

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-30-R-32

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

**Lake Crook**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Crook were surveyed in 2006 using electrofishing and trap nets, and in 2007 using gill nets. Aquatic vegetation and habitat surveys were conducted on Lake Crook during August 2006. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Lake Crook is a 1,060-acre impoundment located in Lamar County, Texas, on Pine Creek, a tributary of the Red River. It was constructed by the City of Paris for municipal water supply, but currently acts as a supplemental source to the main supply from Pat Mayse Reservoir. Habitat consists primarily of featureless banks and shallow areas are dominated by native emergent aquatic vegetation.
- **Management history:** Important sport fishes include largemouth bass, white crappie, blue and channel catfish. The management plan from the 2002 survey report recommended stocking saugeye to reduce the abundance of small white crappie and create a new fishery. Lake Crook was not stocked, however, since it did not meet the criteria for saugeye stocking.
- **Fish community**
  - **Prey species:** Prey species in the reservoir consist primarily of gizzard shad. Electrofishing catch of gizzard shad was moderate, with the majority of gizzard shad being available as prey to most sport fish. Electrofishing catch of bluegills was extremely low, with only one bluegill sampled. No threadfin shad were collected.
  - **Catfishes:** Catch rates of catfishes collected during gill netting were low, but many fish were of harvestable size. Blue catfish had never previously been caught in gill nets in Lake Crook, and no record exists of TPWD stocking this species into the reservoir. Blue catfish may have been introduced by anglers in the recent past. No flathead catfish were sampled in the reservoir during the spring 2007 survey.
  - **Largemouth bass:** Only one largemouth bass was caught during electrofishing, most likely due to the lack of suitable habitat. Largemouth bass are present in the reservoir in low abundance and are unable to thrive in Lake Crook's highly turbid water.
  - **Crappies:** Only white crappie were sampled during the survey, and were extremely abundant. Size structure was poor, however, with most individuals less than six inches.

**Management strategies:** Recommend improvements to the public ramps and fishing pier at the park on the lake. Promote the new blue catfish fishery through local media outlets. Continue with standard monitoring using trap nets, gill nets, and electrofishing in 2010-2011.

## INTRODUCTION

This document is a summary of fisheries data collected from Lake Crook 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*

Lake Crook is a 1,060-acre impoundment constructed in 1923 on Pine Creek, a tributary of the Red River. It is located in Lamar County approximately 2 miles north of Paris, Texas, and is operated and controlled by the City of Paris. Primary water use includes municipal water supply, but it currently acts as a supplemental source to the main supply from Pat Mayse Reservoir. Habitat at the time of sampling consisted of featureless banks with very limited cover provided by flooded timber. Emergent vegetation was not useable habitat for fish due to extremely low water conditions. Boat access consisted of two public boat ramps. Bank fishing access was present at all public boat ramps and along some of the shore in the city park. The fishing pier at the city park is structurally unstable and in need of repairs. Other descriptive characteristics for Lake Crook are in Table 1.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Storey and Myers 2003) included:

1. Saugeye stocking. The introduction of saugeye was proposed as a way to reduce the abundance of the stunted white crappie and improve that fishery while creating a new fishery.

**Action:** No action was taken because Lake Crook did not meet the requirements for a saugeye stocking- the reservoir is 1,060 acres, slightly larger than the 1,000 acre maximum.

2. Creation of a northern-strain largemouth bass sanctuary.

**Action:** Since 1994, only 18 age-0 largemouth bass have been caught electrofishing on Lake Crook. All 18 of the fish were determined to be pure northern bass based on electrophoretic analysis. It was suggested that Lake Crook might serve as a northern bass sanctuary. However, because so few fish have been sampled, we cannot say with any degree of certainty that Florida alleles are not present in the population.

**Harvest regulation history:** Sport fishes in Lake Crook are currently managed with statewide regulations (Table 2).

**Stocking history:** There is no information available on fish stockings in Lake Crook.

**Vegetation/habitat history:** Lake Crook contained no submerged vegetation and very little native emergent vegetation (21 acres). This vegetation forms a narrow band around the lake perimeter

which in combination with featureless shoreline forms the dominant shoreline habitat type (91%).

## METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (5 net nights at 5 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill and trap nets, as the number of fish caught 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 2005).

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

## RESULTS AND DISCUSSION

**Vegetation/habitat:** Shoreline habitat during fall 2006 was composed primarily of featureless bank with native emergent vegetation, eroded bank, and concrete (91.0%, 4.7% and 4.2% respectively; Table 3). The aquatic vegetation in Lake Crook consists exclusively of emergent vegetation which forms a narrow band around the lake perimeter (21.2 acres) contributing little in terms of the total area of the reservoir (2%).

