

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-34

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

Brownwood Reservoir

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July 31, 2009

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Brownwood Reservoir were surveyed in 2008 using electrofishing and trap nets and in 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:** 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. Watershed land use was primarily agriculture, residential, and ranching. The reservoir was 4-5 ft. below spillway level at time of sampling.
- **Management History:** Palmetto bass were regularly stocked from the 1980s through the mid 1990s before being discontinued because of lack of directed fishing effort and insufficient numbers of palmetto bass available from state hatcheries. Largemouth bass were managed with a 16-inch minimum length limit (MLL) from 1 September 1993 to 1 September 1999. Blue catfish were stocked in 2007 to improve catfish populations and fisheries.
- **Habitat:** Brownwood Reservoir was rocky, with many boat docks and some standing timber, aquatic vegetation, and brush.
- **Fish Community**
 - **Prey species:** Forage consisted primarily of shad and bluegill. There appeared to be enough forage to support sport fish populations.
 - **Catfishes:** Several blue catfish from the 2007 stocking were collected in 2009. Channel catfish were present in moderate numbers with excellent sizes of fish available to anglers. Flathead catfish continued to be present.
 - **Temperate basses:** Numbers and sizes of white bass available to anglers were excellent. No palmetto bass were collected and few likely remain in the reservoir.
 - **Largemouth bass:** Largemouth bass were thin and plentiful. Few larger fish were available to anglers. Florida-strain largemouth bass were well established.
 - **White crappie:** White crappie abundance was high, and 30% of adult crappie were legal-size or longer. Many sub-legal sized crappie should be legal size in 2010 and 2011 under normal growing conditions.
- **Management Strategies:** Monitor blue catfish to determine if a self-sustaining population develops. Stock blue catfish fingerlings in 2010 at 50 fish/acre.

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INTRODUCTION

This document is a summary of fisheries data collected from Brownwood Reservoir in 2008-2009. 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 2008-2009 data for comparison.

Reservoir Description

Brownwood Reservoir is a 7,300-acre impoundment constructed on Pecan Bayou approximately 70 miles southeast of Abilene, Texas. It is located in the Colorado River Basin, and its primary use was municipal water supply. Secondary uses included recreation and flood control.

Water level generally fluctuates less than 5 ft. from conservation level under normal conditions. Low-water periods occurred from 1998-2000 and from 2005-2006 (Figure 1). Large water level increases occurred in 2001 and 2007 (Figure 1). Water level was 4-5 foot below conservation level at time of sampling.

Brownwood Reservoir was mesotrophic based on Carlson's Trophic State Index for Chlorophyll-a (TSI Chl-a) with a mean TSI chl-a of 45.34 and a trend that indicated a decrease in algal content (Texas Commission on Environmental Quality 2008). Boat access consisted of several public boat ramps. Bank fishing access was limited to boat ramp areas, Lake Brownwood State Park, and several marinas and parks. Other descriptive characteristics for Brownwood Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Dumont and Farooqi 2005) included:

1. Introduce blue catfish to supplement poor catfish populations and improve catfish fishery.
Action: Blue catfish were stocked in 2007.
2. Discontinue palmetto bass stockings because of reduced capacity to raise sufficient numbers of palmetto bass for statewide demands and low directed effort by anglers targeting palmetto bass.
Action: No palmetto bass have been stocked since 2002.
3. Construct stratified sampling design to improve poor precision of catch rate data and increase sample sizes for size structure and age determination of white crappie.
Action: Stratified random surveys were conducted in 2005 and 2008. The stratified sample in 2008 had much improved precision of CPUE-Total and CPUE-Stock catch rates.

Harvest regulation history: All sport fish are currently regulated with statewide harvest regulations (Table 2). Largemouth bass were managed with a 14-inch minimum length limit (MLL) one year prior to the regulation going statewide (1 September 1986) and with a 16-inch MLL from 1 September 1993 to 1 September 1999.

Stocking history: Florida largemouth bass were introduced in the 1970s, and supplemental stockings occurred in 1996 and 2007. Palmetto bass were heavily stocked from the 1980s to the mid 1990s. Smallmouth bass were stocked in 1980 and 1982, but a viable population failed to develop. A few adult blue catfish were stocked in 1988. In 2007 a large number of fingerlings were stocked in an effort to establish blue catfish. Threadfin shad were stocked in 1984 and have since maintained a viable population. The complete stocking history is in Table 3.

Vegetation/habitat history: Brownwood Reservoir has no vegetation/habitat management history.

METHODS

Fishes were collected by electrofishing (1.2 hours at 14 5-min stations), gill netting (10 net nights at 10 stations), and trap netting (15 net nights at 15 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). Microsatellite DNA analysis was used in 2006 to determine largemouth bass genetics. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008). Survey sites for the 2008 trap net survey were determined based on a stratified random design. Using trap net catch data of stock-size crappie collected from 88 nn of effort from 1997 to 2005, three strata were delineated for Brownwood Reservoir; Jim Ned, Pecan Bayou, and main lake. Sampling effort in each stratum was determined based on a formula involving the perimeter of the stratum, the standard deviation of the mean catch of stock-size crappie for each stratum, and the desired effort:

$$n_i = n^* (N_i \sigma_i / \sum N_i \sigma_i)$$

where n_i = number of samples allocated to stratum "i", n = total number of samples desired, N_i = perimeter of stratum "i", and σ_i = standard deviation of the mean catch for stratum "i". In 2008, 15 nn were pre-determined to be the desired effort. Allocation of effort was 4 nn in Jim Ned, 8 nn in Pecan Bayou, and 3 nn in the main lake. Habitat composition was determined by assessing habitat at random points throughout the reservoir. Near-shore habitat and substrate were assessed with 79 random points located on the shore/water interface, and off-shore habitat was assessed with 88 points randomly distributed throughout the reservoir. Presence or absence was determined for each habitat type at each point. Random points were generated in ArcView 3.3. Percent occurrence was calculated for each habitat type and 95% confidence intervals were generated with 5,000 resamples of the original data (with replacement) by the percentile method.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD)] (Guy *et al.* 2007), and condition indices [relative weight (W_r)] were calculated for some target fishes according to Anderson and Neumann (1996). Stratified mean CPUE ($CPUE_{ST}$) of crappie catch rates were calculated as follows:

$$Mean_{ST} = (\sum N_i * Mean_i) / N$$

where $Mean_{ST}$ = stratified mean, N_i = perimeter of stratum "i", $Mean_i$ = observed mean catch for stratum "i", and N = perimeter of reservoir. Index of vulnerability (IOV) was calculated for gizzard shad (DiGenzo *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. Confidence intervals were determined using the percentile method with 1,000 resamples of the original data (with replacement) by the percentile method. Ages of largemouth bass were determined using otoliths. Source for water level data was the United States Geological Survey website. Resampling Stats in Excel, Version 2 was used for all resample analyses.

