PERFORMANCE REPORT

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FEDERAL AID PROJECT F-30-R-35

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2009 Survey Report

Benbrook Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Benbrook Reservoir were surveyed in 2009 with electrofishing and trap nets, and in 2010 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:** Benbrook Reservoir is a 3,635-acre impoundment located on the Clear Fork of the Trinity River approximately 10 miles southwest of Fort Worth. Water level fluctuates widely in the reservoir. Benbrook Reservoir has consistently been eutrophic. Habitat consisted of standing timber and rocks.

- **Management history:** Important sport fish included white bass, palmetto bass, largemouth bass, white crappie, and catfish. The management plan from the 2005 survey report included stocking palmetto bass at 10 fish/acre annually. Largemouth bass have historically been managed with state-wide minimum length limit of 14 inches. Florida largemouth bass were introduced in the mid-to-late 1970s and stocked again in 2007. Blue catfish were stocked in 1990 and 1991 to capitalize on the abundant prey base. Recent efforts to improve the fish habitat and angler success have included construction of brush-piles in various locations.

- **Fish Community**
  - **Prey species:** Threadfin shad continued to be abundant. Electrofishing catch of gizzard shad was high. Electrofishing catch of bluegills and longear sunfish was much lower than in previous surveys. The reservoir was approximately 5 feet above conservation pool when the electrofishing survey was conducted which made it difficult to get to the bank.

  - **Catfishes:** The channel catfish catch rate nearly doubled from the previous sample. Blue catfish numbers in Benbrook Reservoir declined from the previous sample.

  - **Temperate basses:** White bass, yellow bass, and palmetto bass were present. White bass were collected at a higher rate than in previous years. Yellow bass, which may have been introduced through a pipeline connecting Cedar Creek Reservoir to Benbrook Reservoir, were collected in gill nets for the first time 2006 and continued to be abundant. Palmetto bass abundance remained good over the past two surveys.

  - **Largemouth bass:** Largemouth bass were captured in low abundance. Only one fish over 14 inches was collected. Largemouth bass body condition was poor.

  - **Crappies:** Size and body condition of white crappie continued to be good, and abundance was much higher than the previous sample. Black crappie were sampled for the first time since 2001, but in low numbers.

- **Management Strategies:** Stock palmetto bass at a rate of 10/acre annually. Conduct standard sport fish monitoring in 2013-2014 with an additional electrofishing survey in 2010, and an additional gill netting survey in 2012. Attempt habitat improvements through water willow plantings.

INTRODUCTION

This document is a summary of fisheries data collected from Benbrook Reservoir in 2009-2010. 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 2009-2010 data for comparison.

Reservoir Description

Benbrook Reservoir is a 3,635-acre impoundment constructed in 1952 on the Clear Fork of the Trinity River. It is located in Tarrant County approximately 10 miles southwest of Fort Worth and is operated and controlled by the United States Army Corps of Engineers (USACE). Primary water uses included municipal water supply (controlled by Tarrant Regional Water District [TRWD]) and recreation. Benbrook Reservoir was listed as hypereutrophic with a mean TSI chl-*a* reading of 58.24, which was slightly higher than the 2004 sample (Texas Commission on Environmental Quality 2008). The primary habitat at time of sampling consisted of rocks and standing timber. No aquatic vegetation was observed during the habitat survey. Water level has been highly variable since 1999, and in subsequent years the water level has reached 10 or more feet below conservation pool (Figure 1). Tarrant Regional Water District began drawing more water from Benbrook Reservoir (Clear Fork) for municipal uses in 2005 to reduce the demand on the West Fork of the Trinity River Reservoirs (e.g., Bridgeport, Eagle Mountain, and Worth). Boat access consisted of 16 public boat ramps witin six public parks, but can be extremely limited when water levels are low. Bank fishing access was available at Holiday Park, Mustang Park, Rocky Creek Park, and Longhorn Park. Other descriptive characteristics for Benbrook Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Hungerford and Brock 2006) included:

1. Maintain a quality palmetto bass fishery through annual stocking.
   Action: Palmetto bass have been stocked annually at a rate of 10 fish/acre since the early 1990s, except in 2000 and 2001 due to golden alga toxins at TPWD fish hatcheries. Subsequent gill netting surveys have indicated these stockings have been successful. An annual creel survey in 2001 revealed 12% of anglers were seeking palmetto bass.

2. In 2006, water levels rose to conservation pool after a significant period of low water inundating terrestrial vegetation.
   Action: Florida largemouth bass were stocked at a rate of 50/acre.

3. Drastic water level fluctuations have persisted at Benbrook since 1999. Low water levels in 2005 along with collaboration with TRWD and the USACE allowed us to build and place several brush piles made of recycled Christmas trees.
   Action: Subsequent visual inspections of the brush piles revealed their longevity was poor; they were essentially gone in 6 months. The low return for the effort expended caused us to discontinue the plan. Planting water willow was also discussed, but never was performed because we were unable to identify a good source of transplants.

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

Stocking history: Benbrook Reservoir has been stocked periodically since the early 1990's and annually since 2002 with palmetto bass. Threadfin shad were introduced in 1984, blue catfish in 1990, and Florida largemouth bass in 1974; these species were still present in the reservoir. The complete stocking history

is in Table 3.

Vegetation/habitat history: No aquatic vegetation was found in Benbrook Reservoir during the 2009 habitat survey. Historically, native emergent aquatic vegetation (cattail and water willow) was present (Brock 2002). Drastic water level fluctuations since 1999 are likely the cause for the disappearance.

Water Transfer: Benbrook Reservoir is primarily used for municipal water supply, recreation, and to a lesser extent, flood control. There is currently one permanent pumping station on the reservoir which connects to a raw water treatment plant for municipal use. There is also an outfall from a pipeline operated by TRWD that transfers water to Benbrook Reservoir from Richland Chambers and Cedar Creek Reservoirs in East Texas. According to TRWD staff, the water is mixed with approximately 66.7% Richland Chambers water and 33.3% from Cedar Creek.

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 per net night (fish/nn). Due to excessively low water levels during the fall of 2005, electrofishing was not conducted at Benbrook Reservoir because access was not available. 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).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and condition indices [relative weights (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 and SE was calculated for structural indices and IOV. Ages were determined using otoliths. Source for water level data was the United States Geological Survey website with cooperation from the Fort Worth District of the United States Army Corps of Engineers.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of natural and standing timber (Table 4). Large water level fluctuations beginning in 1999 have been detrimental to the littoral habitat in Benbrook Reservoir. Native emergent vegetation (cattail and water willow) was present prior to drastic water level fluctuations.

Prey species: Electrofishing catch rates of gizzard shad were 288.0/h in 2006 and 207.0/h in 2009. Index of vulnerability (IOV) for gizzard shad was excellent, indicating that 95% of gizzard shad were available to existing predators; this was higher than IOV estimates in previous years (Figure 2). Total CPUE of gizzard shad was slightly lower in 2009 compared to the 2006 survey but higher than the 2003 survey (Figure 2). Electrofishing catch rate of threadfin shad was 787.0/h. Total CPUE of bluegill in 2009 was only 21.0/h, which is much lower than the previous surveys (Figure 3). Longear sunfish total CPUE was 12.0/h in 2009 which is much lower than the previous two surveys (Figure 4). The reservoir was 4.7 feet above conservation pool making it difficult to sample the shoreline because terrestrial vegetation obstructed our path. With the exception of the sunfishes in 2009, Benbrook Reservoir continued to support an excellent forage base.

