

PERFORMANCE REPORT

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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

**Buffalo Springs Reservoir**

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## TABLE OF CONTENTS

Survey and management summary .....	2
Introduction.....	3
Reservoir description.....	3
Management history.....	3
Methods.....	4
Results and discussion.....	4
Fisheries management plan .....	5
Literature Cited.....	6
Figures and tables.....	7-16
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
Channel catfish (Figure 3).....	12
Striped bass (Figure 4).....	13
Largemouth bass (Figure 5).....	14
White crappie (Figure 6).....	15
Proposed sampling schedule (Table 5).....	16
Appendix A	
Species Table.....	17
Appendix B	
Location of sampling sites.....	18

## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Buffalo Springs Reservoir were surveyed in the fall of 2008 using trap nets and electrofishing and the spring of 2009 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:** Buffalo Springs is a 225-acre reservoir that was impounded in 1960 on Yellowhouse Draw, a tributary of the North Fork of the Double Mountain Fork of the Brazos River, located 5 miles southeast of Lubbock, Texas. It is owned by the Lubbock County Water Control and Improvement District Number 1 and used for recreational purposes. Water levels are stable and nutrient levels are extremely high. A large portion of the fish habitat was cattail. Bank and boat access was good and handicap specific facilities were good. The reservoir has experienced *Prymnesium parvum* (golden algae) kills beginning in 2003 which had a major impact on the fisheries.
- **Management history:** The sport fisheries have been managed with statewide regulations. Intensive striped bass stocking was used to manage an overabundant gizzard shad population with good success. The reservoir historically had a high quality largemouth bass fishery.
- **Fish community**
  - **Prey species:** The electrofishing catch rate for gizzard shad in 2008 was 310.0/h with an index of vulnerability (IOV) of 91 indicating the majority of the population was less than 8 inches in length and available to most predators. The electrofishing catch rate for bluegill in 2008 was 39.0/h. The population was dominated by fish 4 inches or smaller.
  - **Catfishes:** Blue catfish were stocked in 2003 and 2007 following the *P. parvum* fish kills. None have been collected in gill nets since 2001. No channel catfish were collected in gill nets in 2009. This is much lower than historic samples and was likely due to repeated *P. parvum* fish kills.
  - **Temperate bass:** There were no white bass caught in gill nets since 2001 when the catch rate was 3.6/nn. The gill net catch rate for striped bass was 0.4/nn in 2009 and was much lower than previous samples. All fish collected appeared to be from the 2008 stocking.
  - **Largemouth bass:** The 2008 electrofishing catch rate for largemouth bass was 10.0/h, similar to the 2006 catch rate of 7.0/h. Size structure was poor.
  - **White crappie:** The trap net catch rate for white crappie was 8.2/nn in 2008 and the population appeared to be recovering from repeated fish kills. Only one legal-size fish was collected in trap net surveys.
- **Management Strategies**

Based on current information, the reservoir should continue to be managed with existing regulations. Redbreast sunfish adults should be obtained from another source and stocked in an attempt to re-establish this quality population. Continue stocking striped bass to help maintain control of the gizzard shad population. Striped bass should be stocked on an alternating basis at a rate of 15/acre and 40/acre in two consecutive years and then have two years of no stocking based on protocols used during the research project by Schramm, et al. (2000). The reservoir should be monitored for *P. parvum* and associated fish kills. Mitigation of kills by stocking should be conducted as soon as practical.

3  
INTRODUCTION

This document is a summary of fisheries data collected from Buffalo Springs Reservoir in fall 2008 and spring 2009. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While data on other species of fish were collected, this report deals primarily with major sport fishes and important prey species. Management strategies are included to address existing problems or opportunities. Historical data is presented for comparison.

*Reservoir Description*

Buffalo Springs is a 225-acre reservoir that was impounded in 1960 on Yellowhouse Draw, a tributary of the North Fork of the Double Mountain Fork of the Brazos River, located 5 miles southeast of Lubbock, Texas. It is owned by the Lubbock County Water Control and Improvement District Number 1 and used for recreational purposes. Water levels are stable and nutrient levels are extremely high. Most of the fish habitat was cattail. Bank and boat access was good and handicap specific facilities have been improved since the last report. The reservoir experienced a significant *Prymnesium parvum* (golden algae) kill during 2003 which had a major impact on the fisheries. The reservoir experienced another kill in 2005 and annual small kills since. Additional reservoir characteristics are presented in Table 1.

*Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Munger 2004) included:

1. Re-establish redbreast sunfish population and monitor by electrofishing.  
**Action:** Redbreast sunfish have not been re-established in the reservoir due to continued *Prymnesium parvum* blooms and related fish kills. This species appears to be very sensitive to *P. parvum* and should not be restocked until blooms abate.
2. Stock striped bass to help control gizzard shad population. Stock at an adjusted rate of 15/acre and 40/acre in two consecutive years and then have two years of no stocking.  
**Action:** Stocking has been conducted as planned but timing has been adjusted due to repeated fish kills. Striped bass were stocked in 2005 and 2006 according to schedule but due to repeated kills the interval between stocking was reduced to one year and striped bass were stocked again in 2008.
3. Monitoring of *P. parvum* blooms.  
**Action:** Contacts have been made with Buffalo Springs Reservoir staff and they are monitoring for fish kills. When a fish kill is occurring or suspected, water samples are collected and the cause of the kill is confirmed by Texas Parks & Wildlife Department Kills and Spills staff.

