

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

Gladewater City Lake

Prepared by:

Timothy J. Bister and Michael W. Brice

Inland Fisheries Division
District 3-A, Marshall, Texas



Robert L. Cook
Executive Director



Phil Durocher
Director, Inland Fisheries

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Gladewater City Lake were surveyed in 2005 using electrofishing and in 2006 using trap nets and gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Gladewater City Lake is 481-acre reservoir on Glade Creek, which was constructed in 1953 by the City of Gladewater for use as municipal and industrial water supply. Habitat features consisted of inundated timber, brush, creek channels, and riprap. The lake has a history of limited aquatic vegetation, but the latest survey indicated aquatic plants were more abundant than in previous years. Waterhyacinth, a non-native invasive plant, was detected at the reservoir in 2005.
- **Management history:** Important sport fish include largemouth bass, channel catfish, bluegill, redear sunfish, and crappie. The management plan from the 2001 survey report included the need for aquatic vegetation enhancement and the monitoring of the genetics of the largemouth bass population.
- **Fish Community**
 - **Prey species:** Threadfin shad continued to be present in the reservoir. Electrofishing catch of gizzard shad was lower than the previous survey and few fish were small enough to be available as prey to sport fish. Bluegill catch was higher in 2005 than in 2001, and many of these fish were available as prey to most sport fish. Redear sunfish serve as an additional prey source for predators and also grow to sizes desirable to anglers.
 - **Catfishes:** The channel catfish population has many fish above legal size and provides good angling opportunities. Gill net catch rates of channel catfish were lower in 2006 than in previous surveys.
 - **Temperate basses:** No white bass were collected by gill nets in 2006. This reservoir has never contained white bass, but yellow bass were present.
 - **Black basses:** Largemouth bass electrofishing catch rates were higher in 2005 than previous surveys. The average age of a 14-inch fish was 2.5 years. Largemouth bass were collected to 19 inches and body condition was good. The increase in abundance was likely due to the increase in vegetation coverage. Spotted bass abundance was also higher in 2005 than previous years. These fish provide additional angling opportunities.
 - **Crappie:** Experimental spring trap netting for crappie was conducted during the spawning season in an attempt to catch more fish than fall samples. Larger white crappie were collected, but the increase in numbers from spring trap netting was not seen. Black crappie were also present.
- **Management Strategies:** Conduct electrofishing survey in 2007 to assess largemouth bass population genetics and to collect population trend data. Conduct waterhyacinth inspections annually from 2006-2008. Conduct a 3-month angler creel survey from March-May 2009. Conduct general monitoring with trap nets, electrofishing, and aquatic vegetation surveys in 2009 and gill netting in 2010.

INTRODUCTION

This document is a summary of fisheries data collected from Gladewater City Lake in 2005-2006. 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

Gladewater City Lake is located in Upshur County on Glade Creek. It was constructed in 1953 by the City of Gladewater for use as a municipal and industrial water supply and for public recreation. Annual rainfall in the watershed averages 44.8 inches. The lake has a drainage area of approximately 35 square miles. Shoreline length is 10.7 miles with a shoreline development ratio of 2.7:1. Water level is relatively stable; average annual fluctuation is 2-3 feet (Figure 1). Structural habitat is comprised of inundated timber, brush, creek channels, and riprap (Brice and Ryan 1999). Aquatic macrophytes densities have been historically low. However, waterhyacinth was discovered in the reservoir during the 2005 vegetation survey. The upper third of the reservoir contains flooded timber and the majority of the aquatic vegetation, including the waterhyacinth. Abundant residential development exists along the lower half of the reservoir. The City of Gladewater operates a boat ramp on the reservoir and bank angling access is adequate. Other descriptive characteristics for Gladewater City 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. Develop a habitat enhancement program to increase aquatic vegetation densities in the lake.
Action: Habitat enhancement research has not been finalized and approved for use by fisheries management districts at this time. However, vegetation coverage in 2005 was estimated at almost 30%.
2. Monitor genetic composition of the largemouth bass population and stock Florida largemouth bass if electrophoresis results indicate <20% Florida largemouth bass alleles.
Action: Florida largemouth bass alleles have remained above 20%. No supplemental stocking has been required.
3. Keep anglers and other public aware of harvest regulations, fishing methods, and other fisheries-related topics.
Action: News releases have been written and sent to the Gladewater Mirror. In 2005, waterhyacinth was discovered in the upper end of the lake. District biologists met with the Gladewater City Manager and the Gladewater City Lake Advisory Board to discuss waterhyacinth management options.
4. Meet with City of Gladewater officials to recommend modifications of access and facilities to accommodate ADA needs.
Action: Upon recommendation, facilities were modified to allow wheelchair access to docks.

