

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-2

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2011 Survey Report

Fort Phantom Hill Reservoir

Prepared by:

Spencer Dumont
Inland Fisheries Division
District 1-B, Abilene, Texas



Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

July 31, 2012

TABLE OF CONTENTS

Survey and management summary	2
Introduction.....	3
Reservoir description.....	3
Management history.....	3
Methods.....	4
Results and discussion.....	4
Fisheries management plan.....	7
Literature cited.....	8
Figures and tables.....	9-29
Water level (Figure 1).....	9
Reservoir characteristics (Table 1)	9
Harvest regulations (Table 2)	10
Stocking history (Table 3).....	11
Habitat (Table 4).....	12
Gizzard shad (Figure 2).....	13
Bluegill (Figure 3)	14
Bluegill, threadfin shad, gizzard shad (Figure 4)	15
Blue catfish (Figures 5-6).....	16
Channel catfish (Figures 7-8).....	18
White bass (Figures 9-10).....	20
Palmetto bass (Figures 11-12).....	22
Largemouth bass (Figures 13-17; Tables 5-7).....	24
White crappie (Figure 18; Table 8)	28
Proposed sampling schedule (Table 9).....	30
Appendix A	
Catch rates of all target species from all gear types	31
Appendix B	
Map of 2011-2012 sampling locations	32
Appendix C	
Angler facility characteristics	33

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Fort Phantom Hill Reservoir were surveyed in 2011 using electrofishing and trap nets and in 2012 using gill nets. This report summarizes survey results and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Fort Phantom Hill Reservoir is a 4,246-acre impoundment constructed on Elm Creek approximately 15 miles north of Abilene, Texas. It is located in the Brazos River Basin, and its primary use was municipal water supply. Secondary use was recreation. Beginning in December 2003, power-plant generation was reduced to peak use only. The power plant disassembly began in 2011 and was finished in 2012. Improvements to the main boat ramp included a breakwater structure installed in 2011 to reduce wave-action on the boat ramp and boat dock and an extension of two boat-ramp lanes in 2012. The reservoir filled to conservation level in August 2007, 10 years after it was last full. Water level was 10-feet low at time of sampling. Habitat was primarily rock and mud flats.
- **Management History:** Walleye were stocked 10 times from 1973 to 1995 before requests were discontinued because of poor stocking success and failure to establish a fishery. Blue catfish were introduced in 1974. An 18-inch minimum length limit on blue catfish existed from 1993 to 1999 before reinstatement to the statewide regulation. Threadfin shad were introduced in 1984 and the population is self-sustaining. Florida largemouth bass were introduced in 1976 and have been stocked eight times from 1976 to 2001. A 16-inch minimum length limit on largemouth bass, in effect from 1994 to 2012, will change to the statewide 14-inch minimum length limit on 1 September 2012. Palmetto bass were introduced in 1977 and have since been stocked nearly every year.
- **Fish Community**
 - **Prey species:** Small gizzard shad was the primary forage, but bluegill and threadfin shad were also important. These species provided an excellent forage as indicated by good growth and body condition of existing sport fish.
 - **Catfishes:** Blue catfish were the most abundant catfish in this reservoir, and 69% of the blue catfish collected were legal size (12 inches) or longer. A 51-lb blue catfish was caught in 2011, shattering the previous water-body record (36 lbs). Channel catfish and flathead catfish were present in the reservoir.
 - **Temperate basses:** White bass and palmetto bass were abundant and many were legal size.
 - **Largemouth bass:** Abundance of adult largemouth bass has increased since 2007. Abundance of larger fish (> 14 inches long) in 2011 was the highest since 1989. Changes in water level have had a large impact on largemouth bass at Fort Phantom Hill Reservoir.
 - **White crappie:** White crappie continued to be abundant, but less than in recent years, and 33% of adult fish were legal size or longer.
- **Management Strategies:** Continue stocking palmetto bass annually. Educate the public about negative impacts of invasive species and how to prevent their spread. Continue trap-net, electrofishing, and gill-net surveys at two-year intervals.

INTRODUCTION

This document is a summary of fisheries data collected from Fort Phantom Hill Reservoir in 2011-2012. 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 2011-2012 data for comparison.

Reservoir Description

Fort Phantom Hill Reservoir is a 4,246-acre impoundment constructed on Elm Creek approximately 15 miles north of Abilene, Texas. It is located in the Brazos River Basin, and its primary use was municipal water supply. A secondary use was recreation. Power generation was essentially discontinued in 2003 and dismantling of the power plant began in 2011 and finished in 2012.

The reservoir filled to conservation level in August 2007, 10 years after it was last full, and stayed full until late 2008 before water level began a steady decline through early 2010 (Figure 1). Heavy rainfall in 2010 nearly filled the reservoir, but from late 2010 through late 2011, water level steadily declined (Figure 1). Water level was approximately 10 feet below conservation level at time of sampling. Littoral habitat consisted primarily of rocks and mud flats.

Boat access at the beginning of 2011 consisted of four public boat ramps. By November 2011, boat access was limited to one public boat ramp. Bank-fishing access was very good for a reservoir of this size and improved as water level declined. In addition, there was one privately operated pay-for-fishing dock and one public-fishing dock. Boat-access improvements in 2011 and 2012 to the main boat ramp at the northwest corner of the reservoir included installation of a breakwater structure (to reduce wave-action on the boat ramp and boat dock) and extension of two boat-ramp lanes. Other descriptive characteristics for Fort Phantom Hill Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Dumont 2008) included:

1. Continue annual stocking of palmetto bass at 15 fish/acre.
Action: Palmetto bass were stocked in 2008 and 2009 at the full stocking rate. Low hatchery production led to no stocking in 2010, a half stocking in 2011, and no stocking in 2012.
2. Investigate a change in the largemouth bass regulation from the 16-inch MLL to a 14-inch MLL.
Action: Two angler opinion surveys indicated anglers were evenly split between the 14-inch and 16-inch regulation. No differences in largemouth bass relative abundance or size structure were found under the 14-inch MLL or the 16-inch MLL. Water level was an influential factor on largemouth bass recruitment. Based on angler and electrofishing data, the harvest regulation will revert to the 14-inch MLL on 1 September 2012.

Harvest regulation history: Blue catfish were managed with an 18-inch MLL from 1 September 1993 to 31 August 1999. The regulation reverted to the statewide 12-inch MLL because of low angler support and extremely slow growth of blue catfish. Largemouth bass harvest was regulated with a 16-inch MLL from 1 September 1994 to 1 September 2012. Other sport fishes have been managed with statewide regulations (Table 2).

Stocking history: Walleye were stocked 10 times from 1973 to 1995. Blue catfish were introduced in

1974. Threadfin shad were introduced in 1984. Florida largemouth bass were introduced in 1976 and have been stocked eight times from 1976 to 2001. Palmetto bass were introduced in 1977 and have been stocked nearly every year thereafter. The complete stocking history is in Table 3.

Vegetation/habitat management history: Fort Phantom Hill Reservoir has no significant vegetation/habitat management history.

Water Transfer: There is one permanent pumping station on the reservoir which transfers water from the Clear Fork of the Brazos River to the reservoir during periods of high stream flow. Water can also be transferred, at very low rates, from Hubbard Creek Reservoir.

METHODS

Fishes were collected by electrofishing (1.5 hours at 18 5-min stations), gill netting (five net nights at five sites), and trap netting (10 net nights at 10 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). Largemouth genetics were determined with Microsatellite DNA analysis in 2005 and 2011 and electrophoresis in 1998 and 2003. A random sample of largemouth bass (no size or age excluded) was used for Microsatellite DNA analysis in 2011; prior to 2011, random samples included only age-0 or age-1 largemouth bass. All survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Substrate habitat composition was determined by assessing presence or absence of each substrate type in the water, within 10 feet of the shoreline, at 108 random sites selected on the 1,625-foot contour line (10 feet below conservation pool and the approximate water level elevation at the time of the survey) of a digitized bathymetric map. Substrate was categorized as soft (clay, silt, sand), small rock (diameter < 4") or large rock (diameter >4"). Water-column habitat composition was determined by assessing presence or absence of habitat (excluding substrate) in the water column at 227 random sites in the reservoir. Additionally, occurrence of vegetation (aquatic or semi-aquatic) in the littoral zone (151 random sites located within the 1,632 to 1,625 elevations) was determined in 2010. Water level at time of habitat sampling was approximately 8 feet below conservation level in 2011 and 3 feet below conservation level in 2010. Percent occurrence was determined for each habitat type and 95% confidence intervals were calculated with 1,000 resamples of the original data (with replacement) by the percentile method.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for some target fishes according to Anderson and Neumann (1996). Size categories for calculation of palmetto bass PSD indices were based on Dumont and Neely (2011). 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 most structural indices and IOV. Ages of largemouth bass and white crappie were determined using otoliths. Mean age of 12- and 14-inch largemouth bass were based on ages from fish 11.0-12.9 inches long and 13.0-14.9 inches long, respectively. Mean age of 10-inch long white crappie was based on ages of white crappie 9.0-10.9 inches long. Source for water level data was the United States Geological Survey website (<http://waterdata.usgs.gov/tx/nwis/>).

RESULTS AND DISCUSSION

Habitat: Soft substrates (clay, silt, sand) were most prevalent, but rock, both small and large, were common, too (Table 4). Water-column habitat was 76% open water, with scattered brush (16%), boat docks (6%), and water stargrass (3%). Twelve species of vegetation were present in the littoral zone in 2010, ranging from 29% occurrence of water stargrass to 1% occurrence of chara. Only one species

(water stargrass; 5% occurrence) was present in 2011 (Table 4). Water level had a profound effect on aquatic vegetation abundance and diversity in this reservoir.

