

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-31

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2005 Survey Report

Caddo Lake

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Caddo Lake (Texas side only) were surveyed in 2005 using electrofishing and in 2006 using trap nets and gill nets. An angler creel survey and economic assessment of the fishery was conducted from June 2002 to May 2003. 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 natural lake 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 invasive species waterhyacinth and hydrilla.
- **Management history:** Important sport fish include largemouth bass, bluegill, redear sunfish, and crappie. The management plan from the 2001 survey report included the need for aquatic vegetation monitoring strategies, unified fish harvest regulations between Texas and Louisiana, largemouth bass genetic monitoring and supplemental stocking when appropriate, economic assessment of the Caddo Lake fishery, and the formulation of a multi-agency task force to protect this important resource. Largemouth bass were managed with 14- to 18-inch slot-length limit. Florida largemouth bass stocking was requested for 2006 and 2007. Annual efforts to control waterhyacinth coverage 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 higher in 2005 than previous surveys, and many of these fish were available as prey to most sport fish.
 - **Catfishes:** The channel catfish population has many fish above legal size and provides good angling opportunities. Gill net catch rates of flathead catfish were higher in 2006 than in previous surveys.
 - **Temperate basses:** Gill net catch rates of white bass in Caddo Lake were low, but similar to previous years, probably due to the limited open-water habitat available on the Texas side of the lake. No palmetto bass were collected in the 2006 gill net sample. Palmetto bass were never stocked in Caddo Lake, but they have been collected during previous gill net surveys, presumably from upstream stocking in Lake O' the Pines.
 - **Largemouth bass:** Largemouth bass were relatively abundant. Size structure was good, and fish had excellent body condition. Nearly 50% of all anglers at Caddo Lake fished for largemouth bass during a 2002-2003 creel survey.
 - **Crappie:** Experimental spring trap netting for crappie during the spawning season did not result in expected higher catch rates. However, both black and white crappie were collected.
- **Management Strategies:** Conduct electrofishing survey in 2007, aquatic vegetation surveys annually from 2006-2009, and general monitoring with trap nets and electrofishing surveys in 2009 and gill netting in 2010. Stock Florida largemouth bass in 2007 and reassess population genetics in 2010. Continue to assist Caddo Lake Stakeholders with nuisance aquatic vegetation management strategies as part of their development of a Watershed Protection Plan for the Cypress Basin.

INTRODUCTION

This document is a summary of fisheries data collected from Caddo Lake in 2005-2006, 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 is presented with the 2005-2006 data for comparison.

Reservoir Description

Caddo Lake is a 27,472-acre natural lake 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. Annual water level fluctuations are 1-3 ft (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 2005 revealed 1,700 acres of waterhyacinth, 2,500 acres of hydrilla, and 3,600 acres of American lotus. All hydrilla was located within stands of American lotus or in areas of waterhyacinth infestation. Waterhyacinth continues 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 (Ryan and Brice 2002) included:

1. Continue to survey aquatic vegetation, conduct maintenance spraying of waterhyacinth, maintain signage at boat ramps and marinas regarding exotic plants, and to 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 other major plant species since 2001. The TPWD Aquatic Habitat Enhancement crew has conducted annual spraying of waterhyacinth to maintain access in the WMA, boat roads, and along residential properties. Boat ramps and marinas have been periodically inspected for appropriate signage pertaining to exotic plants, as well as fish harvest regulations and contaminant advisories. TPWD has recently joined a group of stakeholders that has begun the process of developing a Watershed Protection Plan for the Cypress Creek Basin as a strategy to protect Caddo Lake. The plan is intended to address a wide variety of concerns including, nuisance aquatic vegetation management, excessive nutrient input, and water flow regimes. The plan will include grant writing efforts to access Environmental Protection Agency funds to accomplish portions of the plan.

2. Unify fish harvest regulations between Texas and Louisiana.

Action: Little has been accomplished to unify harvest regulations between Texas and Louisiana. Efforts will be continued in the future to address this issue.

3. Monitor effects of Florida largemouth bass stockings.

Action: Genetic analysis of a sample of age-0 largemouth bass from the fall 2005 electrofishing survey indicated that the percentage of pure Florida genotypes was below the target of 20% for trophy fish management. Therefore, Florida largemouth bass stocking was requested for 2006 and 2007 at a rate 25 fish/acre to attempt to increase the percentage of pure Florida largemouth bass in the population. The lake was stocked with 500,582 Florida largemouth bass fingerlings (18 fish/acre) from the Texas Freshwater Fisheries Center in Athens, TX in 2006 to meet the first year of this two-year supplemental stocking.

4. Conduct economic assessment of the Caddo Lake fishery in 2002-2003.

Action: The economic assessment was conducted in conjunction with an angler creel survey on both the Texas and Louisiana side of the lake (Bradle 2005).

5. 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 have been 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 scheduled to be stocked in 2006 and 2007. 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 waterhyacinth and hydrilla. Alligatorweed and East Indian hygrophylla, although present, have yet to cause any serious problems. In addition to the exotic species mentioned, American lotus, a native species, has reached problematic proportions in many areas. The vegetation survey conducted in summer 2005 (Table 4, Figure 2) estimated the 3 dominant species on the Texas side of the lake were waterhyacinth (1,700 acres), hydrilla (2,500 acres), and American lotus (3,600 acres).

The most problematic aquatic vegetation species on Caddo Lake is waterhyacinth. 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. Waterhyacinth may be expected to be problematic on Caddo Lake for many years, perhaps forever.

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.

METHODS

Data were collected 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), and a roving angler creel survey from 1 June 2002 to 31 May 2003 on 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). Electrofishing and gill netting sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Spring trap netting was conducted to determine if sampling crappie during the spawning season increased catch rates compared to standard fall sampling.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], 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 ($RSE = 100 \times SE \text{ of the estimate/estimate}$) 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 14 fish 13.6-14.9 inches and from 13 channel catfish 11.8-13.5 inches. Source for water level data was the United States Army Corps of Engineers website (Fort Worth, Texas office).

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of inundated bald cypress trees, native submersed vegetation, and submersed and floating non-native aquatic vegetation (Table 4, Figure 2). Coverage of dominant plant species was estimated. 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 2002 through May 2003 encompassed both the Texas and Louisiana portions of the lake. Therefore, results from this survey are not comparable to previous surveys conducted only on the Texas side. However, previous survey results can be found in Ryan and Brice (2002). Directed fishing effort by anglers was highest for black bass (47%), followed by anglers fishing for sunfishes and those fishing for anything (Table 5). Total fishing effort for all species at Caddo Lake was 303,369 h from June 2002 to May 2003, and anglers spent an estimated \$1,119,841 on direct expenditures (Table 6).

Prey species: Electrofishing catch rates of bluegill and gizzard shad were 277.5/h and 92.5/h, respectively. Index of vulnerability (IOV) for gizzard shad was good, indicating that 64% of gizzard shad were available to existing predators; this was higher than IOV estimates in previous years (Figure 3). Total CPUE of gizzard shad was considerably higher in 2005 compared to the 2001 survey (Figure 3). Total CPUE of bluegill in 2005 was higher than total CPUE from surveys in 2001 but similar to that in 1998. However, because electrofishing was conducted at randomly-selected stations in 2005, direct comparisons to previous years were not possible. The size structure of bluegill continued to be dominated by small individuals (Figure 7). However, bluegill and redear sunfish were present at larger sizes and available to anglers (Figure 7; Figure 8). Directed effort for sunfish accounted for over 20% of total fishing effort (Table 8). Harvested sunfish ranged from 4-10 inches (Figure 9).

Catfish: The gill net catch rate of channel catfish was 5.3/nn in 2006. The channel catfish population continued to have moderate relative abundance with larger fish available to anglers (Figure 4). 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). Poor recruitment may have been a result of excessive submersed aquatic vegetation in 2005. The gill net catch rate of flathead catfish was 1.1/nn in 2006, which was much higher than previous surveys. These fish provide an additional opportunity for catfish anglers in addition to channel catfish (Figure 5). Directed fishing effort, catch per hour, and total harvest for channel catfish showed a minimal catfish fishery (Table 7). Harvested fish ranged in length from 8 to 18 inches (Figure 6).

White bass: The gill net catch rate of white bass was 1.2/nn in 2006. Catch rates indicated that white bass continue to be present in the reservoir, but lack of preferred open-water habitat likely limits their numbers (Figure 10). Directed fishing effort for Morone species was only 1.4% of total fishing effort from June 2002 to May 2003. Catch per hour for all Morones was 0.79 fish/h and harvest was dominated by yellow bass (Table 9). Harvested fish ranged in length from 7 to 16 inches (Figure 11).

