

.PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-35

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2009 Survey Report

**Caddo Lake**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Caddo Lake (Texas side only) were surveyed in 2009 using electrofishing and trap netting and in 2010 using gill netting. An angler creel survey was conducted from June 2009 through May 2010. 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. Flooding during fall 2009 delayed electrofishing and trap netting surveys. The lake level was still approximately 3 feet above full pool at the time of fall sampling, which likely resulted in poor success for fish sampling.
- **Management history:** Important sport fish include largemouth bass, bluegill, redear sunfish, and crappie. The management plan from the 2005 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 issues related to Caddo Lake. Largemouth bass were managed with a 14- to 18-inch slot-length limit on the Texas side of the lake. Efforts to control nuisance aquatic plants on the lake continue.
- **Fish Community**
  - **Prey species:** Threadfin shad continued to be present in the reservoir. Electrofishing catch of gizzard shad and bluegill was lower in 2009 than previous surveys. Most gizzard shad were too large to be available as prey to sport fish.
  - **Catfishes:** The channel catfish population has many fish above legal size and provides good angling opportunities. Gill net catch rates of channel catfish were higher in 2010 than the previous survey.
  - **Temperate basses:** White bass were still present in gill netting surveys, but only two fish were caught. The lack of preferred open-water habitat likely limits their abundance.
  - **Black basses:** Largemouth bass 2009 electrofishing catch rates were lower than previous years, which was likely due to sampling conditions. The size distribution of the population was stable, and fish exhibited excellent body condition. Most angler hours spent fishing at Caddo Lake was directed toward largemouth bass during a 2009-2010 creel survey. Spotted bass were present in low density.
  - **Crappie:** Both black and white crappie were collected during fall trap netting. However, catch rates were lower than previous years. Crappie were the second most sought fish by anglers and all legal fish ( $\geq 10$  inches) caught by anglers interviewed during a year-long creel survey were harvested.
- **Management Strategies:** Conduct electrofishing survey in fall 2011, aquatic vegetation surveys annually from 2010-2013, and general monitoring with trap netting and electrofishing surveys in 2013 and gill netting in 2014. Stock Florida largemouth bass annually to maintain 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 2009-2010, as well as previously unreported data. 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 2009-2010 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 (msl).

Approximately 7,000 acres of 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 have altered the hydrology in the Lower Cypress River Basin, negatively impacting 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 2009 revealed 3,228 acres of giant salvinia, 1,740 acres of waterhyacinth, and 4,341 acres of hydrilla. Water hyacinth and giant salvinia continue to create problems for navigation and recreational use in many areas of the lake.

Boat access is available at Caddo Lake State Park, at two additional public ramps, and at several private marinas. Bank fishing access is limited on the lake. Other descriptive characteristics for Caddo Lake are in Table 1.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Bister and Brice 2006) included:

1. Continue to survey aquatic vegetation, conduct maintenance spraying of waterhyacinth, maintain signage at boat ramps and marinas regarding exotic plants, and search for long-term

funding for an aquatic vegetation management program.

**Action:** Annual aquatic vegetation surveys have been conducted to monitor the coverage of waterhyacinth, hydrilla, and giant salvinia since 2006. The discovery of giant salvinia on the Louisiana side of the lake in 2006 has resulted in several changes in the management of invasive aquatic plants. TPWD has entered into a contract agreement with the Cypress Valley Navigation District (CVND) to conduct herbicide treatment of giant salvinia and water hyacinth to maintain boat roads. The TPWD Aquatic Habitat Enhancement crew has continued to conduct herbicide spraying to augment efforts by CVND. Boat ramps and marinas have been periodically inspected for appropriate signage pertaining to exotic plants, as well as fish harvest regulations and contaminant advisories. A Watershed Protection Plan for the Cypress Creek Basin, which has been managed by the Northeast Texas Municipal Water District (NETMWD), has continued to work with stakeholders in addressing several issues of concern at Caddo Lake including invasive aquatic vegetation.

2. Unify fish harvest regulations between Texas and Louisiana.

**Action:** Proposed changes have been provided to the Louisiana Department of Wildlife and Fisheries for review as of 29 April 2010. Any regulation change proposals will depend on LDWF making successful changes to their regulations prior to TPWD proceeding with changes.

3. Maintain and monitor trophy largemouth bass population. Stock Florida largemouth bass (25 fish/acre) in 2006 and 2007. Conduct genetic analysis of age-0 largemouth bass in 2010. Conduct electrofishing survey in fall 2007.

**Action:** Approximately 500,000 Florida largemouth bass fingerlings were stocked each year in 2006 and 2007 as recommended in the previous management plan. Due to changes in the stocking protocol for Florida largemouth bass, stocking was allowed in 2009, when 706,319 fingerlings were stocked. The recommendation to evaluate the genetics of age-0 fish should have been for 2009 instead of 2010 to coincide with the fall electrofishing schedule. However, no genetic analysis was conducted because fish were stocked earlier that year. The fall 2007 electrofishing survey was conducted.

4. Inform anglers and stakeholders about issues pertaining to Caddo Lake.

**Action:** District staff have been active in providing information pertaining to Caddo Lake to the public through written news releases and presentations. Staff have also been involved with stakeholder groups and interagency meetings to discuss or present information relating to fisheries management issues at Caddo Lake.

**Harvest regulation history:** Sport fishes in the Texas side of Caddo Lake are currently managed with statewide regulations with the exception of largemouth bass (Table 2). Largemouth bass in Caddo Lake were managed with a 10-inch minimum length and 10-fish daily bag from 1975-1987, a 12-inch minimum length and 10-fish daily bag from 1988-1990, a 14-inch minimum 8-fish daily bag from 1991-1992, and a 14- to 18-inch slot-length limit and 3-fish daily bag from 1993-1994. The current harvest regulation for largemouth bass on the Texas side of Caddo Lake is a 14- to 18-inch slot-length limit and a 5-fish daily bag implemented in 1995. Louisiana Department of Wildlife and Fisheries manages largemouth bass on their side of the lake with a 14- to 17-inch slot-length limit with a 10-fish daily bag where no more than 4 fish can be greater than 17 inches.

**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 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. Because the genetic makeup of the largemouth bass population in fall 2005 did not meet objectives for trophy largemouth bass management, Florida largemouth bass were stocked in 2006 and 2007. To further enhance the trophy potential of the largemouth bass fishery, Florida largemouth bass were stocked in 2009

and 2010. Paddlefish have been stocked in Big Cypress Creek at the Caddo Lake State Park boat ramp. However, because the legal boundary of Caddo Lake extends upstream to the Texas State Highway 43 bridge, these fish are recorded as being stocked in Caddo Lake. The intention was that they be stocked in the river, which they were. The complete stocking history is in Table 3.

**Vegetation/habitat 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 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.

Another of the most problematic aquatic vegetation species on Caddo Lake is water hyacinth. Since its initial introduction to the lake in the 1940s, some active form of control has been required to keep the population in check. In spite of annual herbicide applications, the waterhyacinth population continues to persist and expand on Caddo Lake. A series of mild winters has contributed to an increase in waterhyacinth on Caddo Lake. Continued efforts to manage water hyacinth will be necessary to keep coverage at a manageable level.

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 to the deeper portion of the lake. From all records available, by 2000 a decline in hydrilla was noted and by 2001 hydrilla had been reduced to non-problematic levels. 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. In recent years, hydrilla coverage has increased. The 2009 vegetation survey documented 4,341 acres on the Texas side of the lake.

## METHODS

Data were collected on the Texas side of Caddo Lake by electrofishing (2 hours at 24, 5-min stations), gill netting (15 net nights at 15 stations), experimental spring trap netting (15 net nights at 15 subjectively-selected stations). A roving angler creel survey consisting of 36 survey days (4 weekdays, 5 weekend days per quarter, from 1 June 2009 through 31 May 2010) was conducted to estimate angler catch and harvest rates and angling effort. This creel survey was only conducted on the Texas side of the lake. The previous creel survey presented in the report was conducted by TPWD both the Texas and Louisiana sides of the lake. 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 2009).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined 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). Relative standard error ( $RSE = 100 \times SE$  of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Average age at length was determined using otoliths for largemouth bass from 13 fish 12.3 -14.9 inches. Source for water level data was the United States Army Corps of Engineers website (Fort Worth, Texas office).

## RESULTS AND DISCUSSION

**Habitat:** The complexity of Caddo Lake and its aquatic vegetation community made it difficult to estimate the coverage of all species/growth forms during the 2009 survey. Therefore, the primary goal of the survey was to estimate the coverage of the most problematic invasive species. Giant salvinia was estimated to cover 3,228 acres. This was much higher than 2008 (1,092 acres) and 2007 (100 acres). However, flooding and freezing conditions in the winter 2009/2010 have reduced its coverage by at least 95%. Water hyacinth coverage was estimated at 1,740 acres in 2009, which was slightly more than 2008 (1,350 acres), but much less than the 3,700 acres estimated in 2007. Hydrilla coverage has been relatively stable over recent years. Hydrilla coverage was 4,341 acres in 2009, 4,370 acres in 2008, and 4,200 acres in 2007. The recent history of invasive aquatic plant coverage can be found in Table 4. 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.

