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

Lake Waxahachie

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TABLE OF CONTENTS

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Waxahachie were surveyed in 2013 using electrofishing and trap netting, and in 2014 using gill netting. An aquatic vegetation survey was conducted in July 2013. Historical data are presented with the 2013-2014 data for comparison. This report summarizes these survey results and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Waxahachie is a 656-acre reservoir on Prong Creek, a tributary of the Trinity River, Texas, built to provide water for municipal and industrial purposes. Persistent low water levels frequently limit boat access to one of three public ramps; bank angler access is also limited. There are no handicap-specific facilities. Prolonged periods of low water levels and the subsequent lack of available habitat have resulted in limited year-class strength of several species.

- **Management History :** Important sport fishes include Channel Catfish, Blue Catfish, White Bass, Largemouth Bass, White Crappie and Black Crappie. Blue Catfish were stocked in 2003, 2005 and 2007, and have been closely monitored during gill netting in 2009 and 2013. Fluctuating water levels have kept the spread of hydrilla to a minimum; however vegetation surveys were conducted to monitor abundance of hydrilla and native aquatic species.

- **Fish Community**
  - **Prey species:** Both Gizzard Shad and Threadfin Shad are relatively abundant, providing adequate forage for sport fishes. Bluegill, Redear Sunfish, and Longear Sunfish all add to the prey base at Lake Waxahachie.

  - **Catfishes:** Gill net catch rates of Channel Catfish were moderate, and within the long-term average for the reservoir. Blue Catfish catch rates have increased over the last two surveys, indicating successful recruitment from stockings in 2003, 2005, and 2007.

  - **White Bass:** White Bass recruitment is inconsistent and abundance is low, likely due to variable water levels and drought conditions.

  - **Largemouth Bass:** Largemouth Bass numbers have remained high and relatively stable over the last several surveys; however, the population is still dominated by smaller, sub-legal fish.

  - **Crappie:** White and Black Crappie catch rates have remained relatively stable and adequate over the last three surveys. In the 2013 survey, more legally-harvestable fish were collected than in previous surveys.

Management Strategies: Standard electrofishing, trap netting and gill netting will be conducted in 2017-2018 to monitor sport- and prey-fish populations. Monitor the success of Blue Catfish stockings through low frequency electrofishing in 2016 and gill netting in 2018. Conduct age and growth analysis on Blue Catfish to determine age structure and identify possible natural recruitment. Conduct aquatic vegetation survey in 2017 to monitor the abundance of hydrilla and native aquatic macrophyte communities. Discuss boat ramp improvements and fishing pier construction with the city of Waxahachie to improve angler access.

INTRODUCTION

This document is a summary of fisheries data collected at Lake Waxahachie from June 2013 through May 2014. The purpose of this 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 where appropriate.

Reservoir Description

Lake Waxahachie is a 656-acre reservoir on Prong Creek (a tributary of the Trinity River), Texas, built to provide water for municipal and industrial purposes. Persistent low water levels frequently limit boat access to one of three public ramps; bank angler access is also limited. There are no handicap-specific facilities. Since 2000, the water level has remained below conservation pool except for brief periods from 2004 to 2005, and 2007 (Figure 1). Hydrilla *(Hydrilla verticillata)* has continued to decline since 1998 when it was considered problematic around the city water intake structure and swimming beach (Bonds and Ott 1999). Hydrilla covered 5 acres in August 2005, but was only observed in trace amounts in August 2009. Historically, American pondweed *(Potamogeton nodosus)*, southern naiad *(Najas guadalupensis),* chara *(Chara spp.),* water-willow *(Justicia americana),* and smartweed *(Polygonum sp.)* were present in the reservoir; however, coverage has been drastically reduced or eliminated by fluctuating water levels. Other descriptive characteristics for Lake Waxahachie are in Table 1.

Angler Access

Lake Waxahachie has three public boat ramps; however, low water level at the time of the survey restricted use primarily to Public Ramp 2. Public Ramps 1 and 3 were useable, but restricted to small boats. Additional boat ramp characteristics are available in Table 2. Shoreline access is limited to the public ramps and Waxahachie City Park located around Public Ramp 1.

Management History

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

1. Seek opportunities to implement habitat improvements and introduce native plant species in Lake Waxahachie.
   Action: Due to extreme water level fluctuation, no action was taken.
2. Evaluate the success of Blue Catfish Stockings through standard gill netting in 2014.
   Action: Standard gill netting was conducted in the spring of 2014.
3. Coordinate with water controlling authority and conduct standard vegetation survey in 2013 to monitor hydrilla abundance
   Action: A vegetation survey was conducted in July, 2013.
4. Seek opportunities to promote the Sunfish fishery.
   Action: TPWD staff informed anglers of the quality sunfish population in Lake Waxahachie during field operations and through a TPWD magazine article.

Harvest regulation history: Largemouth Bass regulations reverted from a 14- to 18-inch slot-size limit to a 14-inch minimum-length limit on September 1, 2003. All other sport fishes in Lake Waxahachie are managed with statewide harvest regulations (Table 3). Regulations have not changed since the last management report was prepared.

Stocking history: Lake Waxahachie was stocked with Threadfin Shad (*Dorosoma petenense*) in 1987. The initial stocking of Florida Largemouth Bass (*Micropterus salmoides floridanus)* was conducted in 1988 and further stockings were completed in 1997 and 1998. Blue Catfish were stocked in 2003, 2005, and 2007. The complete stocking history is presented in Table 4.

Vegetation/habitat management history: Lake Waxahachie has historically supported a diverse aquatic vegetation community including pondweed (*Potamogeton spp.*), southern naiad (*Najas guadalupensis*), and coontail (*Ceratophyllum demersum*) (Bonds and Ott 1999, Ott and Bister 2002, Ott and Beck 2006). Vegetation has been limited in recent years due to fluctuating water levels and increased shoreline development. Hydrilla was identified in the reservoir in 1995 (unpublished data, author), and spread to cover 10% of the reservoir by 1998 (Bonds and Ott 1999). Since that time, fluctuating and predominately low water levels have reduced the coverage of hydrilla to trace amounts. Pilot introductions of several native aquatic plant species were conducted in 2007, however declining water levels and vandalism of plant exclosures soon after their introduction resulted in limited persistence of any species. Species included wild celery *(Vallisneria americana)*, Illinois pondweed (*P. Illinoensis),* water star-grass *(Heteranthera dubia),* pickerel weed *(Pontederia cordata*), and bull tongue *(Sagittaria spp.)*.

Water transfer: Lake Waxahachie is primarily used for municipal water supply and industrial use. Water is pumped into Lake Waxahachie from Bardwell Reservoir. One pump station subsequently supplies water to the city of Waxahachie. No other interbasin transfers are known to exist.

METHODS

Fishes were collected by electrofishing (1 hour at 12, 5-min stations), gill netting (4 net nights at 4 stations; one net stolen), 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). All survey stations were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Aquatic vegetation survey was performed according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Vegetation coverage (area) was estimated using ArcView GIS software. Angler access and facility characteristics were conducted through on-site inspection and end of boat ramp depth was calculated using down and side scan sonar imaging.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified Guy et al. (2007)], and condition indices [relative weights (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of Vulnerability (IOV) was calculated for Gizzard Shad *(Dorsoma cepedianum)*, (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. White Crappie *(Pomoxis annularis)* ages were determined using otoliths from 13 specimens with lengths ranging from 9.6-10.8 inches. Water level data were obtained from the United States Geological Survey web site (USGS 2014).

