

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-35

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2009 Survey Report

**Daniel Reservoir**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Daniel Reservoir were surveyed in 2009 using electrofishing and trap nets and in 2010 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:** Daniel Reservoir is a 950-acre impoundment constructed in 1948 on Gonzales Creek. It is located in Stephens County approximately 65 miles northeast of Abilene and is operated and controlled by the city of Breckenridge. The reservoir provides municipal water supply for the city of Breckenridge. It was nearly dry from fall 2003 to spring 2007. It filled in June 2007, and water level began to decline in summer 2008. It was approximately 7 feet low at time of sampling. Boat access consisted of one public boat ramp. Bank fishing access was limited to boat ramp area.
- **Management History:** Drought recovery efforts began in 2007 after the reservoir filled. It was stocked with various forage fishes and largemouth bass, white crappie, and channel catfish.
- **Habitat:** Daniel Reservoir's habitat consisted primarily of rock, brush, and black willow trees. There was some aquatic vegetation present (American lotus, Illinois pondweed, and smartweed).
- **Fish Community**
  - **Prey species:** Forage was abundant and consisted primarily of shad and bluegill. Black bullhead provided additional forage for largemouth bass.
  - **Catfishes:** Channel catfish up to 21" in length were present in the reservoir.
  - **Largemouth bass:** The largemouth bass population showed excellent progress since re-establishment in 2007. Continued improvement is expected because of ample forage base and large number of largemouth bass naturally produced in 2008 and 2009.
  - **Crappie:** Both black and white crappie were present in Daniel Reservoir. Black crappie were 41% of the total catch in the 2009 trap-net sample. Size structure and abundance of crappie were excellent.
- **Management Strategies:** Stress the importance of water conservation to fisheries management in Daniel Reservoir to city of Breckenridge leadership staff and local media. Conduct electrofishing and trap net surveys in 2011 to monitor forage, largemouth bass, and crappie populations. Catfish populations will be monitored with hoop nets in 2013.

## INTRODUCTION

This document is a summary of fisheries data collected from Daniel Reservoir in 2008-2010. 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 of pre-drought (1997) and post-drought conditions (2008-2010).

### *Reservoir Description*

Daniel Reservoir is a 950-acre impoundment constructed in 1948 on Gonzales Creek. It is located in Stephens County approximately 65 miles northeast of Abilene and is operated and controlled by the city of Breckenridge. The reservoir provides municipal water supply for the city of Breckenridge. Land use around the reservoir is primarily agricultural.

Water level began dropping in 1998, and the reservoir was nearly dry from fall 2003 to spring 2007 (Figure 1). It filled in June 2007, and water level began declining in summer 2008 (Figure 1). It was approximately 7 feet low at time of sampling.

Boat access consisted of one public boat ramp. Bank fishing access was limited to boat ramp area. Other descriptive characteristics for Daniel Reservoir are in Table 1.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Dumont and Farooqi 2006) included:

1. Stock forage and sport fish species when water level reaches 1,270 ft. above mean sea level to recover from severe drought conditions.

**Action:** Began stocking fish in spring 2007. By the end of 2007 inland silversides, gizzard shad, bluegill, white crappie, channel catfish, and largemouth bass had been stocked.

**Harvest regulation history:** All sport fish have always been regulated with statewide harvest regulations (Table 2).

**Stocking history:** Stocking history prior to 2007 is irrelevant because severe drought conditions resulted in near total loss of water by spring 2007. Post-drought stockings included major sport and forage fishes (Table 3).

**Vegetation/habitat management history:** Daniel Reservoir has no vegetation/habitat management history.

## METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting (5 net nights at 5 sites), and trap netting (10 net nights at 10 sites). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing, 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 2009). Habitat composition was determined by assessing habitat at 95 random points distributed throughout the reservoir. Presence or absence was determined for each habitat type at each point. Percent occurrence was calculated for each habitat type, and 95% confidence intervals were generated 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)] (Guy et al. 2007)], 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). Sub-stock ratio (SSR) was calculated for largemouth bass and is defined as the number of sub-stock fish divided by the number of stock-sized fish and multiplying the quotient by 100. 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. Confidence intervals were determined for  $W_r$  using the percentile method with 1,000 resamples of the original data (with replacement) by the percentile method. Source for water level data was the United States Geological Survey website. Resampling Stats in Excel, Version 2, was used for all resample analyses.

## RESULTS AND DISCUSSION

**Habitat:** The most prevalent habitat type was dead brush, followed by open water (assigned when no other habitat type was present), and black willow (Figure 2). Aquatic vegetation occurred in approximately 7% of sites and was comprised of American lotus, Illinois pondweed, and smartweed.