Catfishes: Flathead catfish are present in the reservoir as one individual was collected in 2009-2010. The gill net catch rate of blue catfish was 1.4/nn in 2010 (Figure 5). This CPUE is approximately half that of the previous two surveys. Relative weights of blue catfish were good in 2006 and 2008. Because of the relatively low catch rate, only one blue catfish was weighed from the 2010 sample. Several small

individuals were collected indicating natural reproduction. Total CPUE of channel catfish was 7.2/nn in 2010, which is more than double the 2006 and 2008 surveys (Figure 6). Relative weights of stock-size (11 inches) channel catfish were generally above 90.

White bass: The gill net catch rate of white bass was 7.6/nn in 2010. This CPUE was much higher than the previous two (Figure 7). Nearly all fish collected were legal for harvest and relative weights were around 100.

Palmetto bass: The gill net catch rate of palmetto bass was 3.8/nn, down from the historic high of 8.4/nn in 2006, but similar to the catch rate in 2008. Mean relative weights were generally between 90 and 100 (Figure 8). Growth of palmetto bass was good with fish reaching 18 inches in 2 to 3 years (Figure 9).

Largemouth bass: The electrofishing catch rate of largemouth bass in 2009 was 32.0/h. As was the case with the sunfish species, the high water levels encountered during the fall electrofishing survey in 2009 made the sampling conditions less than ideal. Flooded terrestrial vegetation blocked us from accessing the water level and we ultimately were sampling deeper water than usual. The electrofishing catch rate of largemouth bass was 120.0/h in 2006 and 66.0/h in 2003. Catch rate of largemouth bass over 14 inches remained low, with only 1 individual collected in 2010. A ten-year high of 9 individuals were collected in 2006, and 3 individuals were observed during the 2003 survey. So few fish were sampled in 2009 that relative weight calculations were meaningless; however, the mean relative weights of nearly all sizes of fish in 2006 were good, ranging between 90 and 110. It appears the varying water level is, at the very least, affecting our ability to collect adequate and consistent electrofishing data, and could potentially be influencing the abundance of the largemouth bass population. Florida largemouth bass influence has remained relatively constant as Florida alleles have ranged from 48.3% (1999) to 63.0% (2009) and the pure Florida genotype has ranged from 0.0 to 19.2% (Table 5). Procedures for genetic analysis changed from testing one to two allozymes in the early 2000s to testing micro-satellites in 2007. This could explain the drop in the pure Florida genotype.

Crappie: The trap net catch rate of white crappie was 11.0/nn in 2009, much higher than in 2005 (2.0/nn) and higher than in 2001 (8.6/nn). The PSD was 98 which was higher than the PSD in 2005 and higher than the PSD in 2001 (Figure 11). Mean relative weight was around 90 for all size classes in 2009. Four black crappie were collected during the 2009 trap net survey.

Fisheries management plan for Benbrook Reservoir, Texas

Prepared – July 2010.

ISSUE 1: Palmetto bass continue to provide a quality fishery in Benbrook Reservoir. However, the fishery has to be maintained through stocking.

MANAGEMENT STRATEGIES

1. Stock fingerling palmetto bass (10/acre) annually based upon actual surface area.
2. Conduct gill net surveys every other year to monitor growth, relative abundance, and condition of palmetto bass.

ISSUE 2: Recently, the Tarrant Regional Water District (TRWD) has modified their policy of drinking water distribution resulting in drastic water level fluctuations at Benbrook Reservoir. In addition, drought conditions have amplified the effects of the water level. In the winter of 2005, the water level reached a historic low of 14 feet below conservation pool. The potential detrimental impact on habitat with these water level fluctuations is great. Collaboration among TRWD, U.S Army Corps of Engineers, and TPWD to enhance aquatic habitat (brush-pile construction) during low water levels was successful; however effectiveness was short-lived due to the rapid deterioration of the material used.

MANAGEMENT STRATEGY

1. Request water willow from new TPWD aquatic plant nursery site in Athens for test planting in several shoreline areas. If test plots are successful, the strategy will be expanded to other portions of the reservoir.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant Salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes an additional electrofishing survey in the fall of 2010, gill netting in spring of 2012, and standard monitoring in 2013/2014 (Table 6). Gill net surveys will be conducted every other year to monitor the palmetto bass fishery.

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, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Hungerford, T. and R. Brock. 2006. Statewide freshwater fisheries monitoring and management program survey report for Benbrook Reservoir, 2005. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

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.

Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional Size Distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7):348.

Texas Commission on Environmental Quality. 2008. Trophic Classification of Texas Reservoirs: 2008 Water Quality Inventory and 303(d) List. 15 pp.

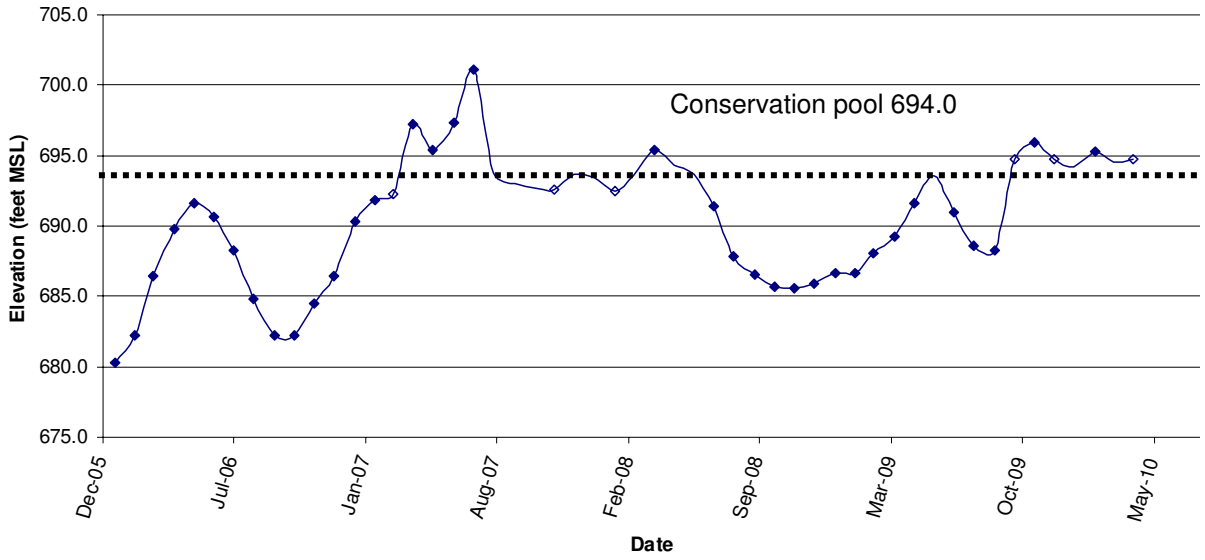


Figure 1. Mean monthly water level elevations in feet above mean sea level (MSL) recorded for Benbrook Reservoir, Texas.

Table 1. Characteristics of Benbrook Reservoir, Texas.

Characteristic	Description
Year Constructed	1952
Controlling authority	U.S. Army Corps of Engineers
Counties	Tarrant
Reservoir type	Mainstream
Shoreline Development Index (SDI)	4.48
Conductivity	303 umhos/cm

Table 2. Harvest regulations for Benbrook Reservoir, Texas.

