

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2013 Fisheries Management Survey Report

Balmorhea Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Balmorhea Reservoir were surveyed in 2013 using electrofishing, and in 2014 using gill nets. Historical data are presented with the 2013-2014 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:** Balmorhea Reservoir is a 573-acre impoundment located in the Pecos River Basin approximately 5 miles southwest of Balmorhea. Due to heavy irrigation demand, the reservoir water level usually drops severely each summer, reaching a low point in the fall, and then refills from spring inflows during the winter. Balmorhea Reservoir experienced a mild golden alga (*Prymnesium parvum*) bloom and subsequent fish kill in winter 2004. A severe bloom and fish kill occurred in winter 2006, and moderate blooms were observed in 2007, 2008, and 2010. Habitat was mostly nondescript (natural) shoreline or flooded dead terrestrial vegetation, with a small amount of native emergent vegetation.
- **Management History:** Important sport fish have included Largemouth Bass, Redear Sunfish, White Crappie, and catfish species. Fish populations were mostly eradicated in August 1998 in an effort to eliminate the introduced Sheepshead Minnow and improve the sportfish population that had been overtaken by Common Carp, large Gizzard Shad, and small sportfish. Texas Parks and Wildlife Department re-stocked the reservoir with Channel and Blue Catfish, Northern Largemouth Bass, sunfish species, and White Crappie during 1998-2001. A special research project included the introduction of triploid Florida Largemouth Bass from 1999 through 2003. Genetic analyses demonstrated that some cross-breeding was occurring between Northern and Florida Largemouth Bass, indicating that not all of the stocked Florida Largemouth Bass were sterile. After a golden alga fish kill in 2004, TPWD restocked the reservoir with fingerling Blue and Channel Catfish, Bluegill, Florida and Northern Largemouth Bass, and adult White Crappie. No White Crappie have been collected in surveys since 2005; therefore trap net sampling has been suspended pending re-establishment of this population.
- **Fish Community**
 - **Prey species:** Gizzard Shad and Bluegill have declined to very low numbers.
 - **Catfishes:** Channel Catfish were present in extremely low numbers; no Blue Catfish were collected.
 - **Largemouth Bass:** Abundance has declined to low numbers.
- **Management Strategies:** Suspend stocking and other management activities until water quality conditions improve. Conduct at least annual water quality tests to detect changes in golden alga presence and toxicity. Monitor fish populations with electrofishing every other year and gill netting every four years. Write next management report in 2017/2018.

INTRODUCTION

This document is a summary of fisheries data collected from Balmorhea Reservoir in 2013-2014. 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 2013-2014 data for comparison.

Reservoir Description

Balmorhea Reservoir is a 573-acre impoundment constructed in 1917 on Sandia Creek. It is located in Reeves County approximately 5 miles southwest of Balmorhea and is operated and controlled by the Reeves County Water Improvement District No. 1. Maximum depth when full is 25 ft. Primary water uses include irrigation and recreation. Due to heavy irrigation demand, the reservoir water level usually drops severely each summer (6-8 ft), reaching a low point in the fall, and then refills from spring inflows (San Soloman Spring) during the winter (Figure 1). Water level at time of sampling was near full pool. A habitat survey conducted in 2005 (Scott and Bonds 2006) showed that habitat consisted of nondescript shoreline, flooded dead terrestrial vegetation (saltcedar), concrete bulkhead, eroded bank, rocky shore, boulder, and some native emergent vegetation (cattail). Balmorhea Reservoir experienced a mild golden alga bloom and subsequent fish kill in winter 2004. A severe bloom and fish kill occurred in winter 2006, and moderate blooms were observed in 2007, 2008, and 2010. Boat access consisted of one public boat ramp in poor condition. Bank fishing access was excellent, with the majority of the shoreline accessible to anglers. Other descriptive characteristics for Balmorhea Reservoir are in Table 1.