**Creel:** The angler creel survey conducted from June 2009 through May 2010 only included the Texas side of the lake. Directed fishing effort by anglers was highest for black bass (53%), followed by anglers fishing for crappie and those fishing for sunfishes (Table 5). Total fishing effort for all species at Caddo Lake was 140,292 h from June 2009 through May 2010, and anglers spent an estimated \$788,363 on direct expenditures (Table 6).

**Prey species:** Electrofishing catch rates of bluegill and gizzard shad were 72.0/h and 44.0/h, respectively. Index of vulnerability (IOV) for gizzard shad was low, indicating only 14% of gizzard shad were available to existing predators; this was lower than IOV estimates in previous years. Total CPUE of gizzard shad was considerably lower in 2009 compared to 2007 and 2005 surveys (Figure 2). Total CPUE of bluegill in 2009 was lower than total CPUE from surveys in 2007 and 2005. Flooding conditions during fall 2009 at the lake delayed electrofishing by three weeks. Besides sampling later in the fall than desired, the lake elevation was still high at the time of electrofishing and likely had a negative effect on sampling success. However, bluegill and redear sunfish were present at larger sizes and available to anglers (Figure 3; Figure 4). Directed effort for sunfish accounted for over 20% of total fishing effort (Table 7). Harvested sunfish ranged from 4 to 8 inches (Figure 5).

**Catfishes:** The gill net catch rate of channel catfish was 7.5/nn in 2010, which was higher than 2006, but slightly less than 2004. The channel catfish population size structure was optimal, with moderate numbers of larger fish available to anglers (Figure 6). Bister and Brice (2006) reported growth of channel catfish in Caddo Lake was moderate. Average age at 12 inches (11.8-13.5 inches) was 3.0 years ( $N = 12$ ; range = 2 – 5 years) during the 2006 gill netting survey. The gill net catch rate of flathead catfish was 0.3/nn in 2010 compared to 1.1/nn in 2006 (Figure 7). These fish provide an additional opportunity for catfish anglers in addition to channel catfish. Directed fishing effort, catch per hour, and total harvest for channel catfish showed a minimal catfish fishery (Table 8). Harvested fish ranged in length from 12 to 18 inches (Figure 8).

**Temperate basses:** The gill net catch rate of white bass was only 0.1/nn in 2010 compared to 1.2/nn in 2006. Catch rates indicated that white bass continue to be present in the reservoir, but lack of preferred

open-water and optimal spawning habitat likely limit their numbers (Figure 9). The 2009/2010 angler creel survey did not document any directed effort for white bass (Table 9). However, anglers harvested an estimated 2,932 yellow bass during the survey period (Table 9, Figure 10).

**Black basses:** The electrofishing catch rate of stock-length largemouth bass was 36.0/h in 2009, which was less than 55.5/h in 2007 and 51.0/h in 2005 (Figure 11). Delayed sampling due to flooding and high water likely had a negative effect on sampling success. Population size structure has been consistent over the past three surveys; PSD was 47 in 2009, 59 in 2007, and 41 in 2005 (Figure 11). Growth of largemouth bass in Caddo Lake was moderate. Average age at 14 inches (12.3 -14.9 inches) was 2.5 years ( $N = 13$ ; range = 1 – 6 years). Body condition in 2009 was moderate ( $W_r$  above 95) for most size classes of fish (Figure 11). Directed fishing effort, catch per hour, and total harvest for black bass was 73,779 h, 0.55 fish/h, and 12,611 fish, respectively, from June 2009 through May 2010 (Table 10). Throughout the survey, 77% of legal-size fish caught were released (Table 10). There was good compliance with harvest regulations during the survey period (Figure 12). Spotted bass were present (1.5/h).

**Crappie:** Trap netting catch rates of white crappie and black crappie were much lower in 2009 than in previous surveys (Figure 13, Figure 14). This may be due to delayed sampling and high water associated with flooding conditions in fall 2009. Body condition for both species was adequate ( $W_r$  above 90) for all size classes (Figure 13, Figure 14). Directed fishing effort for crappie was 23.9% of total fishing effort from June 2009 through May 2010 (Table 5). Total catch per hour and total harvest were 1.87 fish/h and 40,367 fish, respectively (Table 11). Harvested fish ranged in size from 10 to 16 inches (Figure 15). Anglers interviewed during the survey period harvested 100% of legal crappie caught.



## Fisheries management plan for Caddo Lake, Texas

Prepared – July 2010

**ISSUE 1:** Caddo Lake continues to experience problems associated with excessive growth of aquatic vegetation, especially giant salvinia, water hyacinth and hydrilla. Annual herbicide applications to control water hyacinth have proven effective, but the lack of funding and manpower limits the total acreage of waterhyacinth that can be treated each year. In addition to herbicide treatments conducted by the TPWD Aquatic Habitat Enhancement crew, water hyacinth is being controlled through efforts from the Cypress Valley Navigation District (CVND). Stakeholders have been working on a Watershed Protection Plan for the Cypress Creek Basin over the last few years as a strategy to protect Caddo Lake. One of the primary concerns is the management of nuisance aquatic vegetation. 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 and 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 as part of a Watershed Protection Plan.
3. Continue to maintain signage at boat ramps and marinas to inform boaters about exotic plants and their threat to Caddo Lake.

**ISSUE 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.

### MANAGEMENT STRATEGY

1. Continue to seek opportunities to meet with representatives from the Louisiana Department of Wildlife and Fisheries (LDWF) to develop and unify harvest regulations and consolidate management plans for Caddo Lake. Currently, TPWD Inland Fisheries District 3A staff have provided LDWF with proposed unified regulations. Plans to meet and discuss potential regulation changes have not been finalized.

**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. Sixty-three largemouth bass  $\geq 8$  pounds were entered into the Bass Life Associates (BLA) Trophy Replica Program during 2009. The lake produced a largemouth bass that was donated to the Toyota ShareLunker Program in 2009 and another fish that was entered in the program in 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 annually.
2. Conduct a standard electrofishing survey during fall 2011 to monitor largemouth bass and prey species populations.

**ISSUE 4:** Anglers and stakeholders might benefit from information about fisheries management activities, fishing opportunities, and other issues on Caddo Lake.

**MANAGEMENT STRATEGIES**

1. Continue to provide news releases to appropriate media outlets.
2. Continue to provide fisheries presentations to fishing clubs, stakeholder organizations, and other interested constituents.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes annual aquatic vegetation surveys, a supplemental electrofishing survey in 2011, and required monitoring surveys in 2013/2014 (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 2011 is necessary to maintain consistent data for trend information on this trophy largemouth bass fishery. 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. However, trap netting is scheduled for fall 2013 to determine the presence or absence of white and black crappie. An angler access and facilities survey is required once every 4 years.

## LITERATURE CITED

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## Monthly Water Level

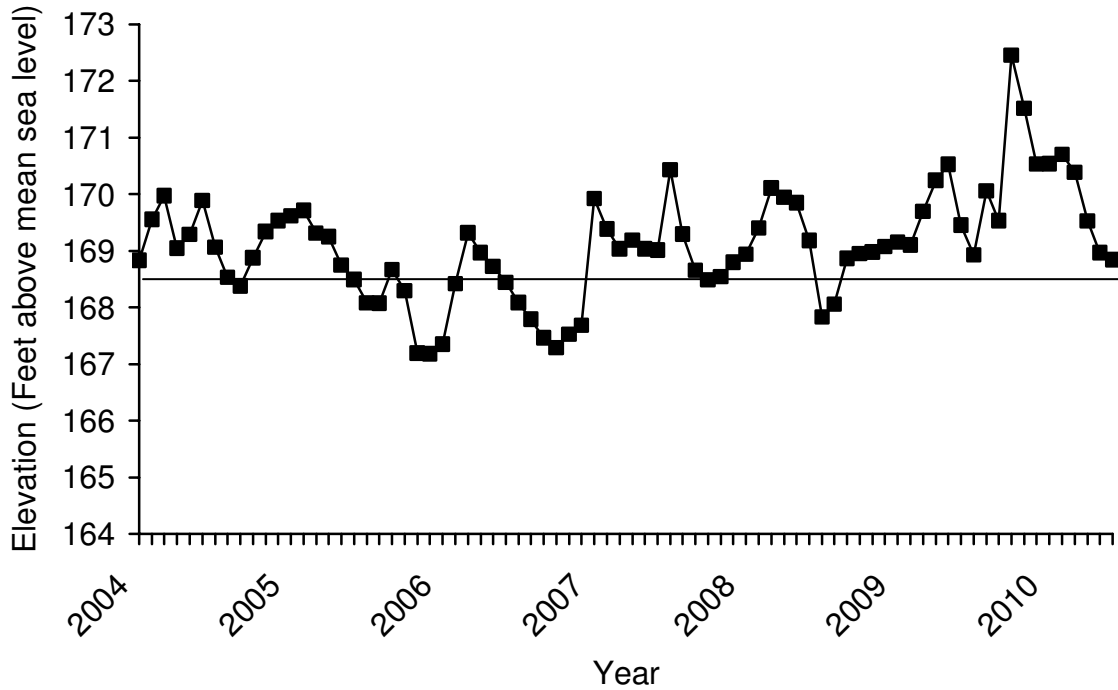


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Caddo Lake, Texas. Conservation water level is 168.5 feet.

