

PERFORMANCE REPORT

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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

Caddo Lake

Prepared by:

Lynn D. Wright, Assistant District Management Supervisor
and
Timothy J. Bister, District Management Supervisor

Inland Fisheries Division
District 3A, Marshall, Texas



Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Caddo Lake (Texas side only) were surveyed in 2013 using electrofishing. 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:** Caddo Lake is a 27,472-acre lake (12,712 acres in Texas) on Big Cypress Creek located in the Cypress Creek Basin approximately 20 miles northeast of Marshall, Texas, in Harrison and Marion Counties and Caddo Parish, Louisiana. Habitat features consisted of bald cypress wetlands and a complex aquatic plant community including the invasive species giant salvinia, water hyacinth, and hydrilla.
- **Management History:** Important sport fishes include Largemouth Bass, Bluegill, Redear Sunfish, and crappies. The management plan from the 2009 survey report included the need for nuisance aquatic vegetation monitoring, unified fish harvest regulations between Texas and Louisiana, largemouth Bass supplemental stocking, and the need to keep stakeholders informed of fisheries-related issues related to Caddo Lake. Largemouth Bass were managed with a 14- to 18-inch slot-length limit. Efforts to control nuisance aquatic plants on the lake continued.
- **Fish Community**
 - **Prey species:** Shad and sunfish species are the primary prey species in Caddo Lake. IOV was low for Gizzard Shad, and catch rates of Bluegill were lower than they were in past surveys. Redear Sunfish displayed good size structure and provide additional angling opportunities.
 - **Catfishes:** Gill netting was not conducted in 2014; thus, no catfish were collected. Historically, Channel Catfish population abundance has been low and Flathead Catfish have been present in surveys.
 - **Temperate basses:** Gill netting was not conducted in 2014; thus, no White Bass were collected. Historically, few White Bass have been collected during sampling and lack of preferred open-water habitat likely limits their abundance.
 - **Black bass:** Largemouth Bass catch rates were lower than they were in previous years but were likely due to poor sampling conditions. Size structure was excellent, and growth was average (mean age at 14 inches long was 2.7 years). Spotted Bass were present but at low abundance.
 - **Crappies:** Trap netting was not conducted in 2013; thus, no crappies were collected. Historically, crappie catch rates in trap nets were low, but angling effort for crappies was second only to black basses, indicating a viable fishery was present.
- **Management Strategies:** Conduct additional electrofishing surveys in fall 2015, aquatic vegetation surveys annually from 2014-2017, and standard monitoring with trap nets and electrofishing surveys in fall 2017 and gill netting in 2018. Conduct non-standard spring electrofishing in 2015 and 2017. Stock Florida Largemouth Bass semi-annually to enhance the trophy fishery. Continue to assist stakeholders with nuisance aquatic vegetation management strategies.

INTRODUCTION

This document is a summary of fisheries data collected from Caddo Lake (Texas side only) 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

Caddo Lake is a 27,472-acre natural lake (12,712 acres in Texas) on Big Cypress Creek in the Cypress Creek Basin approximately 20 miles northeast of Marshall, Texas in Harrison and Marion Counties and Caddo Parish, Louisiana. Principal tributaries include Big Cypress Creek and Bayou, Little Cypress Creek, Black Cypress Bayou, Jeems Bayou, and Harrison Bayou. Littoral area (depth < 15 feet) accounts for 95% of the lake. Annual average rainfall in the watershed is 44.8 inches. The lake was initially formed when water was backed-up from a log jam in the Red River below Caddo Lake. The log jam sustaining the lake was removed in the late 1800s to facilitate navigation on the Red River, which contributed to the de-watering of Caddo Lake. The U. S. Army Corps of Engineers (USACE) constructed a low-water dam near Mooringsport, Louisiana, in 1912 to maintain water levels in an effort to return navigational commerce between Mooringsport and Jefferson, Texas. The dam was modified in the 1940s and again in the 1960s to increase water levels. Entities responsible for activities on Caddo Lake include the USACE for permitting issues (e.g., dredging or boat house installation) and the Cypress Valley Navigation District for the maintenance of boat roads. Average monthly water levels are shown in Figure 1. The current conservation pool elevation is 168.5 ft above mean sea level.

Approximately 7,000 acres of water, wetlands, and riparian areas at Caddo Lake were purchased by the Texas Nature Conservancy in 1991 and given to the Texas Parks and Wildlife Department (TPWD) for utilization as a wildlife management area (WMA). In 2000, the U. S. Fish and Wildlife Service (USFWS) acquired the U.S. Army Installation (formerly known as the Longhorn Ammunition Plant). The 8,000-acre tract will be managed as a wildlife preserve. The bottomland hardwood and cypress wetland habitats present in Caddo Lake are the largest of their kind in Texas. This unique natural resource received recognition by the Ramsar Convention as a wetland of international importance in 1993. Upstream reservoir construction (since the late 1950s) designed for flood control and municipal water sources has altered the hydrology in the Lower Cypress River Basin, negatively impacting the ecology of Caddo Lake.

Caddo Lake supports a diverse aquatic plant community, which includes native and non-native species. High densities of aquatic macrophytes reduce water quality for fishes during summer and fall, presenting major management problems and concerns. A survey of aquatic vegetation during summer 2013 revealed 6,000 acres of giant salvinia, 10 acres of waterhyacinth, and 1,269 acres of hydrilla. Giant salvinia continues to create problems for navigation and recreational use in many areas of the lake. Other descriptive characteristics for Caddo Lake are listed in Table 1.

Angler Access

Caddo Lake has ten public boat ramps on the Texas side; however, most are privately owned and require a launch or day-use fee. The F. R. Camp Road ramp located on the Caddo Lake WMA is for canoe, kayak, or small boats only. Boat ramp accessibility may be limited in some areas due to infestations of giant salvinia, especially in the fall when plant coverage is at its highest. Additional boat ramp characteristics are listed in Table 2. Shoreline access is limited to the public boat ramp areas and the fishing pier located at Caddo Lake State Park.

Management History

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

1. Caddo Lake continues to experience problems associated with excessive growth of aquatic vegetation, especially giant salvinia, water hyacinth, and hydrilla. Continued management of invasive aquatic plants on Caddo Lake is necessary to maintain boater access, protect native aquatic plants, and protect quality habitat available for fish
Action: Annual invasive vegetation surveys were conducted to monitor the coverage of invasive nuisance species and evaluate treatment efforts. District staff worked with stakeholders to develop and implement strategies to manage nuisance aquatic vegetation. Continued to maintain signage at boat ramps and marinas to inform boaters about exotic plants and their threat to Caddo Lake.
2. Anglers are frequently confused by the differences in fish harvest regulations between Texas and Louisiana. These differences also hinder law enforcement efforts. Unified regulations would increase effectiveness of management programs and benefit the fishery.
Action: Harvest regulations were unified for boundary waters between Texas and Louisiana on September 1, 2011. Current harvest regulations are listed in Table 3.
3. An excellent trophy Largemouth Bass fishery has developed following the introduction of Florida Largemouth Bass in the early 1980s. Continued stocking of Florida Largemouth Bass is necessary to enhance this trophy fishery.
Action: Over 500,000 Florida Largemouth Bass were stocked in Caddo Lake in 2010, 2011, and 2013.
4. Anglers and stakeholders might benefit from information about fisheries management activities, fishing opportunities, and other issues on Caddo Lake.
Action: Information regarding issues at Caddo Lake was provided to media outlets, anglers, stakeholders, and other interested constituents.