Largemouth bass: The electrofishing catch rate of stock-length largemouth bass was 51.0/h in 2005, which was the same as the catch in 2004. Population size structure was good. PSD was 41 in 2005 and 65 in 2004. This decrease was a result of the increase of 8 to 10-inch fish in the electrofishing sample (Figure 12). Growth of largemouth bass in Caddo Lake was moderate. Average age at 14 inches (13.6-14.9 inches) was 3.4 years (N = 14; range = 2 – 5 years). Body condition in 2005 was good (Wr above 95) for most size classes of fish (Figure 12). Data from previous surveys conducted at subjective sampling sites are shown in Figure 13. Directed fishing effort, catch per hour, and total harvest for black bass was 141,532 h, 0.67 fish/h, and 26,724 fish, respectively, from June 2002 through May 2003 (Table 10). Throughout the survey 74% of legal-size fish caught were released (Table 10). There was good compliance with harvest regulations during the survey period (Figure 14). Florida largemouth bass influence has remained relatively constant as Florida alleles have ranged from 33% to 45% since 2001 and Florida genotype has ranged from 2% to 10% (Table 11).

Crappie: Because experimental spring trap netting was conducted in 2006 in an attempt to increase catch rates by sampling during the spawning season, data were not comparable to previous samples. Trap net catch rates for white and black crappie were 1.1/nn and 1.2/nn, respectively. These catch rates

were not as high as expected. Body condition for both species was adequate (W_r above 90) for most size classes (Figure 15, Figure16). Directed fishing effort for crappie was 11.4% of total fishing effort from June 2002 to May 2003. Total catch per hour and total harvest was 2.88 fish/h and 85,082 fish, respectively (Table 12). Harvested fish ranged in size from 6 to 15 inches (Figure 17). Angler compliance could not be assessed because creels were conducted on both the Texas and Louisiana sides of the lake. Louisiana does not regulate the harvest of crappie with a minimum length limit.

Fisheries management plan for Caddo Lake, Texas

Prepared – July 2006

ISSUE 1: Caddo Lake continues to experience problems associated with excessive growth of aquatic vegetation, especially waterhyacinth and hydrilla. Annual herbicide applications to control waterhyacinth 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, waterhyacinth is being controlled through efforts from the Cypress Valley Navigation District (CVND) and the Greater Caddo Lake Association. Recently, a group of stakeholders has begun the process of developing a Watershed Protection Plan for the Cypress Creek Basin as a strategy to protect Caddo Lake. This plan will address many issues of concern regarding the watershed as well as Caddo Lake. One of the primary concerns is the management of nuisance aquatic vegetation. This process has the potential to access the long-term funding necessary to support the intensive management of invasive aquatic plants in Caddo Lake.

MANAGEMENT STRATEGY

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. Seek opportunities to meet with representatives from the Louisiana Department of Wildlife and Fisheries to develop and unify harvest regulations and consolidate management plans for Caddo Lake.

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 has also contributed to the development of this trophy fishery. Approximately 50 largemouth bass ≥ 8 pounds were entered into the Bass Life Associates (BLA) Trophy Replica Program during 1995. The current lake record largemouth bass is 16.01 pounds, set in 1992. Even though there was 33% influence from Florida largemouth bass in the genetic sample taken in 2005, only 2% of fish in the sample were pure Florida Largemouth bass. Supplemental stocking of Florida largemouth bass is necessary to achieve a benchmark of 20% pure Florida largemouth bass for trophy fish management objectives.

MANAGEMENT STRATEGIES

1. Stock Florida largemouth bass at 25 fish/acre in 2006 and 2007.
2. Conduct genetic analysis of age-0 largemouth bass (N = 60) in 2010 to evaluate the need for additional stocking.
3. Conduct a standard electrofishing survey during fall 2007 to monitor largemouth bass and prey species populations.

ISSUE 4: Anglers and stakeholders need to be informed about fisheries management activities, fishing opportunities, and other issues on Caddo Lake.

MANAGEMENT STRATEGIES

1. Continue to provide news releases to the print and broadcast media.
2. Continue to provide fisheries presentations to fishing clubs, stakeholder organizations, and children.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual aquatic vegetation surveys, a supplemental electrofishing survey in 2007, an angler creel survey from June 2009 through May 2010, largemouth bass genetic analyses in 2009, and required monitoring surveys in 2009/2010 (Table 13). Annual vegetation surveys are necessary to monitor coverage of nuisance species and to provide information to Caddo Lake stakeholders. A supplemental electrofishing survey in 2007 is necessary to maintain consistent data for trend information on this trophy largemouth bass fishery. The annual angler creel survey in 2009/2010 will characterize directed effort on the lake as well as estimate catch and harvest rates for angler-targeted species. Genetic analysis of the age-0 largemouth bass in 2009 will evaluate the effectiveness of supplemental Florida largemouth bass stocking in 2006 and 2007 and determine the necessity for additional stocking in 2011 and 2012. Gill net 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 2009 to determine the presence or absence of white and black crappie. An angler access and facilities survey is needed once every 4 years.

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Monthly Water Level

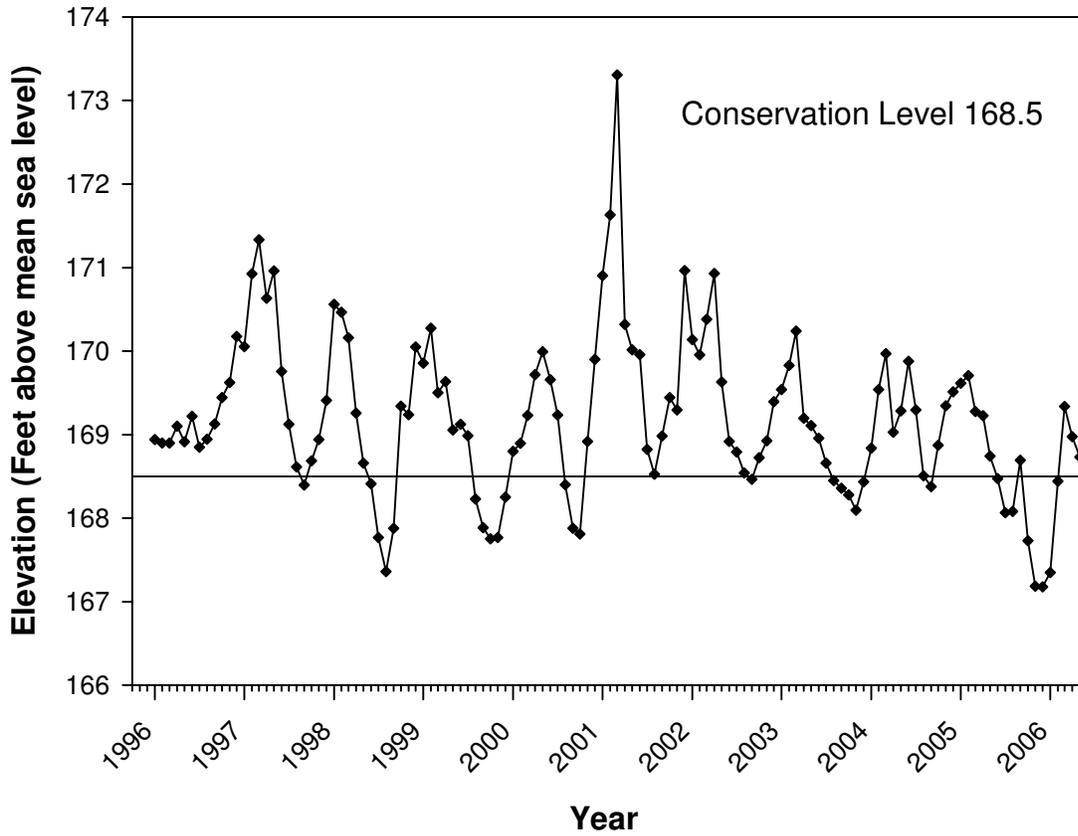


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Caddo Lake, Texas.

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	151 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 Hwy. 43 bridge. Harvest regulations for the Louisiana side of Caddo Lake are published at <http://www.wlf.state.la.us/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 ^a	14 - 18
Bass: spotted	5 ^a	No Limit - No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

^a 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
Total	5,639,503		
Paddlefish	1992	12,970	
	1994	2,460	
	1998	12,254	
	Total	27,684	