**Prey species:** Electrofishing CPUE was 971.0/h for gizzard shad and 323.0/h for bluegill. Bluegill and gizzard shad CPUE increased considerably from 2008 to 2009, and CPUE of both species was much higher in 2009 compared to 1997 (Figures 3 and 4). Gizzard shad IOV was higher in post-drought years (99 in 2008 and 81 in 2009) than in the last survey done prior to the drought (56 in 1997). Threadfin shad were first collected in Daniel Reservoir in 2008 (8.0/h), and catch rate increased slightly in 2009 (25.0/h). Several thousand black bullheads were caught in fall trap nets, and they provided additional forage for larger largemouth bass.

**Channel catfish:** Gill net catch rate of channel catfish in 2010 was 1.6/n compared to 3.6/n in 1997 (Figure 5). Gill net catch in 2010 indicated that adult channel catfish have become established in the reservoir.

**Largemouth bass:** Electrofishing CPUE of all largemouth bass (Total CPUE) was 175.0/h in 2008 and 187.0/h in 2009 and was much higher than pre-drought CPUE of 103.0/h in 1997. Electrofishing CPUE of stock-size largemouth bass increased slightly from 35.0/h in 2008 to 47.0/h in 2009, and both years were similar to the 30.0/h observed in 1997. Reproduction was extremely successful in 2008 and 2009; the sub-stock ratio (SSR; a measure of year-class strength compared to adult abundance) was 400 in 2008 and 298 in 2009, compared to the district average of 120. Size structure improved from 2008 to 2009 (Figure 6) as more fish reached quality and legal sizes; PSD increased from 14 in 2008 to 45 in 2009, CPUE-14 doubled, and PSD-14 increased slightly from 9 to 13 (Figure 6). Relative weight was 98-99 for stock-size and longer largemouth bass in 2009. There was a slight decrease in  $W_r$  of stock- to quality-size largemouth bass from 2008 to 2009, but  $W_r$  estimates were still high compared to pre-drought conditions (Table 4).

**Crappie:** Trap net catch of crappie was 33.1/n, compared to 110.0/n in 1997. Catch of stock-size crappie was 32.0/n in 2009 and 39.8/n in 1997. The notable difference between pre-drought and post-drought crappie populations was the presence of post-drought black crappie; 41% of crappie collected in 2009 were black crappie, and they should be a significant contributor to the crappie fishery (Figure 7). Black crappie were never collected in any survey prior to 2009. White crappie adults were stocked in 2007 to re-establish a crappie population in Daniel Reservoir. It was possible that this management stocking accidentally consisted of some black crappie. Regardless of how black crappie became established, both species were combined for analysis in this report because they are managed conjointly with statewide regulations. Crappie size structure was excellent; PSD was 76 and PSD-10 was 28. This was similar to pre-drought size-structure estimates (Figure 7). Body condition of crappie increased with size and  $W_r$  ranged from 89 to 102 (Table 5). Compared to pre-drought crappie, small and large crappie in 2009 had similar body condition, but crappie from 8.0-9.9 inches were in much better condition in 2009 relative to 1997 (Table 5). Based on body condition, there appeared to be slightly limited forage availability for 5.0-

7.9-inch crappie. However, it is doubtful that this current situation will have any lasting adverse affects.

## **Fisheries management plan for Daniel Reservoir, Texas**

Prepared – July 2010.

**ISSUE 1:** Declining water level will have disastrous effects on the still expanding fish community in Lake Daniel. A repeat of water loss that occurred in 1999-2007 would destroy any progress made in the last two years.

### **MANAGEMENT STRATEGY**

1. Provide press releases on successful reestablishment of quality sport fish populations to Breckenridge newspaper.
2. Continue discussions with Breckenridge leadership staff regarding stricter water conservation measures.

### **SAMPLING SCHEDULE JUSTIFICATION:**

Sampling with gill nets and hoop nets once every four years is sufficient to monitor catfish populations. An additional electrofishing and trap net survey in 2011 would be important to monitor forage, largemouth bass, and crappie populations. A proposed sampling schedule is in 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.
- Dumont, S., and M. Farooqi. 2006. Statewide freshwater fisheries monitoring and management program survey report for Daniel Reservoir, 2005. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-31, Austin.
- Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution (PSD): a further refinement of population size structure index terminology. *Fisheries* 32(7): 348.



