PERFORMANCE REPORT

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STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2009 Survey Report

Balmorhea Reservoir

Prepared by:

Mandy Scott and Mukhtar Farooqi Inland Fisheries Division District 1-C, San Angelo, Texas





Carter Smith Executive Director

Gary Saul Director, Inland Fisheries

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Fish populations in Balmorhea Reservoir were surveyed in 2009 using electrofishing, and in 2010 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** 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 more severe bloom and fish kill occurred in winter 2006, and perennial blooms have occurred since. 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. 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 carp, large gizzard shad, and small sportfish. Texas Parks and Wildlife Department (TPWD) re-stocked the reservoir with channel and blue catfish, northern largemouth bass, sunfish, 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 the fish kill of 2004, TPWD restocked the reservoir with fingerling blue and channel catfish, bluegill, Florida and northern largemouth bass, and adult white crappie.
- Fish community
 - **Prey species:** Gizzard shad and bluegill have declined to very low numbers due to golden alga blooms. Redear sunfish were not encountered in recent samples.
 - Catfishes: Channel catfish were present in extremely low numbers.
 - Largemouth bass: Abundance appears to have declined significantly, but the 2009 sample indicated some bass were able to survive over-winter despite toxic golden alga blooms.
 - White crappie: This species apparently is no longer present in the reservoir.
- **Management strategies:** Suspend stocking and other management activities until conditions improve. Conduct at least annual water quality tests to detect changes in golden alga presence and toxicity. Conduct mandatory monitoring in 2013/2014, and determine whether largemouth bass are reproducing.

INTRODUCTION

This document is a summary of fisheries data collected from Balmorhea Reservoir in 2009-2010. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2009-2010 data for comparison.

Reservoir Description

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 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 (*Prymnesium parvum*) bloom and subsequent fish kill in winter 2004. A more severe bloom and fish kill occurred in winter 2006, and blooms have been recorded 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.

Management History

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

1. Stock blue catfish, bluegill, northern largemouth bass, channel catfish, and white crappie in response to golden alga fish kills.

Action: Stocking was conducted as planned; however, continued toxic algal blooms have prevented recovery of the fish populations. In 2009, the decision was made to suspend all stocking until water quality conditions improve.

2. Discuss with Balmorhea controlling authorities the issue of possible overharvest from the canal and potential solutions.

Action: District staff met with Reeves County Water Improvement District personnel in fall 2009. Since lake conditions had deteriorated since 2006, the decision was made to continue allowing harvest at the canal, which may be the best fish harvest opportunity available.

3. Continue to work with lake authorities and encourage application for a TPWD boat ramp grant.

Action: Reeves County Water Improvement District experienced staff turnover since 2005, so another copy of the boat ramp grant packet was supplied to them during the fall 2009 meeting.

Harvest regulation history: Sportfishes in Balmorhea Reservoir currently are, and have historically been, managed with statewide regulations (Table 2).

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 (TPWD) reintroduced blue and channel catfish, redbreast sunfish, bluegill, and green sunfish x bluegill hybrids into Balmorhea Reservoir. In 1999, TPWD introduced pure northern strain, as well as triploid Florida strain, 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 3.

Vegetation/habitat history: Before renovation in 1998, the reservoir was devoid of aquatic vegetation, probably because of high turbidity (Dennis 2002). Water clarity increased after renovation (Dennis 2002), and Balmorhea reservoir supported a small amount of native emergent vegetation (cattail) in fall 2005. Most fish habitat in the reservoir consisted of flooded dead saltcedar (Scott and Bonds 2006).

METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations) and gill 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 nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected using the Random Point Generator in ArcView 3.3. All surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). Trap netting was discontinued in 2009 because new procedures allow biologists to eliminate trap net sampling on reservoirs where the crappie fishery is negligible.

Golden alga analyses were performed on water samples collected from Balmorhea Reservoir at the dam and at the spring inlet canal in 2007 and at the boat ramp only in 2008 and 2010. The samples were 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.

Sampling statistics (CPUE for various length categories), size structure index [Proportional Size Distribution (PSD)], and condition index [relative weight (W_i)] were calculated for target fishes according to Anderson and Neumann (1996). Size structure index terminology was modified according to Guy et al. (2007). 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. Source for water level data was the Reeves County Water Improvement District No. 1.

RESULTS AND DISCUSSION

Habitat: The latest habitat survey results can be found in Scott and Bonds (2006). As of the last survey, littoral zone habitat consisted primarily of nondescript (natural) shoreline and flooded dead terrestrial vegetation, with limited stands of cattails.

Prey species: Electrofishing catch rates of gizzard shad went from 183/h in 2005 to 135/h in 2007, and then declined further to 12/h in 2009 (Figure 2). Bluegill abundance also declined from 47/h to 20/h to 3/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.

Channel catfish: No channel catfish were collected in 2006 and 2008 gill net surveys. In 2010, only one 13-inch channel catfish was captured in a gill net. We had incidental catches of 4/nn in our fall 2007 trap net survey, and one fish in our 2009 electrofishing survey. Historically, channel catfish were present in low numbers.

Largemouth bass: From 2005 to 2007, electrofishing catch rate of largemouth bass increased slightly from 137/h to 156/h (Figure 4). By 2009, abundance had apparently declined, indicated by a catch rate of 104/h. Size structure also shifted, with fewer stock-length (8" and up) fish appearing in the 2009 sample (Figure 4). Largemouth bass fingerlings were stocked by TPWD in 2005, 2007, and 2008. The 2005 and

2007 electrofishing samples may have been primarily reflective of those stockings; however, there appears to be at least three distinct year-classes present in the 2009 sample. Although we did not age these fish, it is likely that the 4-6" fish are from the 2009 year-class, indicating some reproduction. Also, the presence of fish over 12" in the sample suggests that at least some bass are finding refuge from golden alga toxicity and surviving through the winter, enabling them to spawn.

