PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-32

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

Moss Reservoir

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SURVEY AND MANAGEMENT SUMMARY

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

- **Reservoir description:** Moss Reservoir is a 1,140-acre impoundment on Fish Creek, a tributary of the Red River, in Cooke County. Water level has been within 2.5 feet of the spillway since June 2004. The reservoir waters are low in nutrients because of the watershed properties; hence, low to moderate productivity. Habitat features consisted mainly of rocky shoreline and native submerged and emergent vegetation. Standing timber was also present.

- **Management history:** Important sport fish include channel catfish, largemouth bass, and white bass. The management plan from the 2002 survey report included a recommendation to update the boat ramp and boarding facilities to improve access for the physically challenged. The boat ramp and boarding facilities have been updated, but improvements to the handicap facilities have not been done. In addition fishing piers were constructed near the boat ramps. A recommendation was also made to explain the declining fish production. Research of historical water quality records of Texas Commission on Environmental Quality indicated the waters were low in chlorophyll-a, a primary nutrient for productive reservoirs.

- **Fish community**

  - **Prey species:** Electrofishing catch rate of gizzard shad was low, but has been low in previous surveys. The relative abundance of prey-size gizzard shad ($\leq$ 7-inches) continued to be low. This was indicative of low nutrient levels in the reservoir. High electrofishing catch rates of threadfin shad and bluegill indicated the prey base was adequate.

  - **Catfishes:** Gill net catch rate of channel catfish was lower than previous surveys, but most of the population was legal size and in fair to excellent condition. Recruitment was evident. Although never stocked or collected, a state and reservoir record blue catfish was caught by bow fishing in 2007.

  - **White bass:** The historical catch rate of white bass has always been low and this survey had the lowest catch rate since the 1990 survey. The entire sample was legal size, but their relative weights were poor, especially for the larger size classes. This may have been the result from the low IOV for gizzard shad. Moss Reservoir is not suitable for white bass because of reservoir size, low forage base, and low productivity.

  - **Black basses:** Smallmouth bass were collected for the first time since 1990. Spotted bass electrofishing catch rates were similar to past years. Their condition was good for spotted bass up to 11 inches, but average for 12- to 14-inch fish. Electrofishing catch rate of largemouth bass was a record high, growth rates were good, and the fish were in average condition. Electrophoretic samples produced one pure Florida bass and the sample had 46% Florida largemouth bass alleles.

  - **White crappie:** Trap net catch rate of white crappie was a record high, although most surveys in the past have had very low catch rates. The crappie were in excellent condition and growth rates were also good.

- **Management strategies:** Based on current information, Moss Reservoir should continue to be managed with existing fish harvest regulations. Although improvements to the boat ramps and related facilities have been made, there are no handicap facilities at the access areas of the reservoir. The City of Gainesville will be encouraged to make those improvements.

INTRODUCTION

This document is a summary of fisheries data collected from Moss Reservoir in 2006-2007. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2006-2007 data for comparison.

Reservoir Description

Moss Reservoir is a 1,140-acre impoundment on Fish Creek, a tributary of the Red River, in Cooke County. It was constructed in 1966 by the City of Gainesville for municipal and industrial water supply and recreation. The City of Gainesville charges $15 for a three-day boat access permit or $35 for an annual (January 1 to December 31) boat access permit. There is no charge for bank angling. The average depth is 20.6 feet with a maximum depth of 68 feet. Water level has been within 2.5 feet of conservation level since June 2004 (Figure 1). Moss Reservoir has a drainage area of approximately 65 square miles, a shoreline length of 16 miles, and a shoreline development index of 3.43. Approximately 42% of the reservoir was $\leq$ 15 feet deep. Moss Reservoir was mesotrophic with a mean TSI chl-*a* of 35.96 (Texas Commission on Environmental Quality 2002). A TSI chl-a index $\leq$ 35 is considered oligotrophic; the reservoir reflects low to moderate productivity. This is further supported by the watersheds of South and North Fish Creeks, which are very clear water streams running over limestone bedrock. Habitat at time of sampling consisted of native emergent vegetation, native submerged vegetation, rocky shoreline, and dead trees. Native aquatic plants present were southern naiad, chara, cattail, coontail, and water willow. Hydrilla, a non-native aquatic plant, was first discovered in two coves in August, 2003. Presently it is confined to one cove near the north launch ramp. Boat access consisted of two public boat ramps on the north and south sides of the reservoir. The two public boat ramps are in good shape and have ample lighting. Bank fishing access near each boat ramp was augmented by a fishing pier. However, there are no handicap facilities. Other descriptive characteristics for Moss Reservoir are in Table 1.

Management History

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

1. Encourage the City of Gainesville to repair the boat ramps and related facilities.
   Action: Both ramps were repaired. Boarding piers were added at each ramp.
2. Encourage the City of Gainesville to develop additional shoreline access to the public.
   Action: Fishing piers were built on adjacent areas near the boat ramps.
3. Encourage the City of Gainesville to develop facilities for handicapped anglers.
   Action: The City was appraised of the situation. No facilities have been constructed.
4. Review historical water quality data from Moss Reservoir collected by the Texas Commission on Water Quality, interpret data, and recommend appropriate action.
   Action: Chlorophyll-a, Secchi disk, and total phosphorus data indicate the reservoir to have a low to moderate algal productivity, not limited by phosphorus, with some of the nutrients going to the abundant aquatic vegetation, and some non-algal turbidity, which could be caused by rock quarry activity in South Fish Creek. The City of Gainesville uses the water for municipal and industrial purposes; therefore, is not amenable to nutrient enrichment. This will probably happen naturally as development increases around the reservoir.
5. Update the Moss Reservoir web page as required.
   Action: Recommendations were made as appropriate.

Harvest regulation history: Sport fishes in Moss Reservoir are currently managed with statewide regulations (Table 2).

Stocking history: Moss Reservoir has not been stocked since 1988 (smallmouth bass). Prior to 1988, Florida largemouth bass were stocked in 1981 and 1982. Threadfin shad were stocked in 1984 and 1985 due to possible winter kills. Walleye were introduced as fry from 1977 through 1979. The complete stocking history since 1967 is in Table 3.

