

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2012 Fisheries Management Survey Report

**Mackenzie Reservoir**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Mackenzie Reservoir were surveyed in 2012 using electrofishing and trap netting and in 2013 using gill netting. Historical data are presented with the 2012-2013 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Mackenzie Reservoir was constructed in 1974 on Tule Creek, a tributary of the Prairie Dog Town Fork of the Red River. It is located 12 miles northwest of Silverton in Briscoe County, Texas. The reservoir is owned by the Mackenzie Municipal Water Authority and is used for water supply and recreational purposes. Mackenzie Reservoir is characterized as being a deep, clear, eutrophic reservoir that experiences strong thermal stratification during summer months. At conservation pool (3,100 feet above mean sea level; FMSL) the reservoir is a 900-acre impoundment. At the time of sampling, the reservoir had a mean elevation of 3009.6 FMSL and a surface area of approximately 179 acres. Habitat consisted primarily of natural featureless shoreline and rock bluff.
- **Management History:** Important sport fish include Largemouth Bass, Palmetto Bass, White Bass, White Crappie, and Catfish. All species have been managed with statewide harvest regulations.
- **Fish Community**
  - **Prey species:** Gizzard Shad and Bluegill were present in the reservoir. Electrofishing catch rates for Gizzard Shad and Bluegill have declined greatly since 2008. Only 14% of the sampled Gizzard Shad were small enough to be available as prey to sport fish, and all Bluegill sampled were six inches in length and smaller, also available to most predators.
  - **Catfishes:** The Blue Catfish gill net catch rate showed a decrease from 2009 while the Channel Catfish gill net catch rate doubled.
  - **Temperate basses:** White Bass gill net catch rate increased from 2009 to 2011, but declined to historic levels in 2013. Past creel surveys indicated that White Bass in the reservoir received little angling effort. Gill net catch rates for Palmetto Bass have decreased over the past four years.
  - **Largemouth bass:** Largemouth Bass abundance has declined since 2008, and the majority of fish sampled were below the legal length limit (14 in).
  - **White crappie:** White Crappie were present in the reservoir. Trap net catch rates for 2012 were similar to 2008. However, no legal sized crappie was sampled in 2012.
- **Management Strategies:** Stock Palmetto Bass at 5-10 fish/acre annually if lake level increases. Continue management under current harvest regulations. The proposed sampling schedule is a continuation of the current schedule with the addition of electrofishing and trap netting in 2014 and gill netting in 2015. Access and habitat surveys will be conducted in 2016.

## INTRODUCTION

This document is a summary of fisheries data collected from Mackenzie Reservoir in 2012-2013. 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 2012-2013 data for comparison.

### *Reservoir Description*

Mackenzie Reservoir is a 900-acre impoundment constructed in 1974 on Tule Creek, a tributary of the Prairie Dog Town Fork of the Red River. It is located 12 miles northwest of Silverton in Briscoe County, Texas. The reservoir is owned by the Mackenzie Municipal Water Authority and is used for water supply and recreational purposes. The reservoir has a history of water level fluctuations and has never caught sufficient runoff to fill to capacity (Figure 1). Mackenzie Reservoir is characterized as a eutrophic reservoir with a mean Trophic State Index chl-a of 53.2 (Texas Commission on Environmental Quality 2011). The lake has also been known to experience strong thermal stratification during summer months. At the time of sampling, the habitat consisted primarily of natural featureless shoreline and rock bluff. The reservoir surface area has steadily declined from approximately 313 acres in late 2007 to approximately 161 acres in April, 2013 and is currently at 6.2 percent of capacity. Other descriptive characteristics for Mackenzie Reservoir are in Table 1.

### *Angler Access*

Mackenzie Reservoir has two public boat ramps and one private boat ramp. At current lake levels only the Mackenzie boat ramp located on the southeast side of the dam is useable. Extension of the Marina boat ramp is not feasible due to reduced slope. Additional boat ramp characteristics are in Table 2. There is one courtesy fishing dock located near the Marina boat ramp; however, the dock is currently sitting on dry ground. Shoreline access is limited to a beach area on the west end of the lake and to areas around the boat ramps. There are no handicapped specific facilities.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Clayton and Munger 2009) included:

1. In an effort to maintain a quality Palmetto Bass fishery, it is recommended that stocking every other year at 5 fish/acre, based upon actual surface area of the reservoir, be continued.  
**Action:** Palmetto Bass were stocked in 2010. Golden algae issues at the fish hatchery have resulted in poor palmetto bass production and no other stockings occurred since 2010.
2. Add additional electrofishing survey during the 2009-2010 sampling season to monitor the forage populations.  
**Action:** Largemouth Bass and forage species were sampled with electrofishing in 2009 and 2010.

**Harvest regulation history:** Sport fishes in Mackenzie Reservoir have been and currently are managed with statewide regulations (Table 3).

**Stocking history:** Mackenzie Reservoir was last stocked in 2010 (Palmetto Bass). The complete stocking history is in Table 4.

**Vegetation/habitat management history:** There is no vegetation or habitat management history for this reservoir.

**Water transfer:** Mackenzie Reservoir is primarily used for municipal water supply and recreation. One permanent pumping station on the reservoir transfers water to the Mackenzie Municipal Water Authorities water treatment plant for municipal water supply. No interbasin transfers are known to exist.

## 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). 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). A habitat survey was conducted in August, 2012.

The 2008 trap net survey was part of a statewide lighted trap net study. Ten trap net sites (lighted trap nets were used at 5 of the sites and unlighted nets were set at the other 5 sites) were set at randomly selected locations throughout the reservoir and fished overnight following standard TPWD crappie sampling protocols (TPWD Fishery Assessment Procedures Manual). The same trap net sites were then reassigned (5 lighted switched to 5 unlighted and 5 unlighted switched to 5 lighted) and fished for a second night for a total of 20 net nights.