Prey species: Electrofishing CPUE of threadfin shad, sub-stock gizzard shad, and bluegill was 71.3/h, 488.0/h, and 140.7/h, respectively, in 2011. Gizzard shad relative abundance was high and variable since 2007, but size structure was similar (Figure 2). The length frequency mode was 3 inches, and IOV ranged from 90 to 96 (Figure 2). The mean IOV from 1996 to 2011 was 91 with a coefficient of variation (CV) of 6, indicating a gizzard shad population that consistently had a size structure composed of smaller fish, ideal for predators. Bluegill size structure has been consistent and composed primarily of fish less than 6 inches long (Figure 3). Bluegill relative abundance has steadily declined since 2003, and the CPUE in 2011 was similar to catch rates observed from 1996 to 2002 (Figure 4). Threadfin shad continued to be present (Figure 4). In most years, sub-stock gizzard shad were the most abundant forage for predator fishes (Figure 4).

Blue catfish: Gill net CPUE of blue catfish was 15.6/nn in 2012, intermediate to CPUE in 2010 and 2005 (Figure 5). A larger percentage of the catch was at least 12 inches long in 2012 (69%) compared to 2008 (57%) and 2010 (52%), and one fish over 30 inches was caught in 2012. In gill-net surveys from 2008 to 2012, proportion of 12- to 18-inch fish has been higher than in any previous survey dating back to 1996, when random sampling began, yet rarity of blue catfish over 18 inches long continued (Figure 6). Nonetheless, a 51-lb blue catfish was caught in 2011, shattering the previous water-body record of 36 lbs.

Channel catfish: Gill net CPUE of channel catfish was 0.6/nn in 2012, similar to catch rates in previous years (Figures 7 and 8). Channel catfish remain present, likely with low abundance.

Flathead catfish: Flathead catfish were present (0.4/nn).

White bass: Gill net CPUE of white bass was 5.0/nn in 2012. Most white bass captured in gill-net surveys from 2008 to 2012 were legal size (10 inches) or larger (Figure 9), as is the case in most years (Figure 10).

Palmetto bass: Gill net CPUE of palmetto bass was 18.2/nn in 2012, similar to the 2010 catch rate but higher than the 2008 catch rate (Figure 11). A large proportion of the fish in 2012 were quality-size (16 inches; PSD=93), but few fish were preferred size (20 inches; PSD-P=10) relative to 2008 and 2010 (Figure 11). Gill net CPUE in 2010 and 2012 represented the highest catch rates of palmetto bass since 2000 (Figure 12).

Largemouth bass: Electrofishing CPUE-S and CPUE-14 steadily increased since 2007 (Figure 13). These increases resulted, in part, from a strong 2007 year class (Figure 13). Size structure in 2007 was primarily composed of sub-stock fish and few fish over 16 inches long. Comparatively, size structure in 2009 and 2011 had a higher proportion of 16-inch fish (Figure 13). Mean CPUE-14 and CPUE-16 under the 14-inch MLL and the 16-inch MLL were similar, and no distinctive upward or downward trend, for catch of 14- or 16-inch fish, was apparent under either harvest regulation (Figure 14). Although statistically similar, mean PSD-14 and PSD-16 was empirically higher under the 14-inch MLL (Figure 15). Body condition generally declined for all sizes of largemouth bass since 2007, and 8.0- to 11.9-inch fish were in better condition than larger fish (Table 5). Mean age of largemouth bass 11.0-12.9 inches long ranged from 1.5 to 2.2 years in 2001 to 2011 (Table 6). Age of 13.0-inch to 14.9-inch largemouth bass improved from 3.2 years in 2001 to 2.1 years in 2007, but slowed to 4.2 years (range; ages 3-7) in 2011. Sixty-five percent of the 13.0-14.9-inch fish in 2011 were from the 2007 year class. It was likely, however, that many of the larger fish—those over 14.9 inches that were not aged—were from the same year class, but grew faster. It was also probable that growth was slower in 2011 because of drought conditions. Florida influence (% Florida largemouth bass alleles) has been consistent and over 55% since 2003 (Table 7). Long-term decline of water level followed by brief periods with a high water level likely played a large role in determining largemouth bass population dynamics in this reservoir, over shadowing the effects, in any, of a small change in the MLL. For example, growth declined during low-water level years and relative

abundance of larger fish was variable. Additionally, sub-stock CPUE mirrored water- level elevations in April and the difference in water level from October to July (Figures 16-17).

White crappie: Trap net CPUE of white crappie in 2011 was similar to 2007, but much lower compared to 2009 (Figure 18). Relative abundance of stock- and preferred-size crappie in 2011 was similar to the average at this reservoir (mean CPUE-S; 11.4; mean CPUE-P; 4.4). Size structure, in terms of PSD and PSD-P, has been similar since 2007 with the exception of a lower catch of 8- and 9-inch fish in 2011 (Figure 18). Relative weight among size classes in 2009 and 2011 was similar and, relative weight increased with fish size (Table 8). Mean age of 10-inch white crappie was 2.14 years in 2011 (N=21; range=1-4 years; 71% were age 1 or age 2), similar to district-age metrics (mean=2.09 years; 74% age 1 or age 2), but slightly older than in 2003 (1.92 years; N=49; range=1-2 years; 100% were age 1 or age 2). High relative weight (91-105) and average growth suggest adequate forage was available for white crappie. However, a slight decline in body condition of 5.0-9.9-inch fish and growth of 9.0-10.9-inch fish suggest declining water level may be starting to influence the white crappie population.

Fisheries management plan for Fort Phantom Hill Reservoir, Texas

Prepared – July 2012.

ISSUE 1: Palmetto bass do not naturally reproduce and must be stocked to maintain this fishery.

MANAGEMENT STRATEGY

1. Continue with annual stocking of fingerling palmetto bass at 15/acre.

ISSUE 2: Fort Phantom Hill Reservoir, located just minutes from the Abilene MSA, offers close-to-home fishing opportunities. These opportunities should be publicized to Abilene-area residents.

MANAGEMENT STRATEGIES

1. Publicize fishing opportunities and results of fish-population surveys via print and social media.

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

SAMPLING SCHEDULE JUSTIFICATION:

Conduct electrofishing, trap net, and gill net surveys in 2013/2014 and in 2015-2016 to continue with long-term database and as a means of informing area anglers on potential fishing opportunities at Fort Phantom Hill Reservoir. A sampling schedule is in Table 9.

8
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.
- 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.
- Dumont, S. 2008. Statewide freshwater fisheries monitoring and management program survey report for Fort Phantom Hill Reservoir, 2007. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- Dumont, S.C., and B. C. Neely. 2011. A proposed change to palmetto bass proportional size distribution length categories. North American Journal of Fisheries Management 31:722-725.
- 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.

Quarterly Water Level

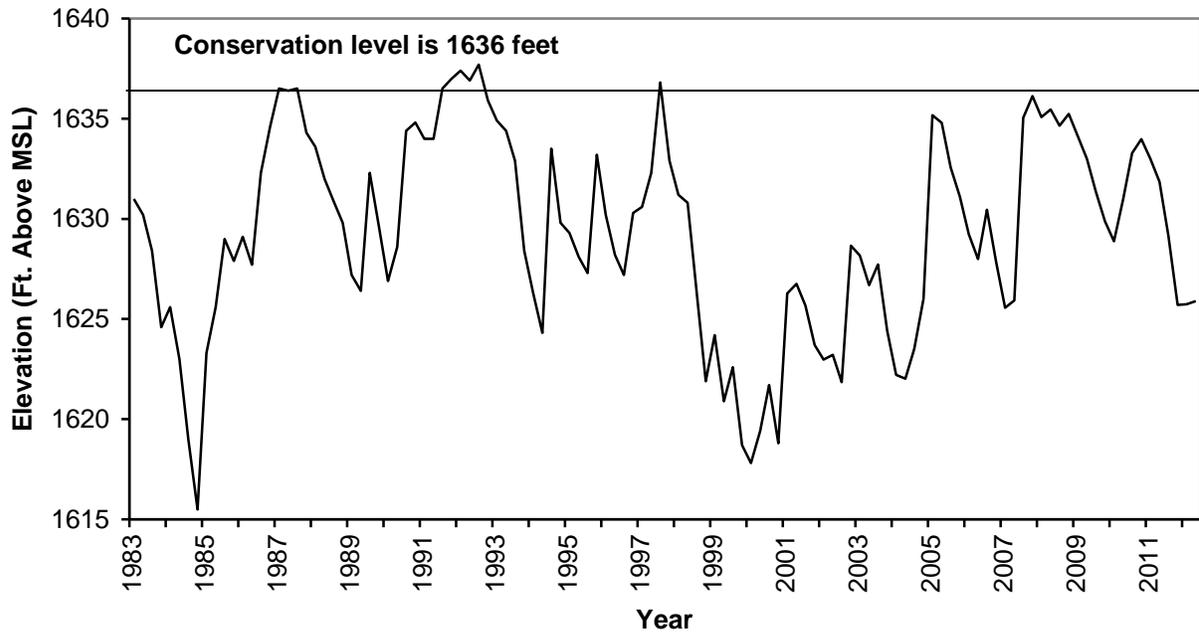


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) for Fort Phantom Hill Reservoir, Texas, 1983-2012.

Table 1. Characteristics of Fort Phantom Hill Reservoir, Texas.