RESULTS AND DISCUSSION

Habitat: Water level at time of habitat survey was 3.66 ft. below conservation elevation. The most prevalent near-shore habitat types were boat docks, featureless banks, and woody cover (standing timber, brush) (Figure 2). Aquatic vegetation community was dominated by water willow, with small amounts of several other species present (Figure 2). Despite the prevalence of boat docks and developed property on Brownwood Reservoir, bulkheads had less than 5% occurrence. Substrate of near-shore sites was dominated by hard surfaces (rock, gravel, bedrock) (Figure 2). Clay substrate was also common at many sites (Figure 2). Open water, with no discernable habitat features, was found in over 80% of off-shore sites. Standing timber and boat docks were the most common cover types found off-shore (Figure 3).

Prey species: Electrofishing CPUE of sub-stock gizzard shad and all bluegill was 211.8/h and 344.6/h, respectively. Size structure of gizzard shad improved in 2008 compared to previous years as IOV increased and PSD decreased (Figure 4). Although relative abundance of sub-stock gizzard shad is typically low, it has increased somewhat since 2004 (Figure 5). Threadfin shad continued to be present (Figure 5). Size structure of bluegill was composed of small individuals with a low PSD (Figure 6). Relative abundance of bluegill in 2008 was similar to estimates in 2004 and 2006 (Figure 6) and within the historical range of CPUE estimates observed since 1997 (Figure 5).

Blue catfish: Gill net catch rate of blue catfish was 0.6/nn. This was the first documented catch of blue catfish in Brownwood Reservoir. Size of blue catfish collected ranged from 8 to 10 inches in length. Two of these fish were aged and estimated to be two years old. Blue catfish were collected in the Pecan Bayou and Jim Ned river arms.

Channel catfish: Gill net catch rate of channel catfish was 2.5/nn. Total catch and PSD of channel catfish was similar in 2001, 2005, and 2009 (Figure 7). Proportion of legal-size (12-inches and longer) channel catfish was much higher in 2009 (84%) than in previous years (38-54%). Overall, the channel catfish population had moderate abundance and good size structure for anglers.

White bass: Gill net catch rate of white bass was 6.6/nn. Relative abundance of white bass was much higher in 2009 compared to 2001 and 2005 (Figure 8). There was also a large improvement in size structure as many white bass over 12 inches long were collected. The last time white bass had favorable relative abundance and size structure was in the early 1990s (Figure 9). Mean relative weight of white bass was 89 and 92 for white bass less than 10 inches in length and 10-15 inches in length, respectively. Given the high relative abundance of larger white bass, there was sufficient forage to support this white bass population.

Palmetto bass: No palmetto bass were collected in 2009. It is likely that few palmetto bass remain in the reservoir.

Largemouth bass: Electrofishing CPUE of all largemouth bass (Total CPUE) and stock-size largemouth bass has been high and similar since 2004 (Figure 10). Relative abundance of legal-size fish (14" or longer) has been poor since 2004 according to CPUE-14 and PSD-14 estimates (Figure 10). Relative weight for stock- to preferred-size largemouth bass was below the desired objective of 95 (Table 4). Mean W_r decreased with fish size and ranged from 80-82 for quality- to preferred-size fish since 2004. In 2004, mean age of 14-in fish (13.0-14.9 in) was 2.5 years (N=24; age-2 and age-3 fish made up 96% of sample). Mean age of 14-in fish from 1996-2000 was 2.7 years (N=21; range age-2 through age-4). Poor body condition, periods of slow growth, increased natural mortality, and likelihood of moderate exploitation have resulted in fewer fish reaching larger sizes. Florida largemouth bass influence, as measured by percent Florida alleles in the population, has been stable since 1997, ranging from 41 to 46% (Table 5).

White crappie: White crappie have been extremely abundant since 2004, although few adult crappie were legal size as indicated by low CPUE-10 and PSD-10 estimates (Figure 11). Body condition of white crappie indicated that sufficient forage was available as mean W_r values ranged from 94-100. Mean W_r of stock- to preferred-size white crappie improved slightly from 2004 to 2008 (Table 6). No change in W_r occurred for preferred-sized white crappie (Table 6). Mean age of 10-in (9.0-10.9 in) crappie in 2004 was 2.3 (N=18), which was an average growth rate. The stratified trap net catch rate of white crappie was 23.8/nn. Stratification of sampling effort was successful in 2008; RSE estimates of crappie catch rates were less than 25 and were considerably less than RSE estimates in 2004 and 2005 (Figure 11). Figure 12 shows the delineation of strata and effort allocated to each stratum.

Fisheries management plan for Brownwood Reservoir, Texas

Prepared – July 2009.

ISSUE 1: Blue catfish were introduced in 2007. If this stocking was successful, it may take several years for blue catfish to become established. Long-term monitoring will be required to evaluate stocking success.

MANAGEMENT STRATEGY

1. Conduct a gill net survey in 2013 to determine presence or absence of blue catfish recruitment.
2. Stock blue catfish (50/acre) in 2010 to supplement 2007 stocking.

SAMPLING SCHEDULE JUSTIFICATION:

Sampling once every four years is sufficient to monitor catfish and white bass populations. An additional electrofishing survey in 2010 would maintain a consistent sampling frequency for trend information on this heavily used largemouth bass fishery. Conduct additional stratified random trap net survey in 2009 to further evaluate a stratified sampling design for crappie.

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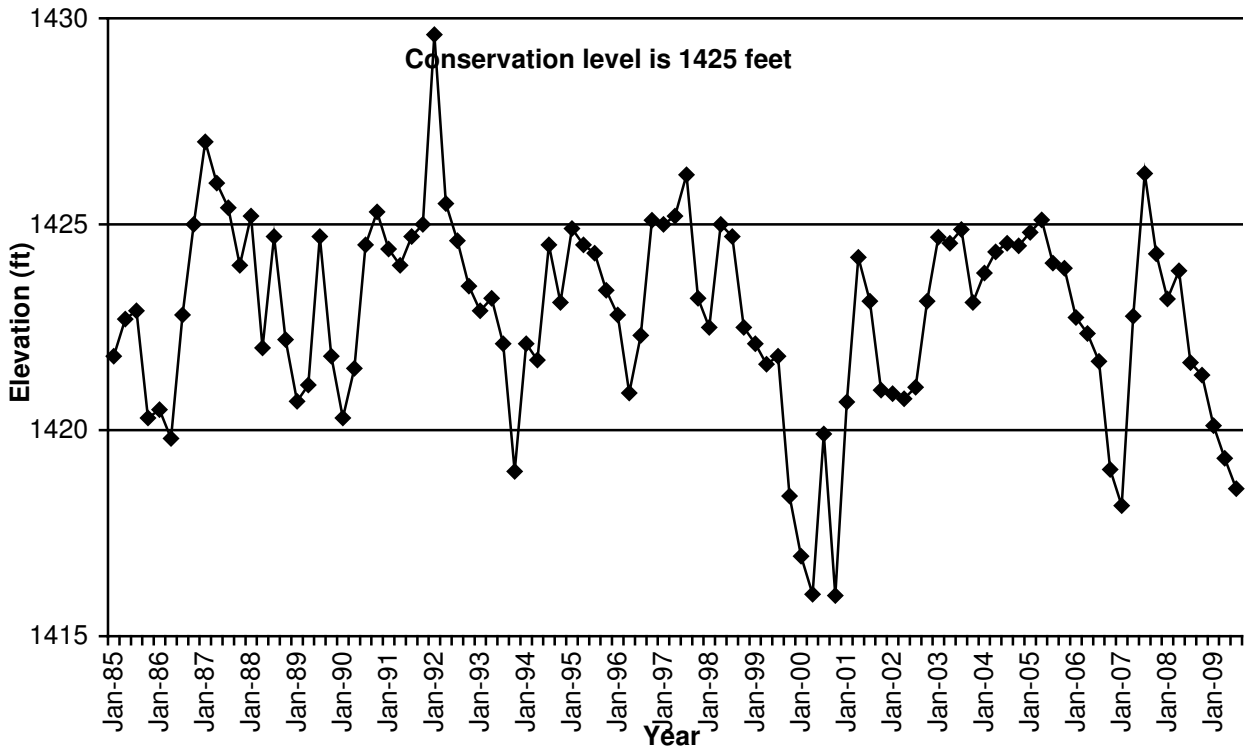


Figure 1. Quarterly water level elevations in feet above mean sea level for Brownwood Reservoir, Texas.

