PERFORMANCE REPORT

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FEDERAL AID PROJECT F-30-R-33

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2007 Survey Report

Twin Buttes Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Twin Buttes Reservoir were surveyed in 2007 using electrofishing and trap nets, and in 2008 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:** Twin Buttes Reservoir is a 9,080-acre (currently 2,750-acre) impoundment located 3 miles southwest of San Angelo, Texas in Tom Green County. The reservoir consists of two pools ("North Pool" and "South Pool") connected by an equalization channel. This eutrophic reservoir experiences dramatic water level fluctuations, and has extensive fish habitat mostly in the form of flooded terrestrial vegetation. Boating access is good on the North Pool, and fair on the South Pool.

- **Management History:** Important sport fish include white bass, largemouth bass, white crappie, and catfishes. Striped bass were stocked in the past, and are still occasionally caught by anglers or in gill nets. Sport fishes have been managed with statewide regulations.

- **Fish Community**
  - **Prey species:** Bluegill and gizzard shad relative abundances were good. Availability of gizzard shad to predators was adequate but lower than previous years.
  - **Catfishes:** Blue catfish and flathead catfish were present in low numbers. Channel catfish relative abundance and size structure were fair.
  - **Temperate basses:** White bass were moderately abundant, with good size structure and fair growth to 12 inches. The white bass water body record of 3.3 lbs. was set in 2003. Striped bass are present in very low numbers; one large striped bass was caught in a 2007 gill net, and a water body record for that species was set at 20.3 lbs. in 2008.
  - **Largemouth bass:** The increase in flooded terrestrial vegetation and submerged vegetation since 2005 has corresponded with improvements in largemouth bass abundance and size structure. Body condition and growth were also good for most bass in the 2007 survey.
  - **White crappie:** Catch rates for stock-size and legal-size crappie remained moderate and fairly steady from 2005-2008. Size structure and body condition were fairly good in the 2007 standard trap net survey, but growth was poor, with some "bottle-necking" occurring around 10 inches.

- **Management Strategies:** Visit the reservoir frequently to check for blue-green alga bloom, and keep in touch with relevant agencies to monitor the bloom status. Conduct a creel survey in 2008/2009, an intensive age-and-growth survey in 2009, and public meeting(s) in preparation to consider a largemouth bass harvest regulation change. Conduct additional electrofishing and trap netting in 2009/2010, and standard monitoring in 2010/2011.

INTRODUCTION

This document is a summary of fisheries data collected from Twin Buttes Reservoir in 2007-2008. 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 2007-2008 data for comparison.

Reservoir Description

Twin Buttes Reservoir was constructed in 1963 on the South and Middle Concho Rivers three miles southwest of San Angelo. The 9,080-acre (when full) impoundment is used for recreation, municipal water supply and irrigation. The reservoir consists of two pools ("North Pool" and "South Pool") connected by an equalization channel. At the time of sampling the reservoir was 20-25 feet below conservation pool, and had approximately 2,750 surface acres (Figure 1). Twin Buttes Reservoir was eutrophic with a mean TSI chl-*a* of 53.88 (Texas Commission on Environmental Quality 2008). Habitat at time of sampling consisted primarily of flooded dead terrestrial vegetation and native submerged vegetation (e.g., pondweed, coontail). Boat access on the North Pool was good with two concrete public boat ramps, but boat access at the South Pool was limited to launching off of a gravel shoreline. Bank fishing access was fair in the areas adjacent to the boat-launching sites; however, no fishing piers or disabled access facilities were available. Other descriptive characteristics for Twin Buttes Reservoir are presented in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Scott and Van Zee 2004) included:

1. Conduct supplemental sampling when water levels rise significantly.
   Action: The reservoir's water level rose significantly in early 2005; we conducted supplemental electrofishing, trap netting, and gill netting surveys in 2005-2006.
2. Stock fingerling channel catfish at 100/acre to supplement the declining catfish population.
   Action: Channel catfish were stocked at 100/acre to support the bank-access fishery during the low-water period.

Harvest regulation history: Sportfishes in Twin Buttes Reservoir are currently managed with statewide regulations (Table 2).

Stocking history: Species stocked have included threadfin shad, blue catfish, channel catfish, Florida and northern largemouth bass, and striped bass. Species that were unsuccessfully stocked in the past included smallmouth bass and walleye. The complete stocking history is in Table 3.

Vegetation/habitat history: Twin Buttes Reservoir has historically had fluctuating water levels (Figure 1). Low water levels were maintained from 1995-1998 to facilitate repairs to the dam, and long-term drought caused further dewatering for the next seven years. Heavy rains in 2005 brought the reservoir back to pre-1998 level. Flooded terrestrial vegetation has been the primary fish habitat, but native submerged vegetation (e.g., Illinois pondweed, coontail) has recently become more abundant.

METHODS

Fishes were collected by electrofishing (1.5 hours at 18, 5-min stations), gill netting (10 net nights at 10 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 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), with the exception of the trap netting effort. Twin Buttes was part of a special gear evaluation in 2007 where dual-cod trap nets were compared to single-cod trap nets (our standard gear), and 1-night sets were compared to 3-night sets. Only data from the single-cod, 1-night-set trap nets are presented here because results from the experimental net types will be published elsewhere.

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). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics. Ages were determined using otoliths for white bass, largemouth bass and white crappie; all individuals of these species were retained for age-and-growth analysis. We collected enough individual white bass from 11-13 inches to calculate mean-age-at-length for 12-inch white bass. A littoral habitat and vegetation survey was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005) in late summer 2007. Water level data were provided by U.S. Geological Survey website.

RESULTS AND DISCUSSION

Habitat: In 2007, Twin Buttes had abundant submerged terrestrial vegetation (saltcedar, willow baccharis) that provided most of the littoral fish habitat. There was also a good amount of native submerged vegetation (e.g. Illinois pondweed, coontail) and a smaller amount of native emergent plants (cattail, waterwillow). Both the North Pool and South Pool had spring-influenced tributary arms where the water was somewhat clearer, and overhanging willow trees provided extra fish cover near the banks. Complete results of the 2007 habitat survey for Twin Buttes' North Pool and South Pool can be found in Tables 4 and 5, respectively.

Water quality at Twin Buttes became a concern in May 2008, as a blue-green alga (Cyanobacteria) bloom was documented for the first time. The bloom was associated with low dissolved oxygen readings and a small fish kill on the north end of the North Pool. A nutrient imbalance was suspected to be contributing to the bloom, as nitrogen was very low and phosphorous was at an unprecedented high during the bloom (Chuck Brown, Upper Colorado River Authority, personal communication).

Prey species: Bluegill and gizzard shad relative abundances were good, with electrofishing CPUE of 135/h and 139/h, respectively (Figures 2 and 3). Gizzard shad catch rate was similar to the previous two surveys, but IOV decreased from 98 in 2003 to 55 in 2007. Even with this decreased availability of shad to predators, overall prey availability for sport fish was adequate. Bluegill catch rates increased dramatically since the 2005 and 2003 surveys, but PSD remained <10 and the population was made up mostly of individuals <5 inches.