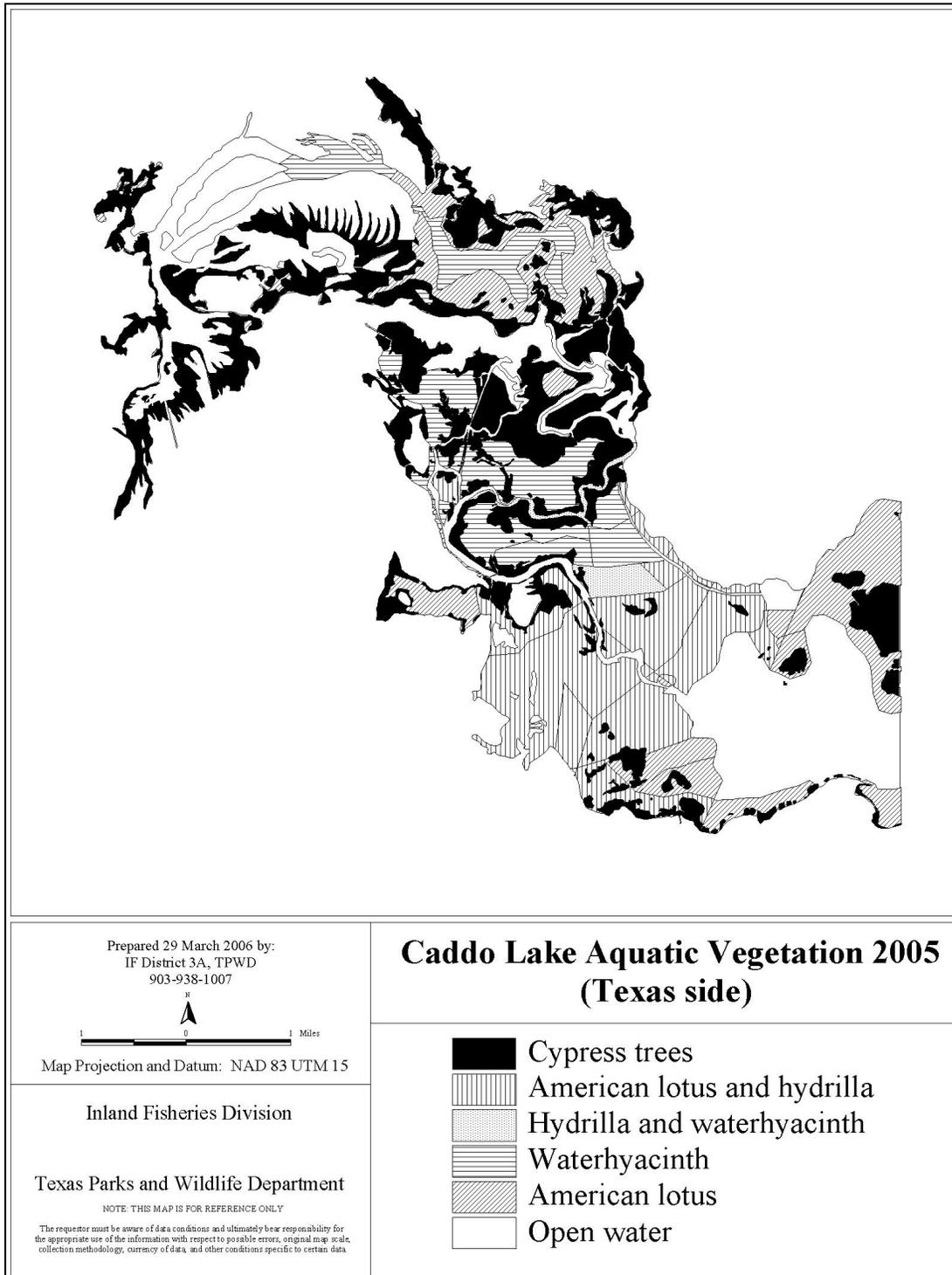


Figure 2. Results of 2005 summer survey of aquatic vegetation in Caddo Lake (Texas side only). Only the dominant species are represented on this map.

Table 4. Survey of aquatic vegetation, Caddo Lake, Texas, 2005. Surface area (acres) and percent of reservoir surface area was determined for dominant aquatic vegetation species. The survey was conducted on the Texas side only, percentages are based on 10,800 acres. Hydrilla always occurred in combination with other species, primarily American lotus.

Species	Acres	Percent of reservoir surface area
American lotus	3,600	33
Waterhyacinth	1,700	16
Hydrilla	2,500	23

Table 5. Percent directed angler effort by species for Caddo Lake, Texas, 2002–2003.

Species/Group	Percent directed effort
Black bass	46.7
Sunfishes	21.9
Anything	16.9
Crappie	11.4
Catfish	1.6
Morone species	1.4
Chain pickerel	0.1

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

Creel statistic	2002/2003
Total fishing effort (h)	303,369
Total directed expenditures	\$1,119,841

Gizzard Shad

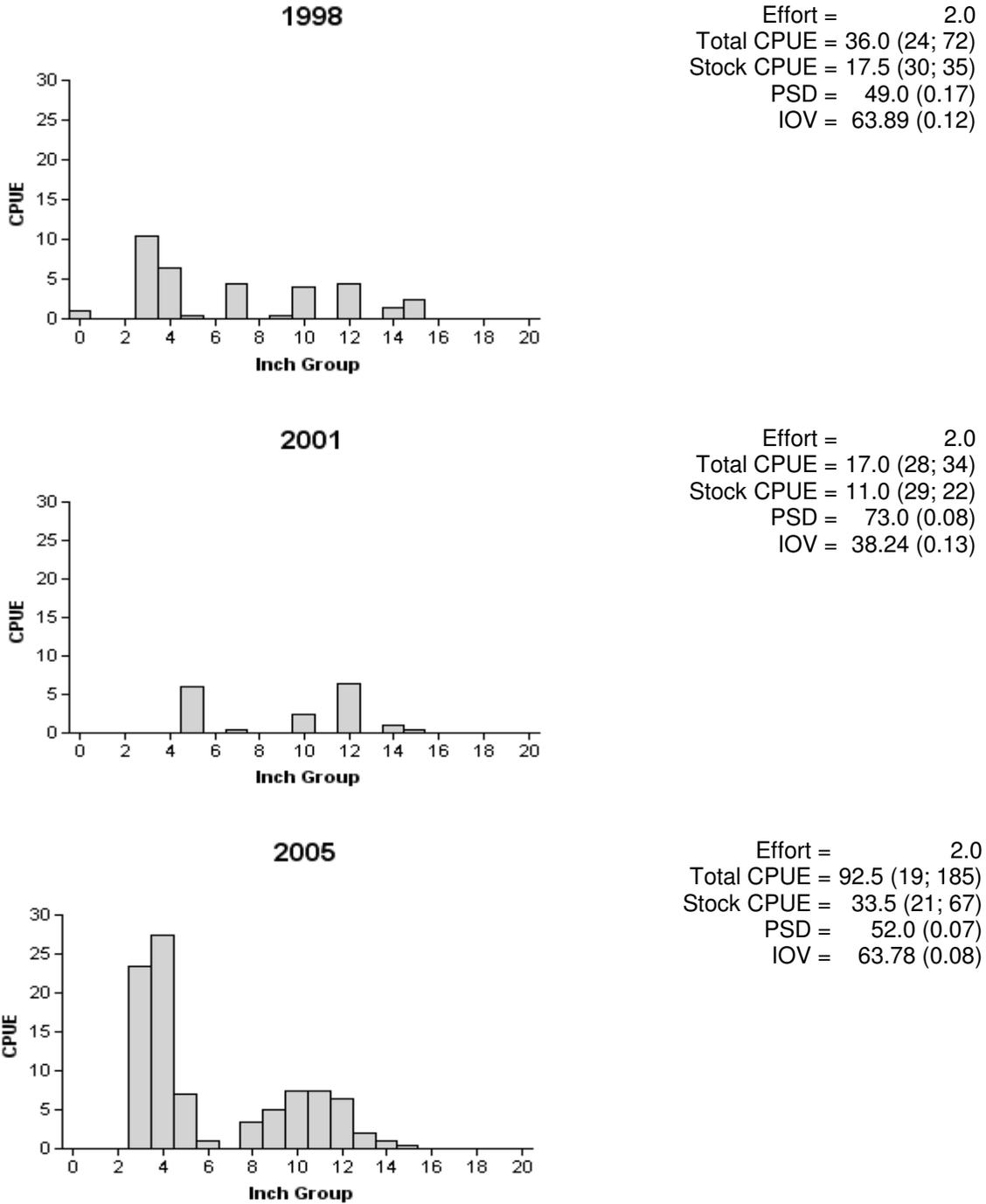


Figure 3. Number of gizzard shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for PSD and IOV are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 1998, 2001, and 2005. Sampling in 2005 was conducted at randomly-selected stations.