Harvest regulation history: Sport fishes in Gladewater City Lake are currently managed with statewide regulations (Table 2). Largemouth bass have been managed with a 14-inch minimum length and 5-fish daily bag since 1986. Other black bass were included under this regulation in 1988. The minimum length limit on spotted bass was removed in 2000, but the daily bag for black bass in any combination remains at 5 fish/day. The 12-inch minimum length limit and 25 fish daily bag for channel catfish and blue catfish (in any combination) has been in effect since 1994. The minimum length limit for flathead catfish was reduced from 24 inches to 18 inches in 1994. There is a 5-fish daily bag on flathead catfish.

Stocking history: Channel catfish were stocked from the early 1970s to the mid 1990s in order to maintain a fishable population. The population has maintained itself without stocking for the last 10 years. Florida largemouth bass were last stocked in 1992. The population has maintained sufficient Florida largemouth bass alleles to meet fisheries management objectives since then. The complete stocking history is in Table 3.

Vegetation/habitat history: Previous habitat surveys have suggested that the recruitment of sunfishes, largemouth bass, and crappie has been limited by the lack of preferred habitat. The upper end of the reservoir has had abundant spatterdock. The discovery of waterhyacinth during the 2005 aquatic vegetation survey was the first case of a non-native species present in this waterbody. Total estimated coverage of dominant plants as well as other species observed can be found in Figure 2 and Table 4.

METHODS

Data were collected by electrofishing (1 hours at 12 5-min stations), gill netting (5 net nights at 5 stations), and experimental spring trap netting (10 net nights at 10 subjectively-selected stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill and trap nets, as the number of fish per net night (fish/nn). 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 13 fish (13.2-14.6 inches) and from 7 channel catfish (11.8-14.6 inches). Source for water level data was the United States Geological Survey (USGS) website.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of Chara and spatterdock (Table 4). Coverages of dominant plant species and a list of other aquatic plants are presented in Figure 2. The relatively new infestation (< 4 years) of waterhyacinth is a cause for concern as this species can grow rapidly, restrict access to portions of the lake or boat docks, and cause water quality problems. Management options were presented to the City of Gladewater and the reservoir's advisory board for the control of waterhyacinth. They decided to pursue chemical treatment of the plant to restrict its spread in the lake. At this time it is unknown if any herbicide treatments have been conducted.

Prey species: Electrofishing catch rates of bluegill and gizzard shad were 497/h and 102/h, respectively. Index of vulnerability (IOV) for gizzard shad was poor, indicating that only 6% of gizzard shad were available to existing predators; this was lower 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 lower than 1998. The size structure of bluegill continued to be dominated by small individuals (Figure 5). However, bluegill and redear sunfish were present at larger sizes and available to anglers (Figure 5; Figure 6).

Catfish: The gill net catch rate of channel catfish was 4.8/nn in 2006, which was lower than catch rates in

2002 and 1998. However, the channel catfish population continued to have moderate relative abundance with larger fish available to anglers (Figure 4). Growth of channel catfish was fast. Average age at 12 inches (11.8-14.6 inches) was 2.0 years (N = 7; all were age 2). Body condition was excellent with mean Wr for most inch groups >100 (Figure 4).