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 target fishes according to Anderson and Neumann (1996). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE.

Source for water level data was the United States Geological Survey (USGS) website.

## RESULTS AND DISCUSSION

**Habitat:** A habitat survey was conducted in August, 2012. Primary habitat consisted of natural featureless shoreline (49.5%) and rock bluff (34.7%). Remaining shoreline consisted of large rock (12.4 %) and gravel (3.4 %) (Table 5). No aquatic vegetation was present in the reservoir.

**Prey species:** Electrofishing catch rates of Gizzard Shad and Bluegill were 124.0/h and 44.0/h, respectively. Index of vulnerability (IOV) for Gizzard Shad was poor, indicating only 14% of Gizzard Shad were available to existing predators; this was considerably lower than the IOV estimates from 2009 (IOV=72) and 2010 (IOV=54) (Figure 2). Total CPUE of Gizzard Shad was higher in 2012 compared to the 2010 survey, but it was similar to the 2009 survey (Figure 2). Total CPUE of Bluegill in 2010 (44.0/h) was higher than 2010 (19.0/h), but much lower than 2009 (123.0/h). Size structure of Bluegill appears to be dominated by small individuals (Figure 3).

**Blue Catfish:** Blue Catfish CPUE in 2009 was 0.6/nn, a decrease over the 2009 catch rate of 1.4/nn in 2007, but similar to 0.4/nn in 2011 (Figure 4).

**Channel Catfish:** Channel Catfish CPUE was 5.8/nn in 2013, an increase over previous surveys (4.2/nn in 2011 and 2.4/nn in 2009) (Figure 5). Larger Channel Catfish had a mean  $W_r > 100$ ; however, smaller fish had a mean  $W_r$  near or below 90. Reproduction was indicated by the catch of smaller fish.

**Flathead Catfish:** Flathead Catfish have been present in the reservoir in low numbers, and survey results typically include only 1 or 2 Flathead Catfish collected during sampling. One Flathead Catfish was collected during a gill net survey in 2011, but none were sampled in 2013.

**White Bass:** The gill net catch rate of White Bass was 2.2/nn in 2013 (Figure 6) representing a decrease in relative abundance of White Bass from 2009 (4.4/nn) and 2011 (8.8/nn). Mean  $W_r$  of White Bass in 2013 ranged from high 70's to just over 90, similar to relative weight values in 2009 and 2011 (Figure 6).

**Palmetto Bass:** Palmetto Bass CPUE was 0.4/nn in 2013, a decline from 3.8/nn in 2011 and 6.8/nn in 2009 (Figure 7). Only two fish were sampled during the 2013 gill net survey. Population abundance decline is most likely attributed to loss of habitat through declining lake level; as well as, golden algae issues in the hatcheries which resulted in sporadic stockings.

**Largemouth Bass:** The electrofishing catch rate of Largemouth Bass was 47.0/h in 2012, similar to 2010 at 38.0/h, but much lower than 123.0/h in 2009 (Figure 8). A poor 2012 year class, most likely attributed to loss of fish habitat due to declining lake level, could suggest continued declines in population abundance (Figure 8).

**White Crappie:** The trap net catch rate of White Crappie was 2.0/nn in 2012; the same as 2008 (2.0/nn) but lower than 2004 (7.9/nn). The PSD in 2012 was 20; much lower than observed values of 84 in 2008 and 83 in 2004 (Figure 9). No legal size crappie were sampled.

## Fisheries management plan for Mackenzie Reservoir, Texas

Prepared – July 2013

**ISSUE 1:** Gill net catch rates for Palmetto Bass decreased substantially since 2009. Stocking of Palmetto Bass is required to sustain the population and maintain the fishery.

### MANAGEMENT STRATEGY

1. Stock Palmetto bass annually at 5-10 fish/acre once the reservoir size increases to 200 surface acres.

**ISSUE 2:** Persistent drought conditions have resulted in record low lake level and loss of large amounts of fish habitat.

### MANAGEMENT STRATEGIES

1. Conduct sonar mapping of remaining lake basin and investigate feasibility of habitat restoration project such as brush piles or PVC trees.
2. Add additional electrofishing, trap net, and gill net surveys during the 2014-2015 sampling season to monitor the effects of low water levels on sport fish populations.

**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 is a continuation of the current schedule with the addition of electrofishing and trap net surveys in the fall of 2014 and a gill net survey in 2015, and mandatory monitoring surveys in 2016-2017 (Table 6).