Characteristic	Description
Year constructed	1938
Controlling authority	City of Abilene
County	Jones
Reservoir type	Tributary, Brazos River Basin
Shoreline Development Index (SDI)	2.0
Conductivity	420 umhos/cm

Table 2. Harvest regulations for Fort Phantom Hill 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, palmetto	5	18 – No Limit
Bass, largemouth	5	16 – No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 – No Limit

Table 3. Stocking history of Fort Phantom Hill 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	1974	10,000	FGL
Palmetto bass	1977	55,440	FGL
	1979	43,000	FGL
	1983	43,000	FGL
	1984	100,575	FGL
	1986	63,690	FGL
	1987	105,950	FGL
	1988	87,094	FGL
	1989	102,955	FGL
	1991	64,180	FGL
	1992	44,480	FGL
	1993	35,960	FGL
	1994	65,800	FGL
	1995	63,960	FGL
	1996	65,760	FGL
	1997	51,756	FGL
	1998	42,733	FGL
	1999	20,018	FGL
	2002	32,200	FGL
	2003	63,209	FGL
	2004	64,777	FGL
2005	63,400	FGL	
2006	65,346	FGL	
2007	64,145	FGL	
2008	63,453	FGL	
2009	63,728	FGL	
2011	29,498	FGL	
	Total	1,566,107	
Redear sunfish	1981	42,800	FGL
Largemouth bass	1973	2,500	FGL
Florida largemouth bass	1976	210,087	FGL
	1977	65,280	FGL
	1979	10,000	FGL
	1986	152,000	FGL
	1994	213,334	FGL
	1995	10,000	FGL
	1997	213,179	FGL
2001	212,650	FGL	
	Total	1,021,250	

Table 3. Continued.

Species	Year	Number	Size
Walleye	1973	770,000	FRY
	1974	700,000	FRY
	1975	800,000	FRY
	1979	6,797,500	FRY
	1982	335,738	FRY
	1983	6,996,441	FRY
	1985	8,637,242	FRY
	1991	2,440,295	FRY
	1993	8,520,000	FRY
	1995	8,500,000	FRY
	Total	44,497,216	

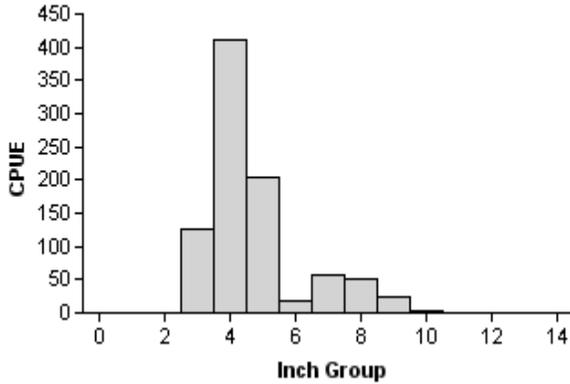
Table 4. Percent occurrence and 95% confidence intervals (C.I.) of substrate (108 random sites) and water-column habitat (227 random sites) in 2011 and vegetation habitat in 2010 (151 random sites) and in 2011 (108 random sites) in Fort Phantom Hill Reservoir, Texas.

Habitat Type	% Occurrence 2010	95 % C. I.	% Occurrence 2011	95 % C. I.
Substrate				
Clay, silt, sand			61	52 – 70
Large rock (> 4")			44	34 – 53
Small rock (< 4")			34	26 – 42
Vegetation				
Water stargrass	29	23 – 36	5	1 – 9
Cutgrass	21	15 – 29		
Black willow	13	8 – 19		
Smartweed	13	8 – 19		
Duckweed	6	3 – 10		
Illinois pondweed	5	2 – 9		
Coontail	5	2 – 9		
Bulrush	5	2 – 9		
Cattail	5	2 – 9		
American lotus	3	1 – 5		
Button brush	2	0 – 5		
Chara	1	0 – 2		
Water-column				
Open water			76	71 – 82
Dead brush			16	12 – 20
Boat dock			6	4 – 10
Water stargrass			3	1 – 5
Bulkhead			< 1	0 – 1

Gizzard Shad

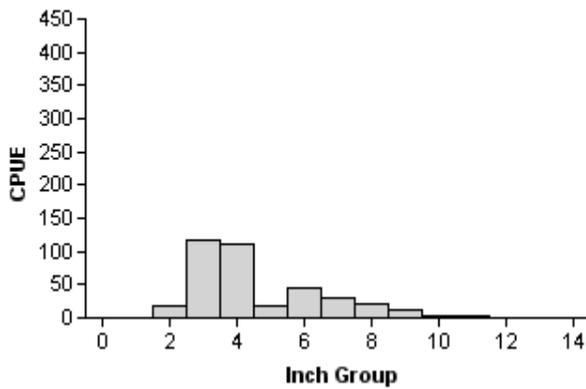
2007

Effort = 2.0
 Total CPUE = 898.5 (13; 1797)
 Stock CPUE = 137.5 (20; 275)
 IOV = 91 (2)



2009

Effort = 1.3
 Total CPUE = 375.2 (27; 469)
 Stock CPUE = 65.6 (30; 82)
 IOV = 90 (1)



2011

Effort = 1.5
 Total CPUE = 551.3 (18; 827)
 Stock CPUE = 63.3 (22; 95)
 IOV = 96 (1)

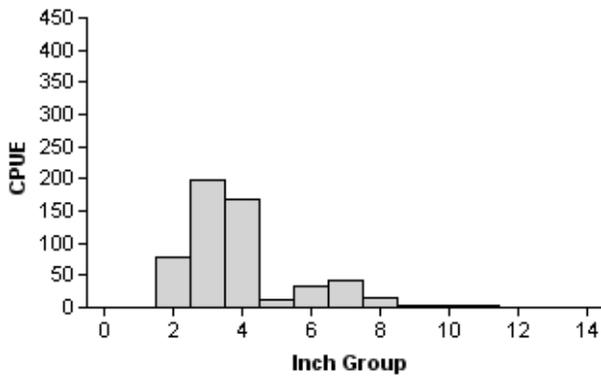
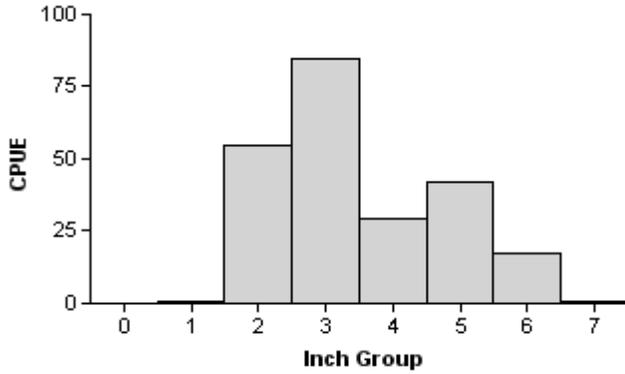


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2007, 2009, and 2011.

Bluegill

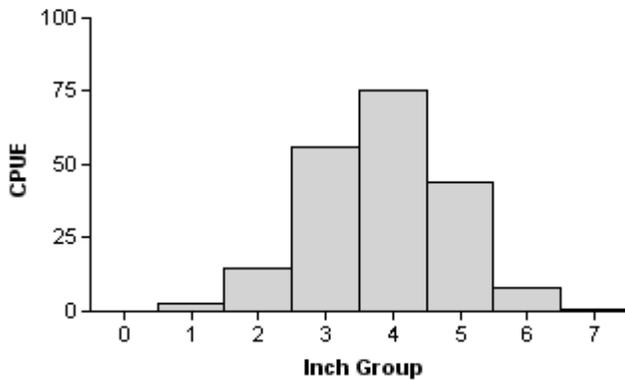
2007

Effort = 2.0
 Total CPUE = 231.0 (26; 462)
 PSD = 11 (2)



2009

Effort = 1.3
 Total CPUE = 200.8 (27; 251)
 PSD = 5 (2)



2011

Effort = 1.5
 Total CPUE = 140.7 (21; 211)
 PSD = 5 (2)

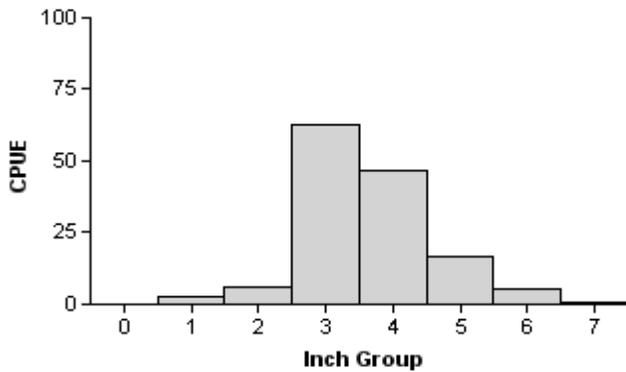


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 2007, 2009, and 2011.

Bluegill, Sub-Stock Gizzard Shad, Threadfin Shad

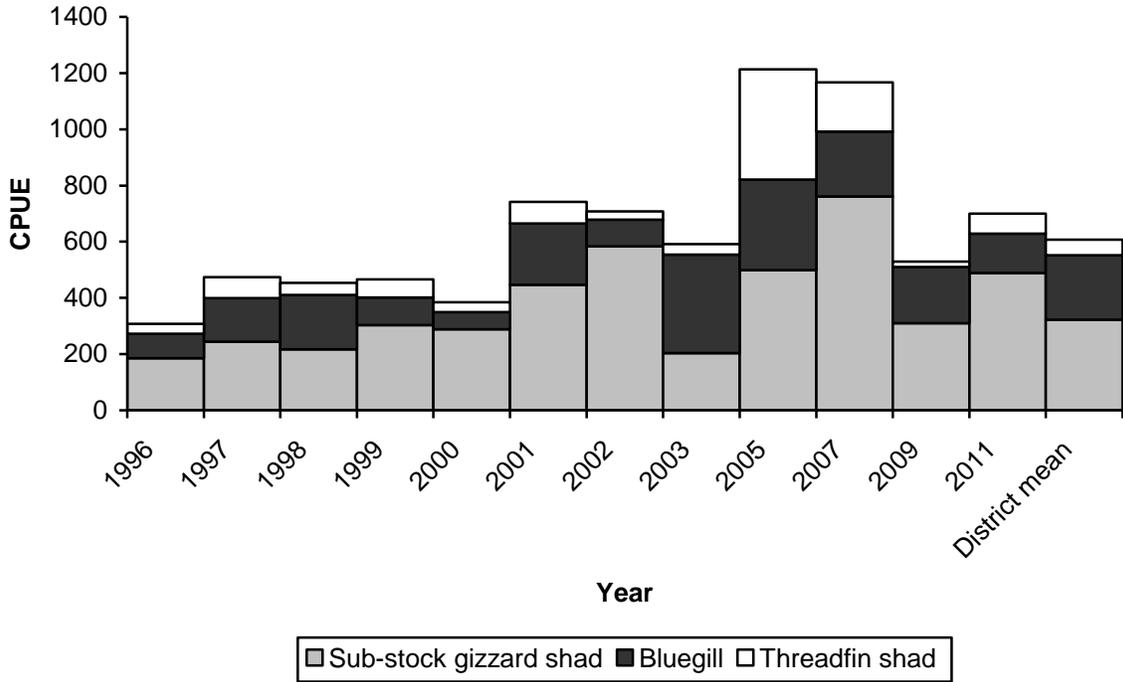
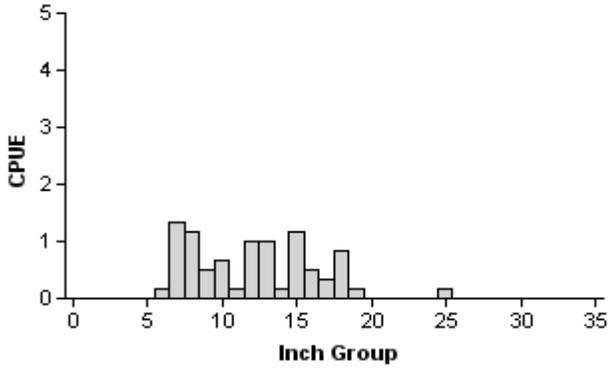