**Prey species:** Electrofishing catch rate of gizzard shad was 125.0/h. Index of vulnerability (IOV) for gizzard shad was excellent, indicating that 100% of gizzard shad were available to existing predators (Figure 1). Total CPUE of gizzard shad was similar to 1997 (134.0/h) but much higher than the 2002 survey (28.0/h) survey. Only one bluegill was caught in 2006 (Figure 2). The 1997 survey resulted in a bluegill CPUE of 39.0/h, but no bluegill were caught during our 2002 electrofishing survey. No other sunfishes were caught in 2006.

**Catfishes:** The gill net catch rate of blue catfish was 3.0/nn in 2007 (Figure 3). Prior to the 2007 survey, blue catfish had not appeared in our sampling, and there is no record of stocking blue catfish in Lake Crook. Though the sample size in 2007 was small ( $n=15$ ), 9 of the blue catfish captured were less than 12 inches indicating limited natural reproduction and recruitment. Blue catfish may provide a new opportunity for anglers in a reservoir with few other fisheries. The channel catfish population showed similar relative abundance in 2007 (1.6/nn) compared to the 2003 survey (2.6/nn), with similar size distribution (Figure 4). Both blue and channel catfish exhibited poor body condition, with the relative weights of most individuals ranging from 70 – 85.

**White bass:** One white bass was captured using gill nets in 2007. No white bass were collected in 2003 and few were sampled in 1997 (0.8/nn; Figure 5). The population consisted of a few, large individuals.

**Largemouth bass:** The electrofishing catch rate of largemouth bass was poor, with only one fish

caught in both 2006 and 2002 (Figure 6). Largemouth bass in 1997 was better (21.0/h) than more recent years, but catch rates of bass in Lake Crook have been historically low. Recent electrofishing surveys may have resulted in few fish because of the highly turbid conditions at the time of sampling combined with a lack of suitable habitat. Electrophoresis of the 18 age-0 largemouth bass sampled between 1994 and 2002 indicated all to be northern genotypes (Table 4).

**White crappie:** The trap net catch rate of white crappie was 71.2/nn in 2006, which was similar to 1997 (67.8/nn) but higher than 2002 (14.6/nn; Figure 7). The PSD of 3 was much lower than previous surveys, and indicated a population dominated by small fish. Mean relative weight ranged from 75 to 105 in the 2006 survey. No age and growth data were collected because of low sample size of crappie 9 inches and larger.

**Fisheries management plan for Lake Crook, Texas**

Prepared – July 2007

**ISSUE 1:** Prior to 2007, blue catfish had not been collected in Lake Crook. The fact that the blue catfish population appears to be reproducing naturally is encouraging. We believe that the growth and expansion of the blue catfish population may provide a productive fishery in the future.

**MANAGEMENT STRATEGY**

1. Continue to monitor the blue catfish population using standard gill net surveys in 2011.
2. Promote the blue catfish fishery through news releases to local media outlets.

**ISSUE 2:** Boat access to Lake Crook is limited to two ramps located in the city park. Bank access can be found throughout the city park, but could be much improved if the fishing pier was rebuilt and/or expanded.

**MANAGEMENT STRATEGY**

1. Approach the City of Paris with suggestions for increasing and improving public fishing access throughout the city park.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes mandatory monitoring of the reservoir using fall trap nets and electrofishing in 2010, and gill nets in 2011 (Table 5). A habitat and vegetation survey in summer 2010 will be conducted to monitor the littoral zone habitat.

## 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. Stimpert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- Storey, K., and R. Myers. 2003. Statewide freshwater fisheries monitoring and management program survey report for Lake Crook, 2002. Texas Parks and Wildlife Department, Federal Aid in Sport Fish Restoration, Performance Report, Project F-30-R-28, Job A, 19 pages.



Table 1. Characteristics of Lake Crook, Texas.

Characteristic	Description
Year constructed	1923
Controlling authority	City of Paris
Surface area	1,226 acres
County	Lamar
Reservoir type	City impoundment
Mean depth	10.0 ft.
Maximum depth	24.0 ft.
Shoreline Development Index (SDI)	3.4
Conductivity	81 $\mu\text{mho} / \text{cm}$
Secchi disc range	<1 ft.
Watershed area	52 $\text{mi}^2$

Table 2. Harvest regulations for Lake Crook.