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, Palmetto	5	18 minimum
Bass, largemouth	5	14 minimum
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 minimum

Table 3. Stocking history of Benbrook, 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)
Blue catfish	1990	38,246	FGL	1.9
	1991	37,446	FGL	2.1
	Total	75,692		
Channel catfish	1970	15,000	AFGL	7.9
	1972	9,374	AFGL	7.9
	Total	24,374		
Florida Largemouth bass	1974	50,800	FGL	2.0
	1974	48,000	FRY	1.0
	1976	180,000	FRY	1.0
	1992	38,271	FGL	1.2
	1992	151,318	FRY	0.9
	1997	190,546	FGL	1.6
	2002	181,438	FGL	1.6
	2007	182,472	FGL	1.6
	Total	1,022,845		
Largemouth bass	1968	115,000	UNK	UNK
	1969	98,000	UNK	UNK
	Total	213,000		
Palmetto bass (striped X white bass hybrid)	1978	19,980	UNK	UNK
	1979	38,190	UNK	UNK
	1982	30,000	UNK	UNK
	1991	59,600	FRY	1.0
	1992	30,126	FGL	1.3
	1994	57,133	FGL	1.3
	1995	97,887	FGL	1.3
	1996	59,212	FGL	1.3
	1997	57,000	FGL	1.7
	1998	57,423	FGL	1.1
	1999	32,244	FGL	1.5
	2002	18,954	FGL	1.5
	2003	33,760	FGL	1.5
	2004	38,050	FGL	1.4
	2005	54,628	FGL	1.7
	2006	36,336	FGL	1.6
	2008	26,209	FGL	1.4

Table 3, continued

Species	Year	Number	Life Stage	Mean TL (in)
	2009	27,847	FGL	1.4
	Total	774,579		
Threadfin shad	1984	1,000	AFGL	2.0
	Total	1,000		

Table 4. Survey of littoral zone and physical habitat types, Benbrook Reservoir, Texas, 2009. 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 habitat found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Rocky shoreline	1.8	4.7		
Standing timber			1081	29.7
Natural	29.1	76.1		
Riprap	1.0	2.6		
Rock bluff	1.9	5.0		
Gravel	4.4	11.6		

Gizzard shad

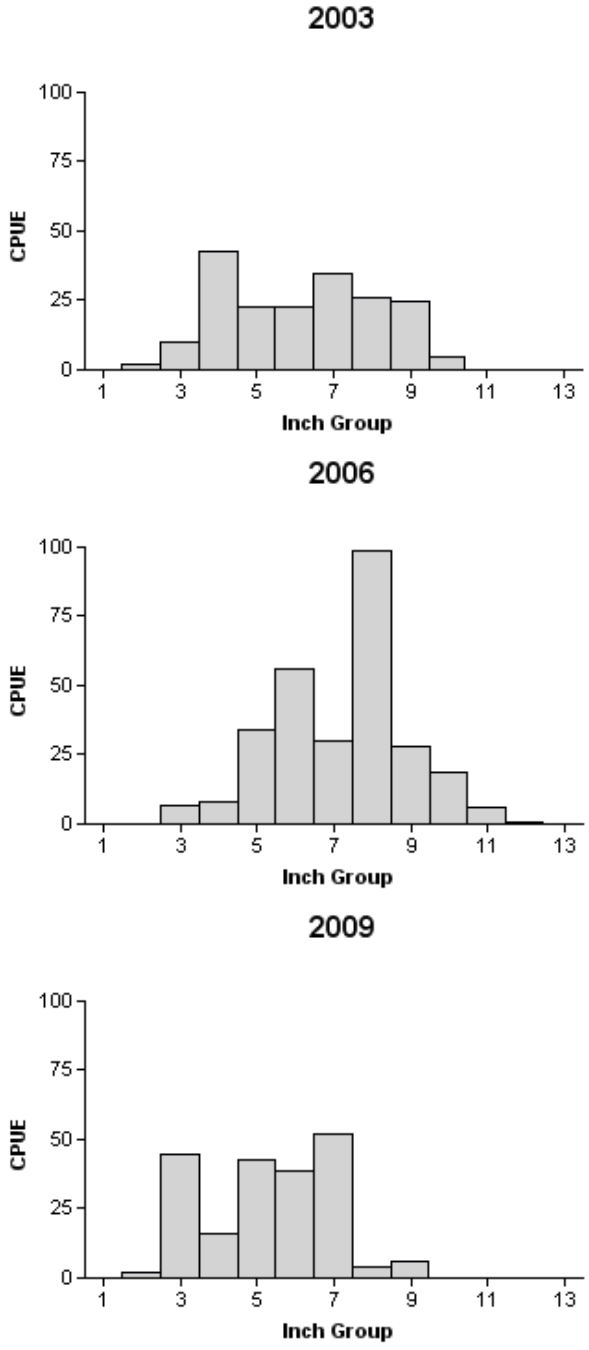
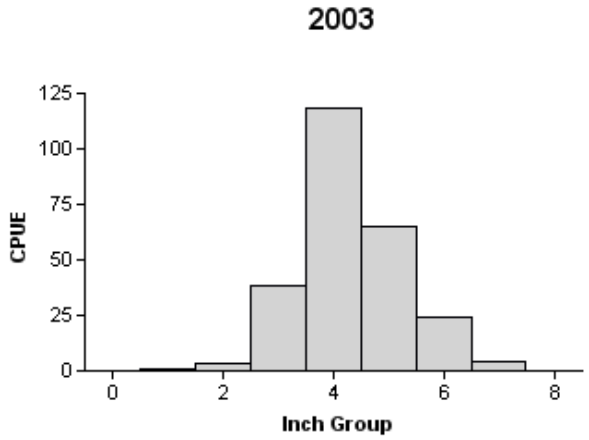
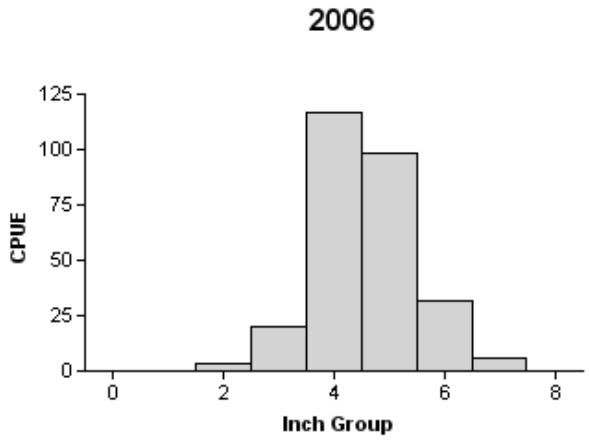


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Benbrook Reservoir, Texas.

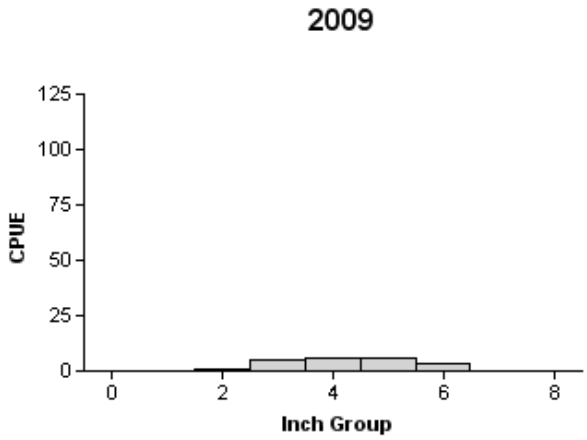
Bluegill



Effort = 1.0
Total CPUE = 253.0 (25; 253)
Stock CPUE = 249.0 (25; 249)
CPUE-6 = 28.0 (53; 28)
PSD = 11 (4.3)



Effort = 1.0
Total CPUE = 276.0 (30; 276)
Stock CPUE = 273.0 (30; 273)
CPUE-6 = 38.0 (40; 38)
PSD = 14 (2.4)



Effort = 1.0
Total CPUE = 21.0 (40; 21)
Stock CPUE = 20.0 (38; 20)
CPUE-6 = 3.0 (52; 3)
PSD = 15 (5.3)

Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE in parentheses) for fall electrofishing surveys, Benbrook Reservoir, Texas.