Blue catfish: Only one large blue catfish was captured in gill nets in 2008, which was the same as the 2004 survey (Figure 4). This population seems to have declined somewhat since 1998, when gill net CPUE was 1.3/nn.

Channel catfish: Relative abundance of channel catfish was low in 2008, with CPUE of 1.0/nn (Figure 5). Size structure was good, with PSD of 44, and individuals up to 22 inches in the sample. This population looked to be suffering from poor recruitment in the 2004 survey, so Texas Parks and Wildlife Department (TPWD) stocked over 196,000 fingerling channel catfish in 2004 and 2005 (Table 3). Stocking may have helped increase recruitment to stock size, but rising water levels since 2005 probably also contributed to the more balanced size structure we found in 2008.

Flathead catfish: One flathead catfish was collected in 10 net-nights in 2008. Gill net catch rates in 2004 (0.3/nn) and 1998 (0.1/nn) were similarly low.

White bass: Gill net catch rate improved slightly from 2004 (2.2/nn versus 1.7/nn), but was still much lower than in 1998 (5.2/nn, Figure 6). Also, CPUE of white bass ≥ 10 inches was up slightly from 2004 but down from 1998. Size structure was good in 2008, with PSD of 64, and RSD-P of 41 indicating many of the fish were in the larger size categories. Size structure was even better in the previous two surveys. Body condition of white bass was good; mean relative weights ranged from approximately 90-100. Mean-age-at-length for 12-inch white bass was 3.1 years (N=13), indicating fair growth. The water body record for white bass was broken twice between 2004-2008, with the current record standing at 3.3 lbs. and 18.5 inches.

Largemouth bass: The 2005 and 2007 electrofishing surveys showed dramatic improvements in the largemouth bass population since 2003. Catch rate increased from 13.7/h in 2003 to 126.0/n in 2005 and 86.0 in 2007 (Figure 7). Catch rate of stock-size (8-inch) bass increased from 8.6/h in 2003 to 14.7/h in 2005 and 28.0/h in 2007. In the 2005 survey, a strong year class of age-0 bass was present, probably due to the substantial water rise that year. This year class was responsible for the increase in relative abundance, but size structure indices were low (PSD=14, RSD-P=5), as the population contained few larger fish. The 2007 survey showed good largemouth bass relative abundance and good size structure (PSD=52, RSD-P=14). Also, body condition was excellent for bass above the minimum length limit. Age-and-growth analysis showed some size overlap among bass ages 1-4 years, but many bass were reaching the 14-inch minimum length limit in their third year (Figure 8). The profusion of cover now present in the reservoir has helped the largemouth bass population recover substantially from the 1998-2004 drought period.

White crappie: Total CPUE declined from 30.6/nn in 2003 to 15.4/nn in 2005 and 8.8 in 2007, but catch rates of stock-size (5-inch) and legal-size (10-inch) crappie were similar in all three surveys (Figure 9). Size structure in 2007 was good (PSD=68), but there were no fish > 12 inches caught in the trap nets, as in the two previous surveys. Body condition was also good in 2007, with relative weights ranging 90-100. With standard and experimental gear types combined, 190 white crappie were collected for age-and-growth analysis. There was much size overlap among year classes, especially around 8 inches, where age 1, 2, and 3 crappie were found (Figure 10). Overall growth rates were fair, with several crappie reaching 10 inches by age 2.

Fisheries management plan for Twin Buttes Reservoir, Texas

Prepared – July 2008.

ISSUE 1: Blue-green alga has recently caused concerns about water quality and potential negative impact on fish populations.

MANAGEMENT STRATEGY

1. Visit the reservoir frequently through the remainder of 2008 (or longer if conditions warrant) to observe the shoreline and check for signs of a bloom. Keep in contact with TPWD Kills and Spills staff and other relevant agencies to monitor the situation.

ISSUE 2: The 2005 year class of largemouth bass seems to be making up a large proportion of the reservoir's current brood stock. Fishing effort has increased dramatically since the boat ramps became useable in 2005 (personal observation), and the presence of sometimes-toxic blue-green alga also presents a potential challenge to bass reproduction and recruitment.

MANAGEMENT STRATEGY

1. Conduct a creel survey to estimate angler catch and harvest rates of largemouth bass, with the purpose of investigating the feasibility of a new harvest regulation.

2. Conduct an intensive age-and-growth sample (goal of 400 individuals) on largemouth bass before considering a regulation change.

3. If creel and age-and-growth data indicate a regulation change is needed, present the possible regulation change to stakeholder groups, including local bass clubs, at a public meeting. Also discuss enforcement issues with local game wardens. .

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional electrofishing and trap netting in 2009/2010, mandatory monitoring in 2011/2012, and a creel survey in 2008/2009 (Table 13). This schedule is adequate for monitoring the status of the most important game fish species: largemouth bass, white crappie, white bass, and channel catfish.

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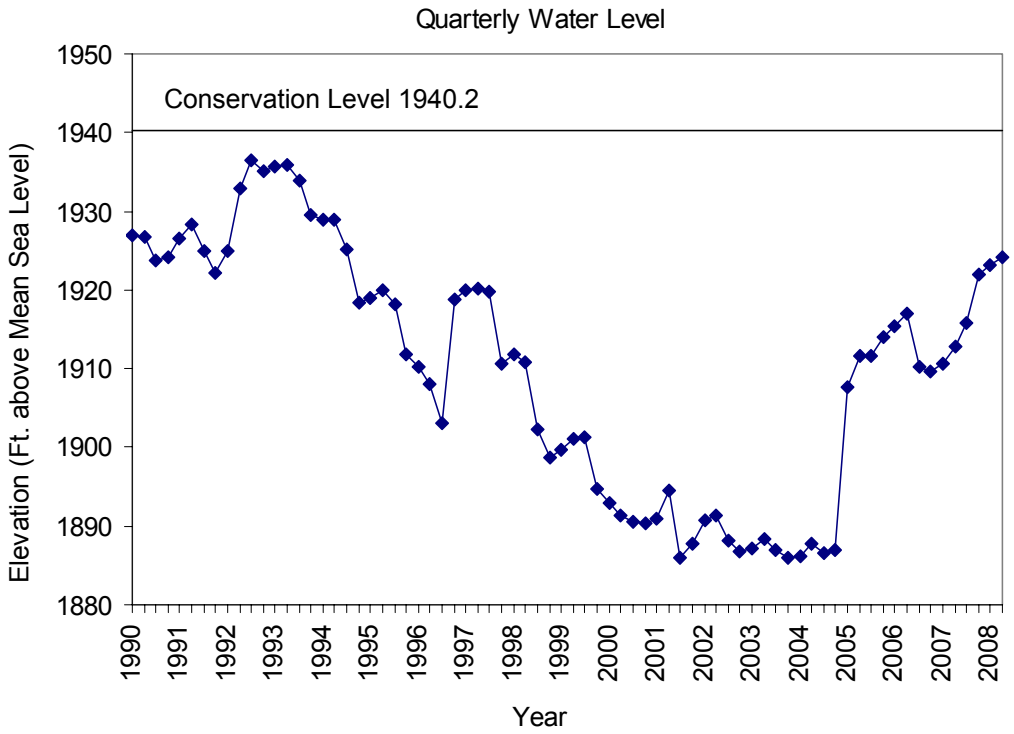


Figure 1. Quarterly water level elevations recorded for Twin Buttes Reservoir, Texas.