Figure 4. Number of sub-stock (< 7") gizzard shad, bluegill, and threadfin shad caught per hour (CPUE) from fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 1996-2011.

Blue Catfish

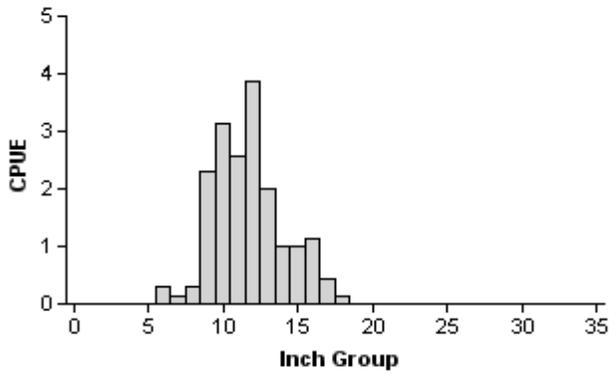
2008

Effort = 6.0
 Total CPUE = 9.3 (13; 56)
 CPUE-12 = 5.3 (30; 32)



2010

Effort = 7.0
 Total CPUE = 18.3 (42; 128)
 CPUE-12 = 9.6 (48; 67)



2012

Effort = 5.0
 Total CPUE = 15.6 (40; 78)
 CPUE-12 = 10.8 (32; 54)

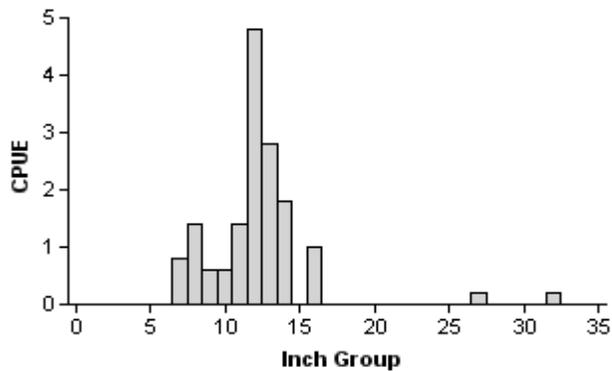


Figure 5. Number of blue catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Fort Phantom Hill Reservoir, Texas, 2008, 2010, and 2012.

17
Blue Catfish

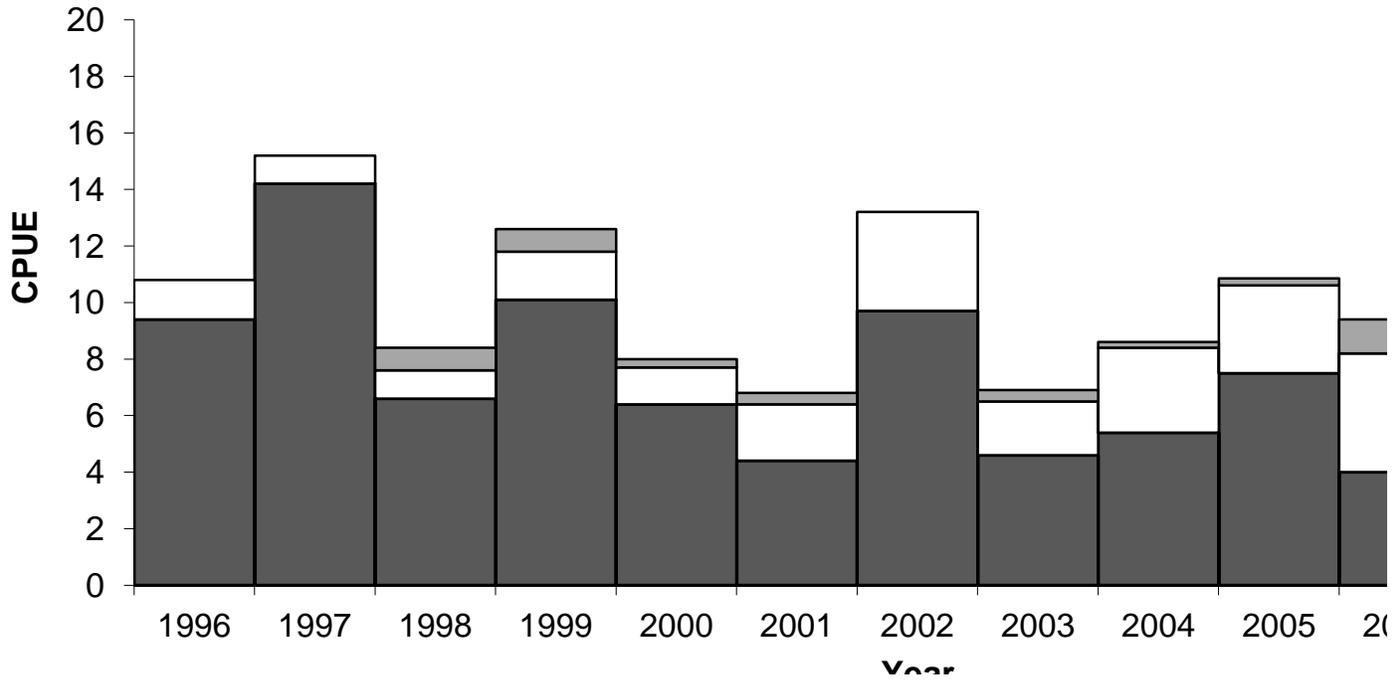
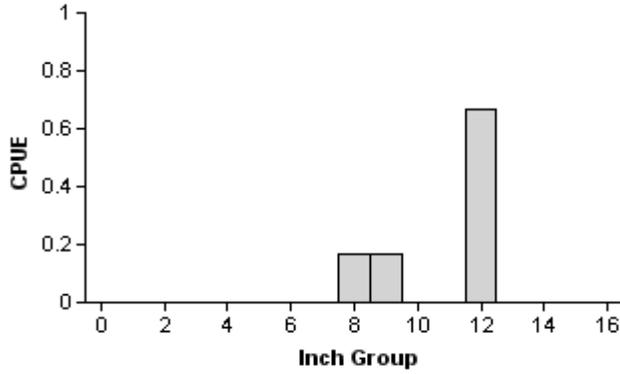


Figure 6. Number of blue catfish caught per net night (CPUE) for spring gill net surveys, Fort Phantom Hill Reservoir, Texas, 1996-2012.

Channel catfish

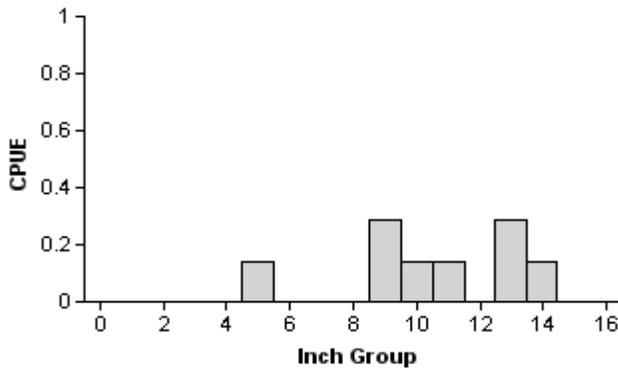
2008

Effort = 6.0
 Total CPUE = 1.0 (52; 6)
 CPUE-12 = 0.7 (50; 4)



2010

Effort = 7.0
 Total CPUE = 1.1 (48; 8)
 CPUE-12 = 0.4 (47; 3)



2012

Effort = 5.0
 Total CPUE = 0.6 (67; 3)
 CPUE-12 = 0.2 (100; 1)

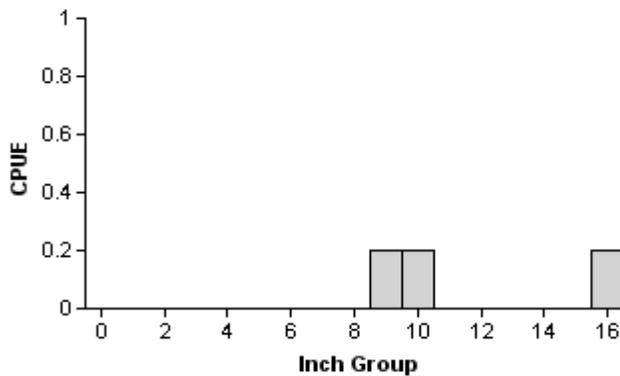


Figure 7. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Fort Phantom Hill Reservoir, Texas, 2008, 2010 and 2012.

