PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2013 Fisheries Management Survey Report

Sulphur Springs Reservoir

Prepared by:

Dan Bennett, Assistant District Management Supervisor
and
Kevin Storey, District Management Supervisor

Inland Fisheries Division
District 3B, Tyler, Texas

Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

July 31, 2014

TABLE OF CONTENTS

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Sulphur Springs Reservoir were surveyed in 2013 using electrofishing and trap netting and in 2014 using gill netting. A vegetation survey was conducted in August 2013. Historical data are presented with the 2013 to 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:** Sulphur Springs Reservoir is a 1,340-acre impoundment located in Hopkins County, Texas, on White Oak Creek, a tributary of the Sulphur River. It was constructed by the City of Sulphur Springs in 1973 as a municipal water supply. Habitat consists primarily of featureless banks with some emergent vegetation and inundated terrestrial vegetation. Water clarity in the reservoir is extremely low due to high levels of suspended, colloidal particles.

- **Management History:** Important sport fishes include Largemouth Bass, White Crappie, and Blue Catfish. Turbid conditions in the reservoir have limited the fishery and the effectiveness of management activities. Anecdotal evidence suggests a limited fishery for catfish exists with anglers employing rod and reel and passive gears.

- **Fish community**
  - **Prey species:** Gizzard Shad and sunfishes provided forage for sport fish populations. Threadfin Shad were historically present, but have not been collected in the past four surveys.

  - **Catfishes:** A low density Blue Catfish population provides a limited fishery.

  - **Largemouth Bass:** A population of young ($\leq$ age 2) Largemouth Bass was observed in the 2013 survey. Largemouth Bass had not been collected since a 1998 survey. The population is believed to have been limited by high turbidity.

  - **White Crappie:** White Crappie were present in the reservoir; however, the population is dominated by small fish.

- **Management strategies:** Conduct monitoring with standard daytime electrofishing survey in 2017, and additional monitoring with low-pulse electrofishing and trap netting in 2017. Conduct standard angler access, habitat and aquatic vegetation surveys in 2017.

INTRODUCTION

This document is a summary of fisheries data collected from Sulphur Springs 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 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

Sulphur Springs Reservoir is a 1,340-acre impoundment, created in 1973 on White Oak Creek, a tributary of the Sulphur River. The reservoir was created from the construction of a new dam merging two existing reservoirs, Century and White Oak reservoirs. It is located in Hopkins County approximately one mile northwest of Sulphur Springs, Texas, and is operated and controlled by the City of Sulphur Springs. The primary water use is for a municipal water supply. Habitat at time of sampling consisted of natural shoreline with flooded terrestrial and native emergent vegetation. Other descriptive characteristics for Sulphur Springs Reservoir are in Table 1.

Angler Access

Sulphur Springs Reservoir has two public boat ramps; however, the west ramp extends less than three-feet below the conservation pool elevation. The east boat ramp provides adequate access to the reservoir extending to a depth of six feet below the conservation pool elevation. Extension of the west ramp is feasible; however, access is adequate considering the small size of the reservoir and limited angler utilization. Bank fishing access was fair and limited to areas around public boat ramps and the remaining levee previously separating Century and White Oak reservoirs before the reservoirs were merged.

Management History

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

1. Maintain the catfish population at its current status. There is a Blue Catfish fishery of good quality that has attracted a limited local following, but it is unlikely this population could sustain increased effort that would result from promoting the fishery.
   Action: Blue and Channel Catfish were managed with statewide fishing regulations. This is a limited fishery that may not support additional angling pressure, so little effort was made to promote the catfish fishery in the reservoir.

2. Stock Threadfin Shad to improve prey base for White Crappie.
   Action: Stocking of Threadfin Shad was not conducted. Management stocking of Threadfin Shad could not be conducted due to increased threat of exotic species introductions through water transfer. The Gizzard Shad population in the reservoir consists predominately of small individuals ($\leq$ 4 inches) and should provide available forage for White Crappie.

3. Introduce additional native emergent vegetation, such as water willow, bull tongue, and pickerelweed to improve near-shore habitat for fishes and to mitigate shoreline degradation and erosion.
   Action: Introduction of native vegetation was not conducted due to an increased abundance of emergent and inundated terrestrial vegetation at the conservation pool elevation. Turbidity prevents vegetation from establishing beyond the current extent.

Harvest regulation history: Sport fishes in Sulphur Springs Reservoir are currently managed with statewide regulations (Table 3).

Stocking history: Saugeye were stocked in Sulphur Springs Reservoir from 1993 to 1997. Largemouth Bass and Florida Largemouth Bass, Blue and Channel Catfish, and Palmetto Bass were introduced during the 1970s. Of the species stocked, only Blue Catfish and Largemouth Bass were sampled during the 2013-2014 survey year. A complete stocking history is found in Table 4.

