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

Gladewater City Lake

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TABLE OF CONTENTS

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Gladewater City Lake were surveyed in 2013 using electrofishing and trap netting and in 2014 using gill netting. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings. 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:** Gladewater City Lake is a 481-acre reservoir on Glade Creek, and was constructed in 1953 by the City of Gladewater for use as municipal and industrial water supply. Habitat features consisted of inundated timber, brush, creek channels, and riprap. The lake has a history of limited aquatic vegetation. Water hyacinth, a non-native invasive plant, was detected at the reservoir in 2005. Periodic herbicide treatments have prevented the spread of water hyacinth in the reservoir.

- **Management History:** Important sport fishes include Largemouth Bass, Channel Catfish, Bluegill, Redear Sunfish, and crappie. Texas Parks and Wildlife Department (TPWD) Inland Fisheries District 3A staff stocked Threadfin Shad in 2008 to improve the prey fish community. Even though the Largemouth Bass population has not met the requirements for Florida Largemouth Bass stocking by TPWD, the City of Gladewater has purchased (from a private fish retailer) and stocked the reservoir with 15,000 pure Florida Largemouth Bass fingerlings each year from 2008-2010.

- **Fish Community**
  - **Prey species:** Threadfin Shad continued to be present in the reservoir. Electrofishing catch of Gizzard Shad was lower than it was in the previous two surveys, and few fish were small enough to be available as prey to most sport fish. Bluegill catch was higher in 2013 than it was in the previous two surveys and are adequate as prey to most sport fish. Redear Sunfish serve as an additional prey source for predators and also grow to sizes desirable to anglers.

  - **Catfishes:** The Channel Catfish population contained many fish above legal size. Gill net catch rates and size structure of Channel Catfish were higher in 2014 than they were in the previous surveys. Flathead Catfish were present in the reservoir.

  - **Temperate basses:** Yellow Bass were the only temperate bass present in Gladewater City Lake.

  - **Black bass:** Largemouth Bass electrofishing catch rates were similar to those of previous surveys. Largemouth Bass were collected up to 21 inches, and size structure was above average. Spotted Bass abundance was lower than it was in previous surveys, but size structure was satisfactory. These fish provide additional angling opportunities.

  - **Crappie:** Both White Crappie and Black Crappie were collected, but in low numbers. Condition was poor for both species. Crappies have typically been in low abundance and condition in this reservoir.

- **Management Strategies:** Conduct additional water hyacinth surveys annually from 2014-2016. Conduct general monitoring with trap netting, electrofishing, and aquatic vegetation surveys in 2017 and gill netting in 2018.

INTRODUCTION

This document is a summary of fisheries data collected from Gladewater City Lake from June 2013 through May 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 previous survey data for comparison.

Reservoir Description

Gladewater City Lake is located in Upshur County on Glade Creek. It was constructed in 1953 by the City of Gladewater for use as a municipal and industrial water supply and for public recreation. The lake has a drainage area of approximately 42 square miles. Shoreline length is 10 miles with a shoreline development ratio of 2.7:1. Water level has been relatively stable, and during dry periods the water level has not dropped more than 3 feet (Figure 1). Water hyacinth was discovered in the reservoir during the 2005 vegetation survey. Abundant residential development exists along the lower half of the reservoir. The City of Gladewater operates a boat ramp on the reservoir, and bank angling access is limited. Other descriptive characteristics for Gladewater City Lake are recorded in Table 1.

Angler Access

Gladewater City Lake has public boat ramps located at the Garland P. Ferguson City Park with parking for about 15 trucks/trailers. The park has two boat ramps located at each end of the parking area. Additional boat ramp characteristics are recorded in Table 2. Shoreline access is limited to the public boat ramp areas, lighted fishing pier, and city park shoreline areas. Boat ramps are operated by the City of Gladewater and a use fee is required.

Management History

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

1. Conduct annual water hyacinth surveys and continue to work with Gladewater City officials and lake advisory board regarding water hyacinth management efforts.
   Action: Annual water hyacinth surveys have been conducted. Water hyacinth levels have remained at low levels over recent years, and currently only annual monitoring is needed.

2. Seek input from stakeholders to assess acceptance of native aquatic plant community improvement project and evaluate Gladewater City Lake for potential sites for native plant establishment.
   Action: No habitat enhancement projects have been initiated; however, native vegetation coverage has increased naturally since the 2009 survey with native floating-leaved plants increasing from 17 acres to 38 acres and native emergent plants increasing from 17 to 20 acres.

3. Continue to provide news releases and presentations regarding angling opportunities at Gladewater City Lake.
   Action: Information regarding the fishery at Gladewater City Lake has been provided to interested anglers.

Harvest regulation history: Sport fishes in Gladewater City Lake are currently managed with statewide regulations (Table 3). Largemouth Bass have been managed with a 14-inch minimum length and 5-fish daily bag since 1986. Other black basses were included under this regulation in 1988. The minimum length limit on Spotted Bass was removed in 2000, but the daily bag for black basses in any combination remains at 5 fish/day. The 12-inch minimum length limit and 25-fish daily bag for Channel Catfish and Blue Catfish (in any combination) has been in effect since 1995. The minimum length limit for Flathead Catfish was reduced from 24 inches to 18 inches in 1995. There is a 5-fish daily bag on Flathead Catfish. Current regulations are found in Table 3.

Stocking history: Channel Catfish were stocked from the early 1970s to the mid-1990s in order to maintain a fishable population. The population has maintained itself since the last stocking in 1996. Florida Largemouth Bass were last stocked by TPWD in 1992. Since then, the largemouth bass population has maintained sufficient Florida Largemouth Bass alleles to meet fisheries management objectives. However, the Gladewater City Lake Advisory Board has stocked 15,000 additional Florida Largemouth Bass obtained from a private fish retailer annually from 2008 to 2010 to further improve the fishery. TPWD stocked Threadfin Shad in 2008 to improve the prey fish community. The complete stocking history is listed in Table 4.

Vegetation/habitat management history: The discovery of water hyacinth during the 2005 aquatic vegetation survey was the first case of a non-native plant species present in this water body. Water hyacinth has not been treated with herbicide since 2006; however, water hyacinth coverage has remained at low levels without inhibiting recreational access. Total estimated aquatic plants observed can be found in Table 6.

Water transfer: 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).

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). 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 and creel statistics. Average age at length was determined using otoliths for Largemouth Bass from 13 fish (13.1-14.5 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 from 2005 through 2013 and by electrophoresis for previous years.

Source for water level data was the United States Geological Survey (USGS 2013).

RESULTS AND DISCUSSION

Habitat: Water level was approximately 2 feet low during the vegetation/habitat survey. Littoral zone structural habitat consisted primarily of bulkheads, natural shoreline, and submerged timber (Table 5). Native aquatic vegetation covered 12% of the reservoir's surface area and was located almost exclusively in the upper end of the reservoir. Submerged vegetation, which was higher in previous surveys, was limited to a fringe in the upper portion of the reservoir. Water hyacinth was present but at low density.