**Harvest regulation history:** Sportfishes in Buffalo Springs Reservoir have been and continue to be managed with statewide regulations (Table 2).

**Stocking history:** Buffalo Springs Reservoir has been stocked with blue catfish, channel catfish, striped bass, bluegill, and Florida largemouth bass multiple times since 2003 in an effort to mitigate the effects of fish kills. The reservoir was experimentally stocked with walleye (1978-1981) red drum (1983), and northern pike (1975-1976) with limited success. The complete stocking history is in Table 3.

**Vegetation/habitat history:** Vegetation in Buffalo Springs Reservoir is limited to cattail and 76% of the shoreline was natural habitat. The water authority has been modifying the upper end of the reservoir with dredging and installation of a walkway across the reservoir. A habitat survey was conducted in 2008.

## METHODS

Fishes were collected by fall electrofishing (1.0 hours at 12 5-minute stations), spring gill nets (5 stations), and fall trap nets (5 stations). Fish sampling was conducted at randomly selected sites. 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 sampling was conducted according to Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and relative weight indices were calculated for target fishes according to Anderson and Neumann (1996). The index of vulnerability (IOV; DiCenzo et al. 1996) was used to determine the percentage of the gizzard shad population most vulnerable to predation. A habitat survey was conducted in August, 2008.

## RESULTS AND DISCUSSION

**Habitat:** A habitat survey was conducted in August, 2008. Primary habitat was natural shoreline (76.5%) followed by bulkhead (17.5%). Aquatic vegetation was limited to cattail, primarily along natural shoreline areas (Table 4).

**Prey species:** Electrofishing catch rates of gizzard shad and bluegill were 310.0/h and 39.0/h, respectively. Index of vulnerability (IOV) for gizzard shad was good, indicating 91% of gizzard shad were available to existing predators; this was similar to the IOV estimate from 2004 but much higher than 2002 (Figure 1). No gizzard shad were collected during electrofishing in 2006. Total CPUE of gizzard shad was higher in 2008 compared to the 2004 and 2002 surveys (Figure 1). Total CPUE of bluegill in 2008 (39.0/h) was much lower than previous surveys in 2004 (174.0/h) and 2002 (280.0/h). Size structure continued to be dominated by small individuals (Figure 2).

**Blue Catfish:** No blue catfish have been collected since 2001 even though they were stocked in 2003 and 2007 following the P. parvum kills.

**Channel Catfish:** No channel catfish were collected in gill nets in 2009. The catch rate in 2007 was 1.2/nn, up slightly from 0.6/nn in 2005, but much lower than 10.0/nn seen in 2001 (Figure 3). The channel catfish population has not recovered from the series of P. parvum kills.

**White bass:** No white bass have been collected in gill nets since 2001, probably due to repeated P. parvum kills.

**Striped bass:** The gill net catch rate of striped bass was 0.4/nn in 2009 and all fish collected were <10 inches (Figure 4). Catch rates and size structure continued to decline and was likely related to repeated fish kills.

**Largemouth bass:** The electrofishing catch rate of largemouth bass was 10.0/h in 2008, similar to 2006 at 7.0/h but much lower than 2004 at 31.0/h (Figure 5). Size structure was poor with a PSD of 0 and only one stock-size fish collected. Regular P. parvum blooms since 2003 appear to have severely impacted the population.

**White crappie:** The trap net catch rate of white crappie was 8.2/nn in 2008 (Figure 6), which was higher than 2004 (0.6/nn) and 2000 (4.2/nn). Only one legal-size fish was collected in 2008. The PSD was 42 and was similar to the PSD in 2004. Mean relative weight was over 90 for all size classes in 2008. The crappie population appears to be recovering from the P. parvum caused fish kills that began in 2003.

**Fisheries management plan for Buffalo Springs Reservoir, Texas**

Prepared – July 2009

**ISSUE 1** Buffalo Springs Reservoir has historically had a quality population of large redbreast sunfish. No redbreast sunfish have been collected in sampling following the P. parvum fish kill in spring 2003.

**MANAGEMENT STRATEGIES**

1. Obtain adult redbreast sunfish from an alternate source and stock in Buffalo Springs to re-establish the population when the risk of additional kills has abated.
2. Monitor the success of re-establishment through standard electrofishing surveys.

**ISSUE 2** Striped bass are an important top level predator in Buffalo Springs Reservoir and they provide additional recreation to anglers. Historically, Buffalo Springs was characterized as having an overabundant gizzard shad population comprised mostly of adult shad too large to be used as prey. Schramm, et al. (2000) found that the gizzard shad population in Buffalo Springs could be restructured to be more conducive to predation by stocking large numbers of striped bass. Stocking prior to a recurrence of this problem may prevent it from redeveloping. Striped bass do not reproduce in Buffalo Springs and stocking is required to maintain their abundance.

