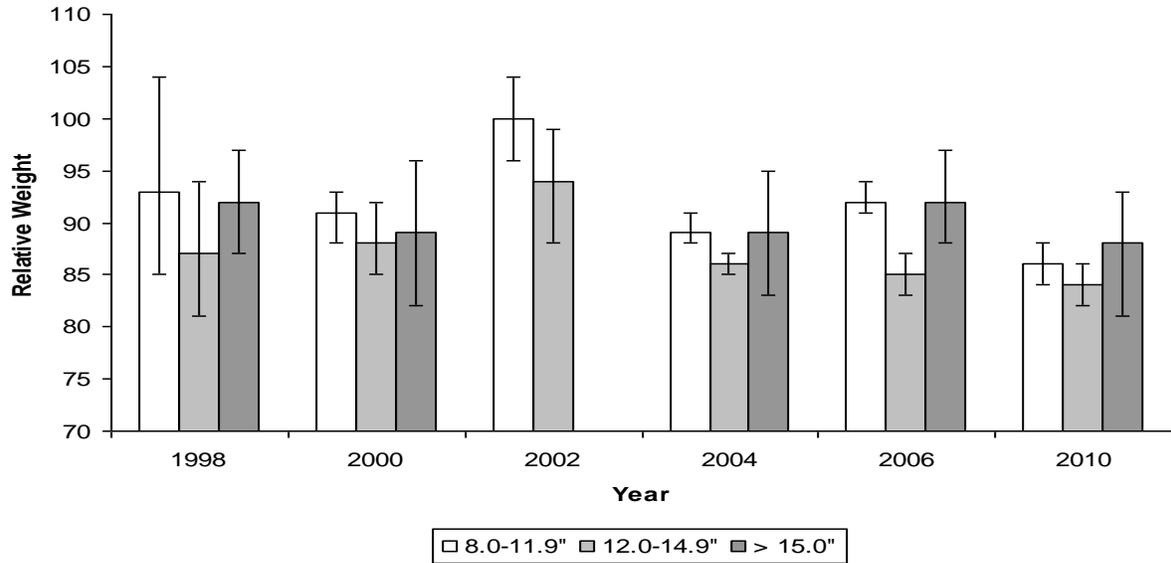
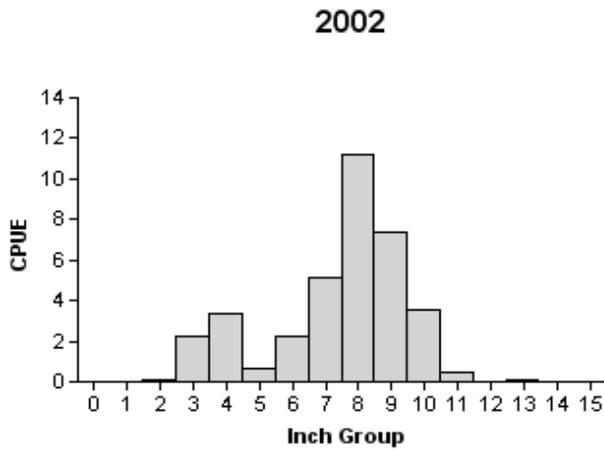
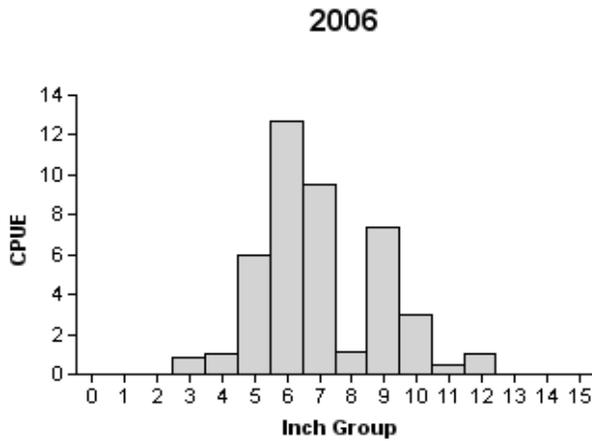


Figure 13. Average relative weight of 8.0-11.9-inch, 12.0-14.9-inch, and ≥ 15 -inch largemouth bass from 1998-2010 at Leon Reservoir, Texas. Error bar represents 95% confidence intervals.

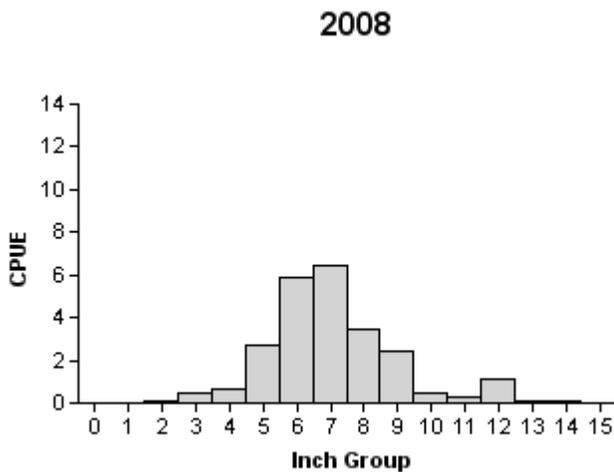
White Crappie



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



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



Effort =	10.0
Total CPUE =	24.3 (59; 243)
Stock CPUE =	23.0 (58; 230)
CPUE-10 =	2.1 (41; 21)
PSD =	35 (11)
PSD-P =	9 (4)

Figure 14. 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, 2002, 2006, and 2008.