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
Shoreline Development Index (SDI)	8.88
Conductivity	140 umhos/cm

Table 2. 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 for the Louisiana side of Caddo Lake are published at <http://www.wlf.louisiana.gov/fishing/recreational/freshwater/regulations/>.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No Limit
Catfish, flathead	5	18 - No Limit
Bass, white	25	10 - No Limit
Bass, palmetto	5	18 - No Limit
Bass: largemouth	5 <sup>a</sup>	14 - 18
Bass: spotted	5 <sup>a</sup>	No Limit - No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

<sup>a</sup> Daily bag for largemouth bass and spotted bass = 5 in any combination.

Table 3. Stocking history of Caddo Lake, Texas. Size categories are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL) and adults (ADL).

Species	Year	Number	Size
Blue catfish	1988	17	ADL
	Total	17	
Channel catfish	1991	9,000	AFGL
	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	
Total	7,347,366		
ShareLunker largemouth bass	2009	3,408	FGL
	2010	2,166	FGL
	Total	5,574	
Paddlefish	1992	12,970	
	1994	2,460	
	1998	12,254	
	Total	27,684	

Table 4. Survey of problematic invasive aquatic vegetation, Caddo Lake, Texas, 2007-2009. Surface area (acres) and percent of reservoir surface area (%) was determined for each species. The survey was conducted on the Texas side only, percentages are based on 12,712 acres.

Species	2007		2008		2009	
	Acres	%	Acres	%	Acres	%
Giant salvinia	100	0.8	1,092	8.6	3,228	25.4
Hydrilla	4,200	33.0	4,370	34.4	4,341	34.1
Water hyacinth	3,700	29.1	1,350	10.6	1,740	13.7

Table 5. Percent directed angler effort by species for Caddo Lake, Texas, 2002/2003 and 2009/2010.

Species/Group	2002/2003 <sup>a</sup>	2009/2010
Black basses	46.7	52.6
Sunfishes	21.9	21.1
Anything	16.9	1.9
Crappie	11.4	23.9
Catfish	1.6	0.5
Temperate basses	1.4	0
Chain pickerel	0.1	0

<sup>a</sup> Creel survey conducted on both Texas and Louisiana side of lake.

Table 6. Total fishing effort (h) for all species and total directed expenditures at Caddo Lake, Texas, 2002/2003 and 2009/2010.

Creel statistic	2002/2003 <sup>a</sup>	2009/2010
Total fishing effort (h)	303,369	140,292
Total directed expenditures	\$1,119,841	\$788,363

<sup>a</sup> Creel survey conducted on both Texas and Louisiana side of lake.

## Gizzard Shad

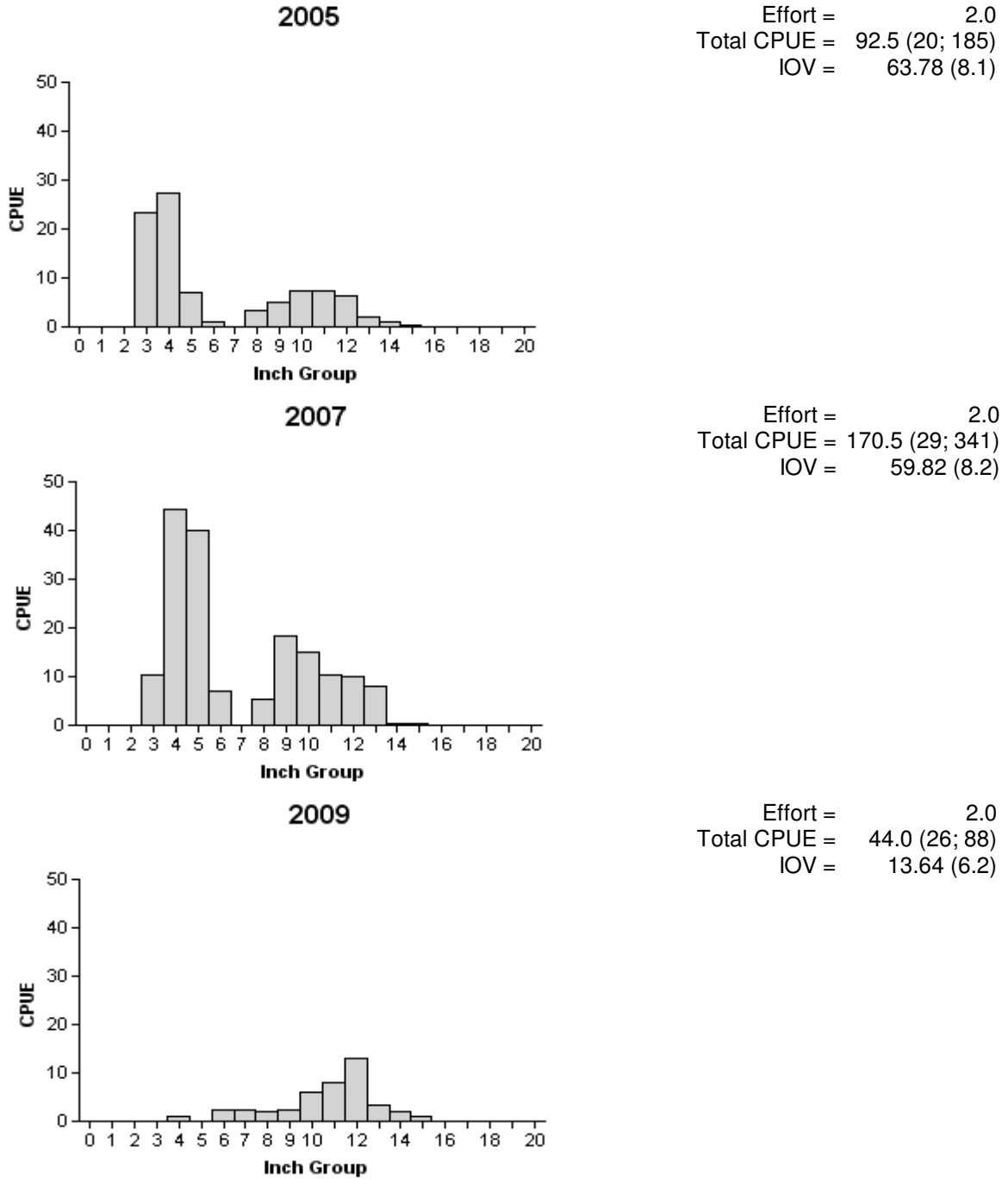
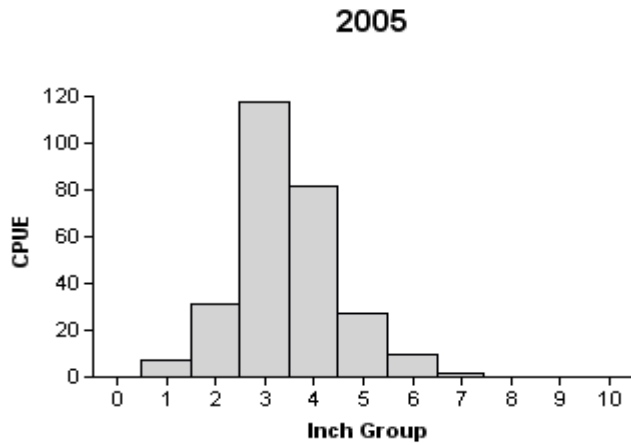


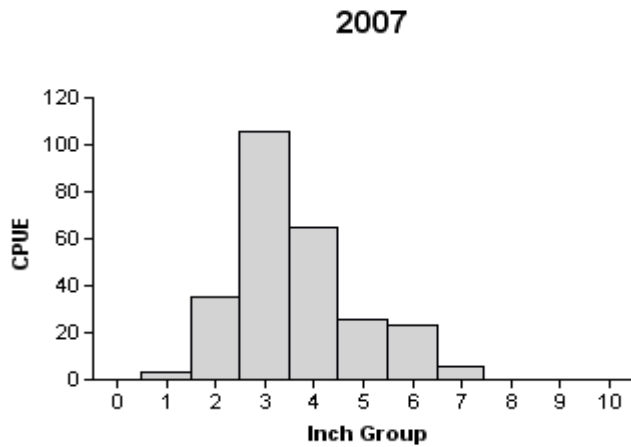
Figure 2. Number of gizzard shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for PSD and IOV are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2005, 2007, and 2009.



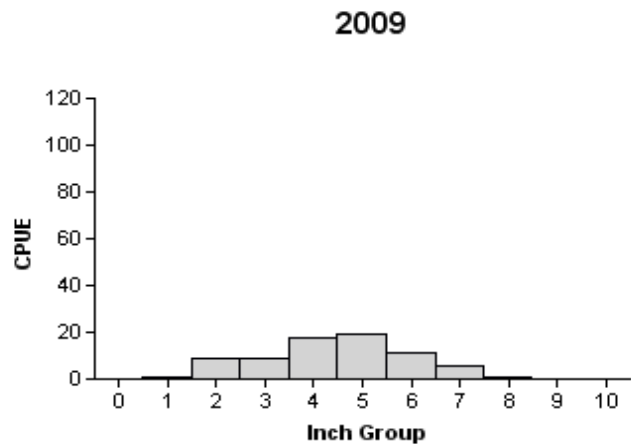
# Bluegill



Effort = 2.0  
 Total CPUE = 277.5 (16; 555)  
 Stock CPUE = 239.0 (17; 478)  
 PSD = 5 (1.5)



Effort = 2.0  
 Total CPUE = 265.5 (28; 531)  
 Stock CPUE = 226.5 (28; 453)  
 PSD = 13 (1.8)



Effort = 2.0  
 Total CPUE = 72.0 (29; 144)  
 Stock CPUE = 63.0 (27; 126)  
 PSD = 28 (4.2)

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 surveys, Caddo Lake, Texas, 2005, 2007, and 2009.