Largemouth bass: The electrofishing catch rate of stock-length largemouth bass was 160.0/h in 2005, which was higher than 78.0/h in 2001. Population size structure was good. PSD was 46 in 2005, which was an increase from 31 in 2001. An increase in recruitment was seen in 2005 and may result in improved population size structure within the next couple of years (Figure 8). Growth of largemouth bass in Gladewater City Lake was good. Average age at 14 inches (13.2-14.6 inches) was 2.5 years (N = 13; range = 2 – 4 years). Body condition in 2005 was good (Wr above 90) for most size classes of fish (Figure 8). Florida largemouth bass influence has remained relatively constant as Florida alleles have been >20% since 1995 (Table 5). This level of Florida largemouth bass influence meets management objectives for largemouth bass management in Gladewater City Lake. The relative abundance of spotted bass has increased since 1998 (Figure 7). Electrofishing catch rate of spotted bass was 41.0/h in 2005. Even though no spotted bass were collected >13 inches, they provide an additional opportunity for anglers.

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 5.0/nn and 0.8/nn, respectively (Figure 9, Figure 10). These catch rates were not as high as anticipated.

Fisheries management plan for Gladewater City Lake, Texas

Prepared – July 2006

ISSUE 1: Waterhyacinth was discovered in Gladewater City Lake during the summer 2005 aquatic vegetation survey. This non-native floating plant can grow rapidly, restrict access to areas of the lake, and cause water quality problems. TPWD Inland Fisheries District 3A staff met with the Gladewater City Lake Advisory Board in December 2005 to present options for managing the waterhyacinth infestation. As of April 2006, plans were in place for the City of Gladewater to pursue aquatic herbicide treatment by a private applicator. Annual application of herbicide should be conducted to ensure waterhyacinth won't reach uncontrollable levels.

MANAGEMENT STRATEGY

1. Conduct annual aquatic vegetation surveys to estimate coverage of waterhyacinth, monitor trends, and to evaluate effectiveness of treatment efforts.
2. Continue to work with Gladewater city officials and the lake advisory board regarding waterhyacinth management efforts.
3. Provide signage to the City of Gladewater to post at the boat ramp to inform boaters about exotic plants and their threat to Gladewater City Lake.

ISSUE 2: Recruitment of sunfishes, black bass, and crappie may be limited by the availability of preferred habitat. Aquatic vegetation coverage was higher in 2005 than in previous years, and recruitment of fishes seems to have responded to this increase. However, increased diversity of the aquatic plant community may be more beneficial to fish populations.

MANAGEMENT STRATEGY

1. Pending results of the USACE-TPWD habitat enhancement research with aquatic plants, develop a habitat enhancement program to increase aquatic vegetation densities at Gladewater City Lake.

ISSUE 3: Florida largemouth bass influence has remained above 20% in Gladewater City Lake since their last stocking in 1995. However, continued monitoring of population genetics is necessary to ensure management objectives are met.

MANAGEMENT STRATEGIES

1. Conduct electrofishing survey in fall 2007 to assess Florida largemouth bass influence. If Florida largemouth bass alleles are <20%, request supplemental stocking for 2008 and 2009 at a rate of 100 fingerlings/acre.
2. Conduct standard electrofishing survey during fall 2007 to monitor the 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 Gladewater City Lake.

MANAGEMENT STRATEGIES

1. Continue to provide news releases to the print and broadcast media.
2. Continue to provide fisheries presentations to public regarding issues/angling opportunities at Gladewater City Lake.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual aquatic vegetation surveys, supplemental electrofishing in 2007, an angler creel survey from March 2009 through May 2009, largemouth bass genetic analyses in 2007, and required monitoring surveys in 2009/2010 (Table 6). Annual vegetation surveys are necessary to monitor coverage of waterhyacinth and to provide information to Gladewater city officials and the lake advisory board. Additional electrofishing survey in 2007 is necessary to maintain consistent data for trend information on this trophy largemouth bass fishery and to assess the genetics of the largemouth bass population. The spring angler creel survey in 2009 will characterize directed effort on the lake as well as estimate catch and harvest rates for targeted species. Gill net surveys are only necessary every four years to ensure presence or absence of channel catfish. 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.

