

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-29

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2004 Survey Report

**Brownwood Reservoir**

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## EXECUTIVE SUMMARY

Brownwood Reservoir was surveyed in fall of 2004 using electrofishing and trap nets and in spring of 2005 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:** Brownwood Reservoir is a 7,300-acre impoundment located on Pecan Bayou in the Colorado River Basin approximately 70 miles southeast of Abilene. It was constructed in 1933 as a municipal water supply and is controlled by the Brown County Water Control and Irrigation District No. 1. Soil types are sandy or clay-loam soil. Watershed land use is primarily agriculture, residential, and ranching. The reservoir was at or near spillway level at time of sampling. Water level has been within two feet of spillway elevation since 2002.
- **Prey species:** Electrofishing catch rates of bluegill and sub-stock gizzard shad were 342.0/h and 26.0/h, respectively. Index of vulnerability (IOV) for gizzard shad was poor, indicating that only 38% of gizzard shad were available to existing predators; this was lower than IOV estimates in previous years. Total CPUE of gizzard shad was considerably lower in 2004 (99.0) compared to the 2002 (230.2) survey but similar to the 2000 (99.0) survey. Total CPUE of bluegill in 2004 (342.0) was higher than total CPUE from surveys in 2002 (186.5) and 2000 (196.0), and size structure continued to be dominated by small individuals.
- **Channel catfish:** The gill net catch rate of channel catfish was 2.4/NN in 2005. The channel catfish population continued to have low relative abundance with an apparent increase in the number of smaller fish in 2005 compared to the 2001 and 1997 surveys.
- **White bass:** The gill net catch rate of white bass was 0.8/NN in 2005, indicating that white bass were present in the reservoir, but in low abundance.
- **Palmetto bass:** The gill net catch rate of palmetto bass was 0.8/NN in 2005, down from 2.2/NN in 2001 and 3.3/NN in 1997. No fish from the 2002 stocking were collected in 2005. Size structure in 2001 and 2005 was similar; fish ranged in length from 18-24 inches in 2001 and from 19-23 inches in 2005.
- **Largemouth bass:** The electrofishing catch rate of stock length largemouth bass was 106.0/h in 2004, compared to 62.0/h in 2002. Size structure was not adequate as PSD and RSD-P varied from 30 to 36 and 3 to 12, respectively, since 2000. Age structure in 2004 was similar to the district average as nearly 75% of the 8.0-11.9 inch fish were age 1 or age 0 and over 50% of the 12.0 to 14.9 inch fish were age 2 or less. Age structure of largemouth bass in 2004 showed some improvement since 2000. Body condition in 2004 was poor (relative weight under 90) for nearly all size classes of fish and was similar to body condition observed in previous surveys. Florida largemouth bass influence has remained relatively constant as Florida alleles ranged from 34 to 46% and Florida genotype ranged from 3 to 13% since 1997.
- **White crappie:** The trap net catch rate of white crappie was 10.4/NN in 2004, higher than in 2000 (5.0/NN) and similar to 1997 (14.0/NN). The PSD was 51 and RSD-P was 22, similar to stock indices from the 2000 survey, while PSD continued to be less than the 66 observed in 1997. Mean relative weight was over 90 for all size classes in 2004 and was similar to values observed in 2000 but generally less than those observed in 1997. Growth of white crappie was adequate; mean age of 9.0 to 10.9 in white crappie was 2.3 in 2005, compared to 2.5 in 2000 and 1.7 in 1997.
- **Management Strategies:** Stock blue catfish to improve poor catfish fishery. Discontinue stocking of palmetto bass because of minimal directed fishing effort and declining abundance of palmetto bass. Evaluate stratified random sampling design for trap net surveys. Conduct trap net survey in 2005, electrofishing survey in 2006, and general monitoring with trap nets, gill nets, and electrofishing surveys in 2008-2009.

## INTRODUCTION

This document is a summary of fisheries data collected from Brownwood Reservoir in 2004-2005. 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 is presented with the 2004-2005 data for comparison.

### STATUS OF MANAGEMENT ACTIONS FROM 2000 SURVEY REPORT (Jons and Dumont 2001)

1. Stock palmetto bass at 5 fish/acre biennially.  
**Action:** Palmetto bass were stocked in 2002. No palmetto bass were stocked between 1997 and 2001 because of reduced hatchery production. Palmetto bass were not requested for 2004 or 2005.

### Harvest regulations for Brownwood Reservoir.

Species	Bag Limit	Minimum-Maximum Length
Catfish, Channel	25	12 in - No Limit
Catfish, Flathead	5	18 in - No Limit
Bass, White	25	10 in - No Limit
Bass, Palmetto	5	18 in - No Limit
Bass, Largemouth	5	14 in - No Limit
Crappie, White and Black	25	10 in - No Limit

## METHODS

- Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill nets (10 net nights at 10 stations), and trap nets (20 net nights at 20 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 per net night (fish/NN). All survey sites were randomly selected and surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004). Electrofishing sampling effort was determined by attaining a relative standard error from CPUE of stock-length largemouth bass of less than 25 and by collecting at least 100 stock-length largemouth bass.
- Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [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). Nonparametric 80% confidence intervals were determined for CPUE estimates with resampling simulations (1,000 resamples with replacement; percentile method) using Resampling Stats in Excel, Version 2. For structural indices and IOV, 80% confidence intervals were determined using formulas from Gustafson (1988).
- Ages were determined using otoliths.
- A habitat survey was last conducted in 1997 (Jons and Dumont 1998).

## LITERATURE CITED

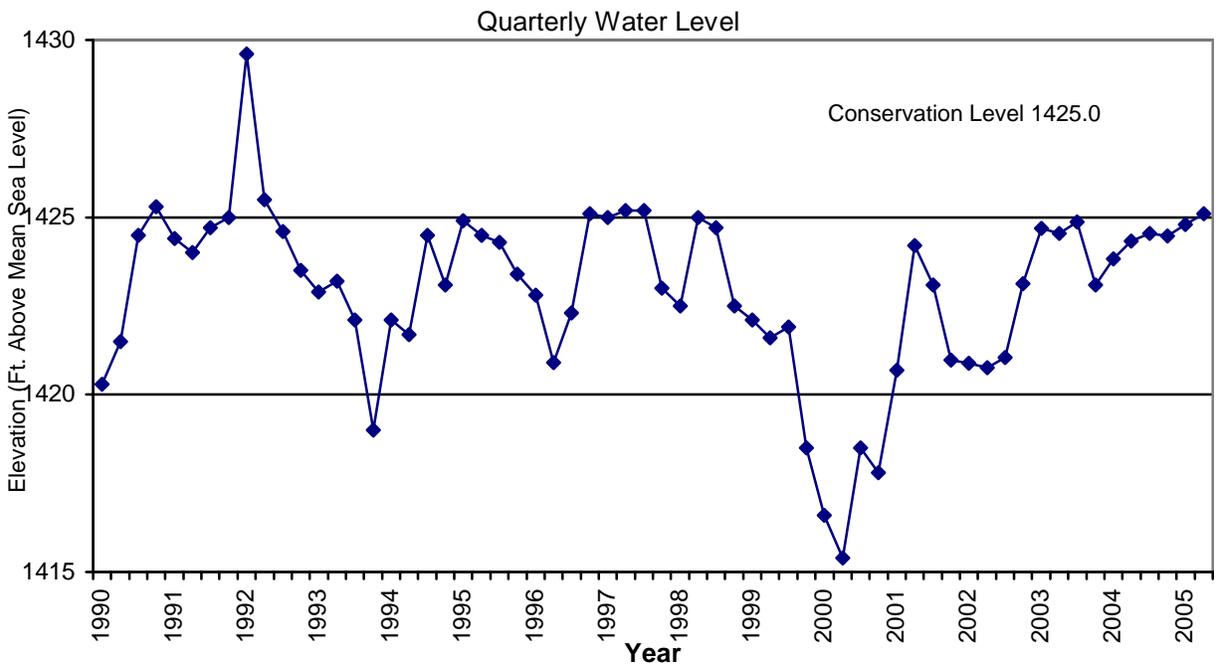
- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- Gustafson, K.A. 1988. Approximating confidence intervals for indices of fish population size structure. North American Journal of Fisheries Management 8:139-141.
- Jons, G. and S. Dumont. 1998. Statewide freshwater fisheries monitoring and management program survey report for Brownwood Reservoir, 1997. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- Jons, G., and S. Dumont. 2001. Statewide freshwater fisheries monitoring and management program survey report for Brownwood Reservoir, 2000. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Physical and historical data for Brownwood Reservoir, Texas, 2004-2005.