Angler Access

Balmorhea Reservoir has one public boat ramp and no private ramps. The boat ramp was useable in 2013-2014 but was in need of improvements. Additional boat ramp characteristics are in Table 2. Shoreline access is good around most of the reservoir's perimeter.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Scott and Farooqi 2010) included:

1. Suspend stockings and other management actions until golden alga subsides. Test water for golden alga cell count and toxicity.
 - Action:** Stockings were suspended from 2009 through 2011. Golden alga tests were conducted four times since the last report, with each test showing no golden alga toxicity. In 2012 a federal hatchery truck became disabled on the highway near Balmorhea; these Channel Catfish fingerlings were stocked into Balmorhea Reservoir with District 1C approval. The decision was made to stock Bluegill and Largemouth Bass fingerlings in 2013 since no fish kills or golden alga blooms had been observed in several years.
2. Collect sub-stock Largemouth Bass and determine ages to see if natural reproduction is occurring.
 - Action:** Fish were not collected for this analysis during this sampling period because fingerling Largemouth Bass were stocked in 2013.

Harvest regulation history: Sportfishes in Balmorhea Reservoir currently are, and have historically been, managed with statewide regulations (Table 3).

Stocking history: Balmorhea Reservoir was partially drained and renovated in 1998; therefore, only stockings since 1998 are discussed here. In 1998, Texas Parks and Wildlife Department reintroduced

Blue and Channel Catfish, Redbreast Sunfish, Bluegill, and Green Sunfish x Bluegill hybrids into Balmorhea Reservoir. In 1999, TPWD introduced Largemouth Bass, as well as triploid Florida Largemouth Bass. Annual stockings of triploid Florida Largemouth Bass continued through 2003. In 2000, TPWD reintroduced White Crappie to the reservoir. After a golden alga fish kill in 2004, TPWD restocked the reservoir with Bluegill, Largemouth Bass, Blue and Channel Catfish, and White Crappie. The complete stocking history since 1998 is in Table 4.

Vegetation/habitat management history: Balmorhea Reservoir has had cattail colonies present since the 1998 renovation project. Although the Reeves County Water Control and Improvement District has reportedly made some efforts to control cattail growth, TPWD has not participated in vegetation management on the reservoir.

Water transfer: Balmorhea Reservoir is primarily used as storage for the irrigation supply district in Reeves County. San Soloman Springs supplies water to the reservoir, and the water is distributed through a network of canals to farmers and residents. No interbasin water transfers are known to occur.

METHODS

Fishes were collected by electrofishing (1 hour at 12, 5-min stations) and gill netting (5 net nights at 5 stations). Trap netting was not conducted because several fish kills had occurred since the last stocking of White Crappie, making the presence of crappie unlikely. 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 nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected and surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

Golden alga and water quality analyses were performed on water samples collected from Balmorhea Reservoir near the dam in 2013 and at the spring canal inlet and dam in 2014. The samples were analyzed on site using handheld digital water quality meters, and then shipped overnight to the TPWD Fish Health Laboratory in San Marcos, Texas, where lab staff conducted cell counts and bioassay toxicity assessments using Fathead Minnows.

A vegetation survey was conducted using satellite imagery from March 10, 2014 (Google Earth). Vegetation type was recorded during sampling trips to the reservoir, and extent of coverage was calculated using the polygon tool in Google Earth and the acreage calculator at www.earthpoint.us/Shapes.aspx.

Sampling statistics (CPUE for various length categories) and size structure index [Proportional Size Distribution (PSD), terminology modified by Guy et al. (2007)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Relative standard error ($RSE = 100 \times SE \text{ of the estimate/estimate}$) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Source for water level data was the Reeves County Water Improvement District No. 1.

RESULTS AND DISCUSSION

Habitat: The latest shoreline habitat survey results can be found in Scott and Bonds (2006). Littoral zone habitat consisted primarily of nondescript (natural) shoreline and flooded dead terrestrial vegetation, with limited stands of cattails. In 2014 there were 11.6 acres of cattails, covering approximately 2% of the reservoir.

Water Quality: Water samples showed zero golden alga cells present (and zero toxicity) in February and September, 2013, and April 2014. In December 2013, golden alga was present at low density (1,000 cells/mL), but the water was non-toxic.

Prey species: Electrofishing catch rates of Gizzard Shad decreased from 135/h in 2007 to 12/h in 2009, and remained low in 2013 (22/h; Figure 2). Bluegill abundance also declined from 20/h to 3/h to 2/h during the same period (Figure 3).