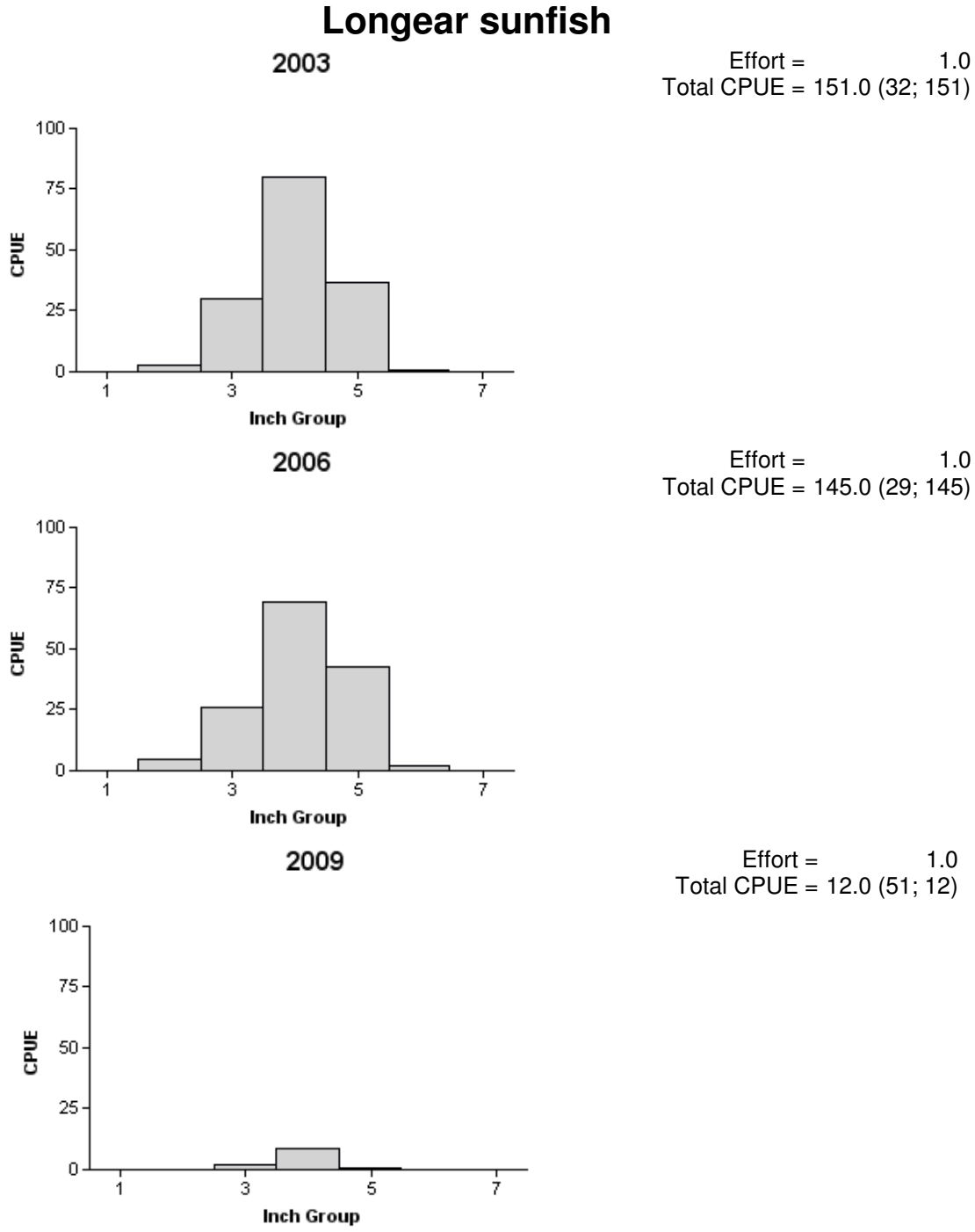


Figure 4. Number of longear sunfish caught per hour (CPUE; RSE and N for CPUE in parentheses) for fall electrofishing surveys, Benbrook Reservoir, Texas.