Water Transfer: Sulphur Springs Reservoir is used as a secondary source for municipal water supply and recreation. Raw water from Cooper Reservoir is transferred via pipeline to a water treatment facility near Sulphur Springs Reservoir. However, water from Cooper Reservoir is not introduced directly into Sulphur Springs Reservoir.

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-netting, as the number of fish per net night (fish/nn). Gill net and trap net survey sites were randomly selected and conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Daytime, biologist-selected stations were utilized for fall 2013 electrofishing samples to maximize the potential for observation and capture of Largemouth Bass.

Aquatic vegetation and angler access surveys were performed according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Shoreline distances and areas of vegetation were estimated using ArcView GIS software.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and condition indices [relative weights (W_r)] 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 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Ages were determined for 13 Largemouth Bass with lengths ranging from 12.9 to 14.6 inches.

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Micro-satellite DNA analysis was used to determine genetic composition of individual fish.

Source for water level data was the United States Geological Survey (USGS 2014)

RESULTS AND DISCUSSION

Habitat: Habitat in Sulphur Springs Reservoir consisted primarily of flooded terrestrial and native emergent vegetation (Tables 5 & 6). Aquatic vegetation coverage was limited by poor water clarity (Secchi depth ~10 inches). American lotus has historically been abundant in the upper reservoir; however, coverage was minimal during the 2013 survey.

Prey species: Primary prey species consisted of low-density populations of Gizzard Shad and Bluegill. Daytime electrofishing catch rate of Bluegill was greater (32.0/h) than previous surveys (Figures 4 & 5) using different sampling methodology. Longear and Warmouth Sunfish were also collected. Gizzard

Shad and sunfish populations consisted primarily of small individuals and were readily available as forage to most adult predators (IOV=100) (Figures 3 & 5). Threadfin Shad were not collected in the 2013 survey.

Catfishes: Blue Catfish catch rates have remained moderate at 6.0/nn in 2006, 3.4/nn in 2010, and 2.8/nn in 2014 (Figure 6). Size distribution (PSD=57) and relative weights remained stable. Anecdotal evidence suggests a limited fishery exists for catfish, and is primarily utilized by passive gear anglers. Channel Catfish have not been collected in Sulphur Springs Reservoir since a 2002 survey (Jubar and Storey 2006).

Largemouth Bass: Forty-five Largemouth Bass were collected in 2013; the first time the species has been collected since an electrofishing survey in 1998. Largemouth Bass collected ranged from six to fourteen inches and represented three year-classes from 2011 to 2013. The mean age at 14 inches was 2 years (N=13; Range = 12.9-14.6). Body condition (Wr) ranged from 85 to 100 for most size classes (Figure 7). Daytime, biologist-selected stations may have improved bass catch rates over previous years; although the population is suspected to have benefitted from an improvement in habitat in 2011. Low water levels in 2010 and 2011 increased coverage of inundated terrestrial vegetation that may have improved recruitment of the 2011 year class.

Sulphur Springs Reservoir was stocked with Florida Largemouth Bass (FLMB) fingerlings once in 1978. A genetic sample of 30 Largemouth Bass from the reservoir revealed one intergrade (hybrid between a FLMB and a NLBM) (Table 7); the rest were pure Northern Largemouth Bass.

White Crappie: The trap net catch rate of White Crappie continued to exhibit an abundance of small (<5 inch) individuals. Catch rate was 143/nn in 2009 and 57/nn in 2013, with very few legal-length individuals (PSD-10=7 in 2009, PSD-10=13 in 2013) (Figure 8). An insufficient number of legal-length White Crappie was collected for aging in 2014. In 2009, mean lengths of White Crappie at ages 1 and 2 were 6.3 and 8.0 inches, respectively (Jubar and Storey 2010).

Fisheries management plan for Sulphur Springs Reservoir, Texas

Prepared – July 2014

ISSUE 1: Sulphur Springs Reservoir is extremely turbid due to the presence of suspended colloidal clay particles. Anecdotal accounts suggest turbidity and subsequent decline in the fishery may have resulted from demolition or modification of one or more pre-existing levees before impoundment of the existing dam in 1973. Additional fisheries management actions may be ineffective unless turbidity can be significantly reduced. Lab tests in 2014 resulted in flocculation and significant improvement in water clarity at a rate of 0.5 grams/liter or ~0.7 tons/acre foot of calcium sulfate (gypsum), and 0.25 grams/liter or ~0.3 tons/acre foot of aluminum sulfate (alum). A volumetric survey of the reservoir has not been conducted since 1973, and would require a new survey to estimate treatment costs. However, application and product costs (~$45 per ton gypsum; ~$425 per ton aluminum sulfate) may make treatment impractical.

MANAGEMENT STRATEGY

1. Explore available methods and associated costs to reduce turbidity in the reservoir. Communicate options with controlling authority and investigate potential funding opportunities. Maintain fishery regulations at their current status.