Channel Catfish

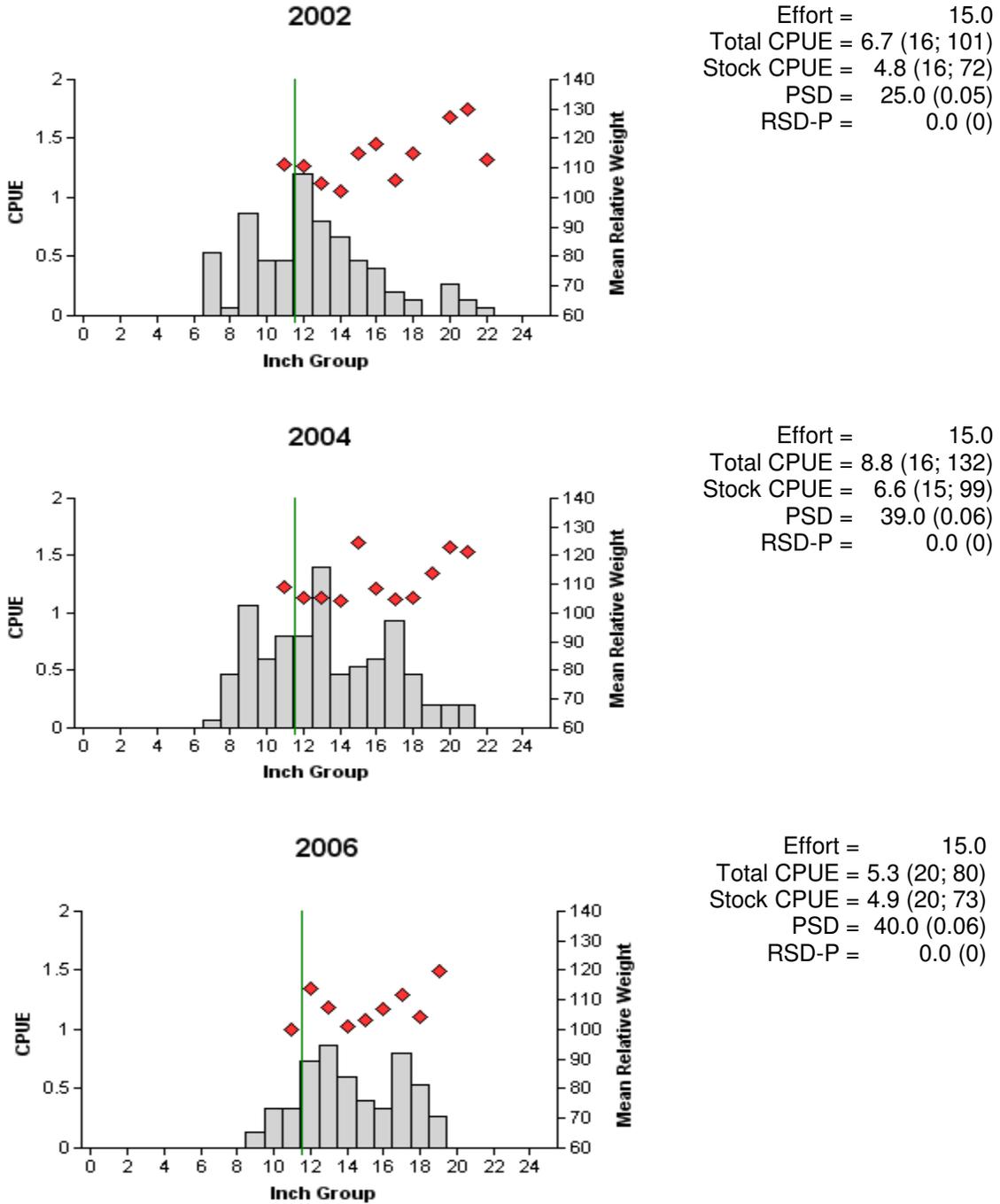


Figure 4. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Caddo Lake, Texas, 2002, 2004, and 2006. Vertical line indicates minimum legal length.

Flathead Catfish

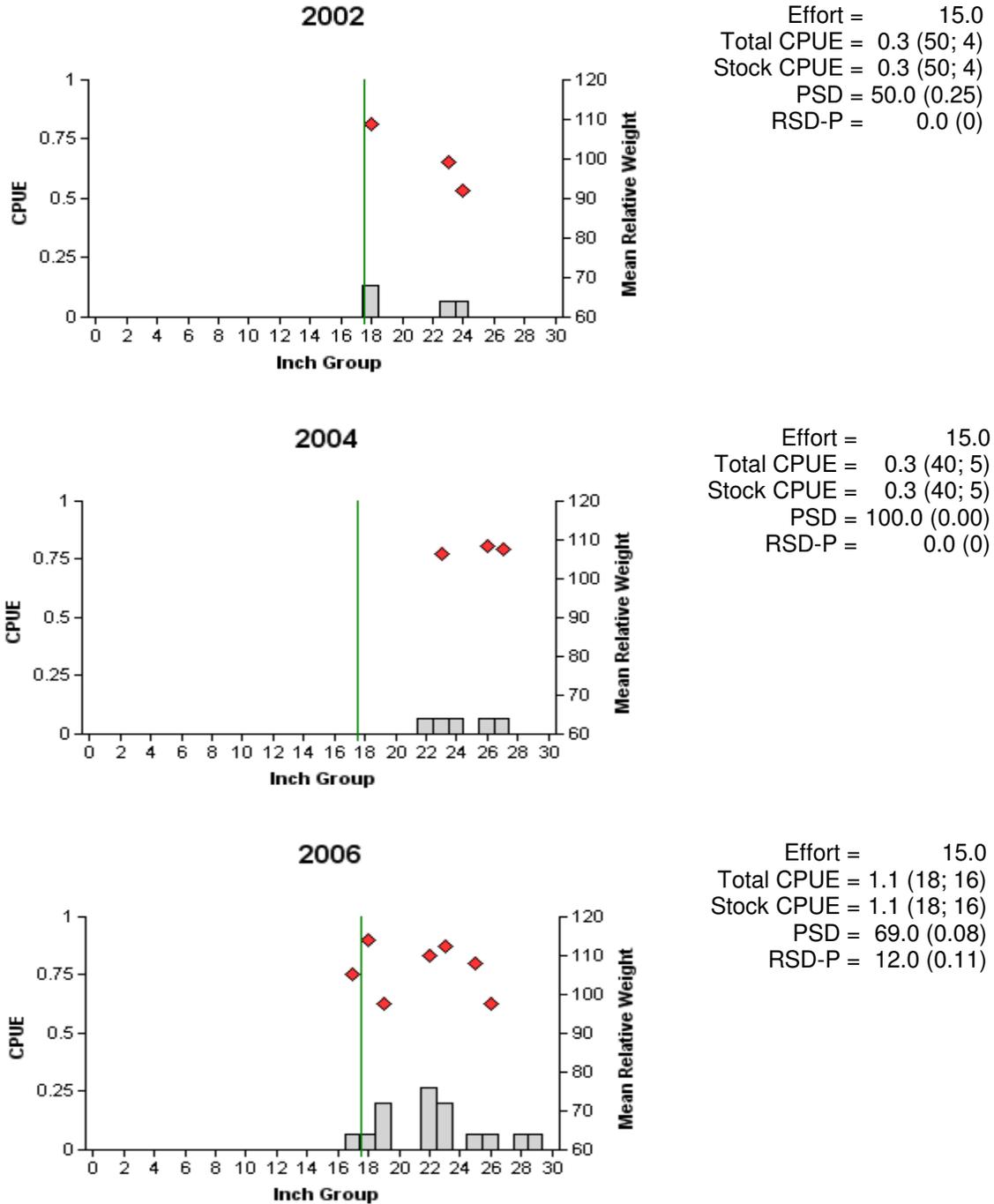


Figure 5. Number of flathead catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Caddo Lake, Texas, 2002, 2004, and 2006. Vertical line indicates minimum legal length.

Catfish

Table 7. Creel survey statistics for catfish at Caddo Lake from June 2002 through May 2003, 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
Directed effort (h)	4,743 (51)
Directed effort/acre	0.17 (51)
Total catch per hour	0.36 (0)
Total harvest	22,055 (90)
Harvest/acre	0.80 (90)
Percent legal released	20

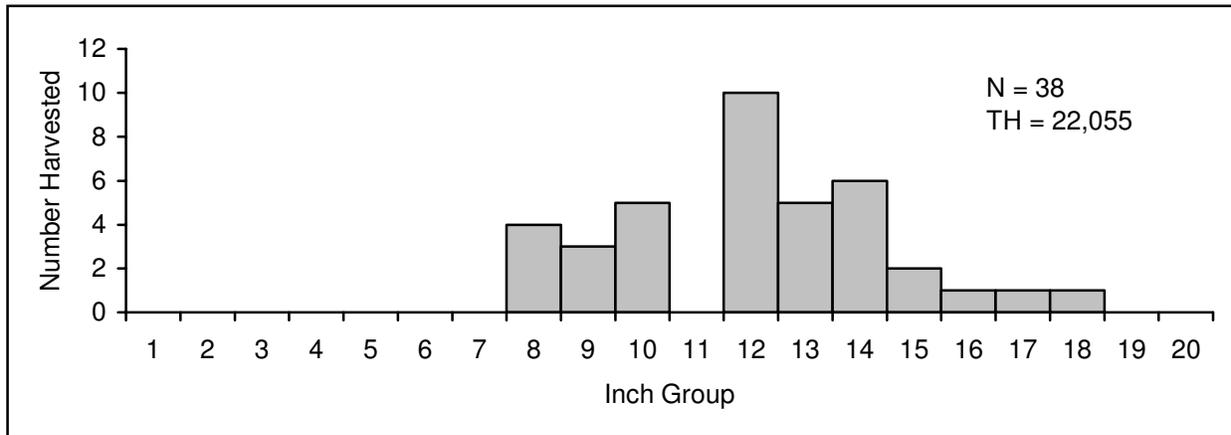


Figure 6. Length frequency of harvested channel catfish observed during creel surveys at Caddo Lake, Texas/Louisiana, June 2002 through May 2003, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Bluegill