**MANAGEMENT STRATEGIES**

1. Stock fingerling striped bass on an alternating basis where they are stocked at a rate of 15/acre and 40/acre in two consecutive years and then two years of no stocking.

**ISSUE 3** The reservoir experienced a severe fish kill in 2003 due to P. parvum and repeated kills since then.

**MANAGEMENT STRATEGIES**

1. Develop contacts with reservoir management authority to monitor for fish kills.
2. Collect water samples during March and April to test for P. parvum.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule is a continuation of the current schedule and includes trap net and electrofishing sampling in fall 2010, gill netting in spring 2011, and a full management survey in 2012-2013 (Table 5).

## 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, second edition. American Fisheries Society, Bethesda, Maryland.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. *North American Journal of Fisheries Management* 16:888-895.
- Munger, C. R. 2005. Statewide freshwater fisheries monitoring and management program survey report for: Buffalo Springs Reservoir, 2004. Texas Parks and Wildlife Department, Federal Aid In Sport Fish Restoration, Grant F-30-R, Performance Report, Austin.
- Schramm, H. L., Jr., J. E. Kraai, and C. R. Munger. 2000. Intensive stocking of striped bass to restructure a gizzard shad population in a eutrophic Texas reservoir. *Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies* 53(1999):180-192.

Table 1. Characteristics of Buffalo Springs Reservoir, Texas, 2008 - 2009.

Characteristic	Description
Year constructed	1960
Controlling authority	Lubbock County WC&ID No. 1
County	Lubbock
Reservoir type	Tributary
Shoreline Development Index (SDI)	3.56
Conductivity	635 $\mu$ mhos/cm

Table 2. Harvest regulations for Buffalo Springs Reservoir.

Species	Bag Limit	Minimum-Maximum Length (Inches)
Catfish, blue and channel, 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	5	14 – No Limit
Crappie, White	25	10 – No Limit



Table 3. Stocking history of Buffalo Springs Reservoir, Texas. Size categories are fry (FRY, 1-25 mm), fingerlings (FGL, 25-102 mm), adults (ADL,  $\geq 229$  mm), and unknown (UNK). Average total length (TL; mm) of each species stocked is given by size category and year.

Species	Year	Number	Life stage
Northern pike	1975	2,719	UNK
	1976	5,940	UNK
	Total	8,659	
Blue catfish	1984	13,120	UNK
	2003	5,635	FGL
	2007	25,164	FGL
	Total	43,919	
Channel catfish	1966	12,500	UNK
	1967	13,000	UNK
	1968	12,000	UNK
	1969	5,500	UNK
	1970	12,540	UNK
	1971	15,000	UNK
	1972	10,500	UNK
	1973	10,000	UNK
	1974	5,000	UNK
	1975	5,000	UNK
	1977	5,000	UNK
	2005	58	ADL
	Total	106,098	
	Flathead catfish	1973	1,500
Striped bass	1983	11,450	UNK
	1984	11,000	UNK
	1986	13,500	UNK
	1988	27,416	UNK
	1989	28,400	UNK
	1990	5,110	FGL
	1991	4,500	FGL
	1992	50,621	FGL
	1993	50,450	FGL
	1998	3,486	FGL
	1999	9,487	FGL
	2002	3,428	FGL
	2003	9,752	FGL
	2005	3,686	FGL
	2006	11,619	FGL
	2008	3,988	FGL
Total	247,893		
Green X Redear sunfish	1970	5,000	UNK
Bluegill	2004	64,550	FGL
	2007	24,597	FGL
	Total	89,147	

Continued next page

Table 3. Continued

Species	Year	Number	Life stage
Largemouth bass	1966	36,000	FGL
	1967	10,500	FGL
	1968	6,450	FGL
	1969	5,000	FGL
	1970	10,000	FGL
	1971	7,000	FGL
	1991	3,050	FGL
	Total	78,000	
Florida largemouth bass	1982	3,000	FGL
	1983	10,500	FGL
	1984	2,400	FGL
	1985	2,000	FGL
	2003	24,316	FGL
	2004	25,019	FGL
	2005	25,105	FGL
	2007	24,361	FGL
Total	116,701		
Walleye	1978	1,124,775	FRY
	1979	500,000	FRY
	1980	1,102,500	FRY
	1981	2,345,000	FRY
	Total	5,072,275	
Red drum	1983	27,900	UNK

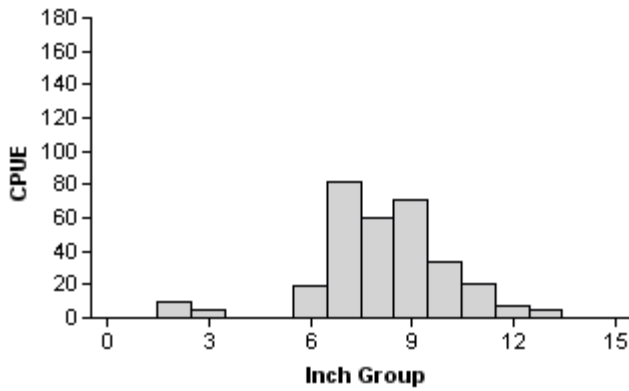
Table 4. Habitat survey of littoral zone and physical habitat types, Buffalo Springs Reservoir, Texas, August 27, 2008. A linear shoreline distance (miles) was recorded for each habitat type found. Percent indicated is percent of total shoreline distance.