Vegetation/habitat history: Moss Reservoir supported submerged and emergent aquatic vegetation (Table 4). Historically, submerged aquatic vegetation (chara, southern naiad, and coontail) was common, but not problematic (Hysmith and Moczygemba 2003). These species persist currently and provide fish habitat. Historically and currently, water willow is abundant along a third of the shoreline. The persistence of water willow along the shoreline probably contributes to the success of largemouth bass recruitment in this reservoir (Aggus and Elliott 1975). Hydrilla was first observed in August 2003 in two coves. Presently hydrilla is found only sparsely in one cove near the north boat ramp and is not problematic. Historically, as well as currently, rocky shoreline provides the most fishery habitat in Moss Reservoir (Table 4; Hysmith and Moczygemba 2003).

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 condition indices [relative weight (Wr)] 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 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Ages were determined using Category 2 protocol and otoliths from 12 to 13 fish according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). The manual specifies for largemouth bass only, but we adapted white crappie to the protocol for identifying the number of white crappie to sample. Source for water level data was the United States Geological Survey (USGS) website.

Fin tissue samples from 30 age-0 largemouth bass were collected, preserved, and transported for electrophoretic analysis according to Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of rocky shoreline, bulkhead, dead trees, and native emergent and native submerged vegetation (Table 4).

Prey species: Electrofishing catch rates of gizzard and threadfin shad were 28.0/h and 173.0/h, respectively. Index of vulnerability (IOV) for gizzard shad was poor, indicating only 4% of gizzard shad were available to existing predators; the IOV estimates have historically been low (Figure 2). Total CPUE of gizzard shad was higher in 2006 compared to the 2002 survey (Figure 2). The highest catch rate of threadfin shad since 1990 augmented the poor quality of prey provided by gizzard shad (Appendix D). For the past three surveys, going back to 1997, the size structure of bluegill was dominated by small individuals $\leq$ 3 inches, also supplementing the poor gizzard shad size structure and abundance (Figure 3 and Appendix D). The total CPUE of bluegill was 187.0/h in 2006 and has fluctuated over the past three surveys, but still remained above 175.0/h in all years.

Catfishes: The gill net catch rate of channel catfish was 1.4/nn in 2007, an all-time low catch (Figure 4 and Appendix D). Relative weights were good for channel catfish over 18 inches, while the 14- to 16-inch fish were in fair condition. Almost 60% of the sample was legal size and larger. As in past surveys catch of sub-legal size fish was low, but the catch verified reproduction.

Although blue catfish have never been stocked or collected (Table 3 and Appendix D), a lake record blue catfish was recognized in 2007. A bow fishing angler set the bowfishing blue catfish record for Moss Reservoir at 59.3 pounds, measuring 46 inches TL. This was also the statewide bow fishing record.

White bass: The gill net CPUE of white bass was 1.8/nn in 2006 (Figure 5), a decline from previous years (Appendix D). The historical catch rate has always been low and this was the lowest since the 1990 survey. The entire sample was legal size, but their relative weight was poor with Wr's below 80 for all sizes (Figure 5). The Wr's for white bass have been declining since the 1997 survey, especially for the larger size classes. This may have been the result of the low IOV for gizzard shad. Moss Reservoir may be unsuitable for white bass because of its small size, low prey base, and low productivity.

Black basses: For the first time since 1990 smallmouth bass were collected from Moss Reservoir (Appendix D). Although the catch rate was only 2.0/h, the sizes (4- and 7-inch) indicated smallmouth bass are recruiting.

The electrofishing CPUE of stock-length spotted bass was 35.0/h in 2006, down from 2002, but higher than 1997 (Figure 6). Size structure showed evidence of recruitment to 14 inches in the past three surveys. Relative weights were near 90 for 7- to 12-inch fish, but below 80 for spotted bass >12 inches (Figure 6).

The electrofishing total CPUE (126.0/h; Figure 7) was the highest on record for largemouth bass (Appendix D). Good recruitment was evidenced by consistent catch rates of stock-size largemouth bass since 1997 (Figure 7). Young-of-the-year contributed most to the total catch rate. Size structure was marginal (PSD = 28) and only two largemouth bass $\geq$14 inches were collected. Largemouth bass in Moss Reservoir reached 14 inches between 2 and 3 years (N = 8; range = 2 – 3 years). Body condition in 2006 was below the Wr range of 95-100 recommended by Anderson for nearly all size classes of fish (Figure 7). With only two stockings (1981 and 1982), Florida largemouth bass influence has remained high with Florida largemouth bass alleles at 46% in 2006 and the Florida largemouth bass genotype at 3.0% (Table 5).

White crappie: The trap net catch rate of white crappie was 4.6/nn in 2006 (Figure 8), by far the highest catch on record (Appendix D). The PSD was 96, which was higher than 2002, but below the PSD of 100 in 1997, which only had a crappie catch rate of 1.0/nn (Figure 8). The CPUE of white crappie $\geq$ 10 inches (legal size) was 3.0/nn, which accounted for 65% of the total catch. White crappie up to 14 inches were collected, which, is two inches longer than previous years. Relative weights for most inch groups were also higher than past surveys with only the 14-inch group (85) going below 90 (Figure 8). Growth was good as demonstrated by 11 of 12 sampled crappie growing to 10 inches in 2 years (N=12; range 1 – 2 years).

Fisheries management plan for Moss Reservoir, Texas

Prepared – July 2007.

ISSUE 1: There are no facilities for handicapped anglers.

MANAGEMENT STRATEGY

1. Encourage the City of Gainesville to develop facilities for handicapped anglers.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule consists of mandatory monitoring in 2010/2011 (Table 6).