Harvest regulation history: Sport fishes in Caddo Lake are currently managed with special regulations for Black Bass, Catfish, White Bass, and Crappie (Table 3). Largemouth Bass were managed with a 10-inch minimum-length limit (MLL) and 10-fish daily bag from 1975-1987, a 12-inch MLL and 10-fish daily bag from 1988-1990, a 14-inch MLL 8-fish daily bag from 1991-1992, and a 14- to 18-inch slot-length limit (SLL) and 3-fish daily bag from 1993-1994. The current harvest regulation for Largemouth Bass is a 14- to 18-inch SLL and a 5-fish daily bag implemented in 1995. On September 1, 2011 Texas and Louisiana unified harvest regulations for boundary waters, including Caddo Lake. Blue and Channel Catfish, which had been managed with a 12-inch MLL and a 25-fish daily bag, changed to no MLL and 50-fish daily bag, of which no more than 5 may be over 20 inches. The daily bag limit for Flathead Catfish increased from 5 to 10 while the 18-inch length limit remained unchanged. White bass and Crappie have no MLL and a 25-fish daily bag. Effective July 1, 2014 boaters are required to drain all water from boats, live wells, and bait buckets when leaving the reservoir to prevent the spread of invasive aquatic species. Personally caught live bait cannot be transported from the reservoir where the fish were caught. Current regulations are found in Table 3.

Stocking history: Florida Largemouth Bass were introduced into Caddo Lake in 1981 and 1982. By the early 1990s, a trophy Largemouth Bass fishery developed at the lake. In an attempt to maintain and enhance this trophy fishery, Florida Largemouth Bass were stocked from 1994-2000. These stockings were part of a research project that evaluated the contribution of stocked fish to the resident Largemouth Bass population. To further enhance the trophy potential of the Largemouth Bass fishery, Florida Largemouth Bass were stocked in 2006, 2007, 2009-2011, and 2013. In spring 2014, 36 Paddlefish implanted with radio transmitters were stocked at the Caddo Lake State Park boat ramp as part of a U.S.

Fish and Wildlife Service research project. An additional 11 Paddlefish were stocked in the Big Cypress Bayou in the city of Jefferson, approximately 15 river miles above the highway 43 bridge boundary for Caddo Lake. The complete stocking history is listed in Table 4.

Vegetation/habitat management history: Caddo Lake is relatively shallow, consisting of primarily bald cypress swamp with abundant native aquatic vegetation. The lake contains several non-native aquatic vegetation species which, if left unchecked, could block access to many areas of this resource. Problematic invasive exotic species present included giant salvinia, water hyacinth, and hydrilla. Alligatorweed and East Indian hygrophylla, although present, have yet to cause any serious problems.

Giant salvinia was first detected on the Louisiana side of the lake in 2006. By the time the infestation was detected, there was at least 300 acres present in the Jeem's Bayou arm of the lake. Immediate actions involving herbicide treatments were conducted in an attempt to reduce the level of giant salvinia in this area. Despite attempts by TPWD and LDWF, as well as efforts from local stakeholder groups, giant salvinia migrated to the Texas side of the lake during the winter of 2006/2007 and continued in the spring of 2007. A separate introduction was discovered at a private boat ramp on the upper end of the lake on the Texas side in 2007. A 2007 vegetation survey of the Texas side of the lake estimated the presence of 100 acres of giant salvinia. This plant continued to expand its coverage to more areas of the lake, and by 2008, coverage had increased to 1,092 acres. By 2009, 3,228 acres of giant salvinia was estimated on the Texas side. However, an extended flood and freezing conditions during the winter of 2009/2010 drastically reduced the coverage of giant salvinia. A survey of the plant in March 2010 estimated at least a 95% reduction in coverage since the September 2009 survey, leaving an estimated 161 acres in isolated areas. By 2012, giant salvinia coverage had again increased to 1,370 acres and, combined with a mild winter, grew rapidly to 6,000 acres in 2013. A cold winter in 2013/2014 appears to have greatly reduced giant salvinia coverage although many immature plants remained present in most parts of the lake.

Water hyacinth was discovered in Caddo Lake in the 1940s and, until recently, some active form of control has been required to keep the population in check. Water hyacinth coverage was estimated at 3,700 acres in 2007, 1,350 acres in 2008, and 1,740 acres in 2009. However, the increase in giant salvinia caused water hyacinth coverage to decrease dramatically over the past few years. Coverage of water hyacinth was only 389 and 10 acres in 2012 and 2013, respectively. Despite the recent decline in coverage, water hyacinth needs to be monitored for a possible increase.

Hydrilla was first reported on Caddo Lake in 1993. In 1996, hydrilla had expanded to 575 acres and by 1997 was estimated to cover over 5,000 acres. At that time, the infestation was concentrated in the deeper portion of the lake. From available records, hydrilla declined by 2000 and was reduced to non-problematic levels by 2001. Records do not reflect any chemical treatments targeting hydrilla on Caddo Lake during this period. Surveys in 2004 documented isolated hydrilla populations on Caddo Lake in shallow, more remote areas less frequented by resource users. The 2005 survey indicated that hydrilla covered 2,500 acres. From 2009 to 2012, hydrilla coverage hovered around 4,000 acres; however, coverage dropped to 1,269 acres in 2013 due to shading by giant salvinia.

Water transfer: Caddo Lake is primarily used for municipal water supply, recreation, and to a lesser extent, flood control. No interbasin water transfers are known to exist.

METHODS

Fishes were collected by electrofishing (2 hours at 24, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. All survey sites were randomly selected from boat accessible areas of the lake, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Fall electrofishing was conducted during daylight hours in 2011 due to flood conditions and in 2013 due to excessive giant salvinia coverage. Giant salvinia blocked large areas of Caddo Lake from electrofishing and completely prevented trap-netting in 2013. Gill netting was not conducted in spring 2014 to avoid lethal risk to recently-stocked paddlefish during the USACE telemetry study.

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).

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 2012 and by electrophoresis for previous years.

Aquatic vegetation coverage was measured by census method. The reservoir was circumnavigated and habitat features were spatially described and recorded using GPS equipment. These data were converted to digital shapefile using ArcMap and coverage areas were calculated for each vegetation type. Invasive plant species were surveyed annually from 2010-2012 and a full vegetation survey was conducted in 2013. Access surveys were completed by visual inspection.

Source for water level data was the United States Army Corps of Engineers (USACE 2014).