Channel Catfish

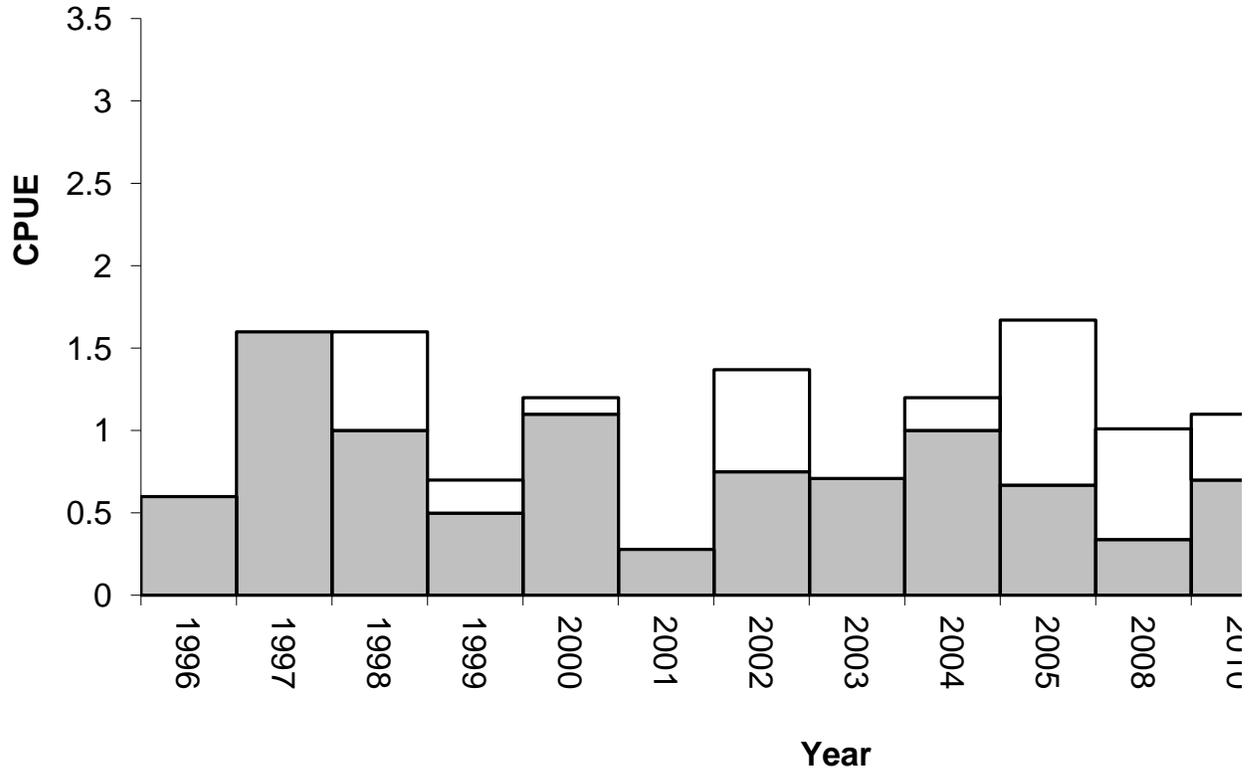


Figure 8. Number of channel catfish caught per net night (CPUE) for spring gill net surveys, Fort Phantom Hill Reservoir, Texas, 1996-2012.

White Bass

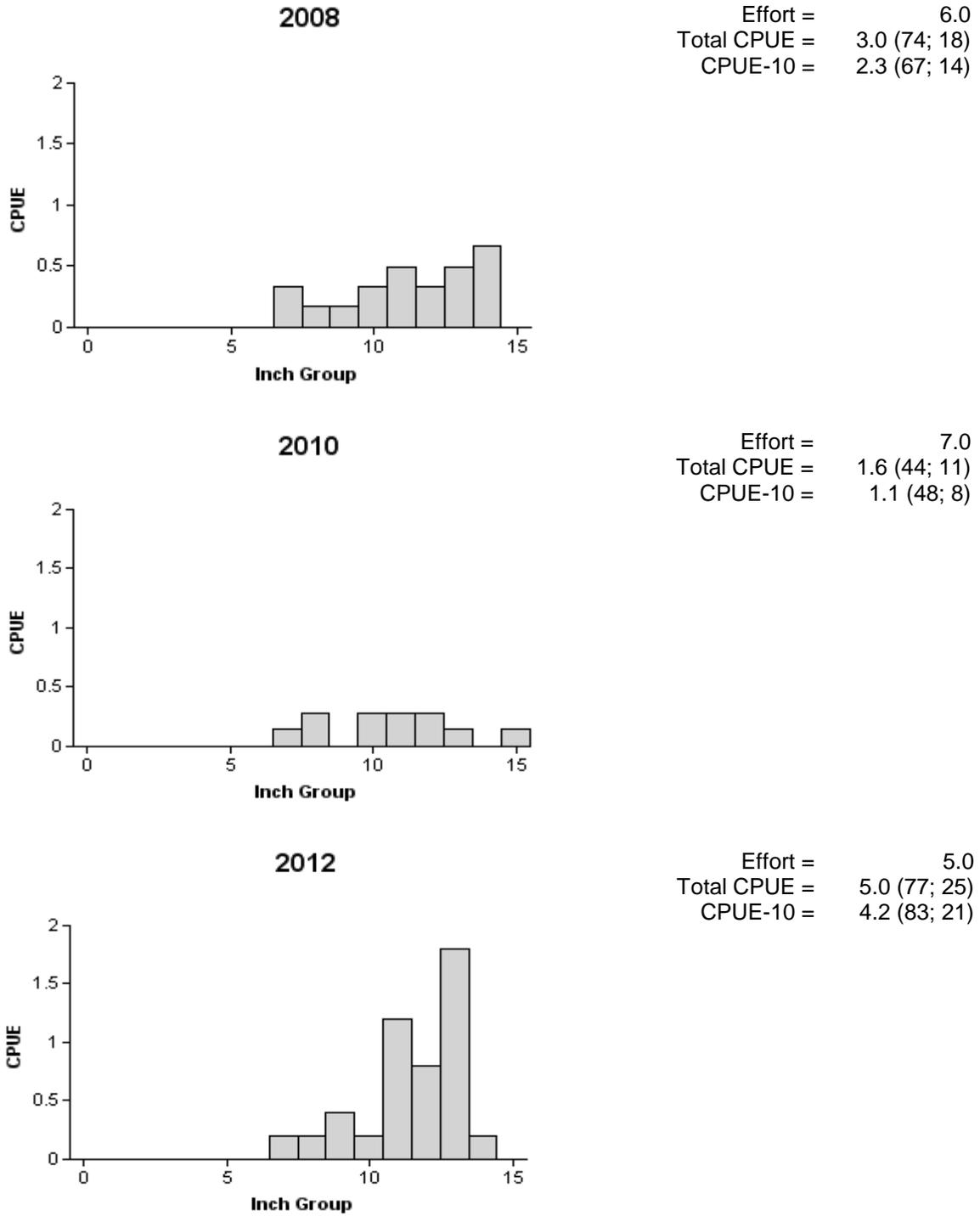


Figure 9. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Fort Phantom Hill Reservoir, Texas, 2008, 2010, and 2012.

White Bass

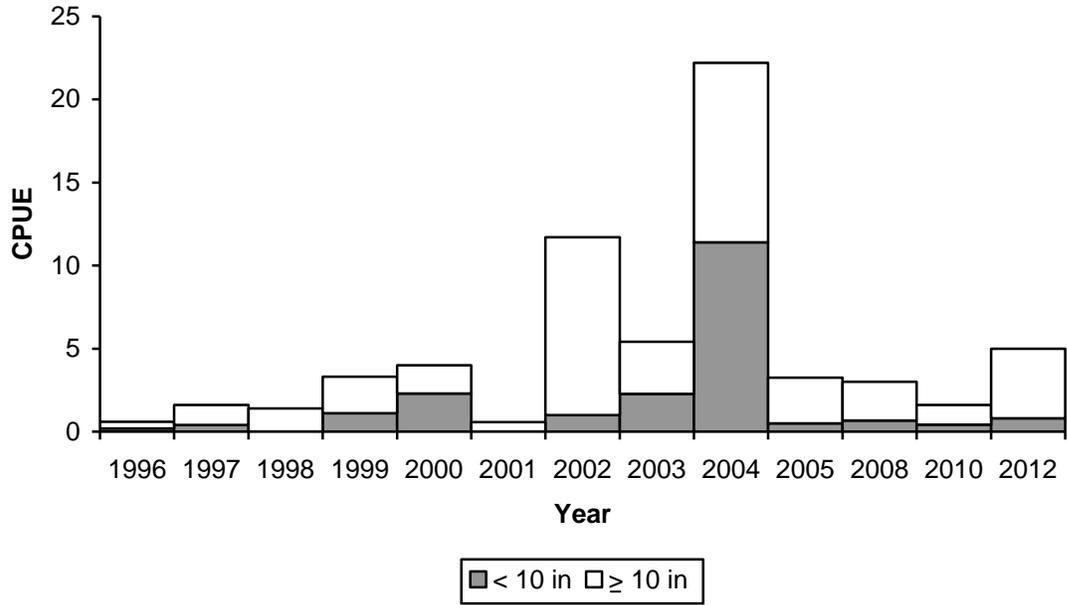
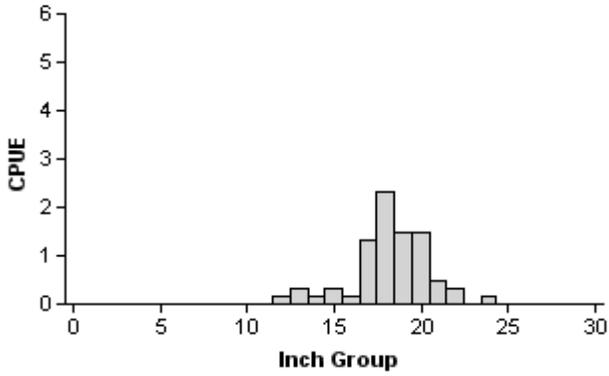


Figure 10. Number of white bass caught per net night (CPUE) for spring gill net surveys, Fort Phantom Hill Reservoir, Texas, 1996-2012.