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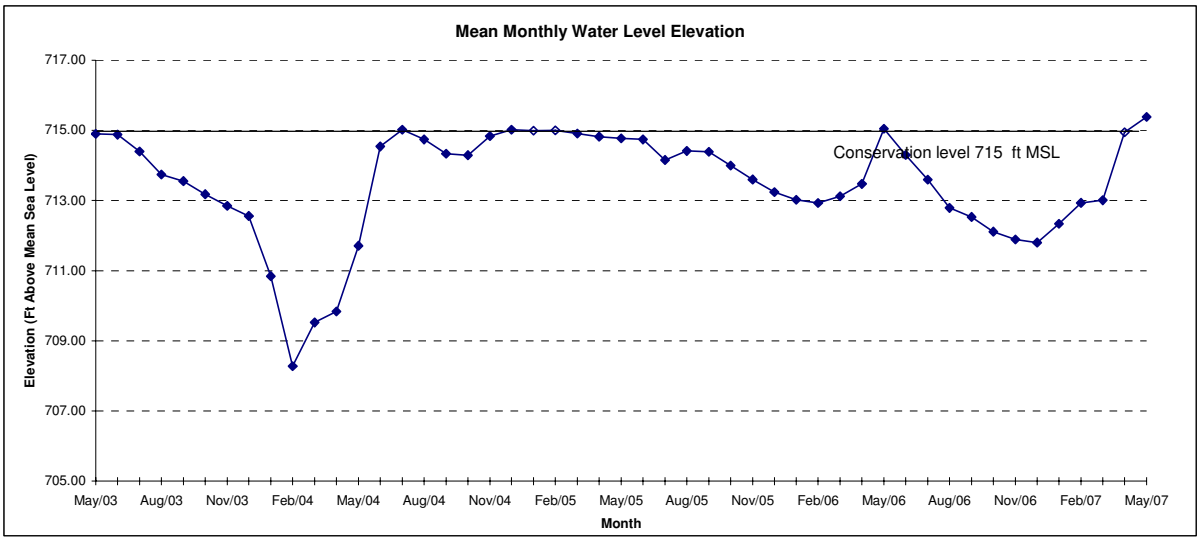


Figure 1. Monthly average water level elevations in feet above mean sea level (MSL) recorded for Moss Reservoir, Texas, May 2003-May, 2007.

Table 1. Characteristics of Moss Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	City of Gainesville
County	Cooke
Reservoir type	Offstream
Shoreline development index	3.43
Conductivity	255 µmhos/cm

Table 2. Harvest regulations for Moss Reservoir.

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

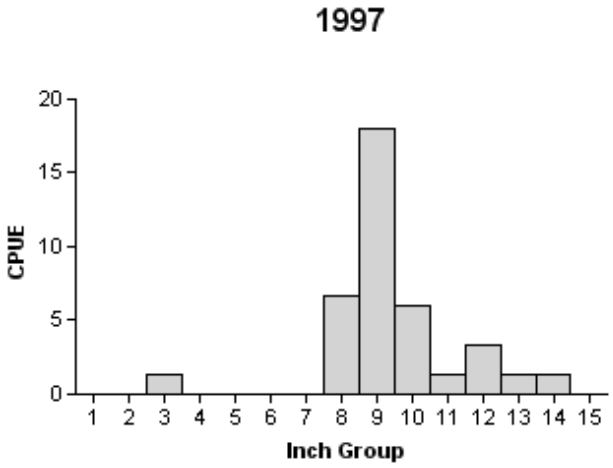
Table 3. Stocking history of Moss, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Florida Largemouth bass	1981	38,500	FGL	2.0
	1982	58,064	FGL	2.0
	Total	96,564		
Largemouth bass	1967	10,000	FGL	1.5
	1971	260,000	FRY	0.5
	Total	270,000		
Smallmouth bass	1985	13	ADL	16.0
	1986	22,080	FGL	2.0
	1987	22,300	FRY	1.0
	1988	56,304	FRY	0.5
	Total	100,697		
Threadfin shad	1984	1,170	AFGL	3.0
	1985	6,500	AFGL	2.0
	Total	7,670		
Walleye	1977	341,100	FRY	0.2
	1978	339,500	FRY	0.2
	1979	339,910	FRY	0.2
	Total	1,020,510		

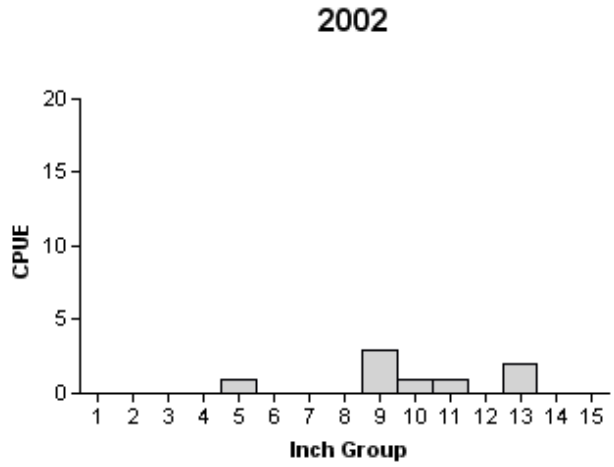
Table 4. Survey of littoral zone and physical habitat types, Moss Reservoir, Texas, 2006. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Riprap	0.3	1.9		
Rocky shore	4.8	30.0		
Eroded bank	0.2	1.2		
Bulkhead	2.0	12.5		
Featureless	2.0	12.5		
Dead trees	2.0	12.5	71	6.0
Docks	0.7	4.4	3	0.3
Native submerged vegetation	2.0	12.5	100	9.0
Native emergent vegetation	2.0	12.5	36	3.0
Hydrilla	<1	<1	<1	<1

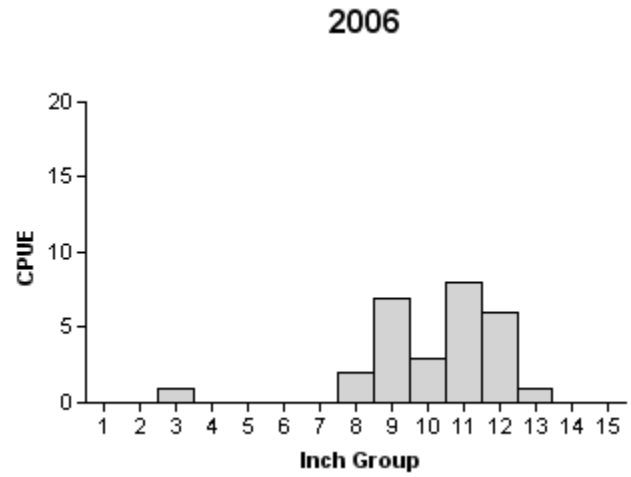
Gizzard Shad



Effort = 1.5
Total CPUE = 39.3 (42; 59)
PSD = 19 (4.6)
IOV = 3 (2.7)



Effort = 1.0
Total CPUE = 8.0 (38; 8)
PSD = 43 (24.7)
IOV = 12 (11.1)



Effort = 1.0
Total CPUE = 28.0 (32; 28)
PSD = 56 (15.8)
IOV = 4 (4)

Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas 1997, 2002, and 2006.