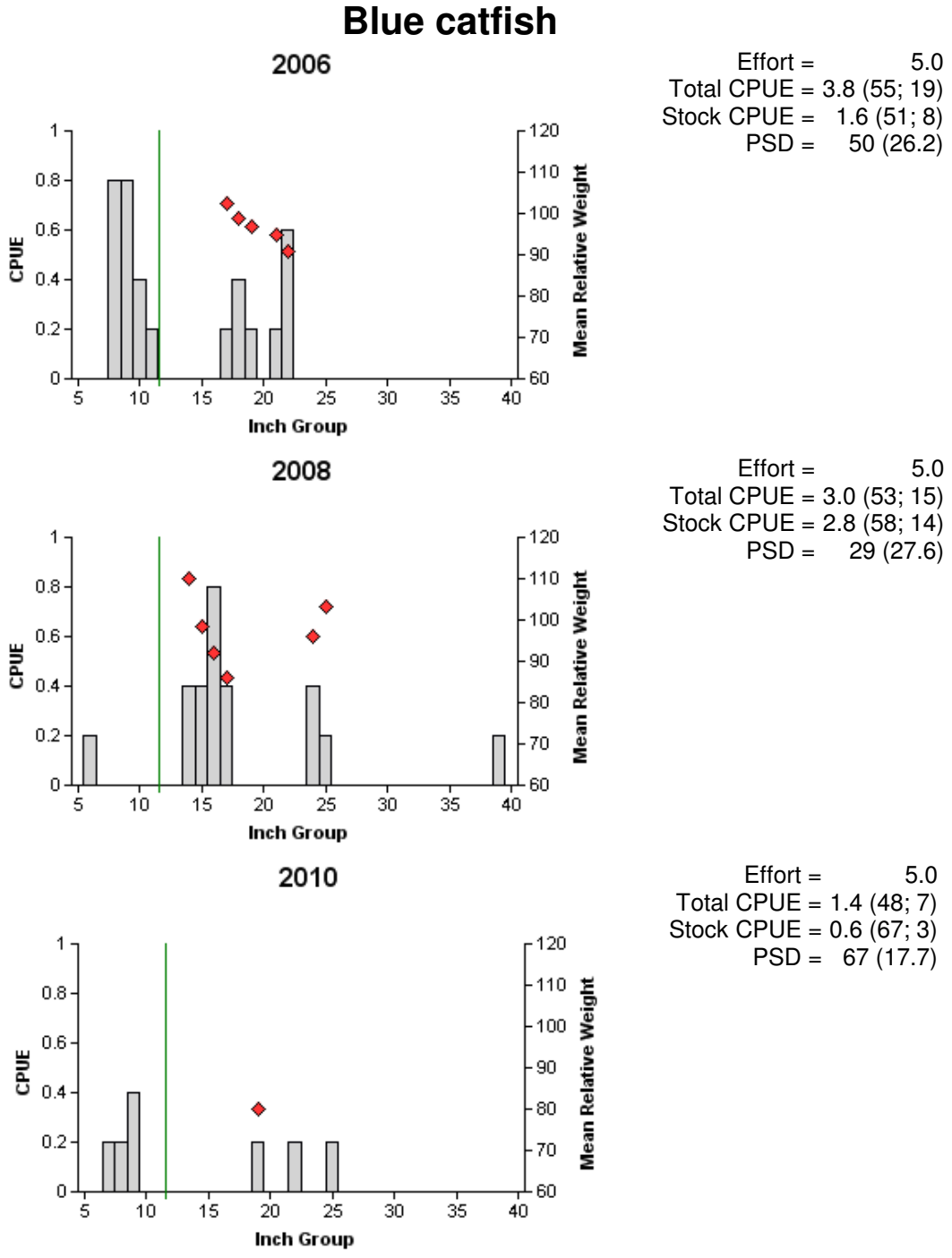
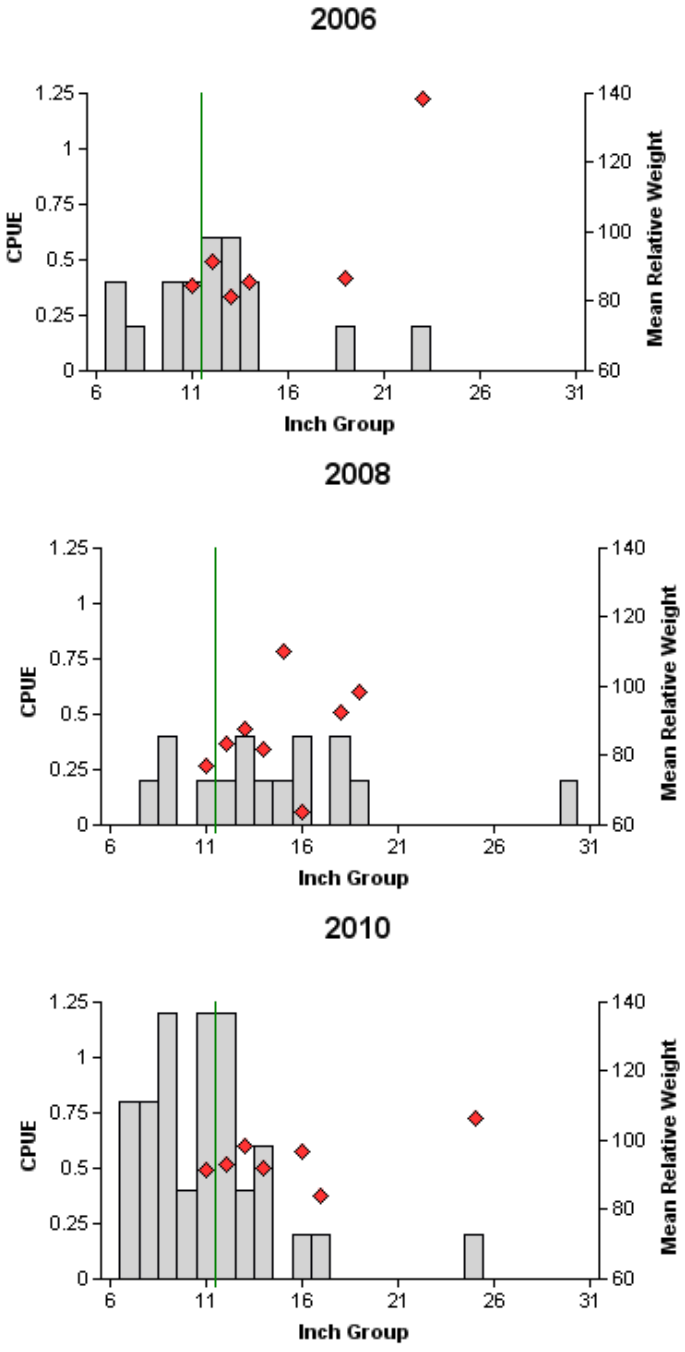


Figure 5. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Benbrook Reservoir, Texas. Solid vertical lines indicate minimum length limit at time of sampling.

Channel catfish



2006
Effort = 5.0
Total CPUE = 3.4 (55; 17)
Stock CPUE = 2.4 (73; 12)
PSD = 17 (6.7)

2008
Effort = 5.0
Total CPUE = 3.0 (45; 15)
Stock CPUE = 2.4 (41; 12)
PSD = 50 (13.2)

2010
Effort = 5.0
Total CPUE = 7.2 (25; 36)
Stock CPUE = 4.0 (33; 20)
PSD = 15 (3.8)

Figure 6. 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 netting surveys, Benbrook Reservoir, Texas. Solid vertical lines indicate minimum length limit at time of sampling.

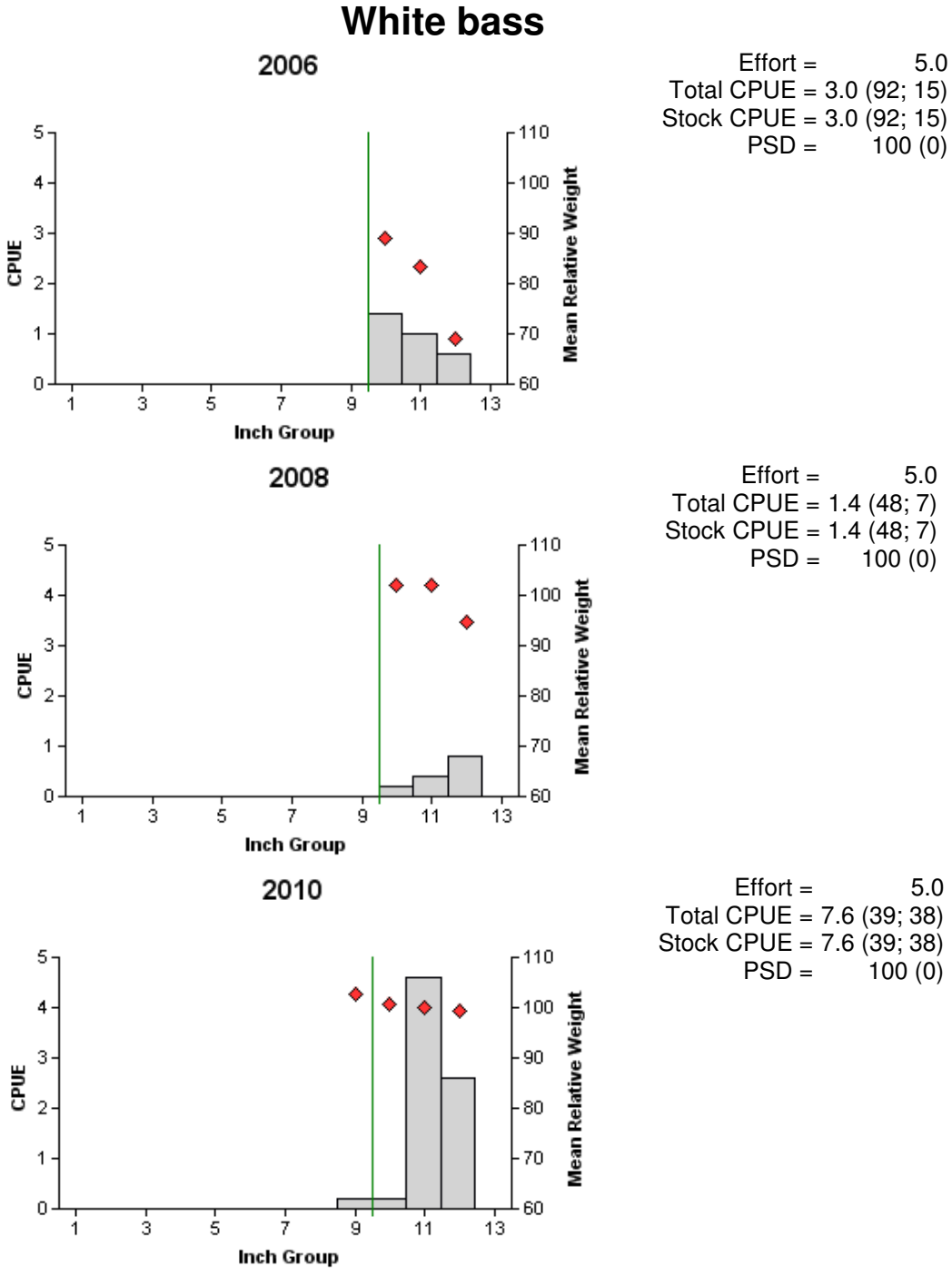


Figure 7. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Benbrook Reservoir, Texas. Solid vertical lines indicate minimum length limit at time of sampling.