Habitat	Type	Shoreline Distance	
		Miles	Percent
Land-water Interface	Natural shoreline	5.4	76.5
	Bulkhead	1.2	17.5
	Rock shore	0.3	4.2
	Bulkhead + piers	0.1	1.8
Vegetation	Native emergent	4.0	100

10  
**Gizzard Shad**

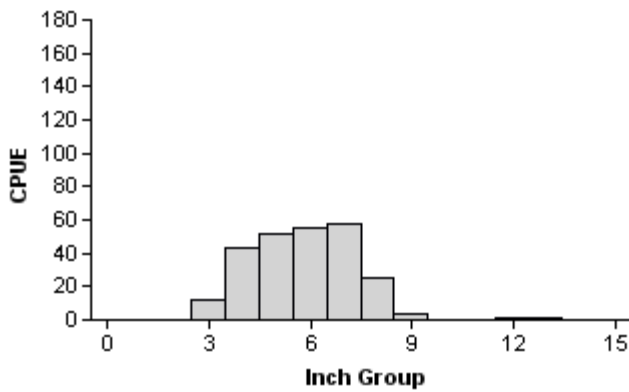
**2002**

Effort = 0.8  
 Total CPUE = 310.7 (27; 233)  
 Stock CPUE = 277.3 (27; 208)  
 IOV = 37 (8)



**2004**

Effort = 1.0  
 Total CPUE = 251.0 (31; 251)  
 Stock CPUE = 89.0 (32; 89)  
 IOV = 88 (2)



**2008**

Effort = 1.0  
 Total CPUE = 310.0 (39; 310)  
 Stock CPUE = 69.0 (52; 69)  
 IOV = 91 (4)

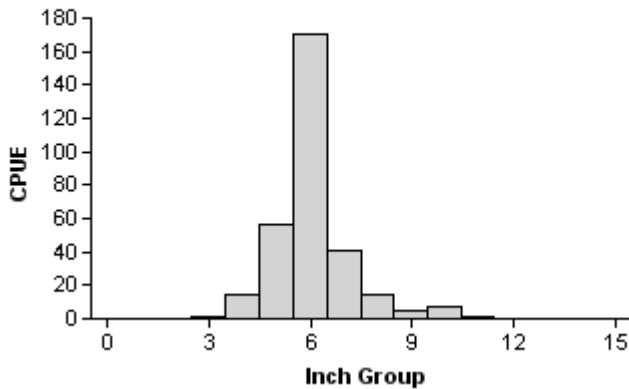
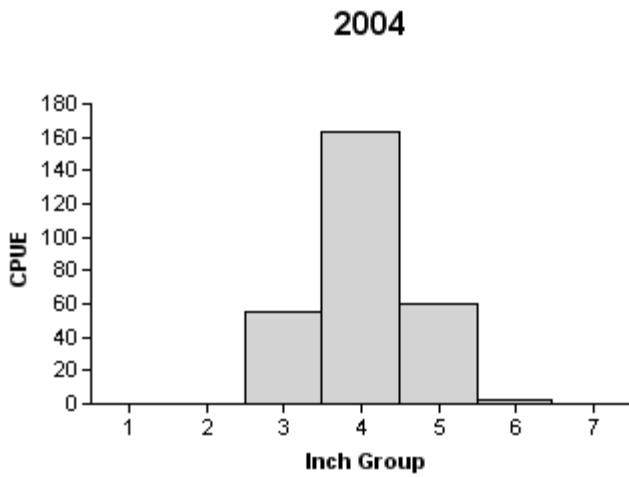
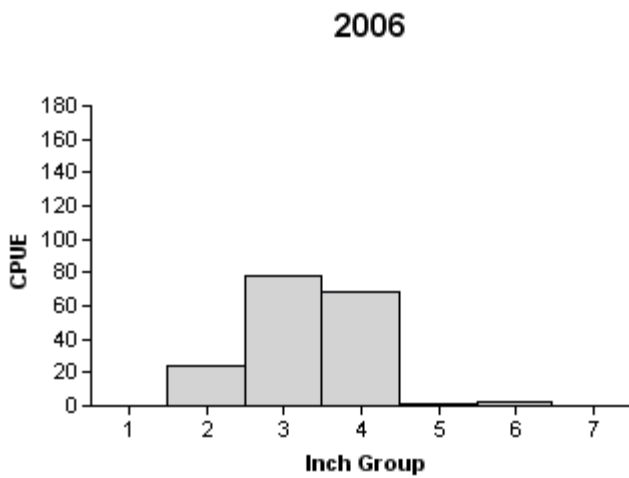


Figure 1. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Buffalo Springs Reservoir, Texas, 2002, 2004, and 2008. No gizzard shad were collected by electrofishing in 2006.