## LITERATURE CITED

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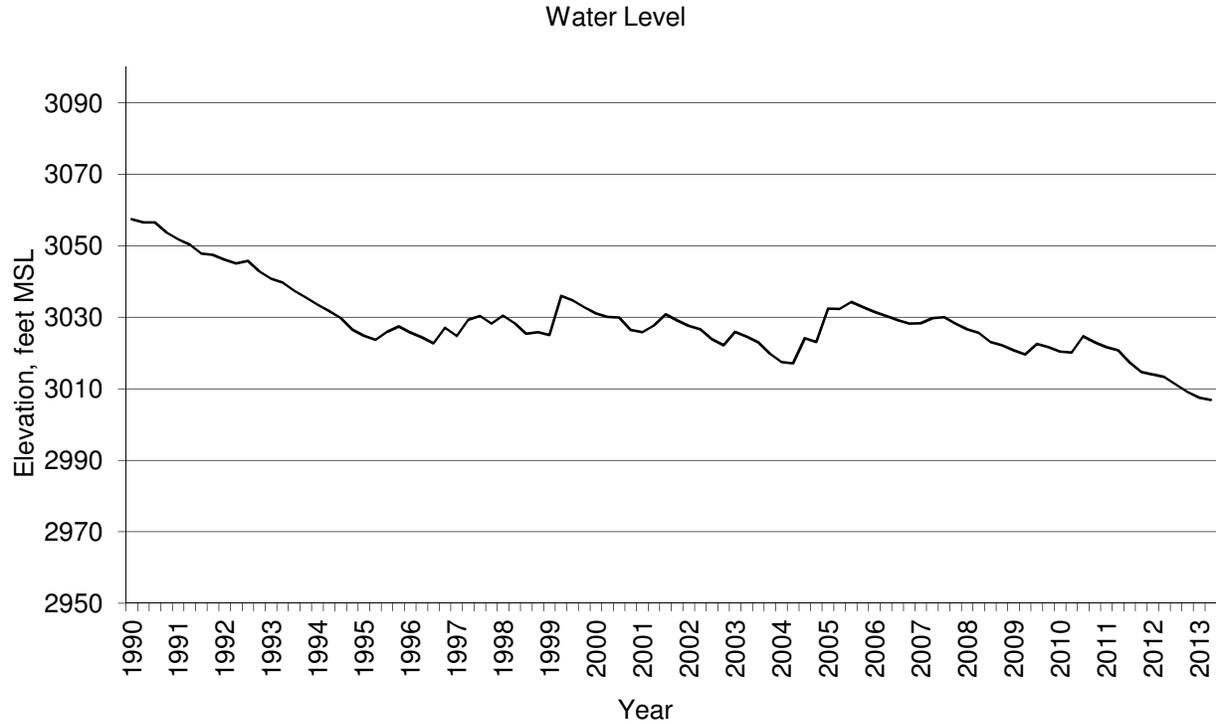


Figure 1. Quarterly water level elevations in feet above mean sea level (FMSL) recorded for Mackenzie Reservoir, Texas. Conservation pool elevation is 3,100 feet above mean sea level.

Table 1. Characteristics of Mackenzie Reservoir, Texas.

Characteristic	Description
Year constructed	1974
Controlling authority	Mackenzie Municipal Water Authority
County	Briscoe
Reservoir type	Mainstream
Shoreline Development Index (SDI)	2.88
Conductivity	784 $\mu\text{mhos/cm}$

Table 2. Boat ramp characteristics for Mackenzie Reservoir, Texas, August, 2012. Reservoir elevation at time of survey was 3009.6 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Mackenzie	34.54498 -101.44220	Y	20	UNK	Useable, currently no access issues.
Marina	34.54467 -101.54083	Y	10	3035	Out of water. Extension is not feasible
Coronado Shores	34.55237 -101.44977	N	unknown	3055	Out of Water.

Table 3. Harvest regulations for Mackenzie Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Palmetto	5	18-inch minimum
Bass: Smallmouth and Largemouth	5 (in any combination)	14-inch minimum
Crappie: White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum
Walleye	5	No more than 2 under 16 inches

Table 4. Stocking history of Mackenzie Reservoir, Texas. Fry = fry; FGL = fingerling; ADL = adults (FGL) and fry (FRY).

Species	Year	Number	Life Stage
Rainbow Trout	1975	10,000	ADL
Brown Trout	1975	5,000	ADL
Blue Catfish	1980	3,000	FGL
	1982	44,998	FGL
	Total	47,998	
Channel Catfish	1973	4,000	FGL
	1974	50,000	FGL
	1986	40,000	FGL
	Total	94,000	
Flathead Catfish	1975	5,000	FGL
Palmetto Bass	1979	5,000	FGL
	1981	10,951	FGL
	1994	13,507	FGL
	1995	13,500	FGL
	1997	9,202	FGL
	1998	9,025	FGL
	1999	13,511	FGL
	2003	9,020	FGL
	2005	8,920	FGL
	2007	9,333	FGL
	2009	10,160	FGL
	2010	2,039	FGL
Total	114,168		
Florida Largemouth Bass	1982	20,680	FGL
	1988	35,400	FGL
	1993	90,194	FGL
	1994	44,944	FGL
	Total	191,218	
Smallmouth Bass	1976	10,600	FGL
	1977	39,800	FGL
	1978	50,000	FGL
	Total	100,400	
Walleye	1976	350,000	FRY
	1977	180,000	FRY
	1978	350,000	FRY
	1983	1,122,000	FRY
	1984	720,000	FRY
	1985	630,000	FRY
	Total	3,352,000	

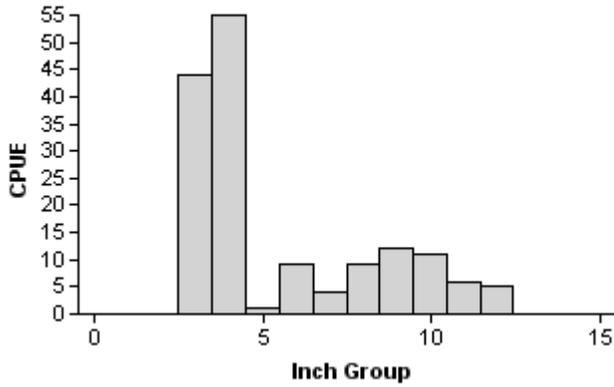
Table 5. Survey of structural habitat types, Mackenzie Reservoir, Texas, 2012. Shoreline habitat type units are in miles.