Prey species: Electrofishing catch rates of Bluegill, Threadfin Shad, and Gizzard Shad were 758.0/h, 231.0/h, and 74.0/h, respectively. Index of vulnerability (IOV) for Gizzard Shad was poor, indicating that only 14% of Gizzard Shad were available to existing adult predators. IOV for Gizzard Shad has declined during the past three surveys (Figure 2). Total catch rate of Bluegill in 2013 was higher than from surveys in 2009 and 2007. Size structure of Bluegill was less than optimum with a PSD of 5 and similar to past surveys with few fish over 5 inches (Figure 3). Redear Sunfish were also present with a total CPUE of 206.0/h and an adequate size structure with a PSD of 19 (Figure 4). Other species present included Warmouth, Longear, Dollar, and Redspotted sunfishes, all at low catch rates. The diversity, abundance, and size range of prey species provide an adequate prey base for Largemouth Bass in Gladewater City Lake.

Channel Catfish: The gill net catch rate and size structure has increased over the past three surveys. Catch rates of Channel Catfish were 8.4/nn in 2014, 7.8/nn in 2010, and 4.8/nn in 2006 (Figure 5). Size structure was excellent with a PSD of 79 and PSD-P of 24, indicating many legal- and preferred-size fish available to anglers. Condition increased with increasing fish lengths and all fish were in at least adequate condition. Most Channel Catfish longer than 18 inches had *Wr* above 100 while fish below 18 inches generally had a *Wr* above 90, indicating an abundant prey base.

Spotted Bass: Total catch rate of Spotted Bass was 48.0/h in 2013 which was lower than it was in 2009 (69.0/h), but similar to 2007 (52.0/h) (Figure 6). Size structure improved since past surveys with a PSD of 30, compared to 2009 (PSD = 10) and 2007 (PSD = 16). Spotted Bass from 10 to 12 inches composed the majority of catchable-size fish. Condition of Spotted Bass was somewhat below average with most fish *Wrs* between 85 and 95. Even though no Spotted Bass >14 inches were collected, this species provides additional opportunity for anglers in Gladewater City Lake.

Largemouth Bass: The electrofishing catch rate of stock-length ($\geq$8 inches) Largemouth Bass was 76.0/h in 2013 and was similar to catch rate of previous surveys (64.0/h in 2009 and 80.0/h in 2007) (Figure 7). Size structure was balanced with a PSD of 55 and PSD-P of 16 (Gablehouse 1984). Abundance and size structure have remained relatively constant over the past three surveys. Growth of Largemouth Bass was moderate; average age at 14 inches (13.0 to 14.9 inches) was 2.7 years (N = 13; range = 2 – 3 years) and was slightly better than growth rates in 2009 when average age at 14 inches was 2.9. Body condition in 2013 was below average (*Wr* < 90) for bass under 14 inches while bass above the minimum length limit generally had adequate relative weights (*Wr* > 90) (Figure 10). Florida Largemouth Bass alleles were 36.0% in 2013 which was higher than it was in past surveys (Table 7). The percentage of pure Florida Largemouth Bass was 3.3 % in 2013 which was not significantly higher than 0.0% observed in 2005 (Table 7). Florida Largemouth Bass stockings by the City of Gladewater from 2007-2009 have been conducted with the goal of increasing Florida Largemouth Bass genetics in the population.

Crappie: The trap net catch rate of Black Crappie and White Crappie was low with a combined CPUE of 2.8/nn. This catch rate was similar when compared to 2009 (5.0/nn) and 2007 (2.4/nn). The PSD was 100 for both species as only fish between 10 and 13 inches were collected. A total of 12 White Crappie

(Figure 8) and 2 Black Crappie (Figure 9) were collected, and the sample size was not large enough to draw any meaningful conclusions regarding growth or size structure. Despite the presence of Threadfin Shad in the reservoir, overall condition was poor with most crappie having a *Wr* below 80.

Fisheries management plan for Gladewater City Lake, Texas

Prepared – July 2014.

ISSUE 1: Gladewater City Lake has the potential to produce large bass. Florida Largemouth Bass stocked by the City of Gladewater have increased Florida genetics in the bass population. Anecdotal evidence from anglers suggests that 8+ pound bass have been caught. Stocking additional Florida Largemouth Bass is needed to maintain the quality fishery and increase trophy potential.

MANAGEMENT STRATEGIES

1. If the presence of Largemouth Bass over 8 lbs. can be documented, recommend stocking Florida Largemouth Bass at a rate of 100 fish/acre every 4 years.
2. Continue to monitor bass and prey populations with standard electrofishing sampling every 4 years.

ISSUE 2: Water hyacinth and alligatorweed are present in Gladewater City Lake; however, coverage has remained low and not problematic.

MANAGEMENT STRATEGIES

1. Continue to monitor invasive aquatic plants with annual surveys.
2. Advise the City of Gladewater and Lake Advisory Board as needed if coverage increases.

ISSUE 3: A quality Channel Catfish population has developed at Gladewater City Lake; however, creel survey's from spring 2008 showed little directed effort for Channel Catfish. Local anglers and the public should be informed about fishing opportunities at Gladewater City Lake.

MANAGEMENT STRATEGY

1. Provide news releases to appropriate media outlets regarding angling opportunities at Gladewater City Lake.

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 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 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 annual aquatic vegetation surveys and required monitoring surveys in 2017/2018 (Table 8). Annual vegetation surveys are necessary to monitor coverage of water hyacinth and to provide information to Gladewater city officials and the lake advisory board. Standard electrofishing, additional trap netting, and gill netting surveys are required every four years at this time to monitor sport fish and prey fish populations. Structural habitat, angler access, and facilities surveys are required once every 4 years.