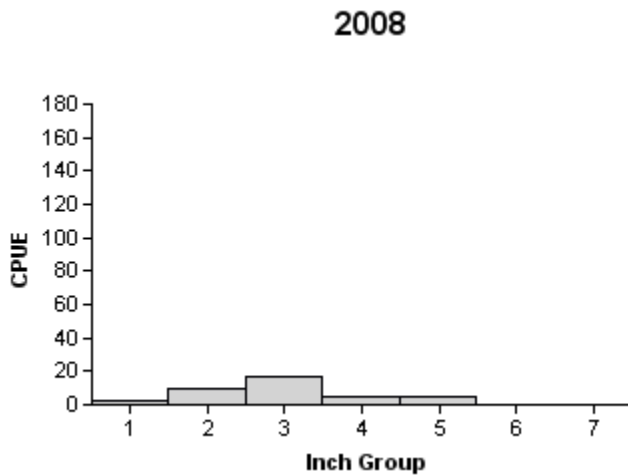
11  
Bluegill



Effort = 1.0  
 Total CPUE = 280.0 (25; 280)  
 Stock CPUE = 280.0 (25; 280)  
 PSD = 1 (1)



Effort = 1.0  
 Total CPUE = 174.0 (16; 174)  
 Stock CPUE = 150.0 (21; 150)  
 PSD = 2 (1)

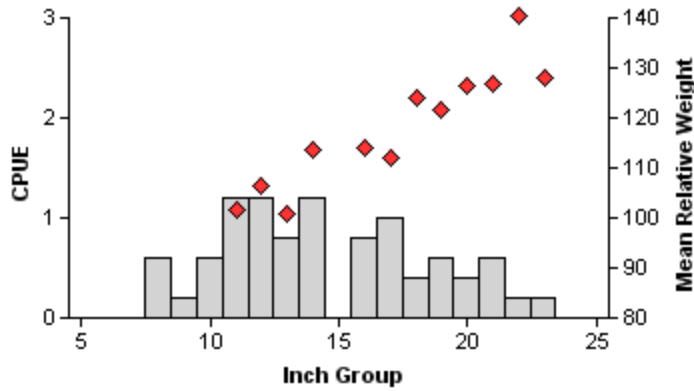


Effort = 1.0  
 Total CPUE = 39.0 (33; 39)  
 Stock CPUE = 27.0 (39; 27)  
 PSD = 0 (65)

Figure 2. 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, Buffalo Springs Reservoir, Texas, 2004, 2006, and 2008.

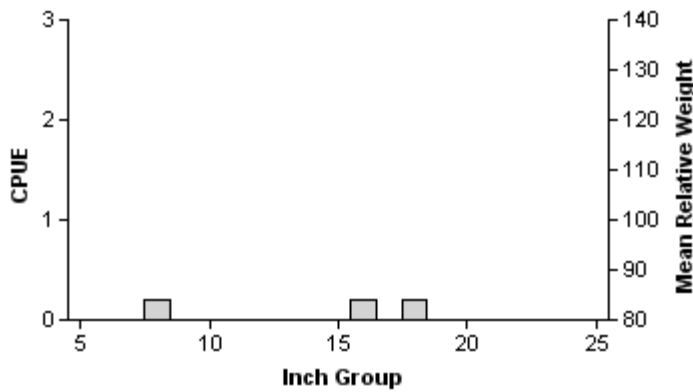
### Channel Catfish

2001



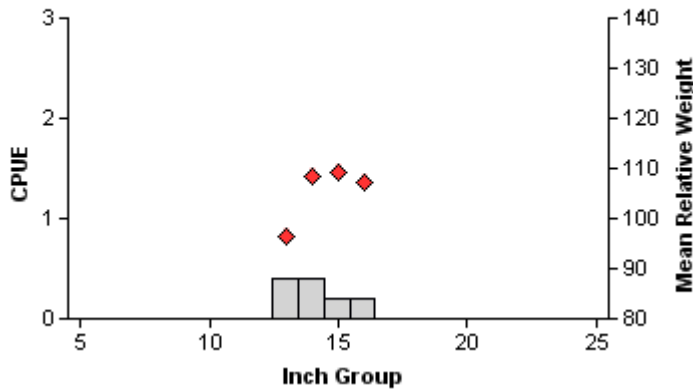
Effort = 5.0  
 Total CPUE = 10.0 (50; 50)  
 Stock CPUE = 8.6 (45; 43)  
 CPUE-12 = 7.4 (46; 37)  
 PSD = 49 (13)

2005



Effort = 5.0  
 Total CPUE = 0.6 (67; 3)  
 Stock CPUE = 0.4 (100; 2)  
 CPUE-12 = 0.4 (100; 2)  
 PSD = 100 (0)