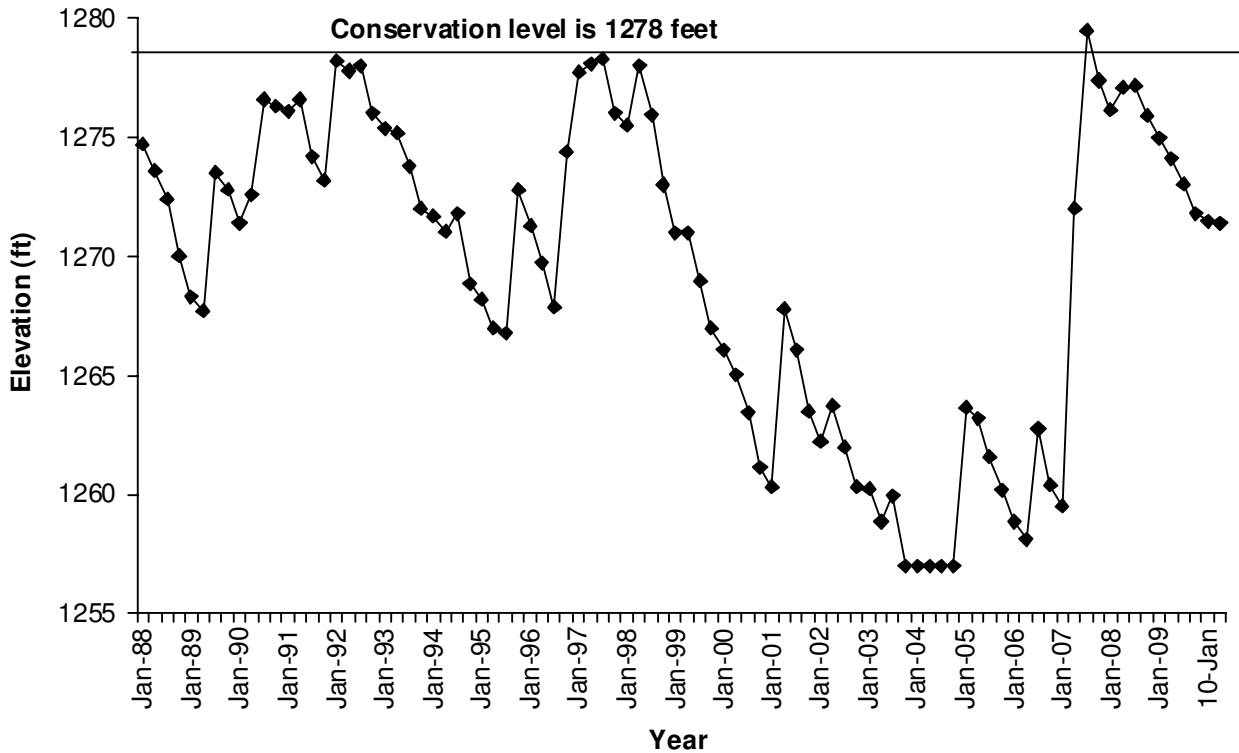


Figure 1. Quarterly water level elevations in feet above mean sea level for Daniel Reservoir, Texas.

Table 1. Characteristics of Daniel Reservoir, Texas.

Characteristic	Description
Year constructed	1948
Controlling authority	City of Breckenridge
County	Stephens
Reservoir type	Tributary, Brazos River Basin
Shoreline Development Index	2.6
Conductivity	341 $\mu\text{mhos/cm}$

Table 2. Harvest regulations for Daniel Reservoir, Texas

Species	Bag Limit	Minimum Length Limit (inches)
Catfish: channel catfish	25	12
Catfish, flathead	5	18
Bass, largemouth	5	14
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10

Table 3. Stocking of Daniel Reservoir, Texas, beginning with drought recovery in 2007. Size categories are: FRY = &lt; 1 inch, FGL = 1-3 inches and ADL = adults.

Species	Year	Number	Size
Gizzard shad	2007	200	ADL
Threadfin shad	2007	100	ADL
Channel catfish	2007	90,314	FGL
Inland silverside	2007	200	ADL
Bluegill	2007	200	ADL
	2007	89,679	FGL
	Total	89,879	
Florida largemouth bass	2007	233,338	FRY
	2007	46,777	FGL
	Total	280,115	
White crappie	2007	40	ADL