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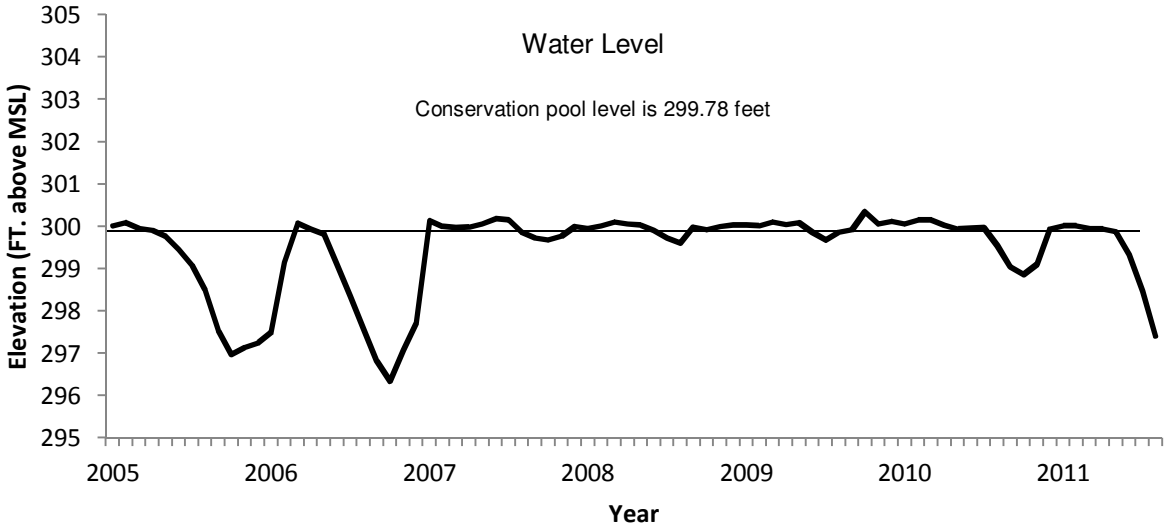


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Gladewater City Lake, Texas. USGS gauge station operation at Gladewater City Lake was discontinued after August 2011.

Table 1. Characteristics of Gladewater City Lake, Texas.

Characteristic	Description
Year constructed	1953
Controlling authority	City of Gladewater
County	Upshur
Reservoir type	Tributary
Surface Area	481 Acres
Shoreline Development Index (SDI)	2.7
Drainage Area	42 Square Miles
Conductivity	78 µS/cm

Table 2. Boat ramp characteristics for Gladewater City Lake, Texas, August 2013. Reservoir elevation at time of survey was near full pool.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
G. P. Ferguson City Park east ramp	32.55730 -94.96225	Y	15	294.7	Good, no access issues
G. P. Ferguson City Park west ramp	32.55754 -94.96319	Y	15	296.7	Good, no access issues

Table 3. Harvest regulations for Gladewater City Lake, Texas.

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, White	25	10-inch minimum
Bass, Palmetto	5	18-inch minimum
Bass, Largemouth	5[a]	14 – No Limit
Bass: Spotted	5[a]	No Limit – No Limit
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

[a] Daily bag for Largemouth Bass and Spotted Bass = 5 fish in any combination.

Table 4. Stocking history of Gladewater City Lake, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults, FRY = fry.

Species	Year	Number	Size
Threadfin Shad	1984	2,600	
	2008	3,000	
	Total	5,600	
Channel Catfish	1972	6,000	AFGL
	1974	3,000	AFGL
	1975	4,000	AFGL
	1976	2,000	AFGL
	1978	3,000	AFGL
	1979	3,000	AFGL
	1982	9,160	AFGL
	1983	10,000	AFGL
	1984	2,000	FGL
	1985	1,998	AFGL
	1986	2,000	FRY
	1989	2,193	FGL
	1991	10,005	FGL
	1992	5,100	FGL
	1993	9,420	FGL
	1995	5,156	FGL
	1996	5,066	FGL
	Total	83,098	
Paradise Bass (Yellow bass X Striped bass)	1977	40,000	
Redbreast Sunfish	1985	3,438	
Largemouth Bass	1969	6,000	FGL
Florida Largemouth Bass	1976	84,000	FRY
	1977	3,000	FRY
	1979	2,499	FRY
	1989	6	ADL
	1992	13,667	FGL
	2008	15,000	FGL
	2009	15,000	FGL
	2010	15,000	FGL
	Total	148,172	

Table 5. Survey of structural habitat types, Gladewater City Lake, Texas, 2013. Shoreline habitat type units are in miles and standing timber unit is acres.

Habitat type	Estimate	% of total
Bulkhead	3.7 miles	37.0
Natural	5.9 miles	59.0
Rocky	0.4 miles	4.0
Standing timber	8.7 acres	1.8

Table 6. Survey of aquatic vegetation, Gladewater City Lake, Texas, 2010 – 2013. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2010	2011	2012	2013
Native submersed				<1 (0.2)
Native floating-leaved				38 (7.9)
Native emergent				20 (4.2)
Non-native				
Alligatorweed (Tier III)[a]			8 (1.7)	<1 (0.2)
Water hyacinth (Tier III)[a]	<1 (0.2)	<1 (0.2)	2 (0.4)	2 (0.4)

[a] Tier I is Immediate Response, Tier II is Maintenance, and Tier III is Watch Status