2007



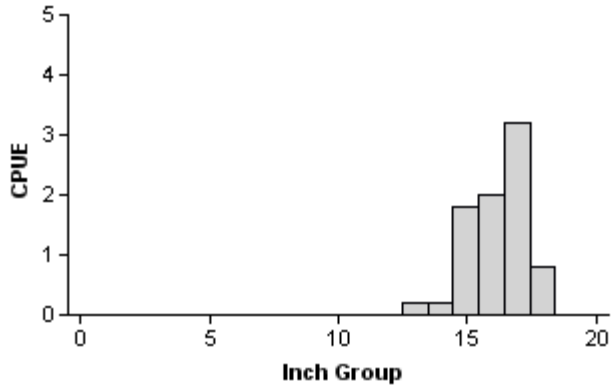
Effort = 5.0  
 Total CPUE = 1.2 (61; 6)  
 Stock CPUE = 1.2 (61; 6)  
 CPUE-12 = 1.2 (61; 6)  
 PSD = 17 (8)

Figure 3. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Buffalo Springs Reservoir, Texas, 2001, 2005, and 2007. No channel catfish were collected in gill nets in 2009.

**Striped Bass**

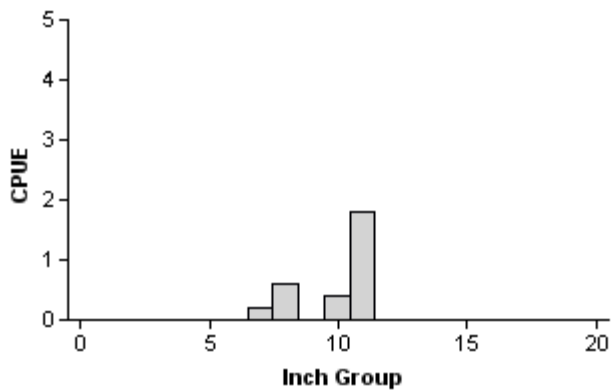
**2005**

Effort = 5.0  
 Total CPUE = 8.2 (35; 41)  
 Stock CPUE = 8.2 (35; 41)  
 CPUE-18 = 0.8 (25; 4)  
 PSD = 0 (61)



**2007**

Effort = 5.0  
 Total CPUE = 3.0 (28; 15)  
 Stock CPUE = 0.0 (0; 0)  
 CPUE-18 = 0.0 (0; 0)  
 PSD = 0 (0)



**2009**

Effort = 5.0  
 Total CPUE = 0.4 (100; 2)  
 Stock CPUE = 0.0 (0; 0)  
 CPUE-18 = 0.0 (0; 0)  
 PSD = 0 (0)

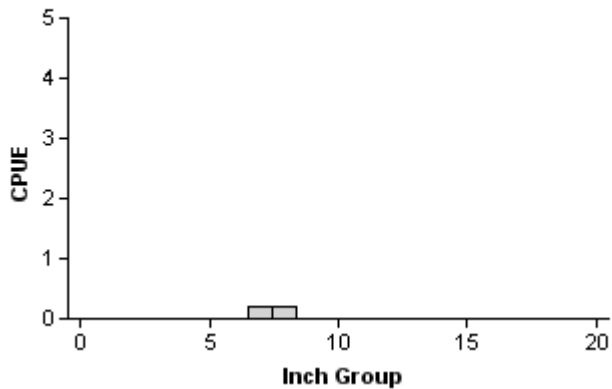
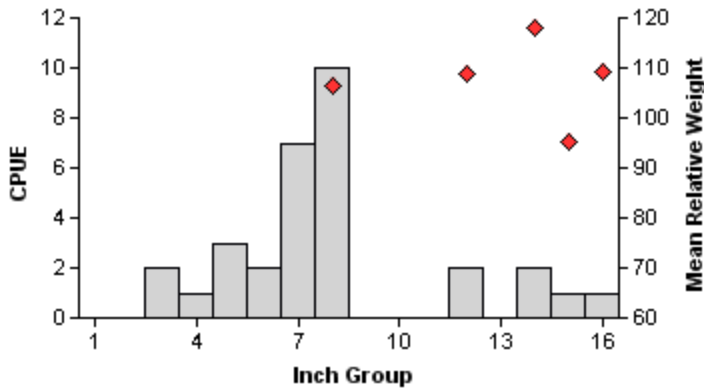


Figure 4. Number of striped bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Buffalo Springs Reservoir, Texas, 2005, 2007, and 2009.