ISSUE 2: Turbid conditions greatly reduce visibility and may reduce catch rates of fishes during standard, nighttime electrofishing surveys.

MANAGEMENT STRATEGY

1. Discontinue standard, nighttime electrofishing sampling at Sulphur Springs Reservoir. Monitor Largemouth Bass and prey populations with daytime electrofishing at randomly selected stations.

ISSUE 3: Anecdotal information suggests a limited catfish fishery exists at Lake Sulphur Springs. Standard gill netting has resulted in low catch rates of catfish species.

MANAGEMENT STRATEGIES

1. Discontinue standard gill net sampling at Lake Sulphur Springs. Assess length frequency and growth rates of Blue Catfish population using optional low-frequency electrofishing in spring 2018.
2. Request stocking of Channel Catfish fingerlings at 100/acre.

ISSUE 4: 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. 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:

The proposed sampling schedule includes daytime electrofishing, optional daytime low-frequency electrofishing, and additional trap netting every four years (Table 8). Growth of Largemouth Bass, catfish, and crappie will be examined every four years. Standard aquatic vegetation and angler access surveys will be conducted in 2017.

LITERATURE CITED

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and Gizzard Shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

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.

Jubar, A., and K. Storey. 2006. Statewide freshwater fisheries monitoring and management program survey report for Sulphur Springs Reservoir, 2005. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-31, Austin.

Jubar, A., and K. Storey. 2010. Statewide freshwater fisheries monitoring and management program survey report for Sulphur Springs Reservoir, 2009. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-35, Austin.

United States Geological Society (USGS). 2014. National water information system: Web interface. Available: http://waterdata.usgs.gov/tx/nwis (July 2014).

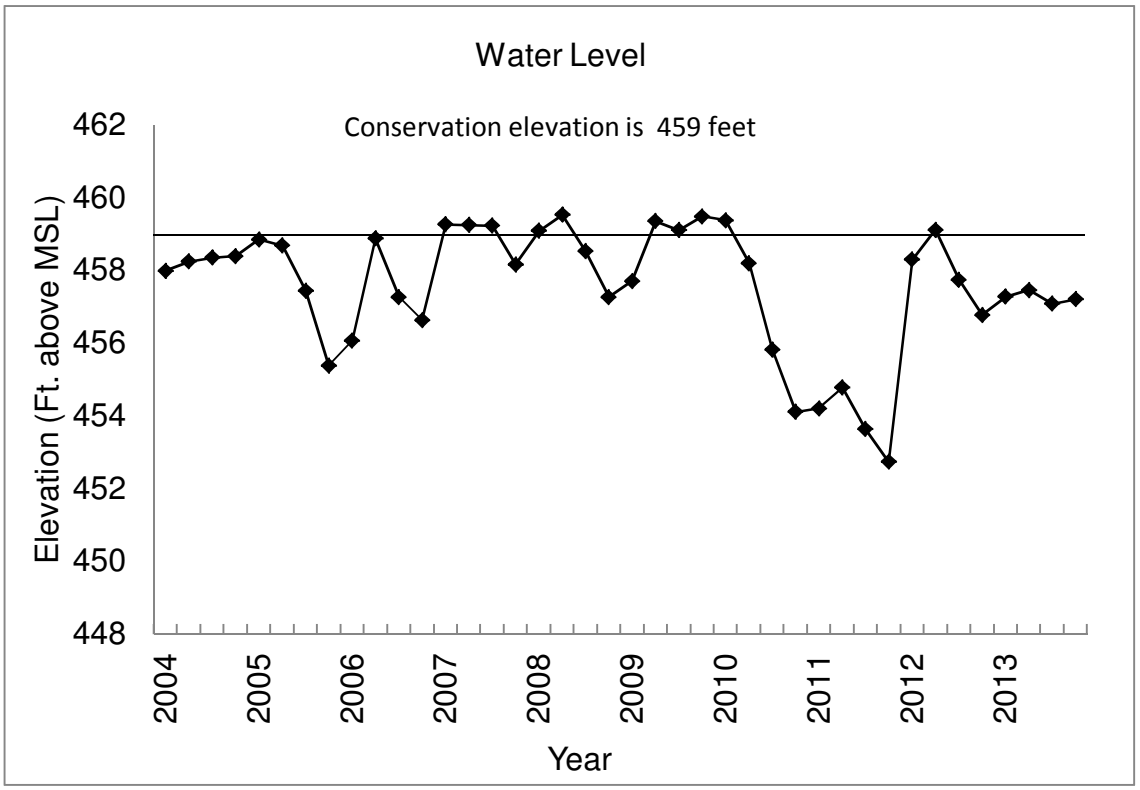


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Sulphur Springs Reservoir, Texas, 2004 to 2014.

Table 1. Characteristics of Sulphur Springs Reservoir, Texas.