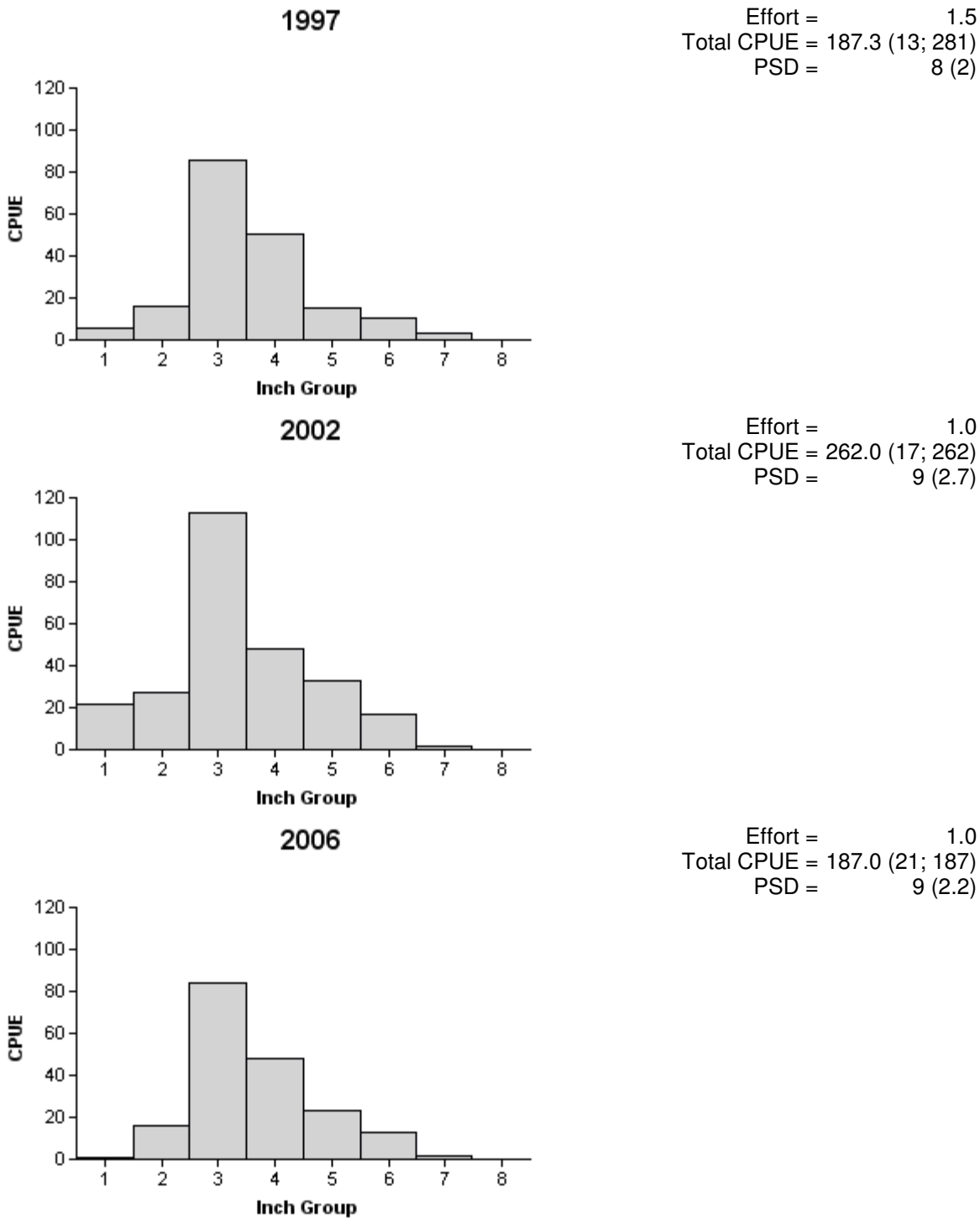


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 1997, 2002, and 2006.