Gizzard Shad

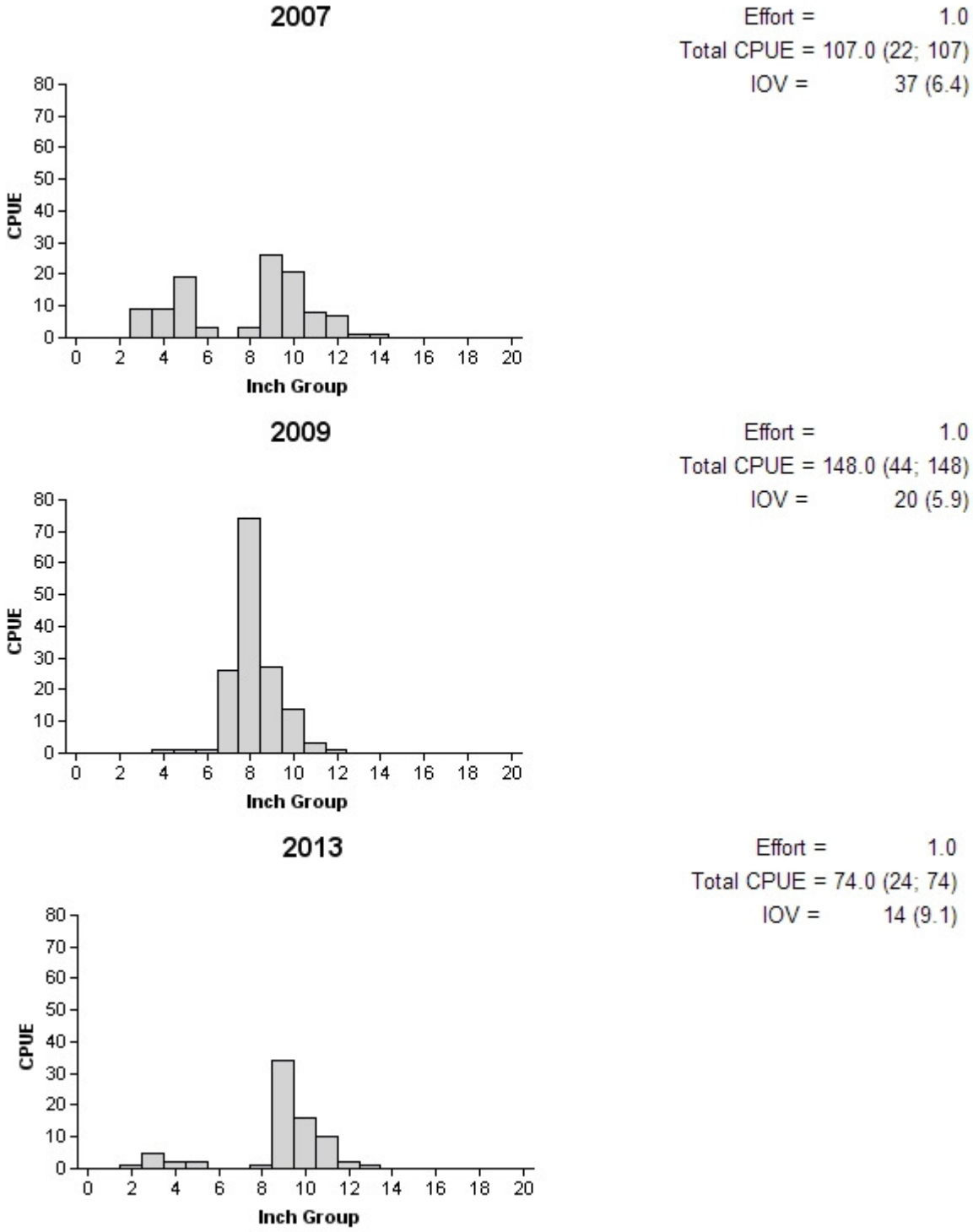
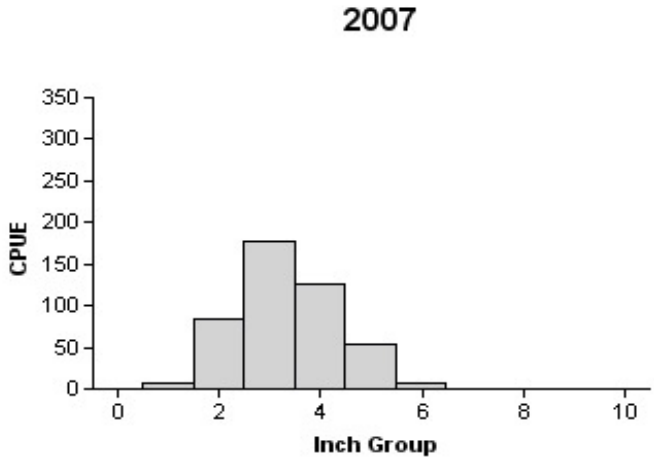
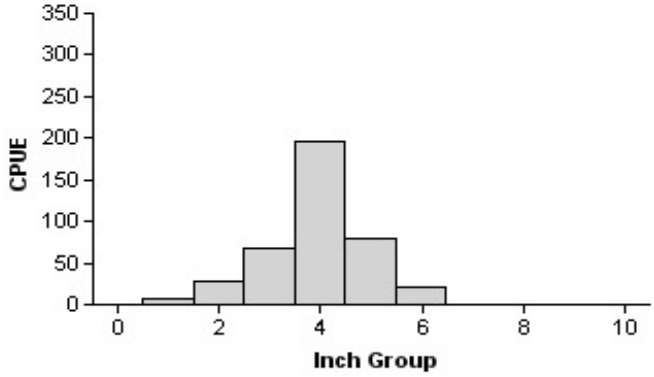


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 2007, 2009, and 2013.

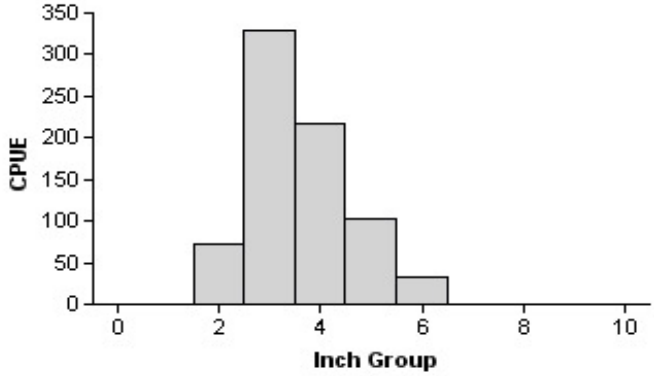
Bluegill



Effort = 1.0
Total CPUE = 455.0 (22; 455)
Stock CPUE = 365.0 (22; 365)
PSD = 2 (1)



Effort = 1.0
Total CPUE = 399.0 (23; 399)
Stock CPUE = 364.0 (22; 364)
PSD = 6 (2)



Effort = 1.0
Total CPUE = 758.0 (17; 758)
Stock CPUE = 685.0 (17; 685)
PSD = 5 (1)

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, Gladewater City Lake, Texas, 2007, 2009, and 2013.