Table 4. Average relative weight of 5.0-7.9-inch and 8.0-9.9-inch, and ≥ 10 -inch white crappie in 2001 and 2008 at Leon Reservoir, Texas. The 95% confidence intervals are in parentheses.

Year	Mean W_r by size category		
	5.0-7.9 in	8.0-9.9 in	≥ 10 in
2002	98 (90 - 105)	106 (104 - 108)	105 (102 - 107)
2008	91 (90 - 93)	96 (94 - 99)	97 (93 - 101)

Table 5. 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.

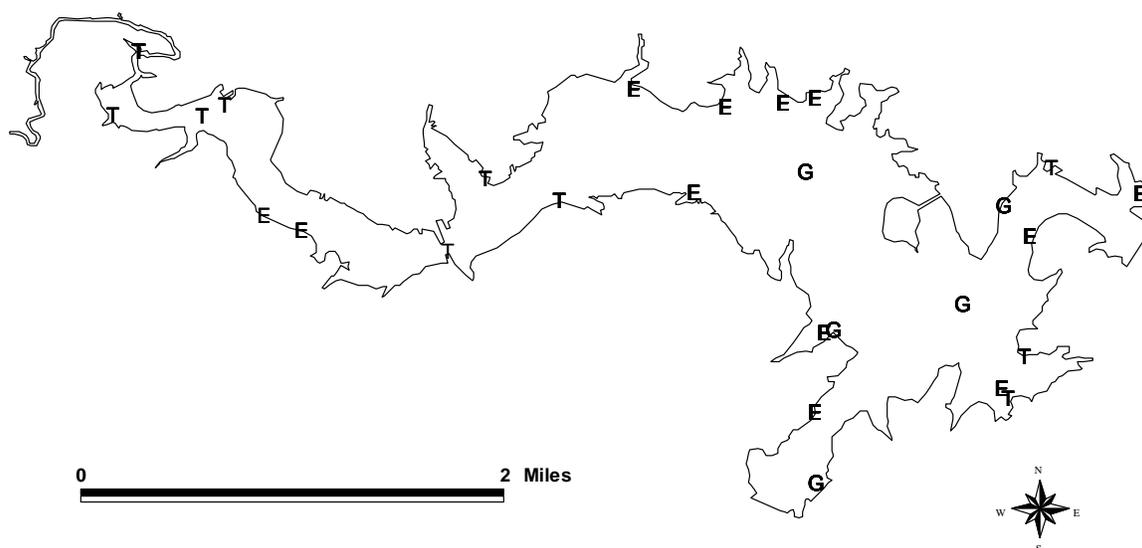
Survey Year	Electrofisher	Trap Net	Gill Net	Vegetation Survey	Access Survey	Report
Fall 2011-Spring 2012				A		
Fall 2012-Spring 2013	A	A				
Fall 2013-Spring 2014						
Fall 2014-Spring 2015	S	S	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species and presence of other species collected from Leon Reservoir, Texas, 2008-2011.

Species	Gill Netting		Electrofishing		Trap Netting	
	N	CPUE	N	CPUE	N	CPUE
Spotted gar			Present			
Gizzard shad	Present		731	731.0	Present	
Threadfin shad			223	223.0		
Common carp	Present		Present			
Smallmouth buffalo	Present		Present			
Bullhead minnow			Present			
Inland silverside			Present			
Spottail shiner			Present			
Channel catfish	45	9.0				
Flathead catfish	3	0.6				
White bass	27	5.4				
Green sunfish			51	51.0		
Warmouth			2	2.0		
Orange spotted sunfish			10	10.0		
Bluegill			364	364.0	Present	
Longear sunfish			167	167.0	Present	
Redear sunfish			50	50.0	Present	
Largemouth bass	Present		166	166.0		
White crappie	Present		Present		243	24.3
Black crappie					4	0.4
Logperch			Present			
Freshwater drum	Present		Present			

APPENDIX B



Location of sampling sites, Leon Reservoir, Texas, 2008-2011. Gill net, trap net, and electrofishing stations are indicated by G, T and E, respectively. Water level was 6 to 8 feet below conservation level at time of gill net and electrofishing sampling in 2010-2011 and 2 feet below conservation level for trap net sampling in 2008.

APPENDIX C

Type, location, size, capacity, American Disability Act (ADA) accessibility, and needed improvements of boat ramps (BR), fishing piers (FP), and jetties (J) at Leon Reservoir, Texas, 2010. Latitude and Longitude are reported as decimal degrees.

Facility Type	Location	Latitude	Longitude	Fee	# of BR Lanes	BR Parking Capacity	Size of FP or J	ADA Accessible (FP or J)	Needed Improvements
BR	Chock-o-Block	32.363183	-98.723655	Y	2	30	NA	NA	Parking lot needs resurfacing and boat ramp may need extension
BR	Dam	32.364629	-98.676099	Y	1	20	NA	NA	Boat ramp needs to be moved or extended