## Redear Sunfish

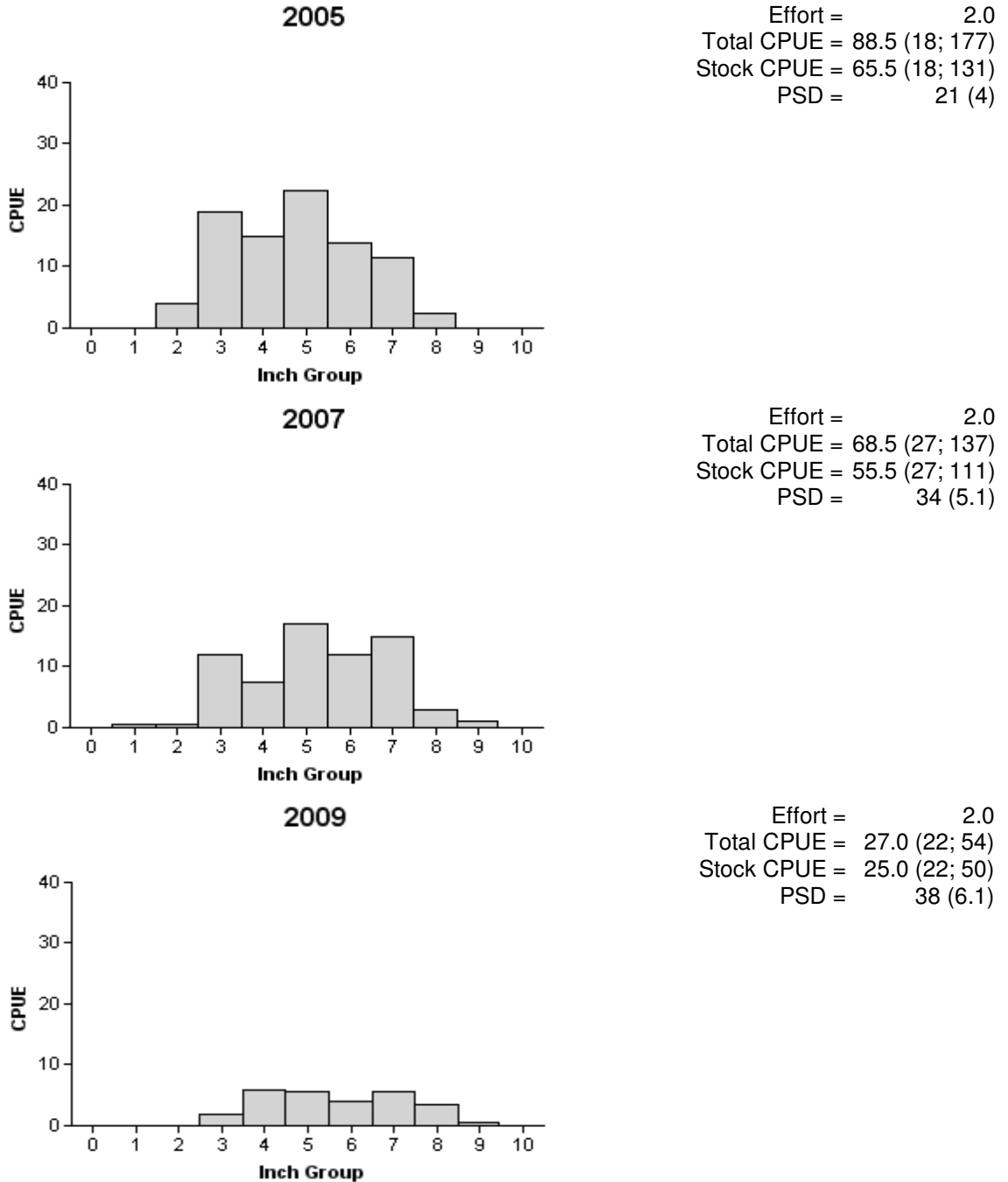


Figure 4. Number of redear sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2005, 2007, and 2009.

## Sunfishes

Table 7. Creel survey statistics for sunfishes at Caddo Lake, Texas from June 2009 through May 2010 where total catch per hour is for anglers targeting sunfish and total harvest is the estimated number of all sunfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2002/2003 <sup>a</sup>	2009/2010
Directed effort (h)	66,658 (22)	29,571 (30)
Directed effort/acre	2.43 (22)	2.33 (30)
Total catch per hour	8.57 (34)	5.3 (24)
Total harvest	327,860 (54)	145,883 (52)
Sunfish (unidentified)	91,153 (44)	12,244 (88)
Warmouth	6,879 (298)	17,195 (75)
Bluegill	190,699 (40)	76,109 (38)
Longear sunfish	414 (1,674)	0
Redear sunfish	37,887 (65)	39,723 (45)
Spotted sunfish	828 (1,182)	612 (943)
Harvest/acre (Total)	12 (54)	11.5 (52)
Percent legal released	53	38

<sup>a</sup> Creel survey conducted on both Texas and Louisiana side of lake.

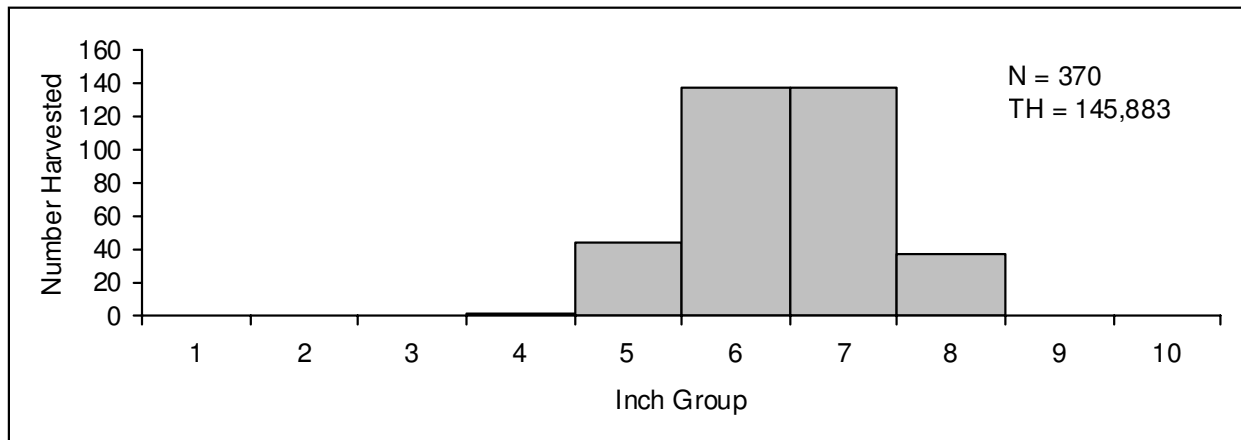


Figure 5. Length frequency of harvested sunfish (all species combined) observed during creel surveys at Caddo Lake, Texas June 2009 through May 2010, all anglers combined. N is the number of harvested sunfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Channel Catfish