Until 2005, Redear Sunfish were moderately abundant and grew to 9" in length (Scott and Bonds 2006). Since then, one Redear Sunfish was collected in the fall 2007 trap net survey, but no others have been collected in any surveys. This species has probably been eliminated by golden alga.

Channel Catfish: Three Channel Catfish were captured in the 2014 gill netting survey. In 2010, only one 13-inch Channel Catfish was captured in a gill net. Gill net catch was poor, despite fingerling Channel Catfish stockings in both 2008 and 2012 (Table 4).

Largemouth Bass: In 2013, electrofishing CPUE was 29/h, much lower than in 2007 (156/h) and 2009 (104/h). Fish ranged in size from 3 to 15 inches (Figure 4). Although some of the sub-stock-size fish were possibly sourced from the spring 2013 stocking, the presence of fish between 8 and 12 inches suggests that at least some bass are finding refuge from golden alga toxicity and surviving through the winter. Largemouth Bass fingerlings were stocked by TPWD in 2007, 2008, and 2013 (Table 3).

Fisheries management plan for Balmorhea Reservoir, Texas

Prepared – July 2014.

ISSUE 1: Toxic golden alga blooms have reduced fish populations to low numbers.

MANAGEMENT STRATEGY

1. Continue at least annual testing of water from the reservoir to detect any changes in golden alga densities and toxicity.
2. Monitor presence/absence of fish species through electrofishing every other year and gill netting every four years.

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

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes electrofishing in 2015/2016 and 2017/2018, and gill netting in 2017/2018 (Table 5). This schedule is adequate to monitor presence/absence of important fish species until golden alga effects subside and fish populations are re-established.

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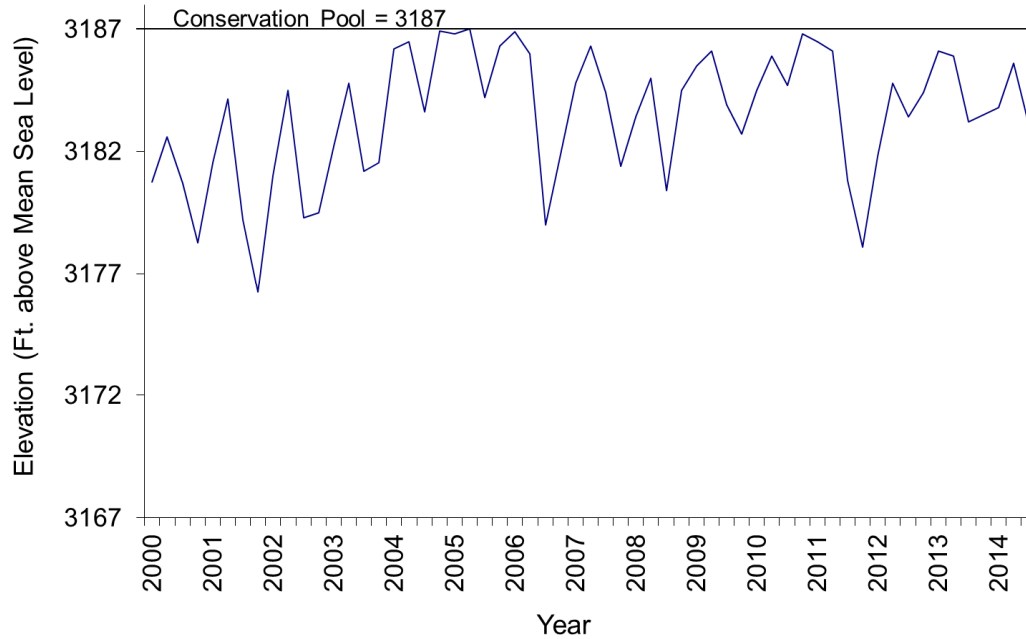


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Balmorhea Reservoir, Texas.

Table 1. Characteristics of Balmorhea Reservoir, Texas.

Characteristic	Description
Year constructed	1917
Controlling authority	Reeves County Water Improvement District No. 1
County	Reeves
Reservoir type	Tributary
Shoreline Development Index (SDI)	2.76
Conductivity	2900 μ mhos/cm

Table 2. Boat ramp characteristics for Balmorhea Reservoir, Texas, March 2014. Reservoir elevation at survey was 3184 feet above mean sea level.