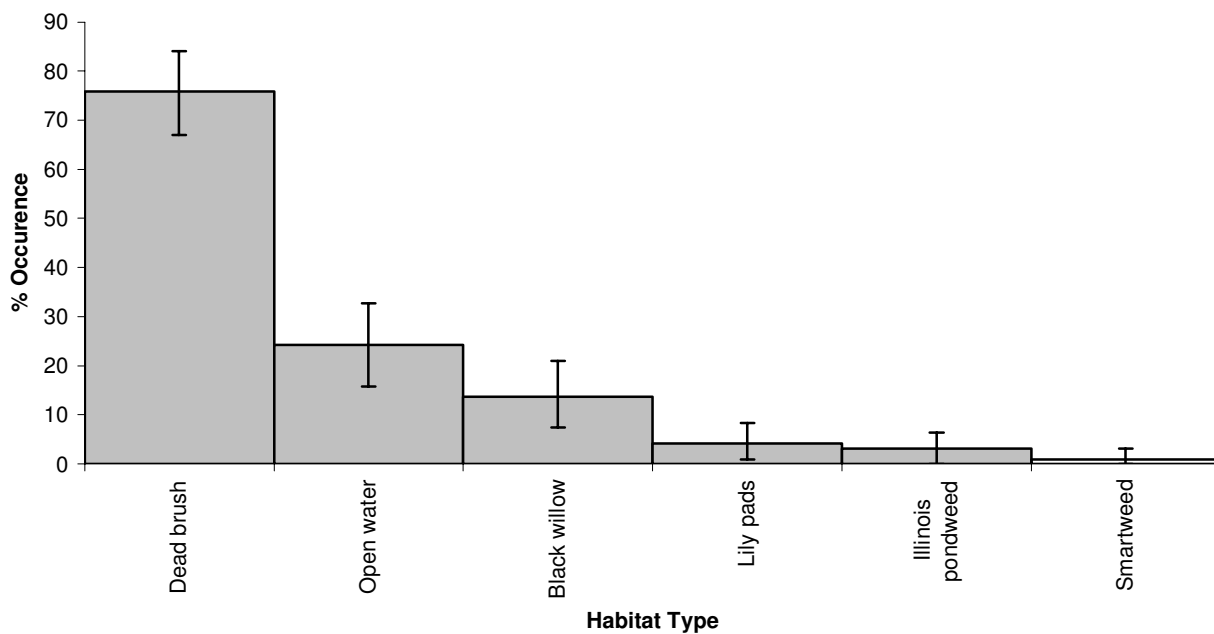
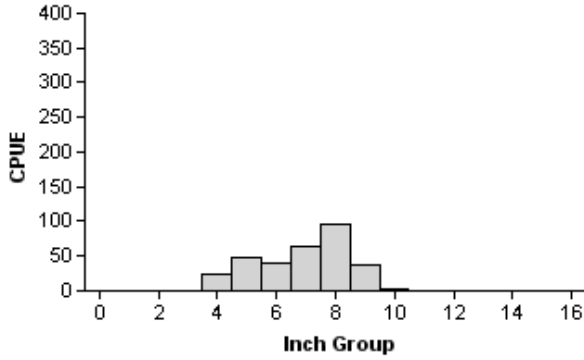


Figure 2. Percent occurrence ( $\pm$  95% C.I., derived from 1,000 resamples, with replacement, of the original data) of habitat types at Daniel Reservoir, Texas, 2009.

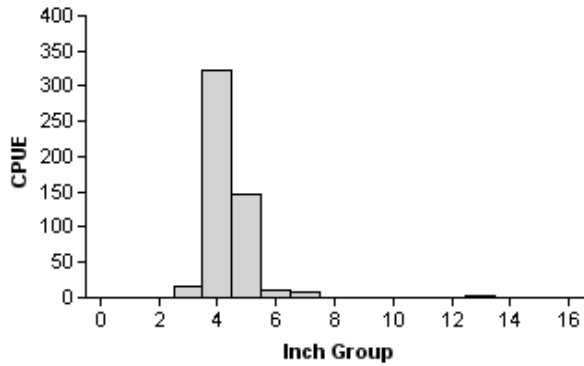
## Gizzard Shad

1997



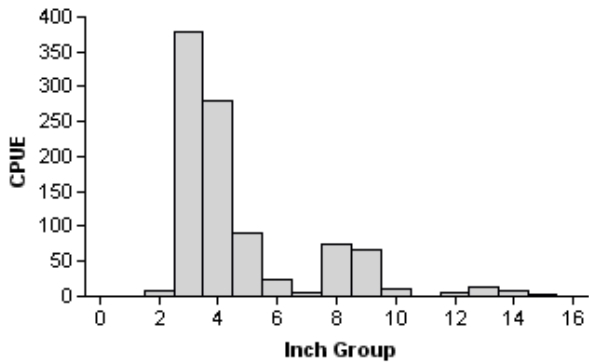
Effort = 1.0  
 Total CPUE = 312.0 (14; 312)  
 Stock CPUE = 200.0 (12; 200)  
 PSD = 0  
 IOV = 56 (7)

2008



Effort = 1.0  
 Total CPUE = 507.0 (16; 507)  
 Stock CPUE = 11.0 (64; 11)  
 PSD = 36 (28)  
 IOV = 99 (0.5)