Table 1. Characteristics of Brownwood Reservoir, Texas.

Characteristic	Description
Year constructed	1933
Controlling authority	Brown County Water Control & Irrigation District No. 1
County	Brown
Reservoir type	Tributary, Colorado River Basin
Shoreline Development Index	4.1
Conductivity	650 μ mhos/cm

Table 2. Harvest regulations for Brownwood Reservoir, Texas

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

Table 3. Stocking history of Brownwood Reservoir, Texas. Size categories are: FRY = < 1 inch, FGL = 1-3 inches and ADL = adults.

Species	Year	Number	Size
Threadfin shad	1984	1,000	ADL
Blue catfish	1988	17	ADL
	2007	326,174	FGL
	Total	326,191	
Channel catfish	1972	72,000	FGL
	1980	150	ADL
	Total	72,150	
Palmetto bass	1980	73,850	FGL
	1983	75,600	FGL
	1986	145,601	FGL
	1987	145,101	FGL
	1988	148,325	FGL
	1989	154,470	FGL
	1991	39,600	FGL
	1992	40,500	FGL
	1994	45,006	FGL
	1995	89,970	FGL
	1996	36,869	FGL
	2002	36,680	FGL
	Total	1,080,709	
Green X redear sunfish	1971	5,000	FGL
	1972	22,000	FGL
	1978	7,000	FGL
	1980	150	ADL
	Total	34,650	
Smallmouth bass	1980	72,950	FGL
	1982	70,000	FGL
	Total	142,950	
Largemouth bass	1969	10,000	FGL
	1970	500,000	FGL
	1994	169	ADL
	1995	86	ADL
	1996	50	ADL
	Total	510,305	

Table 3. Cont.

Species	Year	Number	Size
Florida largemouth bass	1975	200,956	FGL
	1976	236,000	FGL
	1976	118,000	FRY
	1977	367,545	FGL
	1978	218,975	FGL
	1996	177,163	FGL
	2007	326,520	FGL
	Total	1,645,159	
Walleye	1976	75,000	FGL
	1977	1,500,000	FRY
	1978	1,550,000	FRY
	Total	3,125,000	

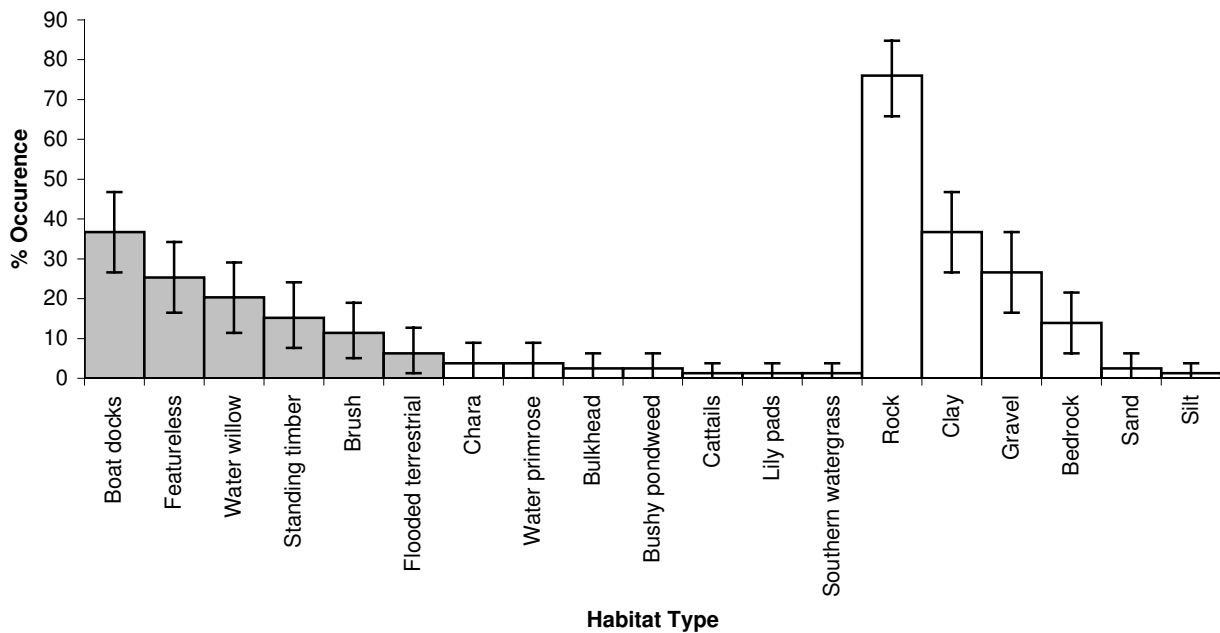


Figure 2. Percent occurrence (\pm 95% C.I., derived from 1,000 resamples, with replacement, of the original data) of near-shore habitat types (grey bars) and substrate (white bars) at Brownwood Reservoir, Texas, Summer 2008.

