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STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2011 Survey Report

Abilene Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Abilene 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**: Abilene Reservoir is a 640-acre impoundment constructed on Elm Creek in the Brazos River Basin approximately 18 miles south of Abilene, Texas. The reservoir was primarily used for recreation. Beginning in 2005, operation and control of the reservoir was transferred from the city of Abilene to Abilene State Park. From 1997 through 2001 water level declined to a record low with only five acre-feet remaining. Large rain events filled or nearly filled the reservoir in 2002, 2005, 2007, and 2010. Each rain event was followed by a steady decline in water level. Water level was 8 to 11 feet below conservation pool at time of sampling in 2011 and 2012, and littoral habitat consisted primarily of dead brush. Two boat ramps were present; one was available only when the reservoir was full and the other when the water level was less than 10-feet low. Boat access was limited to small boats launching off a stretch of shoreline near the dam when the reservoir was more than 10-feet low. Water had a red-clay color with visibility less than 10 inches.

- **Management History:** Stockings of blue catfish, channel catfish, and northern largemouth bass occurred following the 1998-2001 drought. Florida largemouth bass were stocked in 2009. Blue and channel catfish harvest regulations changed in 2005, when Abilene State Park took control of the reservoir, to a no minimum length limit and a five fish daily bag limit, in any combination. Also, fishing is restricted to pole and line only.

- **Fish Community**
  - **Prey species:** Gizzard shad were abundant and small. Bluegill and threadfin shad were present in low abundance.

  - **Catfishes:** Few blue catfish were collected, but their size (15-24 inches long) should interest anglers. Channel catfish numbers increased compared to previous years, and 22% of those collected were at least 12 inches long.

  - **Largemouth bass:** Numbers and size distribution of largemouth bass were excellent and should support above average fishing opportunities.

  - **White crappie:** Abundance of white crappie was high, but only one in every six white crappie was legal size (at least 10 inches long). Growth of crappie was poor (a 10 in crappie was 3 to 6 years old), but some large crappie (up to 15 inches long and over two pounds) were available to anglers.

- **Management Strategies:** Discuss boat ramp and parking improvements with Abilene State Park staff. Educate the public about negative impacts of invasive species and how to prevent their spread. Conduct electrofishing and trap-net surveys biennially and gill-net surveys every four years.

INTRODUCTION

This document is a summary of fisheries data collected from Abilene 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

Abilene Reservoir is a 640-acre impoundment constructed on Elm Creek approximately 18 miles south of Abilene, Texas. It is located in the Brazos River Basin. Its primary function was recreation, but it also provided some municipal water supply to the city of Abilene. Beginning in 2005 operational control of the reservoir was transferred from the city of Abilene to Abilene State Park.

Abilene Reservoir has experienced two severe low-water periods; one in the mid 1980s and one in the late 1990s to early 2000s (Figure 1). From 1986 to mid 1997, water level was relatively stable (Figure 1). From 1997 thru summer 2002, there was substantial water loss; a record low water level occurred in 2001—only five acre-feet of water remained. Large rain events filled or nearly filled the reservoir in 2002, 2005, 2007, and 2010. Each rain event was followed by a steady decline in water level. Water level was 8 to 11 feet below conservation pool at time of sampling, and littoral habitat consisted primarily of dead brush. Water had a red-clay color with visibility less than 10 inches.

Two boat ramps were accessible when the reservoir was less than 3 feet low and one boat ramp when the water level was less than 10-feet low. A stretch of shoreline near the dam can be used to launch small boats when the reservoir was more than 10-feet low. Boat ramps were unusable beginning in April 2012. Bank-fishing access was limited to the south shore, and a fishing pier was installed at the south corner of the dam in 2012. Other descriptive characteristics for Abilene 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. White crappie had poor size structure in 2007 (PSD = 6; PSD-P = 4). The recommended management strategy was to conduct a trap-net survey in 2009 and complete an age-and-growth analysis of the white crappie population.
    - **Action:** A 2009 trap-net survey indicated substantial improvement of white crappie size structure, but growth was poor; mean age of 9.0 – 10.9 inch white crappie was 3.9 years.

Harvest regulation history: Prior to 2005, when the reservoir was under operational control by the city of Abilene, fish populations were managed with statewide harvest regulations. In 2005, when Abilene State Park began operational control, harvest regulations for blue and channel catfish were changed to no minimum length limit and a five fish daily bag limit, in any combination, and fishing was restricted to pole and line only. Harvest regulations for sport fish in Abilene Reservoir are in Table 2.

Stocking history: Blue catfish, channel catfish, and largemouth bass were stocked in 2004-2005. Florida largemouth bass, stocked in 1988, 1991, and 1994, were re-introduced in 2009. The complete stocking history since 1988 is in Table 3.

Vegetation/habitat management history: Attempts to introduce cypress trees and American lotus in the 1990s were unsuccessful.

Water transfer: There are currently no permanent pumping stations on the reservoir which transfer water to or from other locations.