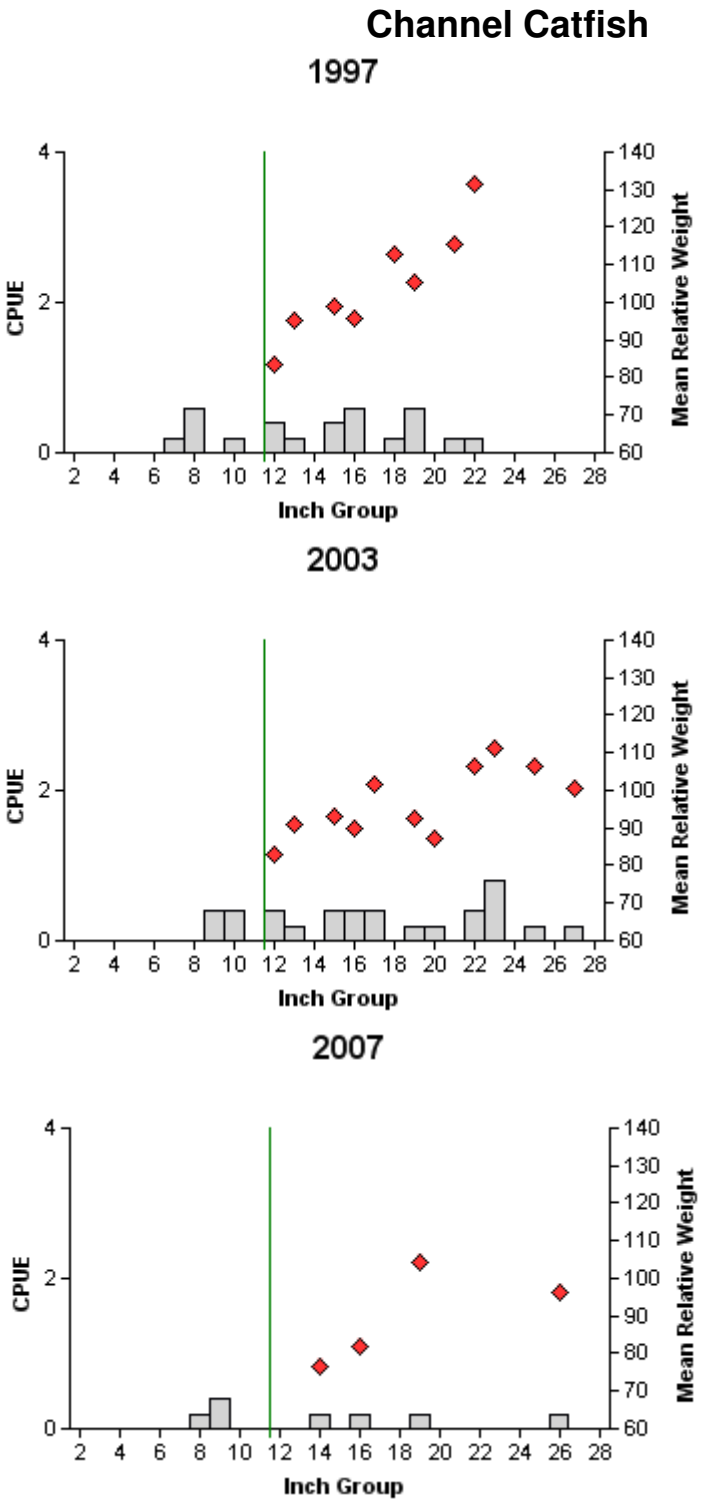


Figure 4. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Moss Reservoir, Texas, 1997, 2003, and 2007. Vertical lines represent length limit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

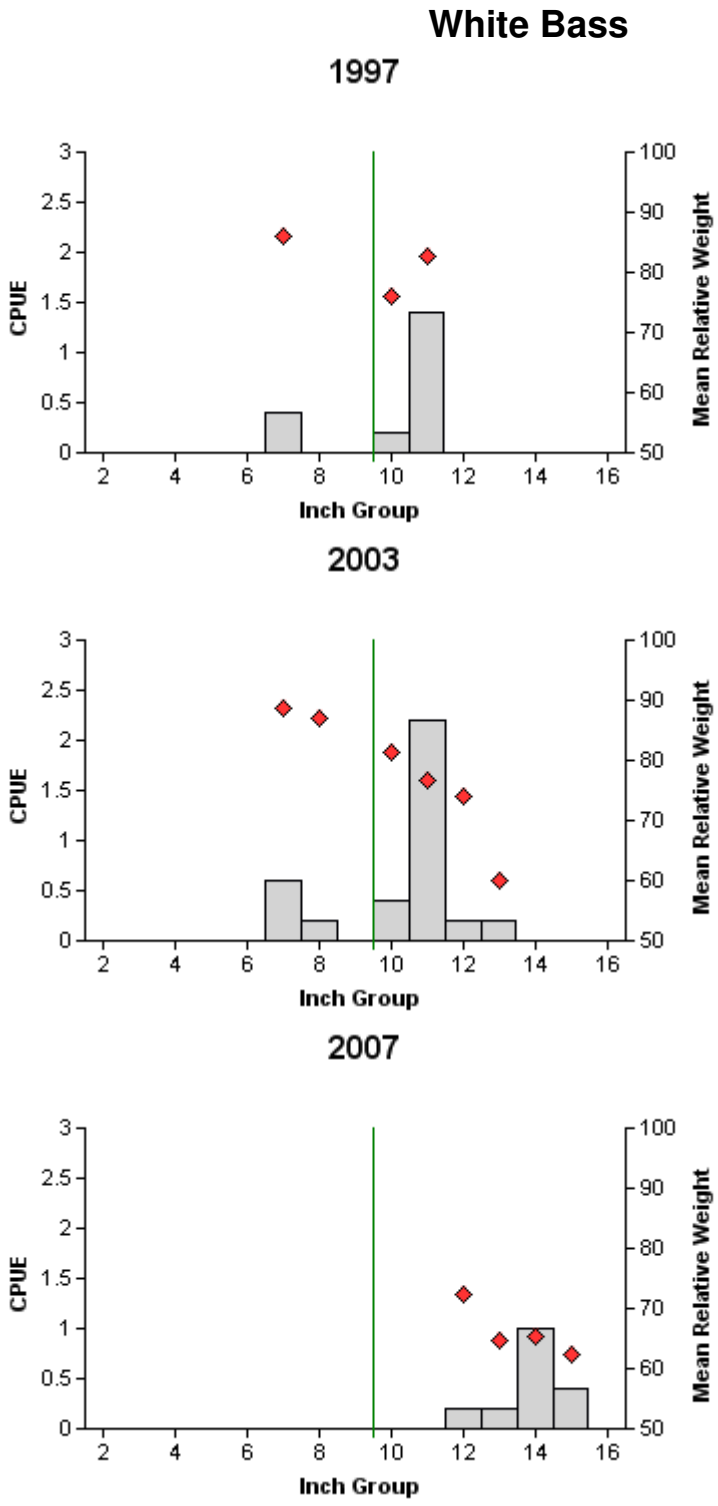


Figure 5. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Moss Reservoir, Texas, 1997, 2003, and 2007. Vertical lines represent length limit at time of collection.