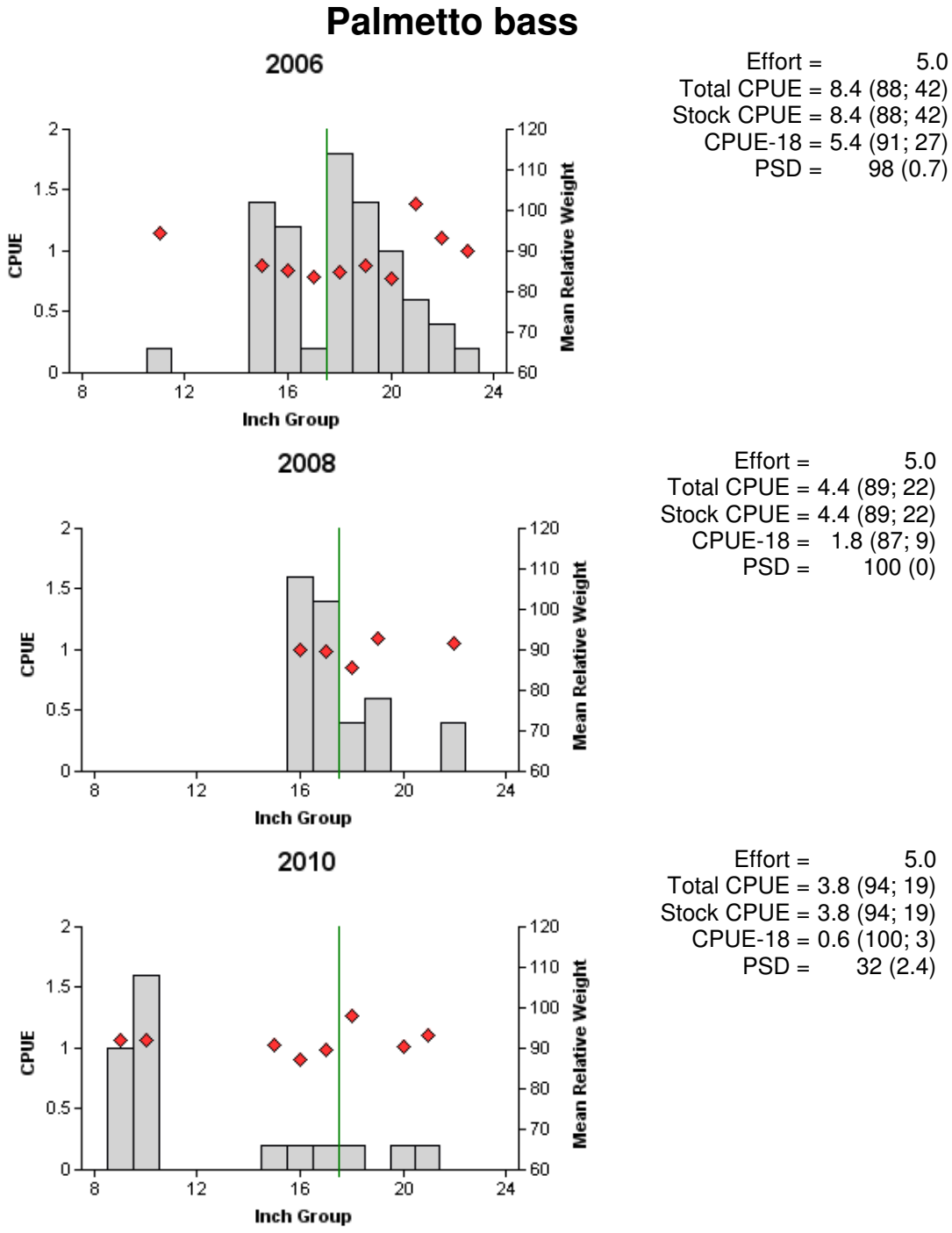


Figure 8. Number of palmetto bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting surveys, Benbrook Reservoir, Texas. Solid vertical lines indicate minimum length limit at time of sampling.