METHODS

Fishes were collected by electrofishing (1.25 hours at 15 5-min stations), trap netting (10 net nights at 10 sites), and gill netting (five net nights at five 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). Largemouth bass genetics were determined with Microsatellite DNA analysis in 2007 and 2011 and electrophoresis in the 1990s. 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 38 random sites selected on the 2,006-foot contour line (6 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, or sand), small rock (< 4" diameter), or large rock (> 4" diameter) (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Water-column habitat composition was determined by assessing presence or absence of habitat (excluding substrate) in the water column at 110 random sites in the reservoir. 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 Gut et al. (2007)], and condition indices [relative weight (W_r)] were calculated for some target fishes according to Anderson and Neumann (1996). Ninety-five percent confidence intervals were calculated for relative weight estimates with 1,000 resamples of the original data (with replacement) by the percentile method. 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 of white crappie were determined using otoliths. 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: The prevalent substrate was soft (clay, silt, or sand) with a mix of small rocks (Table 4). Water-column habitat was primarily open water and dead brush, with scattered aquatic vegetation (Table 4).

Prey species: Electrofishing CPUE was 732.0/h for gizzard shad and 68.8/h for bluegill. Gizzard shad, since 2007, have been abundant with most less than 7 inches long (Figure 2). Total CPUE (732.0/h) and IOV (97) of gizzard shad in 2011 were higher than the district averages (total CPUE=422.5; IOV=79) and the 15-year Abilene Reservoir averages (total CPUE=533.6; IOV=88). Threadfin shad were present in low abundance. Bluegill were small (PSD=0) and had low relative abundance (< 300/h since 2007 and < 100/h in 2011) (Figure 3). Combined abundance of bluegill and sub-stock gizzard shad showed an increasing trend from 1996 through 2009, although gizzard shad were primarily responsible for the increase (Figure 4).

Blue catfish: Gill net CPUE of blue catfish was 2.0/nn in 2012. Catch rates ranged from 0.8 to 4.6 since 2006 (Figure 5). The length distribution of blue catfish shifted from smaller fish in 2006 to larger fish in 2012, suggesting all fish were from the same year class, with no evidence of reproductive success (Figure 5).

Channel catfish: Gill net CPUE of channel catfish was 9.0/nn in 2012, a large increase in catch compared to 2006 and 2008 (Figure 6). Only 22% of channel catfish collected in 2012 were ≥ 12 inches long (Figure 6).

Flathead catfish: Flathead catfish were present (0.2/nn).

Largemouth bass: Electrofishing CPUE of largemouth bass was 94.4/h in 2011. Size structure and relative abundance have been similar since 2007 (Figure 7). The CPUE-14 (14.3/h-24.8/h) and PSD-14 (25-32) since 2007 were higher than the district averages (CPUE-14=12.5/h; PSD-14=18), indicating that angling opportunities for quality fish (14 inches or longer) have been good. Another indication of good fishing was a water-body record 12.26-pound largemouth bass caught in 2010. Body condition, as measured by W_r, has steadily declined for larger fish (≥ 12 inches long) since 2007, but only fish 12-14.9 inches long had an average W_r below 90 (Table 5).

White crappie: Total CPUE of white crappie collected with trap nets was 41.7/nn in 2011, nearly identical to catch rates in 2007 and 2009 (Figure 8). Catch rate of stock-size white crappie from 2007 to 2011 was also similar (Figure 8). Size structure, as defined by PSD and PSD-P, improved from 2007 to 2009, but worsened in 2011 (Figure 8). From 2009 to 2011, W_r improved for fish 5.0-7.9 inches long, but declined for larger fish (Table 6). Average W_r increased with fish size in both years. Historically, white crappie grew slow at Abilene Reservoir; mean age at 10 inches long, from a 1996 and 1999 composite sample, was 5.2 years (N=20; range=3-8 years). Growth in 2011, although faster than in the 1990s, was slow; mean age at 10 inches was 3.9 years (N=13; range=3-6 years). The district mean age at 10 inches was 2.1 years (N=762).

ISSUE 1: Boat access is limited to launching off the bank at low water levels (> 10 feet low) and the main boat ramp has no parking lot.

MANAGEMENT STRATEGY

1. Approach Abilene State Park about extending the boat ramp and constructing a paved parking area at the Elm Creek access point.

ISSUE 2: 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:

Continue trap-net and electrofishing surveys every other year for continuation of biennial trend data. A four-year rotation for gill nets is sufficient to monitor catfish populations. A sampling schedule is in Table 8.

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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.