Table 1. Characteristics of Twin Buttes Reservoir, Texas.

Characteristic	Description
Year constructed	1963
Controlling authority	City of San Angelo, U.S. Bureau of Reclamation
County	Tom Green
Reservoir type	Mainstream
Shoreline Development Index	4.0 [north (3.8) and south (4.2) pools, averaged]
Conductivity	750 μmhos/cm

Table 2. Harvest regulations for Twin Buttes Reservoir, Texas.

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, striped, its hybrids and subspecies	5	18 - 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. Stocking history of Twin Buttes Reservoir, Texas. Size categories are: FRY =<1 inch; FGL = 1-3 inches; ADL = adult, and UNK = unknown.

Year	Number	Size
Channel Catfish		
1966	9,550	UNK
1967	20,000	UNK
1970	10,500	UNK
1971	100,549	UNK
1974	20,000	UNK
1987	100,300	FGL
2004	41,950	FGL
2005	154,733	FGL
Species Total	457,582	
Blue Catfish		
1972	1,400	UNK
1973	11,610	UNK
1974	4,840	UNK
1976	28,000	UNK
1977	39,200	UNK
1978	24,515	UNK
1979	83,903	UNK
1980	57,130	UNK
Species Total	250,598	
Florida Largemouth Bass		
1975	188,500	FGL
1976	200,500	FGL
1977	199,900	FRY
1977	25,750	FGL
1978	183,776	FGL
1986	14,981	FGL
1996	139,304	FGL
2005	150,017	FGL
2005	135	ADL
2008	98,871	FGL
Species Total	1,201,734	
Walleye		
1971	100,000	UNK
1972	782,325	UNK
1973	1,400,000	UNK
1974	105,000	UNK
Species Total	2,387,325	
Largemouth Bass		
2005	295	ADL
Green X Redear		
1966	24,500	UNK
1967	9,000	UNK
1972	7,200	UNK
Species Total	40,700	
Northern Largemouth Bass		
1966	100,000	UNK
1967	10,000	UNK
1968	416,000	UNK
1970	33,725	UNK
1976	6,100	UNK
Species Total	565,825	
Striped Bass		
1995	51,196	FGL
Palmetto Bass		
1979	90,720	UNK
1982	27,526	UNK
Species Total	118,246	
Smallmouth Bass		
1982	105,611	
1983	80,901	UNK
1984	168,070	UNK
1987	30	FGL
Species Total	354,612	ADL
Warmouth		
1966	4,000	UNK
Threadfin Shad		
1982	2,000	UNK
1984	8,500	UNK
Species Total	10,500	
White Crappie		
1972	53,000	UNK
Redear Sunfish		
1972	3,000	UNK

Table 4. Survey of littoral zone and physical habitat types, Twin Buttes Reservoir (North Pool), Texas, 2007. 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. Native submerged vegetation consisted primarily of sago and Illinois pondweeds, coontail, marine naiad, and chara. Flooded live terrestrial consisted primarily of saltcedar. Native emergent vegetation consisted primarily of cattail and waterwillow. Traces of duckweed (native floating vegetation) were also found.

Littoral habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of total
Flooded live terrestrial	7.3	27.3		
Flooded live terrestrial/native submerged vegetation	5.7	21.3		
Flooded live terrestrial/native emergent vegetation	0.4	1.5		
Non-descript	3.9	14.6		
Non-descript/native submerged vegetation	1.4	5.2		
Riprap	2.4	9.0		
Overhanging brush	1.3	4.9		
Overhanging brush/native emergent vegetation	0.1	0.4		
Gravel	1.0	3.7		
Gravel/native submerged vegetation	0.5	1.9		
Eroded bank	0.8	3.0		
Rock bluff	0.7	2.6		
Flooded dead terrestrial	0.7	2.6		
Flooded dead terrestrial/native submerged vegetation	0.1	0.4		
Boulder	0.4	1.5		
Native submerged vegetation			397.3	9.6
Native emergent vegetation			16.7	0.4

Table 5. Survey of littoral zone and physical habitat types, Twin Buttes Reservoir (South Pool), Texas, 2007. 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. Native submerged vegetation consisted primarily of Illinois pondweed and coontail. Flooded live terrestrial consisted primarily of willow. Native emergent vegetation consisted primarily of cattail and waterwillow. Traces of spatterdock (native floating vegetation) were also found.

Littoral habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of total
Flooded live terrestrial	6.5	56.1		
Flooded live terrestrial/native emergent vegetation	0.8	6.9		
Overhanging brush	2.5	21.6		
Overhanging brush/native emergent vegetation	1.0	8.7		
Riprap	0.3	2.5		
Non-descript	0.2	1.7		
Boulder	0.2	1.7		
Flooded dead terrestrial vegetation	0.1	0.8		
Native emergent vegetation			18.51	2.7