2009



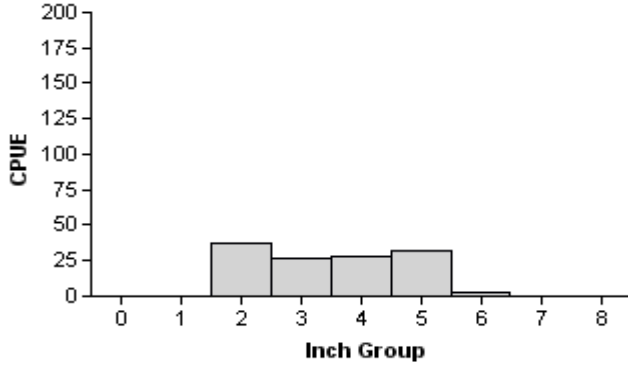
Effort = 1.0  
 Total CPUE = 971.0 (15; 971)  
 Stock CPUE = 191.0 (29; 191)  
 PSD = 17 (2)  
 IOV = 81 (7)

Figure 3. 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, Daniel Reservoir, Texas, 1997, 2008, and 2009.

# Bluegill

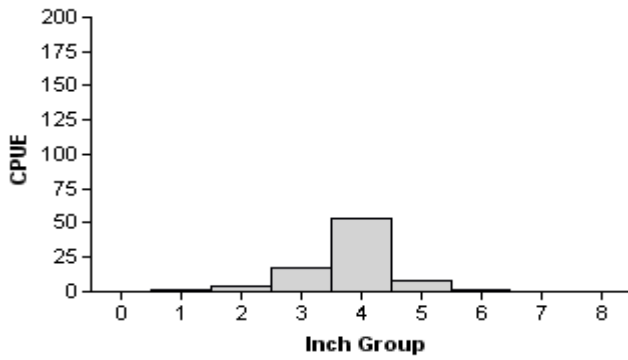
1997

Effort = 1.0  
 Total CPUE = 127.0 (28; 342)  
 PSD = 3 (2)



2008

Effort = 1.0  
 Total CPUE = 86.0 (18; 86)  
 PSD = 1 (1)



2009

Effort = 1.0  
 Total CPUE = 323.0 (23; 323)  
 PSD = 1 (1)

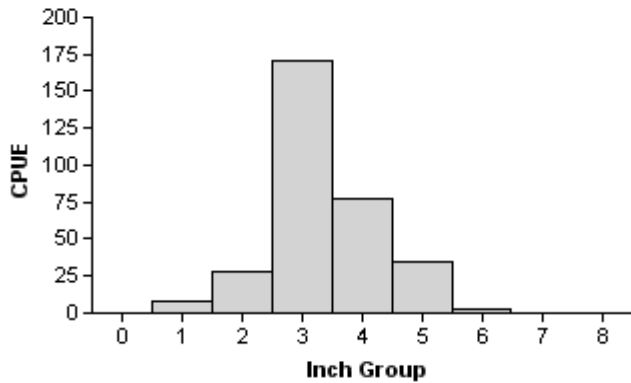


Figure 4. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Daniel Reservoir, Texas, 1997, 2008, and 2009.