Boat Ramp	Latitude Longitude (d° m' s)	Public	Parking Capacity (N)	Elevation at end of boat ramp (ft)	Condition
Park	30° 57' 58.3 N 103° 42' 48.0 W	Y	5	unknown	Poor

Table 3. Harvest regulations for Balmorhea Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Bass, Largemouth	5	14-inch minimum
White Crappie	25	10-inch minimum

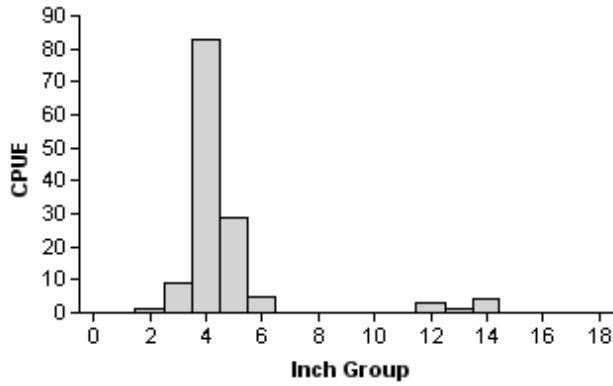
Table 4. Stocking history of Balmorhea Reservoir, Texas since renovation in 1998. FGL = fingerling; ADL = adults.

Year	Number	Size	Year	Number	Size
<u>Blue Catfish</u>			<u>Florida Largemouth Bass (triploid)</u>		
1998	844	ADL	1999	7,125	FGL
2005	57,132	FGL	2000	12,860	FGL
2006	<u>14,570</u>	FGL	2001	15,203	FGL
Species Total	72,546		2002	12,123	FGL
			2003	<u>37,255</u>	FGL
			Species Total	84,566	
<u>Channel Catfish</u>			<u>Florida Largemouth Bass</u>		
1998	2,590	ADL	2008	57,642	FGL
1998	28,651	FGL	<u>Northern Largemouth Bass</u>		
1999	105	ADL	1999	47,300	FGL
1999	29,000	FGL	2005	59,494	FGL
2004	56,140	FGL	2007	60,906	FGL
2006	58,114	FGL	2013	<u>62,010</u>	FGL
2007	57,708	FGL	Species Total	229,710	
2008	57,729	FGL			
2012	<u>4,422</u>	FGL			
Species Total	294,459				
<u>Redbreast Sunfish</u>			<u>White Crappie</u>		
1998	7	ADL	2000	200	ADL
			2004	1,500	ADL
<u>Bluegill</u>			2005	450	ADL
1998	128	ADL	2006	<u>650</u>	ADL
1999	210,626	FGL	Species Total	2,800	
2005	28,709	FGL			
2007	58,570	FGL			
2008	56,503	FGL			
2013	<u>20,537</u>	FGL			
Species Total	375,073				
<u>Green Sunfish X Bluegill</u>					
1998	69	ADL			

Gizzard Shad

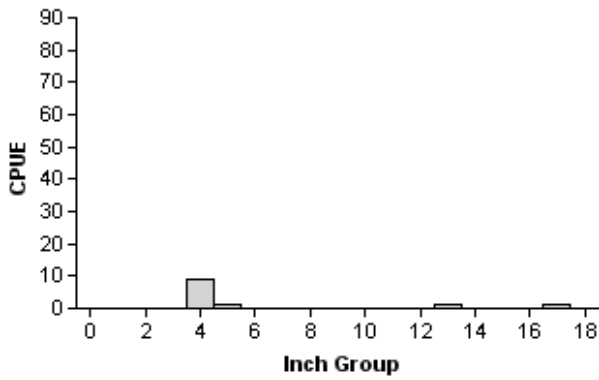
2007

Effort = 1.0
 Total CPUE = 135.0 (19; 135)
 IOV = 94 (4)



2009

Effort = 1.0
 Total CPUE = 12.0 (39; 12)
 IOV = 83 (11)



2013

Effort = 1.0
 Total CPUE = 22.0 (58; 22)
 IOV = 14 (15)