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Inland Fisheries water body code: 0114                      IF District: 1-B – Abilene  
 Controlling authority: Brown County Water Control & Irrigation District No. 1  
 Water Uses: Municipal water supply, recreation    Acres: 7,300  
 Counties: Brown    Location: 70 miles southeast of Abilene  
 Latitude: 31° 50'    Longitude: 99° 00'  
 Nearest major metropolitan area and distance: Abilene- 70 miles  
 Reservoir description: Tributary                              River: Pecan Bayou in the Colorado River Basin  
 Mean depth (ft): 22    Maximum depth (ft): 95  
 Shoreline development ratio: 4.1  
 Secchi disc range (ft): 2-4    Conductivity (umhos/cm): 450  
 Constructed: 1933  
 Access: Boat                              Adequate – 3 public ramps, several private ramps  
           Bank                              Adequate  
           Handicap                          Adequate—fishing pier at Brownwood State Park

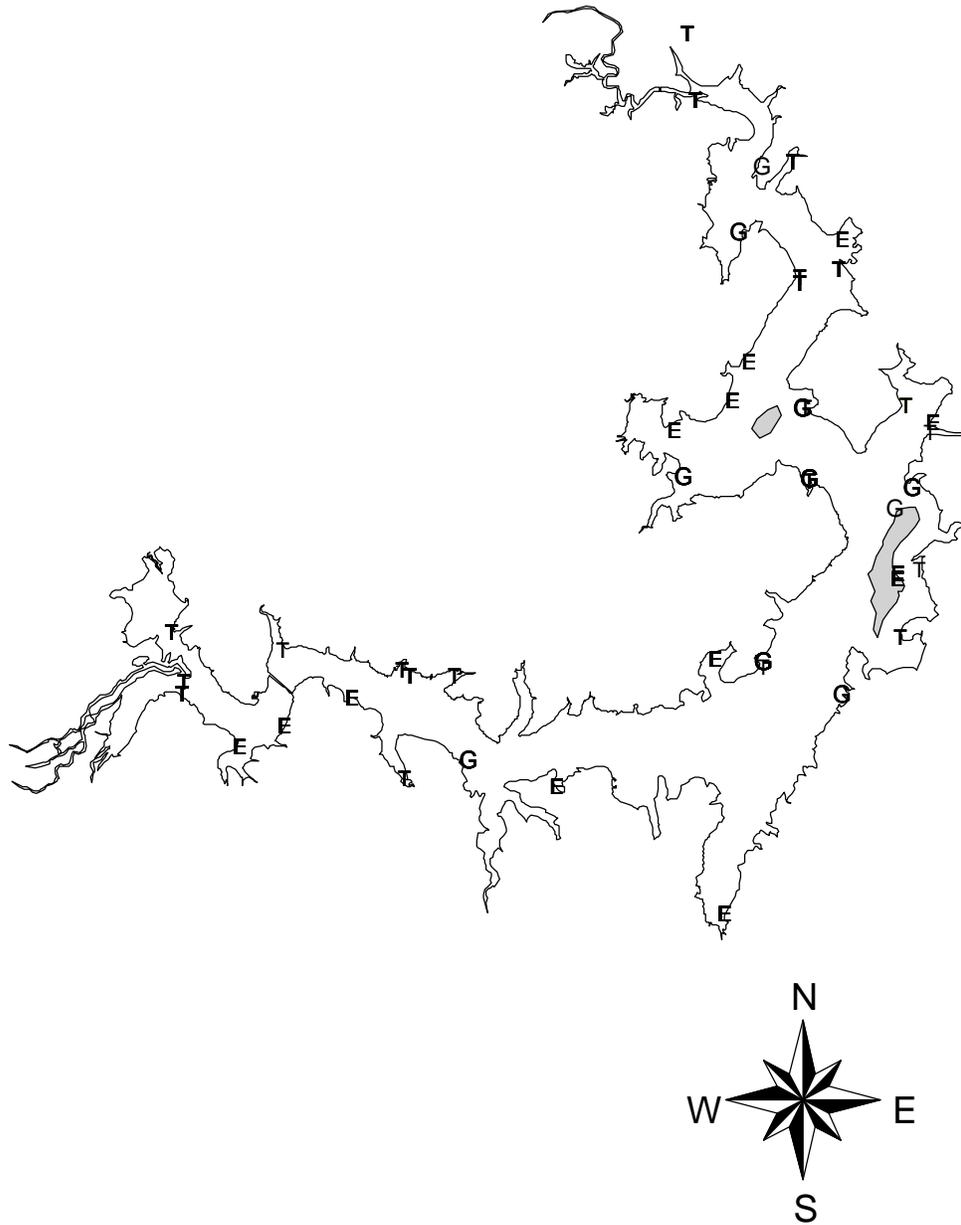
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Quarterly water level elevations in feet above mean sea level (MSL) recorded for Brownwood Reservoir, Texas.

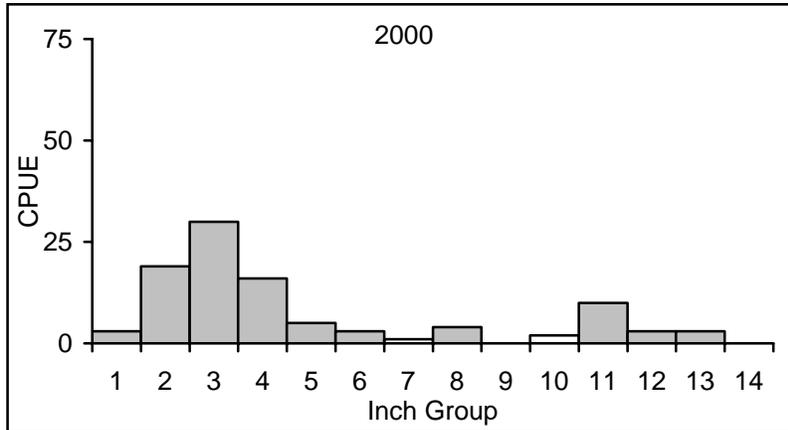
Stocking history of Brownwood Reservoir, Texas. Size Categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