Habitat type	Estimate	% of total
Natural	2.6 miles	49.5
Rock Bluff	1.9 miles	34.7
Rocky	0.7 miles	12.4
Gravel	0.2 miles	3.4

## Gizzard Shad

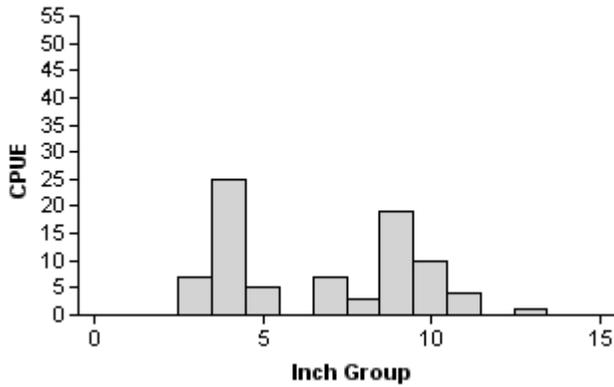
2009

Effort = 1.0  
 Total CPUE = 156.0 (25; 156)  
 IOV = 72 (5)



2010

Effort = 1.0  
 Total CPUE = 81.0 (17; 81)  
 IOV = 54 (11)



2012

Effort = 1.0  
 Total CPUE = 124.0 (45; 124)  
 IOV = 14 (4)

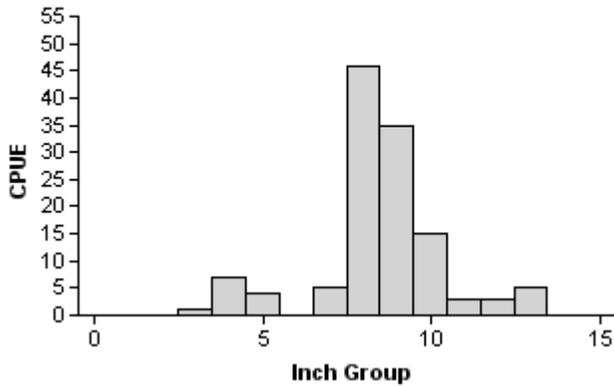
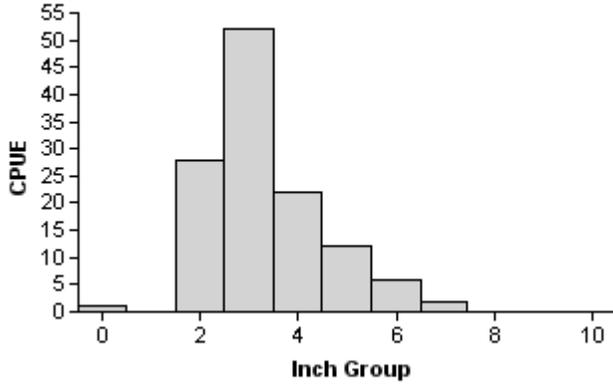


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Mackenzie Reservoir, Texas, 2009, 2010, and 2012.

# Bluegill

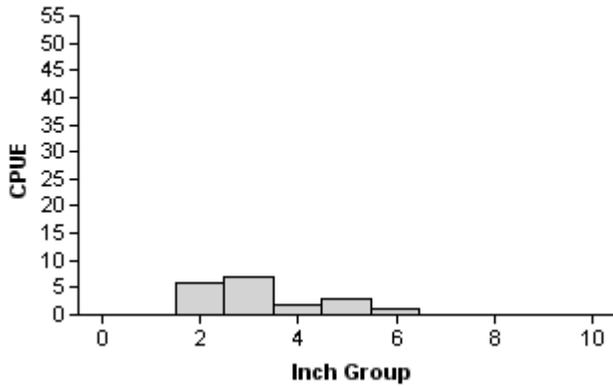
2009

Effort = 1.0  
 Total CPUE = 123.0 (17; 123)  
 PSD = 9 (4)



2010

Effort = 1.0  
 Total CPUE = 19.0 (23; 19)  
 PSD = 8 (8)



2012

Effort = 1.0  
 Total CPUE = 44.0 (33; 44)  
 PSD = 19 (8)

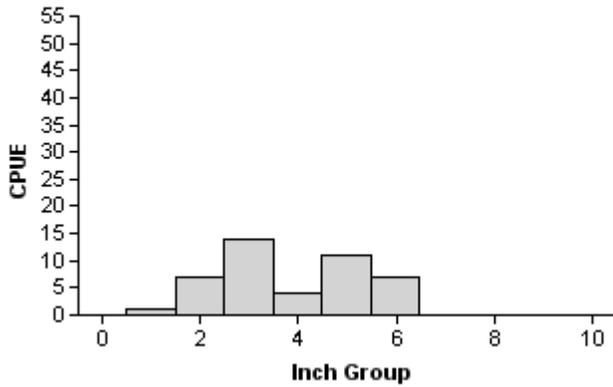


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mackenzie Reservoir, Texas, 2009, 2010, and 2012.