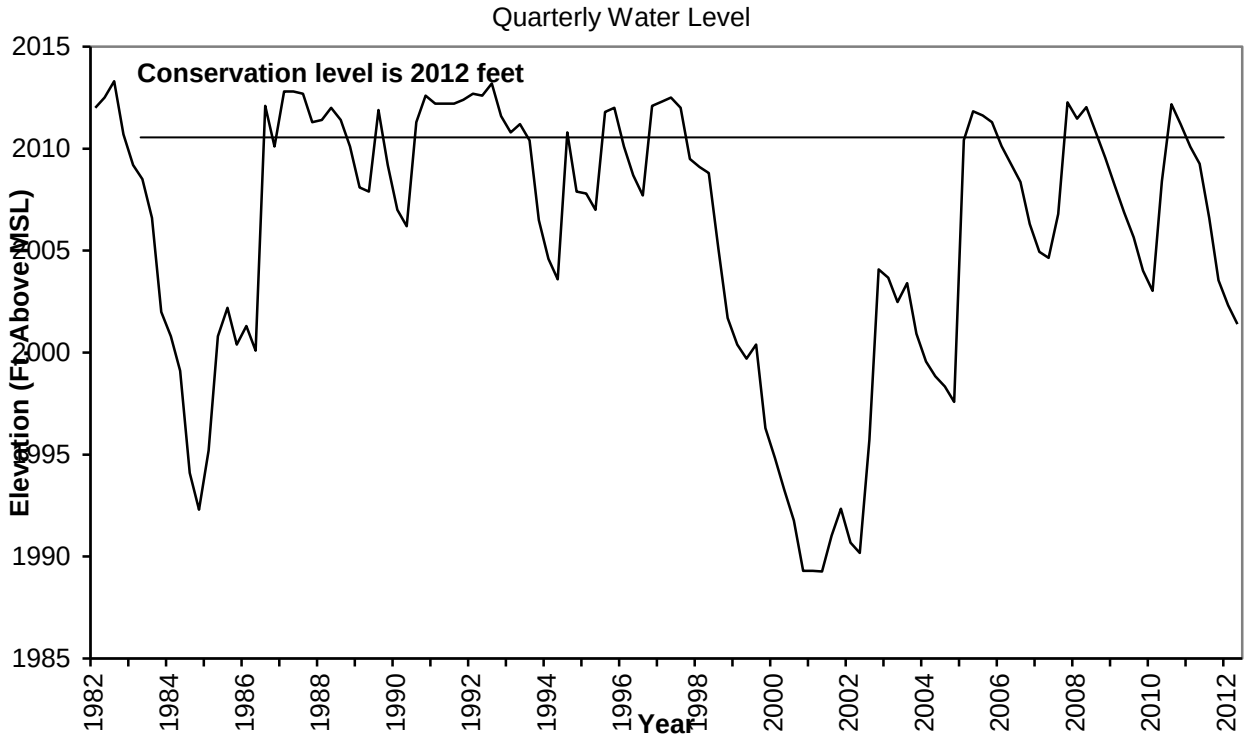


Figure 1. Quarterly water level elevations in feet above mean sea level for Abilene Reservoir, Texas, 1982-2012.

Table 1. Characteristics of Abilene Reservoir, Texas.

Characteristic	Description
Year constructed	1921
Controlling authority	Abilene State Park
County	Taylor
Reservoir type	Tributary, Brazos River Basin
Shoreline Development Index (SDI)	2.27
Conductivity	467 umhos/cm

Table 2. Harvest regulations for Abilene Reservoir, Texas

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	5 (in any combination)	none
Catfish, flathead	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 Abilene Reservoir, Texas. Size categories are: FGL = 1-3 inches.

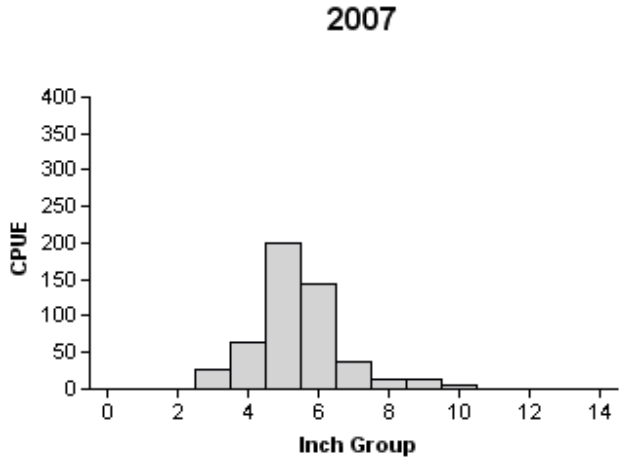
Species	Year		Number	Size
Blue catfish	1995		36,883	FGL
	1996		64,429	FGL
	2004		59,893	FGL
		Total	161,205	
Channel catfish	1998*		19,362	FGL
	2004		53,981	FGL
	2005		401	FGL
		Total	73,744	
Bluegill				
	2001		81,238	FGL
Largemouth bass	2005		63,695	FGL
Florida largemouth bass	1988		64,000	FGL
	1991		30,030	FGL
	1994		64,026	FGL
	2009		59,516	FGL
		Total	217,572	

* Imperial strain

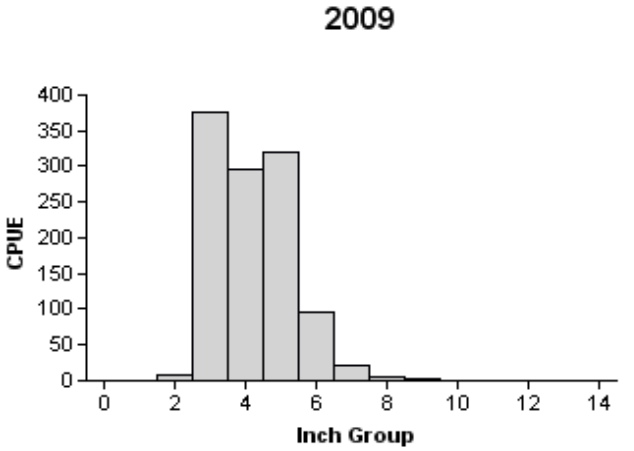
Table 4. Percent occurrence and 95% confidence intervals (C.I.) of substrate habitat (38 random sites) and water-column habitat (110 random sites) in Abilene Reservoir, Texas, 2011.