White crappie: One 10-inch white crappie was collected in seven trap net-nights in fall 2005, for a catch rate of 0.1/nn. No crappie were captured in the 2007 trap net survey, nor were any collected in electrofishing or gill net surveys since 2005. However, white crappie were once abundant in the reservoir (Dennis 2002).

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Fisheries management plan for Balmorhea Reservoir, Texas

Prepared - July 2010.

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

MANAGEMENT STRATEGIES

- 1. Suspend stockings and other management activities until golden alga effects subside.
- Begin at least annual testing of water from the reservoir to detect any changes in golden alga densities or toxicity. Perform at least one test during the winter season (December through February) each year, and cooperate with Reeves County game warden, Reeves County Water Improvement District, and other interested local parties to collect additional water samples as needed.
- **ISSUE 2:** Despite golden alga fish kills, largemouth bass relative abundance remains high. It is possible that some bass are finding refuge in the sprint inlet during times of toxicity, and even spawning, but it is unclear whether natural reproduction has been taking place.

MANAGEMENT STRATEGY

1. During electrofishing monitoring in 2013, collect sub-stock largemouth bass for age-andgrowth analysis, to check for presence of naturally-spawned (versus hatchery-raised) fish.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes mandatory monitoring in 2013/2014 (Table 4). Considering the suspension of stockings, sampling the fisheries once every four years is adequate until golden alga effects subside and the reservoir is restocked.

LITERATURE CITED

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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.
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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 µmhos/cm

Table 2.	Harvest re	egulations	for	Balmorhea	Reservoir,	Texas.
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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, largemouth	5	14 - No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

Quarterly Water Level

Year	Number	Size	Year	Number	Size
	Blue catfish		Florida	largemouth bass (triploid)	
1998	844	ADL	1999	7.125	FGL
2005	57.132	FGL	2000	12.860	FGL
2006	14,570	FGL	2001	15,203	FGL
Species Total	72,546		2002	12,123	FGL
	,		2003	37,255	FGL
C	<u>Channel catfish</u>		Species Tota	l <u>84,566</u>	
1998	2,590	ADL			
1998	28,651	FGL	Flo	rida largemouth bass	
1999	105	ADL	2008	57,642	FGL
1999	29,000	FGL			
2004	56,140	FGL	Nort	thern largemouth bass	
2006	58,114	FGL	1999	47,300	FGL
2007	57,708	FGL	2005	59,494	FGL
2008	<u>57,729</u>	FGL	2007	<u>60,906</u>	FGL
Species Total	290,037		Species Tota	l 167,700	
Re	edbreast sunfish			White crappie	
1998	7	ADL	2000	200	ADL
			2004	1,500	ADL
	Bluegill		2005	450	ADL
1998	128	ADL	2006	<u>650</u>	ADL
1999	210,626	FGL	Species Tota	l 2,800	
2005	28,709	FGL			
2007	58,570	FGL			
2008	<u>56,503</u>	FGL			
Species Total	354,536				
Gree	n sunfish X Blueaill				
1998	69	ADL			

 Table 3. Stocking history of Balmorhea Reservoir, Texas since renovation in 1998. Size Categories are:

 FGL = 1-3 inches; and ADL = adults.

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¹⁰ Gizzard Shad



Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Balmorhea Reservoir, Texas, 2005, 2007, and 2009.

¹¹ Bluegill



Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE are in parentheses) for fall electrofishing surveys, Balmorhea Reservoir, Texas, 2005, 2007, and 2009.

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, 2005, 2007, and 2009.

Table 4. Proposed sampling schedule for Balmorhea Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall. Standard survey denoted by S.

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

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Species	Gill N	letting	Electrofishing	
Species	Ν	CPUE	Ν	CPUE
Gizzard shad	6	1.2	12	12.0
Common carp	16	3.2		
Channel catfish	1	0.2	1	1.0
Bluegill			3	3.0
Largemouth bass			104	104.0

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



Location of sampling sites, Balmorhea Reservoir, Texas, 2009-2010. Electrofishing and gill net stations are indicated by E and G, respectively. Water level was 1-4 feet lower than conservation pool at time of sampling.



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Balmornea Reservoir, Texas, 2005-2010. TT D=Ichthyotoxin unit; measures degree of toxicity.							
Date			Density				
(sampling)	Date (lab)	Site	(cells/mL)	Bioassay	ITUs	Comments	
11/3/2005	11/4/2005	near dam	17,000	non-toxic	0	mixed algal community	
3/2/2006	3/3/2006	near dam	46,000	highly toxic	≥ 25	P. parvum dominant	
5/18/2006	5/19/2006	near dam	3,000	non-toxic	0	low algal densities	
5/18/2006	5/19/2006	canal	0	non-toxic moderately	0	very low algal densities	
3/7/2007	3/7/2007	near dam	22,000	toxic	5	P. parvum dominant	
3/7/2007	3/7/2007	canal	0	non-toxic	0	low algal densities	
11/7/2007	11/8/2007	near dam	14,000	non-toxic moderately	0	mixed algal community	
3/3/2008	3/5/2008	near dam	30,000	toxic	5	P. parvum dominant	
5/27/2008	5/28/2008	near dam	2,000	non-toxic moderately	0	mixed algal community	
3/3/2010	3/5/2010	near dam	15,000	toxic	5	P. parvum dominant	

Results of golden alga cell counts and bioassay toxicity tests performed on water samples from Balmorhea Reservoir, Texas, 2005-2010. ITU=ichthyotoxin unit; measures degree of toxicity.