RESULTS AND DISCUSSION

Habitat: Native floating-leaved plants, primarily American lotus, covered an estimated 17% of Caddo Lake in 2013. Native submerged and native emergent plants were much lower, covering just over 1%. Giant salvinia was estimated to cover 6,000 acres in 2013. This was much higher than in 2012 (1,370 acres). However, a cold winter in 2013/2014 greatly reduced its coverage. Water hyacinth coverage decreased dramatically over the past several years to only 10 acres in 2013, down from 389 acres in 2012. Hydrilla coverage was also down to 1,269 acres in 2013, lower than the 3,405 acres in 2012. The decline in coverage of both water hyacinth and hydrilla was attributed to the thick mat of giant salvinia that covered nearly 50% of the Texas side of the lake in 2013. The recent history of invasive aquatic plant coverage can be found in Table 5. A list of other aquatic plants found in the lake is reported in Hine (1996). Other species not listed in Hine (1996) include alligatorweed and American featherfoil.

Prey species: Electrofishing catch rates of Gizzard Shad and Threadfin Shad were 50.5/h and 44.0/h, respectively. Index of vulnerability (IOV) for Gizzard Shad was low, indicating only 20% of Gizzard Shad were available to existing adult predators (Figure 2). Total CPUE of Bluegill in 2013 was lower than total CPUE from surveys in 2009 and 2007 (Figure 3). Nearly 50% of Caddo Lake was covered by giant salvinia and likely had a negative effect on sampling gear efficiency. Redear Sunfish were present at larger sizes than Bluegill and were available to anglers (Figure 4). Other prey species present included Warmouth, Longear Sunfish, and Redspotted Sunfish and comprised 11% of all sunfish collected (Appendix A).

Catfishes: Gill netting was not conducted in 2014; thus, no catfish were collected. Historically, the gill net catch rate of Channel Catfish ranged from 5.3 to 8.8/nn from 2004 to 2010 (Bister and Brice 2010). The Channel Catfish population has shown an optimal size structure with moderate numbers of larger fish available to anglers. However, directed fishing effort, catch per hour, and total harvest for Channel Catfish indicated a minimal catfish fishery.

White bass: Gill netting was not conducted in 2014; thus, no White Bass were collected. Historically, the gill net catch rate of White Bass has been low, ranging from 0.1 to 1.9/nn from 2004 to 2010 (Bister and Brice 2010). Only 1.4% of total directed effort was observed for White Bass in 2002/2003 and none in 2009/2010. Lack of open-water habitat likely limits the abundance of White Bass in Caddo Lake.

Black bass: Spotted Bass were present in the reservoir but in low abundance. Only three Spotted Bass were collected in 2013 and catch rate was similar to previous surveys. The electrofishing catch rate for stock-size (≥ 8 inches) Largemouth Bass has declined over recent surveys with catch rates of 55.5/hr, 36.0/hr, 37.0/hr, and 20.5/hr in 2007, 2009, 2011, and 2013 respectively (Figure 5-6). However, the decline is more likely related to poor sampling conditions in 2009, 2011, and 2013 than an actual decrease in fish abundance. Additionally, sampling during daylight hours in 2011 and 2013 could have contributed to changes in fish catchability. Size structure of Largemouth Bass was excellent and has remained relatively consistent over the past four surveys (Figures 5-6). Largemouth Bass growth was moderate; average age at 14 inches (13.0 to 14.9 inches) was 2.7 years ($N = 13$; range = 2 – 4 years) and was similar to 2.5 years 2009. Growth rates appear consistent through age 4 and many Largemouth Bass likely make it through the slot limit by age 6 (Figure 7). Mean length at age-1 and age-2 were 9.4 inches ($N = 24$; range 6.7 – 13.2 inches) and 12.3 inches ($N = 27$; range 10.2 – 15.8 inches). Condition was adequate but lower than in previous years; relative weights ranged from 83 to 94 for bass between 9 and 15 inches (Figure 6). Florida Largemouth Bass influence has remained relatively constant as Florida alleles have ranged from 33% to 45% from 2001 to 2013. Pure Florida genotype was 0% in both 2011 and 2013 samples (Table 6).

Crappie: Trap netting was not conducted in 2013 due to giant salvinia limiting access to the shoreline. Historically, the trap net catch rates of crappies have ranged from 0.5 to 5.7/nn for White Crappie and 0.6 to 3.1/nn for Black Crappie from 1998 to 2009 (Bister and Brice 2010, 2006). Although trap nets have displayed low catch rates over time, an excellent crappie fishery exists. Directed fishing effort for crappie was 23.9% of total fishing effort from June 2009 through May 2010, making crappie the second most popular fish for anglers at Caddo Lake (Bister and Brice 2010).

Fisheries management plan for Caddo Lake, Texas

Prepared – July 2014.

ISSUE 1: Caddo Lake continues to experience problems associated with excessive growth of aquatic vegetation, especially giant salvinia, water hyacinth, and hydrilla. The composition of invasive species has shifted in recent years from one dominated by water hyacinth to one dominated by giant salvinia. Currently, the threat from giant salvinia is the focal point of most management efforts. Local stakeholders formed the Greater Caddo Lake Association in 2013 and have been working on and implementing a plan to build a giant salvinia weevil rearing facility near the lake. Additionally, Texas A&M has operated a research-based weevil-rearing facility located Caddo Lake National Wildlife Refuge. Continued management of invasive aquatic plants on Caddo Lake is necessary to maintain boater access, protect native aquatic plants, and protect quality habitat available for fish.

MANAGEMENT STRATEGIES

1. Conduct annual aquatic vegetation survey to estimate coverage of problematic species, to monitor trends, and to evaluate effectiveness of treatment efforts.
2. Continue to work with Caddo Lake stakeholders to help in the development of strategies to manage nuisance aquatic vegetation.
3. Continue to maintain signage at boat ramps and marinas to inform boaters about exotic plants and their threats to Caddo Lake.

ISSUE 2: Effective sampling of fish populations in Caddo Lake has been challenging with the recent expansion of giant salvinia. Electrofishing in 2013 was limited to open water areas due to nearly 50% coverage on the lake. Additionally, trap netting could not be conducted because giant salvinia limited access to the shoreline. Giant salvinia coverage is normally highest during the fall and will likely interfere with sampling every year. In addition, it is possible that trap netting may no longer be a viable sampling method for Caddo Lake. Alternatively, during the spring months, giant salvinia levels are generally near their lowest of the year while water levels are typically near full pool. Sampling in spring would allow for nearly full access to shoreline areas and allow for complete random sampling of the entire lake, which hasn't been the case in past surveys.

MANAGEMENT STRATEGIES

1. Continue conducting fall surveys if lake conditions allow.
2. Recommend conducting additional electrofishing sampling in spring 2016 and 2018 to provide additional data on the important bass fishery at Caddo Lake.
3. Examine crappie population characteristics through the creel survey in 2017/2018 and estimate growth by collecting otoliths from angler harvested crappies.
4. Conduct dual-cod trap netting in fall 2017 to monitor the crappie fishery.