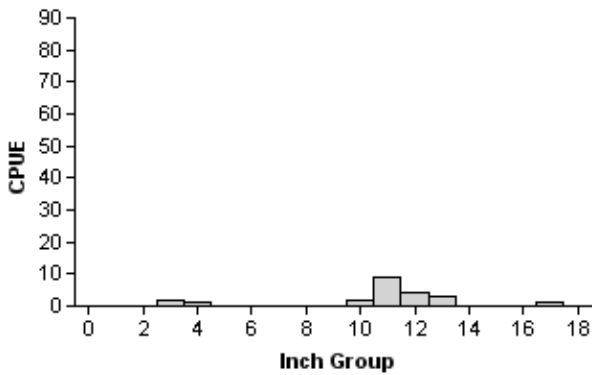
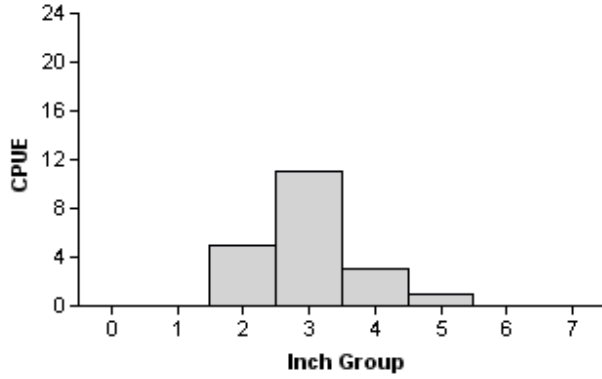


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Balmorhea Reservoir, Texas, 2007, 2009, and 2013.

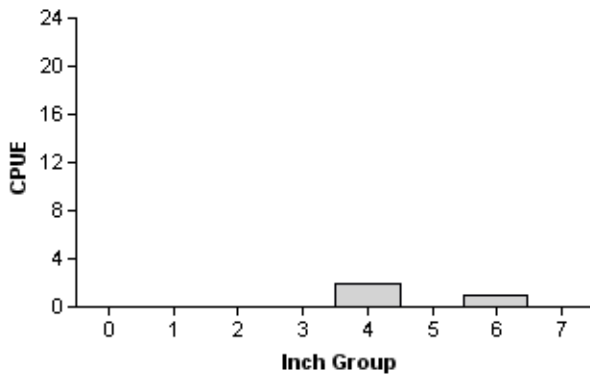
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Bluegill

2007



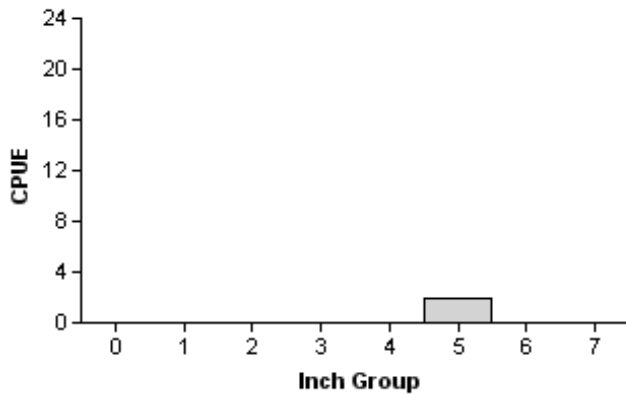
Effort = 1.0
 Total CPUE = 20.0 (34; 20)
 Stock CPUE = 15.0 (38; 15)
 PSD = 0 (0)

2009



Effort = 1.0
 Total CPUE = 3.0 (52; 3)
 Stock CPUE = 3.0 (52; 3)
 PSD = 33 (28)

2013



Effort = 1.0
 Total CPUE = 2.0 (67; 2)
 Stock CPUE = 2.0 (67; 2)
 PSD = 0 (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, Balmorhea Reservoir, Texas, 2007, 2009, and 2013.