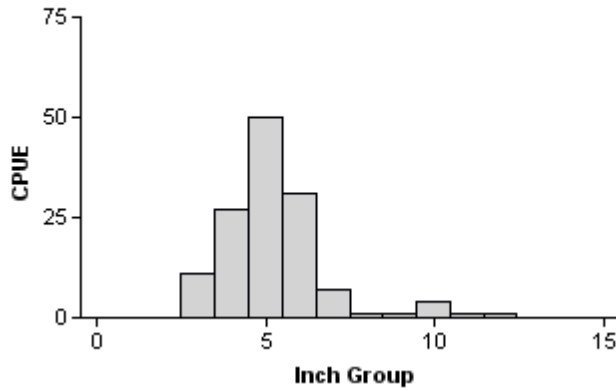
Species	Bag limit	Minimum-Maximum length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No limit
Catfish: flathead	5	18 - No limit
Bass: White	25	10 – No limit
Bass: largemouth	5	14 - No limit
Crappie: white and black crappie, their hybrids and subspecies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

Table 3. Survey of littoral zone and physical habitat types, Lake Crook, Texas, 2006. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Concrete	0.54	4.2		
Eroded bank	0.60	4.7		
Featureless / native emergent	11.66	91.0		
Sawgrass			8.15	
Sawgrass / bullrush			12.49	
Bullrush			0.56	
Total			21.20	2.00

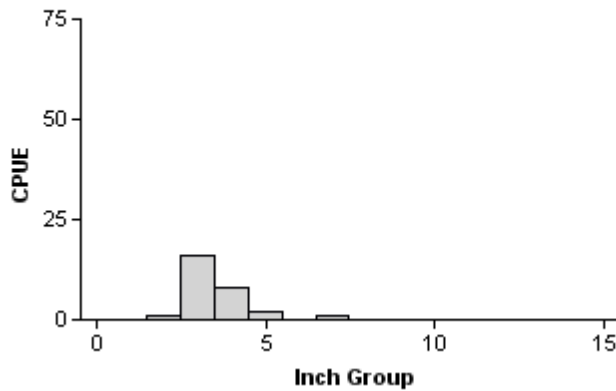
## Gizzard shad

1997



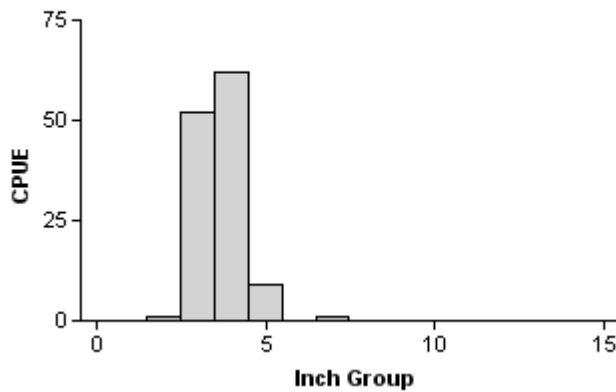
Effort = 1.0  
 Total CPUE = 134.0 (20; 134)  
 Stock CPUE = 15.0 (47; 15)  
 PSD = 13 (7)  
 IOV = 94.03 (2.8)

2002



Effort = 1.0  
 Total CPUE = 28.0 (34; 28)  
 Stock CPUE = 1.0 (100; 1)  
 PSD = 0 (1279.2)  
 IOV = 100.0 (0.0)

2006

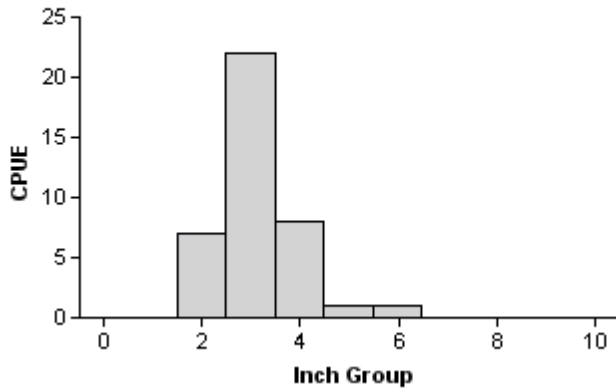


Effort = 1.0  
 Total CPUE = 125.0 (35; 125)  
 Stock CPUE = 1.0 (100; 1)  
 PSD = 0 (5786.2)  
 IOV = 100.0 (0)

Figure 1. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Crook, Texas, 1997, 2002, and 2006.