ISSUE 3: An excellent trophy Largemouth Bass fishery has developed following the introduction of Florida largemouth bass in the early 1980s. Modification of harvest regulations and changes in angler attitudes toward catch-and-release fishing have contributed to the development of this trophy fishery. One-hundred twenty-two Largemouth Bass ≥ 10 pounds have been entered into the Bass Life Associates (BLA) Trophy Replica Program from 2006-2013 (Appendix C). The lake produced Largemouth Bass that were donated to the Toyota ShareLunker Program in 2009 and 2010. The current lake record Largemouth Bass is 16.17 pounds set in 2010. Continued stocking of Florida Largemouth Bass is necessary to maintain this trophy fishery.

MANAGEMENT STRATEGIES

1. Stock Florida Largemouth Bass at 25 fish/acre semi-annually in 2015 and 2017.
2. Conduct an additional electrofishing survey during fall 2015 and spring 2016 to monitor Largemouth Bass and prey species populations.

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. 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. Effective July 1, 2014 boaters are required to drain all water from boats, live wells, and bait buckets when leaving the reservoir to prevent the spread of invasive aquatic species. Personally caught live bait cannot be transported from the reservoir where the fish were caught. Bighead Carp have been documented in the Big Cypress Bayou in the past; however, subsequent investigations could not document their presence. Bighead Carp abundance is low enough to not cause any issues at this time.

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, a supplemental electrofishing survey in fall 2015; non-standard spring electrofishing in 2016 and 2018, and required monitoring surveys in 2017/2018 (Table 12). Annual vegetation surveys are necessary to monitor coverage of nuisance species and to provide information to Caddo Lake stakeholders. A supplemental electrofishing survey in fall 2015 and spring 2016 is necessary to maintain data for trend information on this trophy Largemouth Bass fishery. A full year roving angler creel survey in 2017/2018 will be conducted to monitor angling effort and catch rates. Gill netting surveys are only necessary every four years to ensure presence or absence of Channel Catfish, Flathead Catfish, and White Bass. Trap net surveys are currently optional. Proposed dual-cod trap netting in fall 2017 will be conducted to evaluate the important crappie fishery. An angler access and facilities survey is required once every four years.

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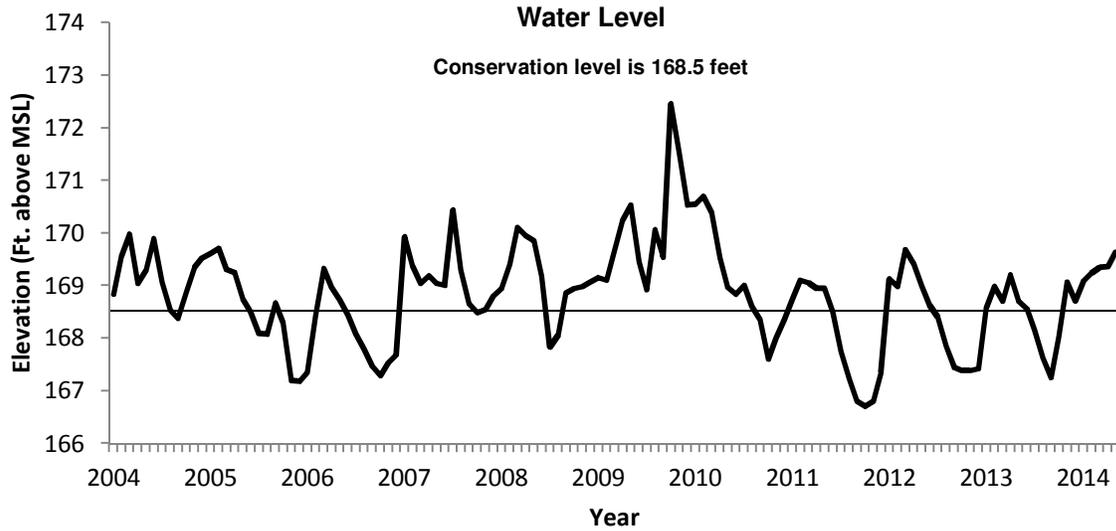


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Caddo Lake, Texas.

Table 1. Characteristics of Caddo Lake, Texas.

Characteristic	Description
Year Formed	Early 1800s (natural formation)
Year Restored	1912 low-water dam constructed with modifications in the 1940s and 1960s
Controlling authority:	
Permitting	US Army Corps of Engineers
Maintenance of boat roads	Cypress Valley Navigation District
Counties/Parishes	Harrison and Marion Counties, Texas Caddo Parish, Louisiana
Reservoir type	Restored natural lake
Surface Area	27,472 Acres (12,712 acres Texas side)
Shoreline Development Index (SDI)	8.9
Drainage Area	2,700 Square Miles
Conductivity	140 umhos/cm

Table 2. Boat ramp characteristics for Caddo Lake, Texas. Reservoir elevation at time of survey was near full pool. This list includes only ramps on the Texas side of Caddo Lake.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Launch or day use fee required	Condition
Highway 43 Bridge	32.69624 -94.18807	Y	15	N	Excellent. no access issues
Caddo Lake State Park	32.69372 -94.17568	Y	20	Y	Excellent. no access issues
F.R. Camp Rd. (Caddo Lake WMA)	32.73906 -94.16644	Y	10	N	Excellent, canoe and kayaks only
Pine Needle Lodge	32.74539 -94.16729	Y	10	Y	Adequate, privately operated
Shady Glade Marina	32.71274 -94.12067	Y	20	Y	Adequate, privately operated
Johnson's Ranch	32.70762 -94.11851	Y	15	Y	Adequate, privately operated
Cripp's Camp	32.70262 -94.12218	Y	30	Y	Adequate, privately operated
Tucker's Camp	32.67269 -94.09593	Y	10	Y	Adequate, privately operated
Collier's Launch	32.66910 -94.04472	Y	10	Y	Adequate, privately operated
Potter's Point	32.70272 -94.07063	Y	15	Y	Adequate, privately operated

Table 3. Harvest regulations for Caddo Lake, Texas. Caddo Lake in Marion and Harrison Counties comprises all impounded waters of Big Cypress Bayou from the Texas-Louisiana border upstream to the State Highway 43 bridge. Harvest regulations are the same for both Texas and Louisiana waters of Caddo Lake.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	50 ^{a, b} (in any combination)	None
Catfish, Flathead	10	18-inch minimum
Bass, White	25	None
Bass, Largemouth	8 ^c	14- to 18-inch slot
Bass: Spotted	8 ^c	None
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	None

^a No more than 5 may be 20 inches or longer

^b Effective September 1, 2014, no more than 5 may be 30 inches or longer

^c Daily bag for Largemouth Bass and Spotted Bass = no more than 8 fish in any combination, of which no more than 4 may be Largemouth Bass 18 inches or longer.