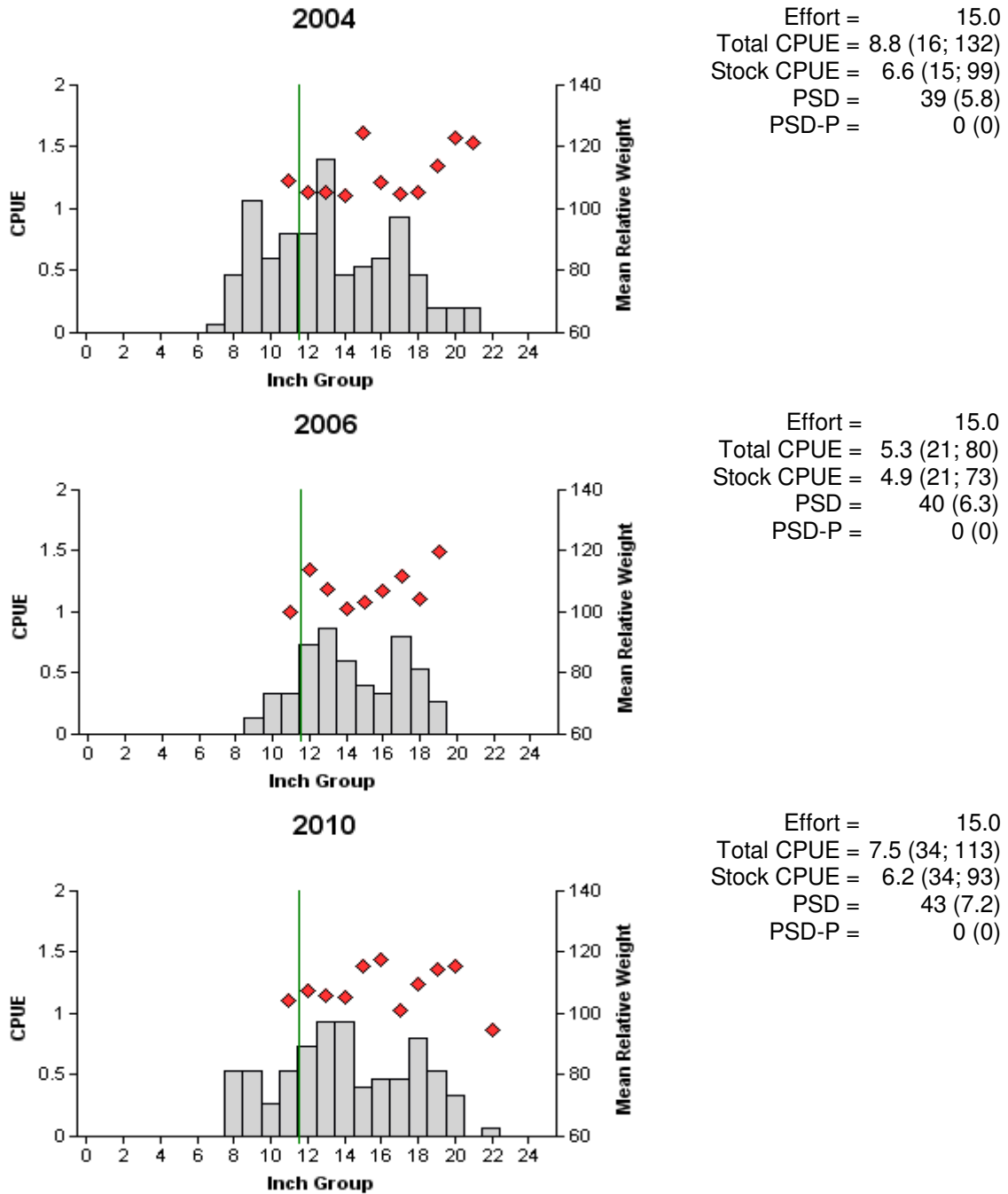


Figure 6. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Caddo Lake, Texas, 2004, 2006, and 2010. Vertical line indicates minimum legal length.

## Flathead Catfish

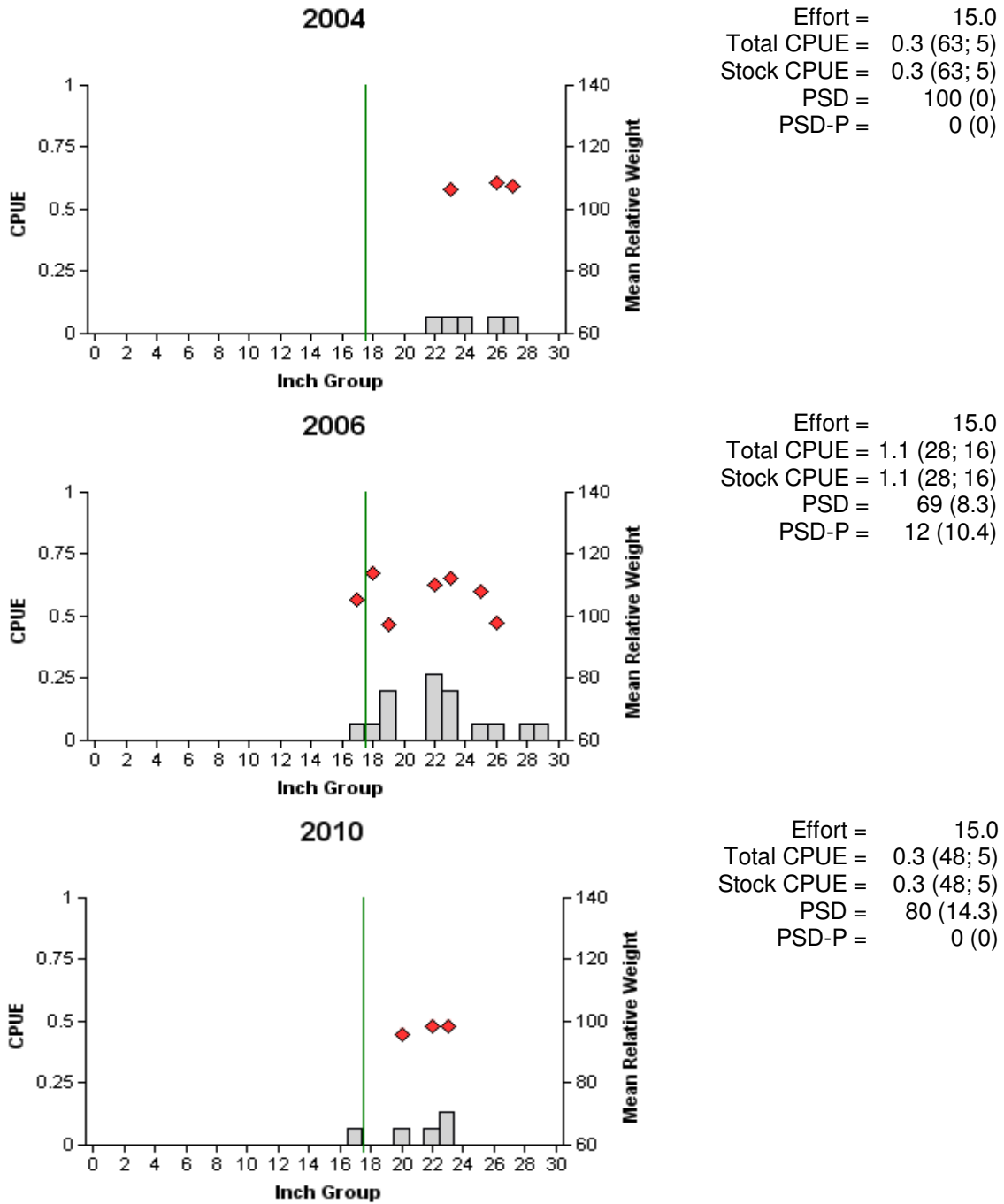


Figure 7. Number of flathead catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Caddo Lake, Texas, 2004, 2006, and 2010. Vertical line indicates minimum legal length.

## Catfish

Table 8. Creel survey statistics for catfish at Caddo Lake, Texas from June 2009 through May 2010, where total catch per hour is for anglers targeting catfish and total harvest is the estimated number of channel catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2002/2003 <sup>a</sup>	2009/2010
Directed effort (h)	4,743 (51)	732 (126)
Directed effort/acre	0.17 (51)	0.06 (126)
Total catch per hour	0.36 (0)	0
Total harvest	22,055 (90)	4,714 (166)
Harvest/acre	0.80 (90)	0.37 (166)
Percent legal released	20	15

<sup>a</sup> Creel survey conducted on both Texas and Louisiana side of lake.

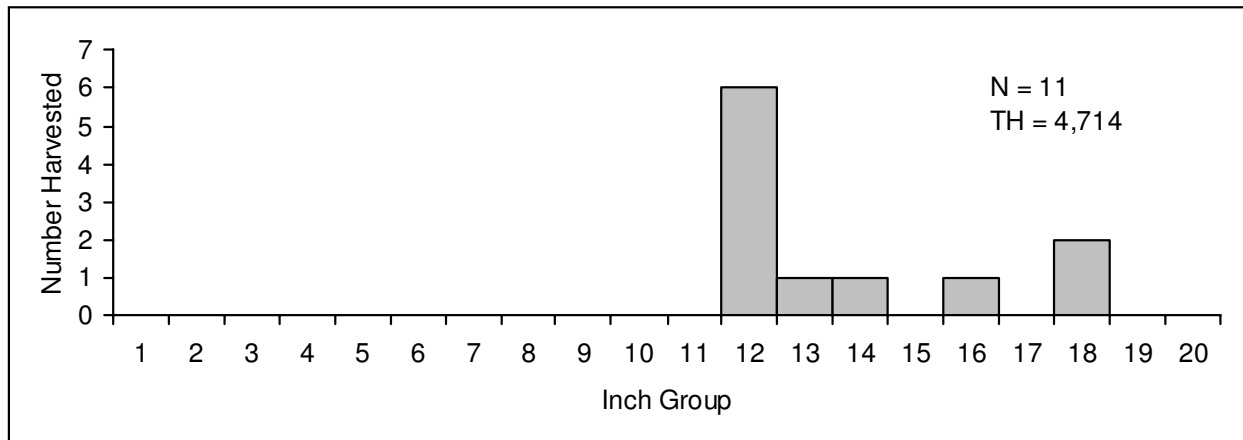


Figure 8. Length frequency of harvested channel catfish observed during creel surveys at Caddo Lake, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