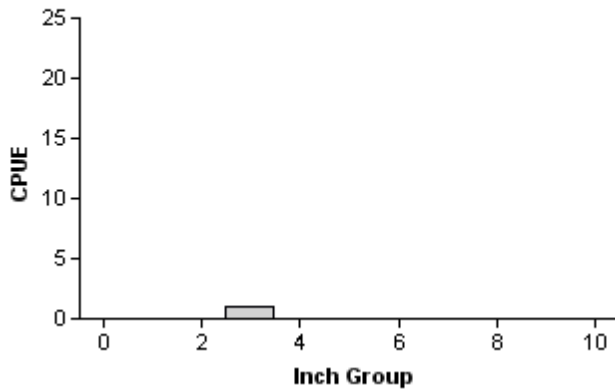
## Bluegill

1997



Effort = 1.0  
 Total CPUE = 39.0 (33; 39)  
 Stock CPUE = 32.0 (40; 32)  
 PSD = 3 (2.4)

2006



Effort = 1.0  
 Total CPUE = 1.0 (100; 1)  
 Stock CPUE = 1.0 (100; 1)  
 PSD = 0 (104.5)

Figure 2. Number of bluegill 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, Lake Crook, Texas, 1997 and 2006. No bluegill were caught in 2002.

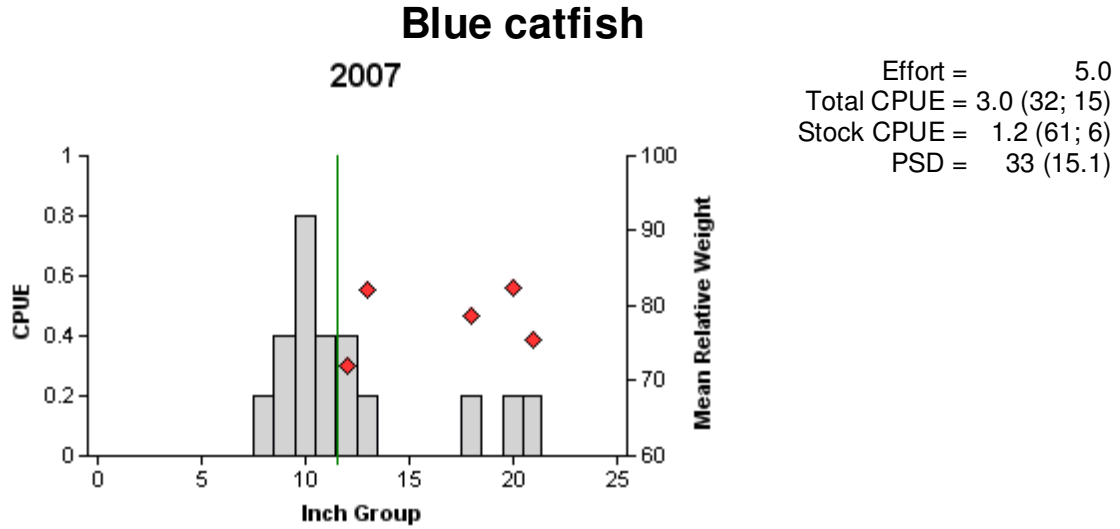


Figure 3. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Crook, Texas, 2007. Vertical line indicates minimum length limit at time of survey.