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

Species	Year	Number	Size
Blue Catfish	1988	17	ADL
	Total	17	
Channel Catfish	1991	9,000	FGL
	Total	9,000	
Florida Largemouth Bass	1981	317,215	FGL
	1981	94,000	FRY
	1982	500,550	FGL
	1994	448,955	FGL
	1994	429,093	FRY
	1995	650,534	FGL
	1995	116,000	FRY
	1996	210,700	FGL
	1996	76,518	FRY
	1997	268,000	FGL
	1998	673,167	FGL
	1999	670,925	FGL
	2000	683,264	FGL
	2006	500,582	FGL
	2007	501,110	FGL
	2009	706,319	FGL
	2010	500,434	FGL
2011	500,790	FGL	
2013	691,408	FGL	
Total	8,539,564		
ShareLunker Largemouth Bass	2009	3,408	FGL
	2010	2,166	FGL
	2011	32,037	FGL
	Total	5,574	
Paddlefish	1992	12,970	
	1994	2,460	
	1998	12,254	
	2014	36 ^a	
	Total	27,731	

^a An additional 11 Paddlefish were stocked in the Big Cypress Bayou at the city of Jefferson, about 15 river miles above the highway 43 bridge boundary for Caddo Lake.

Table 5. Survey of aquatic vegetation, Caddo Lake, Texas, 2010 – 2013. Surface area (acres) is listed with percent of total reservoir surface area in parentheses. Aquatic vegetation survey was not conducted in 2011 due to drought conditions.

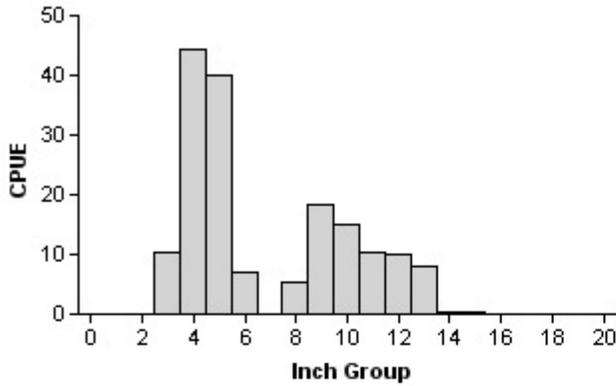
Vegetation	2010	2012	2013
Native submersed			76 (0.6)
Native floating-leaved			2,174 (17.1)
Native emergent			22 (0.2)
Non-native			
Giant salvinia (Tier II) ^a	161 (1.3)	1,370 (10.8)	6,000 (47.2)
Hydrilla (Tier III) ^a	4564 (35.9)	3405 (26.8)	1,269 (10.0)
Water hyacinth (Tier II) ^a	726 (5.7)	389 (3.1)	10 (0.1)
Alligatorweed (Tier III) ^a		319 (2.5)	421 (3.3)

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

Gizzard Shad

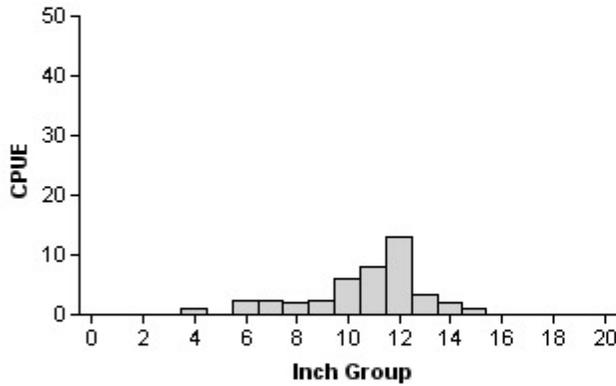
2007

Effort = 2.0
 Total CPUE = 170.5 (29; 341)
 IOV = 60 (8.2)



2009

Effort = 2.0
 Total CPUE = 44.0 (26; 88)
 IOV = 14 (6.2)



2013

Effort = 2.0
 Total CPUE = 50.5 (26; 101)
 IOV = 20 (11.8)

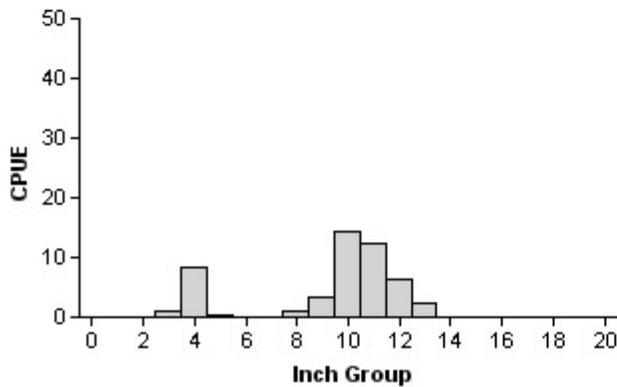


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2007, 2009, and 2013.