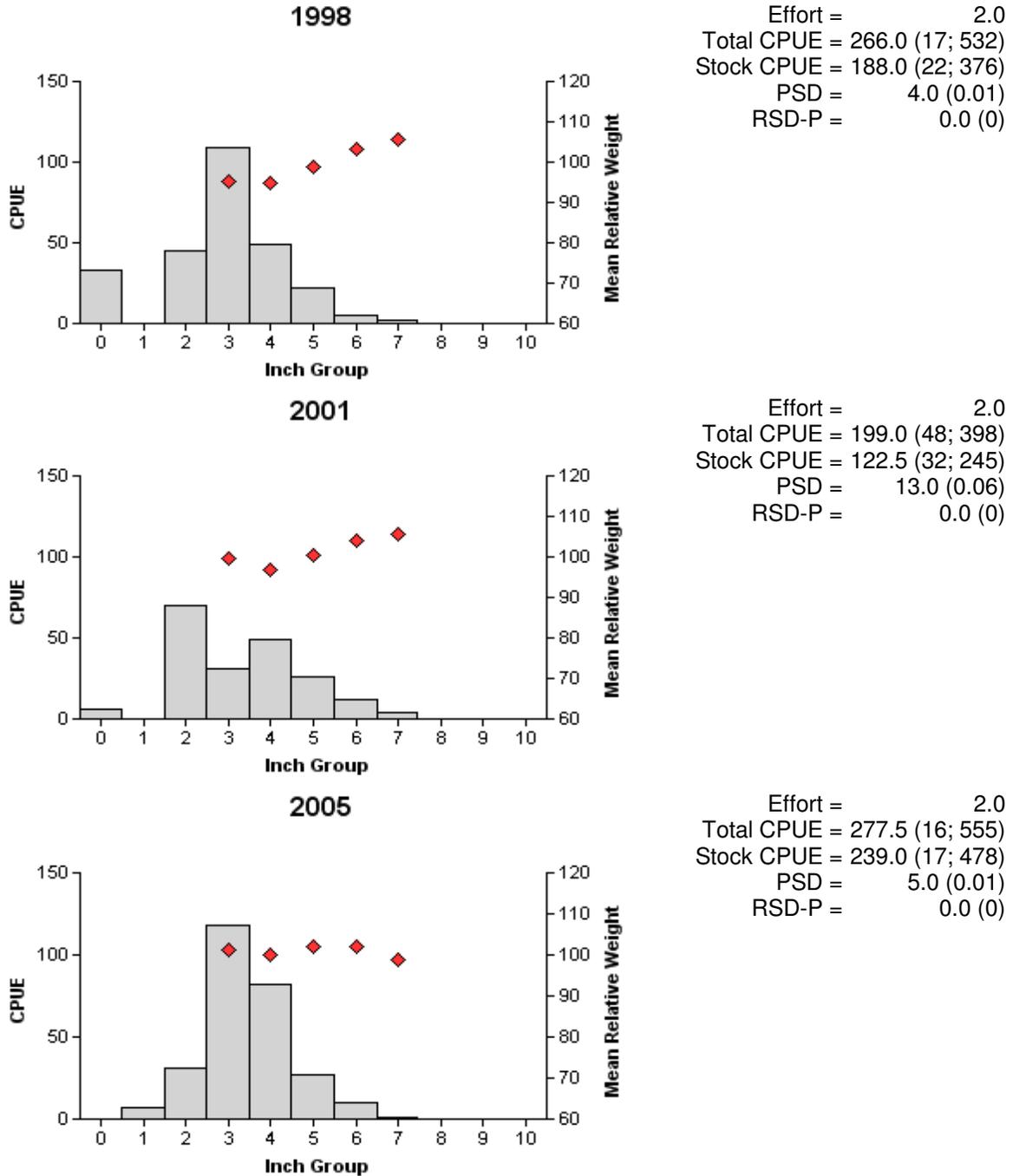


Figure 7. Number of bluegill caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 1998, 2001, and 2005. Sampling in 2005 was conducted at randomly-selected stations.

Redear Sunfish

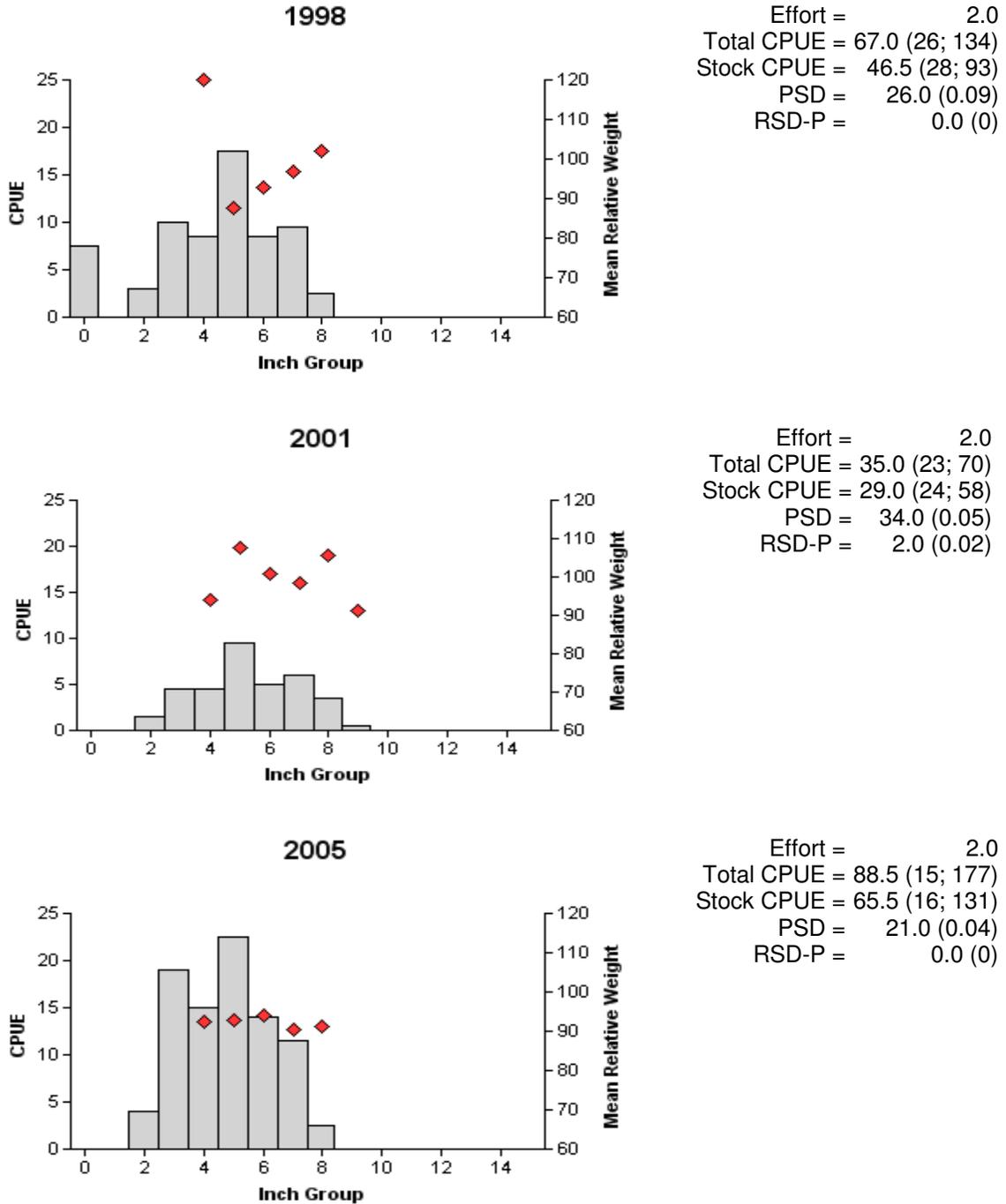


Figure 8. Number of redear sunfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 1998, 2001, and 2005. Sampling in 2005 was conducted at randomly-selected stations.