# Blue Catfish

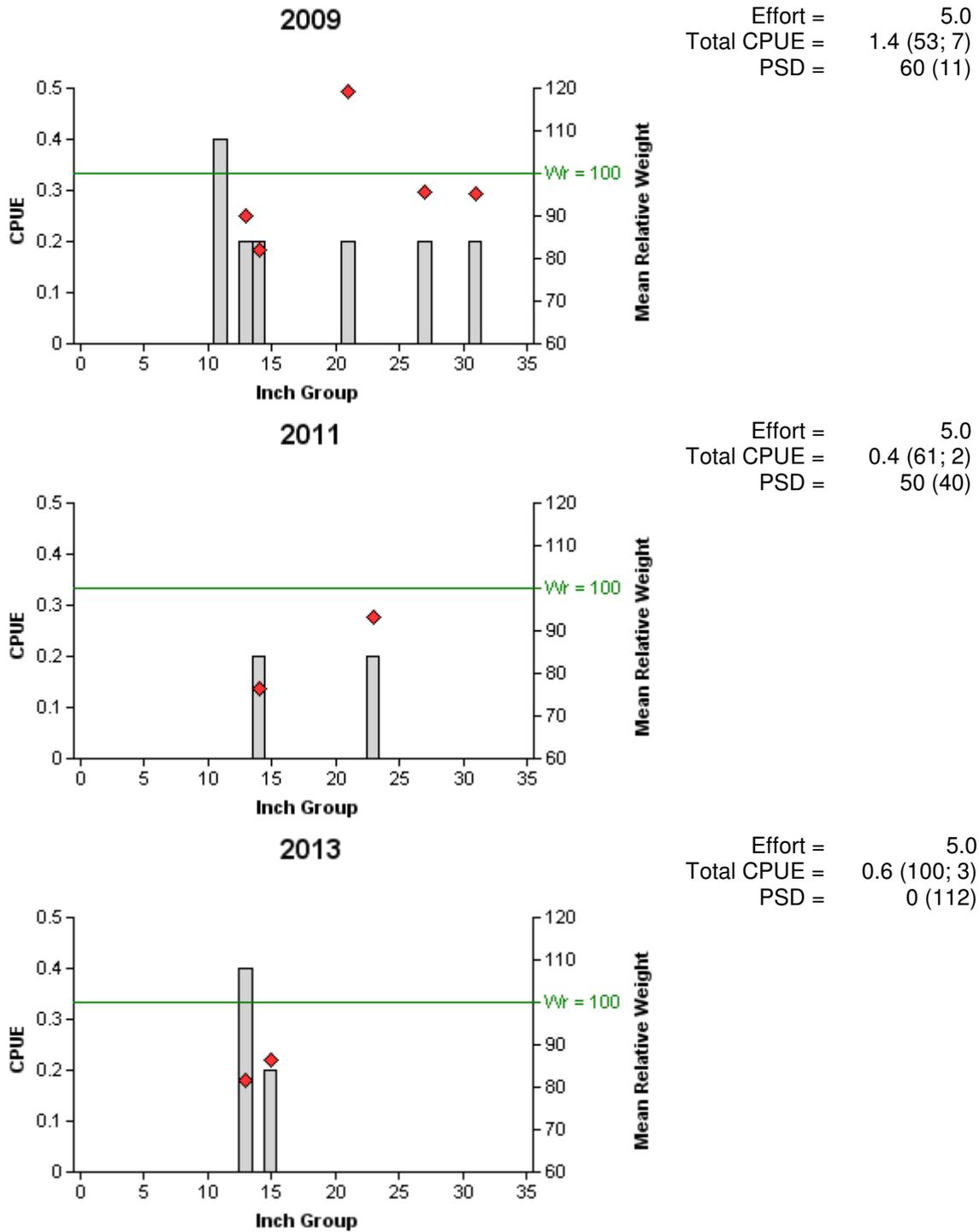
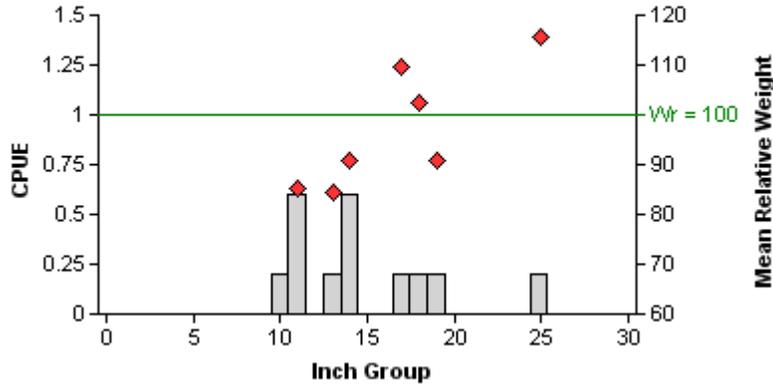


Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Mackenzie Reservoir, Texas, 2009, 2011, and 2013.

# Channel Catfish

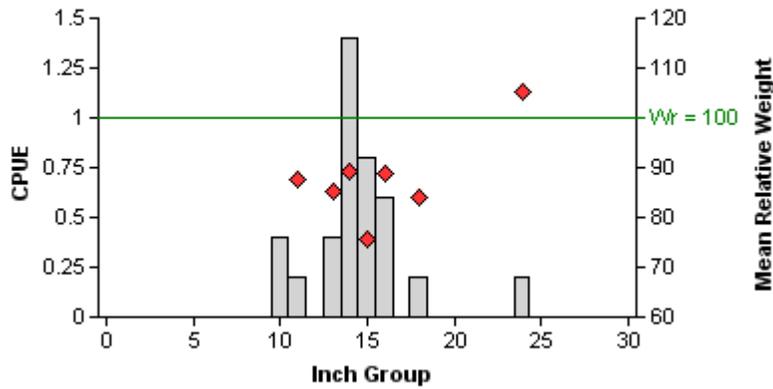
2009

Effort = 5.0  
 Total CPUE = 2.4 (28; 12)  
 PSD = 36 (19)



2011

Effort = 5.0  
 Total CPUE = 4.2 (29; 21)  
 PSD = 26 (9)



2013

Effort = 5.0  
 Total CPUE = 5.8 (17; 29)  
 PSD = 30 (10)

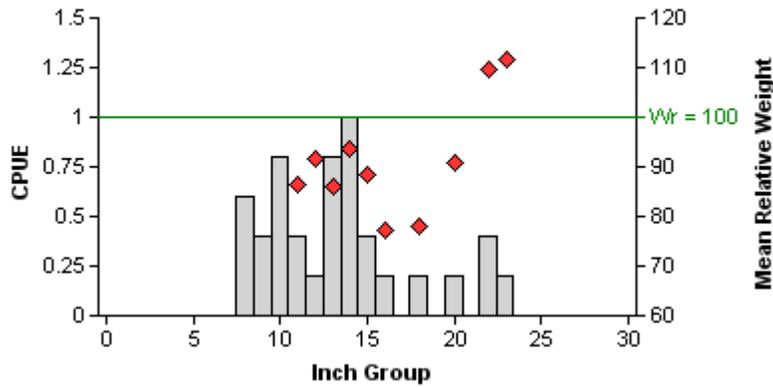
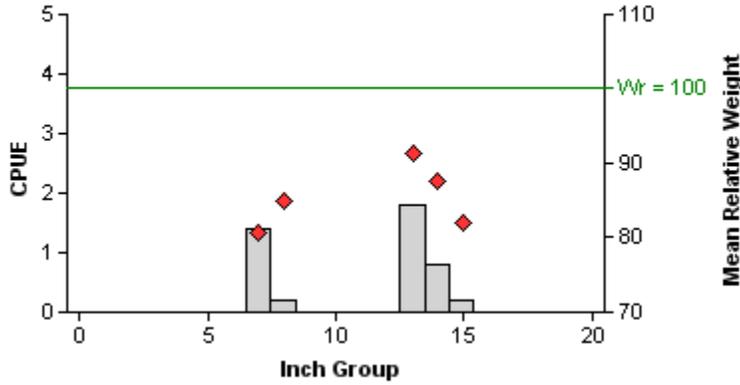