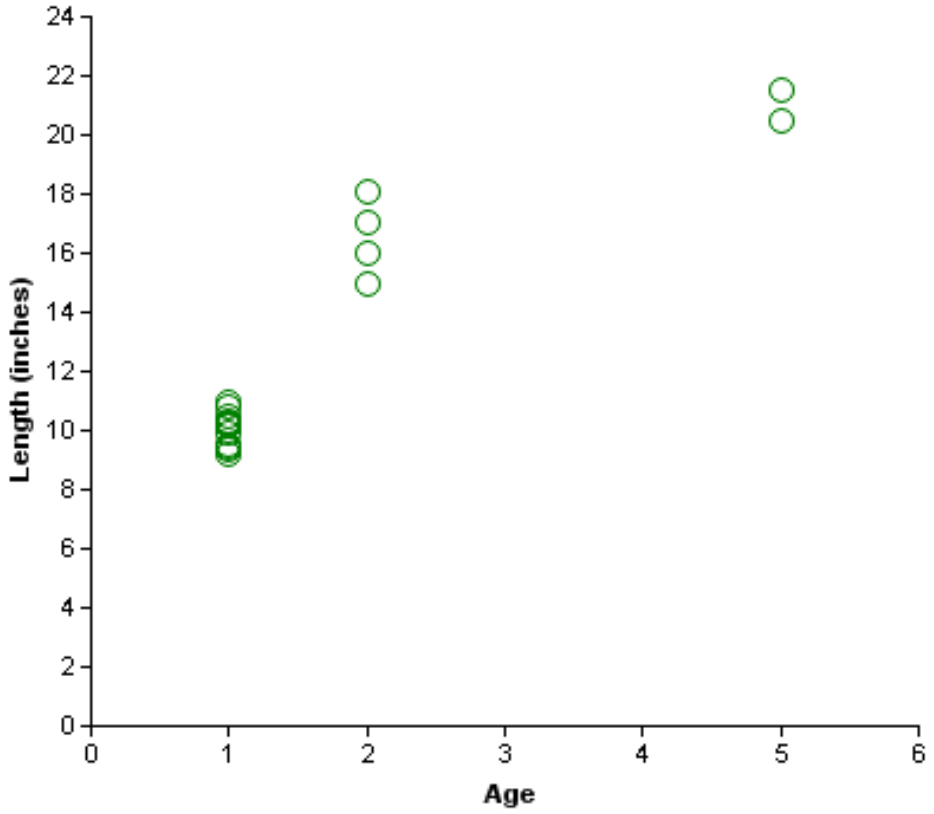
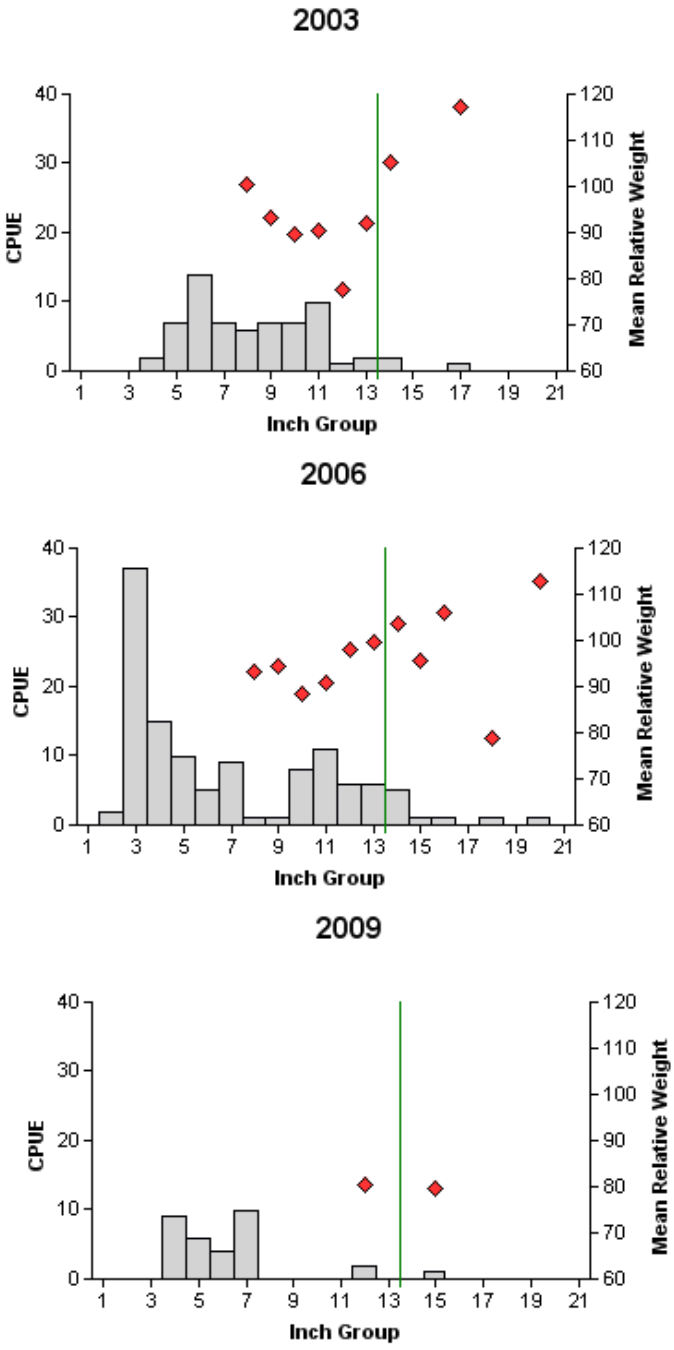


Figure 9. Length at age for palmetto bass (sexes combined) collected from gill nets at Benbrook Reservoir, Texas, March 2010 (N=19).

Largemouth bass



2003
Effort = 1.0
Total CPUE = 66.0 (21; 66)
Stock CPUE = 36.0 (28; 36)
CPUE-14 = 3.0 (52; 3)
PSD = 17 (4)

2006
Effort = 1.0
Total CPUE = 120.0 (18; 120)
Stock CPUE = 42.0 (22; 42)
CPUE-14 = 9.0 (47; 9)
PSD = 50 (7.5)

2009
Effort = 1.0
Total CPUE = 32.0 (27; 32)
Stock CPUE = 3.0 (72; 3)
CPUE-14 = 1.0 (100; 1)
PSD = 100 (0)

Figure 10. 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, Benbrook Reservoir, Texas. Solid vertical lines indicate minimum length limit at time of sampling.

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Benbrook Reservoir, Texas, for various years. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

		Genotype					
Year	Sample size	FLMB	F1	Fx	NLMB	% FLMB alleles	% pure FLMB
1996	26	5	3	13	5	50.1	19.2
1999	30	3	7	14	6	48.3	10.0
2001	29	5	10	10	4	52.6	17.2
2009	25	0	1	24	0	63.0	0.0

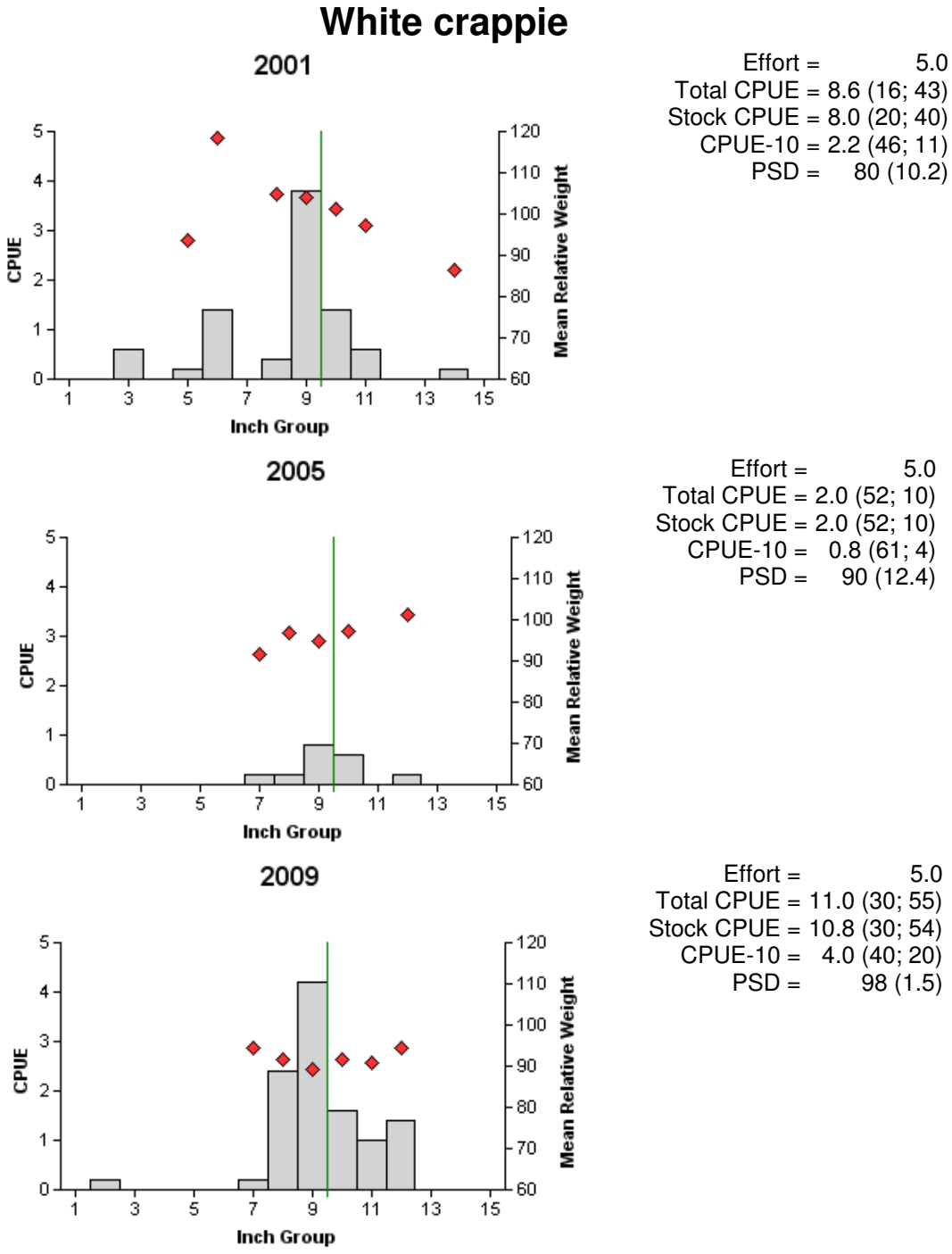


Figure 11. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Benbrook Reservoir, Texas. Solid vertical lines indicate minimum length limit at time of sampling.