Characteristic	Description
Year constructed	1973
Controlling authority	City of Sulphur Springs
Surface area	1,340 acres
Counties	Hopkins
Reservoir type	City impoundment
Mean depth	10.5 ft.
Maximum depth	28.0 ft.
Shoreline Development Index (SDI)	2.16
Conductivity	80 µmho / cm
Secchi depth	10 inches
Watershed area	55 mi^2

Table 2. Boat Ramp characteristics for Lake Sulphur Springs, Texas, August 2013. Reservoir elevation at time of survey was 457 feet above mean sea level (msl).

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft. msl)	Condition
East Ramp	33.16837 -95.61021	Y	30	453	Excellent.
West Ramp	33.18177 -95.62967	Y	40	457	Out of Water. Extension is feasible.

Table 3. Harvest regulations for Sulphur Springs Reservoir.

Species	Bag limit	Length limit
Catfishes: Channel and Blue catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish: Flathead	5	18-inch minimum
Bass: Largemouth	5	14-inch minimum
Crappies: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Sulphur Springs Reservoir, Texas. Size Categories are: FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

Species	Year	Number	Size
Threadfin Shad	1990	7,000	ADL
	1991	14,400	ADL
	Total	21,400	
Blue Catfish	1978	29,680	
Channel Catfish	1973	76,400	FGL
	1974	18,000	FGL
	Total	94,400	
Palmetto Bass	1978	33,680	FGL
	1979	33,600	FGL
	1982	14,028	FGL
	Total	81,308	
Green X Redear Sunfish	1973	15,000	FGL
	1974	25,000	FGL
	Total	40,000	
Largemouth Bass	1972	1,000	AFGL
	1973	36,250	FGL
	Total	37,250	
Florida Largemouth Bass	1978	37,080	FGL
Saugeye	1993	67,100	FGL
	1994	69,302	FGL
	1995	40,305	FGL
	1996	67,242	FGL
	1997	75,009	FGL
	Total	318,958	

Table 5. Survey of structural habitat types, Sulphur Springs Reservoir, Texas, 2013.

Habitat type	Miles	% of total
Native terrestrial/flooded terrestrial/native emergent	12.8	84.7
Native terrestrial/native emergents	<1.0	<1.0
Rocky shoreline	1.8	12.3
Rocky shoreline/flooded terrestrial	<1.0	<1.0
Rocky shoreline/flooded terrestrial/native emergents	<1.0	2.1

Table 6. Survey of aquatic vegetation, Sulphur Springs Reservoir, Texas, 2013. Surface area in acres is listed with percent coverage in parentheses.

Vegetation	2005	2009	2013
Native emergent (bulrush, cattail, maidencane)	0.1 (<0.1)	5.3 (0.3)	<1.0 (<1.0)
Native emergents and flooded terrestrial	2.2 (0.1)	6.3 (0.4)	92.0 (7.0)
Waterleaf (*Hydrolea* spp.)			<1.0 (<1.0)
American lotus (*Nelumbo lutea*)	132.7	315.0	<1.0 (<1.0)