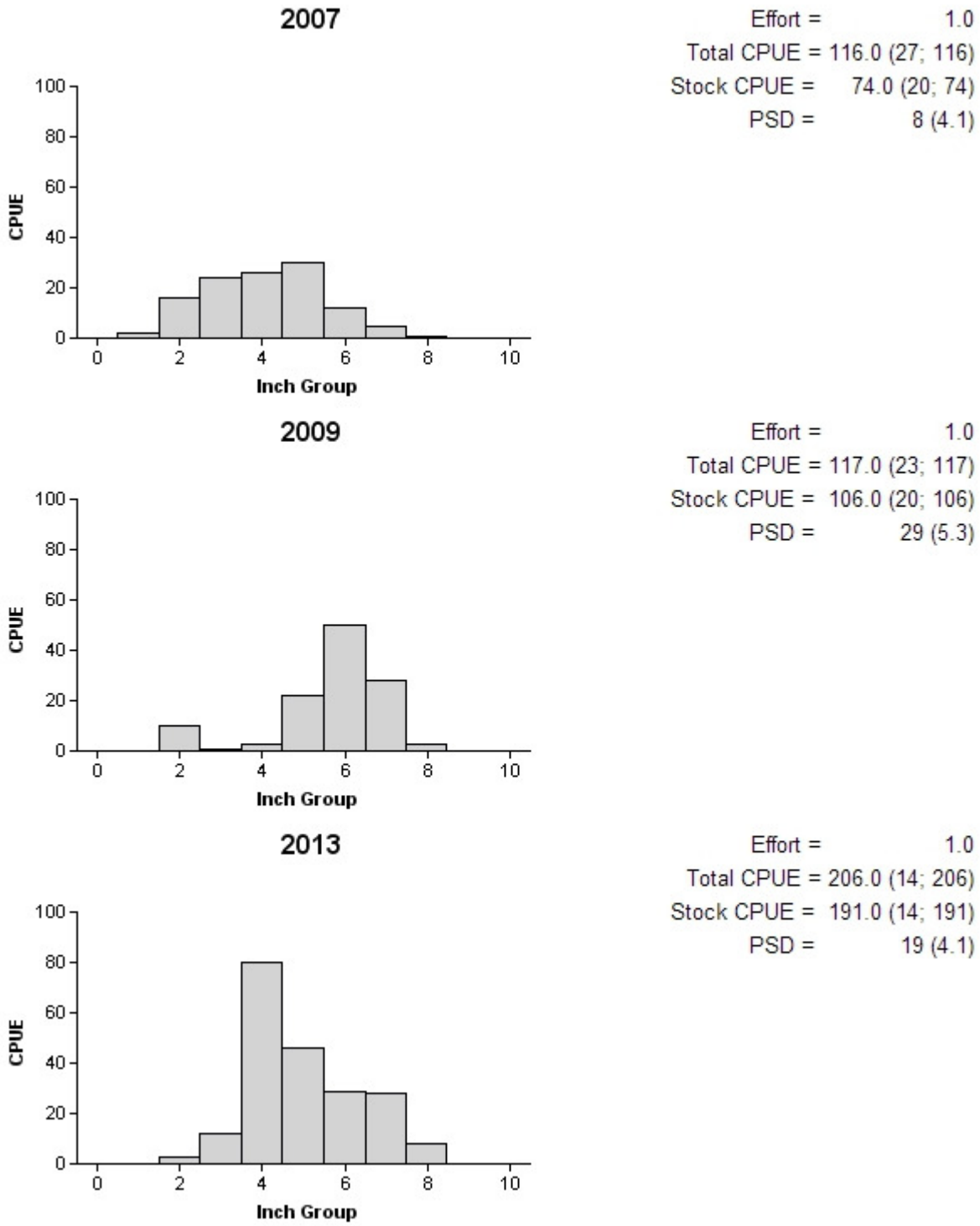


Figure 4. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 2007, 2009, and 2013.

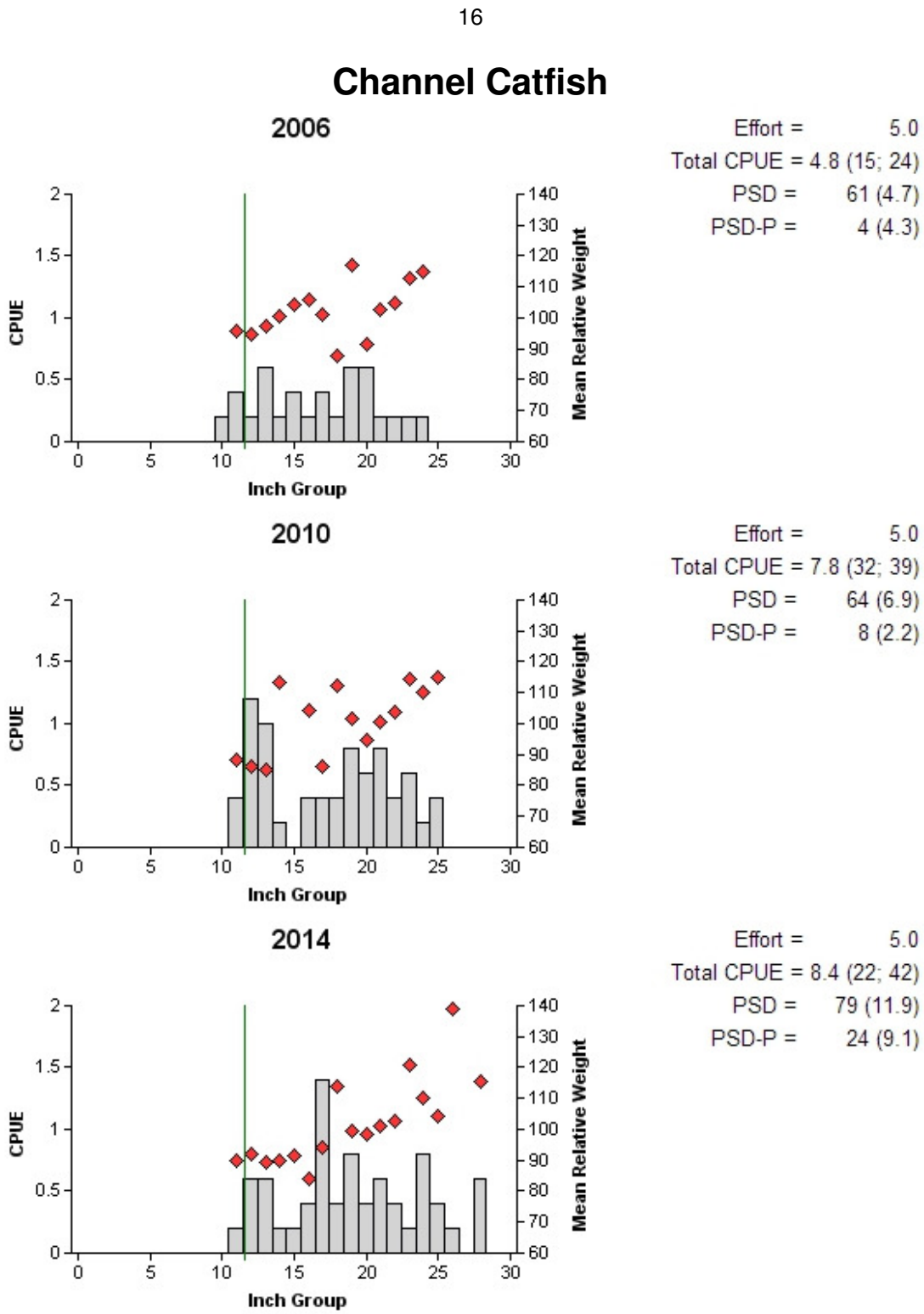


Figure 5. Number of Channel Catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Gladewater City Lake, Texas, 2006, 2010, and 2014. Vertical lines indicate minimum length limit