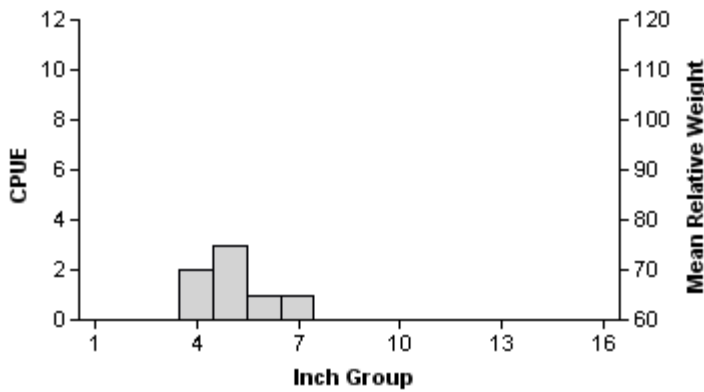
### Largemouth Bass

2004



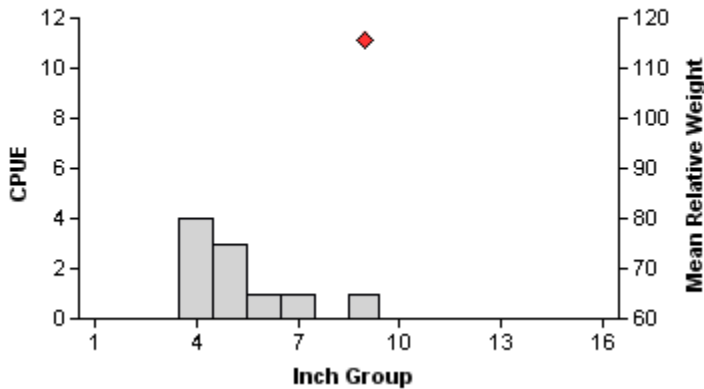
Effort = 1.0  
 Total CPUE = 31.0 (22; 31)  
 Stock CPUE = 16.0 (31; 16)  
 PSD = 38 (17)  
 RSD-14 = 25 (10)

2006



Effort = 1.0  
 Total CPUE = 7.0 (39; 7)  
 Stock CPUE = 0.0 (0; 0)  
 PSD = 0 (0)  
 RSD-14 = 0 (10)

2008

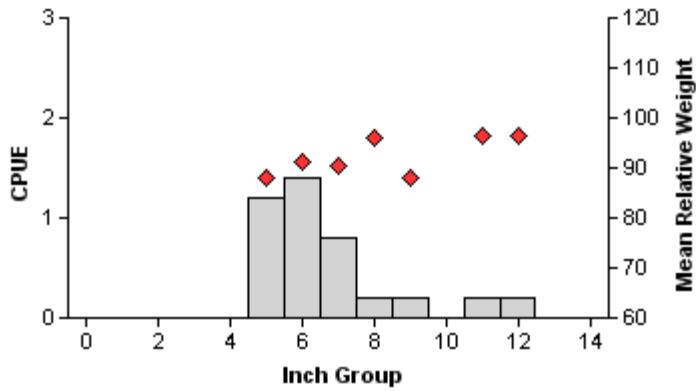


Effort = 1.0  
 Total CPUE = 10.0 (25; 10)  
 Stock CPUE = 1.0 (100; 1)  
 PSD = 0 (391)  
 RSD-14 = 0 (0)

Figure 5. 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, Buffalo Springs Reservoir, Texas, 2004, 2006, and 2008.

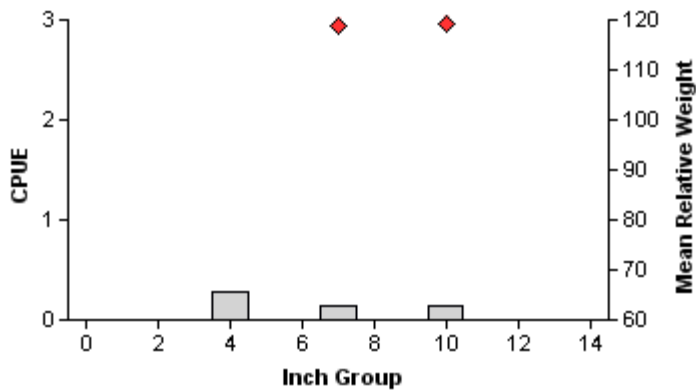
**White Crappie**

**2000**



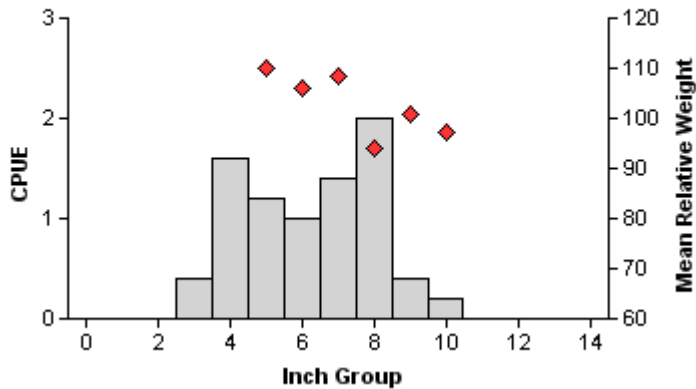
Effort = 5.0  
 Total CPUE = 4.2 (68; 21)  
 Stock CPUE = 4.2 (68; 21)  
 PSD = 19 (1)  
 RSD-10 = 10 (4)

**2004**



Effort = 7.0  
 Total CPUE = 0.6 (65; 4)  
 Stock CPUE = 0.3 (100; 2)  
 PSD = 50 (0)  
 RSD-10 = 50 (0)

**2008**



Effort = 5.0  
 Total CPUE = 8.2 (50; 41)  
 Stock CPUE = 6.2 (55; 31)  
 PSD = 42 (6)  
 RSD-10 = 3 (3)

Figure 6. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Buffalo Springs Reservoir, Texas, 2000, 2004, and 2008.