Native submerged vegetation	4.95	0.7

Gizzard Shad

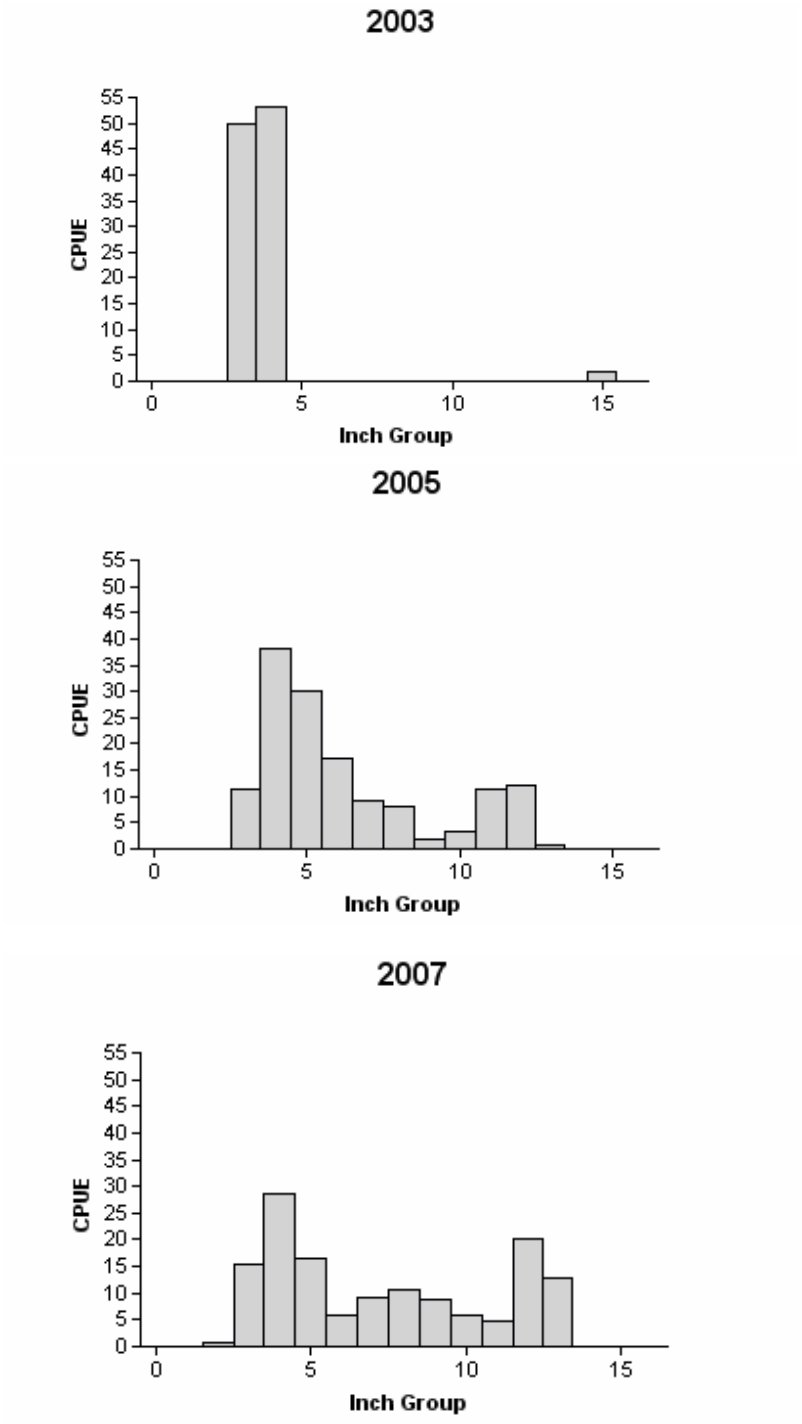
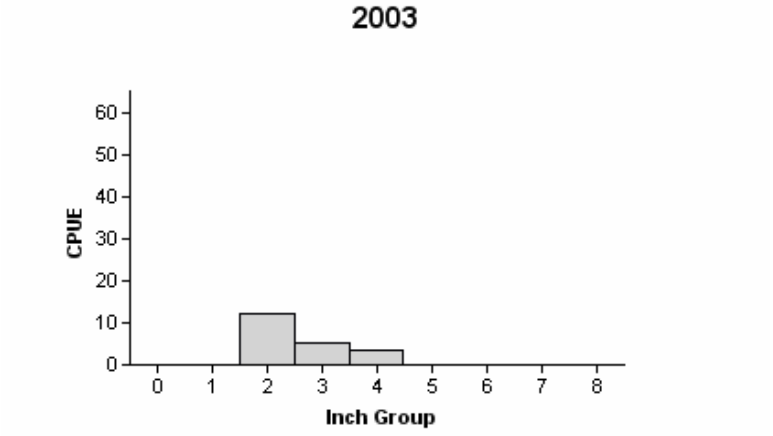
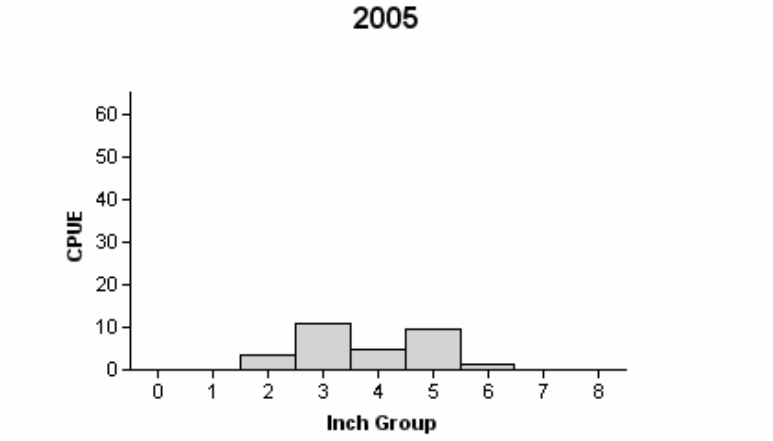


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Twin Buttes Reservoir, Texas, 2003, 2005, and 2007.

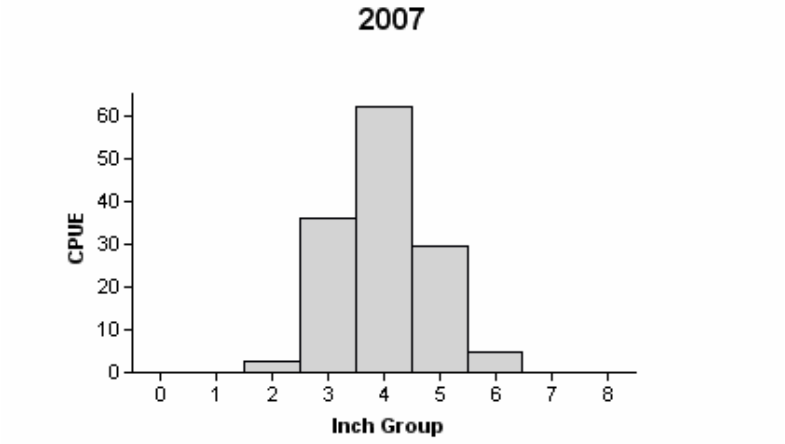
Bluegill



Effort = 0.6
Total CPUE = 20.6 (35; 12)
PSD = 0 (129.6)



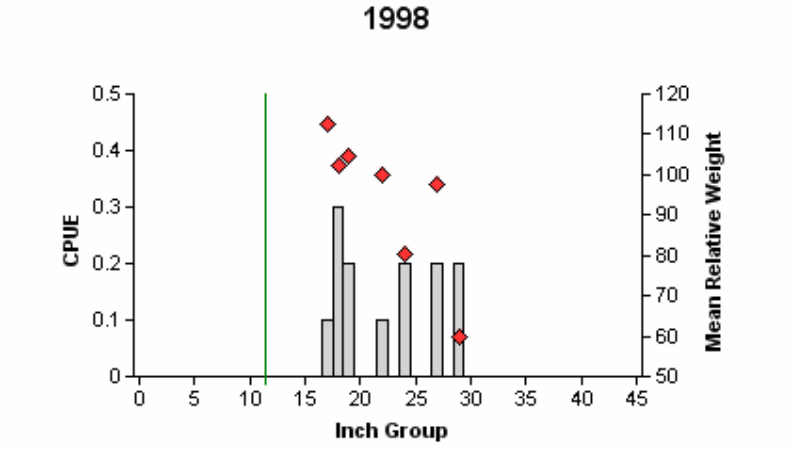
Effort = 1.5
Total CPUE = 29.3 (35; 44)
PSD = 5 (2.9)



Effort = 1.5
Total CPUE = 134.7 (42; 202)
PSD = 4 (1)

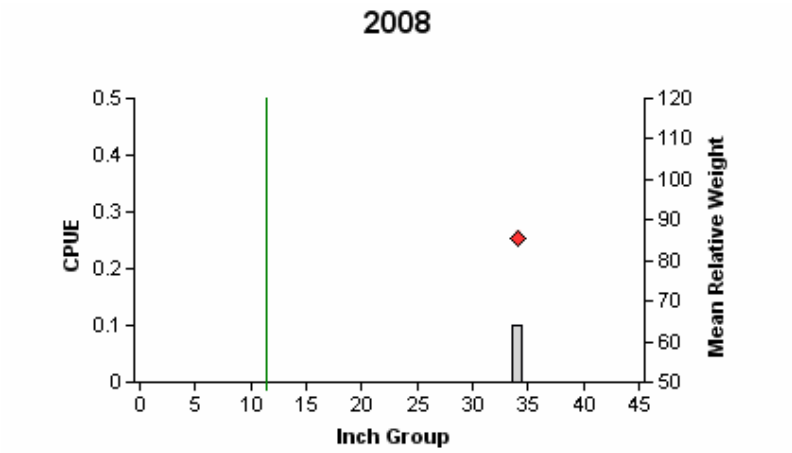
Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Twin Buttes Reservoir, Texas, 2003, 2005, and 2007.