RESULTS AND DISCUSSION

Habitat: Aquatic vegetation in Lake Waxahachie continued to be limited by persistent low water level. The only aquatic species with considerable coverage was isolated patches of water-willow, which accounted for a total of 5.7 acres (Table 5). A small patch of American lotus was also present along a shallow pocket on the north shore of the reservoir. These species would undoubtedly provide beneficial aquatic habitat if they became inundated following rising water elevation.

Prey species: Prey species abundance and availability in Lake Waxahachie have improved in recent surveys. Electrofishing catch rate of Gizzard Shad increased from 41/h, to 72/h and 109/h in surveys from 2005, 2009 and 2013 respectively (Figure 2). Index of Vulnerability (IOV) for Gizzard Shad has also increased from 20% to 56% and 72% over the same time period. Threadfin Shad were also abundant in the 2013 survey (255/h), and increased from 8/h in 2009 (Bennett and Ott 2010) (Appendix A). Bluegill (*Lepomis macrochirus*) electrofishing CPUE was high (241/h) although below levels observed in 2005 (311.0/h) and 2009 (399.0/h) (Figure 3). Longear Sunfish (*L. megalotis)* electrofishing CPUE over the last

three surveys were 137/h, 76/h and 131/h in 2013, 2009 and 2005 respectively (Figure 4). The majority of these fish were ≤ 4 inches, providing an additional prey base to Lake Waxahachie sport fishes. Redear Sunfish (*L. microlophus*) CPUE has remained stable (40/h, 2013) although lower than catch rates for Bluegill and Longear Sunfish. The majority of the population is comprised of fish greater than 5 inches, creating a potential alternative fisheries resource (Figure 5).

Catfishes: Blue Catfish stocked in 2003, 2005, and 2007 were first observed in 2010 gill netting (CPUE = 2.0/nn; Figure 6) and improved in 2014 to 9.0/nn. This increase could still be a product of previous stockings, or potentially evidence of natural reproduction and recruitment. Future age analysis may confirm at least some degree of natural reproduction. All fish collected in 2014 were available for harvest. The majority were 14-15 inches with few greater than 20 inches. This dominant size class suggests either slow growth rates of stocked Blue Catfish, or natural reproduction and recruitment is occurring within the reservoir. Average relative weights *(W_r)* for all Blue Catfish collected decreased slightly from 2010 to 2014, but remained adequate.

Channel Catfish *(I. punctatus)* abundance has remained relatively stable since 2006. Catch rates from 2006, 2010 and 2014 were 6.2/nn, 3.8/nn and 6.0/nn, respectively (Figure 7). However, size distribution has shifted from a balanced population with several fish ≥ 15 inches (PSD = 44, 2006) to a population comprised primarily of sub-legal fish (PSD = 0, 2014). Relative weights decreased over time (W_r > 90, 2006 and 2010; W_r < 85, 2014). The increase in Blue Catfish abundance may be driving the decrease in Channel Catfish size and weights, but inter-specific interactions are unknown.

White Bass: White Bass gill net catch rates have been highly variable over the last three surveys; this can be attributed to prolonged low water levels within the reservoir. Only one White Bass was collected during gill net surveys in 2014 (Figure 8), down substantially from 4.8/nn in 2010 and 2.2/nn in 2006.

Largemouth Bass: Electrofishing catch rates of Largemouth Bass have been consistent over the last three surveys; 168/h, 106/h and 134/h in 2005, 2009 and 2013, respectively (Figure 9). The population has continued to be dominated by fish less than 11 inches in length (PSD-14 = 9). Relative weights have also remained moderate (Average W_r = 86). An age-and-growth analysis conducted in 2009 (N = 101, 3.8-17.8 inches) indicated few Largemouth Bass reach 14 inches before age 4 (Bennett and Ott 2010).

Crappies : Both White and Black Crappie are present within the reservoir. Trap net CPUEs from the 2013 survey were identical for both species (4.4/nn; Figures 10 and 11). Sample sizes were small, but White Crappie observed in trap nets were dominated by larger sizes (PSD = 91; PSD-10 = 55) than Black Crappie (PSD = 43; PSD-10 = 24). The average age of White Crappie at 10 inches (9.6-10.8 inches) was 1.1 years (N = 13, range 1-2 years; Figure 12). Black Crappie were not aged due to limited fish collected in the targeted size range (9-11 inches).

Fisheries management plan for Lake Waxahachie, Texas

Prepared – July 2010

ISSUE 1: Current gill net data suggest Blue Catfish stockings in 2003, 2005, and 2007 have established a fishable population.

MANAGEMENT STRATEGIES

1. Monitor Blue Catfish population dynamics (PSD, relative abundance) with low frequency electrofishing in summer 2016 and standard gill net sampling in 2018.
2. Conduct age analysis on Blue Catfish in 2016; identify year classes present within the reservoir to determine if natural reproduction is occurring.

ISSUE 2: The littoral zone of Lake Waxahachie currently contains limited shallow water habitat. The most recent vegetation survey suggests that water willow may persist even with the fluctuating water levels present.

MANAGEMENT STRATEGY

1. Consider planting bare-root water willow along protected cove shorelines at Lake Waxahachie in 1-3 feet of water to augment the current littoral habitat.

ISSUE 3: Largemouth Bass exhibit moderate relative weights (W_r) and growth suggesting prey, or acquisition of prey is limited. Catch rates of Gizzard Shad, Threadfin Shad and sunfish species were adequate, suggesting prey abundance is not a limiting factor. While some standing timber is present within the reservoir, additional cover may improve foraging efficiency for sport fishes.

MANAGEMENT STRATEGY

1. Contact local bass club to assess interests in artificial habitat partnership and projects.

ISSUE 4: Extended droughts have resulted in persistent low water levels, frequently reducing boat access to one of three public ramps. Low water levels have also resulted in very shallow, unproductive flats for bank anglers.

MANAGEMENT STRATEGY

1. Consult with the city of Waxahachie about pursing a boater access grant to extend existing boat ramps.
2. Discuss the possibility of constructing a fishing pier within Waxahachie City Park to improve and increase fishing access for bank anglers.

ISSUE 5: 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 local business 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 low frequency electrofishing in 2016 to monitor the expanding Blue Catfish population, standard electrofishing and trap netting in fall 2017 and standard gill netting in spring 2018 (Table 11).

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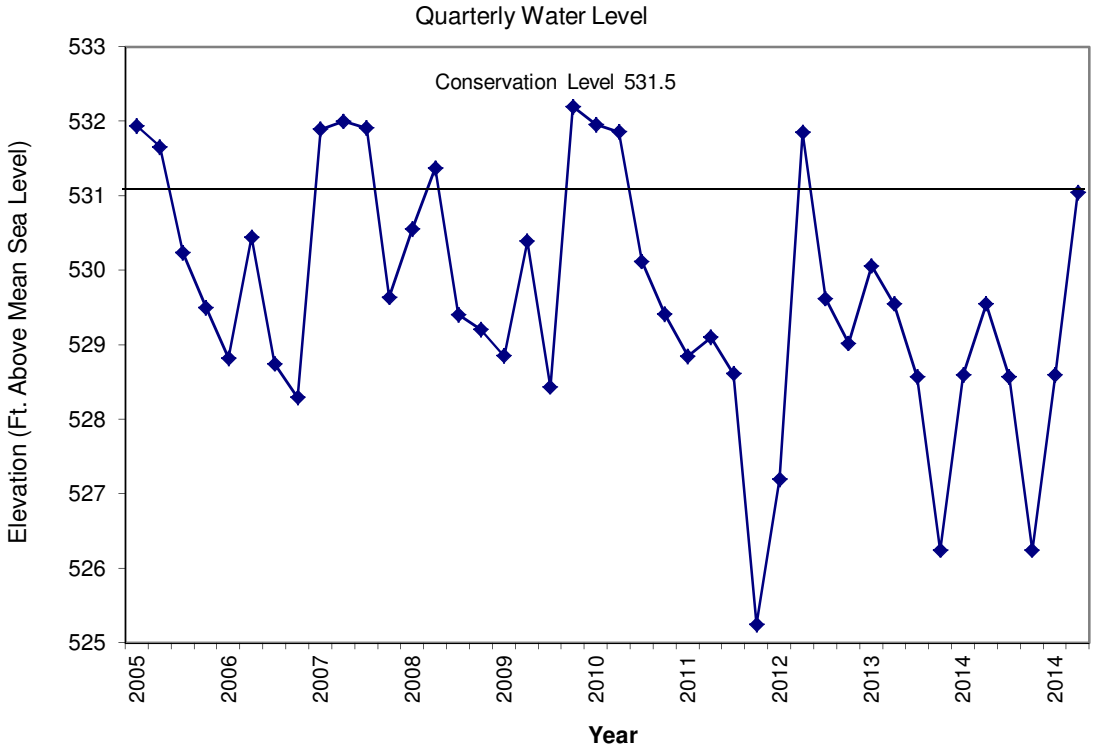