Largemouth Bass

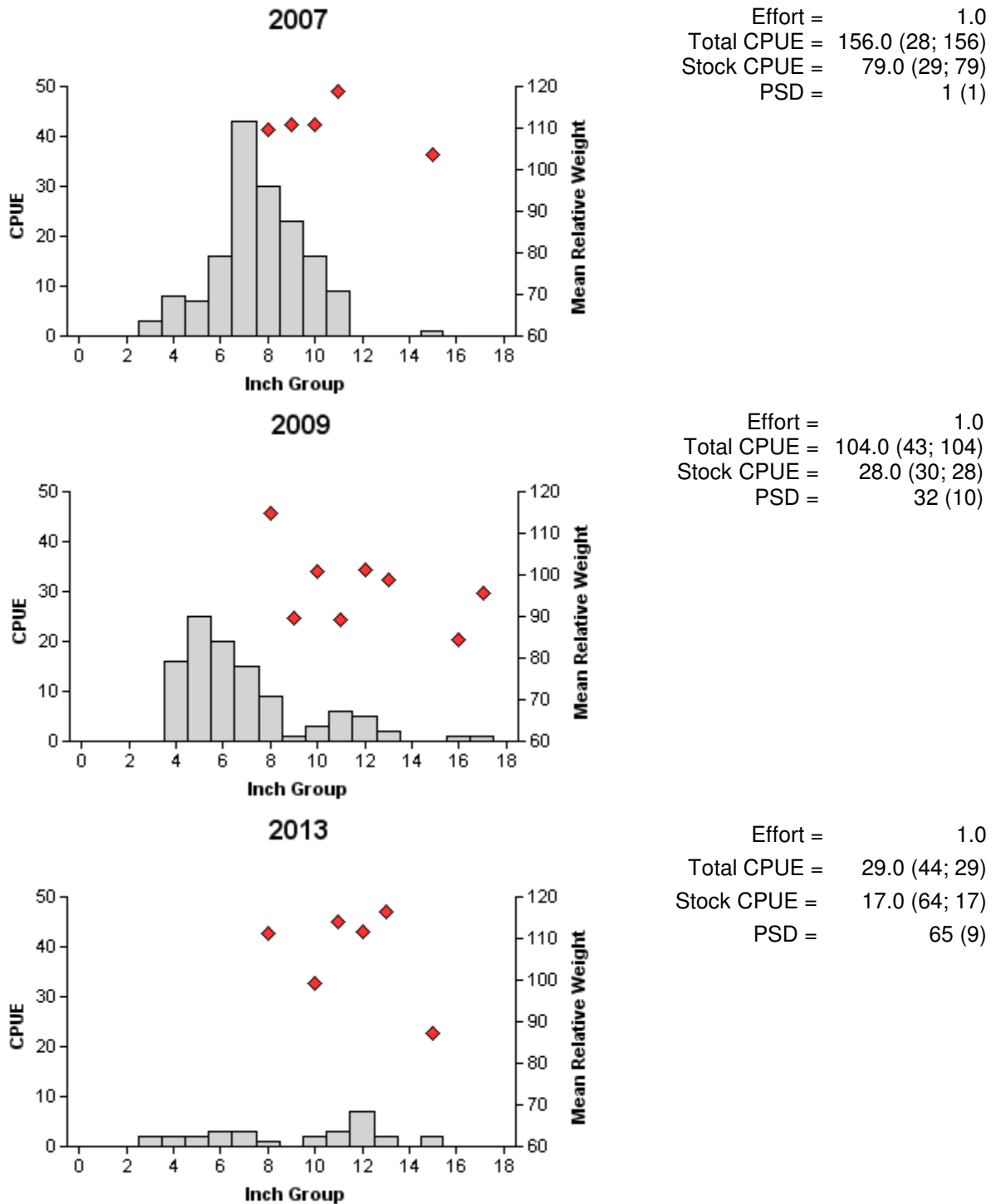


Figure 4. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Balmorhea Reservoir, Texas, 2007, 2009, and 2013.

Table 5. Proposed sampling schedule for Balmorhea Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall. Standard survey denoted by S.