Figure 5. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Mackenzie Reservoir, Texas, 2009, 2011, and 2013.

# White Bass

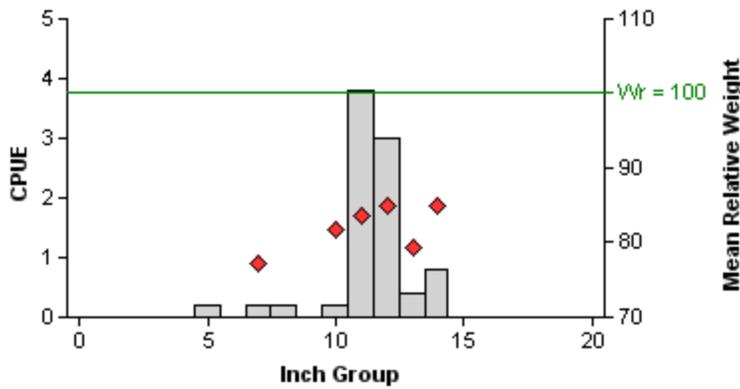
2009

Effort = 5.0  
 Total CPUE = 4.4 (31; 22)  
 PSD = 64 (16)



2011

Effort = 5.0  
 Total CPUE = 8.8 (22; 44)  
 PSD = 95 (3)



2013

Effort = 5.0  
 Total CPUE = 2.4 (39; 12)  
 PSD = 100 (0)

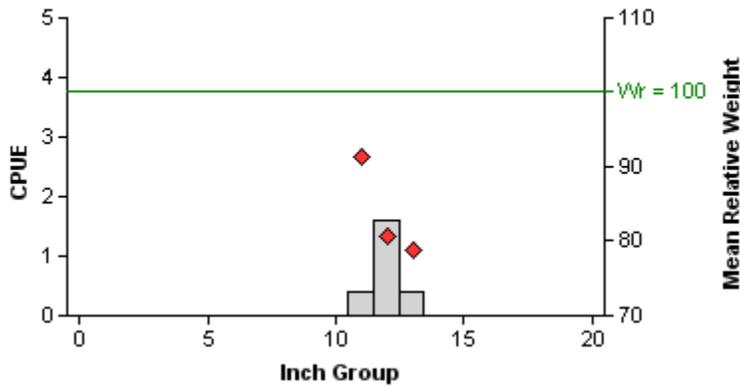
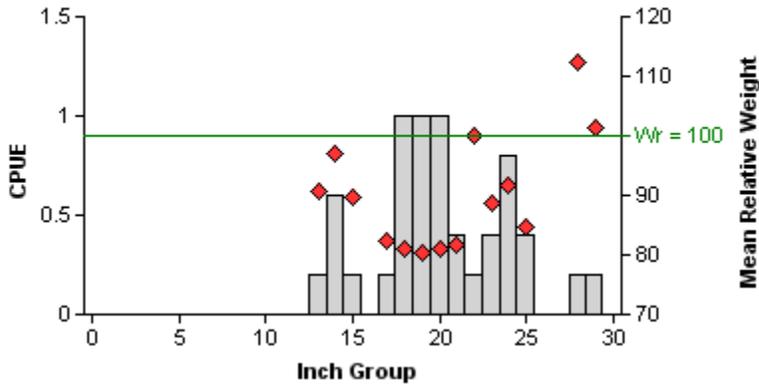


Figure 6. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Mackenzie Reservoir, Texas, 2009, 2011, and 2013.

# Palmetto Bass

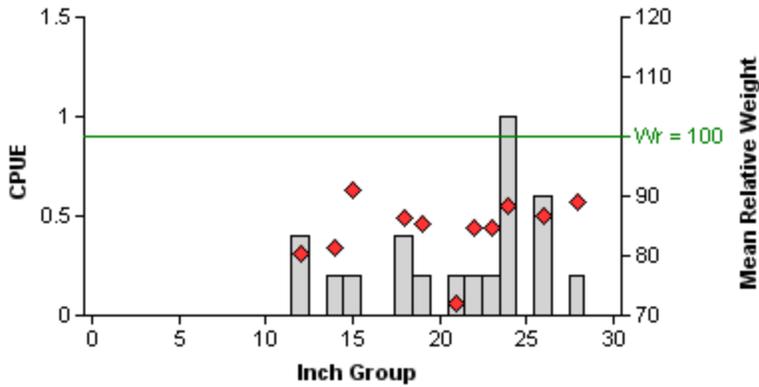
2009

Effort = 5.0  
 Total CPUE = 6.8 (21; 34)  
 PSD = 85 (8)



2011

Effort = 5.0  
 Total CPUE = 3.8 (52; 19)  
 PSD = 79 (5)



2013

Effort = 5.0  
 Total CPUE = 0.4 (100; 2)  
 PSD = 100 (0)