Bluegill

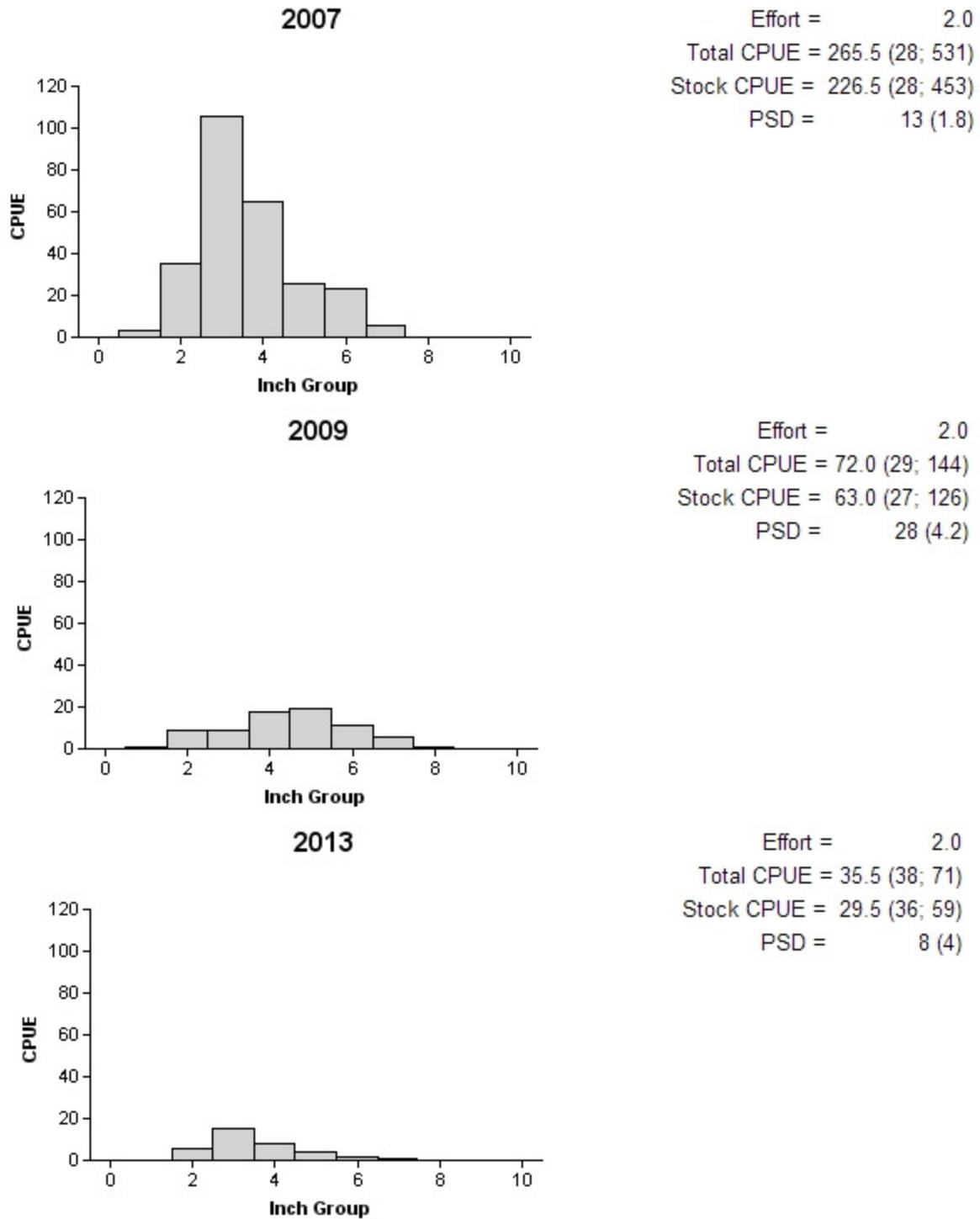


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2007, 2009, and 2013.

Redear Sunfish

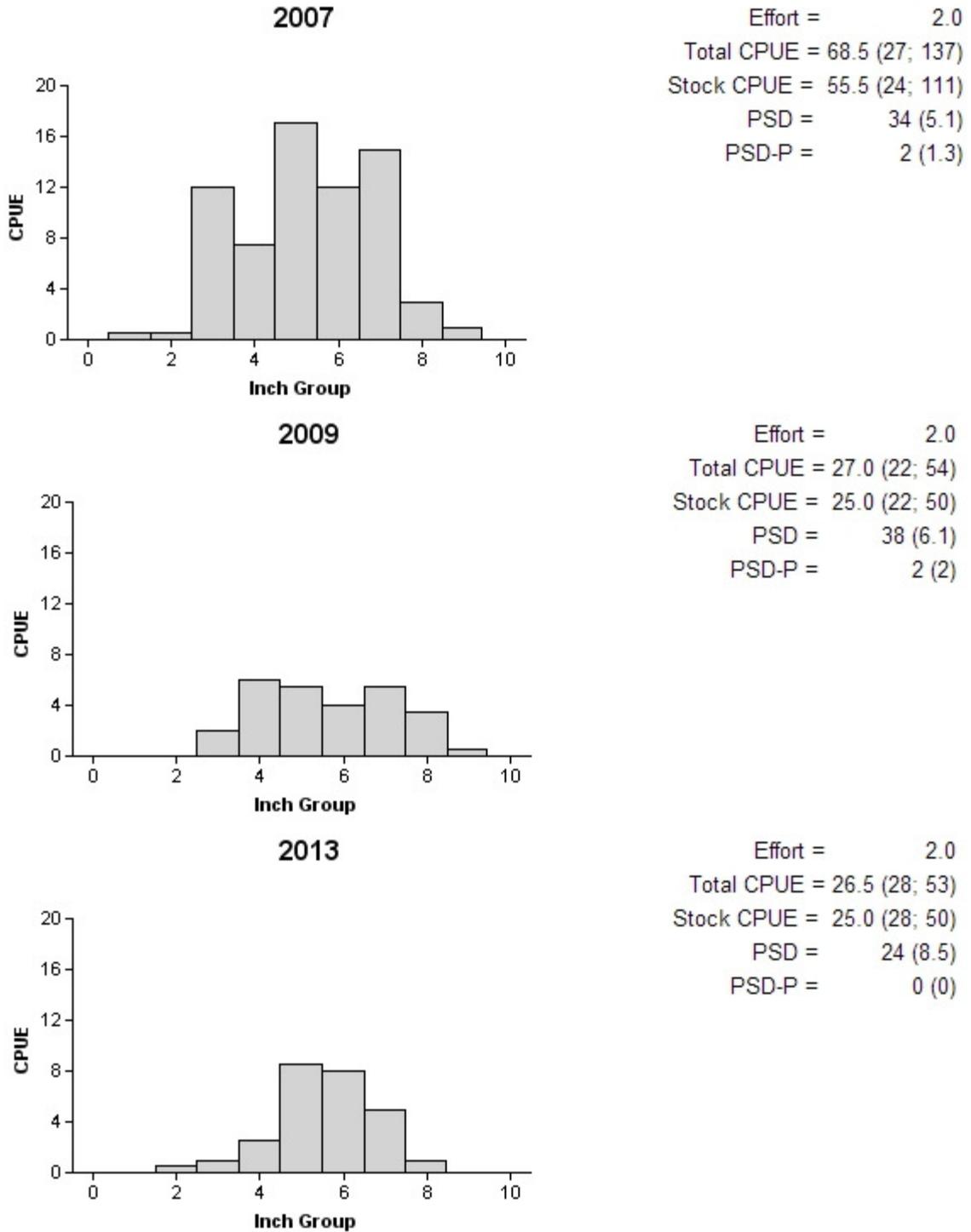


Figure 4. Number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2007, 2009, and 2013.