Year	Number	Size	Year	Number	Size
	<u>Threadfin shad</u>			<u>Florida largemouth bass</u>	
1984	1,000	ADL	1975	200,000	FGL
			1976	356,000	FGL
	<u>Blue catfish</u>		1977	367,545	FGL
1988	17	ADL	1978	218,975	FGL
			1996	<u>177,163</u>	FGL
	<u>Channel catfish</u>		Species Total	1,320,163	
1972	72,000	FGL			
1980	<u>150</u>	ADL		<u>Walleye</u>	
Species Total	72,150		1976	75,000	FGL
			1977	1,500,000	FRY
	<u>Palmetto bass</u>		1978	<u>1,550,000</u>	FRY
1980	73,850	FGL	Species Total	3,125,000	
1983	75,600	FGL			
1986	96,464	FGL		<u>Green X Redear Sunfish</u>	
1987	145,101	FGL	1971	5,000	FGL
1988	148,325	FGL	1972	22,000	FGL
1989	154,470	FGL	1978	7,000	FGL
1991	39,600	FGL	1980	<u>150</u>	ADL
1992	40,500	FGL	Species Total	34,650	
1994	45,006	FGL			
1995	89,970	FGL			
1996	36,869	FGL			
2002	<u>36,680</u>	FGL			
	1,031,572				
	<u>Smallmouth bass</u>				
1980	72,950	FGL			
1982	<u>70,000</u>	FGL			
Species Total	142,950				
	<u>Largemouth bass</u>				
1969	10,000	FGL			
1970	500,000	FGL			
1994	169	ADL			
1995	86	ADL			
1996	<u>50</u>	ADL			
Species Total	510,305				

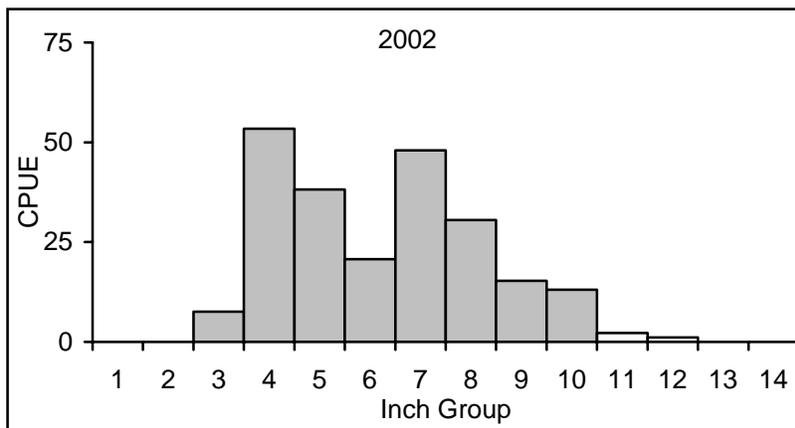


Location of sampling sites, Brownwood Reservoir, Texas, 2004-2005. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.

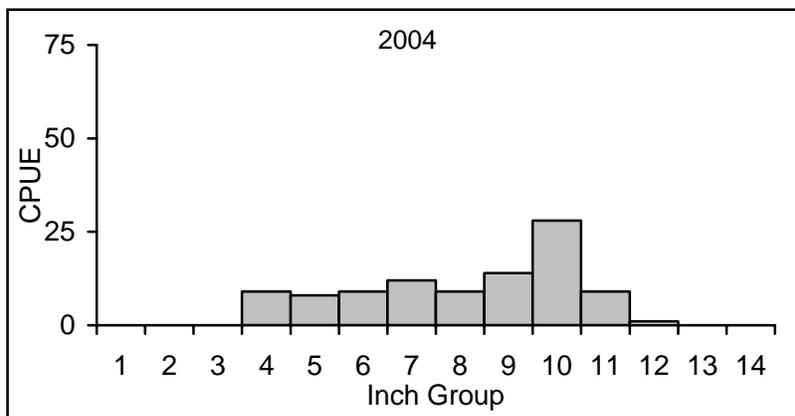
## Gizzard Shad



Effort = 1.0  
 Total CPUE = 99.0(81-118)  
 Stock CPUE = 23.0(17-30)  
 PSD = 70(54-86)  
 IOV = 78(72-84)



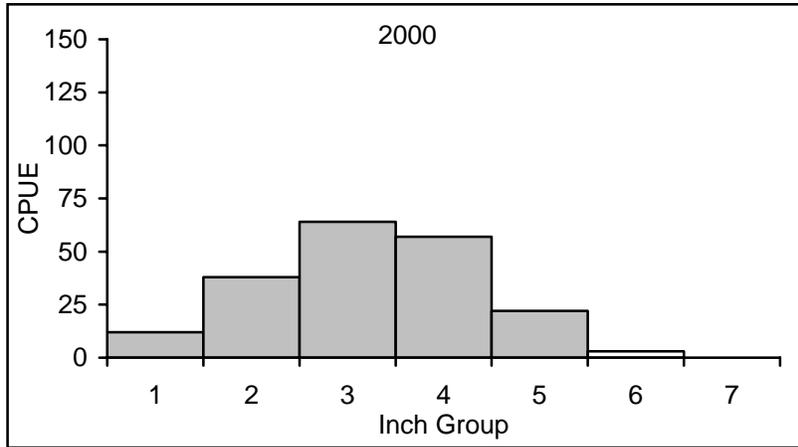
Effort = 0.9  
 Total CPUE = 230.2(157-309)  
 Stock CPUE = 109.8(59-159)  
 PSD = 3(na)  
 IOV = 73(69-77)



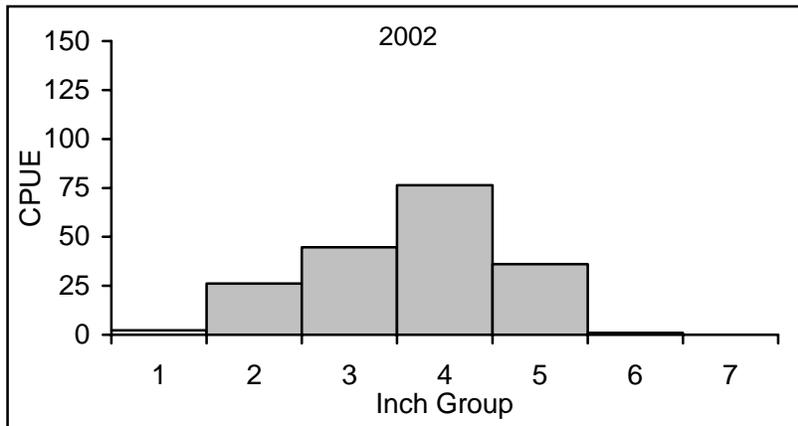
Effort = 1.0  
 Total CPUE = 99.0 (73-124)  
 Stock CPUE = 73.0 (50-99)  
 PSD = 14 (8-20)  
 IOV = 38 (31-45)

Comparison of the number of gizzard shad caught per hour (CPUE) and population indices (80% C.I. in parentheses, na=sample size too small) for fall electrofishing surveys, Brownwood Reservoir, Texas, 2000, 2002, and 2004.