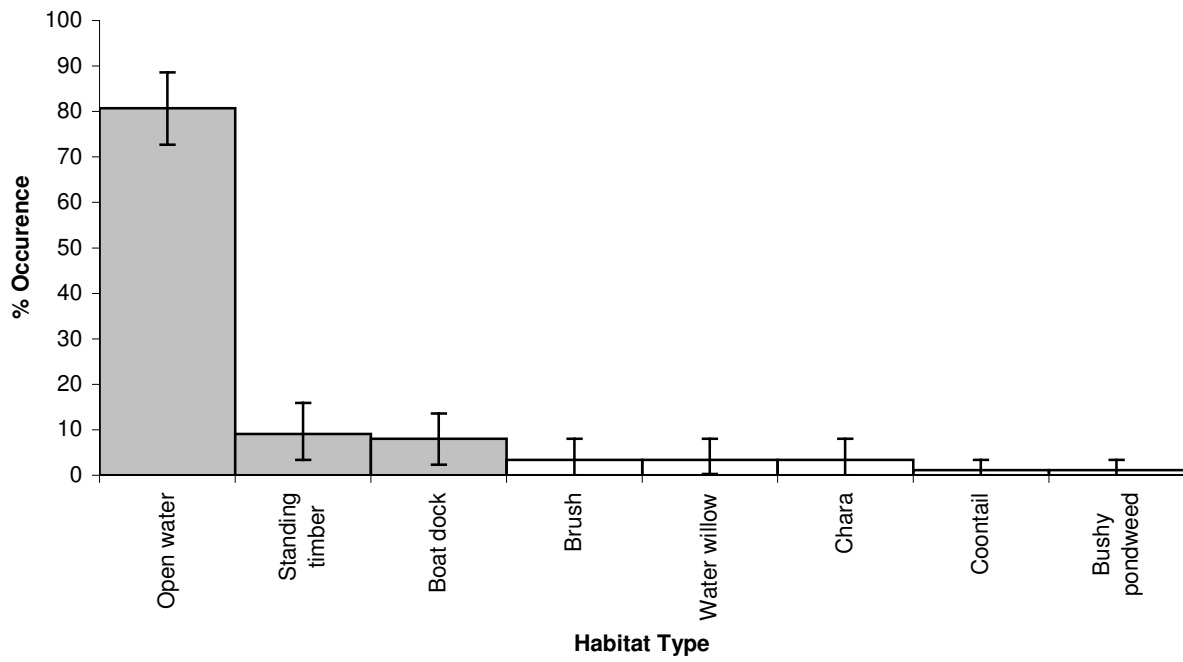
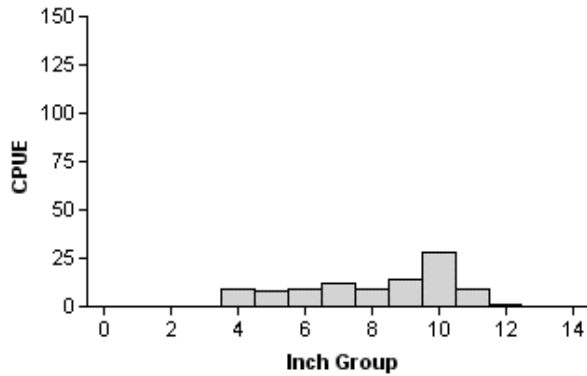
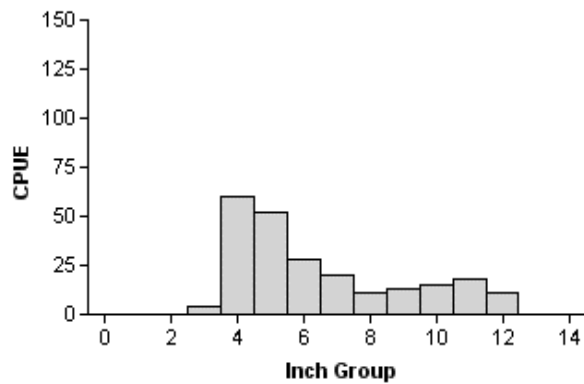


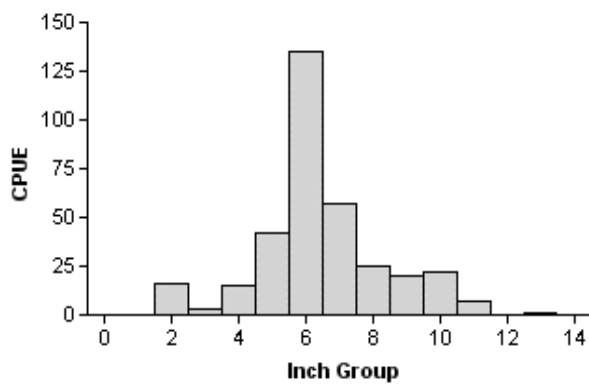
Figure 3. Percent occurrence (\pm 95% C.I., derived from 1,000 resamples, with replacement, of the original data) of off-shore habitat types at Brownwood Reservoir, Texas, Summer 2008.

Gizzard Shad**2004**

Effort = 1.0
 Total CPUE = 99.0 (21; 99)
 Stock CPUE = 73.0 (26; 73)
 PSD = 14 (5)
 IOV = 38 (10)

2006

Effort = 1.0
 Total CPUE = 232.0 (41; 232)
 Stock CPUE = 88.0 (35; 88)
 PSD = 33 (8)
 IOV = 71 (11)

2008

Effort = 1.2
 Total CPUE = 342.9 (28; 400)
 Stock CPUE = 131.1 (33; 153)
 PSD = 6 (2)
 IOV = 78 (4)

Figure 4. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for PSD and IOV are in parentheses) for fall electrofishing surveys, Brownwood Reservoir, Texas, 2004, 2006, and 2008.

Bluegill and Shad

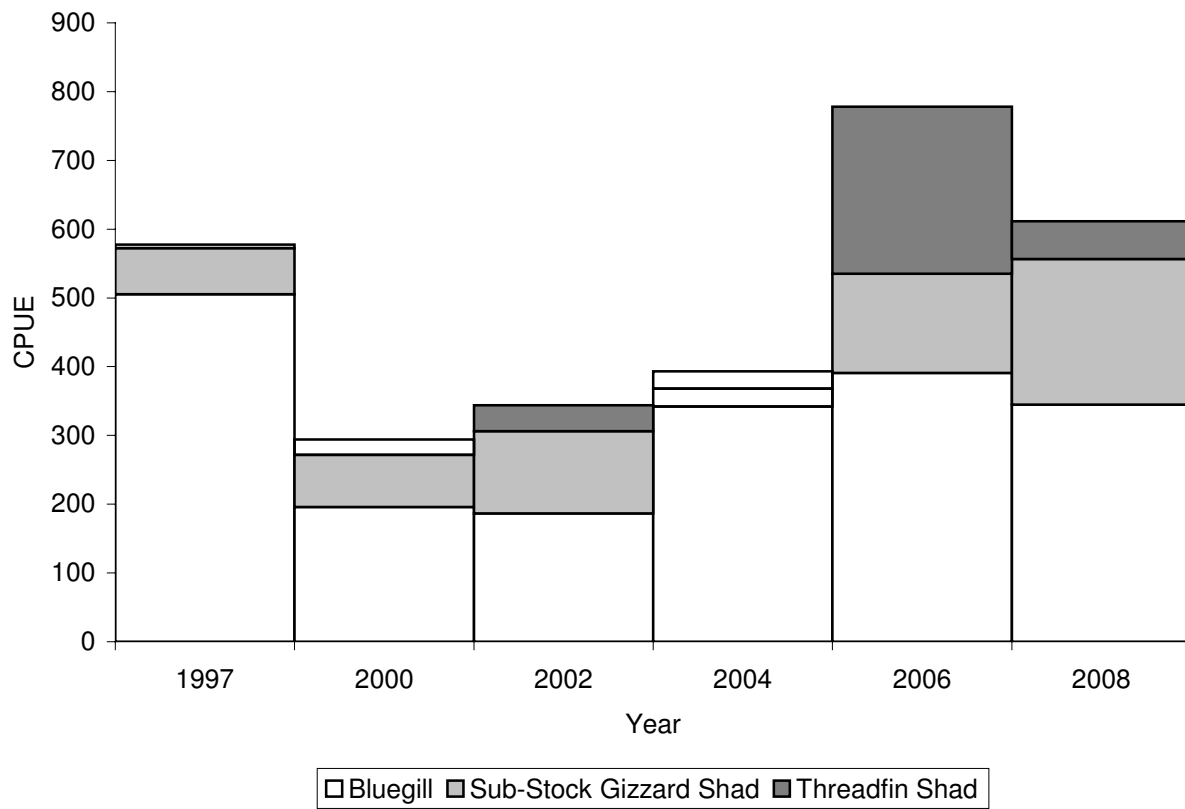


Figure 5. Electrofishing catch per hour (CPUE) of bluegill, sub-stock gizzard shad, and threadfin shad from Brownwood Reservoir, 1997-2008.