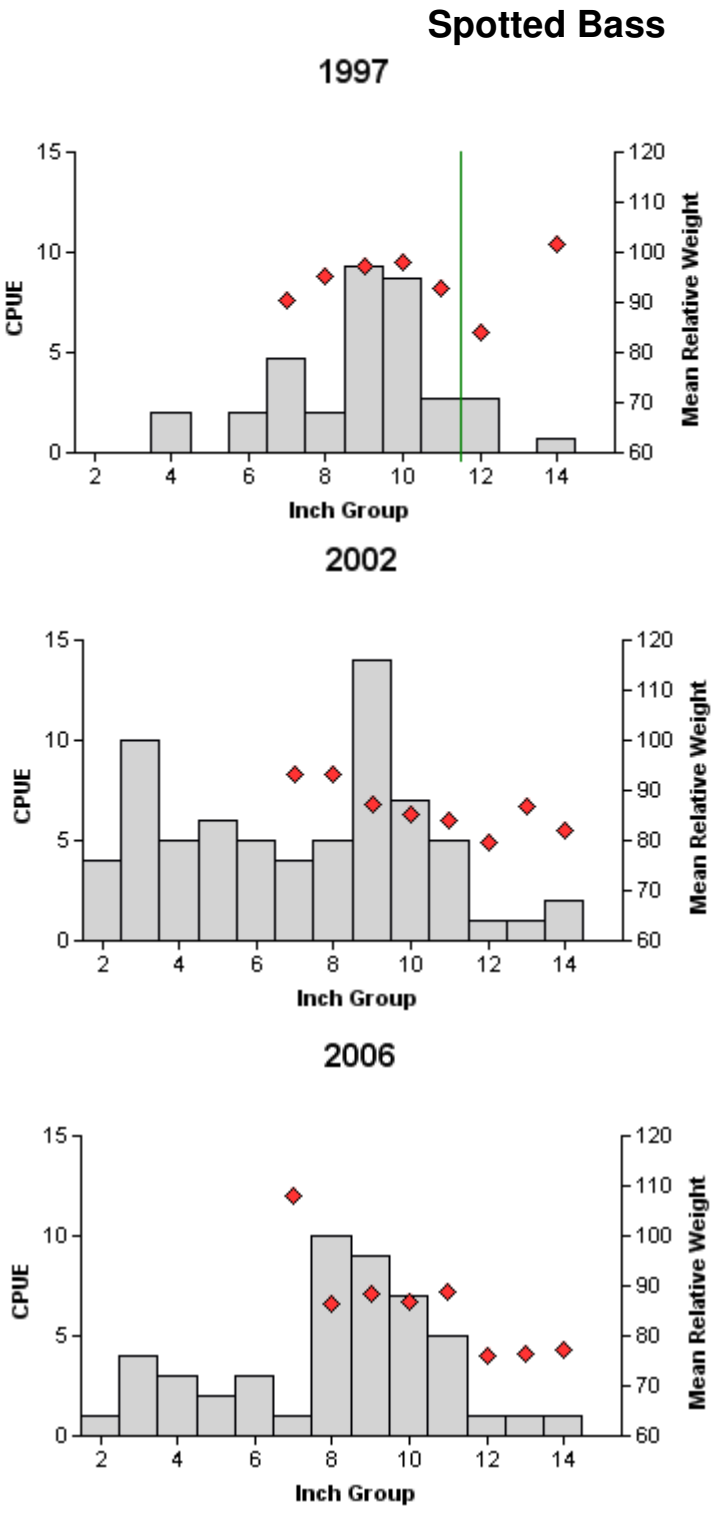


Figure 6. Number of spotted bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 1997, 2002, and 2006.

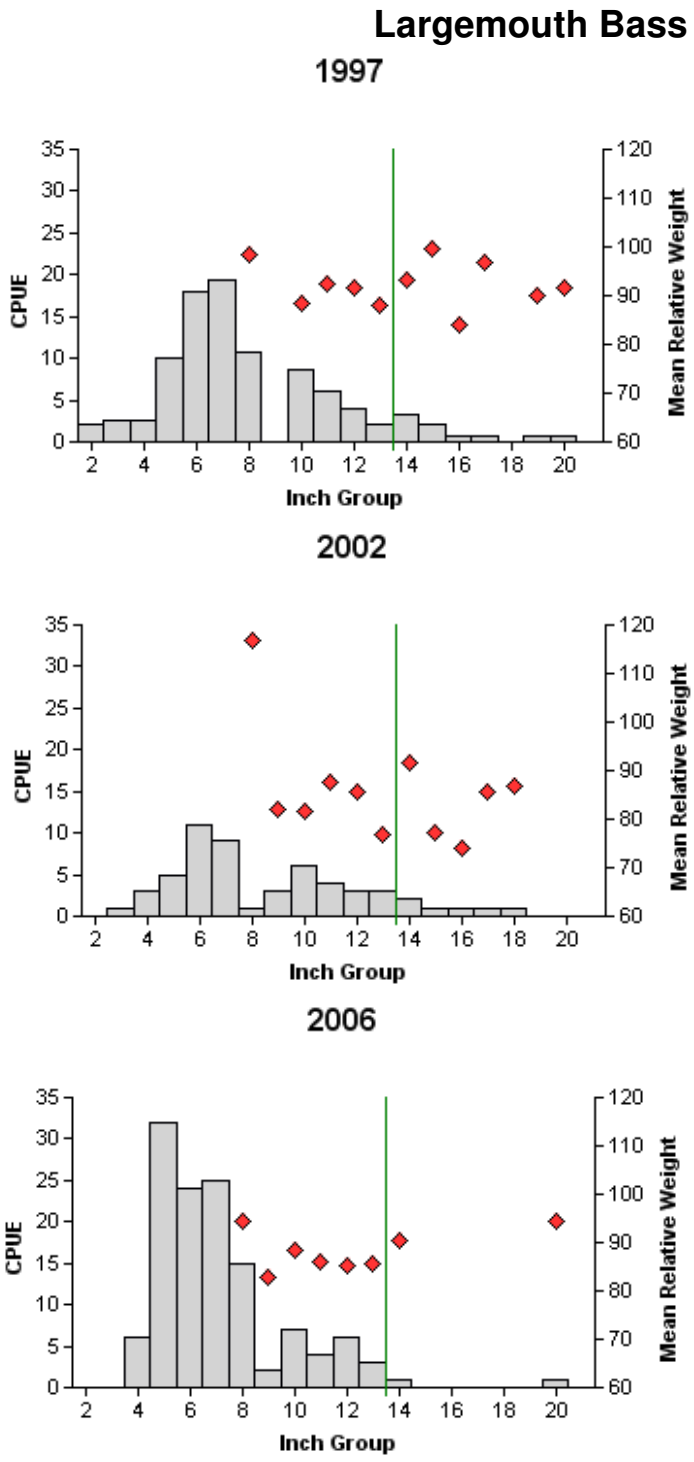


Figure 7. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Moss Reservoir, Texas, 1997, 2002, and 2006. Vertical lines represent length limit at time of collection.