## White Bass

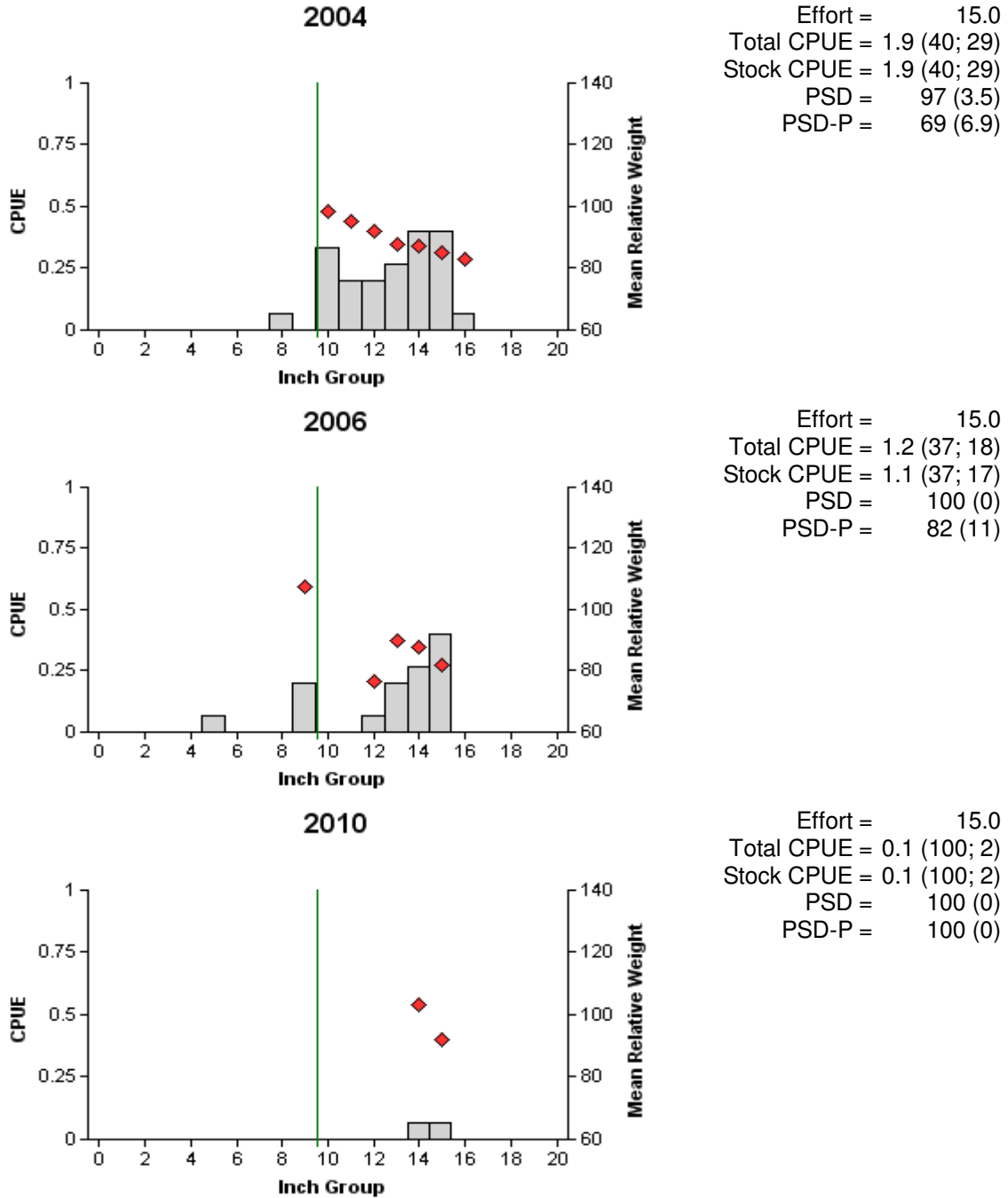


Figure 9. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Caddo Lake, Texas, 2004, 2006, and 2010. Vertical line indicates minimum legal length.

## Temperate Basses

Table 9. Creel survey statistics for temperate basses at Caddo Lake, Texas from June 2009 through May 2010, where total catch per hour is for anglers targeting temperate basses and total harvest is the estimated number of temperate basses harvested by all anglers. Relative standard errors (RSE) are in parentheses

Creel Survey Statistic	Year	
	2002/2003 <sup>a</sup>	2009/2010
Directed effort (h)	4,367 (55)	0
Directed effort/acre	0.18 (55)	0
Total catch per hour	0.79 (5) <sup>b</sup>	0
Total harvest (all Morones)	24,112 (207)	2,932 (323)
White bass	2,734 (357)	0
Yellow bass	20,712 (167)	2,932 (323)
Palmetto bass	663 (838)	0
Harvest/acre (Total)	0.97 (207)	0.23 (323)
Percent legal released	52	62

<sup>a</sup> Creel survey conducted on both Texas and Louisiana side of lake.

<sup>b</sup> Catch per hour estimate includes yellow bass.

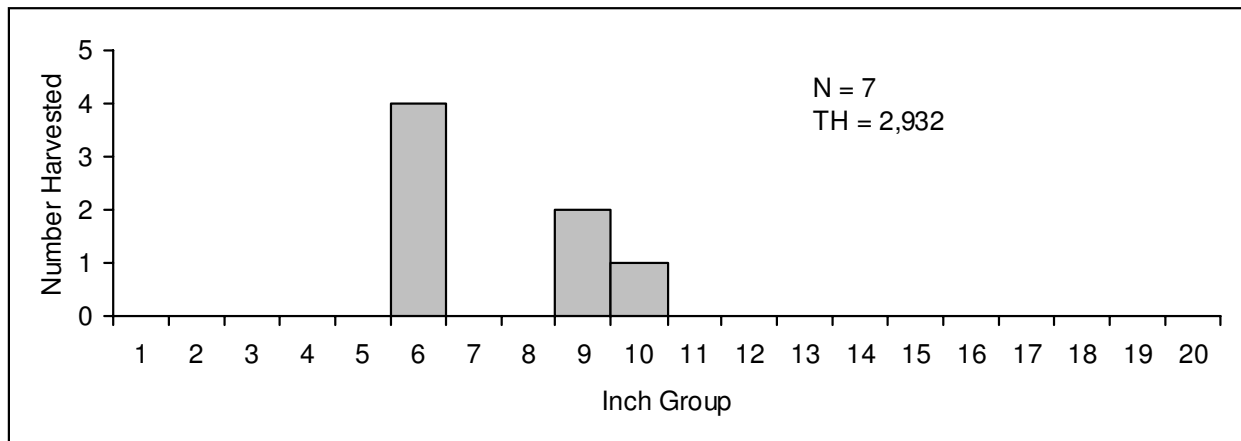


Figure 10. Length frequency of harvested yellow bass observed during creel surveys at Caddo Lake, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested yellow bass observed during creel surveys, and TH is the total estimated harvest for the creel period.



## Largemouth Bass

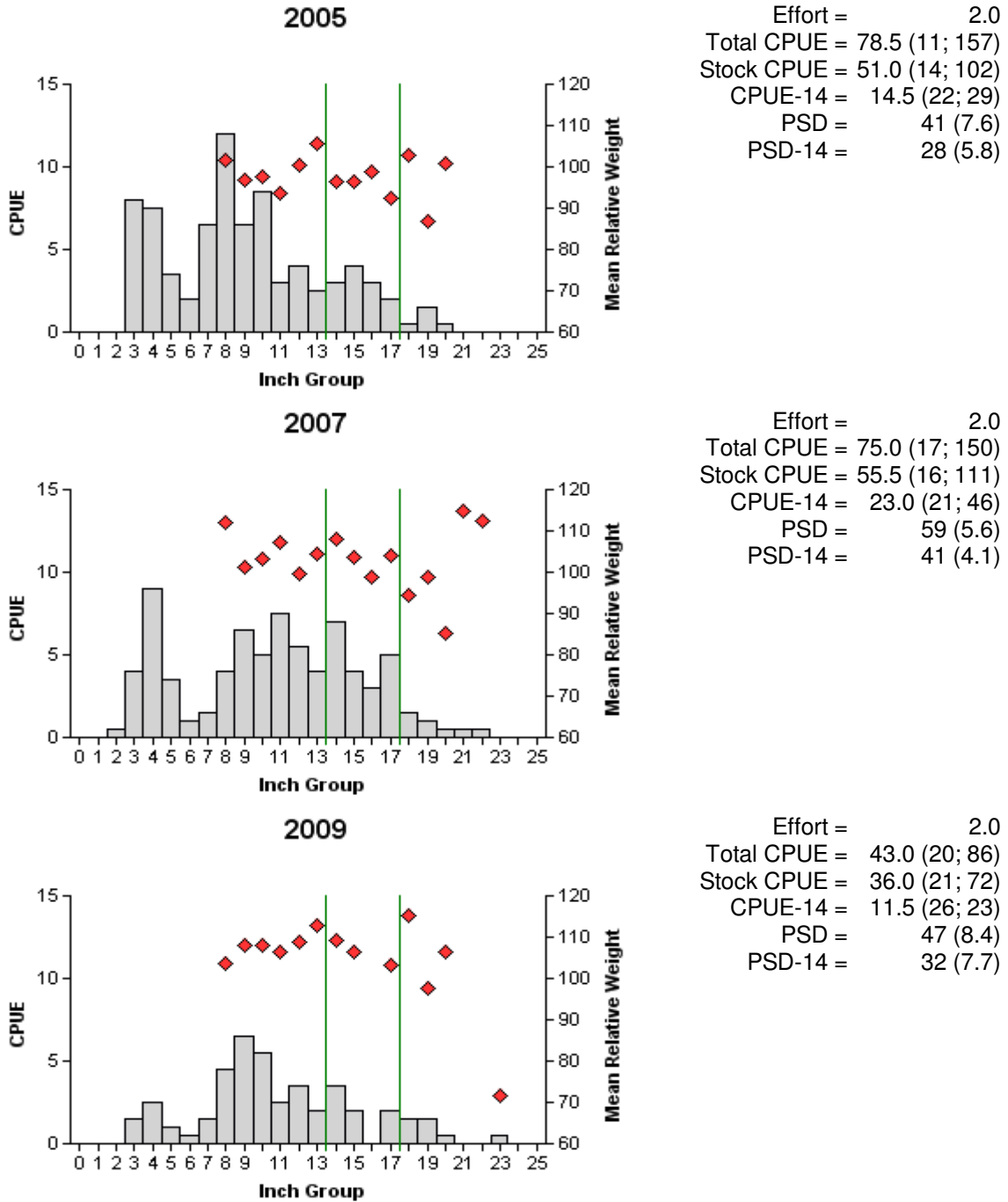


Figure 11. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2005, 2007, and 2009. Vertical lines indicate slot length limit.