Table 5. Proposed sampling schedule for Buffalo Springs Reservoir. Trap net and electrofishing surveys are conducted in the fall while gill net surveys are conducted in the spring. The letter S indicates standard sampling.

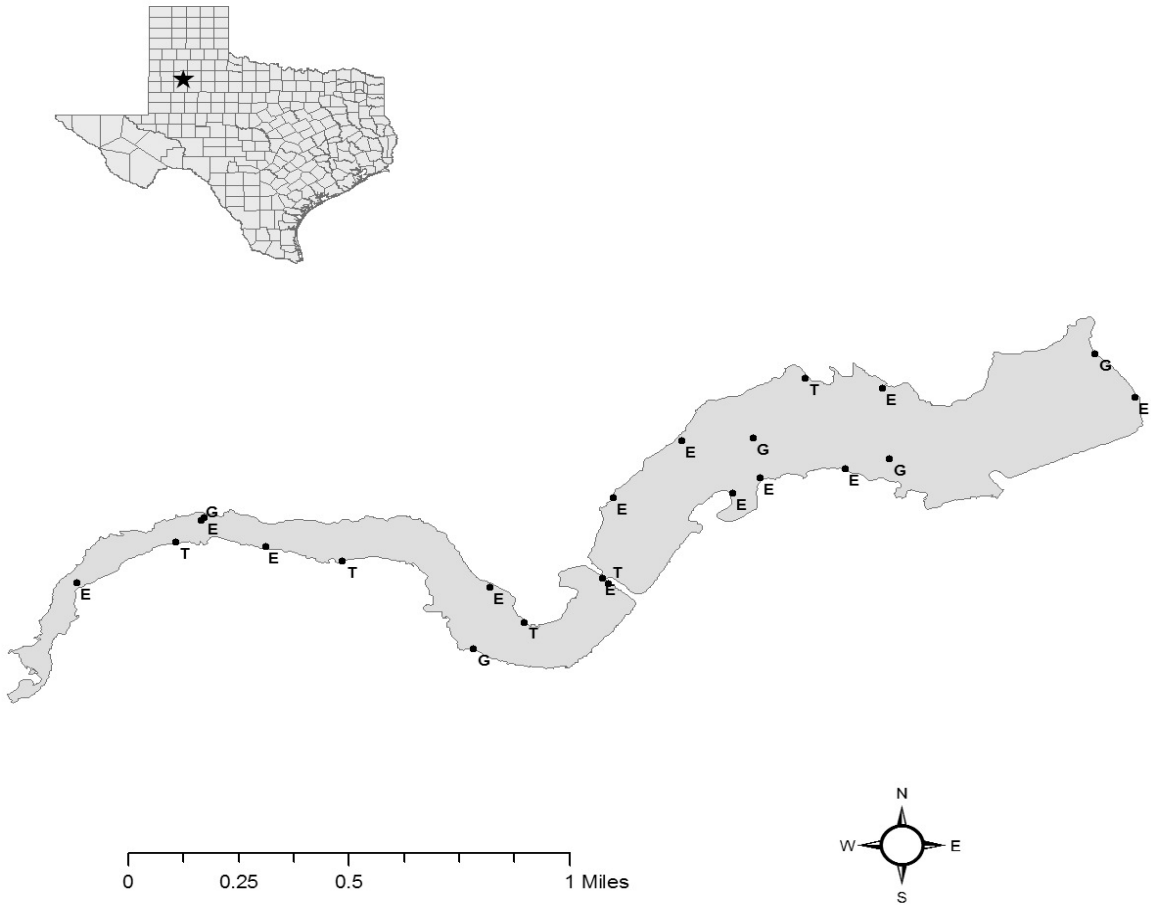
Sampling Year	Electrofishing	Trap Net	Gill Net	Report
Fall 2009-Spring 2010				
Fall 2010-Spring 2011	A		A	
Fall 2011-Spring 2012				
Fall 2012-Spring 2013	S	S	S	S

17  
**APPENDIX A**

Catch per unit effort (number per net night for gill and trap nets and number per hour for electrofishing) of all species collected from all gear types from Buffalo Springs Reservoir, Texas. Trap net and electrofishing surveys were conducted in the fall of 2008 and gill net surveys were conducted in the spring of 2009. Effort was 1 h for electrofishing and 5 nn each for gill net and trap net.

Species	Electrofishing	Trap Net	Gill Net
Gizzard shad	310.0	0.6	55.8
Common carp	481.0	15.8	14.8
Golden shiner	3.0		
Black bullhead	24.0	278.0	3.4
Striped bass	24.0		0.4
Green sunfish	134.0		0.8
Bluegill	39.0	1.6	0.4
Largemouth bass	10.0		0.2
White crappie	14.0	8.2	0.2

18  
APPENDIX B



Location of sampling sites, Buffalo Springs Reservoir, Texas, 2008 - 2009. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.