Blue Catfish



Effort = 10.0
Total CPUE = 1.3 (26; 13)

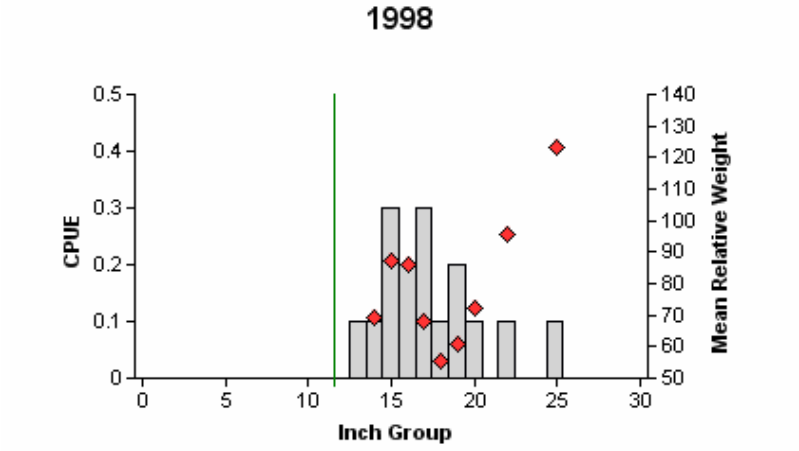
Effort = 7.0
Total CPUE = 0.1 (100; 1)



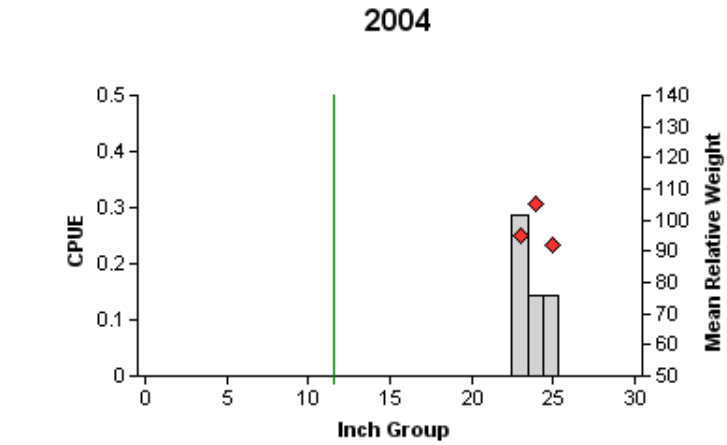
Effort = 10.0
Total CPUE = 0.1 (100; 1)

Figure 4. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Twin Buttes Reservoir, Texas, 1998, 2004, and 2008.

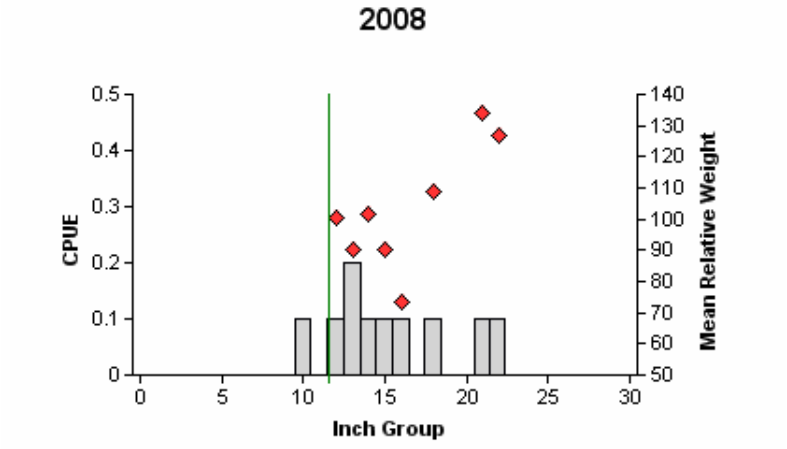
Channel Catfish



Effort = 10.0
Total CPUE = 1.6 (39; 16)
Stock CPUE = 1.6 (39; 16)
PSD = 69 (8)



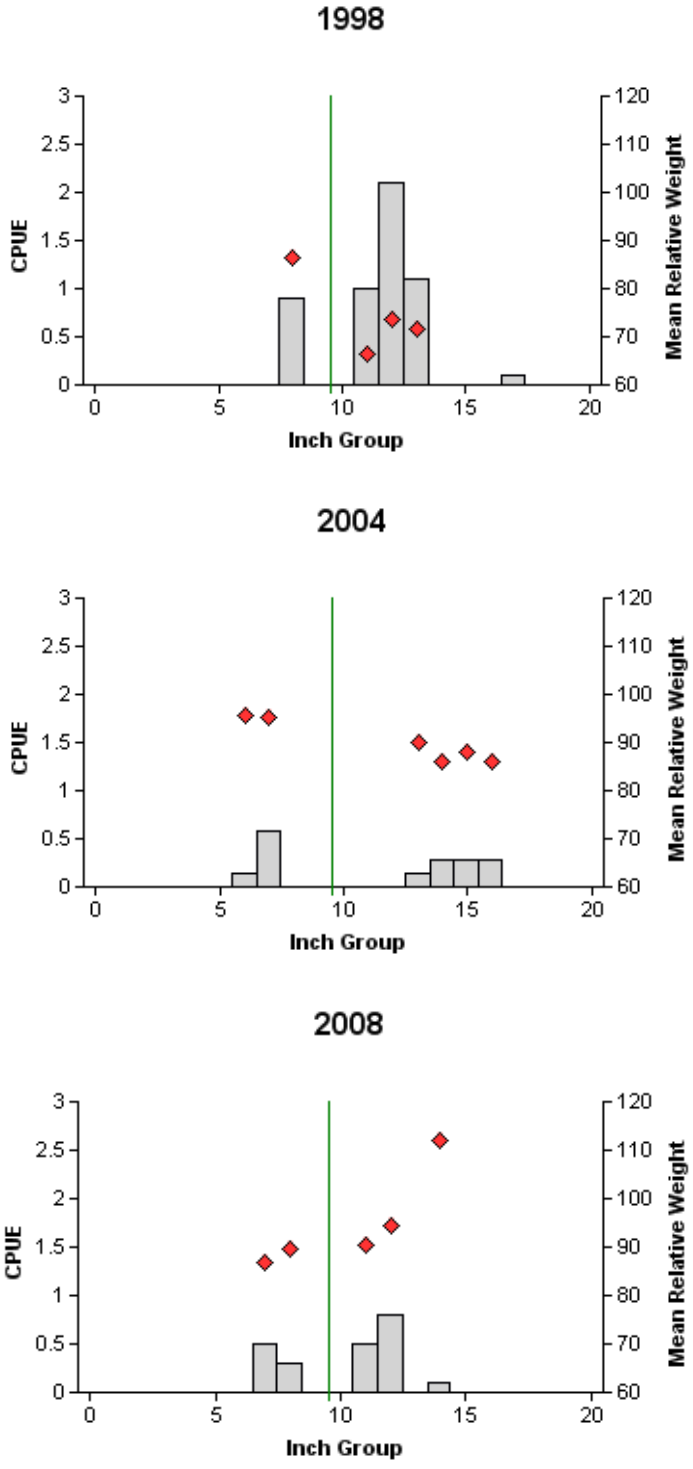
Effort = 7.0
Total CPUE = 0.6 (35; 4)
Stock CPUE = 0.6 (35; 4)
PSD = 100 (0.0)