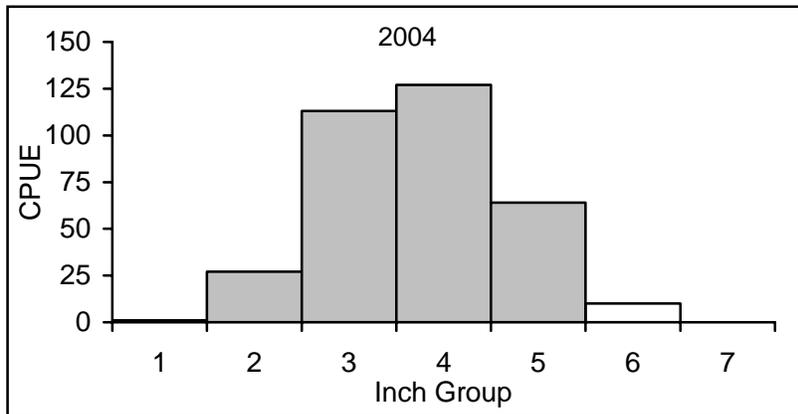
## Bluegill



Effort = 1.0  
 Total CPUE = 196.0(150-248)  
 Stock CPUE = 146.0(108-184)  
 PSD = 2(na)  
 RSD-P = 0



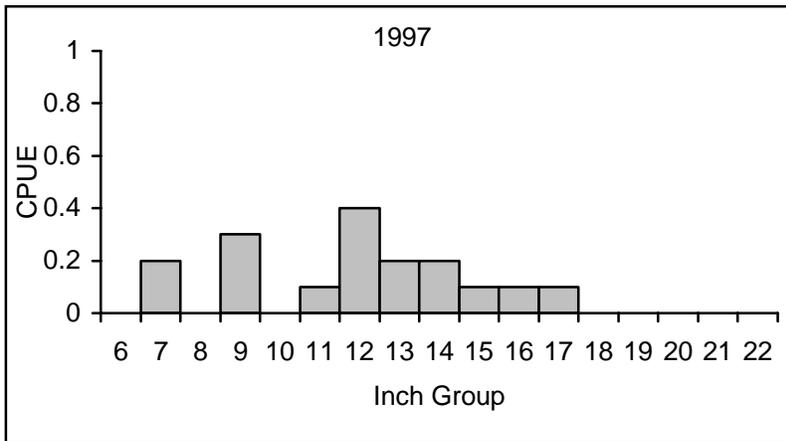
Effort = 0.9  
 Total CPUE = 186.5(141-230)  
 Stock CPUE = 158.1(123-200)  
 PSD = 1(na)  
 RSD-P = 0



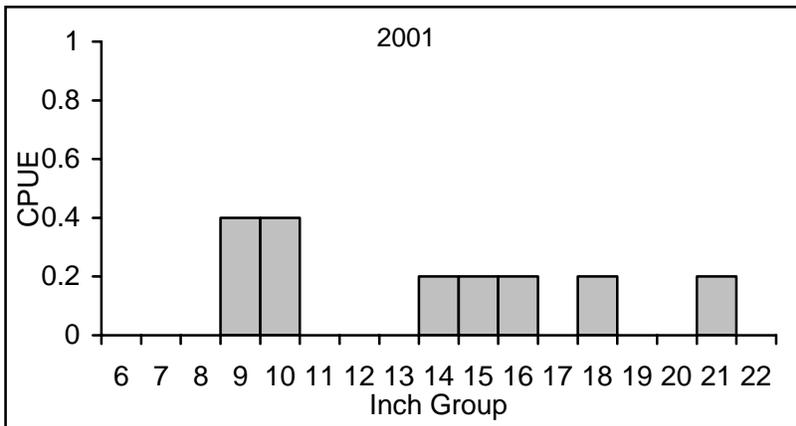
Effort = 1.0  
 Total CPUE = 342.0 (278-412)  
 Stock CPUE = 314.0 (249-380)  
 PSD = 3 (2-5)  
 RSD-P = 0

Comparison of the number of bluegill caught per hour (CPUE) and population indices (80% C.I. in parentheses, na=sample size too small) for fall electrofishing surveys, Brownwood Reservoir, Texas, 2000, 2002, and 2004.

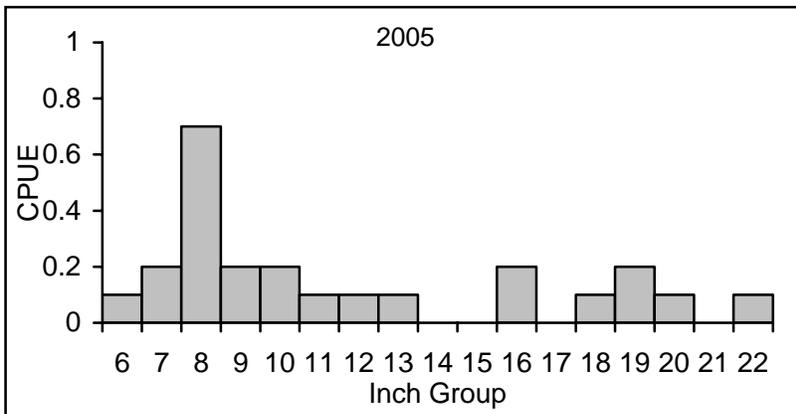
## Channel Catfish



Effort = 10  
 Total CPUE = 1.7(1.2-2.2)  
 Stock CPUE = 1.2(0.9-1.5)  
 PSD = 17(na)  
 RSD-P = 0



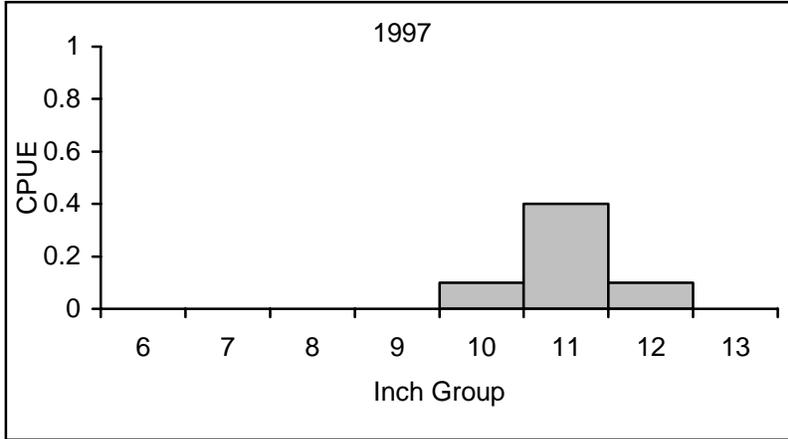
Effort = 5  
 Total CPUE = 1.8(1.4-2.2)  
 Stock CPUE = 1.0(0.4-1.6)  
 PSD = 60(na)  
 RSD-P = 0



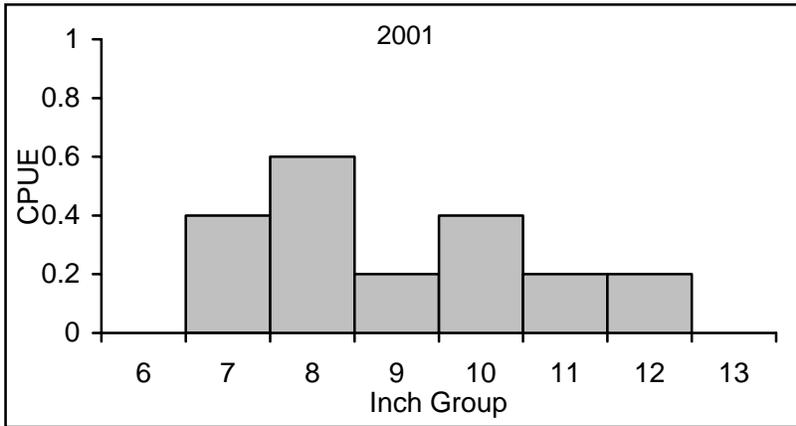
Effort = 10  
 Total CPUE = 2.4(1.2-3.7)  
 Stock CPUE = 1.0(0.6-1.4)  
 PSD = 70(na)  
 RSD-P = 0

Comparison of the number of channel catfish caught per net night (CPUE) and population indices (80% C.I. in parentheses, na=sample size too small) for spring gill net surveys, Brownwood Reservoir, Texas, 1997, 2001, and 2005.