## Channel catfish

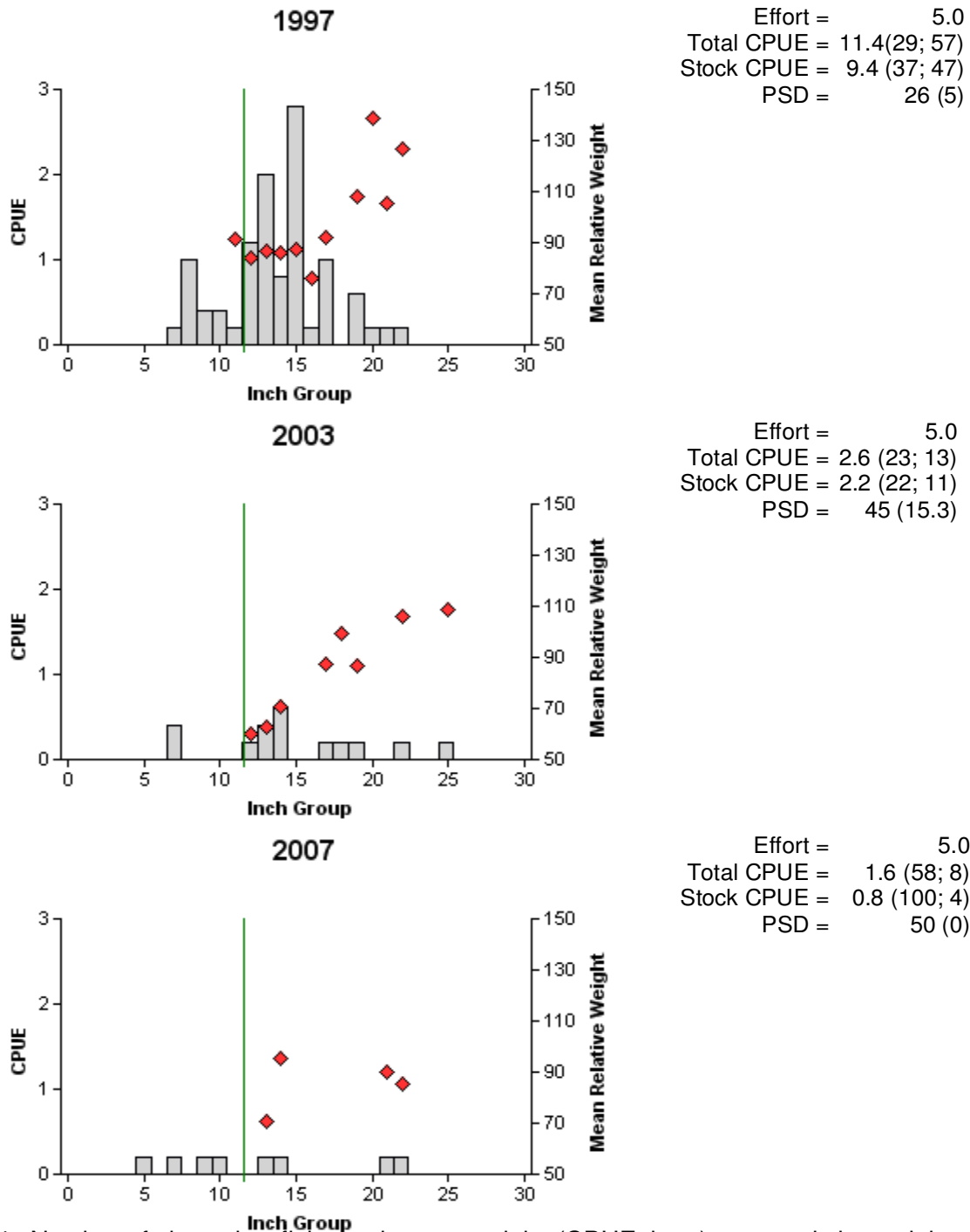


Figure 4. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Crook, Texas, 1997, 2003 and 2007. Vertical lines indicate minimum length limit at time of survey.