Largemouth Bass

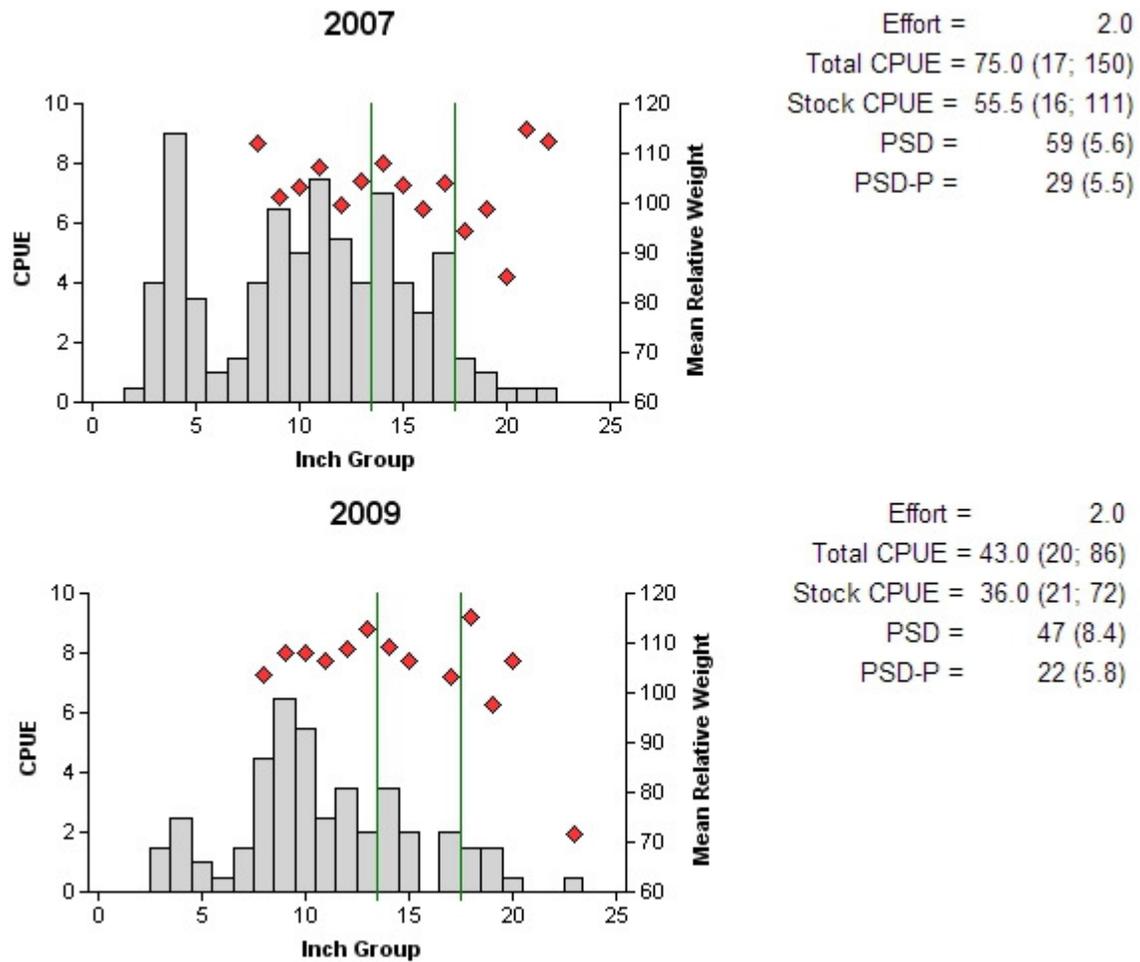


Figure 5. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2007 and 2009. Vertical lines indicate slot length limit.

Largemouth Bass

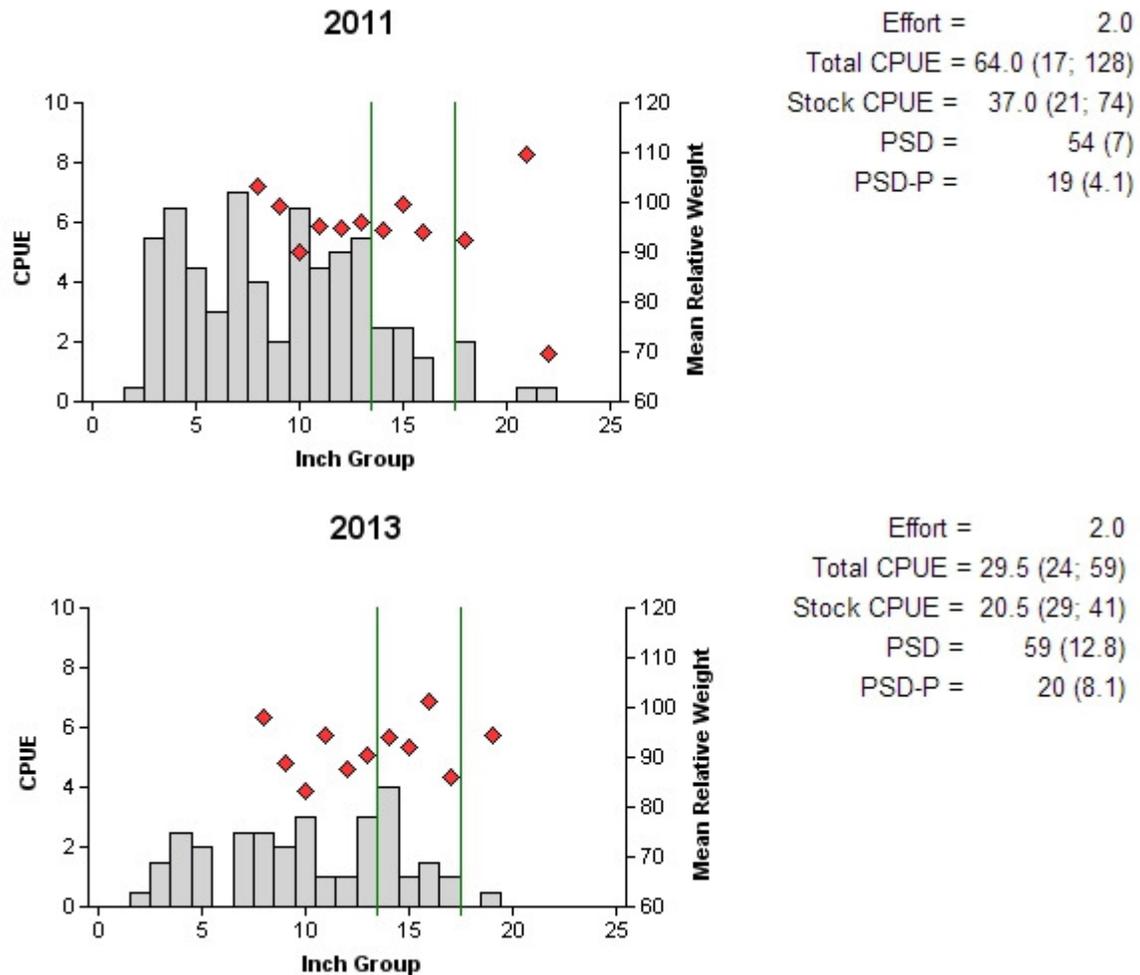


Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2011 and 2013. Vertical lines indicate slot length limit. Sampling during 2011 and 2013 was conducted during daylight hours.