Sunfishes

Table 8. Creel survey statistics for sunfishes at Caddo Lake, Texas from June 2002 through May 2003 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
Directed effort (h)	66,658 (22)
Directed effort/acre	2.43 (22)
Total catch per hour	8.57 (34)
Total harvest	327,860 (54)
Sunfish (unidentified)	91,153 (44)
Warmouth	6,879 (298)
Bluegill	190,699 (40)
Longear sunfish	414 (1,674)
Redear sunfish	37,887 (65)
Spotted sunfish	828 (1,182)
Harvest/acre (Total)	12 (54)
Percent legal released	53

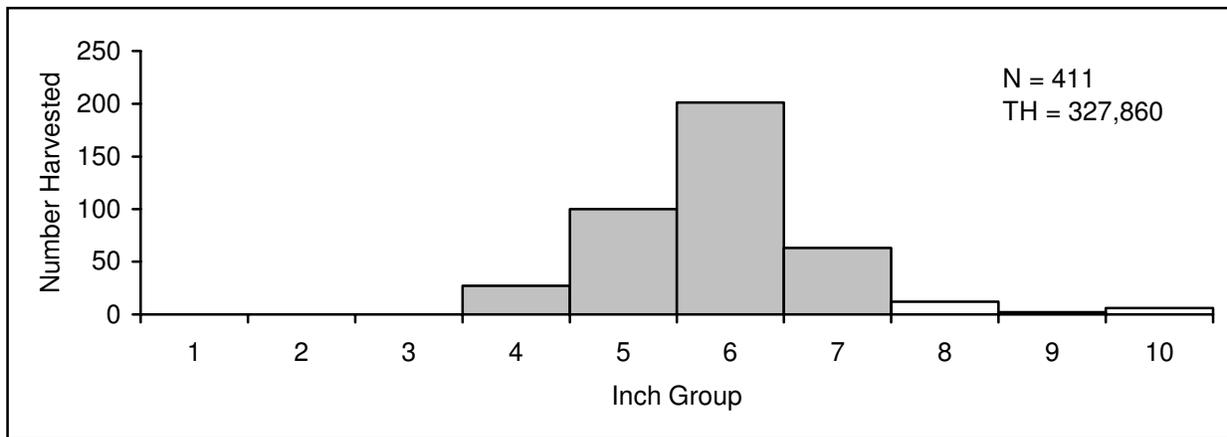
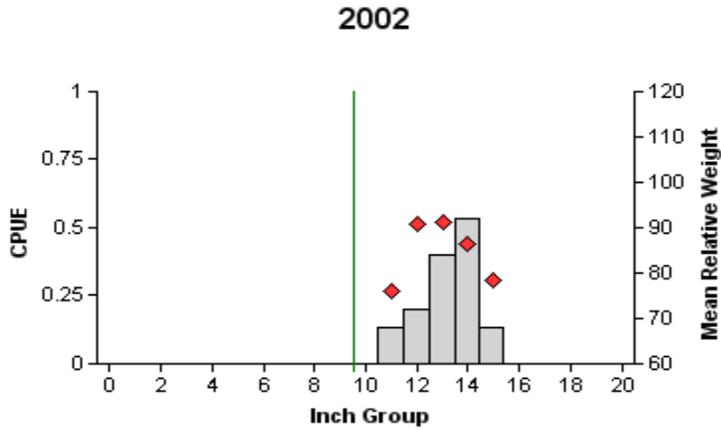
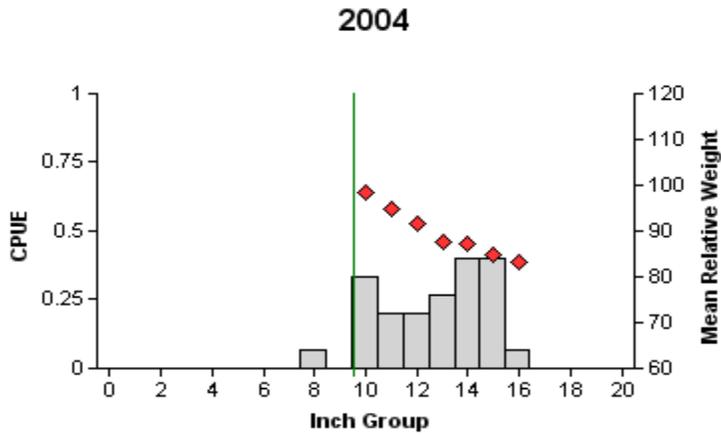


Figure 9. Length frequency of harvested sunfish (all species combined) observed during creel surveys at Caddo Lake, Texas/Louisiana June 2002 through May 2003, all anglers combined. N is the number of harvested sunfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

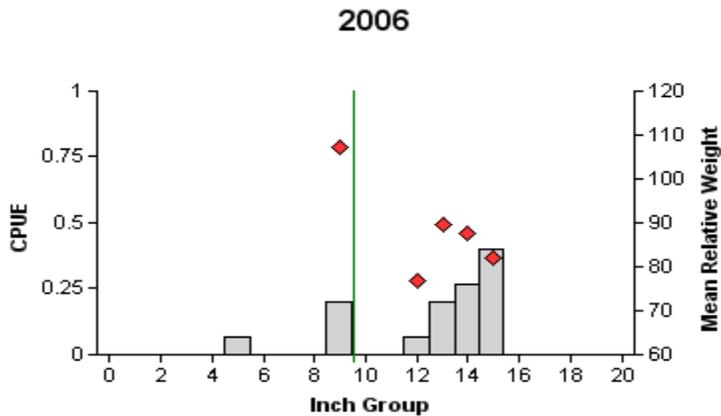
White Bass



Effort = 15.0
 Total CPUE = 1.4 (19; 21)
 Stock CPUE = 1.4 (19; 21)
 PSD = 100.0 (0)
 RSD-P = 90.0 (0.06)



Effort = 15.0
 Total CPUE = 1.9 (34; 29)
 Stock CPUE = 1.9 (34; 29)
 PSD = 97.0 (0.04)
 RSD-P = 69.0 (0.07)



Effort = 15.0
 Total CPUE = 1.2 (17; 18)
 Stock CPUE = 1.1 (19; 17)
 PSD = 100.0 (0)
 RSD-P = 82.0 (0.12)

Figure 10. 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, 2002, 2004, and 2006. Vertical line indicates minimum legal length.

Morones

Table 9. Creel survey statistics for *Morone* species at Caddo Lake from June 2002 through May 2003, where total catch per hour is for anglers targeting *Morone* species and total harvest is the estimated number of *Morones* harvested by all anglers. Relative standard errors (RSE) are in parentheses

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

^a Catch per hour estimate includes yellow bass.

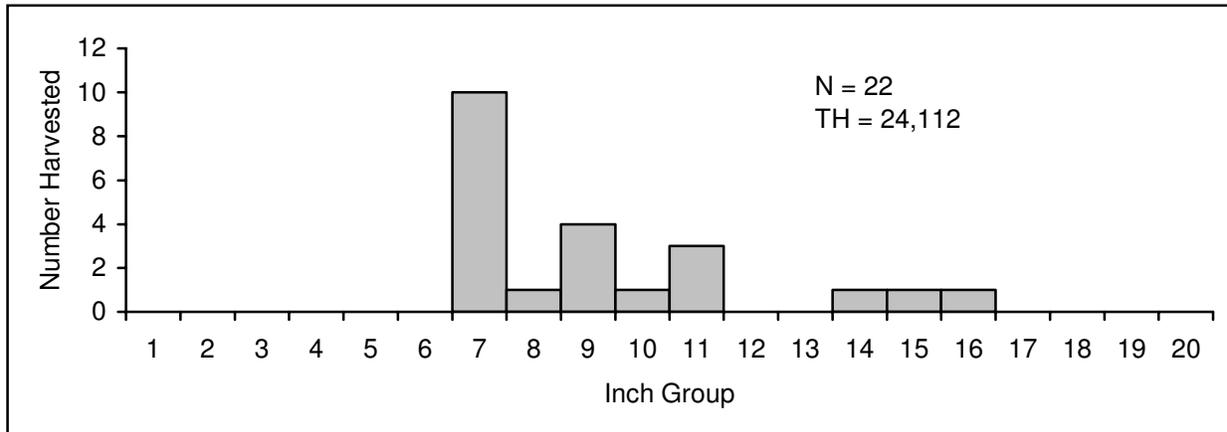
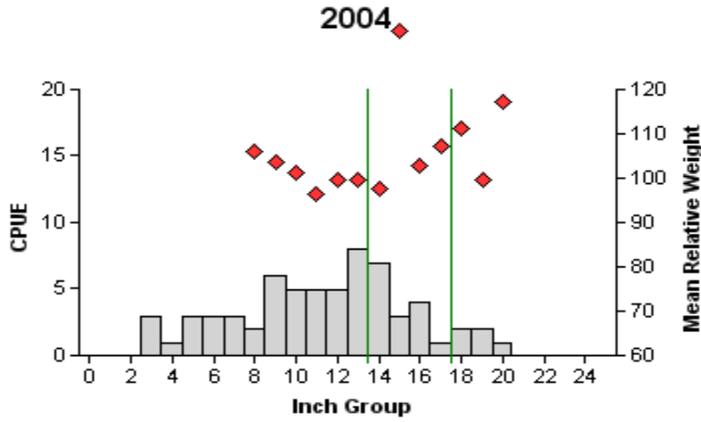
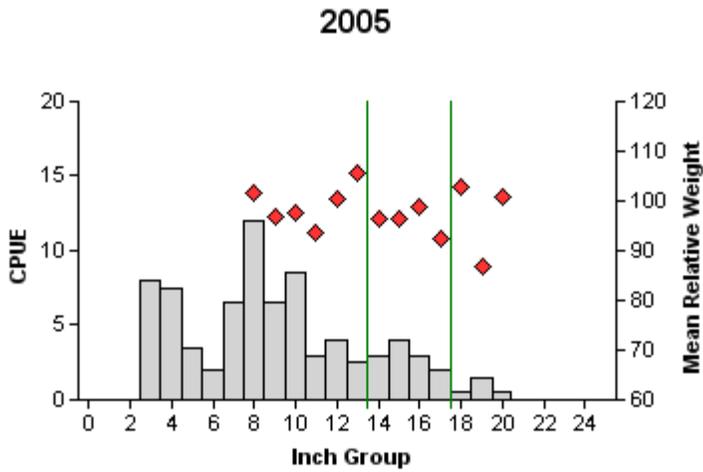