Effort = 10.0
Total CPUE = 1.0 (49; 10)
Stock CPUE = 0.9 (56; 9)
PSD = 44 (21)

Figure 5. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Twin Buttes Reservoir, Texas, 1998, 2004, and 2008. Vertical line represents the minimum length limit.

White Bass



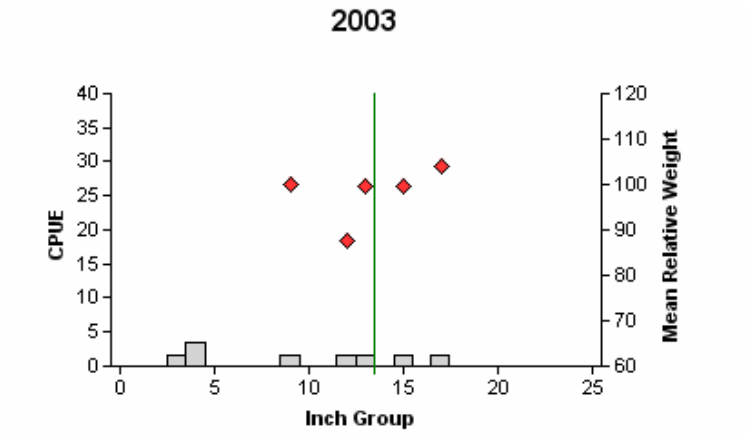
Effort =	10.0
Total CPUE =	5.2 (27; 52)
CPUE-10 =	4.3 (34; 43)
PSD =	83 (9.1)
RSD-P =	63 (8.7)
RSD-M =	2 (2.2)

Effort =	7.0
Total CPUE =	1.7 (55; 12)
CPUE-10 =	1.0 (58; 7)
PSD =	58 (13.5)
RSD-P =	58 (13.5)
RSD-M =	33 (9.4)

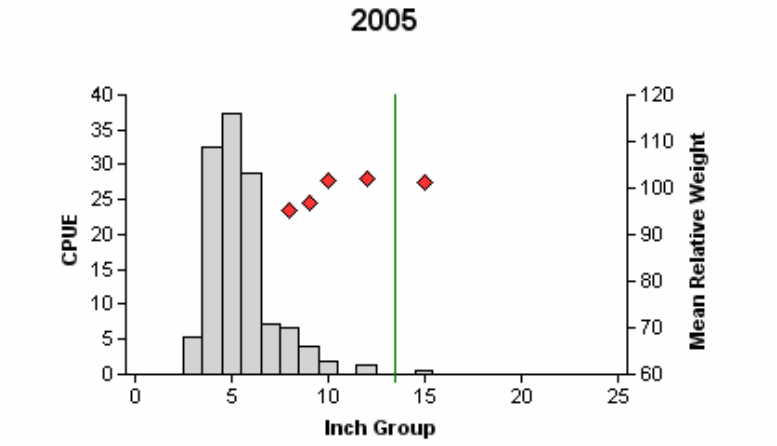
Effort =	10.0
Total CPUE =	2.2 (26; 22)
CPUE-10 =	1.4 (32; 14)
PSD =	64 (15.9)
RSD-P =	41 (10)
RSD-M =	0 (0)

Figure 6. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Twin Buttes Reservoir, Texas, 1998, 2004, and 2008.

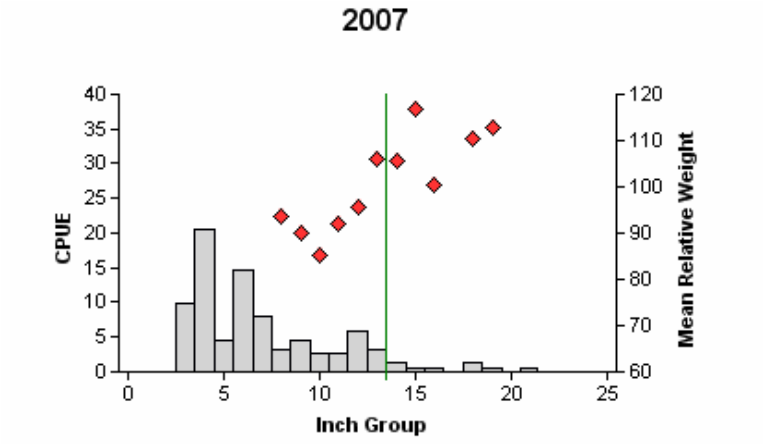
Largemouth Bass



Effort =	0.6
Total CPUE =	13.7 (73; 8)
Stock CPUE =	8.6 (79; 5)
PSD =	80 (6.1)
RSD-P =	40 (12.2)
RSD-M =	0 (0)



Effort =	1.5
Total CPUE =	126.0 (30; 189)
Stock CPUE =	14.7 (34; 22)
PSD =	14 (10.0)
RSD-P =	5 (4.4)
RSD-M =	0 (0)



Effort =	1.5
Total CPUE =	86.0 (34; 129)
Stock CPUE =	28.0 (25; 42)
PSD =	52 (7.3)
RSD-P =	14 (5.3)
RSD-M =	2 (2.4)

Figure 7. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Twin Buttes Reservoir, Texas, 2003, 2005, and 2007. Vertical line represents the minimum length limit.