Gizzard Shad

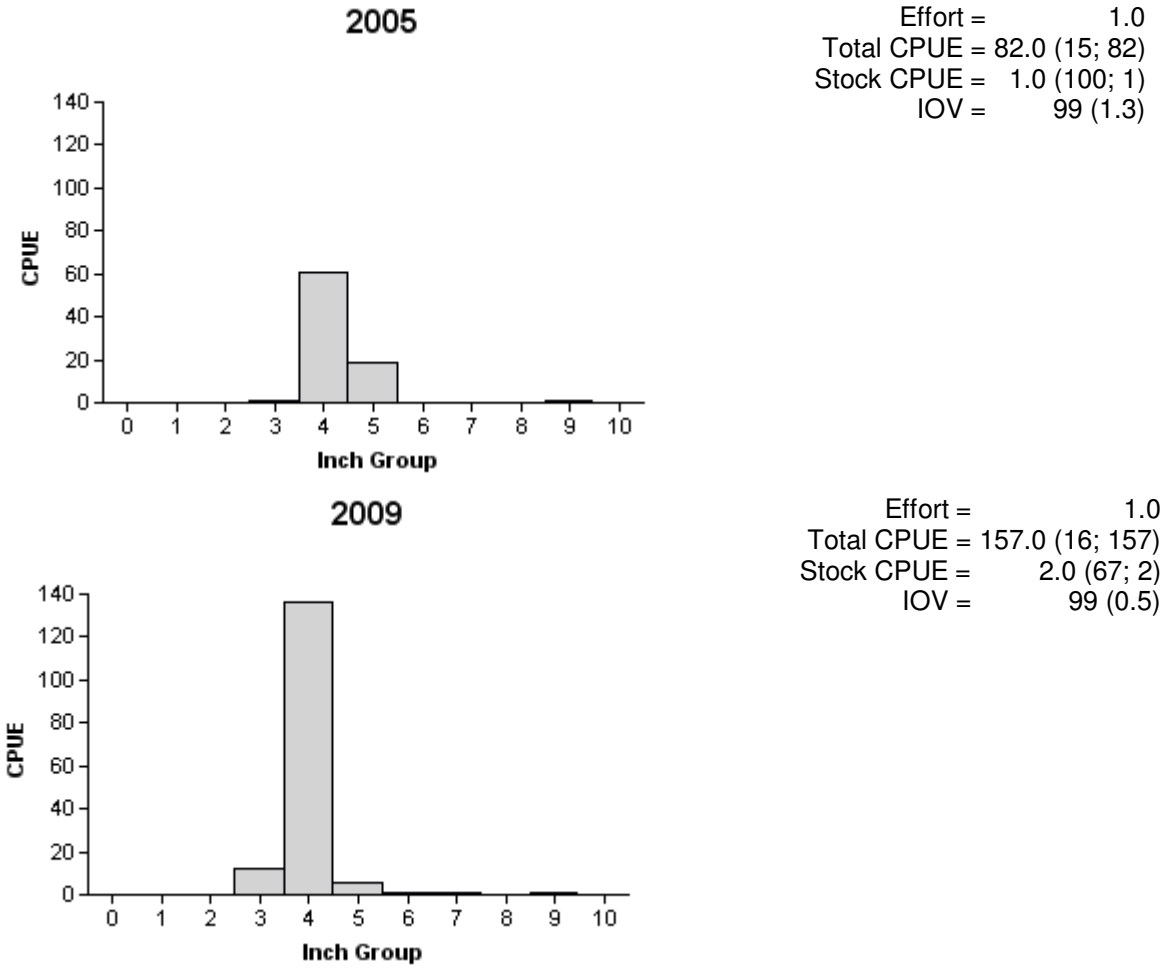
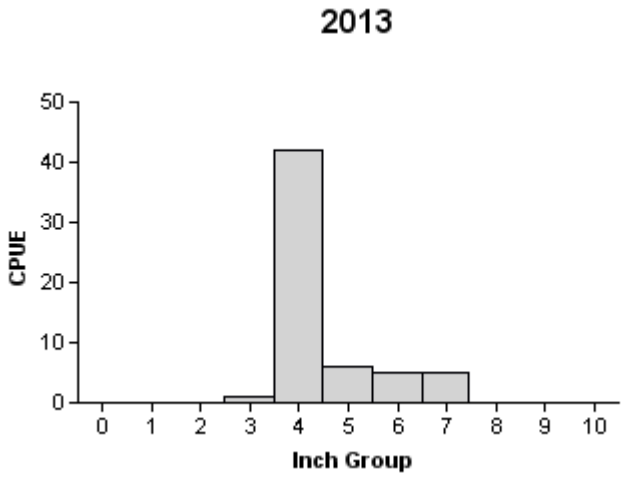


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for nighttime fall electrofishing surveys, Sulphur Springs Reservoir, Texas, 2005 and 2009.

Gizzard Shad



Effort = 1.0
Total CPUE = 59.0 (25; 59)
Stock CPUE = 5.0 (62; 5)
IOV = 100 (0)

Figure 3. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for a daytime fall electrofishing survey, Sulphur Springs Reservoir, Texas, 2013.