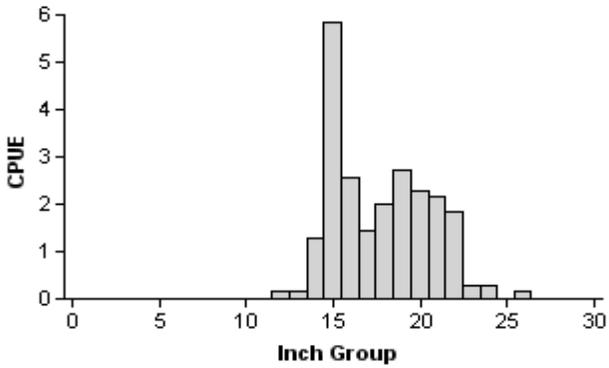
Palmetto Bass

2008



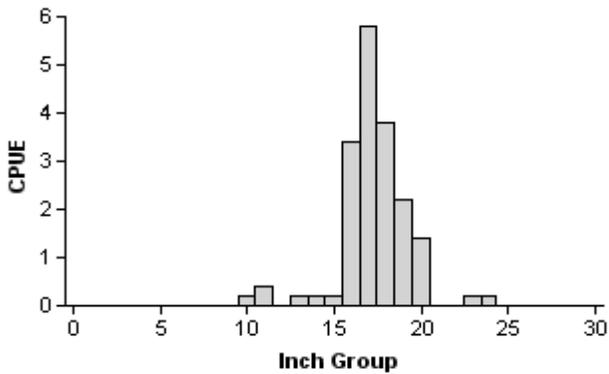
Effort =	6.0
Total CPUE =	8.8 (54; 53)
CPUE-18 =	6.3 (46; 38)
PSD =	89
PSD -P =	28

2010



Effort =	7.0
Total CPUE =	23.1 (35; 162)
CPUE-18 =	11.7 (45; 82)
PSD =	68
PSD-P =	30

2012



Effort =	5.0
Total CPUE =	18.2 (44; 91)
CPUE-18 =	7.8 (38; 39)
PSD =	93
PSD-P =	10

Figure 11. Number of palmetto bass caught per net night (CPUE; RSE and N are in parentheses) and population indices (PSD and PSD-P) for spring gill net surveys, Fort Phantom Hill Reservoir, Texas, 2008, 2010, and 2012.

Palmetto Bass

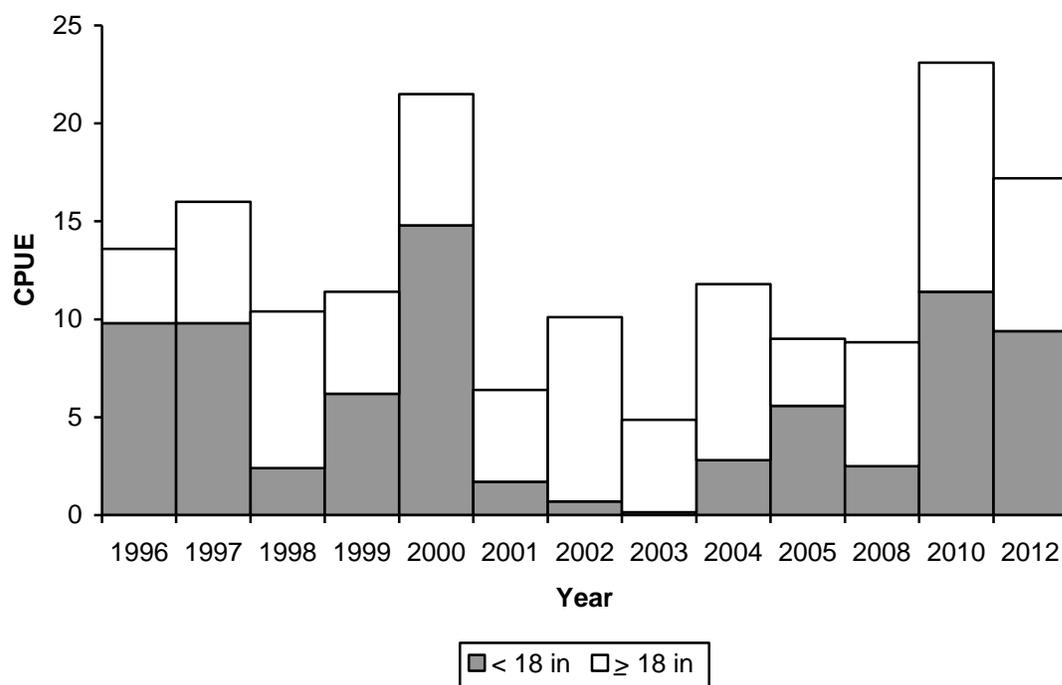
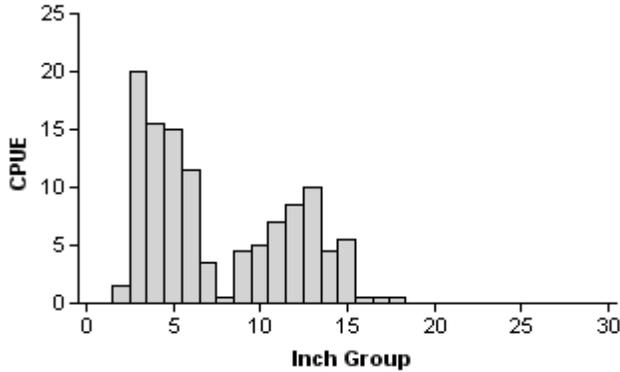


Figure 12. Number of palmetto bass per net night (CPUE) for spring gill net surveys, Fort Phantom Hill Reservoir, Texas, 1996-2012.

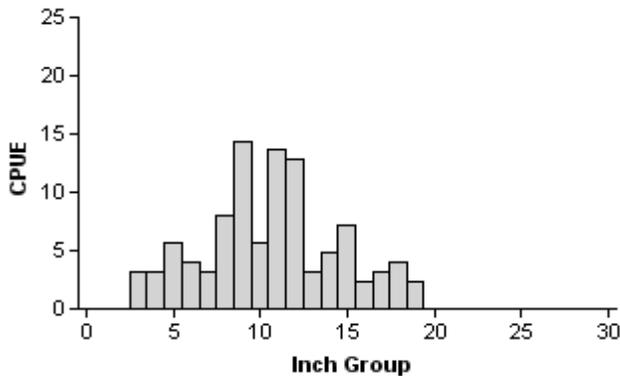
Largemouth Bass

2007



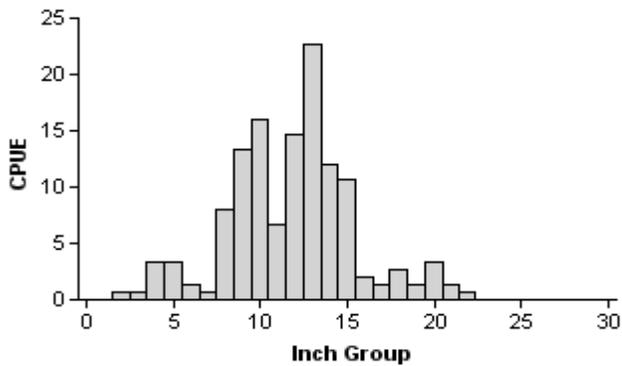
Effort =	2.0
Total CPUE =	114.0 (17; 228)
Stock CPUE =	47.0 (18; 94)
CPUE-14 =	11.5 (21; 23)
CPUE-16 =	1.5 (55; 3)
PSD =	64 (6)
PSD-14 =	24 (5)
PSD-16 =	3 (2)

2009



Effort =	1.3
Total CPUE =	100.8 (19; 126)
Stock CPUE =	81.6 (20; 102)
CPUE-14 =	24.0 (22; 30)
CPUE-16 =	13.6 (31; 17)
PSD =	49 (5)
PSD-14 =	29 (4)
PSD-16 =	17 (5)

2011



Effort =	1.5
Total CPUE =	126.7 (18; 190)
Stock CPUE =	116.7 (19; 175)
CPUE-14 =	35.3 (20; 53)
CPUE-16 =	12.7 (31; 19)
PSD =	62 (5)
PSD-14 =	30 (4)
PSD-16 =	11 (3)

Figure 13. 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, Fort Phantom Hill Reservoir, Texas, 2007, 2009, and 2011.