Largemouth Bass

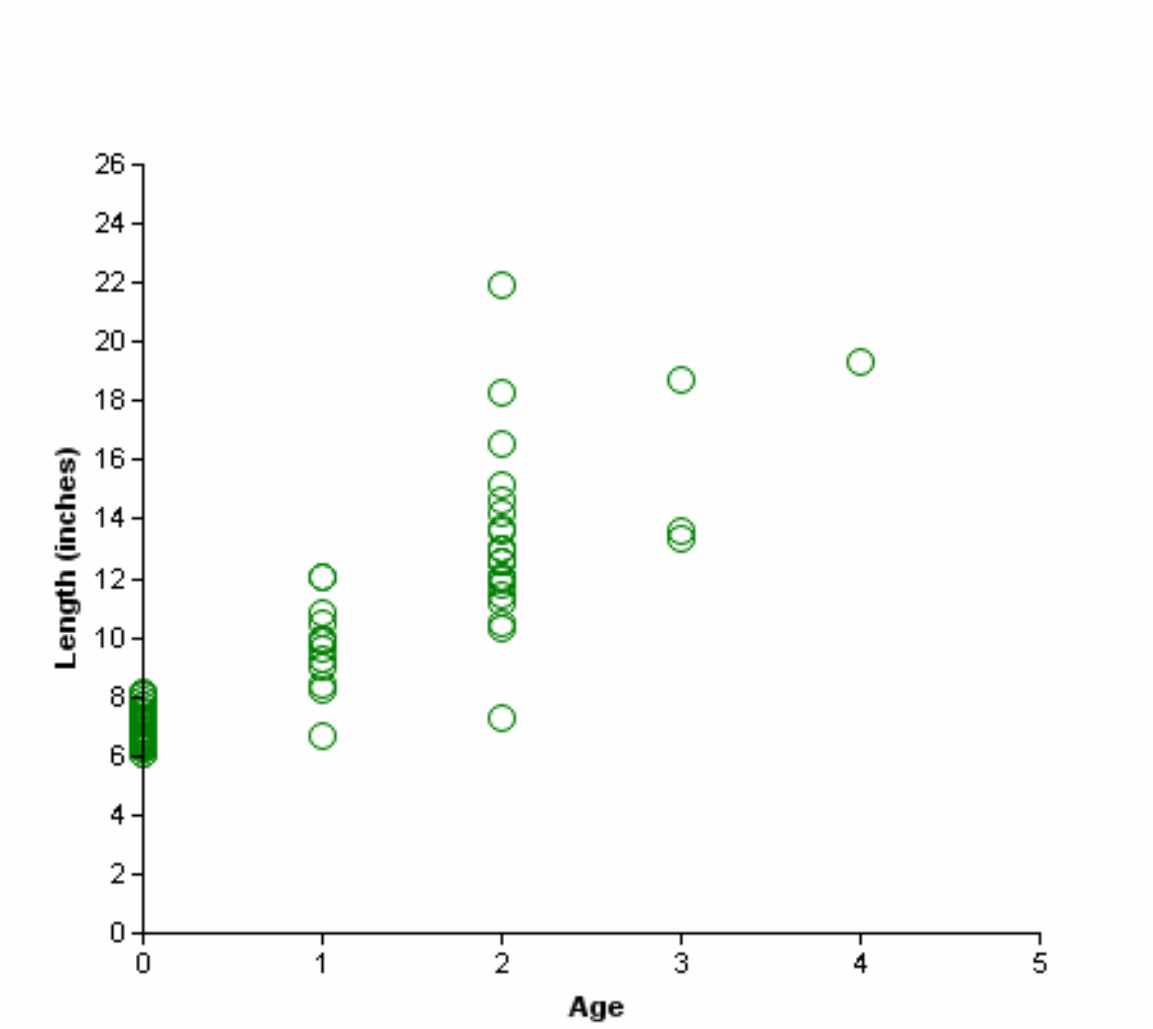
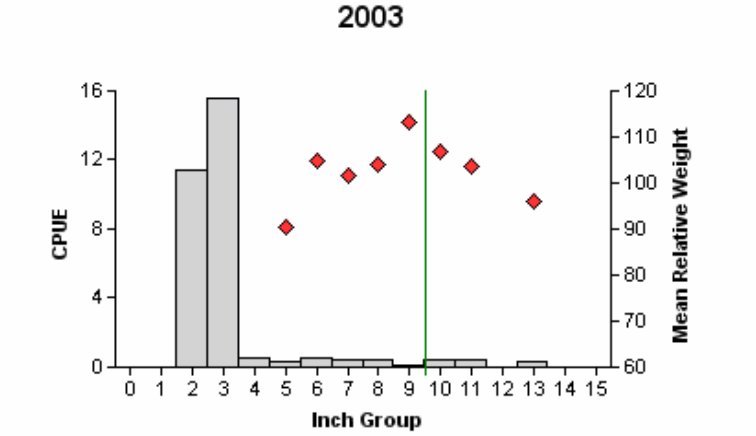
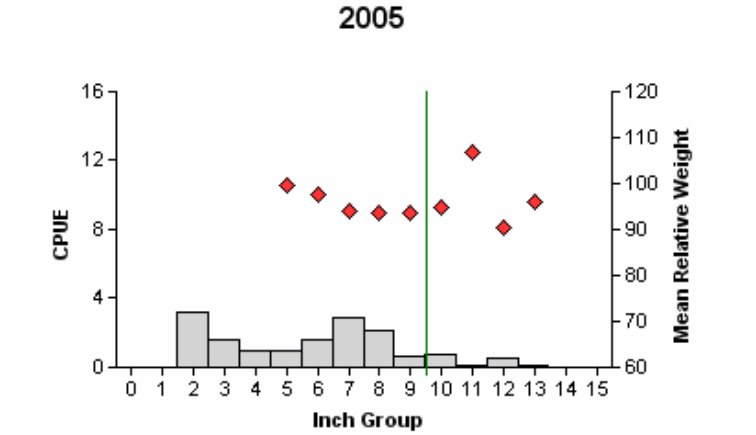


Figure 8. Length at age for largemouth bass collected by electrofishing at Twin Buttes Reservoir, Texas, October 2007. N = 75.

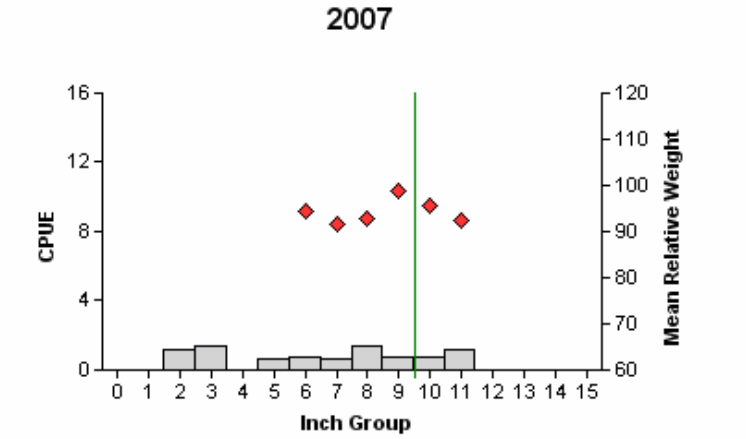
White Crappie



Effort =	7.0
Total CPUE =	30.6 (29; 214)
Stock CPUE =	3.0 (36; 21)
CPUE-10 =	1.1 (55; 8)
PSD =	57 (19.2)



Effort =	10.0
Total CPUE =	15.4 (37; 154)
Stock CPUE =	9.6 (39; 96)
CPUE-10 =	1.4 (42; 14)
PSD =	43 (5.0)



Effort =	5.0
Total CPUE =	8.8 (66; 44)
Stock CPUE =	6.2 (85; 31)
CPUE-10 =	2.0 (100; 10)
PSD =	68 (3.5)

Figure 9. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall trap netting surveys, Twin Buttes Reservoir, Texas, 2003, 2005, and 2007. Vertical line represents the minimum length limit.