Figure 11. Length frequency of harvested *Morone* species observed during creel surveys at Caddo Lake, Texas/Louisiana, June 2002 through May 2003, all anglers combined. N is the number of harvested *Morones* observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass



Effort = 1.0
 Total CPUE = 64.0 (19; 64)
 Stock CPUE = 51.0 (25; 51)
 PSD = 65.0 (0.08)
 RSD-P = 25.0 (0.1)



Effort = 2.0
 Total CPUE = 78.5 (10; 157)
 Stock CPUE = 51.0 (13; 102)
 PSD = 41.0 (0.08)
 RSD-P = 23.0 (0.04)

Figure 12. 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, 2004 and 2005. Sampling was conducted at randomly-selected stations. Vertical lines indicate slot length limit.

Largemouth Bass

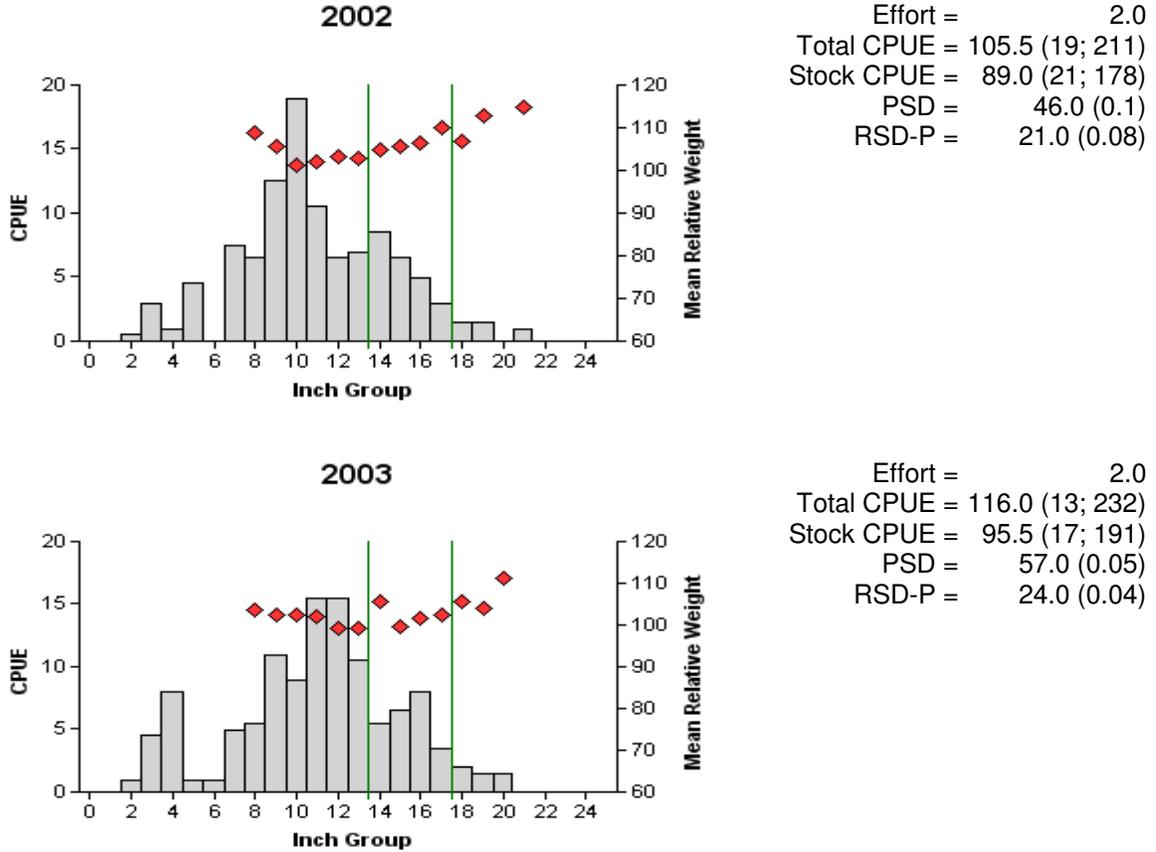


Figure 13. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Caddo Lake, Texas, 2002 and 2003. Sampling was conducted at fixed biologist-selected stations. Vertical lines indicate slot length limit.

Black Bass

Table 10. Creel survey statistics for black bass at Caddo Lake from June 2002 through May 2003, where total catch per hour is for anglers targeting black bass 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
Directed effort (h)	141,532 (12)
Directed effort/acre	5.72 (12)
Total catch per hour	0.67 (33)
Total harvest (all black bass)	26,724 (115)
Spotted bass	663 (1,660)
Largemouth bass	26,061 (76)
Harvest/acre (Total)	1.08 (115)
Percent legal released	74

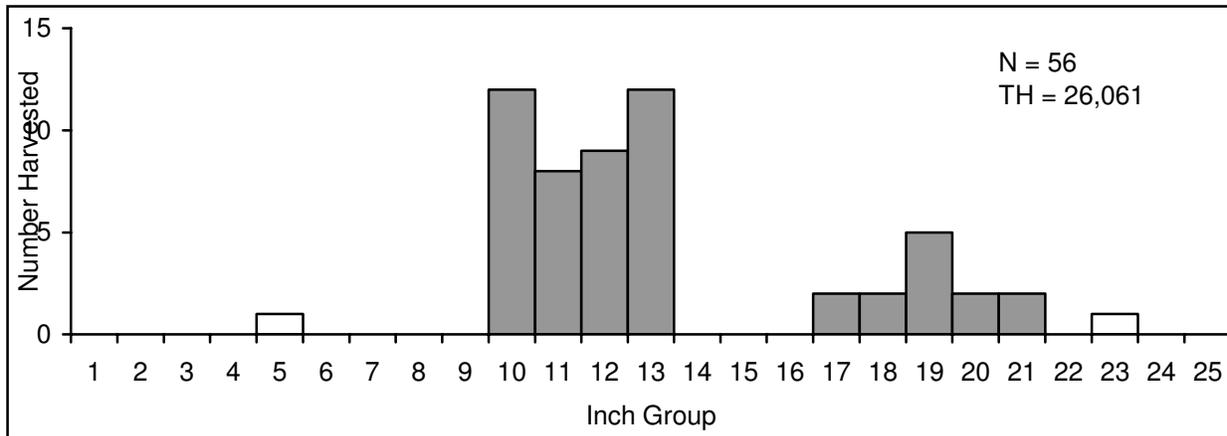


Figure 14. Length frequency of harvested largemouth bass observed during creel surveys at Caddo Lake, Texas/Louisiana, June 2002 through May 2003, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest of largemouth bass for the creel period.

Table 11. Results of genetic analysis of age-0 largemouth bass collected by fall electrofishing, Caddo Lake, Texas, 2001, 2002, 2003, and 2005. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

Year	Sample size	Genotype				% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	NLMB		
2001	31	1	11	13	6	41.1	3.2
2002	31	3	11	14	3	38.9	9.7
2003	60	4	13	36	7	45.0	5.8
2005	62	1	1	52	7	33.1	2.0

White Crappie

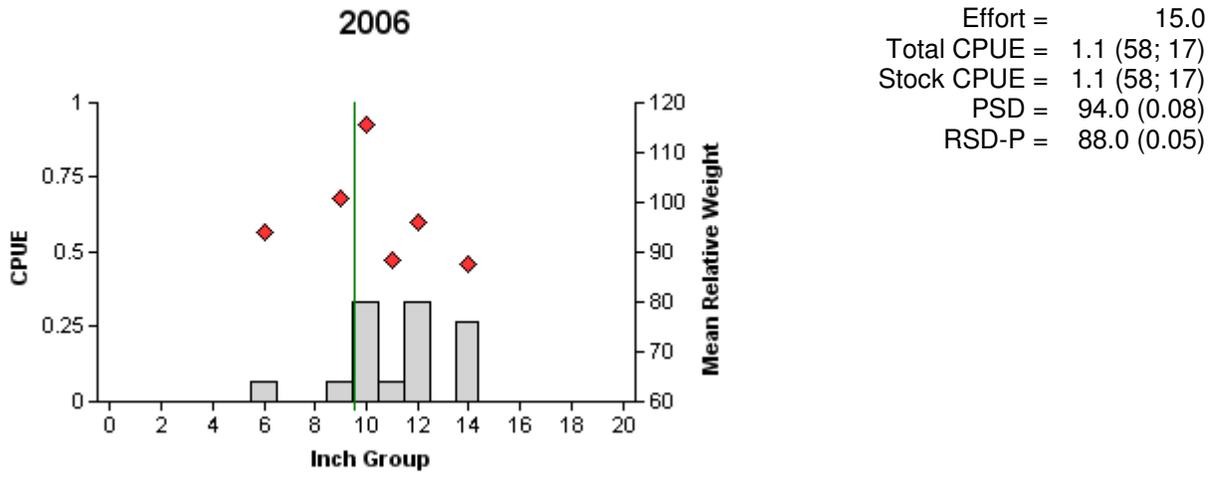


Figure 15. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring trap net surveys, Caddo Lake, Texas, 2006. Vertical line indicates minimum legal length.