Bluegill

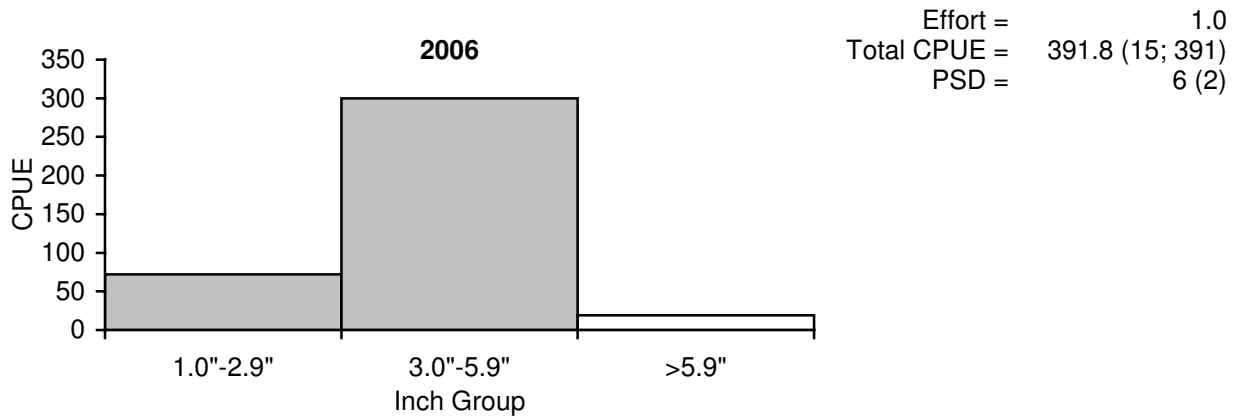
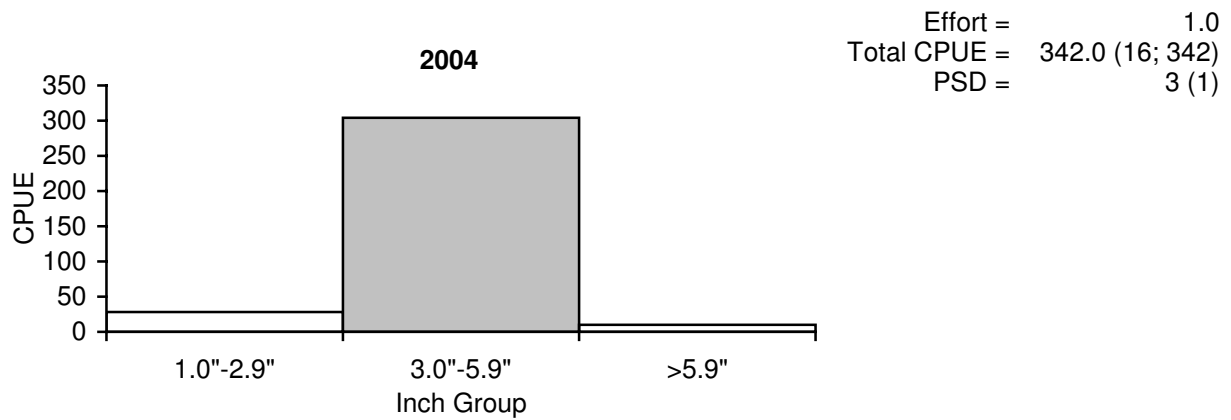


Figure 6. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Brownwood Reservoir, Texas, 2004, 2006, and 2008.

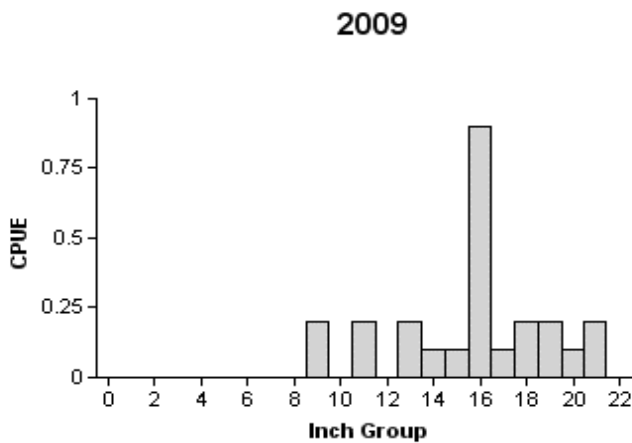
Channel Catfish



Effort = 5.0
 Total CPUE = 1.8 (21; 9)
 CPUE-12 = 1.0 (55; 5)
 PSD = 60 (17)



Effort = 10.0
 Total CPUE = 2.4 (41; 24)
 CPUE-12 = 0.9 (39; 9)
 PSD = 70 (14)



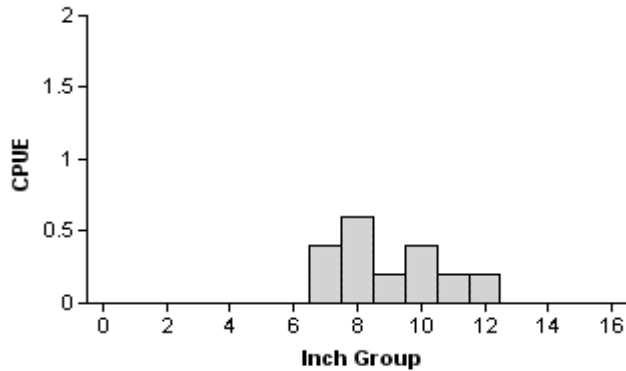
Effort = 10.0
 Total CPUE = 2.5 (25; 25)
 CPUE-12 = 2.1 (27; 21)
 PSD = 74 (10)

Figure 7. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Brownwood Reservoir, Texas, 2001, 2005, and 2009.