Largemouth Bass

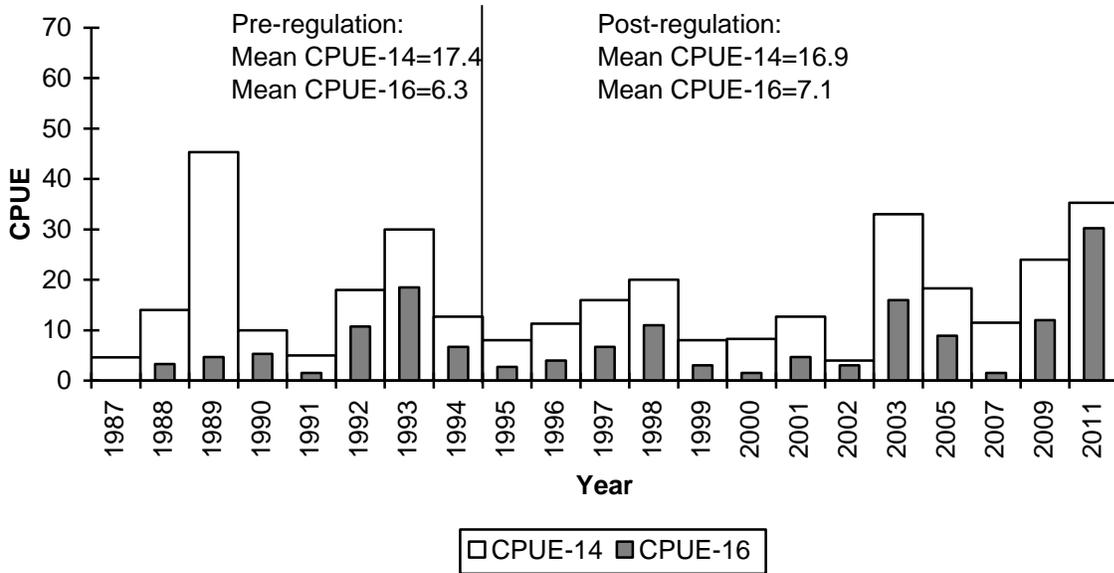


Figure 14. CPUE-14 and CPUE-16 of largemouth bass from fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 1987-2011. Vertical line represents change from 14-inch MLL to 16-inch MLL.

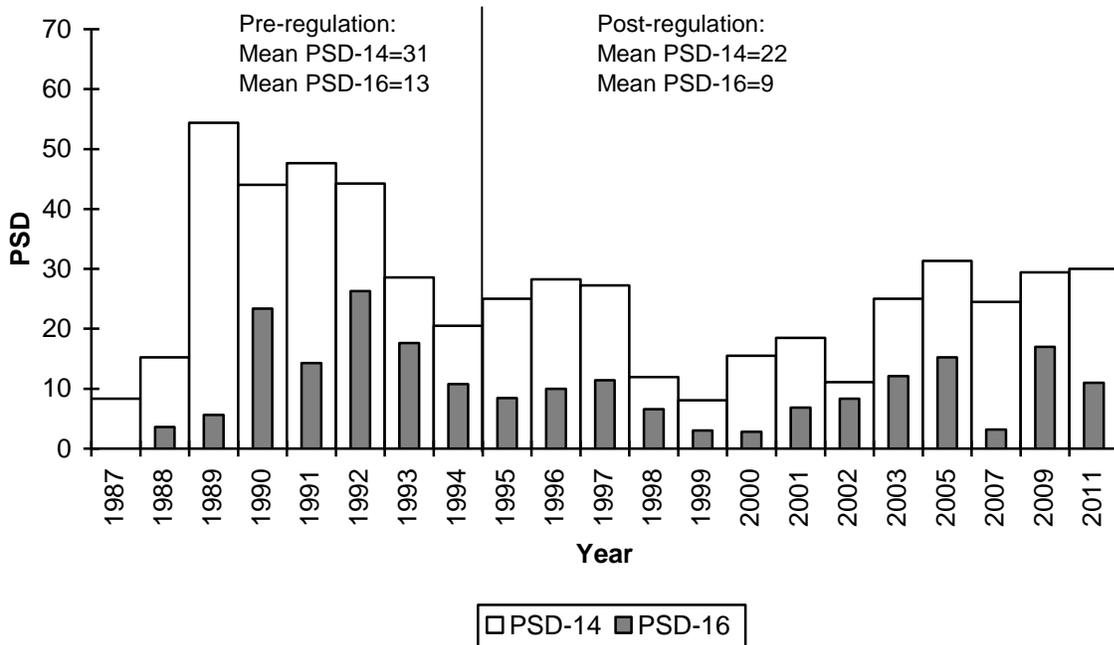


Figure 15. PSD-14 and PSD-16 of largemouth bass from fall electrofishing surveys, Fort Phantom Hill Reservoir, Texas, 1987-2011. Vertical line represents change from 14-inch MLL to 16-inch MLL.

Largemouth bass

Table 5. Average relative weight of 8.0-11.9-in, 12.0-14.9-in, and >14.9-in largemouth bass from 2007, 2009, and 2011 at Fort Phantom Hill Reservoir, Texas. Sample size for each estimate is in parentheses.

Year	Mean Wr		
	8.0-11.9	12.0-14.9	> 14.9
2007	101(34)	102(46)	95(14)
2009	94(52)	89(26)	98(24)
2011	91(66)	87(74)	88(35)

Table 6. Mean age at length of largemouth bass at 12 inches and 14 inches collected from fall electrofishing surveys in Fort Phantom Hill Reservoir, Texas, in 2001, 2003, 2007, and 2011. Sample size for each estimate is in parentheses.

Year	Mean age at length	
	12" (11.0"-12.9")	14" (13.0"-14.9")
2001	1.5 (9)	3.2 (10)
2003	1.9 (23)	2.5 (18)
2007	1.8 (21)	2.1 (12)
2011	2.2 (19)	4.2 (20)

Table 7. Results of genetic analysis of largemouth bass collected by fall electrofishing, Fort Phantom Hill Reservoir, Texas, 1998, 2003, 2005, and 2011. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass. Microsatellite DNA analysis was used in 2005 and 2011, and electrophoresis was used in 1998 and 2003 to determine largemouth bass genetics.

Year	Sample size	Genotype			% FLMB alleles	% FLMB genotype
		FLMB	Intergrades	NLMB		
1998	29	2	24	3	41.4	6.9
2003	31	3	28	0	61.9	9.7
2005	72	2	70	0	56.8	3.0
2011	30	2	28	0	56.8	6.7

Largemouth bass

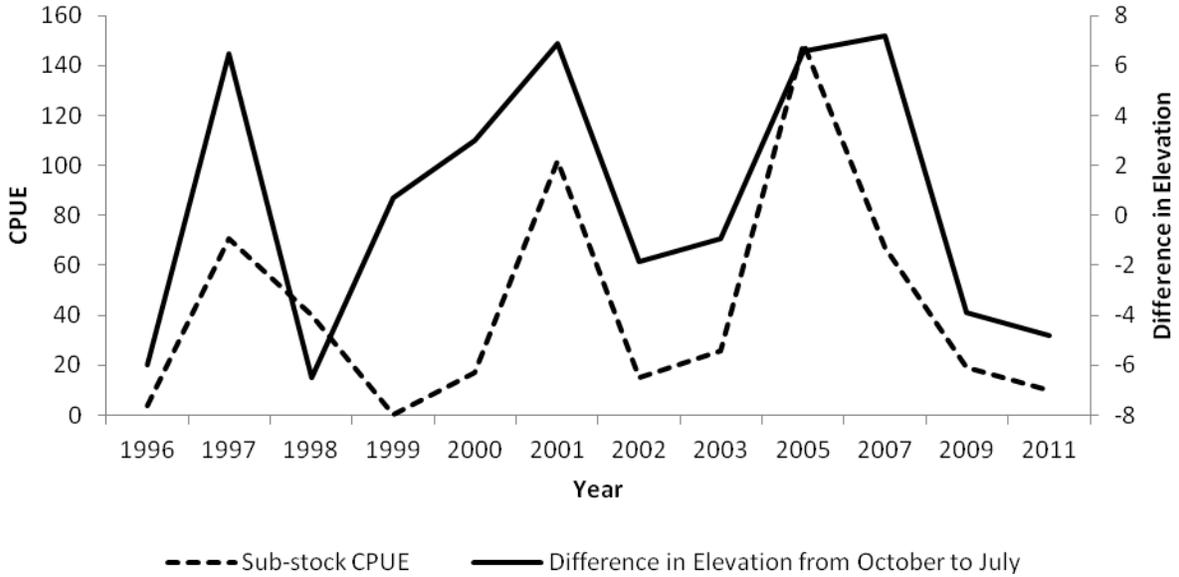


Figure 16. Sub-stock CPUE of largemouth bass and difference in water level elevation from October to July, Fort Phantom Hill Reservoir, 1996-2011.

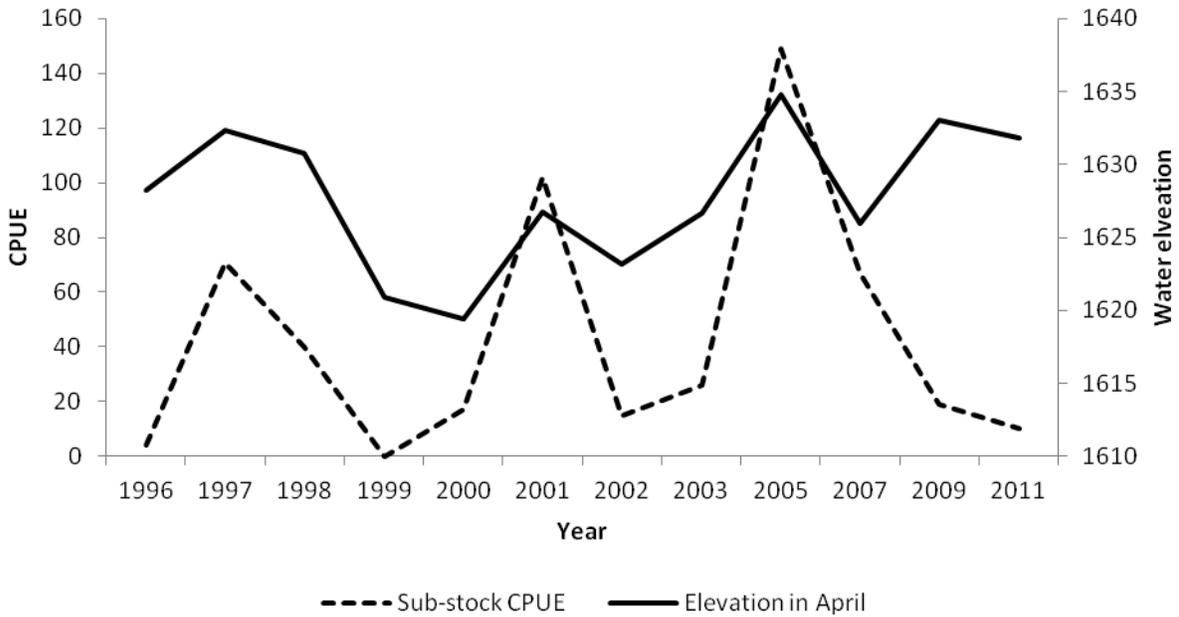
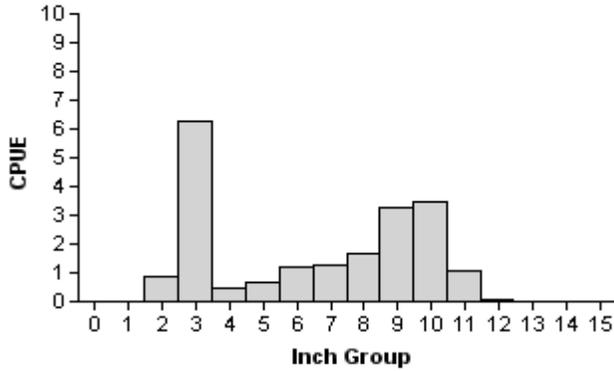


Figure 17. Sub-stock CPUE of largemouth bass and water level elevation in April, Fort Phantom Hill Reservoir, 1996-2011.