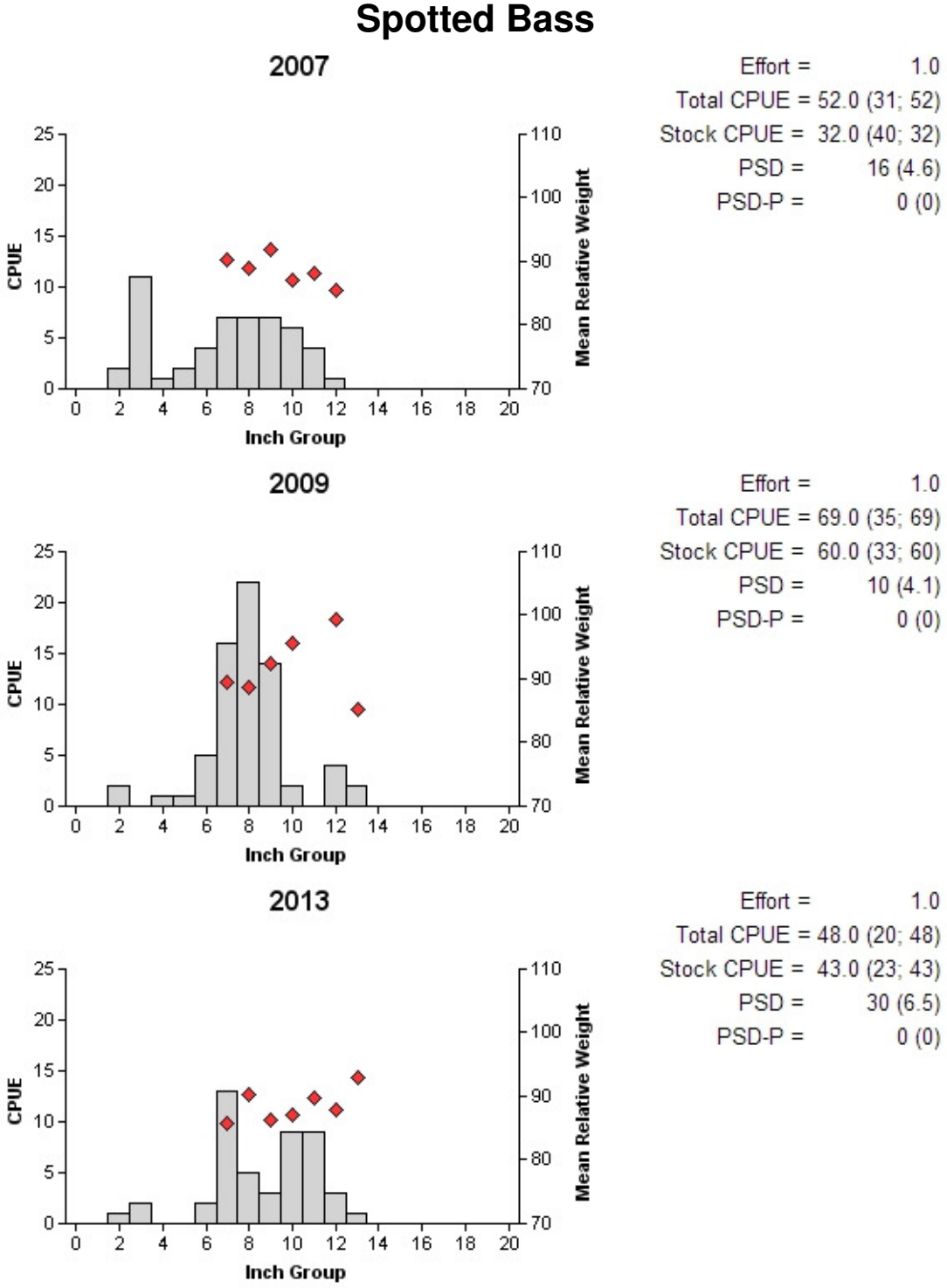


Figure 6. Number of Spotted Bass caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 2007, 2009, and 2013.

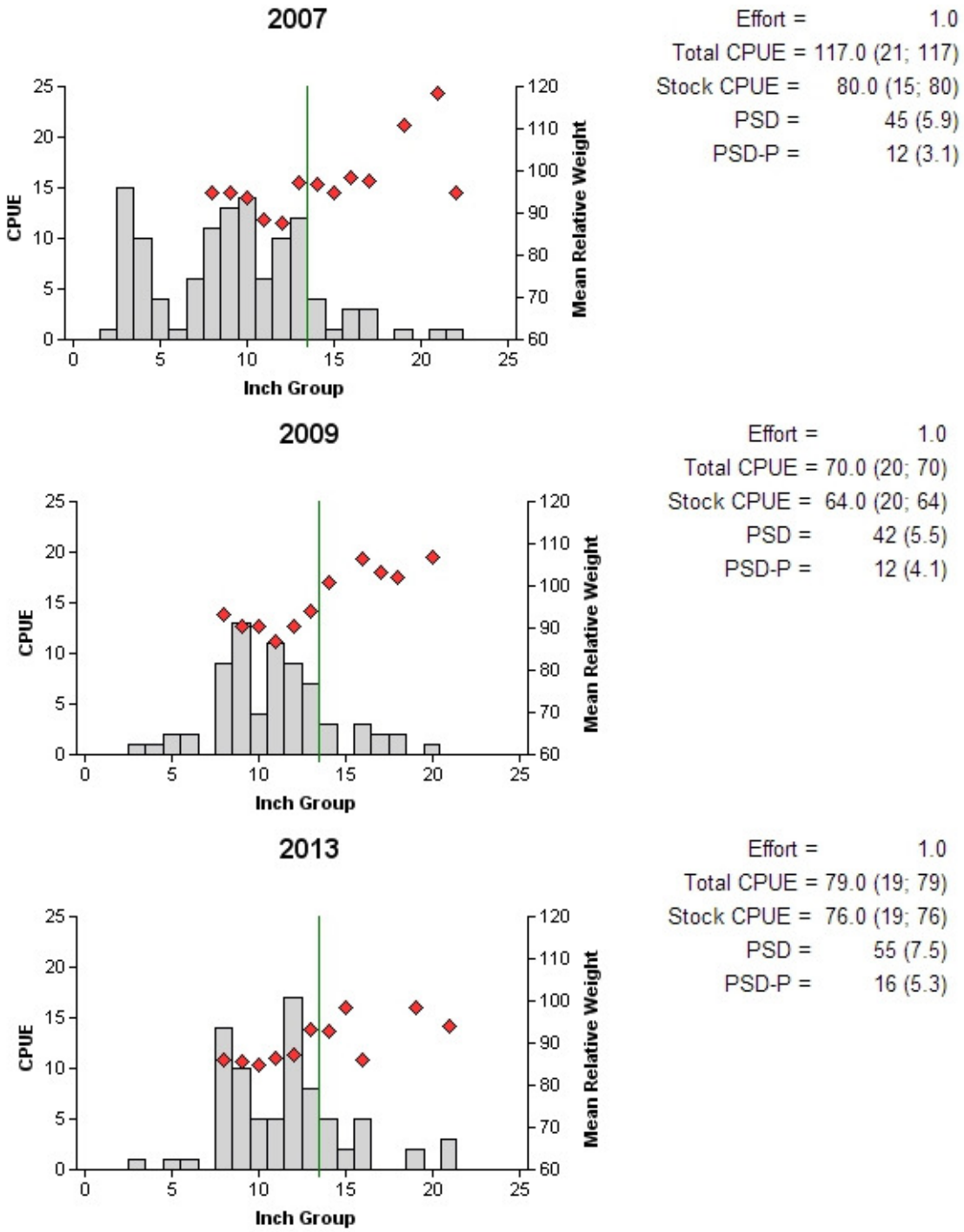


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 2007, 2009, and 2013. Vertical lines indicate minimum length limit.