## Black Basses

Table 10. Creel survey statistics for black basses at Caddo Lake, Texas from June 2009 through May 2010, where total catch per hour is for anglers targeting black basses and total harvest is the estimated number of black bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2002/2003 <sup>a</sup>	2009/2010
Directed effort (h)	141,532 (12)	73,779 (26)
Directed effort/acre	5.72 (12)	5.8 (26)
Total catch per hour	0.67 (33)	0.55 (26)
Total harvest (all black bass)	26,724 (115)	12,611 (66)
Spotted bass	663 (1,660)	0
Largemouth bass	26,061 (76)	12,611 (66)
Harvest/acre (Total)	1.08 (115)	0.99 (66)
Percent legal released	74	77

<sup>a</sup> Creel survey conducted on both Texas and Louisiana side of lake.

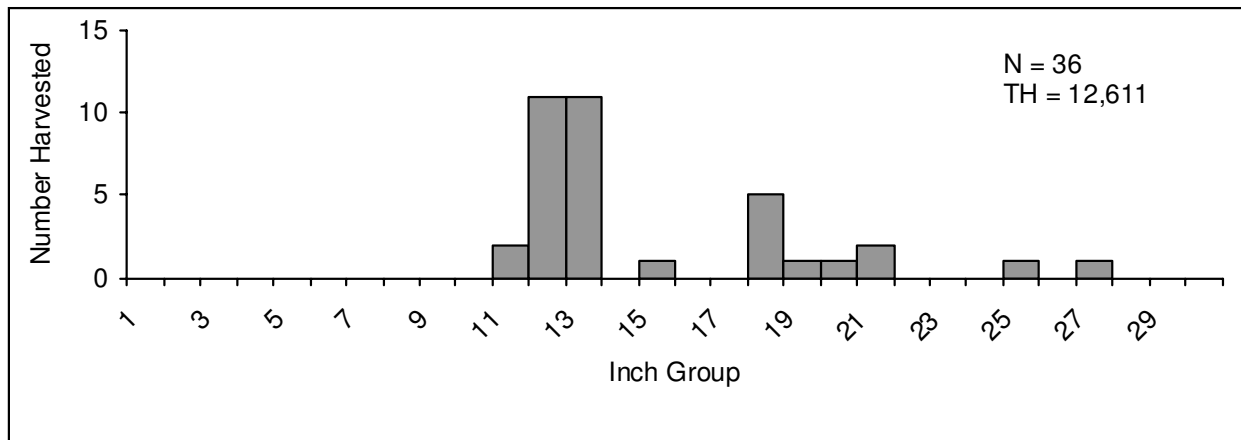


Figure 12. Length frequency of harvested largemouth bass observed during creel surveys at Caddo Lake, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest of largemouth bass for the creel period.

# White Crappie

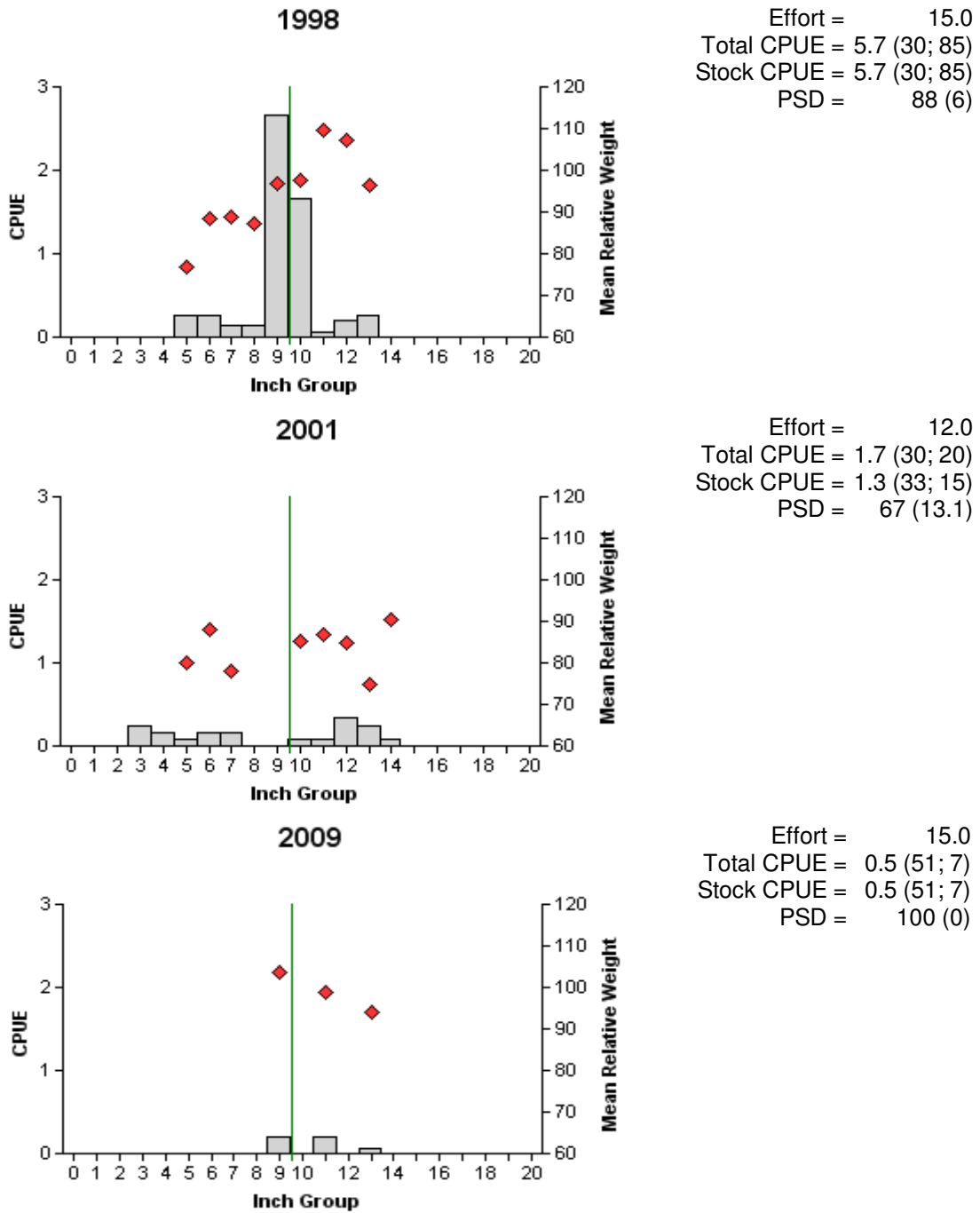
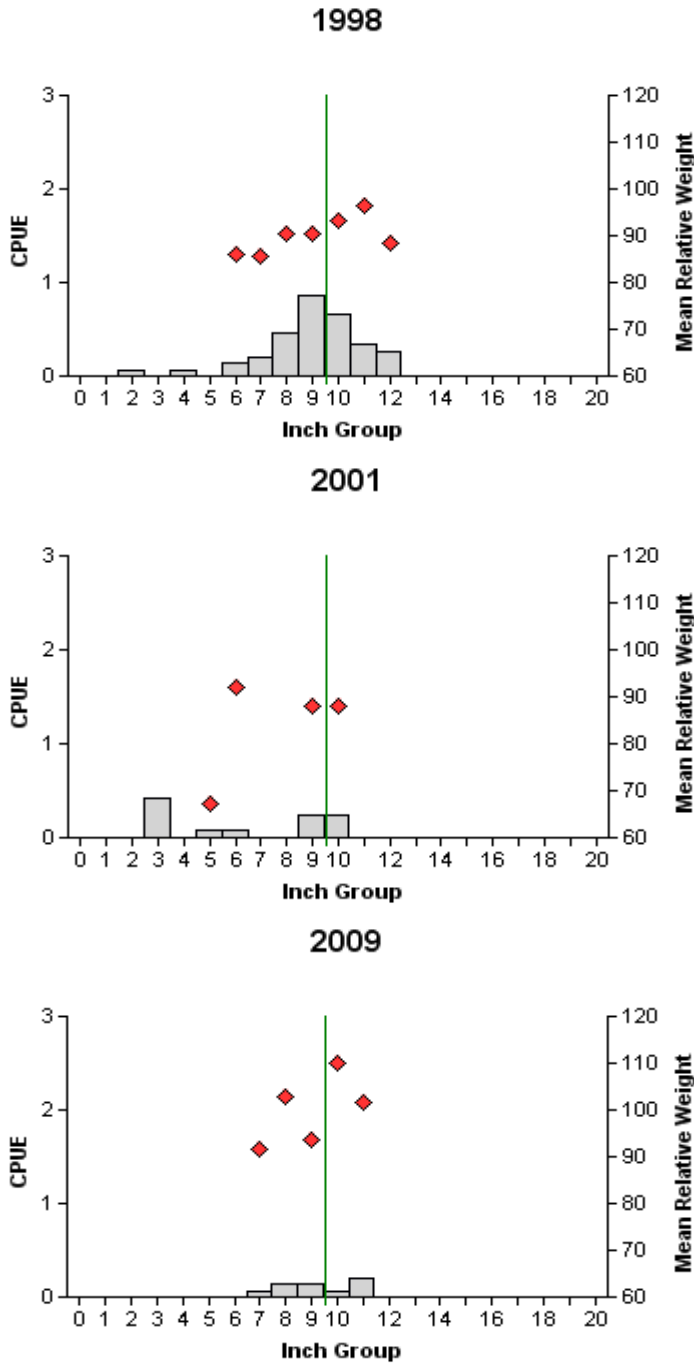


Figure 13. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Caddo Lake, Texas, 1998, 2001, and 2009. Vertical line indicates minimum legal length.