Habitat Type	Percent Occurrence	95 % C. I.
Substrate		
Clay,silt,sand	60	45 - 76
Small rock (< 4”)	37	21 – 53
Large rock (> 4”)	13	3 – 24
Water column		
Open water	56	47 – 66
Dead brush	36	27 – 45
Illinois pondweed	6	3 – 11
Stargrass	4	1 – 7
Water willow	3	0 – 6
Cattail	2	0 – 5
Milfoil	2	0 – 5
Coontail	1	0 – 3
Smartweed	1	0 – 3
Black willow	1	0 – 3

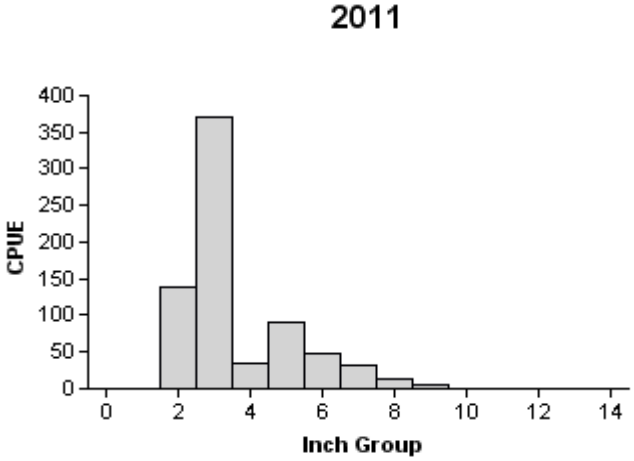
Gizzard Shad



Effort =	1.3
Total CPUE =	505.5 (13; 674)
Stock CPUE =	72.0 (26; 96)
IOV =	93 (3)



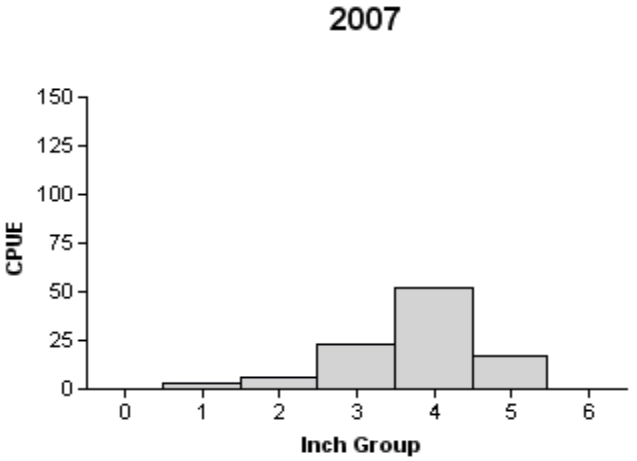
Effort =	1.3
Total CPUE =	1,126.4 (28;
Stock CPUE =	30.4(22; 38)
IOV =	99 (1)



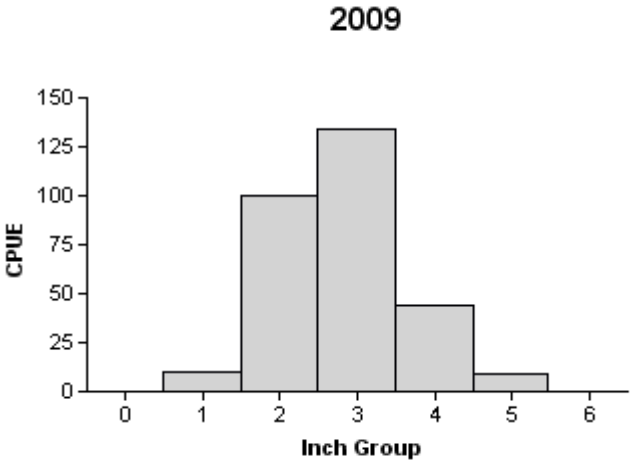
Effort =	1.3
Total CPUE =	732.0 (56; 915)
Stock CPUE =	50.4 (23; 63)
IOV =	97 (2)

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, Abilene Reservoir, Texas, 2007, 2009, and 2011.

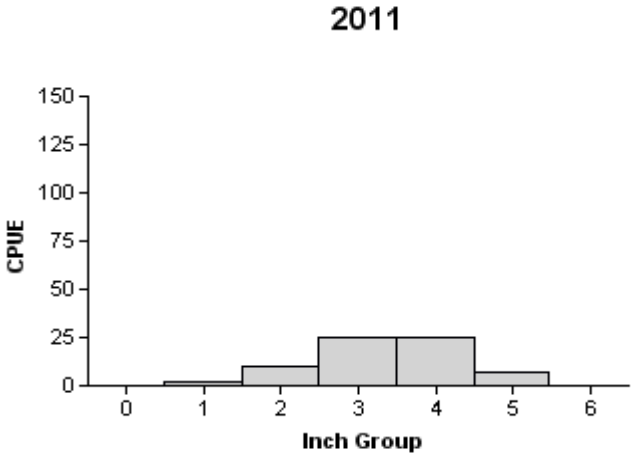
Bluegill



Effort = 1.3
Total CPUE = 101.3.0 (16; 135)
PSD = 0



Effort = 1.3
Total CPUE = 296.0 (33;370)
PSD = 0



Effort = 1.3
Total CPUE = 68.8 (28; 86)
PSD = 0

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, Abilene Reservoir, Texas, 2007, 2009, and 2011.