White Crappie

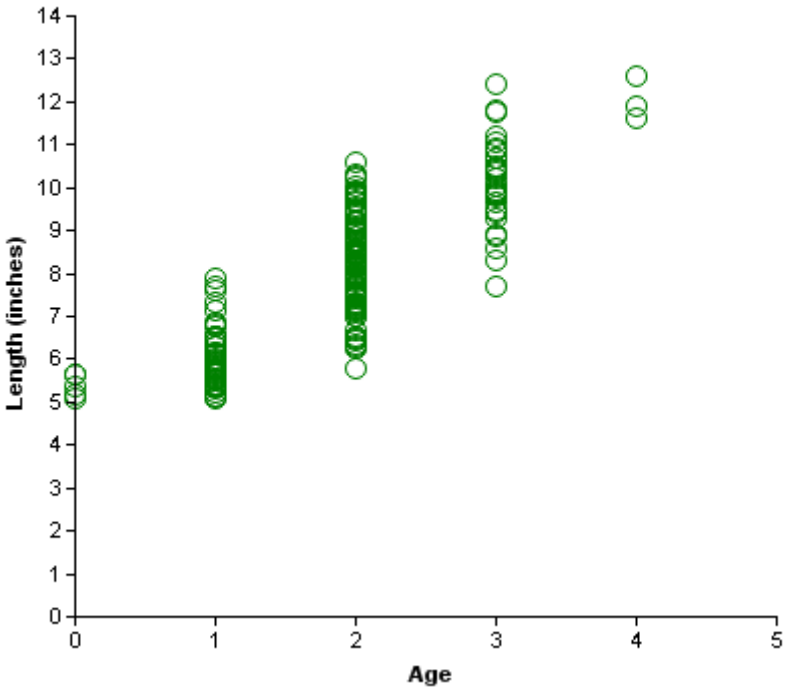


Figure 10. Length at age for white crappie collected by trap netting and experimental netting at Twin Buttes Reservoir, Texas, November 2007. N = 190.

Table 13. Proposed sampling schedule for Twin Buttes Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S, and additional survey denoted by A.

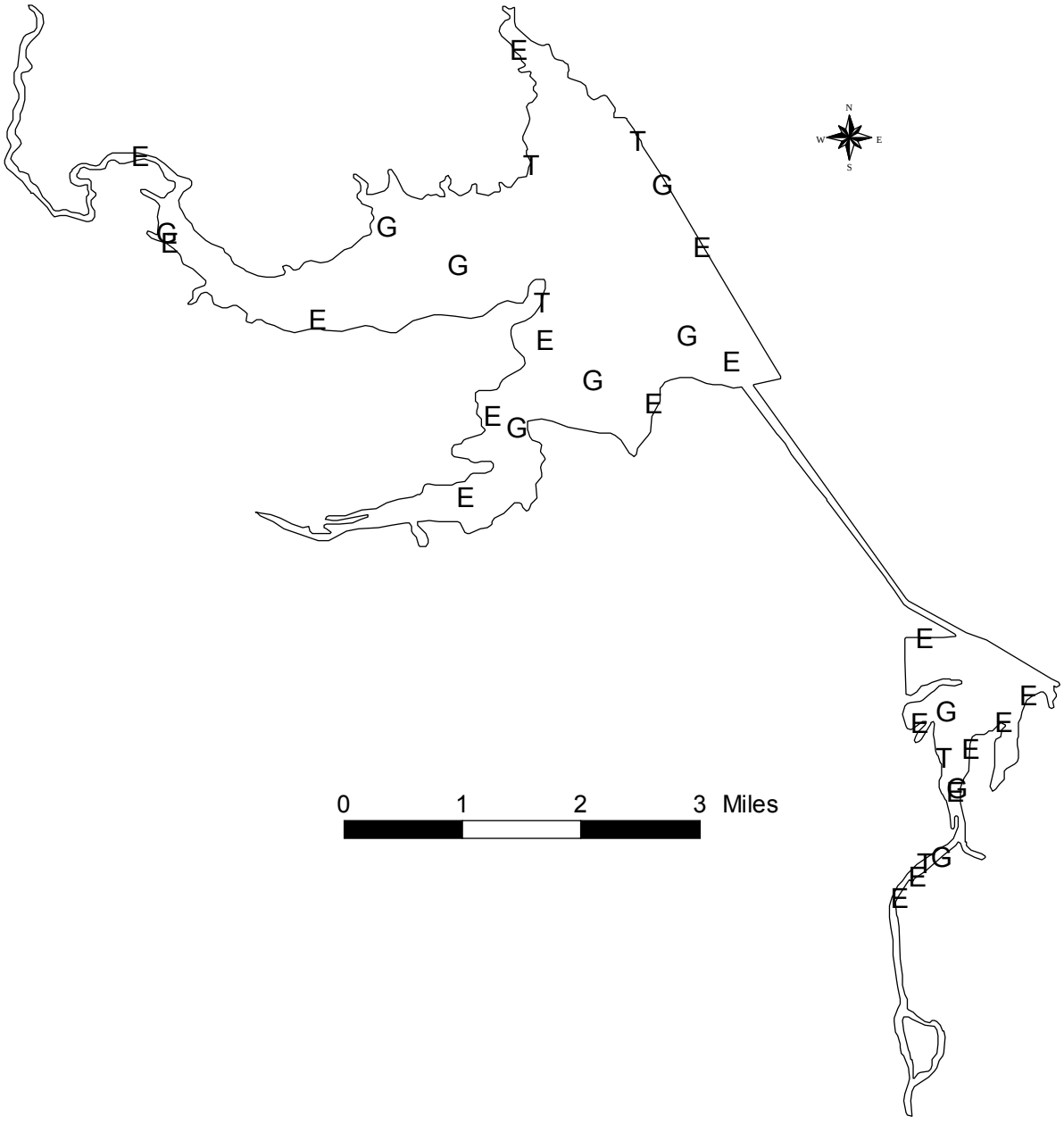
Survey Year	Electrofisher	Trap Net	Gill Net	Creel	Report
Fall 2008-Spring 2009				A	
Fall 2009-Spring 2010	A	A			
Fall 2010-Spring 2011					
Fall 2011-Spring 2012	S	S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Twin Buttes Reservoir, Texas, 2007-2008.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Longnose gar	134	13.40				
Gizzard shad	261	26.10	7	1.40	209	139.33
Threadfin shad					142	94.67
Common carp	74	7.40				
River carpsucker	38	3.80				
Blue catfish	1	0.10				
Channel catfish	10	1.00				
Flathead catfish	1	0.10				
White bass	22	2.20			100	6.67
Striped bass	1	0.10				
Redbreast sunfish					17	1.33
Green sunfish					11	7.33
Warmouth					10	6.67
Bluegill	9	0.90	117	23.40	202	134.67
Longear sunfish			5	1.00	5	31.33
Redear sunfish					2	1.33
Largemouth bass	10	1.00	1	0.20	129	86.00
White crappie	8	0.80	44	8.80	1	0.67
Freshwater drum					1	0.67

APPENDIX B



Location of sampling sites, Twin Buttes Reservoir, Texas, 2007-2008. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was approximately 20-25 feet below conservation pool at time of sampling.