Table 6. Proposed sampling schedule for Benbrook 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.

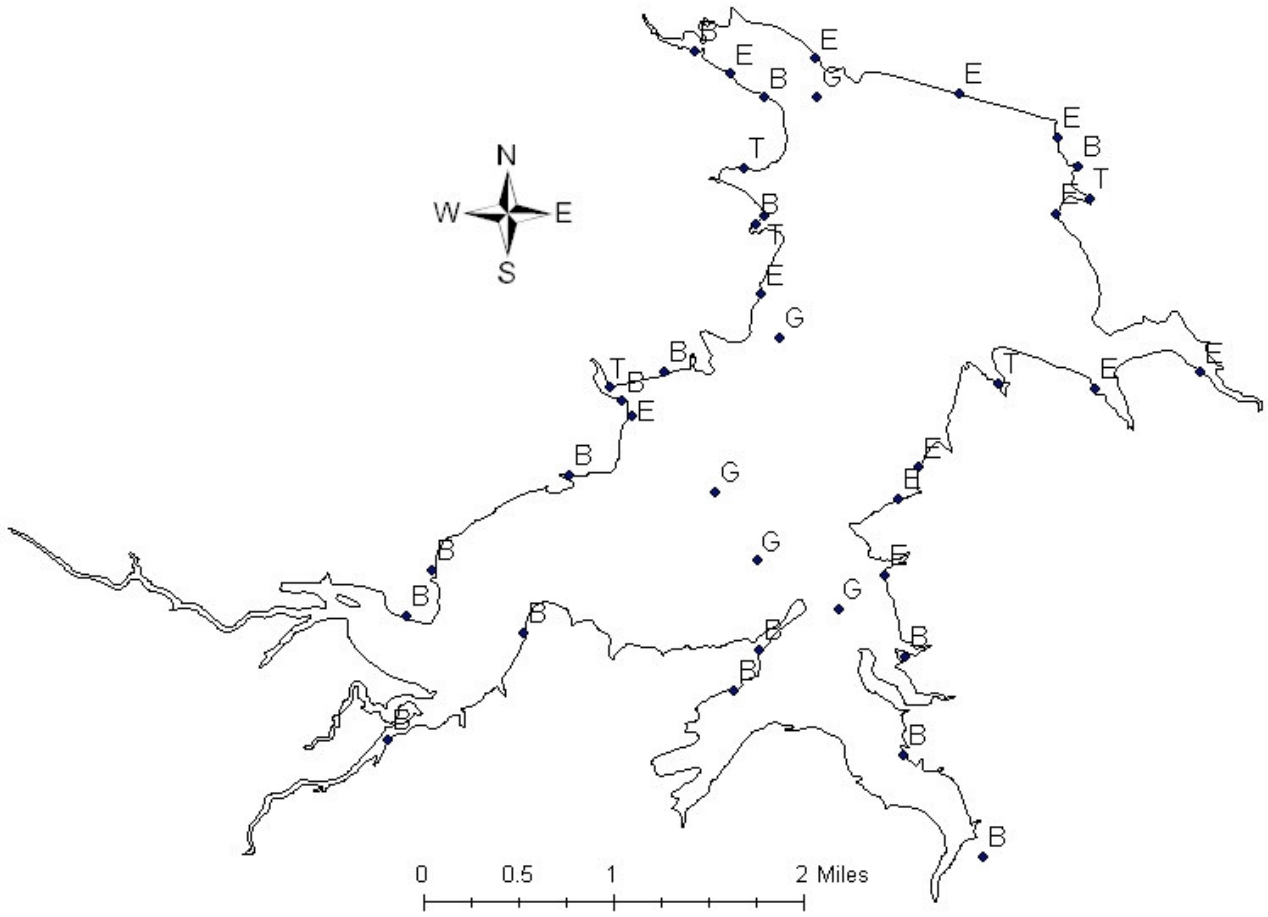
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Report
Fall 2010-Spring 2011	A				
Fall 2011-Spring 2012			A		
Fall 2012-Spring 2013					
Fall 2013-Spring 2014	S	S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Benbrook Reservoir, Texas, 2009-2010.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	139	27.8			207	207.0
Threadfin shad					787	787.0
Common carp	46	9.2				
River carpsucker	8	1.6				
Blue catfish	7	1.4				
Channel catfish	36	7.2				
White bass	38	7.6				
Yellow bass	59	11.8				
Palmetto bass	19	3.8				
Bluegill					21	21.0
Longear sunfish					12	12.0
Largemouth bass	1	0.2			32	32.0
White crappie	8	1.6	55	11.0		
Black crappie	1	0.2	4	0.8		
Freshwater drum	9	1.8				

APPENDIX B



Location of sampling sites, Benbrook Reservoir, Texas, 2009-2010. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Boat ramps are indicated with a B. Water level was 3.6 feet above full pool at time of trap netting, 1.4 feet above full pool at time of gill netting, and 4.7 feet above full pool at the time of electrofishing.

Appendix C

Historical catch rates of targeted species by gear type for Benbrook Reservoir, Texas.

		Year														
Gear	Species	1987	1989	1991	1993	1996	1999	2001	2002	2003	2004	2005	2006	2008	2009	2010
Gill Netting	Blue catfish	0.1	0.1	0.0	0.0	0.6	1.0		0.6		0.8		3.8	3.0		1.4
(fish/net night)	Channel catfish	7.0	12.0	4.0	3.8	3.5	3.0		1.6		6.8		3.4	3.0		7.2
	White bass	28.0	11.0	18.0	23.8	13.8	14.4		8.6		11.5		3.0	1.4		7.6
	Yellow bass	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0		4.4	13.2		11.8
	Palmetto bass	0.0	1.0	0.0	1.4	6.0	9.4		2.4		1.8		8.4	4.4		3.8
Electrofishing	Gizzard shad	311.0	139.0	177.0	394.0	131.0	272.0	256.0		192.0			288.0		207.0	
(fish/hour)	Threadfin shad	518.0	243.3	523.0	298.0	29.0	224.0	232.0		464.0			1089.0		787.0	
	Bluegill	277.0	346.0	165.0	104.0	27.0	41.0	194.0		253.0			276.0		21.0	
	Longear sunfish	191.0	207.3	277.0	0.0	19.0	28.0	97.0		151.0			145.0		12.0	
	Redear sunfish	30.0	80.0	15.0	5.3	2.0	0.0	0.0		3.0			0.0		0.0	
	Largemouth bass	145.0	314.0	159.0	127.3	72.0	125.0	72.0		66.0			120.0		32.0	
Trap Netting	White crappie	3.0	3.0	2.8	5.0	2.6	2.6	8.6				2.0			11.0	
(fish/net night)	Black crappie	0.0	0.0	1.0	0.4	0.6	0.2	0.2				0.0			0.8	