Largemouth Bass

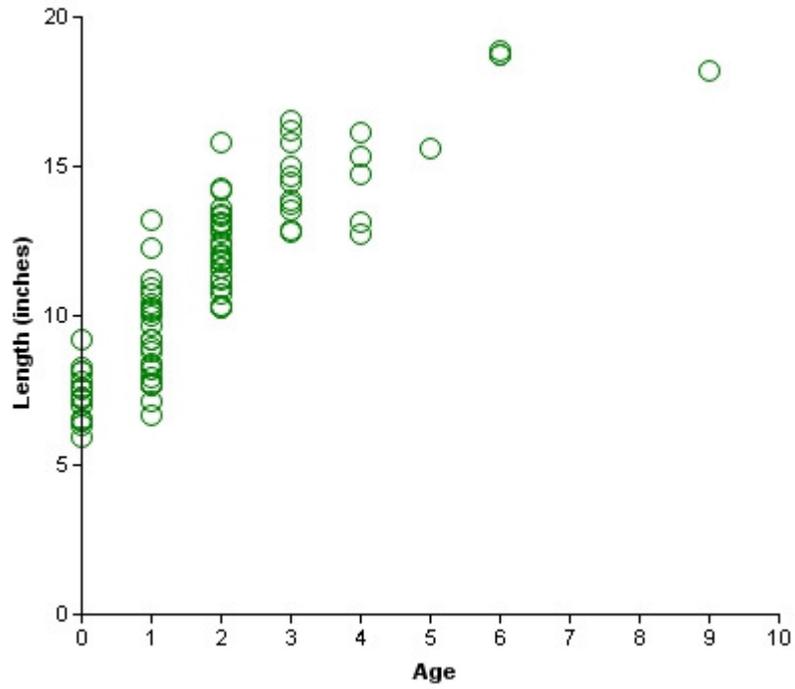


Figure 7. Length-at-age for Largemouth Bass collected by electrofishing at Caddo Lake, Texas, Fall 2011.

Table 6. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Caddo Lake, Texas, 2001-2003, 2005, 2011, and 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.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2001	31	1	24	6	41.1	3.2
2002	31	3	25	3	38.9	9.7
2003	60	4	49	7	45.0	5.8
2005	62	1	53	7	33.1	2.0
2011	30	0	30	0	42.0	0.0
2013	30	0	29	1	34.0	0.0

Table 7. Proposed sampling schedule for Caddo Lake, Texas. Survey period is June through May. 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.

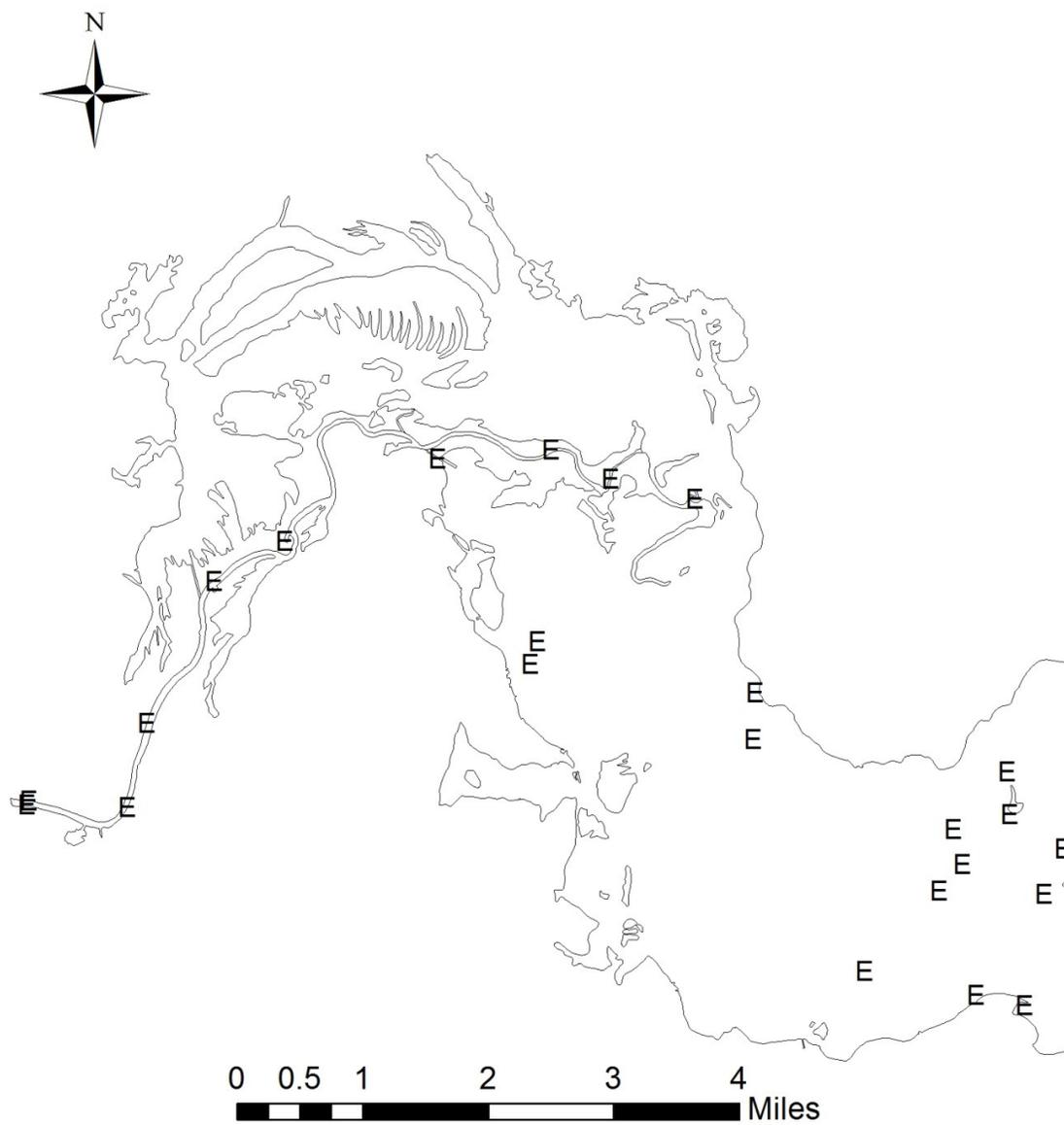
Survey year	Electrofishing Fall(Spring)	Trap net	Gill net	Habitat			Creel survey	Report
				Structural	Vegetation	Access		
2014-2015					A			
2015-2016	A(A)				A			
2016-2017					A			
2017-2018	S(A)	A	S		S	S	A	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types Caddo Lake, Texas, 2013. Sampling effort was 2 hours for electrofishing. No gill or trap netting was conducted.

Species	Electrofishing	
	N	CPUE
Gizzard Shad	101	50.5
Threadfin Shad	188	94.0
Warmouth	4	2.0
Bluegill	71	35.5
Longear Sunfish	11	5.5
Redear Sunfish	53	26.5
Redspotted Sunfish	1	0.5
Spotted Bass	3	1.5
Largemouth Bass	59	29.5

APPENDIX B



Location of sampling sites, Caddo Lake, Texas, 2013. Electrofishing stations are indicated by E. Water level was near full pool at time of sampling.

APPENDIX C

Number of Largemouth Bass by size class from Caddo Lake entered into the Bass Life Associate's Bass Replica Program from 2006 to 2013. Data collected from: <http://www.basslifeassociates.org>.

Year	Bass \geq 8 lbs.	Bass \geq 10 lbs.	Largest Bass
2013	13	7	11.36
2012	27	14	12.00
2011	23	7	12.85
2010	62	25	16.17
2009	60	26	13.43
2008	47	14	12.72
2007	42	14	12.59
2006	47	15	12.30