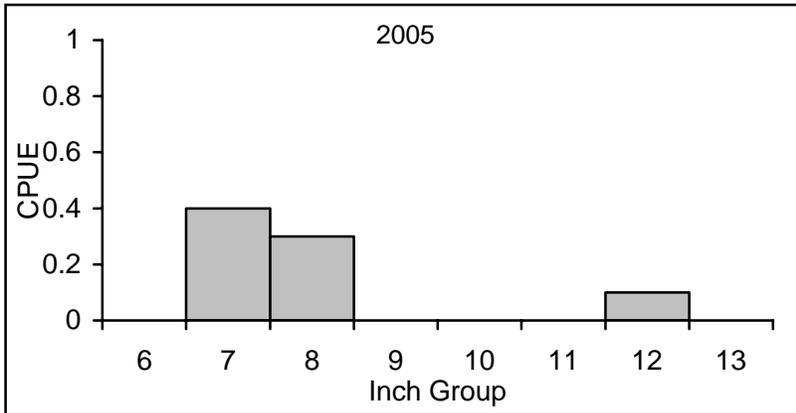
### White Bass



Effort = 10  
 Total CPUE = 0.6(0.0-1.2)  
 Stock CPUE = 0.6(0.0-1.2)  
 PSD = 100  
 RSD-L = 100  
 RSD-P = 0



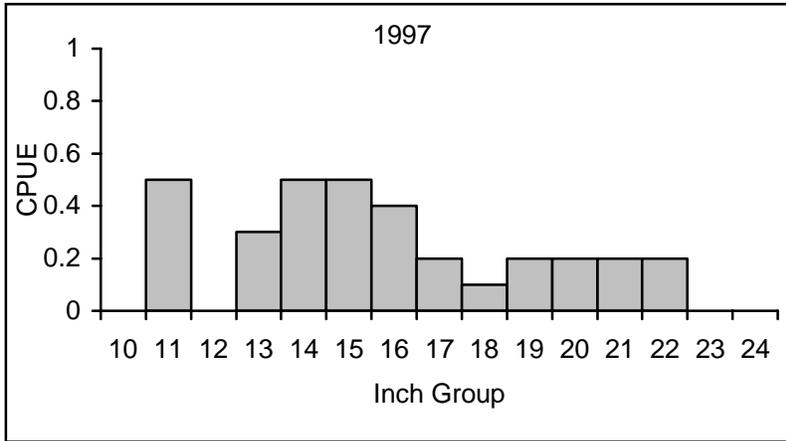
Effort = 5  
 Total CPUE = 2.0(1.4-2.6)  
 Stock CPUE = 2.0(1.4-2.6)  
 PSD = 50(20-80)  
 RSD-L = 40(na)  
 RSD-P = 10(na)



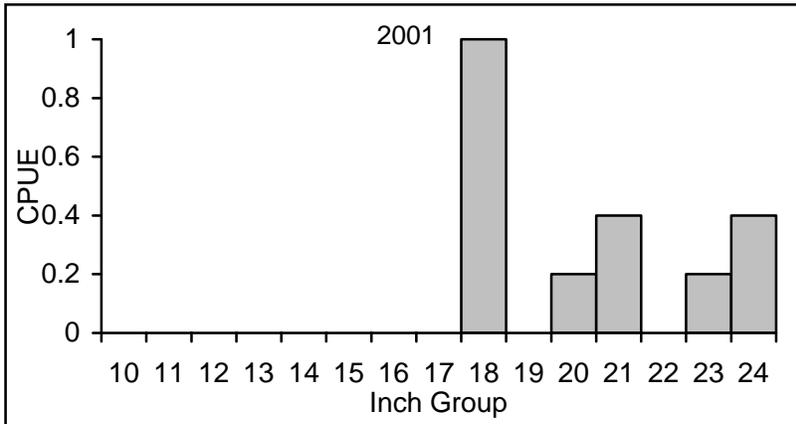
Effort = 10  
 Total CPUE = 0.8(0.3-1.3)  
 Stock CPUE = 0.8(0.3-1.3)  
 PSD = 12(na)  
 RSD-L = 12(na)  
 RSD-P = 12(na)

Comparison of the number of white bass caught per net night (CPUE) and population indices (80% C.I. in parentheses, na=sample size too small) for spring gill net surveys, Brownwood Reservoir, Texas, 1997, 2001, and 2005.

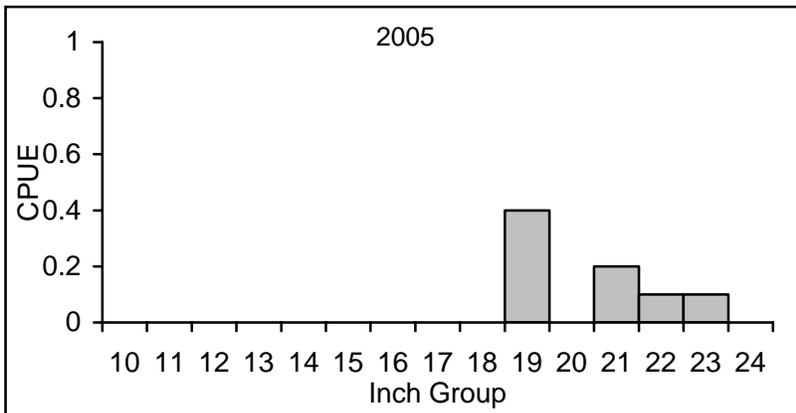
### Palmetto bass



Effort = 10  
 Total CPUE = 3.3(1.5-5.4)  
 Stock CPUE = 3.3(1.5-5.4)  
 PSD = 100  
 RSD-P = 48(34-62)  
 RSD-L = 27(15-39)



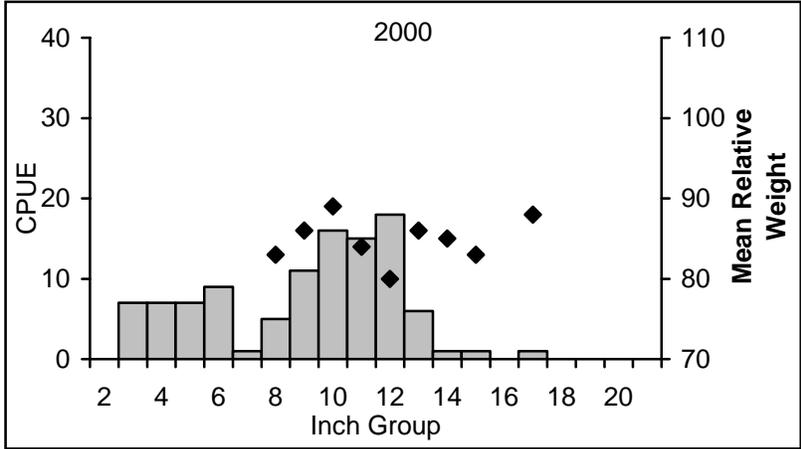
Effort = 5  
 Total CPUE = 2.2(1.4-3.0)  
 Stock CPUE = 2.2(1.4-3.0)  
 PSD = 100  
 RSD-P = 100  
 RSD-L = 100