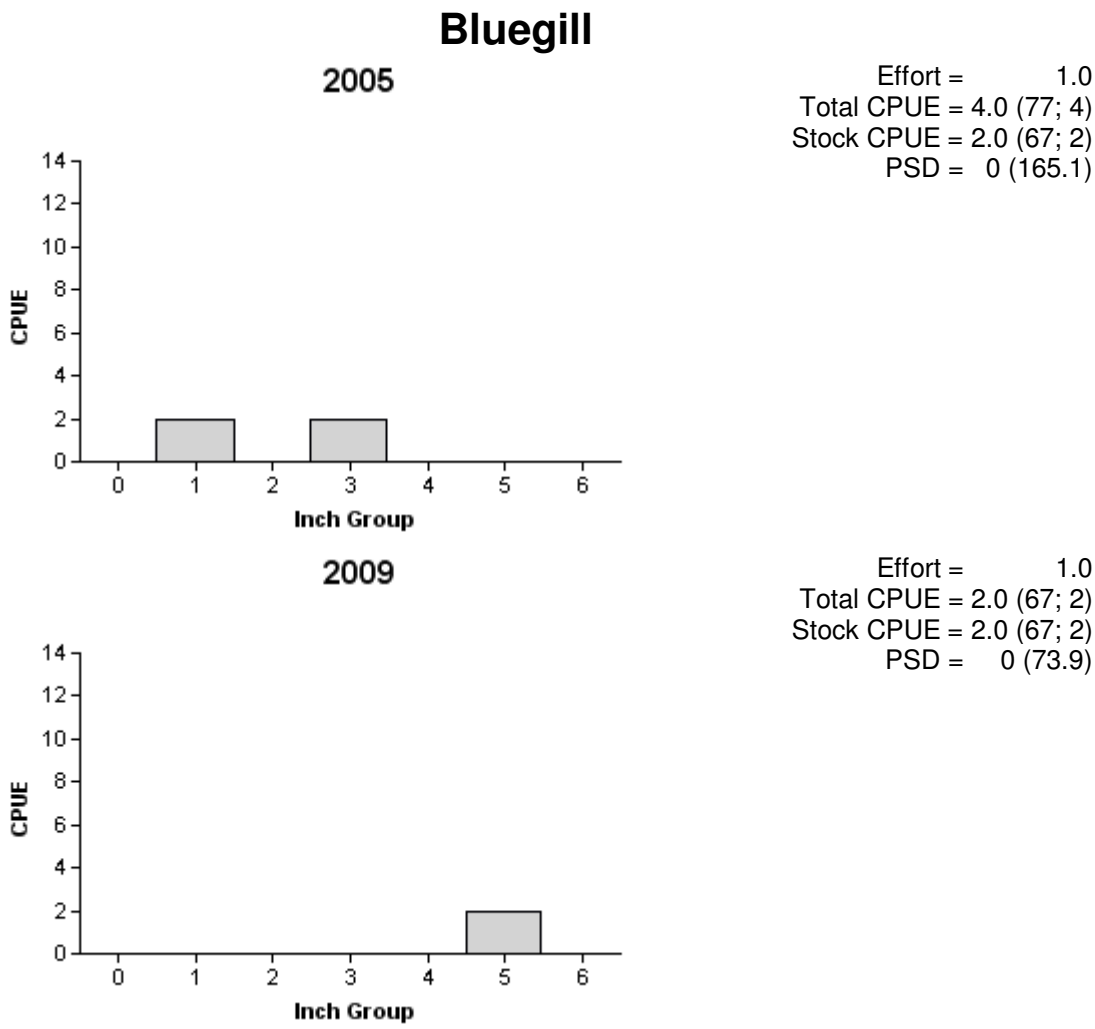
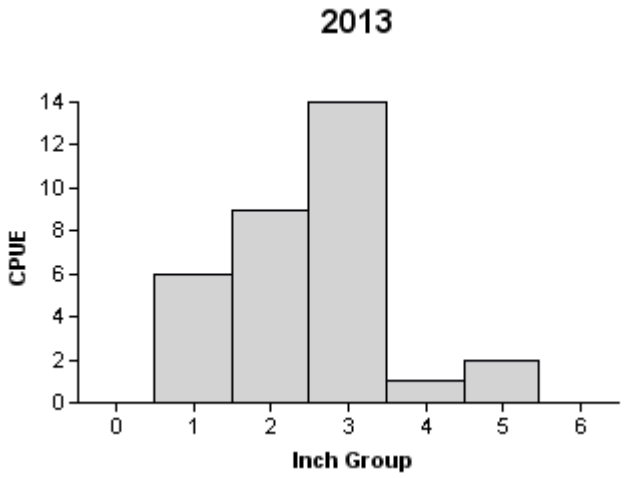


Figure 4. Number of Bluegill caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for nighttime fall electrofishing surveys, Sulphur Springs Reservoir, Texas, 2005 and 2009.

Bluegill



Effort = 1.0
Total CPUE = 32.0 (23; 32)
Stock CPUE = 17.0 (29; 17)
PSD = 0 (71.7)

Figure 5. Number of Bluegill caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for a daytime fall electrofishing survey, Sulphur Springs Reservoir, Texas, 2013.