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Waxahachie, Texas. Horizontal line represents conservation level.

Table 1. Characteristics of Lake Waxahachie, Texas.

Characteristic	Description
Year completed	1958
Controlling authority	City of Waxahachie
County	Ellis
Reservoir type	Tributary
Shoreline Development Index (SDI)	2.8
Conductivity	240 umhos/cm

Table 2. Boat ramp characteristics for Lake Waxahachie, Texas, July, 2013. Reservoir elevation at time of survey was 528.4 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft.)	Condition
Public Ramp 1	32.345181 -96.833542	Y	20	529.8	Limited access
Public Ramp 2	32.344442 -96.816928	Y	10	524.4	Excellent, no access issues
Public Ramp 3	32.344294 -96.813308	Y	25	525.4	Very Limited access

Table 3. Harvest regulations for Lake Waxahachie, Texas.

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

Table 4. Stocking history of Lake Waxahachie. Size categories are: FGL =1-3 inches; ADL = adults.

Species	Year	Number	Size
Threadfin Shad	1987	1,000	ADL
	Total	1,000	
Blue Catfish	2003	57,658	FGL
	2005	49,594	FGL
	2007	55,200	FGL
	Total	162,452	
Florida Largemouth Bass	1988	69,459	FGL
	1997	70,051	FGL
	1998	69,011	FGL
	Total	208,521	

Table 5. Survey of aquatic vegetation, Lake Waxahachie, Texas, 2009 and 2013. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2009	2013
Native submersed		
Bushy Pondweed	0.2 (<1)	
Pondweed	0.3 (<1)	
Chara	0.1 (<1)	0.3 (<1)
Native floating-leaved		
Lotus		0.8 (<1)
Native emergent		
Rattlebox, Smartweed, Sedges	36 (6.5)	
Water willow	1.0 (<1)	5.7 (1.1)
Non-native (prohibited)		
Hydrilla	tr (<1)	

Gizzard Shad

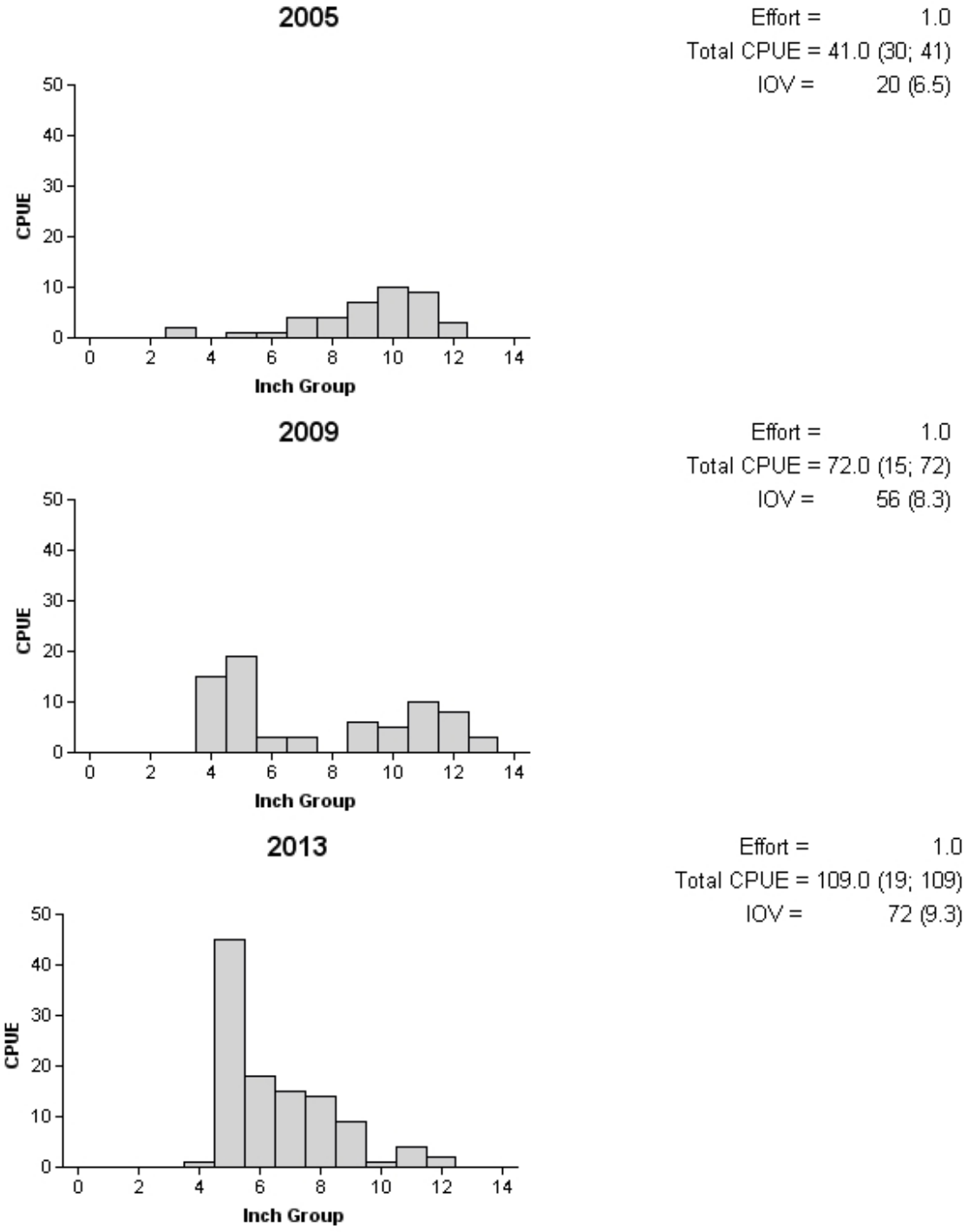


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Waxahachie, Texas, 2005, 2009, and 2013.