White Bass

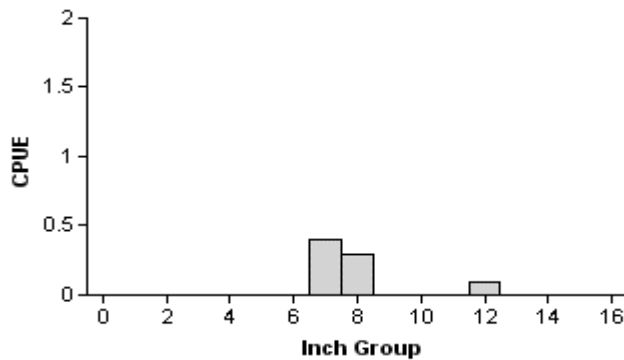
2001

Effort = 5.0
Total CPUE = 2.0 (22; 10)
CPUE-10 = 0.8 (47; 4)



2005

Effort = 10.0
Total CPUE = 0.8 (52; 8)
CPUE-10 = 0.1 (100; 1)



2009

Effort = 10.0
Total CPUE = 6.6 (26; 66)
CPUE-10 = 5.1 (33; 51)

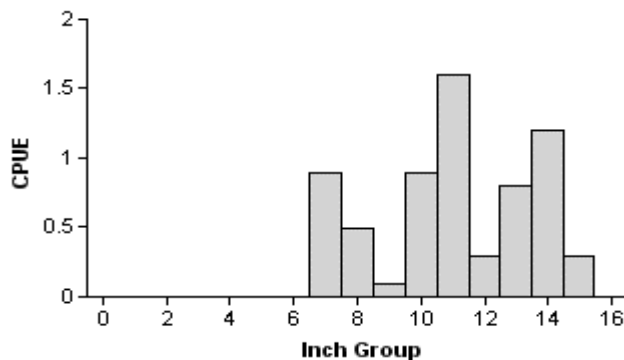


Figure 8. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Brownwood Reservoir, Texas, 2001, 2005, and 2009.

White Bass

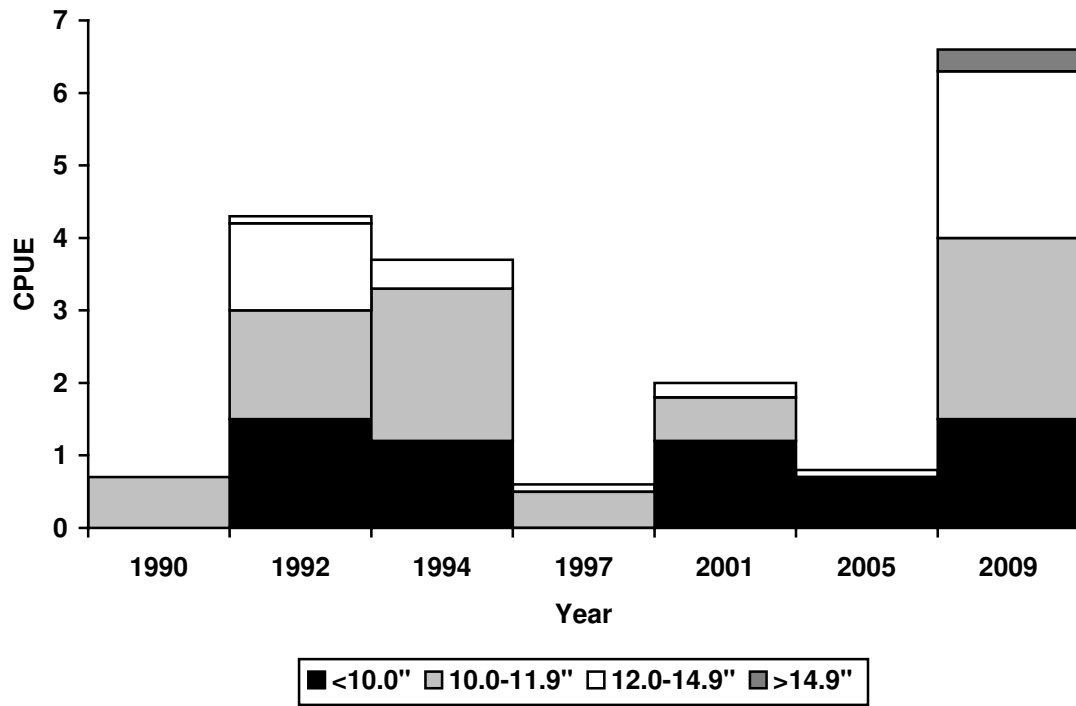
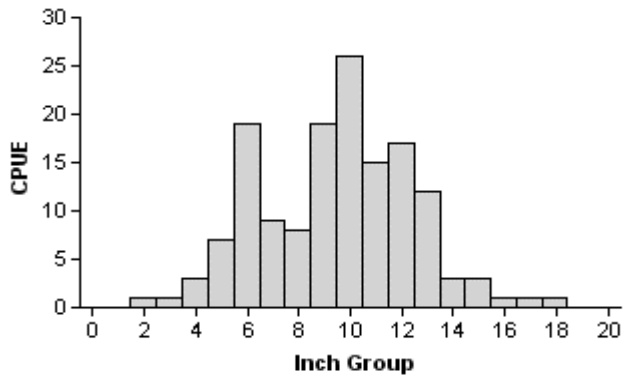


Figure 9. White bass total catch per unit effort (CPUE) delineated by length categories of less than 10 inches, 10.0-11.9 inches, 12.0-14.9 inches, and greater than 14.9 inches collected by gill nets in Brownwood Reservoir, Texas, 1990-2009.

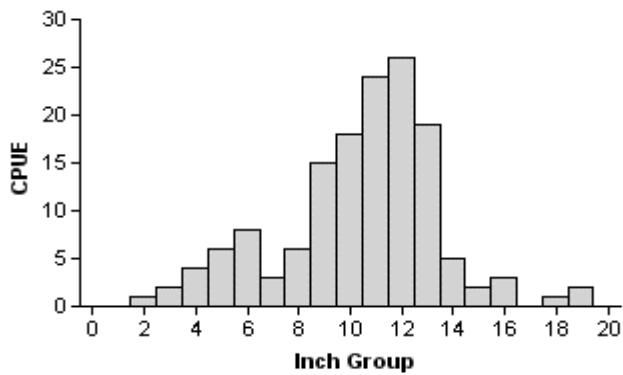
Largemouth Bass

2004



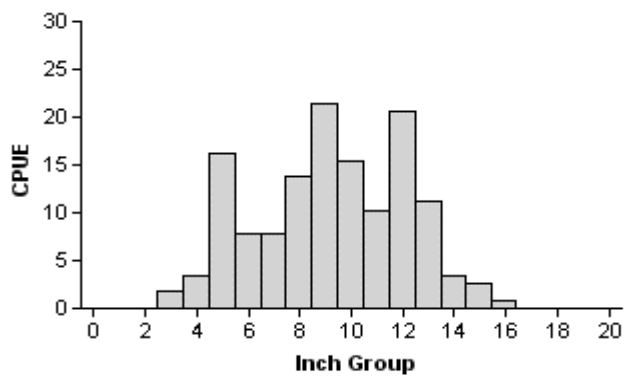
Effort = 1.0
 Total CPUE = 146.0 (15; 146)
 Stock CPUE = 106.0 (13; 106)
 CPUE-14 = 9.0 (33; 9)
 PSD = 36 (4)
 PSD-14 = 8 (3)

2006



Effort = 1.0
 Total CPUE = 145.0 (20; 145)
 Stock CPUE = 121.0 (20; 121)
 CPUE-14 = 13.0 (38; 13)
 PSD = 48 (4)
 PSD-14 = 11 (4)

2008



Effort = 1.2
 Total CPUE = 136.3 (18; 159)
 Stock CPUE = 99.4 (22; 116)
 CPUE-14 = 6.9 (30; 8)
 PSD = 39 (4)
 PSD-14 = 7 (2)

Figure 10. Number of largemouth bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Brownwood Reservoir, Texas, 2004, 2006, and 2008.