## Black Crappie



Effort = 15.0  
 Total CPUE = 3.1 (38; 46)  
 Stock CPUE = 2.9 (40; 44)  
 PSD = 89 (5.5)

Effort = 12.0  
 Total CPUE = 1.1 (46; 13)  
 Stock CPUE = 0.7 (46; 8)  
 PSD = 75 (19.0)

Effort = 15.0  
 Total CPUE = 0.6 (58; 9)  
 Stock CPUE = 0.6 (58; 9)  
 PSD = 89 (12.4)

Figure 14. 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, Caddo Lake, Texas, 1998, 2001, and 2009. Vertical line indicates minimum legal length.

## Crappie

Table 11. Creel survey statistics for black and white crappie at Caddo Lake, Texas from June 2009 through May 2010, where total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year	
	2002/2003 <sup>a</sup>	2009/2010
Directed effort (h)	34,680 (22)	33,587 (30)
Directed effort/acre	1.40 (22)	2.64 (30)
Total catch per hour	2.88 (42)	1.87 (20)
Total harvest	85,082 (77)	40,367 (56)
Crappie (unidentified)	46,970 (39)	0
White crappie	31,834 (114)	13,162 (75)
Black crappie	6,279 (166)	27,205 (47)
Harvest/acre	3.44 (77)	3.18 (56)
Percent legal released	<sup>b</sup>	0

<sup>a</sup> Creel survey conducted on both Texas and Louisiana side of lake.

<sup>b</sup> Because Louisiana did not regulate crappie harvest with a length limit, this statistic could not be calculated.

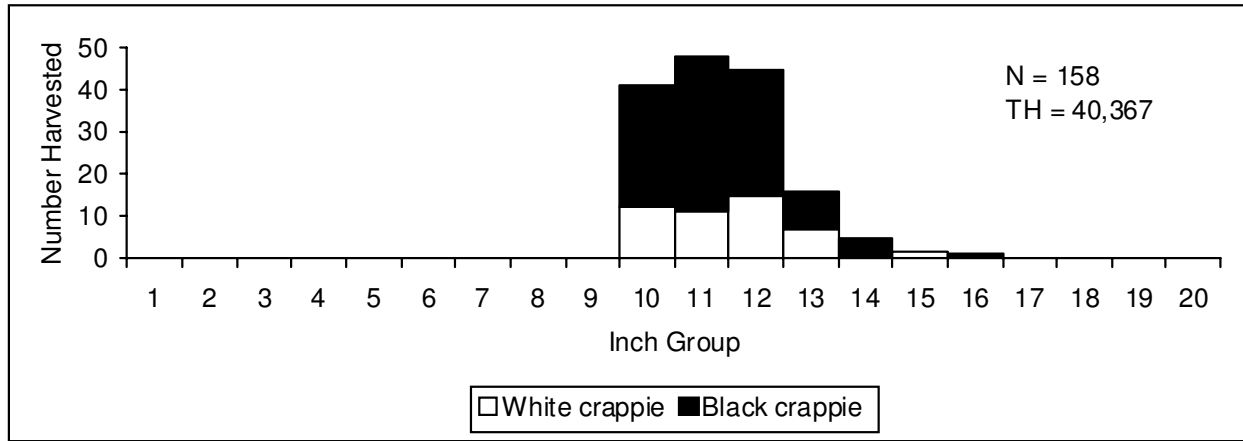


Figure 15. Length frequency of harvested crappie observed during creel surveys at Caddo Lake, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 12. Proposed sampling schedule for Caddo Lake, Texas. Gill netting surveys are conducted in the spring, electrofishing and trap netting surveys are conducted in the fall, and vegetation/habitat surveys are conducted in the summer. Standard survey denoted by S and additional survey denoted by A.

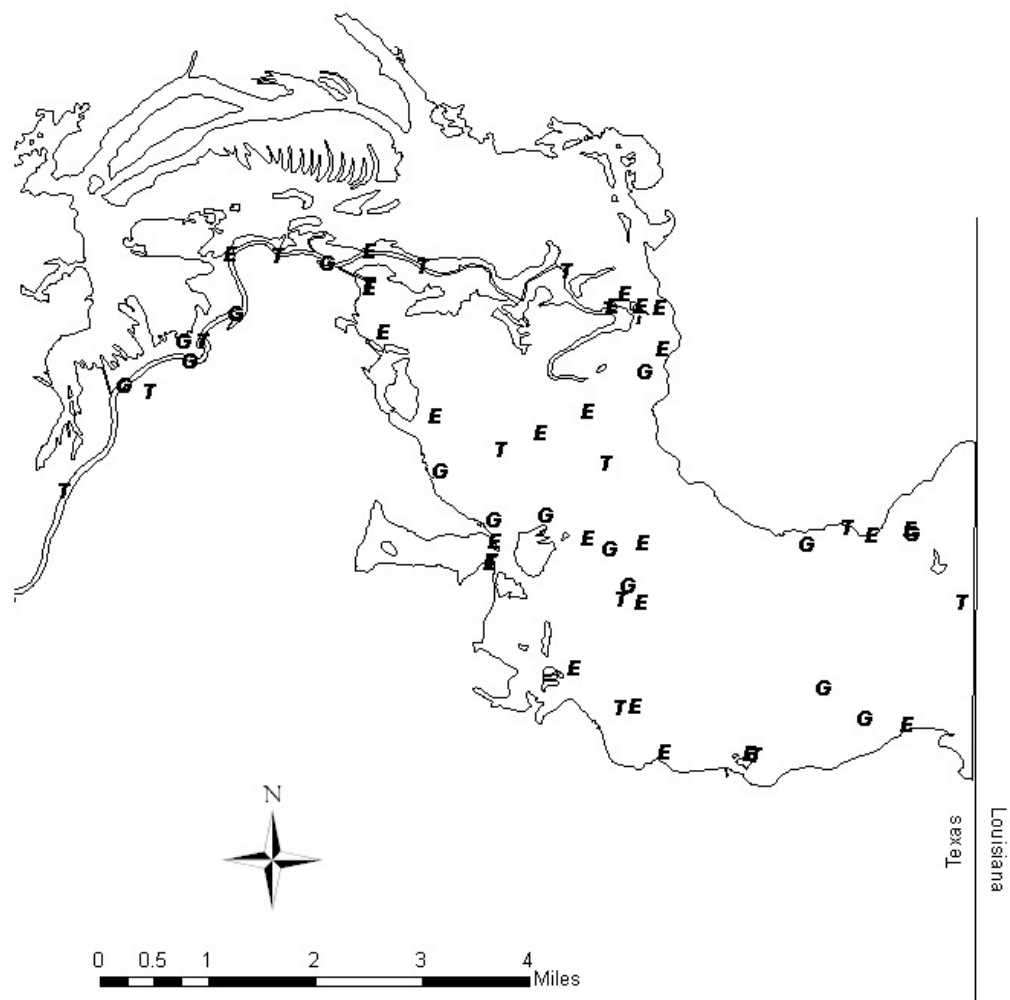
Survey Year	Vegetation	Electrofishing	Trap Net	Gill Net	Report
June 2010 - May 2011	A				
June 2011 - May 2012	A	A			
June 2012 - May 2013	A				
June 2013 - May 2014	S	S	A	S	S

**APPENDIX A**

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

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					88	44.0
Threadfin shad					34	17.0
Blue catfish	1	0.07				
Channel catfish	113	7.53				
Flathead catfish	5	0.33				
White bass	2	0.13				
Flier					1	0.5
Warmouth					22	11.0
Bluegill					144	72.0
Longear sunfish					29	14.5
Redear sunfish					54	27.0
Spotted sunfish					9	4.5
Spotted bass					3	1.5
Largemouth bass					86	43.0
White crappie	4	0.27	7	0.47		
Black crappie	21	1.40	9	0.60		

## APPENDIX B



Location of sampling sites, Caddo Lake (Texas side), Texas, 2009-2010. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level approximately 3 feet above full pool at time of electrofishing and trap netting, and 1 foot above full pool during gill netting.