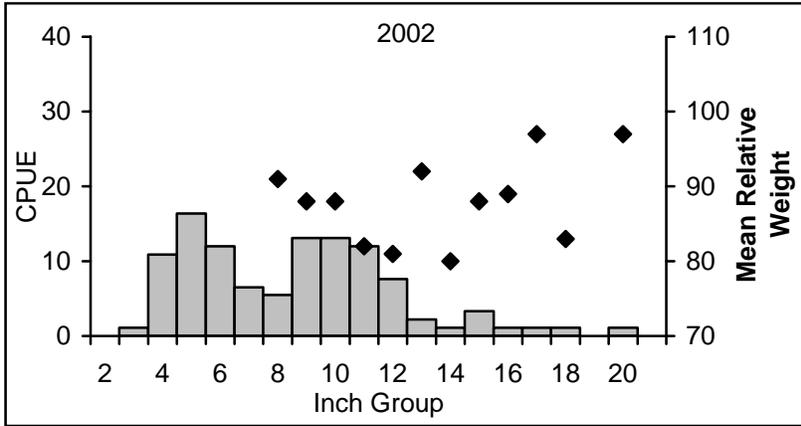
Effort = 10  
 Total CPUE = 0.8(0.3-1.3)  
 Stock CPUE = 0.8(0.3-1.3)  
 PSD = 100  
 RSD-P = 100  
 RSD-L = 100

Comparison of the number of palmetto bass caught per net night (CPUE) and population indices (80% C.I. in parentheses) for spring gill net surveys, Brownwood Reservoir, Texas, 1997, 2001, and 2005.

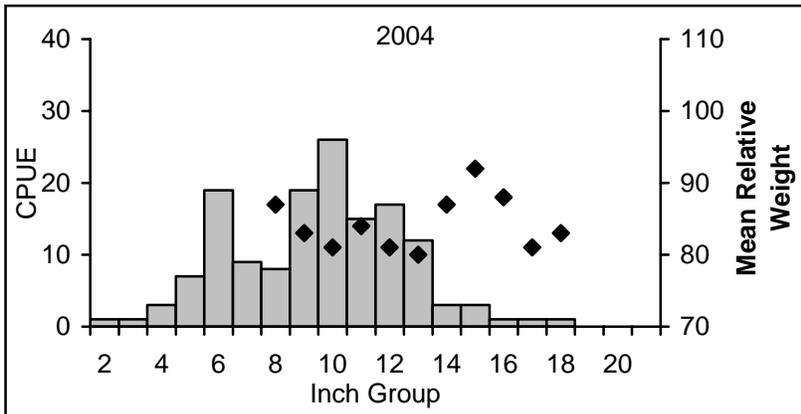
## Largemouth Bass



Effort = 1.0  
 Total CPUE = 105.0  
 (83-129)  
 Stock CPUE = 74.0  
 (57-93)  
 PSD = 36(28-44)  
 RSD-14 = 4(na)  
 RSD-P = 3(na)  
 % Florida alleles = 46  
 % Florida genotype = 3



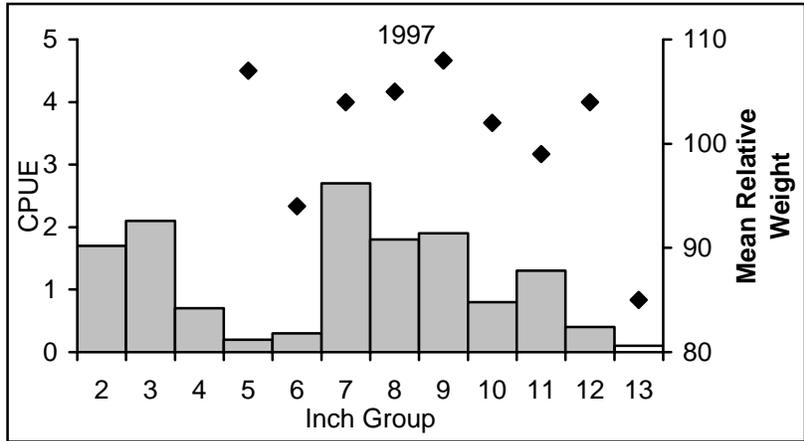
Effort = 0.9  
 Total CPUE = 109.1  
 (84-135)  
 Stock CPUE = 62.0  
 (44-80)  
 PSD = 30(21-39)  
 RSD-14 = 14(7-21)  
 RSD-P = 12(5-19)  
 % Florida alleles = 44  
 % Florida genotype = 13



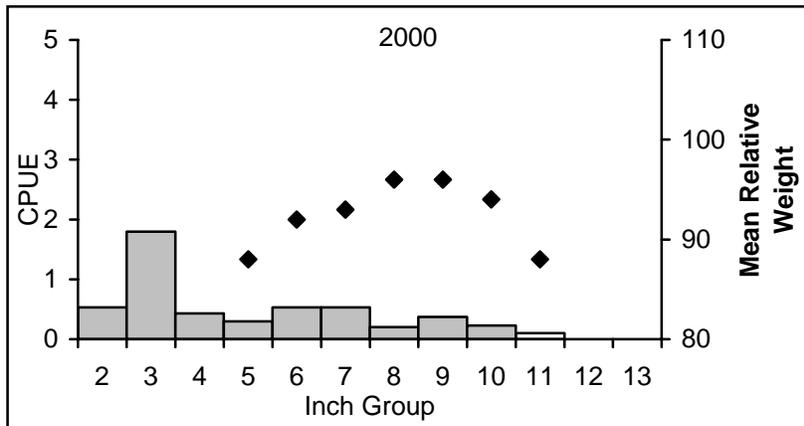
Effort = 1.0  
 Total CPUE = 146.0  
 (119-171)  
 Stock CPUE = 106.0  
 (88-121)  
 PSD = 36 (29-43)  
 RSD-14 = 9 (5-13)  
 RSD-P = 6 (2-10)  
 % Florida alleles = 34  
 % Florida genotype = 5  
 Mean Age at 14 in = 2.5 (N=12)

Comparison of the number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (80% C.I. in parentheses, na=sample size too small) for fall electrofishing surveys, Brownwood Reservoir, Texas, 2000, 2002, and 2004.