Largemouth Bass

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Gladewater City Lake, Texas, 2013. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
1991	30	1	11	18	20.0	3.3
1992	87	5	48	34	57.0	5.7
1995	30	2	21	1	45.3	6.7
1998	17	1	10	6	26.0	5.9
2005	35	0	26	9	23.0	0.0
2013	30	1	27	2	36.0	3.3

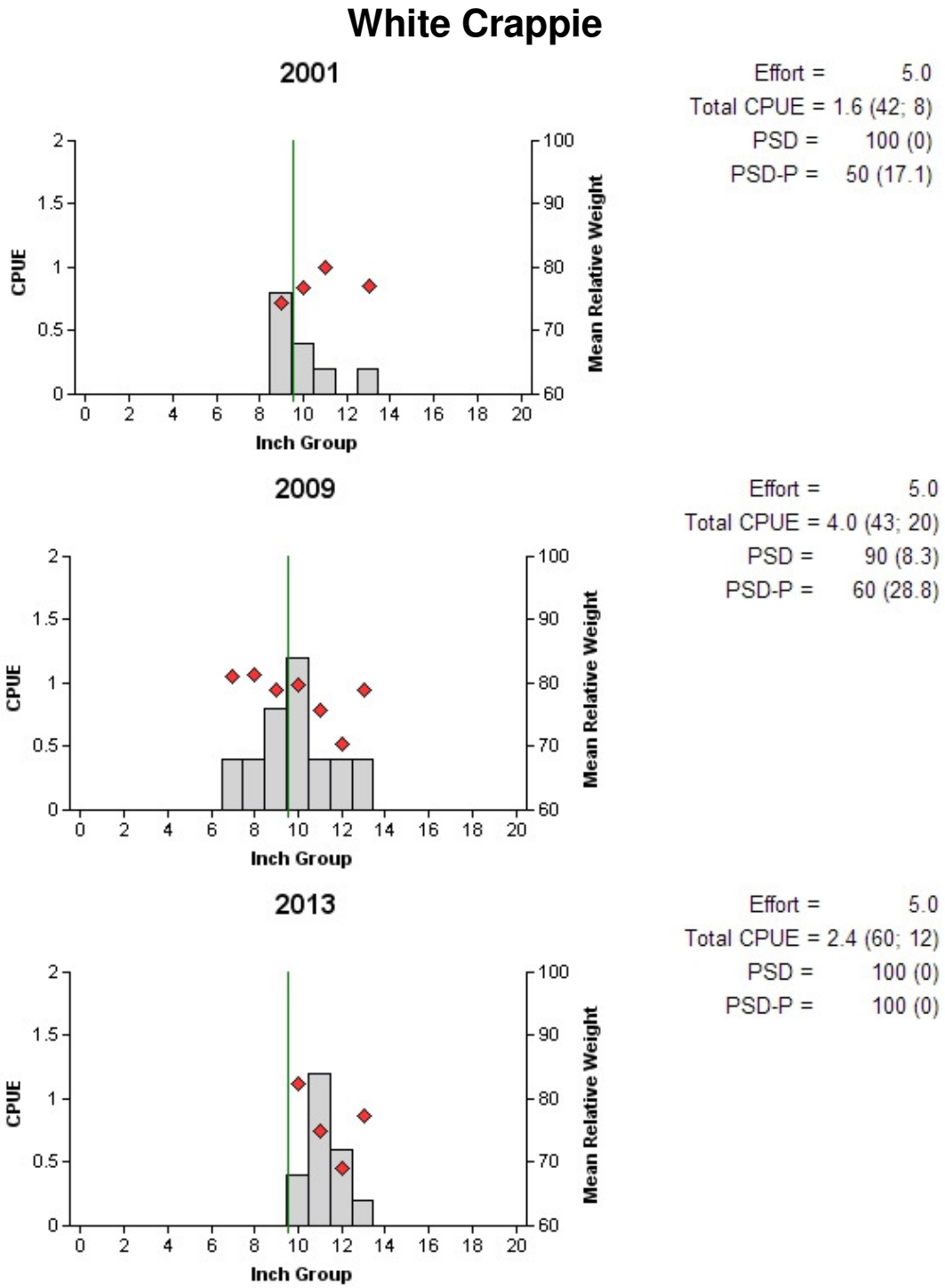


Figure 8. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Gladewater City Lake, Texas, 2001, 2009, and 2013. Vertical lines indicate minimum length limit.