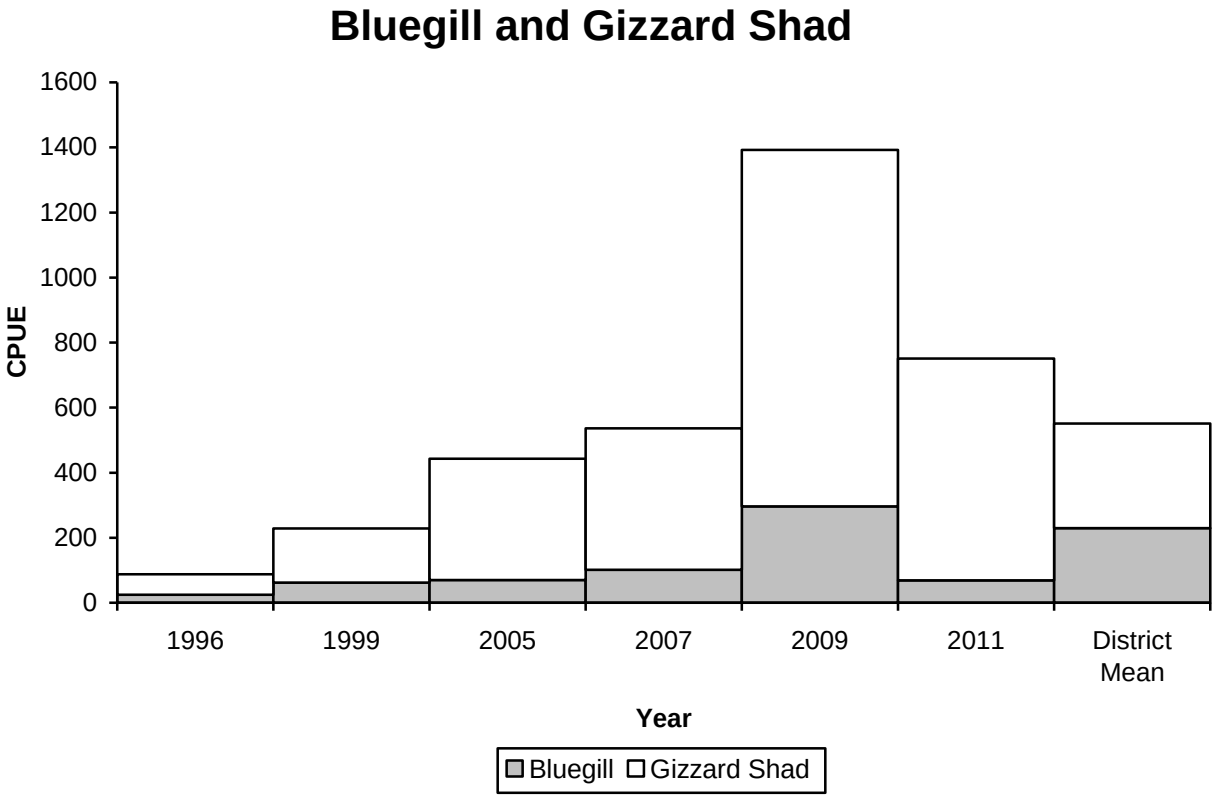
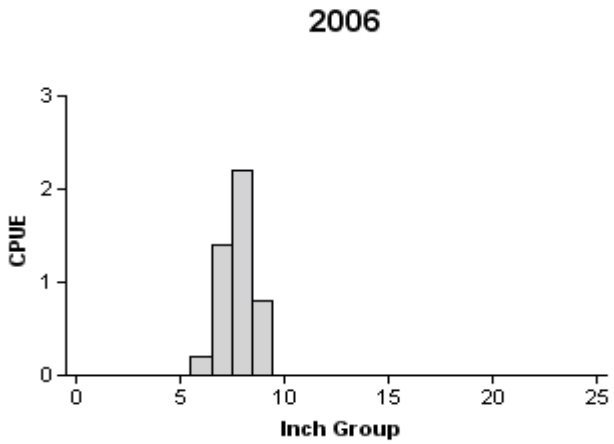
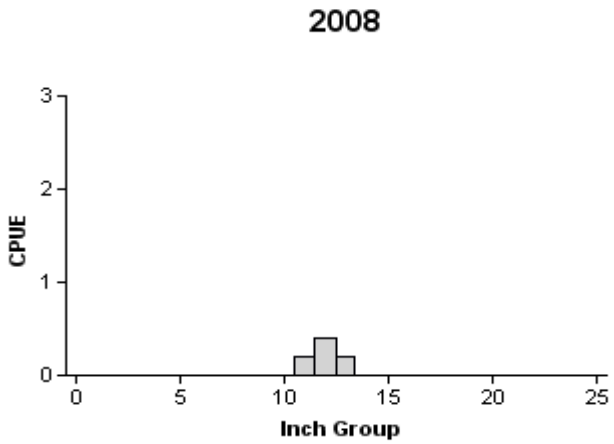


Figure 4. Electrofishing catch per hour (CPUE) of bluegill and sub-stock (< 7 in TL) gizzard shad from Abilene Reservoir, 1996-2011.