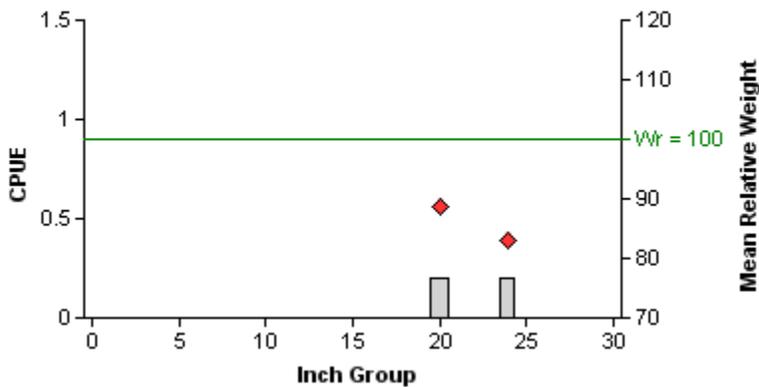
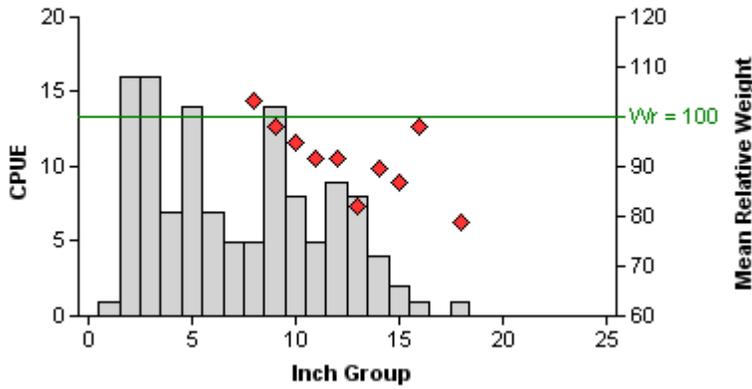


Figure 7. Number of Palmetto Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill netting surveys, Mackenzie Reservoir, Texas, 2009, 2011, and 2013.

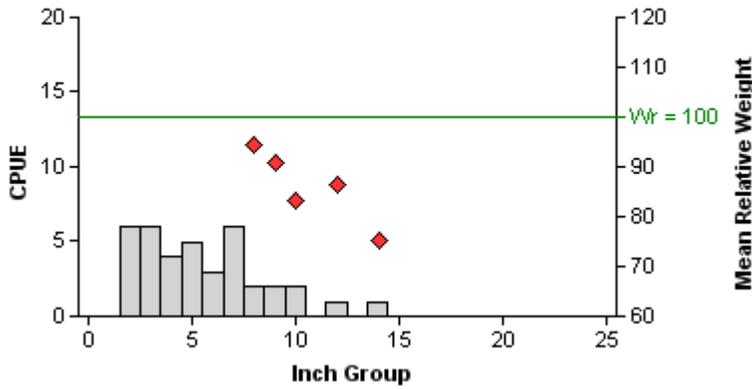
## Largemouth Bass

2009



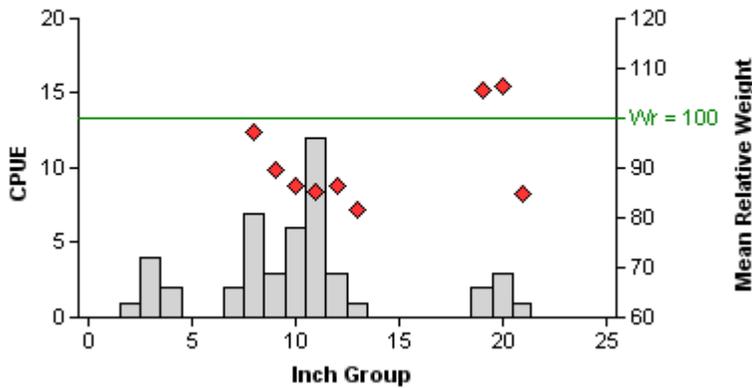
Effort = 1.0  
 Total CPUE = 123.0 (14; 123)  
 Stock CPUE = 57.0 (20; 57)  
 PSD = 44 (11)

2010



Effort = 1.0  
 Total CPUE = 38.0 (22; 38)  
 Stock CPUE = 8.0 (34; 8)  
 PSD = 25 (17)

2012



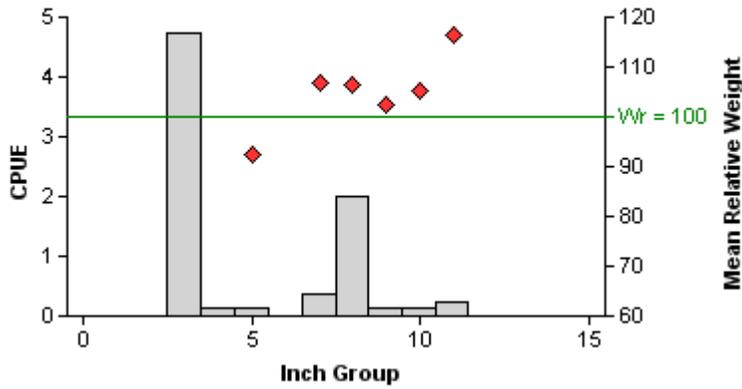
Effort = 1.0  
 Total CPUE = 47.0 (20; 47)  
 Stock CPUE = 38.0 (22; 38)  
 PSD = 26 (6)

Figure 8. 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 all electrofishing surveys, Mackenzie Reservoir, Texas, 2009, 2010, and 2012.