## Channel Catfish

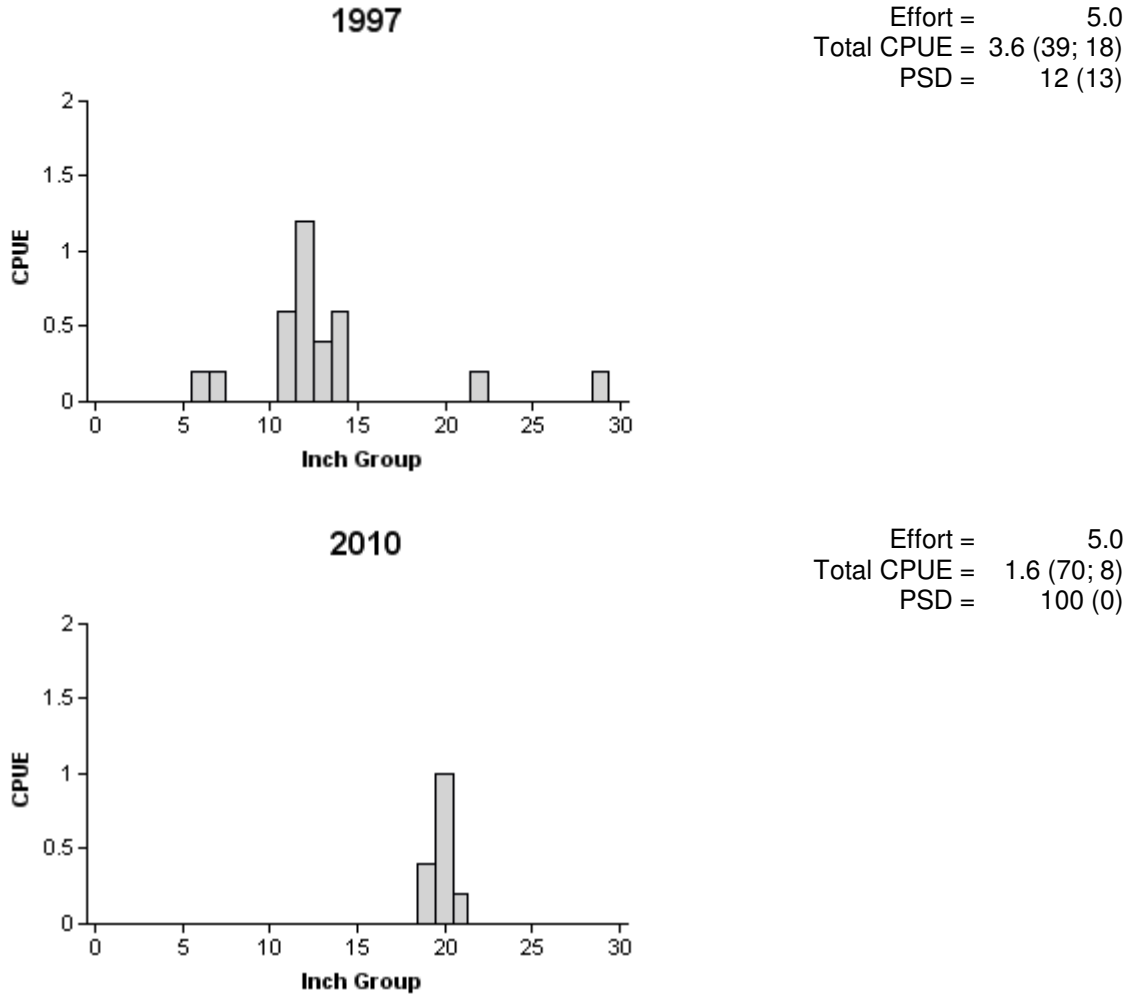
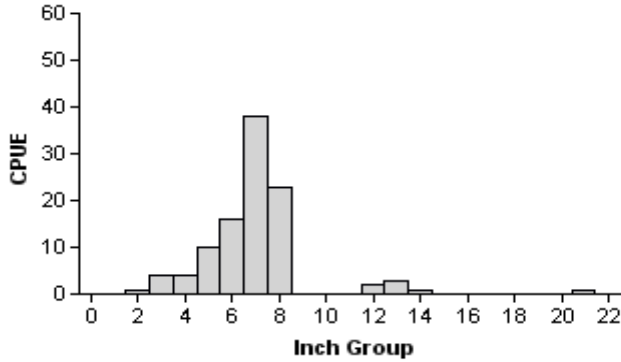


Figure 5. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Daniel Reservoir, Texas, 1997 and 2010.

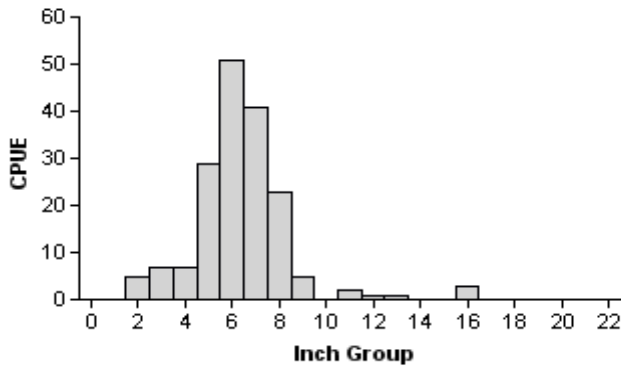
## Largemouth Bass

1997



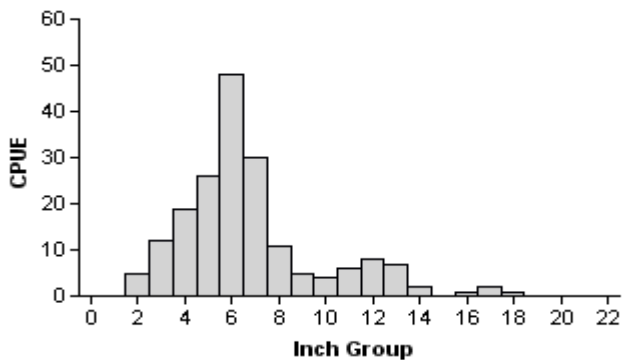
Effort = 1.0  
 Total CPUE = 103.0 (20; 103)  
 Stock CPUE = 30.0 (28; 30)  
 CPUE-14 = 2.0 (67; 2)  
 PSD = 23 (7)  
 PSD-14 = 7 (4)