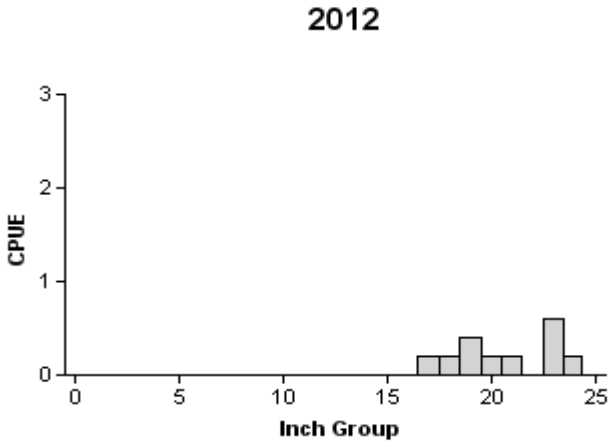
Blue Catfish



Effort = 5.0
Total CPUE = 4.6 (33; 23)
CPUE-12 = 0.0



Effort = 5.0
Total CPUE = 0.8 (25; 4)
CPUE-12 = 0.6 (41;.3)



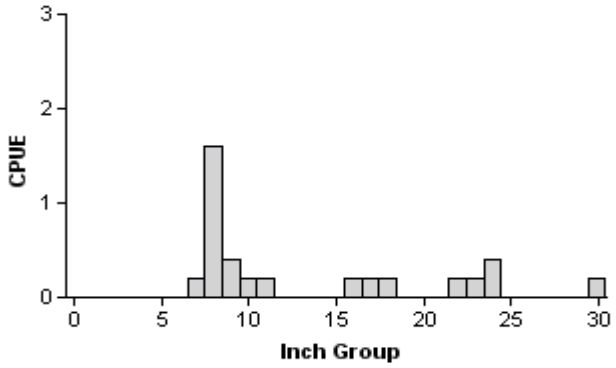
Effort = 5.0
Total CPUE = 2.0 (32; 10)
CPUE-12 = 2.0 (32; 10)

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, Abilene Reservoir, Texas, 2006, 2008, and 2012.

Channel catfish

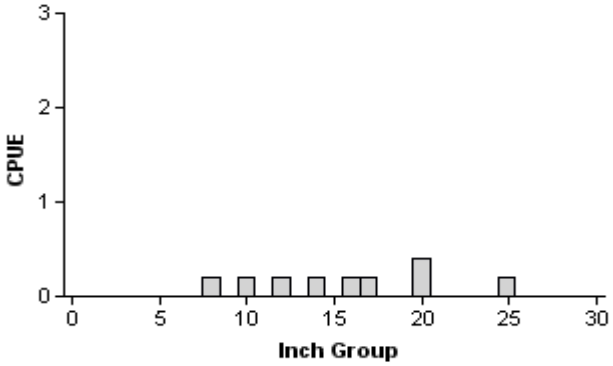
2006

Effort = 5.0
Total CPUE = 4.2 (12; 21)
CPUE-12 = 1.6 (55; 5)



2008

Effort = 5.0
Total CPUE = 1.8 (32; 9)
CPUE-12 = 1.4 (17; 7)



2012

Effort = 5.0
Total CPUE = 9.0 (40; 45)
CPUE-12 = 2.0 (42; 10)

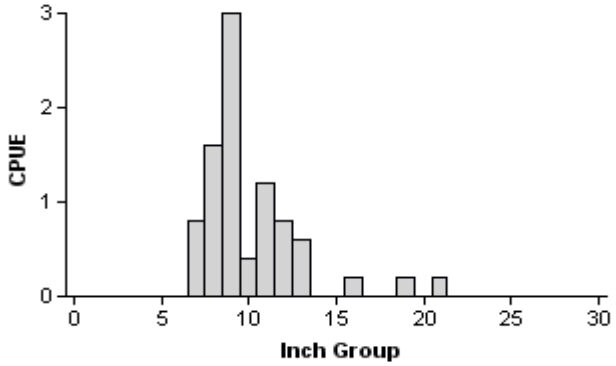
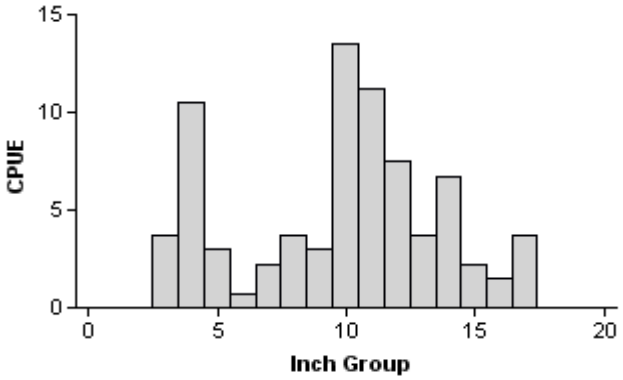


Figure 6. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Abilene Reservoir, Texas, 2006, 2008 and 2012.