Bluegill

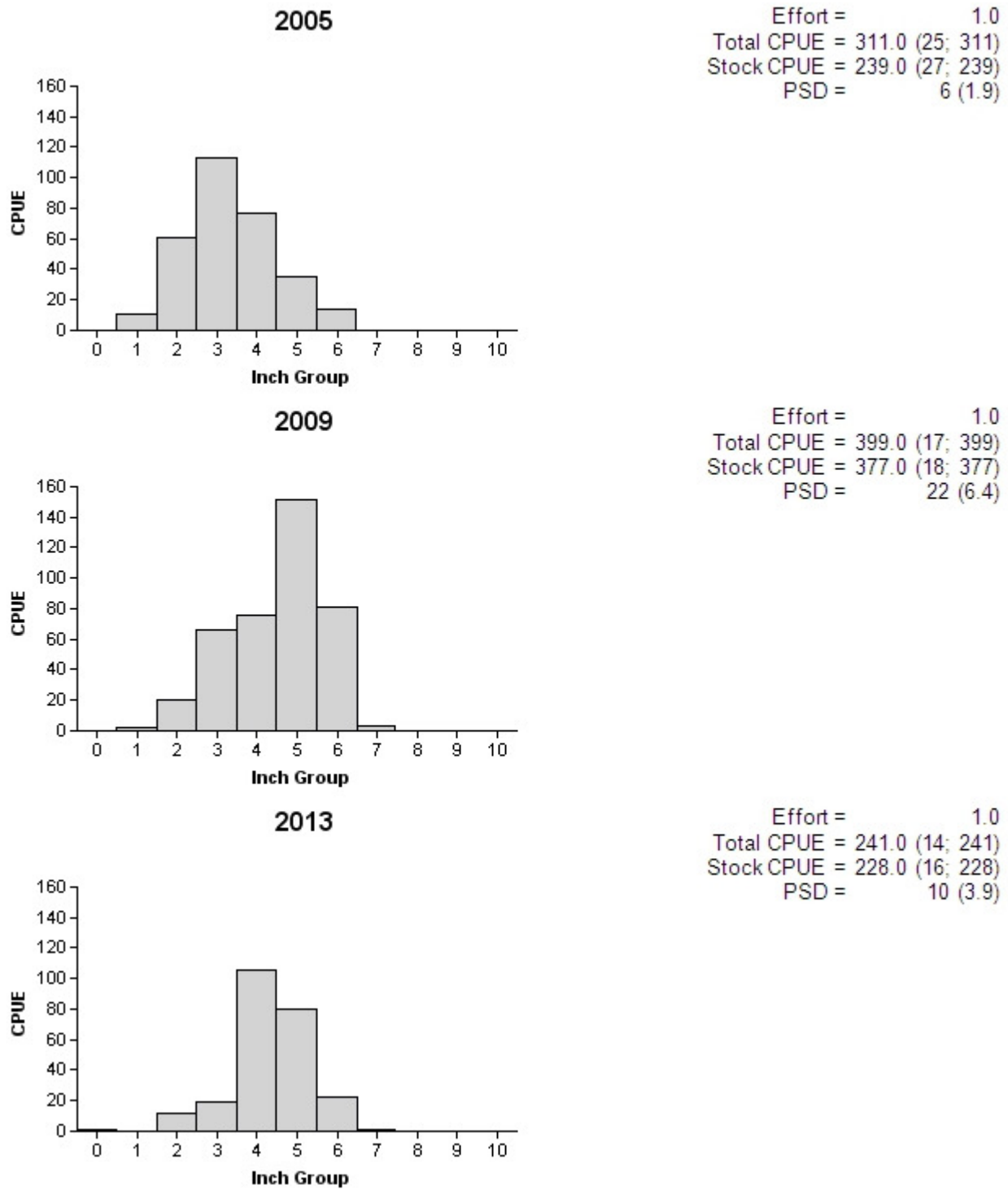


Figure 3. Number of Bluegill caught per hour (CPUE, bars), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, Lake Waxahachie, Texas, 2005, 2009, and 2013.

Longear Sunfish

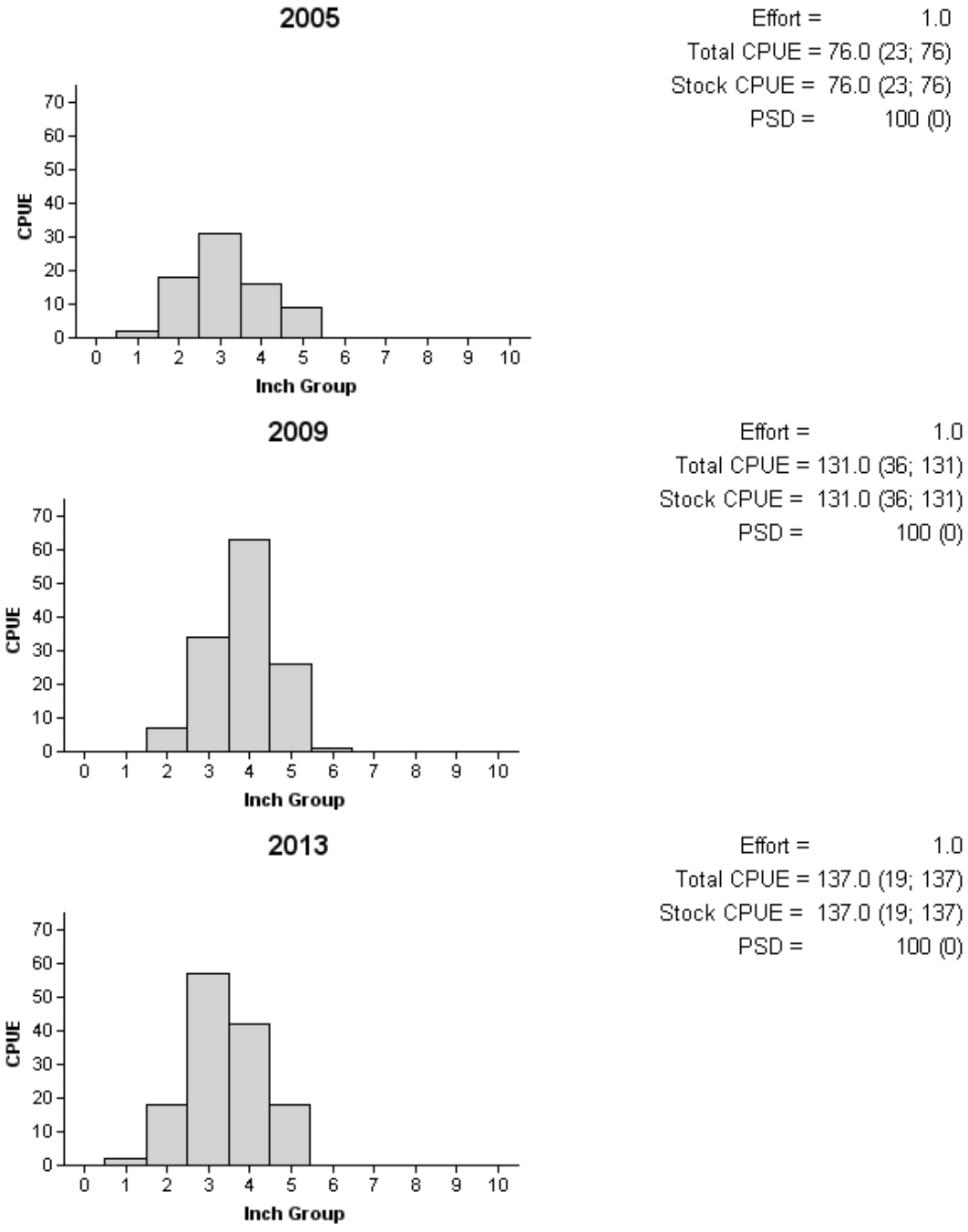


Figure 4. Number of Longear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE are in parentheses) for fall electrofishing surveys, Lake Waxahachie, Texas, 2005, 2009, and 20013.