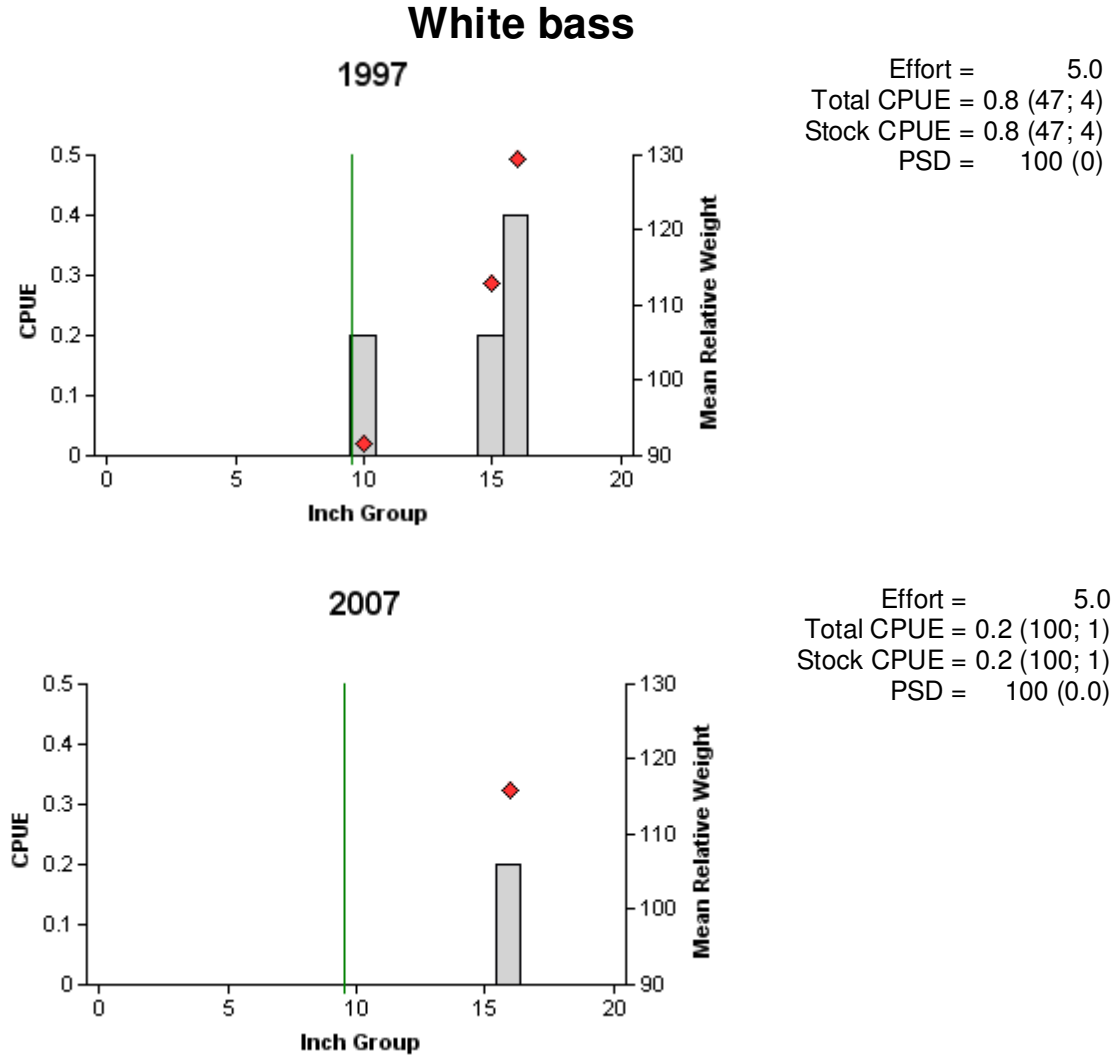
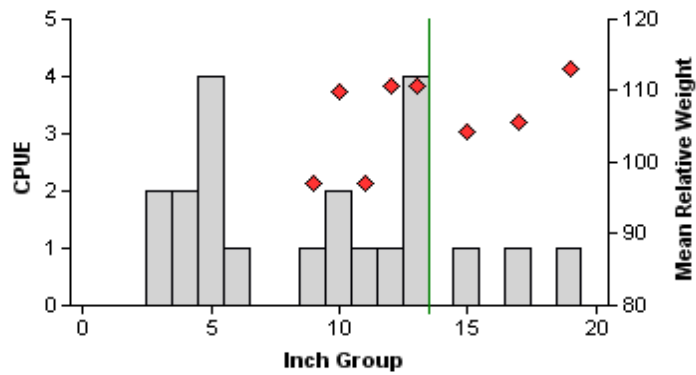


Figure 5. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Crook, Texas, 1997 and 2007. Vertical lines indicate minimum length limit at time of survey. No white bass were sampled in spring 2003.

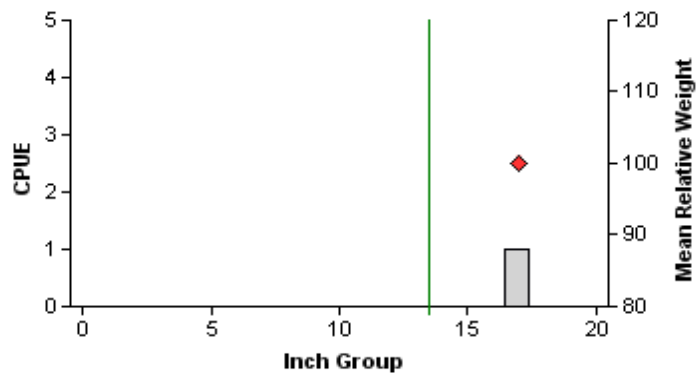
## Largemouth bass

1997



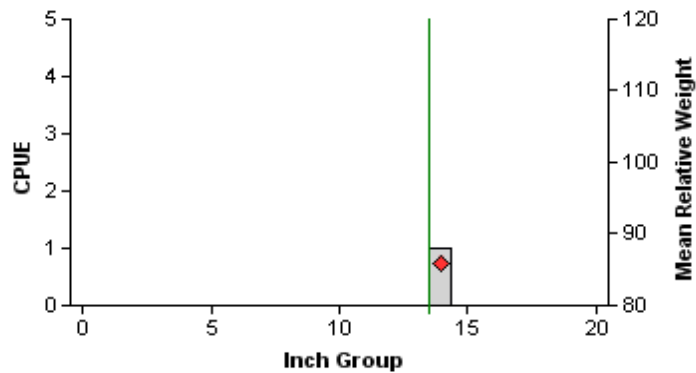
Effort = 1.0  
 Total CPUE = 21.0 (27; 21)  
 Stock CPUE = 12.0 (28; 12)  
 PSD = 67 (11.6)

2002



Effort = 1.0  
 Total CPUE = 1.0 (100; 1)  
 Stock CPUE = 1.0 (100; 1)  
 PSD = 100 (0.0)

2006



Effort = 1.0  
 Total CPUE = 1.0 (100; 1)  
 Stock CPUE = 1.0 (100; 1)  
 PSD = 100 (0)

Figure 6. 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, Lake Crook, Texas, 1997, 2002, and 2006. Vertical lines indicate minimum length limit at time of survey.