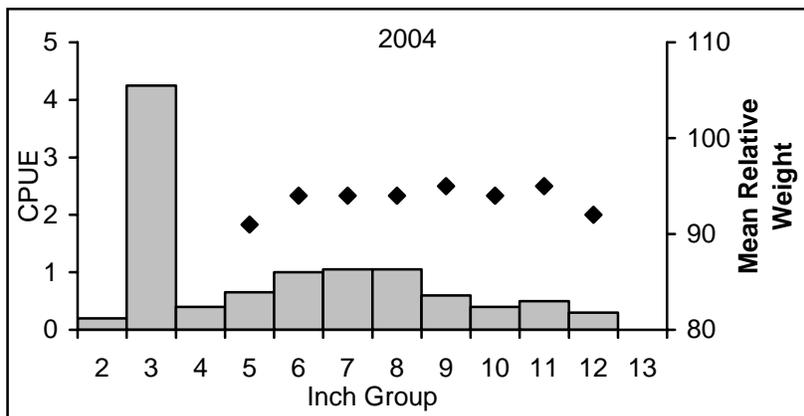
### White Crappie



Effort = 10  
 Total CPUE = 14.0(8.3-19.6)  
 Stock CPUE = 9.5(6-13)  
 PSD = 66(59-73)  
 RSD-P = 27(20-34)



Effort = 30  
 Total CPUE = 5.0(3.3-6.8)  
 Stock CPUE = 2.3(1.6-2.9)  
 PSD = 40(31-49)  
 RSD-P = 15(8-22)



Effort = 20  
 Total CPUE = 10.4 (7.4-13.4)  
 Stock CPUE = 5.5 (3.7-7.5)  
 PSD = 51 (44-58)  
 RSD-P = 22 (16-28)

Comparison of the number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (80% C.I. in parentheses) for fall trap net surveys, Brownwood Reservoir, Texas, 1997, 2000, and 2004.

## White Crappie

Age distribution and mean age of 9.0 to 10.9 in white crappie (sexes combined) collected in fall trap net surveys, Brownwood Reservoir, Texas, 1997, 2000, and 2004. Number aged in parentheses.

Year	Mean Age	Age		
		1	2	3
1997	1.7	42%(5)	42%(5)	16%(2)
2000	2.5	7%(1)	33%(5)	60%(9)
2004	2.3	0%(0)	67%(12)	33%(6)

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

Prepared – July 2005.

**ISSUE 1:** The catfish fishery has historically been poor because of low abundance of channel catfish and flathead catfish populations. Anglers have expressed interest in improving catfish fishery.

### MANAGEMENT STRATEGIES

1. Stock blue catfish (50/acre) in 2005 and 2006. Introduction of blue catfish may improve catfish fishery as they tend to perform better in West Texas reservoirs relative to channel catfish. We do not foresee any significant negative impacts on existing catfish populations.

**ISSUE 2:** Palmetto bass have been a part of the fishery at Lake Brownwood since the early 80s. However, there was a 5-year period from 1997 to 2001 where no hybrids were stocked for various reasons. With increased difficulties of raising enough palmetto bass to meet statewide needs coupled with the generally low directed effort for palmetto bass at Brownwood Reservoir in the mid 90s (% time sought was less than 4% in four of six years from 1990 to 1996 and hours/acre ranged from 0.02 to 0.85) when the palmetto bass population was at its peak, we believe that stocking palmetto bass could be discontinued with relatively minor opposition from anglers.

### MANAGEMENT STRATEGIES

1. Discontinue palmetto bass stockings.

**ISSUE 3:** Random trap net sampling for crappie has resulted in poor precision of catch rate data and small sample sizes for size structure and growth analyses.

### MANAGEMENT STRATEGIES

1. Using catch rate information from Appendix D, construct stratified random sampling design where trap net effort is concentrated in areas with higher variance (and higher catch rates) and set 30 net nights in fall of 2005; 11 nets in the Jim Ned arm, 10 nets in the main lake, and 9 nets in the Pecan Bayou arm. A stratified mean catch rate will then be calculated. In addition, 30 more net nights may optimize demarcation lines for stratification of future surveys.

### **SAMPLING SCHEDULE JUSTIFICATION**

The proposed sampling schedule includes trap net sampling in 2005, electrofishing in 2006, and mandatory monitoring in 2008-2009. Additional trap net sampling in 2005 is necessary to evaluate potential stratified random sampling scheme for crappie with the hypothesis that our precision of catch rates will improve significantly and more crappie will be collected for size structure and growth analyses. Additional electrofishing survey in 2006 is necessary to maintain a consistent sampling frequency for trend information on this heavily used largemouth bass fishery. Gill net surveys are only necessary every 4 years at this point to document presence or absence of channel catfish, flathead catfish, and white bass. Gill net surveys beyond 2009 will be used to evaluate the presence/absence of introduced blue catfish.

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Brownwood Reservoir, Texas, 2004-2005.

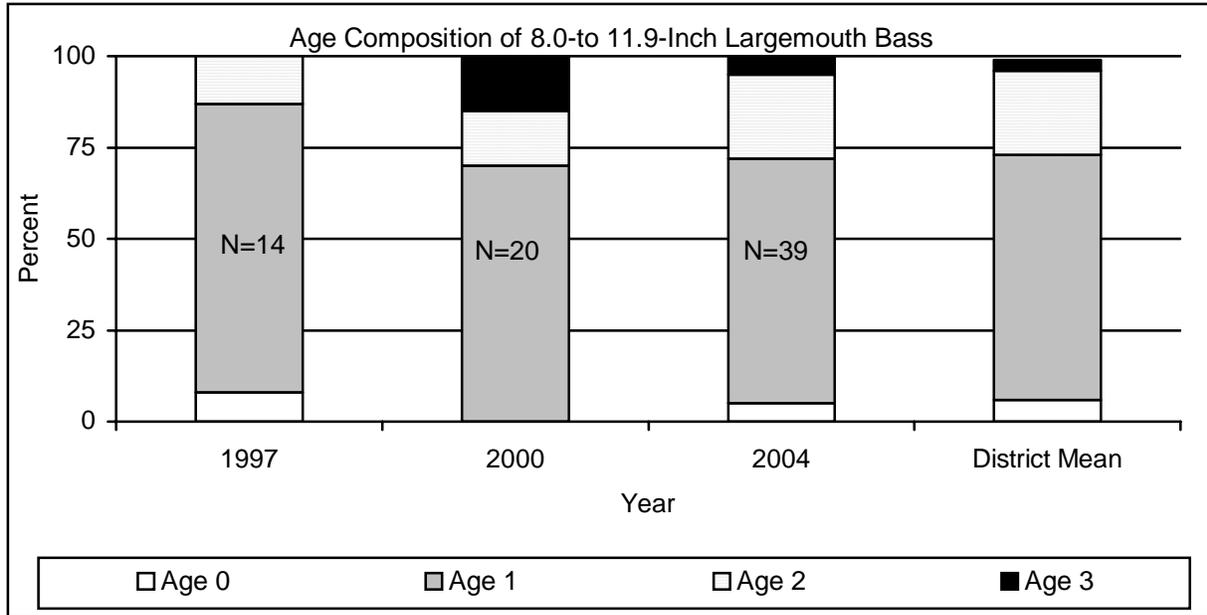
Species	Gill Nets		Trap Nets		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					99	99.0
Threadfin shad					25	25.0
Channel catfish	24	2.4				
Flathead catfish	12	1.2				
White bass	8	0.8				
Palmetto bass	8	0.8				
Redbreast sunfish						
Green sunfish					42	42.0
Warmouth					12	12.0
Orange spotted sunfish					4	4.0
Bluegill					342	342.0
Longear sunfish					65	65.0
Redear sunfish					57	57.0
Largemouth bass					146	146.0
White crappie			208	10.4		