Redear Sunfish

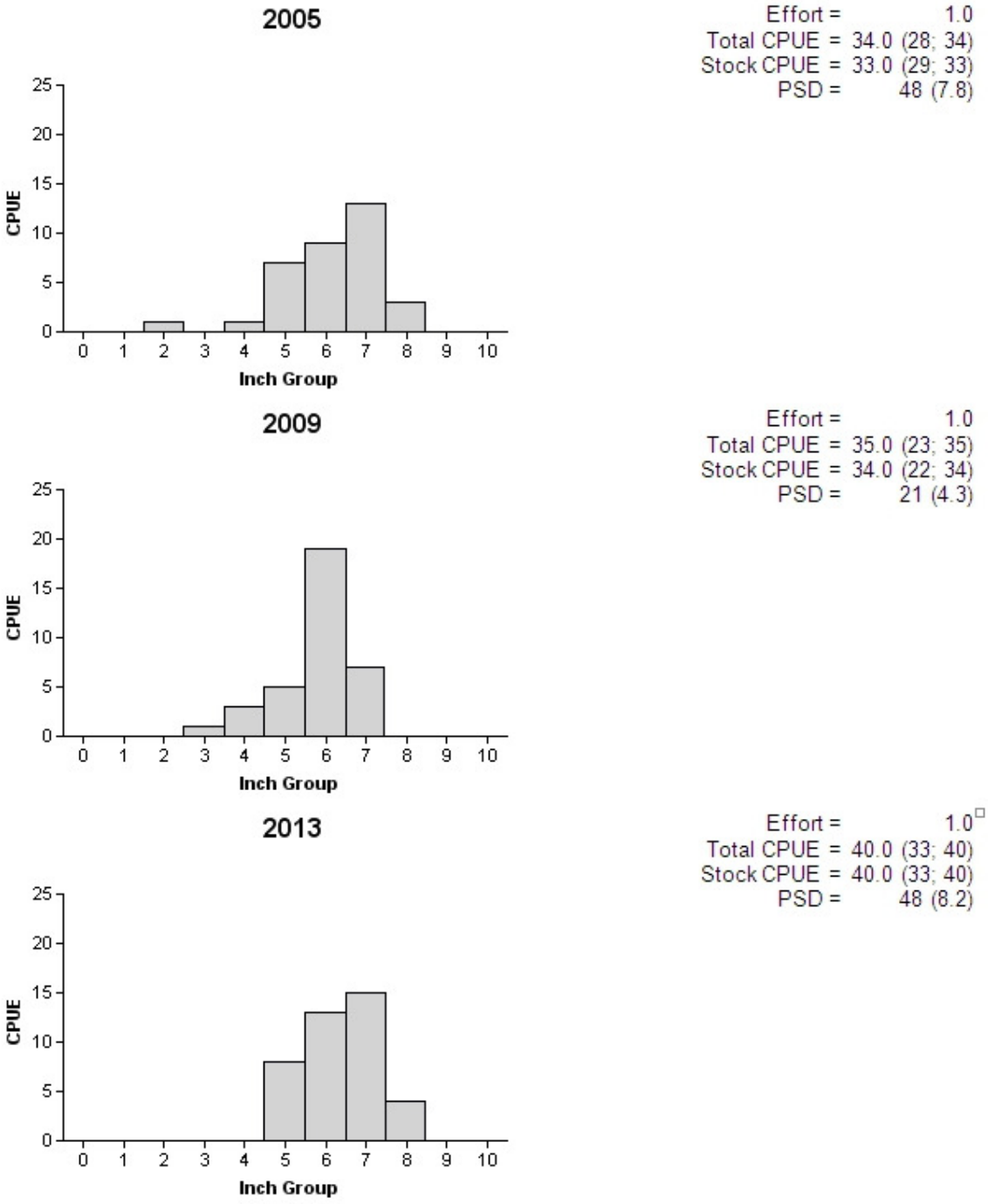


Figure 5. Number of Redear Sunfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for fall electrofishing surveys, Lake Waxahachie, Texas, 2005, 2009, and 2013.

Blue Catfish

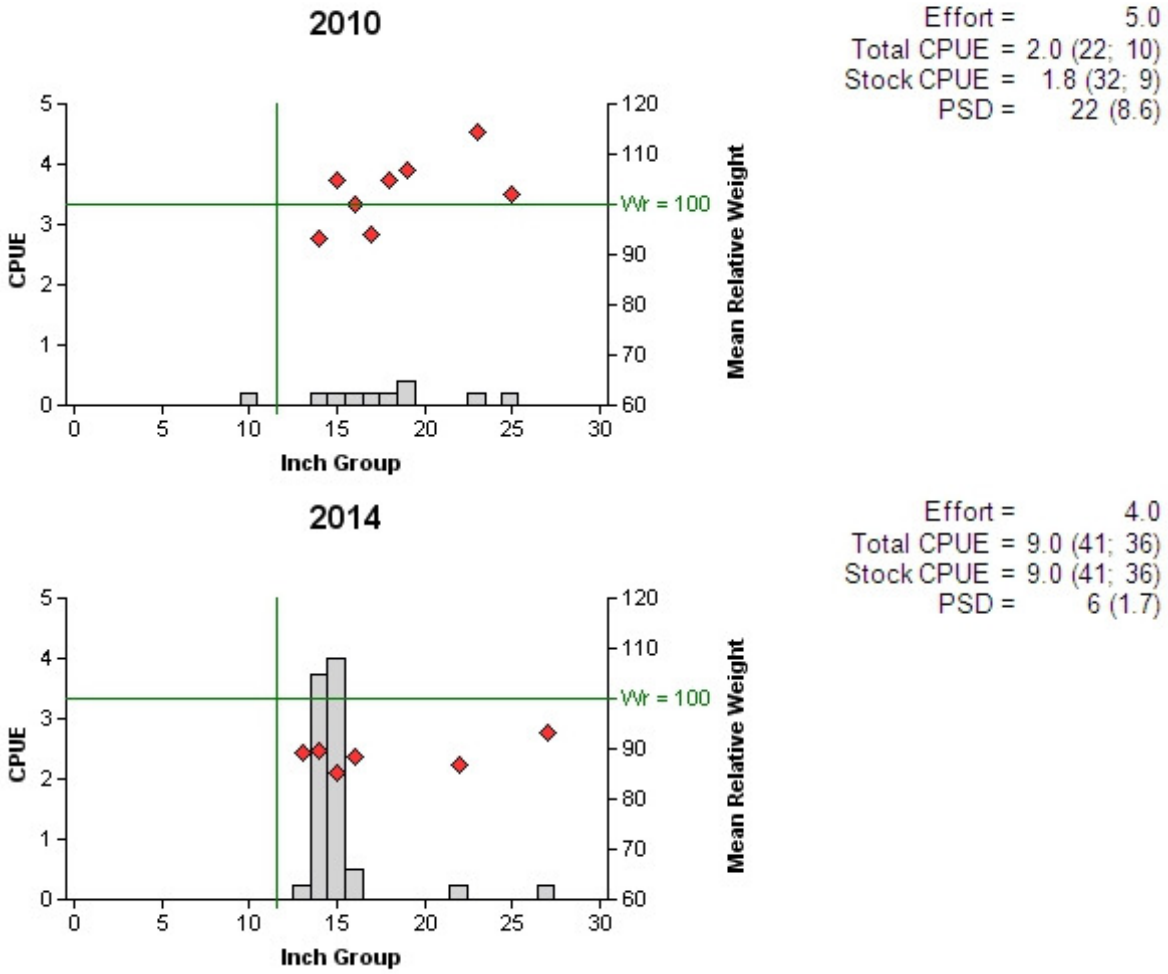


Figure 6. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Waxahachie, 2010 and 2014; no Blue Catfish were collected in the 2006 survey. Vertical lines represent minimum length limit at time of survey and horizontal lines represent mean relative weight of 100.