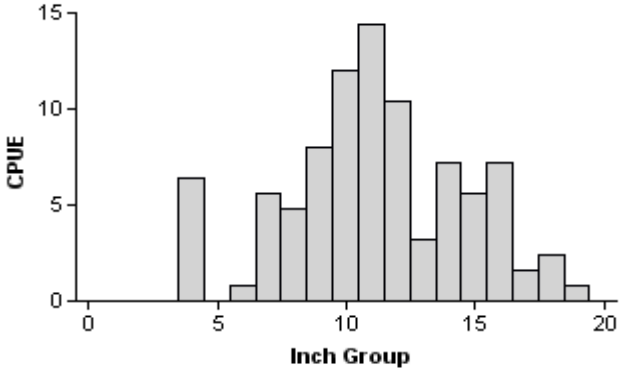
Largemouth Bass

2007



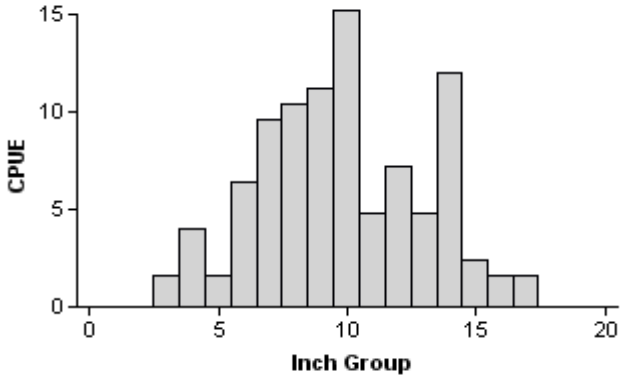
Effort =	1.3
Total CPUE =	77.3 (16; 103)
Stock CPUE =	57.0 (18; 76)
CPUE-14 =	14.3 (19; 19)
PSD =	45 (6)
PSD-14 =	25 (6)
PSD-P=	13 (4)

2009



Effort =	1.3
Total CPUE =	90.4 (15; 113)
Stock CPUE =	77.6 (16; 97)
CPUE-14 =	24.8(17; 31)
PSD =	49 (5)
PSD-14 =	32 (4)
PSD-P=	23 (4)

2011



Effort =	1.3
Total CPUE =	94.4 (30; 118)
Stock CPUE =	71.2 (30; 89)
CPUE-14 =	17.6 (33; 22)
PSD =	42 (4)
PSD-14 =	25 (3)
PSD-P=	8 (2)

Figure 7. 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, Abilene Reservoir, Texas, 2007, 2009, and 2011.

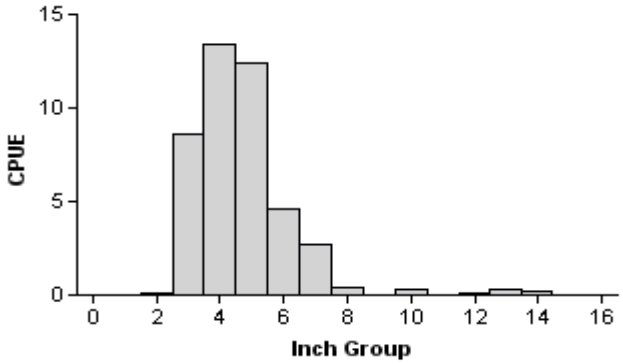
Largemouth Bass

Table 5. Mean relative weight of 8.0-11.9-inch, 12.0-14.9-inch, and > 14.9-inch largemouth bass from 2007, 2009, and 2011, Abilene Reservoir, Texas (95% confidence intervals are in parentheses).

	Mean Wr		
Year	8.0-11.9	12.0-14.9	> 14.9
2007	94 (92-97)	98 (96-100)	105 (99-111)
2009	90 (88-93)	93 (91-96)	101 (97-106)
2011	94 (92-96)	87 (85-88)	93 (88-98)

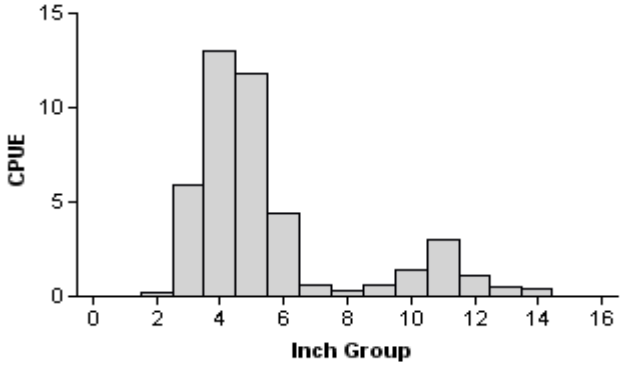
White Crappie

2007



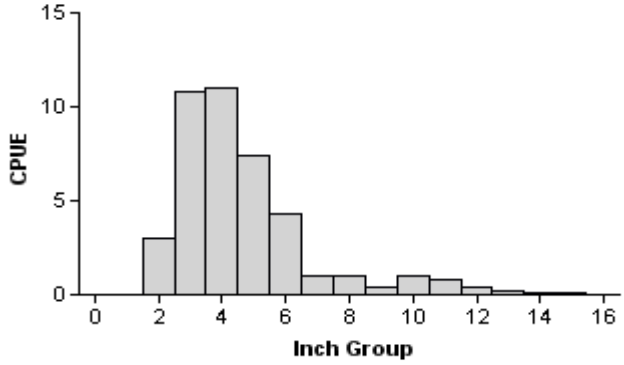
Effort =	10
Total CPUE =	43.1 (32; 431)
Stock CPUE =	21.0 (23; 210)
CPUE-10 =	0.9 (35; 9)
PSD =	6 (2)
PSD-10 =	4 (2)

2009



Effort =	10
Total CPUE =	43.2 (26; 432)
Stock CPUE =	24.1 (26; 241)
CPUE-10 =	6.4 (58; 64)
PSD =	30 (15)
PSD-10 =	27 (13)

2011



Effort =	10
Total CPUE =	41.7 (34; 375)
Stock CPUE =	16.9 (26; 152)
CPUE-10 =	2.7 (35; 24)
PSD =	24 (9)
PSD-10 =	16 (7)

Figure 8. 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, Abilene Reservoir, Texas, 2007, 2009 and 2011.