Black Crappie

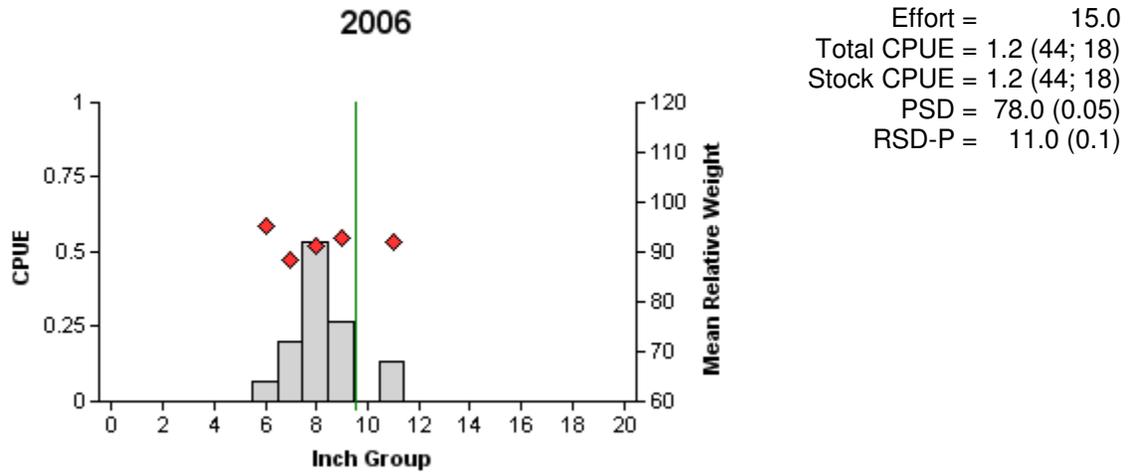


Figure 16. Number of black crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring trap net surveys, Caddo Lake, Texas, 2006. Vertical line indicates minimum legal length.

Crappie

Table 12. Creel survey statistics for black and white crappie at Caddo Lake from June 2002 through May 2003, 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
Directed effort (h)	34,680 (22)
Directed effort/acre	1.40 (22)
Total catch per hour	2.88 (42)
Total harvest	85,082 (77)
Crappie (unidentified)	46,970 (39)
White crappie	31,834 (114)
Black crappie	6,279 (166)
Harvest/acre	3.44 (77)
Percent legal released	^a

^a Because Louisiana did not regulate crappie harvest with a length limit, this statistic could not be calculated.

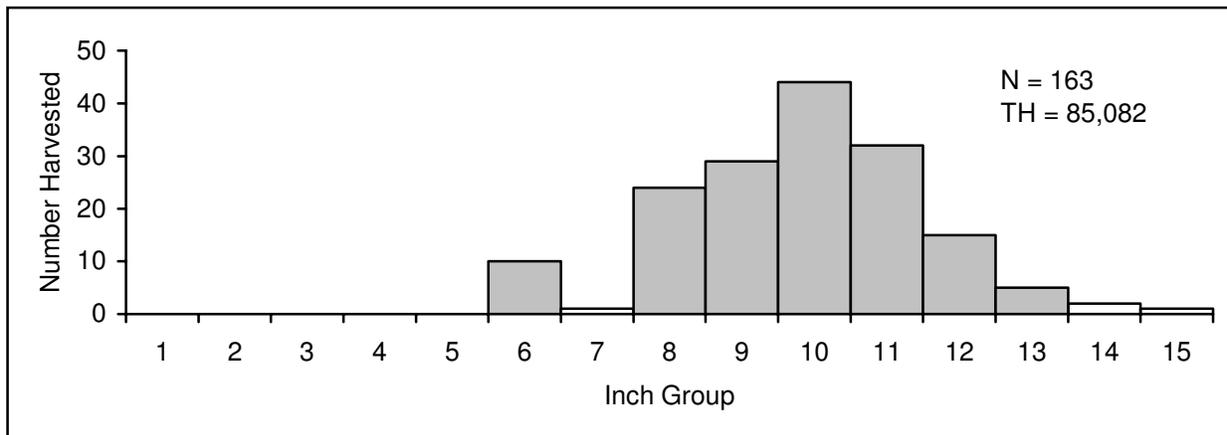


Figure 17. Length frequency of harvested crappie observed during creel surveys at Caddo Lake, Texas/Louisiana, June 2002 through May 2003, all anglers combined. N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 13. 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.

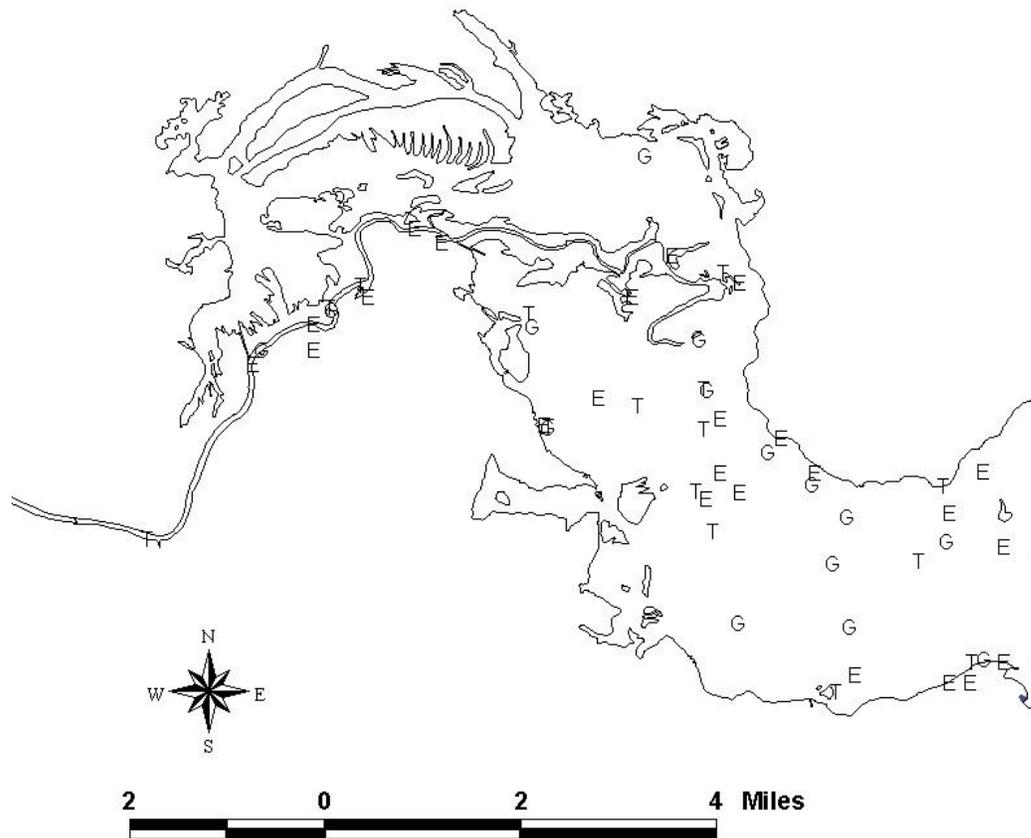
Survey Year	Vegetation	Electrofishing	Trap Net	Gill Net	Creel	Report
June 2006 - May 2007	A					
June 2007 - May 2008	A	A				
June 2008 - May 2009	A					
June 2009 - May 2010	S	S	S	S	A	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Caddo Lake, Texas, 2005-2006.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					185	92.5
Threadfin shad					131	65.5
Channel catfish	80	5.3				
Flathead catfish	16	1.1				
White bass	18	1.2				
Warmouth					21	10.5
Orange spotted sunfish					6	3.0
Bluegill					555	277.5
Longear sunfish					25	12.5
Redear sunfish					177	88.5
Spotted sunfish					8	4.0
Largemouth bass					157	78.5
Spotted bass					4	2.0
White crappie			17	1.1		
Black crappie			18	1.2		

APPENDIX B



Location of sampling sites, Caddo Lake (Texas side), Texas, 2005-2006. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level approximately 1 foot below full pool at time of electrofishing, but close to full pool during trap netting and gill netting.