## Largemouth bass

Table 4. Results of genetic analysis of largemouth bass collected by fall electrofishing, Lake Crook, Texas, 1994, 1997, and 2002. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

Year	Sample size	Genotype				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
1994	6	0	0	0	6	0.0	0.0
1997	9	0	0	0	9	0.0	0.0
2002	3	0	0	0	3	0.0	0.0

## White crappie

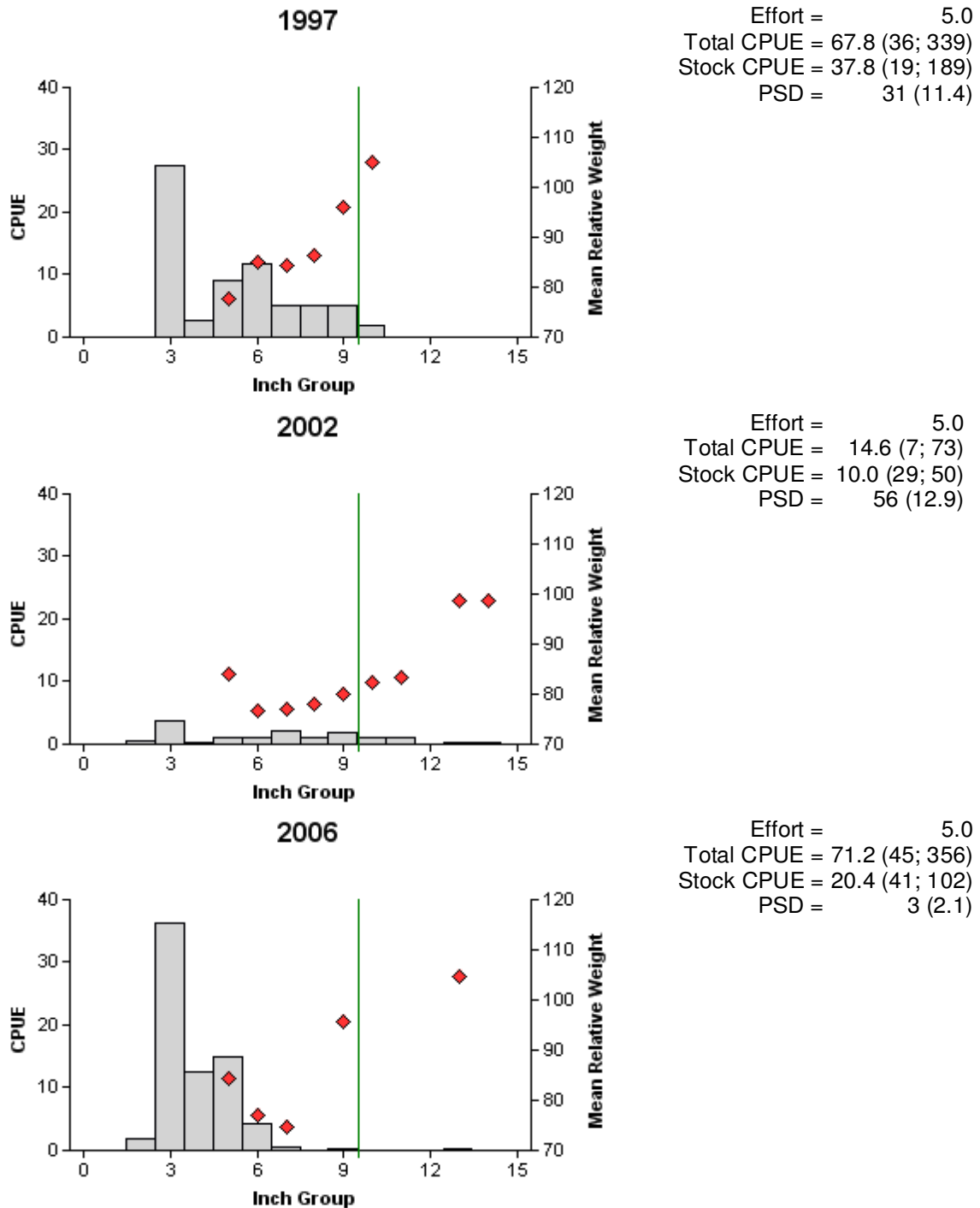


Figure 7. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Crook, Texas, 1997, 2002 and 2006. Vertical lines indicate minimum length limit at time of survey.