Channel Catfish

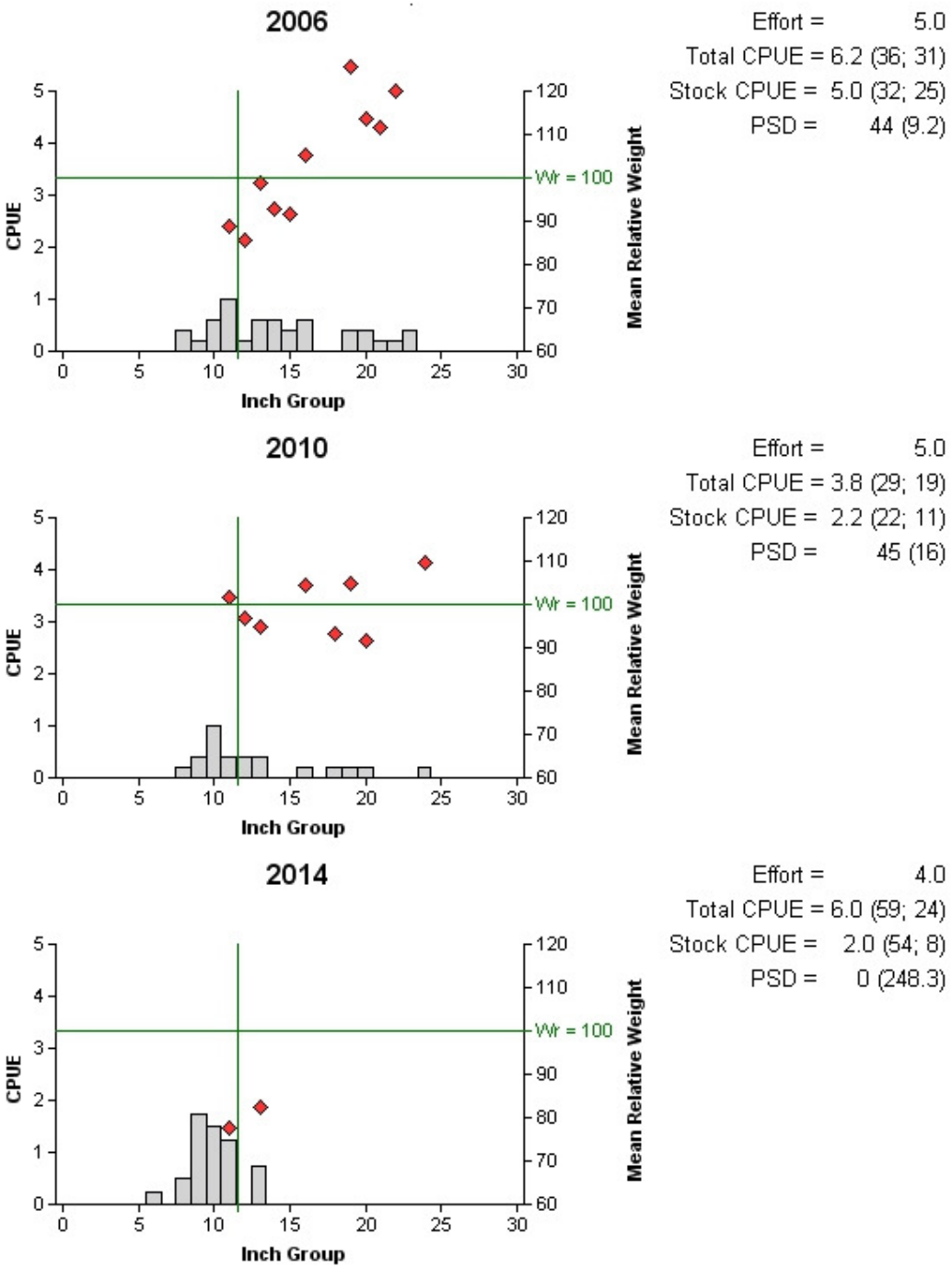


Figure 7. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Waxahachie, Texas, 2006, 2010, and 2014. Vertical lines represent minimum length limit at time of survey and horizontal lines represent mean relative weight of 100.

White Bass

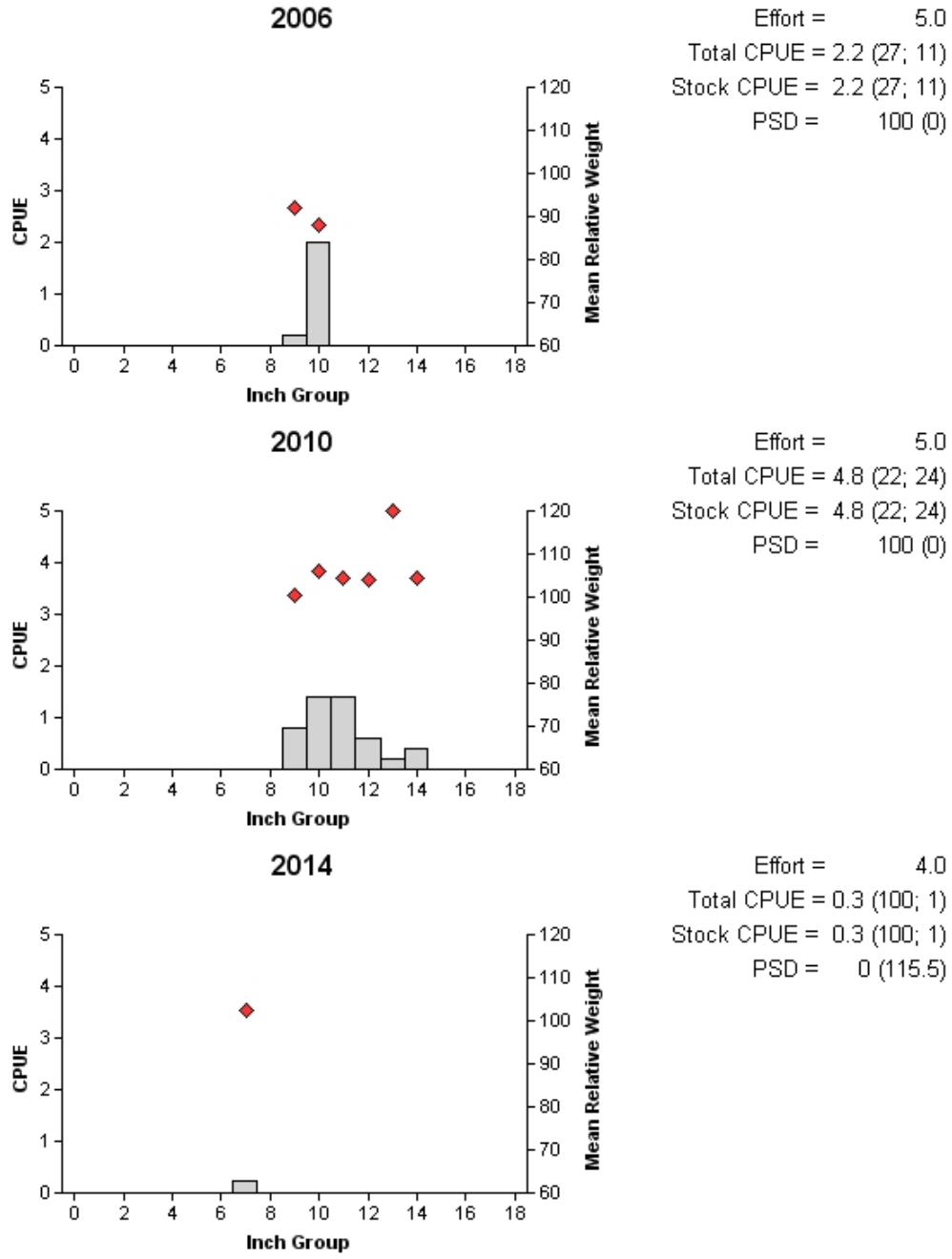


Figure 8. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Waxahachie, Texas, 2006, 2010, and 2014.