Largemouth Bass

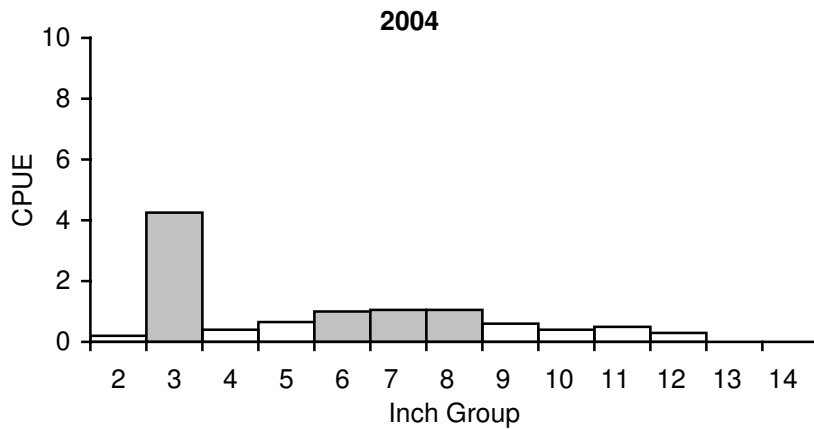
Table 4. Average relative weight of 8.0-11.9-inch and 12.0-14.9-inch largemouth bass from 2004, 2006, and 2008 at Brownwood Reservoir, Texas. 95% confidence interval is in parentheses. Confidence intervals were derived from 1,000 resamples, with replacement, of the original data.

Year	Mean W_r /size category	
	8.0-11.9 in	12.0-14.9 in
2004	82 (81-84)	81 (78-84)
2006	91 (84-100)	80 (78-82)
2008	89 (87-90)	82 (80-85)

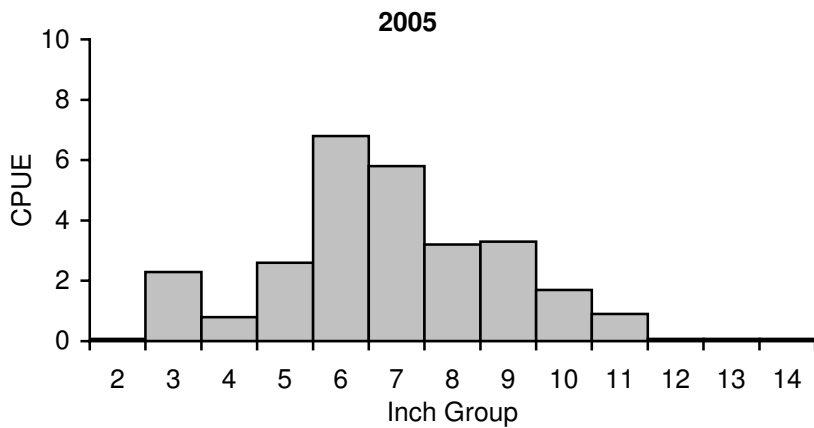
Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Brownwood Reservoir, Texas, 1997, 2000, 2002, and 2006. Electrophoresis procedures were used prior to 2006; microsatellite DNA procedures were used in 2006. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass. 95% confidence intervals are in parentheses. Confidence intervals were derived from 1,000 resamples, with replacement, of the original data.

Year	Sample size	Genotype			% FLMB alleles	% FLMB genotype
		FLMB	Intergrades	NLMB		
1997	24	2	20	2	46 (43-49)	8 (0-21)
2000	30	1	27	2	46 (38-55)	3 (0-10)
2002	31	4	20	7	44 (35-54)	13 (3-26)
2006	30	0	30	0	41 (34-48)	0

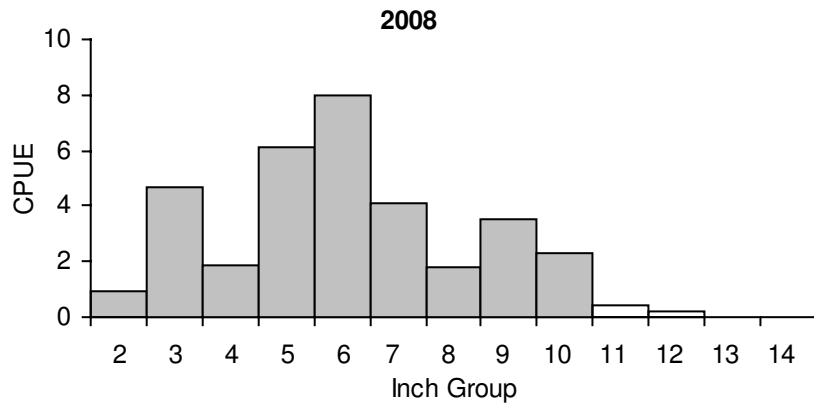
White Crappie



Effort = 20.0
 Total CPUE = 10.4 (23; 208)
 Stock CPUE = 5.6 (26; 111)
 CPUE-10 = 1.2 (51; 24)
 PSD = 51 (8)
 PSD-10 = 22 (8)



Effort = 14.0
 Total CPUE = 27.6 (36; 386)
 Stock CPUE = 24.4 (37; 342)
 CPUE-10 = 2.8 (30; 39)
 PSD = 38 (5)
 PSD-10 = 11 (3)



Effort = 15.0
 Total CPUE_{ST} = 23.8 (17; 507)
 Stock CPUE_{ST} = 18.9 (17; 396)
 CPUE-10_{ST} = 2.5 (30; 44)
 PSD = 31 (5)
 PSD-10 = 11 (3)

Figure 11. Number of white crappie caught per net night (CPUE; 2004 and 2005 and stratified CPUE_{ST}; 2008) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Brownwood Reservoir, Texas, 2004, 2005, and 2008.

White Crappie

Table 6. Average relative weight of 5.0-7.9-inch and 8.0-9.9-inch, and ≥ 10 -inch white crappie from 2004 and 2008 at Brownwood Reservoir, Texas. 95% confidence interval is in parentheses. Confidence intervals were derived from 1,000 resamples, with replacement, of the original data.

Year	Mean W_r /size category		
	5.0-7.9 in	8.0-9.9 in	≥ 10 in
2004	92 (91-94)	94 (92-96)	94 (90-98)
2008	100 (98-103)	97 (94-99)	94 (90-98)