Table 5. Proposed sampling schedule for Lake Crook, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard surveys denoted by S.

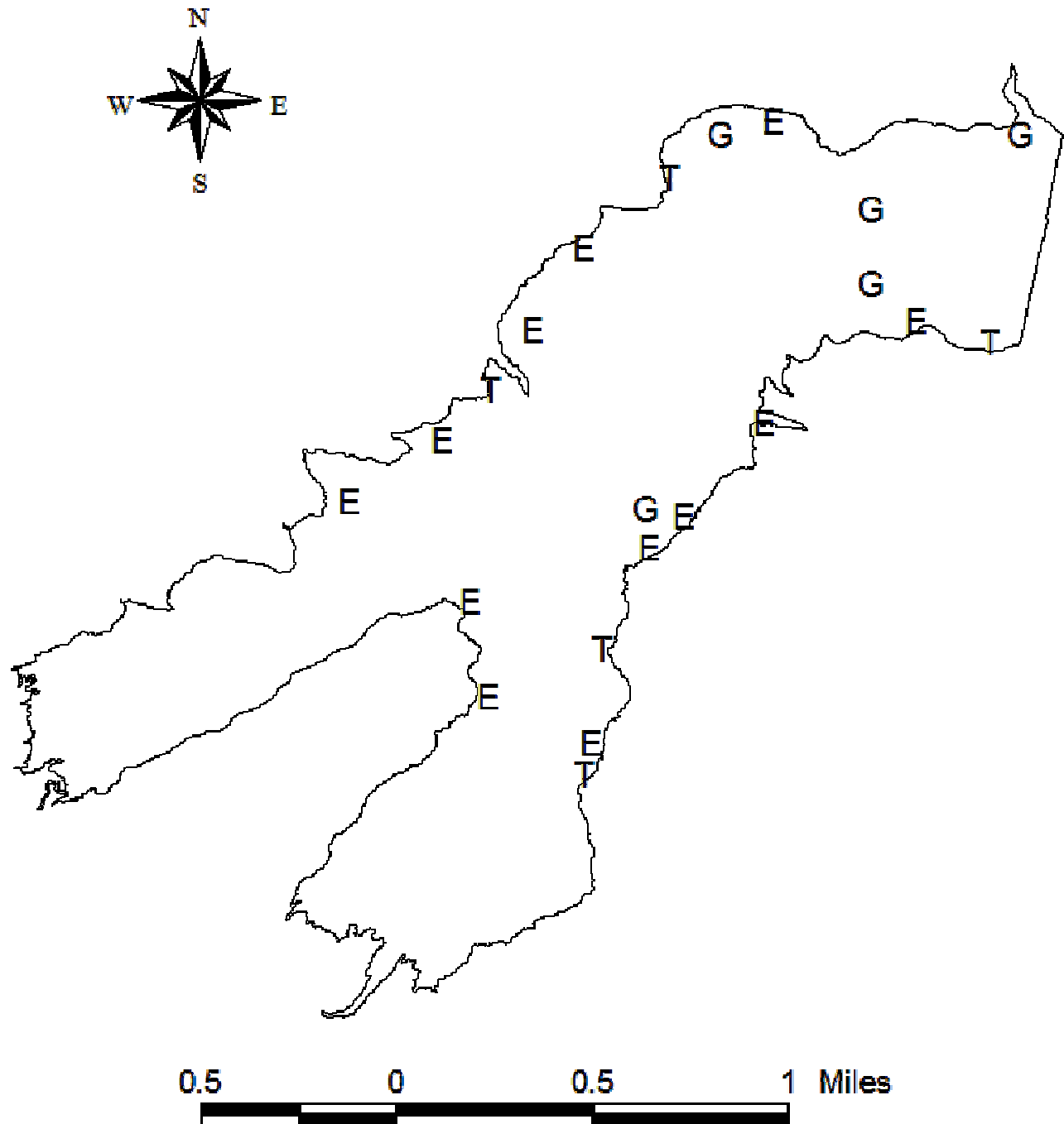
Survey Year	Electrofishing	Trap netting	Gill netting	Vegetation	Report
Fall 2010-Spring 2011	S	S	S	S	S

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Crook, Texas, 2006-2007.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					125	125.0
Blue catfish	15	3.0				
Channel catfish	8	1.6				
White bass	1	0.2				
Bluegill					1	1.0
Largemouth bass					1	1.0
White crappie			356	71.2		

## APPENDIX B



Location of gill net (G), trap net (T), and electrofishing sites (E), Lake Crook, Texas, 2006-2007.