**APPENDIX B**

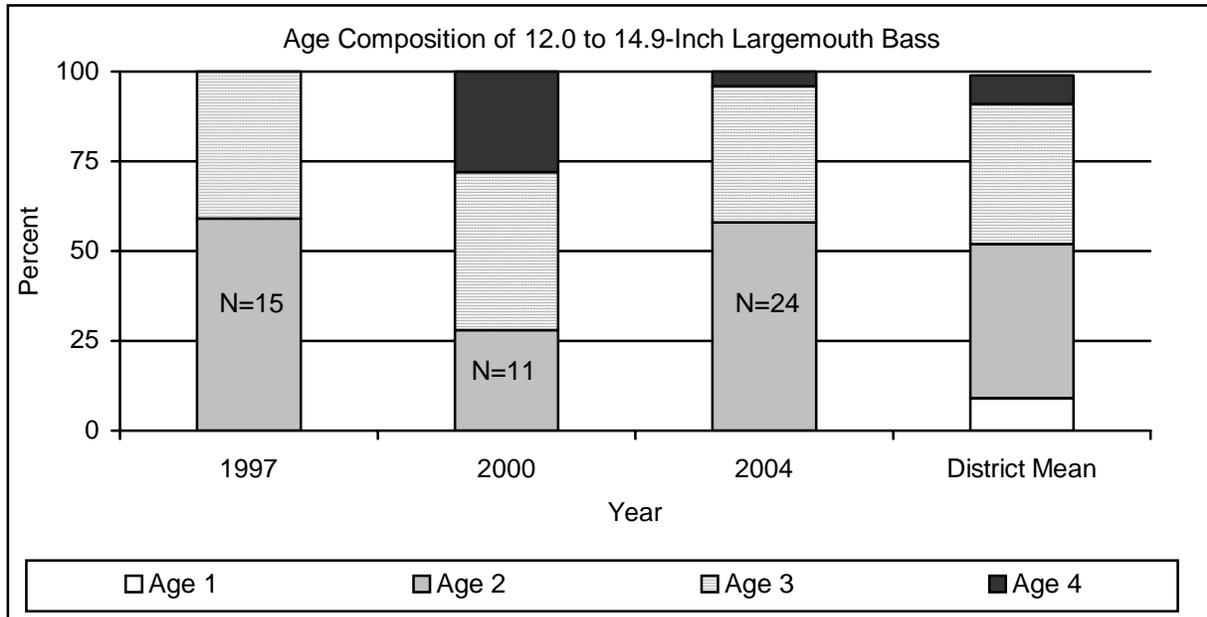
Proposed sampling schedule for Brownwood Reservoir, Texas. Gill net surveys are conducted in the spring, while electrofishing and trap net surveys are conducted in the fall. S denotes standard survey and A denotes additional survey.

Survey Year	Electrofishing	Trap Net	Gill Net	Creel	Report
Fall 2005-Spring 2006		A			
Fall 2006-Spring 2007	S				
Fall 2007-Spring 2008					
Fall 2008-Spring 2009	S	S	S		S

**APPENDIX C**

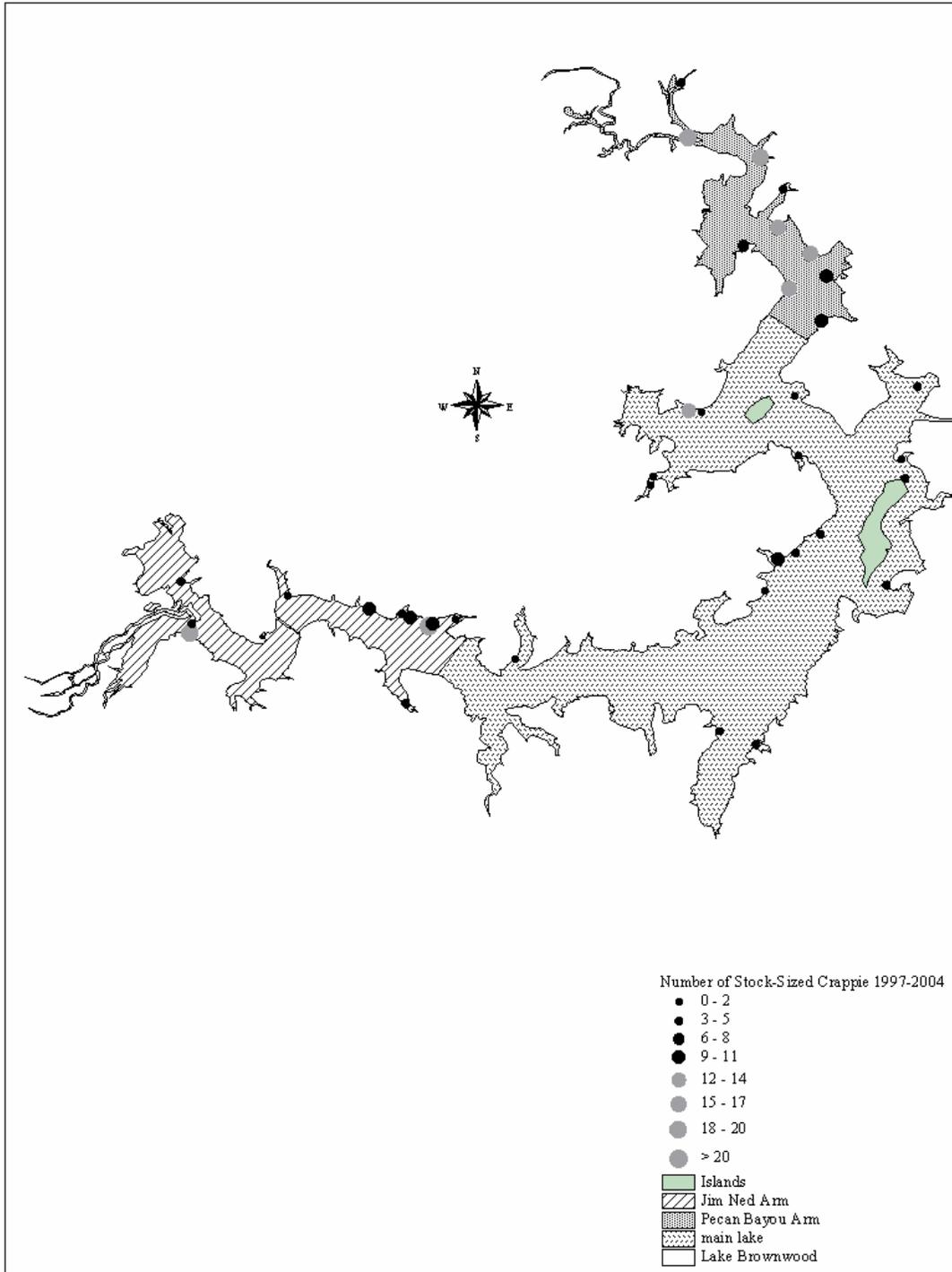


Age composition of 8.0- to 11.9-inch largemouth bass for fall electrofishing surveys, Brownwood Reservoir, Texas, 1997, 2000, and 2004, compared to the district mean. Sample size, N, is the number of fish aged.



Age composition of 12.0- to 14.9-inch largemouth bass for fall electrofishing surveys, Brownwood Reservoir, Texas, 1997, 2000 and 2004, compared to the district mean. Sample size, N, is the number of fish aged.

APPENDIX D



Number of stock-sized white crappie collected from trap nets, Brownwood Reservoir, Texas, 1997, 2000, and 2004 and proposed stratification areas.