Largemouth Bass

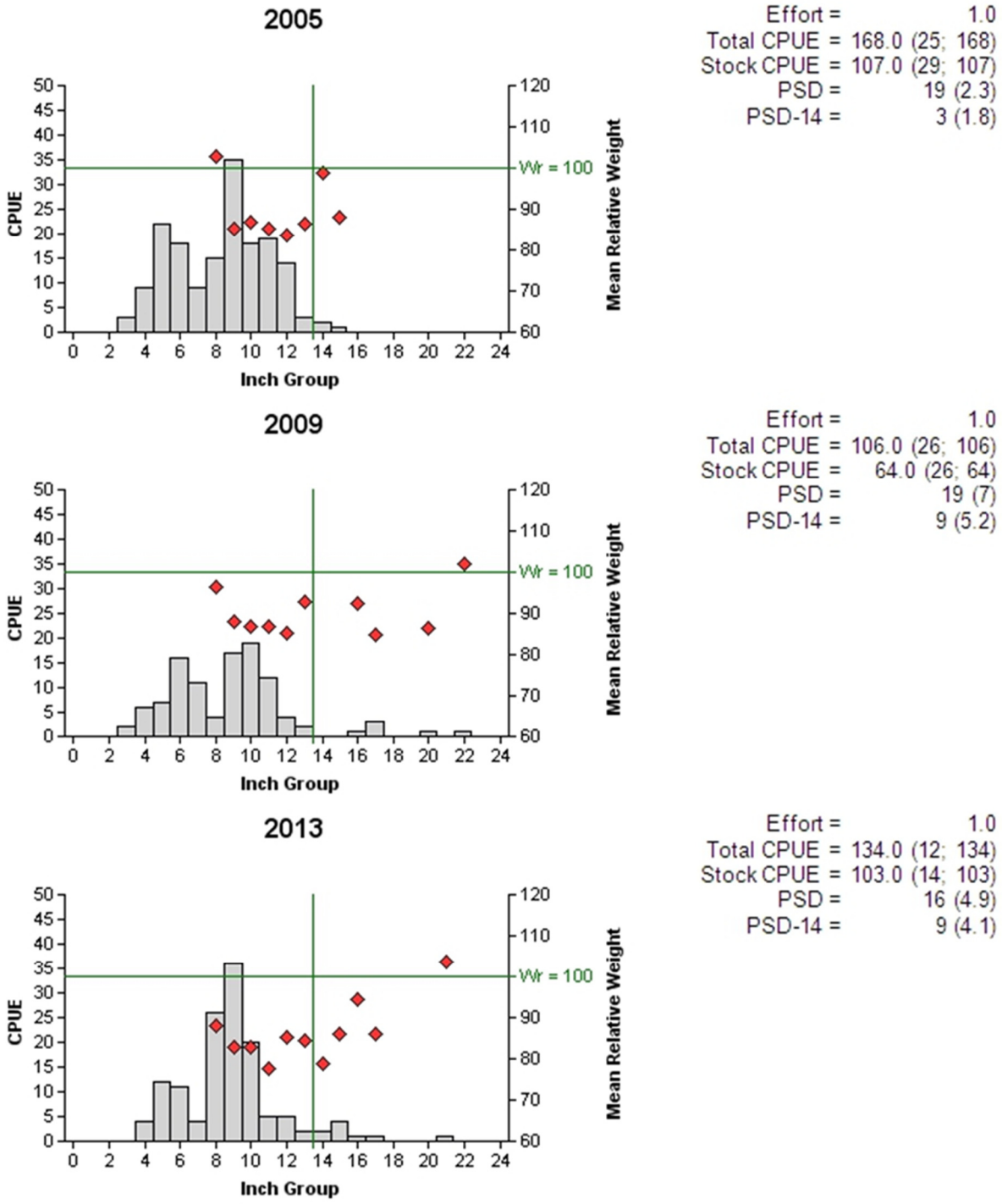


Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for fall electrofishing surveys, Lake Waxahachie, Texas, 2005, 2009, and 2013. Vertical lines represent minimum length limit at time of survey and horizontal lines represent mean relative weight of 100.

White Crappie

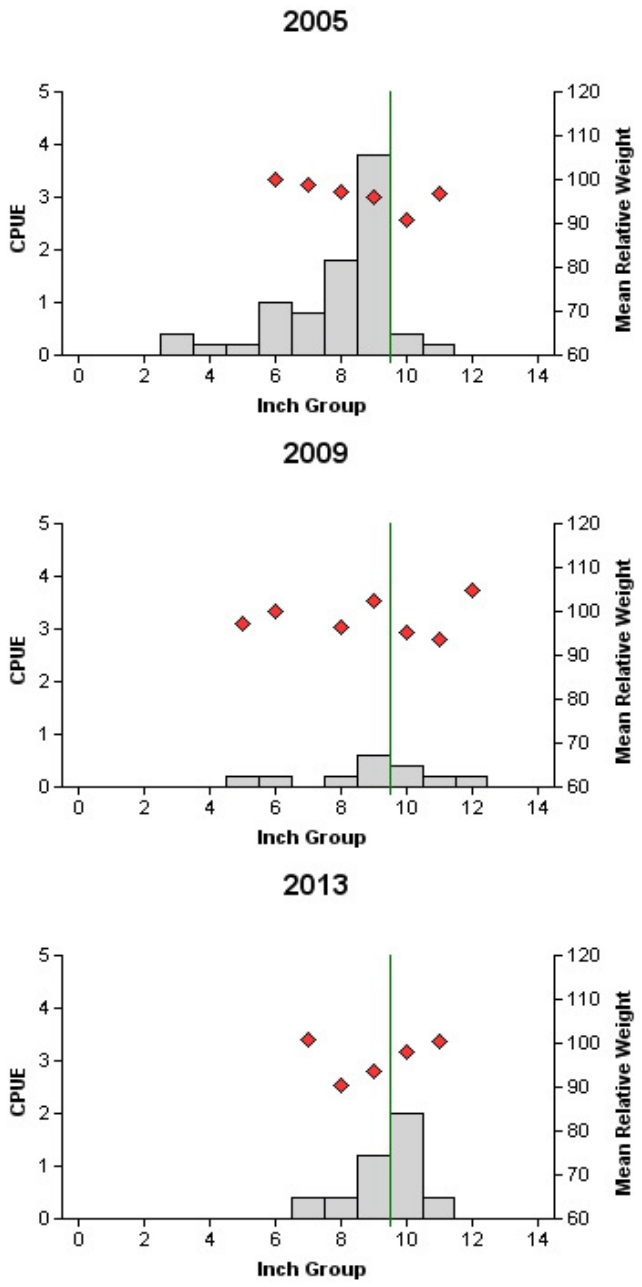
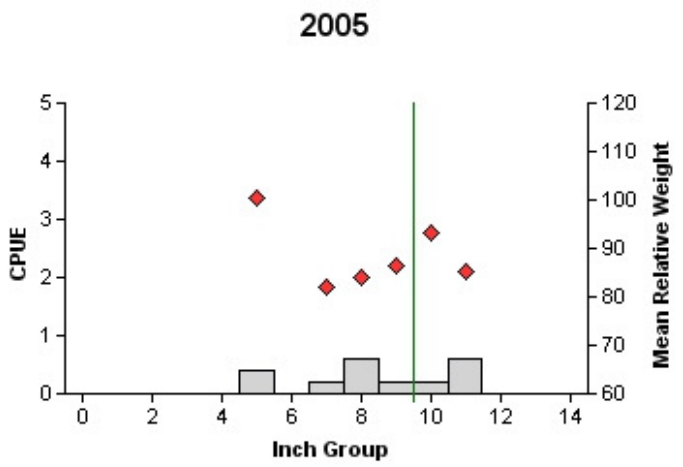
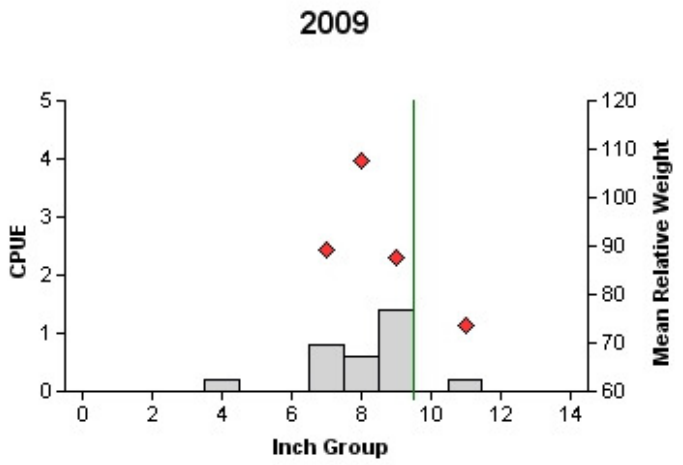