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Moss Reservoir, Texas, 1989, 2002, and 2006. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Hybrids = cross between a FLMB and a NLMB.

		Genotype				
Year	Sample size	FLMB	Hybrids	NLMB	% FLMB alleles	% pure FLMB
1989	33	1	31	1	51.5	3.0
2002	26	0	19	7	34.9	0.0
2006	30	1	28	1	46.0	3.0

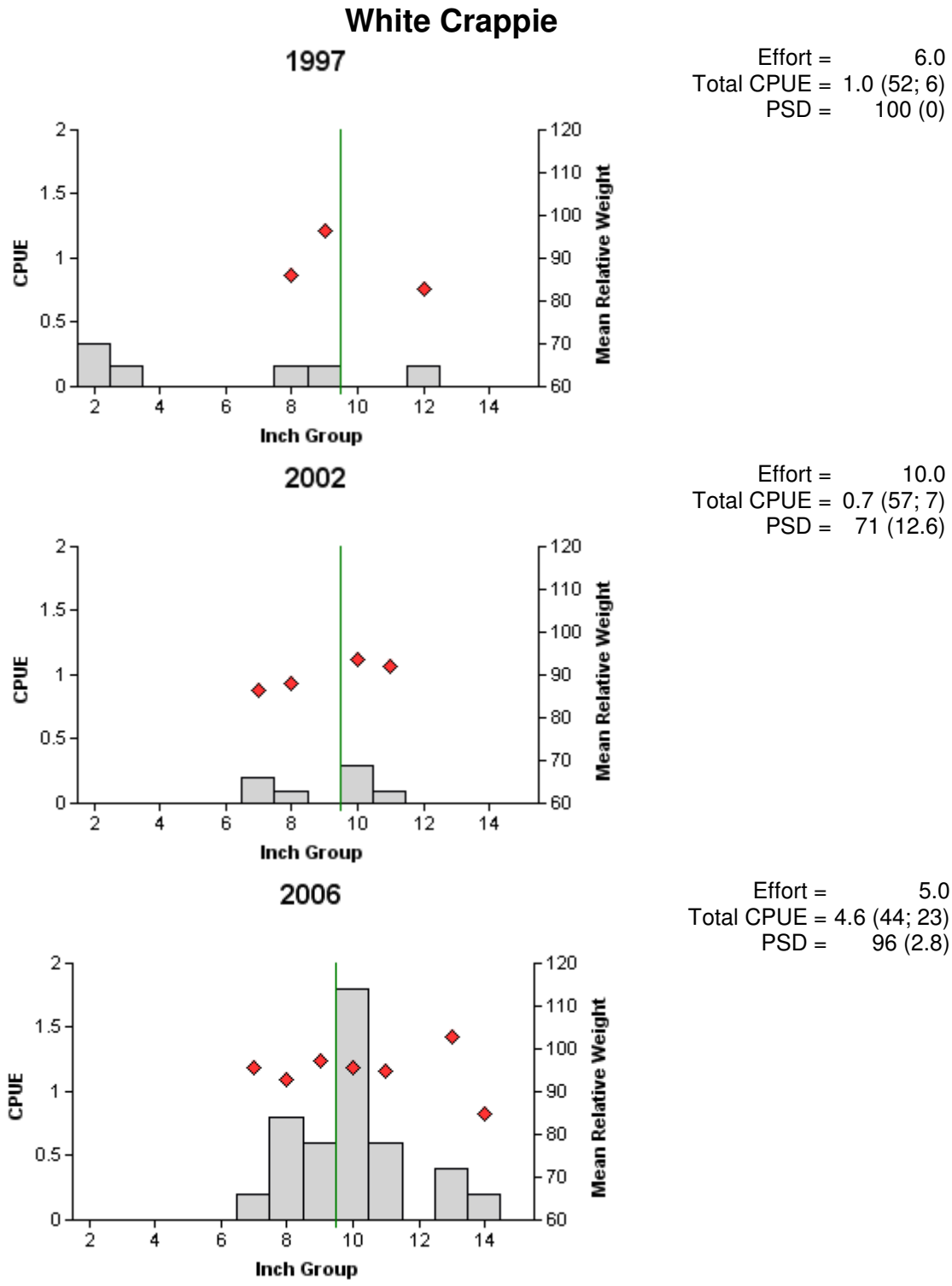


Figure 8. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Moss Reservoir, Texas, 1997, 2002, and 2006. Vertical lines represent length limit at time of collection.

Table 6. Proposed sampling schedule for Moss Reservoir, Texas. Electrofishing and trap netting surveys are conducted in the fall, while gill netting surveys are conducted during the following spring. Standard survey denoted by S.