Blue Catfish

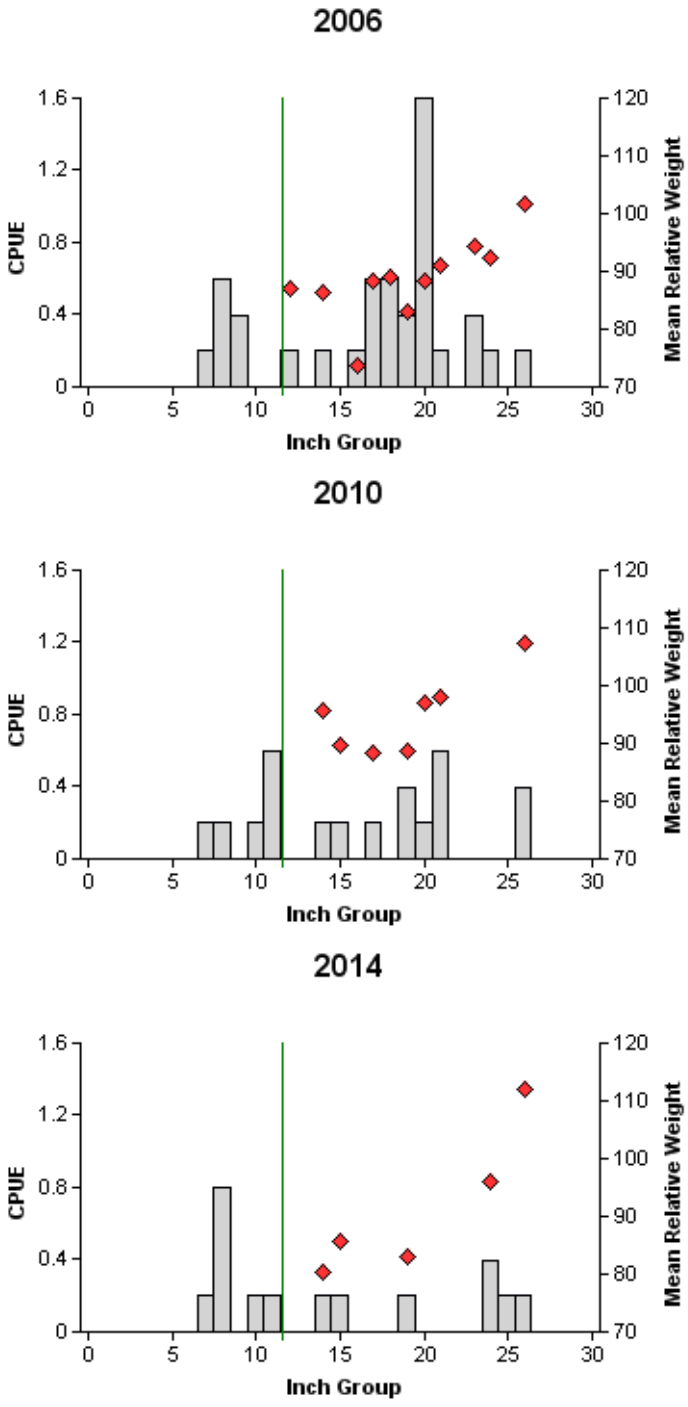
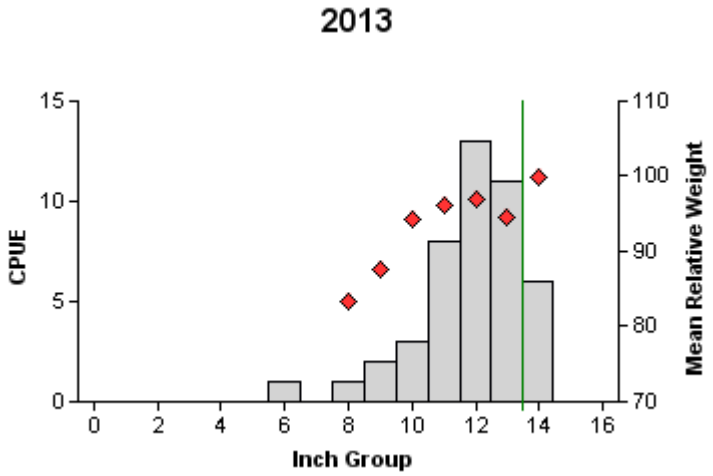


Figure 6. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Sulphur Springs Reservoir, Texas, 2006, 2010, and 2014. Vertical lines indicate minimum length limit.

Largemouth Bass



Effort = 1.0
Total CPUE = 45.0 (29; 45)
Stock CPUE = 44.0 (28; 44)
PSD = 68 (10.3)
PSD-14 = 14 (5.9)

Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for fall electrofishing surveys, Sulphur Springs Reservoir, Texas, 2013. Vertical line represents minimum length limit.

Largemouth Bass

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Sulphur Springs Reservoir, Texas, 2013. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by micro-satellite DNA analysis.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2013	30	0	1	29	3	0