2008



Effort = 1.0  
 Total CPUE = 175.0 (19; 175)  
 Stock CPUE = 35.0 (16; 35)  
 CPUE-14 = 3.0 (52; 3)  
 PSD = 14 (7)  
 PSD-14 = 9 (4)

2009



Effort = 1.0  
 Total CPUE = 187.0 (21; 187)  
 Stock CPUE = 47.0 (29; 47)  
 CPUE-14 = 6.0 (46; 6)  
 PSD = 45 (8)  
 PSD-14 = 13 (6)

Figure 6. 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, Daniel Reservoir, Texas, 1997, 2008, and 2009.

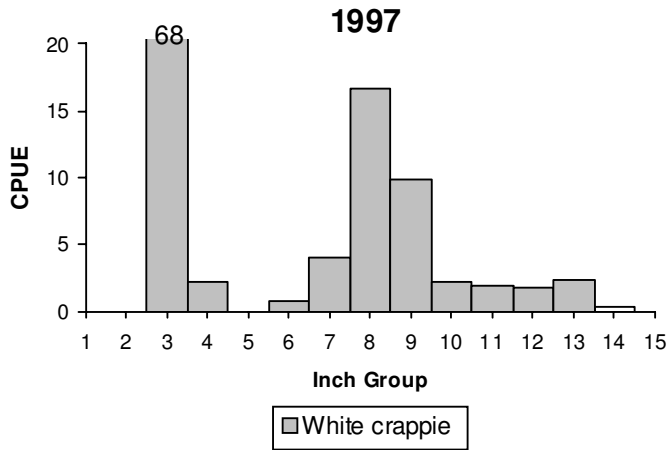
## Largemouth Bass

Table 4. Average relative weight of 8.0-11.9-inch and 12.0-14.9-inch largemouth bass from 1997, 2008, and 2009 at Daniel Reservoir, Texas. 95% confidence interval is in parentheses. Confidence intervals were derived from 1,000 resamples, with replacement, of the original data. Sample size too small to calculate confidence intervals was designated by TS.

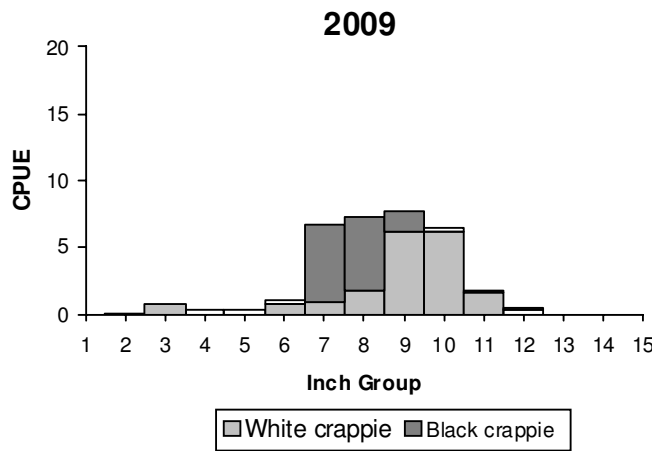
Year	Mean $W_r$ /size category	
	8.0-11.9 in	12.0-14.9 in
1997	98 (95-100)	94 (91-97)
2008	104 (101-107)	TS
2009	98 (94-102)	99 (94-103)



# Crappie



Effort = 5.0  
 Total CPUE = 110.0 (31; 550)  
 Stock CPUE = 39.8 (33; 199)  
 CPUE-10 = 8.8 (42; 44)  
 PSD = 88 (4)  
 PSD-10 = 22 (3)



Effort = 10.0  
 Total CPUE = 33.1 (24; 331)  
 Stock CPUE = 32.0 (25; 320)  
 CPUE-10 = 8.8 (19; 88)  
 PSD = 76 (4)  
 PSD-10 = 28 (5)

Figure 7. Number of crappie caught per net night (CPUE; 1997 and 2009) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Daniel Reservoir, Texas, 1997 and 2009. Only white crappie were present in 1997.

## Crappie

Table 5. Average relative weight of 5.0-7.9-inch and 8.0-9.9-inch, and  $\geq 10$ -inch white crappie in 1997 and white and black crappie combined in 2009 at Daniel Reservoir, Texas. 95% confidence interval is in parentheses. Confidence intervals were derived from 1,000 resamples, with replacement, of the original data.