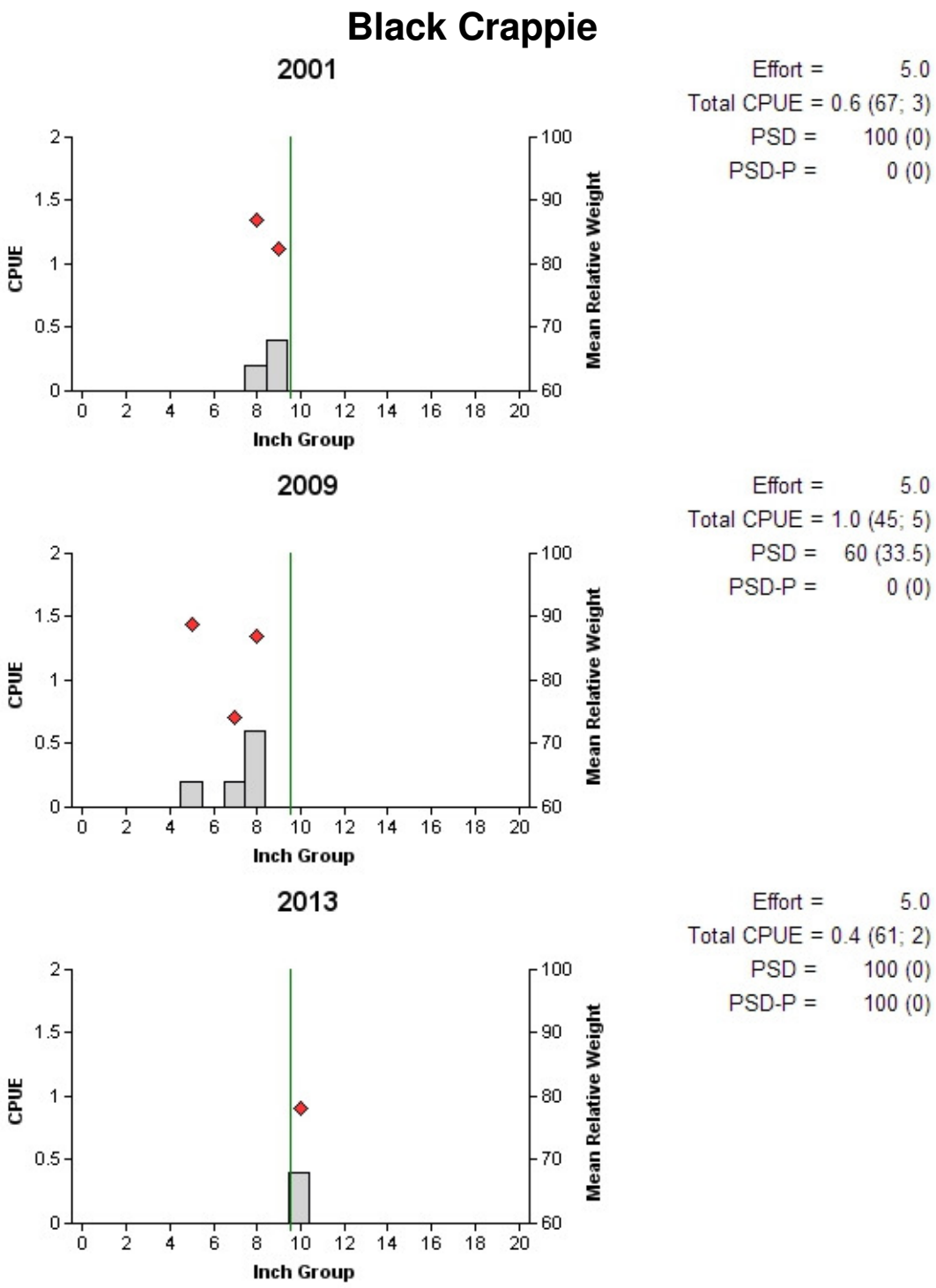


Figure 9. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Gladewater City Lake, Texas, 2001, 2009, and 2013. Vertical lines indicate minimum length limit.

Table 8. Proposed sampling schedule for Gladewater City Lake, Texas. Survey period is Survey year begins June 1 and ends May 30. 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.

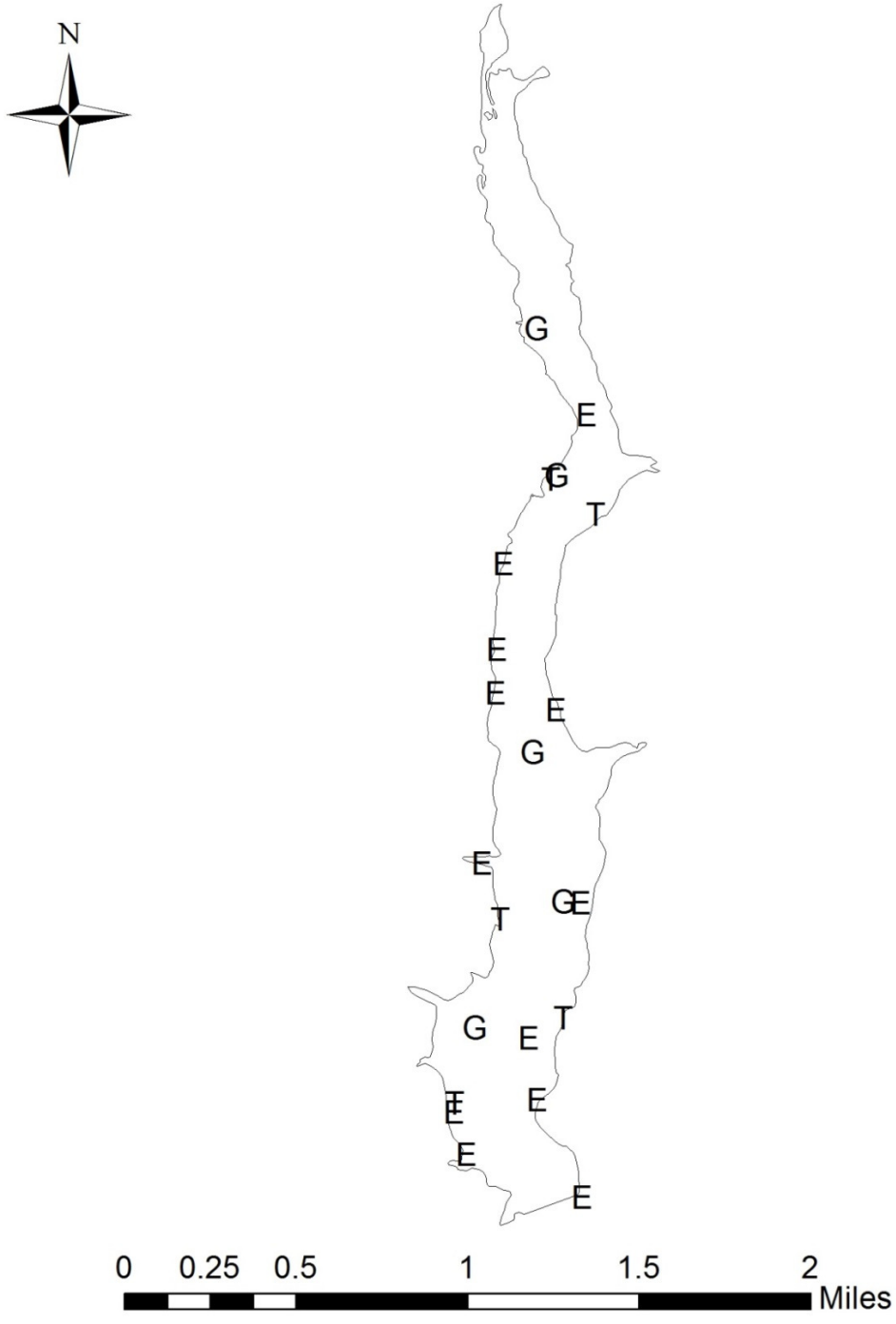
Survey year	Electrofish Fall(Spring)	Trap net	Gill net	Habitat		Access	Creel survey	Report
				Structural	Vegetation			
2014-2015					A			
2015-2016					A			
2016-2017					A			
2017-2018	S	A	S		S	S		S

APPENDIX A

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

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					74	74.0
Threadfin Shad					231	231.0
Channel Catfish	42	8.4				
Flathead Catfish	1	0.2				
Green Sunfish					42	42.0
Warmouth					1	1.0
Bluegill					758	758.0
Dollar Sunfish					25	25.0
Longear Sunfish					121	121.0
Redear Sunfish					206	206.0
Redspotted Sunfish					6	6.0
Spotted Bass					48	48.0
Largemouth Bass					79	79.0
White Crappie			12	2.4		
Black Crappie			2	0.4		

APPENDIX B



Location of sampling sites, Gladewater City Lake, Texas, 2013-2014. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was near full pool at time of sampling.