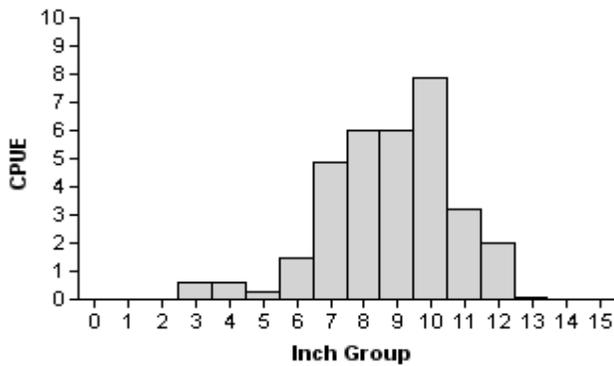
White Crappie

2007



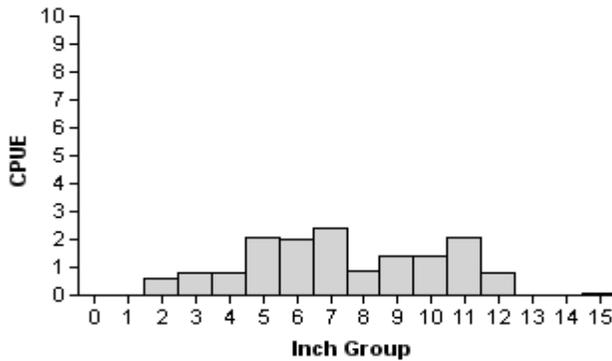
Effort =	10.0
Total CPUE =	20.6 (29; 206)
Stock CPUE =	12.9 (38; 129)
CPUE-10 =	4.7 (50; 47)
PSD =	75 (9)
PSD-10 =	36 (8)

2009



Effort =	10.0
Total CPUE =	33.1 (18; 331)
Stock CPUE =	31.9 (18; 319)
CPUE-10 =	13.2 (22; 132)
PSD =	79 (3)
PSD-10 =	41 (3)

2011



Effort =	10.0
Total CPUE =	15.4 (23; 154)
Stock CPUE =	13.2 (24; 132)
CPUE-10 =	4.4 (34; 44)
PSD =	51 (8)
PSD-10 =	33 (6)

Figure 18. Number of white crappie caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Fort Phantom Hill Reservoir, Texas, 2007, 2009, and 2011.

White Crappie

Table 8. Average relative weight of 5.0-7.9-inch and 8.0-9.9-inch, and ≥ 10 -inch white crappie in 2009 and 2011 at Fort Phantom Hill Reservoir, Texas. Sample size in parentheses.

Year	Mean W_r by size category		
	5.0-7.9 in	8.0-9.9 in	≥ 10 in
2009	95 (67)	103 (120)	103 (132)
2011	91 (65)	99 (23)	105 (44)

Table 9. Proposed sampling schedule for Fort Phantom Hill 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.

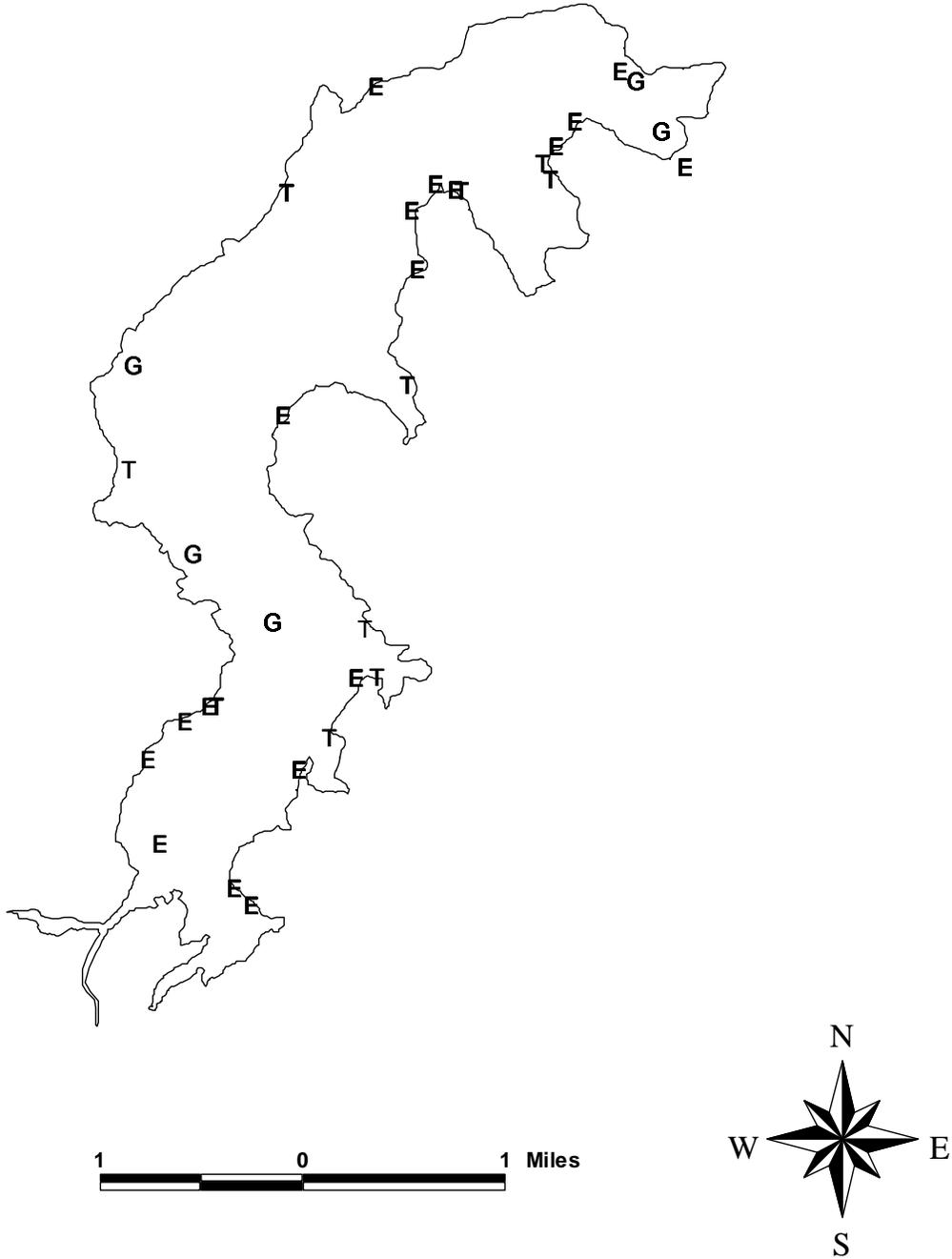
Survey Year	Electrofisher	Trap Net	Gill Net	Vegetation	Access	Report
Fall 2012-Spring 2013						
Fall 2013-Spring 2014	A	A	A			
Fall 2014-Spring 2015						
Fall 2015-Spring 2016	S	S	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types in Fort Phantom Hill Reservoir, Texas, 2011-2012.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					827	551.3
Threadfin shad					107	71.3
Blue catfish	56	9.3				
Channel catfish	3	0.6				
Flathead catfish	2	0.4				
White bass	25	5.0				
Palmetto bass	91	18.2				
Green sunfish					1	0.7
Warmouth					3	2.0
Bluegill					211	140.7
Longear sunfish					43	28.7
Redear sunfish					14	9.3
Largemouth bass					190	126.7
White crappie			206	20.6		

APPENDIX B



Location of sampling sites, Fort Phantom Hill Reservoir, Texas, 2011-2012. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was 10 ft. below conservation level at time of sampling.

APPENDIX C

Type, location, size, capacity, American Disability Act (ADA) accessibility, and needed improvements of boat ramps (BR) and fishing piers (FP) at Fort Phantom Hill Reservoir, Texas, 2011. Latitude and Longitude are reported as decimal degrees.

Facility Type	Location	Latitude	Longitude	Fee	# of BR Lanes	BR Parking Capacity	Size of FP or J	ADA Accessible (FP or J)	Needed Improvements
BR	FM 600	32.609847	-99.685028	N	6	30	NA	NA	
BR	White Elephant	32.615715	-99.666588	N	2	10	NA	NA	
BR	SeeBee Park	32.542851	-99.708126	N	1	10	NA	NA	
BR	East Lake Road	32.557575	-99.690416	N	2	30	NA	NA	
FP	FM 600	32.608912	-99.687683	N			60 ft	Yes	