Year	Mean $W_r$ /size category		
	5.0-7.9 in	8.0-9.9 in	$\geq 10$ in
1997	84 (80-87)	83 (80-86)	100 (96-105)
2009	89 (84-93)	95 (92-98)	102 (100-105)

Table 6. Proposed sampling schedule for Daniel Reservoir, Texas. Gill netting surveys are conducted in the spring, hoop net surveys will be conducted in summer 2013, and electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

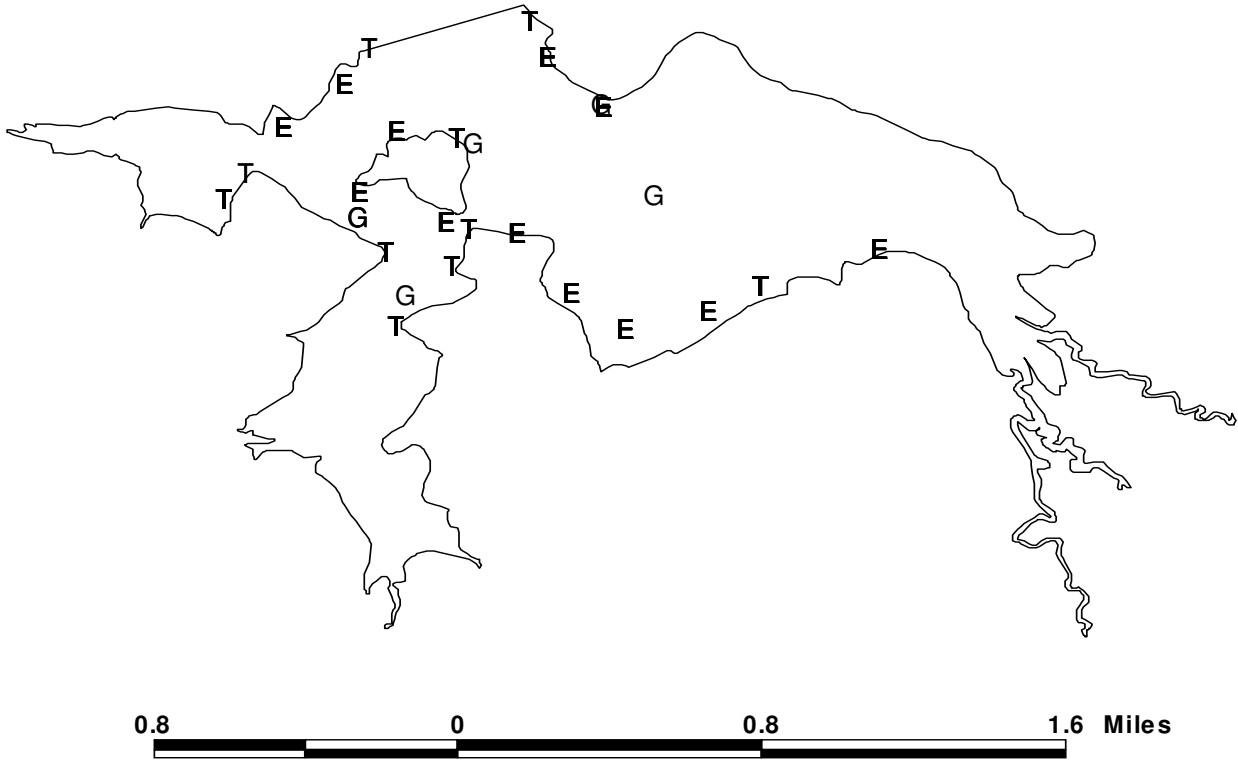
Survey Year	Hoop Net	Electrofisher	Trap Net	Gill Net	Report
Fall 2010-Spring 2011					
Fall 2011-Spring 2012		A	A		
Fall 2012-Spring 2013					
Fall 2013-Spring 2014	A	S	S	S	S

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species and presence of non-target species collected from Daniel Reservoir, Texas, 2009-2010. Non-target species were not counted during surveys, but their presence was noted.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	Present				971	971.0
Threadfin shad					25	25.0
Common carp	Present		Present		Present	
Golden shiner					Present	
Inland silverside					Present	
Black bullhead	Present		Present		Present	
Channel catfish	8	1.6	Present			
Green sunfish			Present		52	52.0
Bluegill			Present		323	323.0
Longear sunfish			Present		29	29.0
Redear sunfish			Present		3	3.0
Largemouth bass	Present				187	187.0
White crappie	Present		194	19.4	Present	
Black crappie			137	13.7		

APPENDIX B



Location of sampling sites, Daniel Reservoir, Texas, 2009-2010. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.