White Crappie

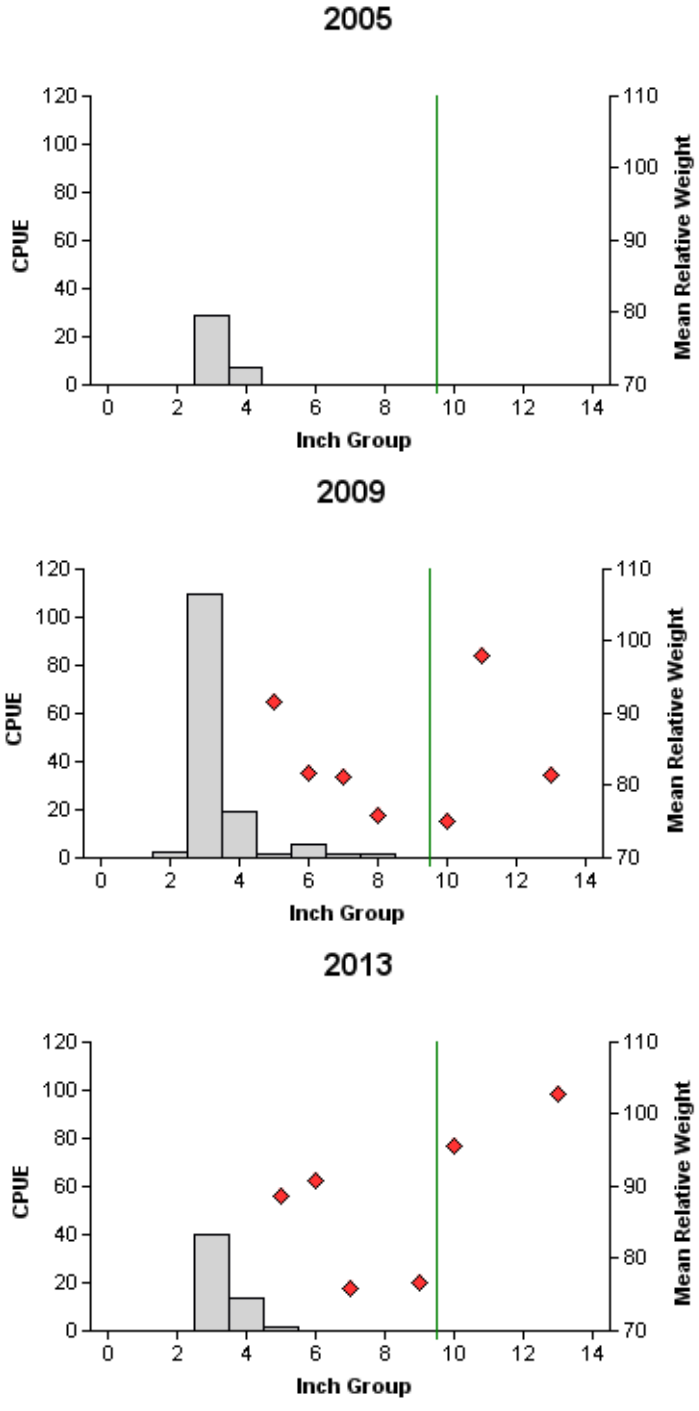


Figure 8. Number of White Crappie caught per net night (CPUE, bars), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Sulphur Springs Reservoir, Texas, 2005, 2009, and 2013. Vertical lines represent minimum length limit at time of survey.

Table 8. Proposed sampling schedule for Sulphur Springs Reservoir, Texas. Standard survey denoted by S and additional survey denoted by A.

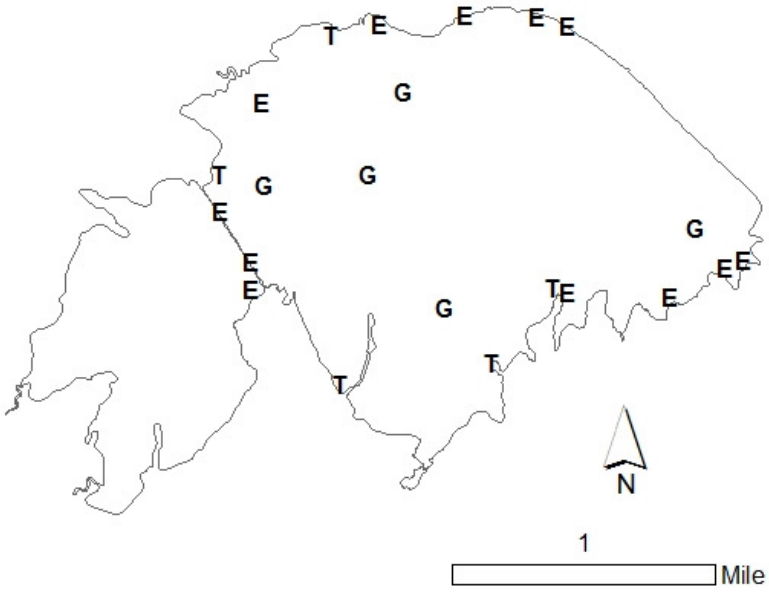
Survey Year	Electrofishing	Low-Frequency Electrofishing	Trap Net	Access	Vegetation	Report
2014-2015						
2015-2016						
2016-2017						
2017-2018	S	A	A	S	S	S

APPENDIX A

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

	Gill Netting		Fall Electrofishing		Trap Netting	
Species	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad			59	59		
Blue Catfish	14	2.8				
Warmouth			3	3		
Bluegill			32	32		
Longear Sunfish			2	2		
Largemouth Bass			45	45		
White Crappie					285	57

APPENDIX B



Location of sampling sites, Sulphur Springs Reservoir, Texas, 2013-2014. Gill net, trap net, and electrofishing stations are indicated by G, T, and E, respectively.