Table 6. 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 Abilene Reservoir, Texas (95% confidence intervals are in parentheses).

	Mean W_r by size category		
Year	5.0-7.9 in	8.0-9.9 in	≥ 10 in
2009	76 (71-82)	92 (86-99)	99 (96–101)
2011	82 (79-85)	87 (83-92)	91 (88–95)

Table 7. Proposed sampling schedule for Abilene 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.

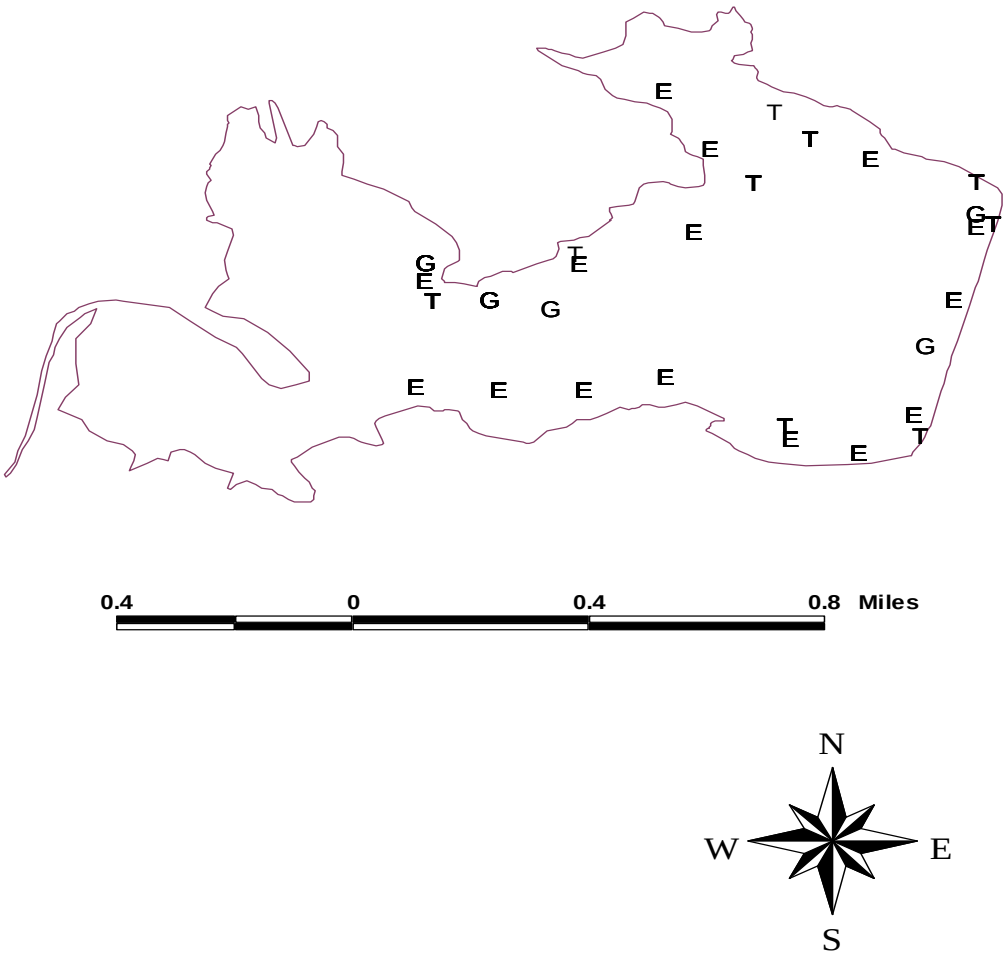
Survey Year	Electrofisher	Trap Net	Gill Net	Vegetation	Access	Report
Fall 2012-Spring 2013						
Fall 2013-Spring 2014	A	A				
Fall 2014-Spring 2015						
Fall 2015-Spring 2016	S	S	S	S	S	S

APPENDIX A

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

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Threadfin shad					9	7.2
Gizzard shad					915	732.0
Blue catfish	4	0.8				
Channel catfish	9	1.8				
Flathead catfish	1	0.2				
Green sunfish					4	3.2
Warmouth					6	4.8
Bluegill					86	68.8
Longear sunfish					7	5.6
Largemouth bass					118	94.4
White crappie			375	41.7		

APPENDIX B



Location of sampling sites, Abilene Reservoir, Texas, 2011-2012. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was 8 to 11 feet below conservation elevation 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 Abilene 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	ADA Accessible (FP)	Needed Improvements
BR	Elm Creek	32.233515	-99.902972	Y	1	5	NA	NA	Pave parking lot and extend boat ramp.
FP	Dam	32.232130	-99.890842	Y	NA	NA	50 ft	Y	