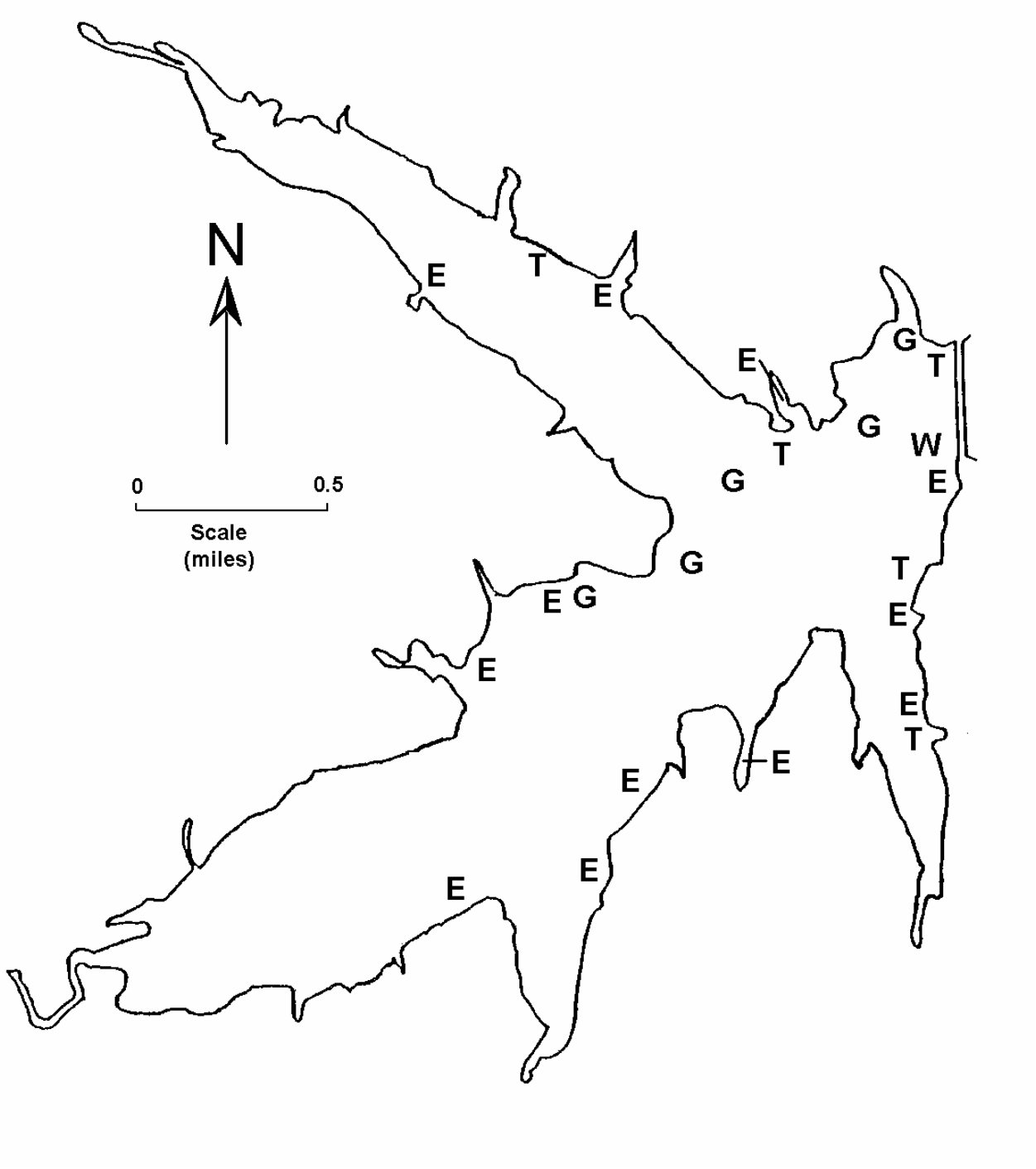
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Report
Fall 2007-Spring2008					
Fall 2008-Spring 2009					
Fall 2009-Spring2010					
Fall 2010-Spring 2011	S	S	S		S

APPENDIX A

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

	Gill Netting		Trap Netting		Electrofishing	
Species	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					28	28.0
Threadfin shad					173	173.0
Channel catfish	7	1.4				
White bass	9	1.8				
Green sunfish					6	6.0
Warmouth					10	10.0
Bluegill					187	187.0
Longear sunfish					31	31.0
Redear sunfish					18	18.0
Smallmouth bass					2	2.0
Spotted bass					48	48.0
Largemouth bass					126	126.0
White crappie			23	4.6		

APPENDIX B



Location of sampling sites, Moss Reservoir, Texas, 2006-2007. Trap netting, gill netting, electrofishing, and water sampling stations are indicated by T, G, E, and W, respectively. Water level was three feet below conservation for trap netting and electrofishing and 0.25 feet above during gill netting.

APPENDIX C

Water sample parameters for Moss Reservoir, Texas, July 18, 2006. Sample station located at dam site.

Depth (m)	Temp. (C°)	D.O. (ppm)	Chlorides (ppm)	Conductivity (µmhos/cm)	Alkalinity (ppm)	Total dissolved solids(ppm)	pH
Surface	31.5	6.8	7	265.0	88	172.3	7.6
1.0	31.3	7.0					
2.0	31.1	6.6					
3.0	29.9	7.5					
4.0	29.2	6.8					
5.0	28.8	5.9					
6.0	28.2	4.3	6	273.6	93	177.8	7.5
7.0	27.3	1.0					
8.0	26.0	0.0	6	279.7	97	181.8	7.3
9.0	23.2	0.0					
10.0	19.9	0.0					
11.0	19.4	0.0					
12.0	18.6	0.0					
13.0	17.8	0.0					
14.0	17.5	0.0	2	285.0	105	185.3	7.2

APPENDIX D

Catch rates (CPUE) of targeted species by gear type for Moss Reservoir, Texas, 1990, 1994, 1997, 2002, 2003, 2006, and 2007.

		Year						
Gear	Species	1990 [a]	1994 [a]	1997 [b]	2002 [b]	2003 [b]	2006 [b]	2007 [b]
Gill Net (fish/net night)	Channel catfish	11.0	6.6	3.8		4.6		1.4
	White bass	1.8	3.6	2.0		3.8		1.8
Electrofisher (fish/hour)	Gizzard shad	43.0	20.0	36.0	8.0		28.0	
	Threadfin shad	273.0	32.0	0.6	7.0		173.0	
	Green sunfish	81.0	32.0	19.3	18.0		6.0	
	Warmouth	18.0	24.7	7.3	23.0		10.0	
	Bluegill	289.0	304.7	187.3	262.0		187.0	
	Longear sunfish	94.0	28.0	18.7	53.0		31.0	
	Redear sunfish	28.0	29.3	19.3	18.0		18.0	
	Smallmouth bass	5.0	0.0	0.0	0.0		2.0	
	Spotted bass	73.0	40.7	34.7	69.0		48.0	
	Largemouth bass	117.0	108.7	94.0	55.0		126.0	
Trap Net (fish/net night)	White crappie	0.8	1.8	0.4	0.5		4.6	

[a] All sampling stations for all gear were subjectively selected.
[b] All sampling stations for all gear were randomly selected.