# White Crappie

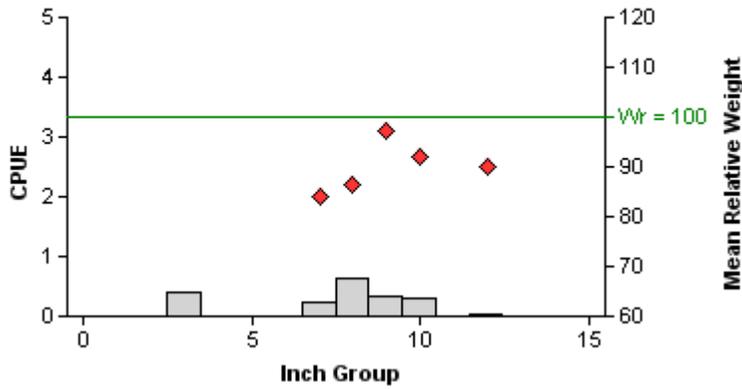
2004

Effort = 8.0  
 Total CPUE = 7.9 (51; 63)  
 PSD = 83 (10)



2008

Effort = 20.0  
 Total CPUE = 2.0 (30; 40)  
 PSD = 84 (8)



2012

Effort = 5.0  
 Total CPUE = 2.0 (63; 10)  
 PSD = 20 (8)

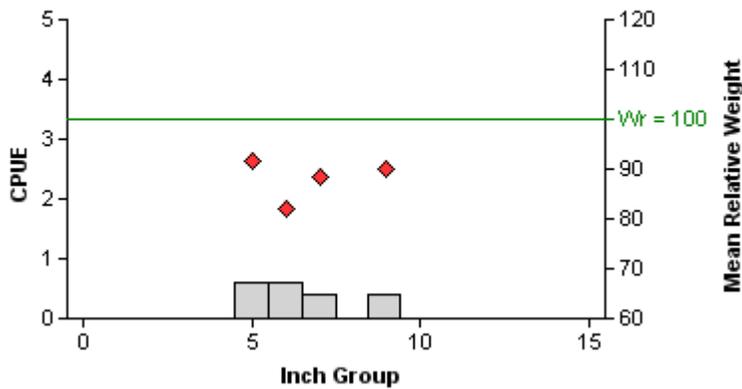


Figure 9. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Mackenzie Reservoir, Texas, 2004, 2008, and 2012.

Table 6. Proposed sampling schedule for Mackenzie Reservoir, Texas. Survey period is June through May. 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.

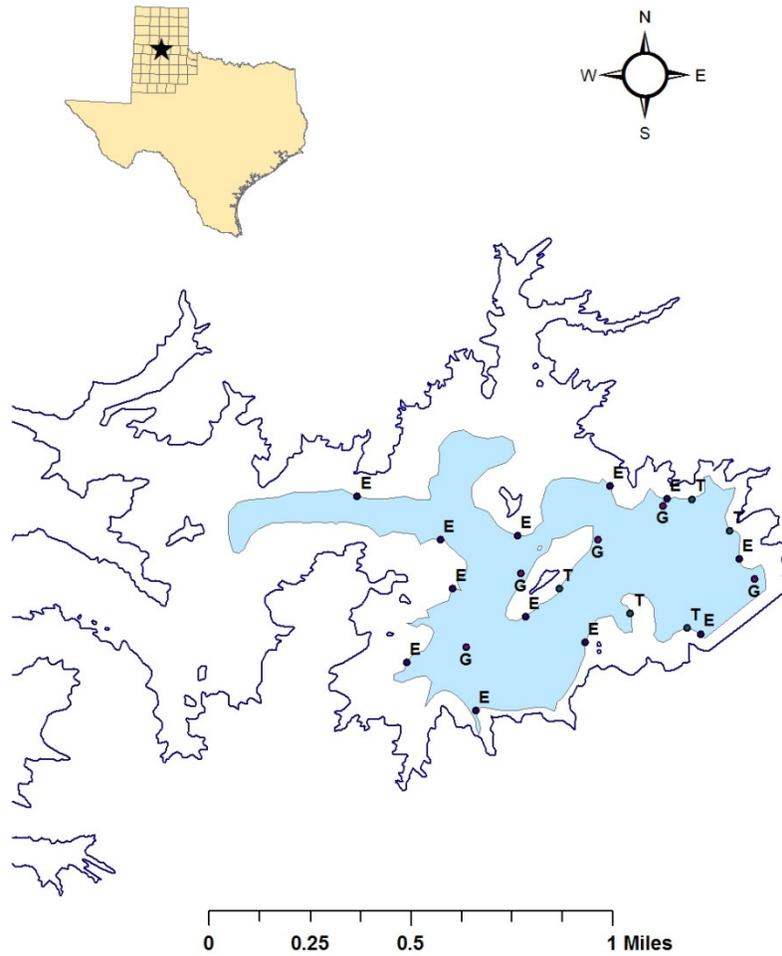
Survey year	Electrofishing Fall	Trap net	Gill net	Habitat			Creel survey	Report
				Structural	Vegetation	Access		
2013-2014								
2014-2015	A	A						
2015-2016								
2016-2017	S	S	S		S	S		S

**APPENDIX A**

Number (N) and catch rate (CPUE) of all species collected from all gear types from Mackenzie Reservoir, Texas, 2012-2013.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad	31	6.2			124	124.0
Common Carp	3	0.6			12	12.0
Blue Catfish	3	0.6				
Channel Catfish	29	5.8			12	12.0
Flathead Catfish					1	1.0
White Bass	12	2.4			2	2.0
Palmetto Bass	2	0.4				
Green Sunfish					13	13.0
Bluegill	5	1.0	8	1.6	44	44.0
Longear Sunfish			4	0.8	25	25.0
Largemouth Bass	1	0.2			47	47.0
White Crappie	8	1.6	10	2.0	3	3.0
Walleye	1	0.2				

## APPENDIX B



Location of sampling sites, Mackenzie Reservoir, Texas, 2012-2013. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level at time of sampling was 3009.6 feet MSL.