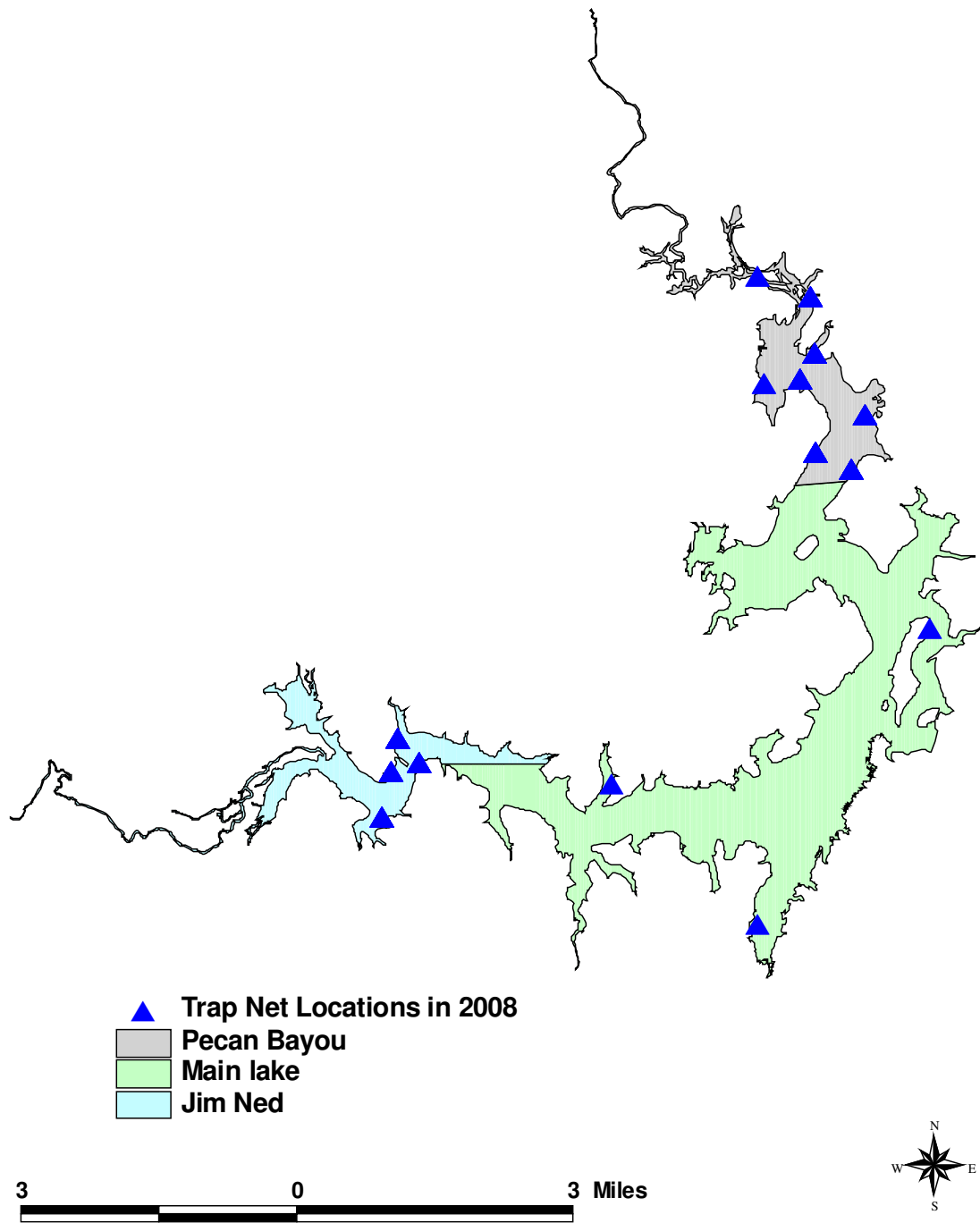


Figure 12. Stratified sampling zones and trap net locations, Brownwood Reservoir, Texas, 2008.

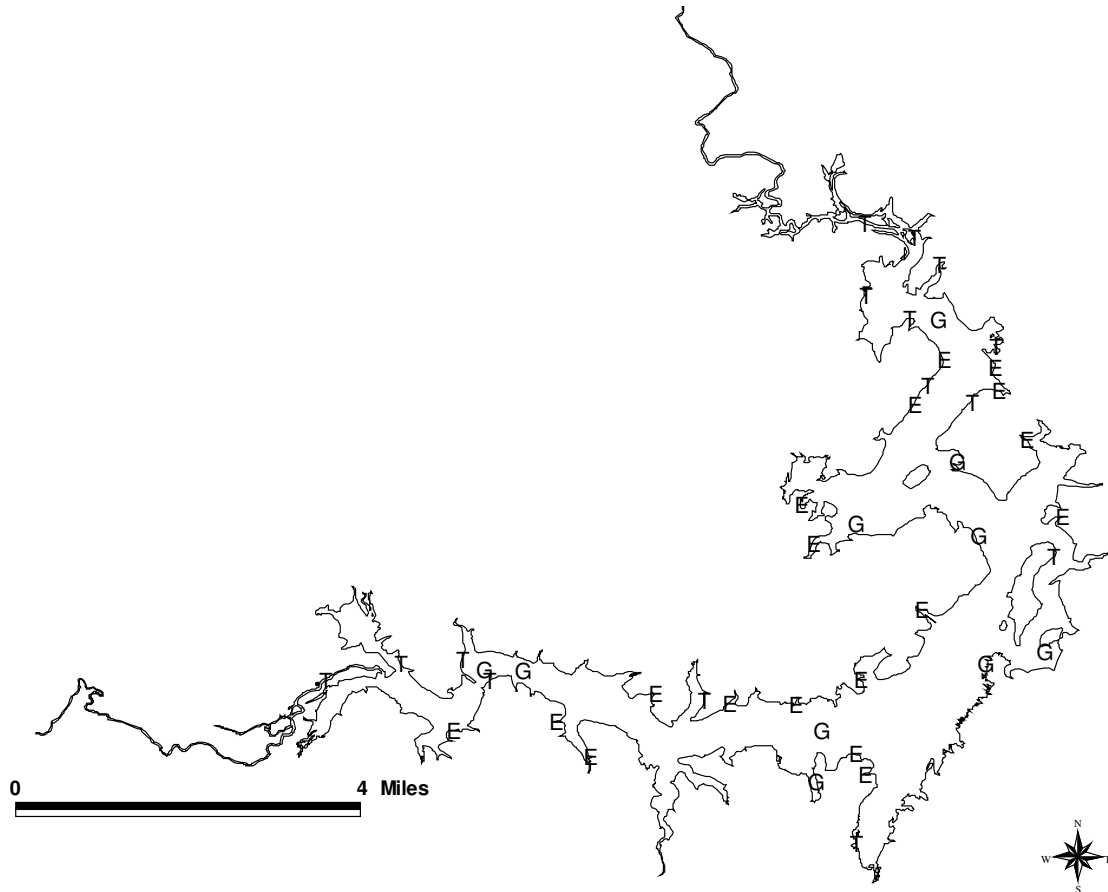
Table 7. Proposed sampling schedule for Brownwood Reservoir, Texas. Gill netting surveys are conducted in the spring, hoop net surveys will be conducted in summer 2012, and electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

Survey Year	Hoop Net	Electrofisher	Trap Net	Gill Net	Report
Fall 2009-Spring 2010			A		
Fall 2010-Spring 2011		A			
Fall 2011-Spring 2012					
Fall 2012-Spring 2013	A	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from Brownwood Reservoir, Texas, 2008-2009.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					400	342.9
Threadfin shad					68	58.6
Blue catfish	6	0.6				
Channel catfish	25	2.5				
Flathead catfish	6	0.6				
White bass	67	6.7				
Green sunfish					37	31.7
Warmouth					17	14.6
Bluegill					402	344.6
Longear sunfish					107	91.7
Redear sunfish					64	54.9
Largemouth bass					159	136.3
White crappie			507	23.8		

APPENDIX B

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