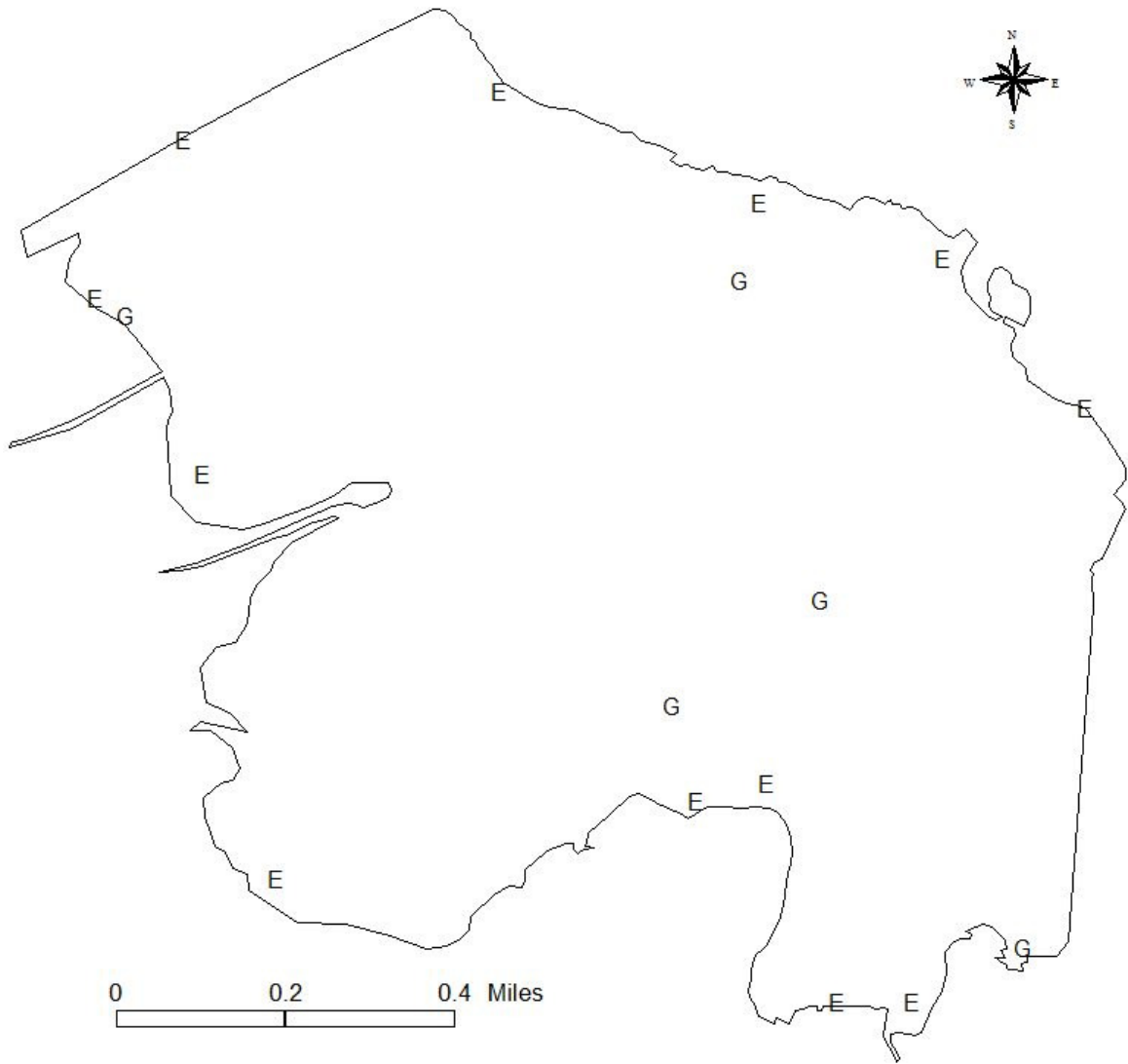
Survey year	Electrofishing	Trap net	Gill net	Habitat			Creel survey	Report
				Structural	Vegetation	Access		
2014-2015								
2015-2016	A							
2016-2017								
2017-2018	S		S		S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Balmorhea Reservoir, Texas, 2013-2014. Sampling effort was 5 net nights for gill netting and 1 hour for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad	58	11.6	22	22.0
Common Carp	51	10.2		
Channel Catfish	3	0.6		
Bluegill			2	2.0
Largemouth Bass			29	29.0

APPENDIX B



Location of sampling sites, Balmorhea Reservoir, Texas, 2013-2014. Electrofishing and gill net stations are indicated by E and G, respectively. Water level was about 3 feet below conservation pool at time of sampling.