Figure 10. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for fall trap net surveys, Lake Waxahachie, Texas, 2005, 2009, and 2013. Vertical lines represent minimum length limit at time of survey.

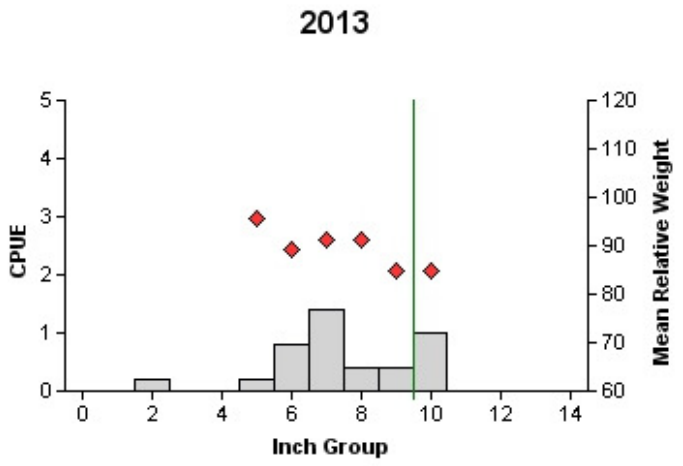
Black Crappie



Effort = 5.0
Total CPUE = 2.2 (33; 11)
Stock CPUE = 2.2 (33; 11)
PSD = 73 (4)



Effort = 5.0
Total CPUE = 3.2 (85; 16)
Stock CPUE = 3.0 (84; 15)
PSD = 73 (5.1)



Effort = 5.0
Total CPUE = 4.4 (36; 22)
Stock CPUE = 4.2 (36; 21)
PSD = 43 (4.9)

Figure 11. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for fall trap net surveys, Lake Waxahachie, Texas, 2005, 2009, and 2013. Vertical lines represent minimum length limit at time of survey.

Table 6. Proposed sampling schedule for Lake Waxahachie, Texas. 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.

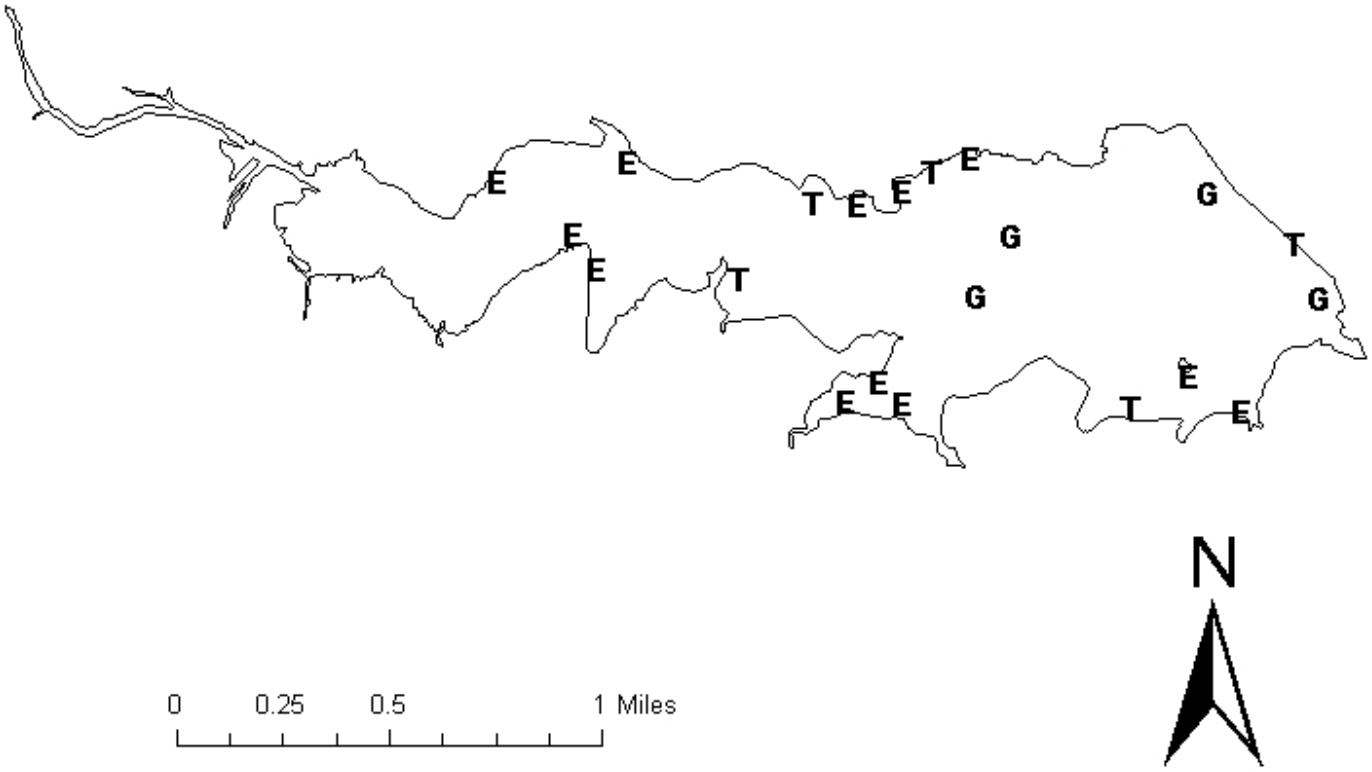
Survey year	Electrofish	Low-Pulse Electrofish	Gill net	Trap Net	Vegetation	Access	Creel survey	Report
2014-2015								
2015-2016		A						
2016-2017								
2017-2018	S		S	A	S	S	A	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Waxahachie, 2013-2014.

Species	Gill netting		Trap netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					109	109
Threadfin Shad					255	255
Blue Catfish	36	9.0				
Channel Catfish	24	6.0				
White Bass	1	0.3				
Bluegill					241	241
Longear Sunfish					137	137.0
Redear Sunfish					40	40
Largemouth Bass					134	134
White Crappie			22	4.4		
Black Crappie			22	4.4		

APPENDIX B



Location of sampling sites, Lake Waxahachie, Texas, 20013-2014. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.