LITERATURE CITED

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- Brice, M. W., and M. J. Ryan. 1999. Statewide freshwater fisheries monitoring and management program survey report for Gladewater City Lake, 1998. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
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Monthly Water Level

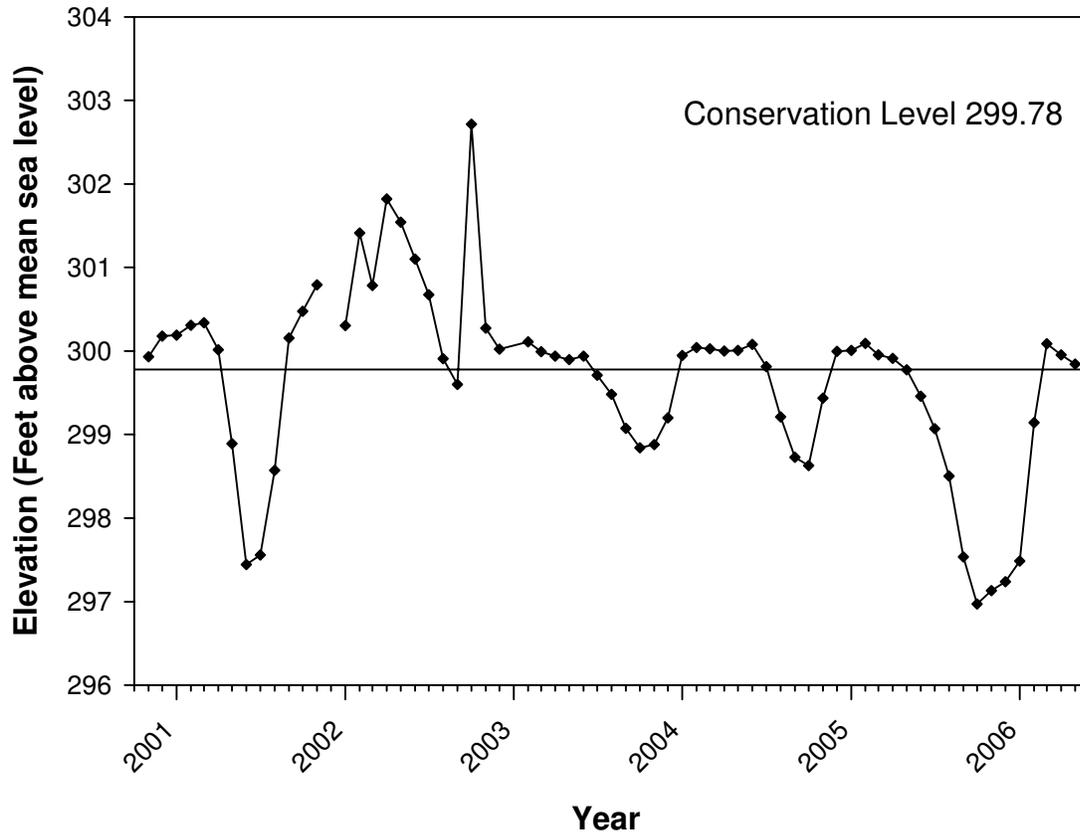


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Gladewater City Lake, Texas.

Table 1. Characteristics of Gladewater City Lake, Texas.

Characteristic	Description
Year Constructed	1953
Controlling authority	City of Gladewater
Counties	Upshur
Reservoir type	Tributary
Shoreline Development Index (SDI)	2.7
Conductivity	142 umhos/cm

Table 2. Harvest regulations for Gladewater City Lake, Texas.

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: largemouth	5 ^a	14 – No Limit
Bass: spotted	5 ^a	No Limit - No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

^a Daily bag for largemouth bass and spotted bass = 5 in any combination.

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

Species	Year	Number	Size
Channel catfish	1972	6,000	AFGL
	1974	3,000	AFGL
	1975	4,000	AFGL
	1976	2,000	AFGL
	1978	3,000	AFGL
	1979	3,000	AFGL
	1982	9,160	AFGL
	1983	10,000	AFGL
	1984	2,000	FGL
	1985	1,998	AFGL
	1986	2,000	FRY
	1989	2,193	FGL
	1991	10,005	FGL
	1992	5,100	FGL
	1993	9,420	FGL
	1995	5,156	FGL
1996	5,066	FGL	
	Total	83,098	
Florida Largemouth bass	1976	84,000	FRY
	1977	3,000	FRY
	1979	2,499	FRY
	1989	6	ADL
	1992	13,667	FGL
	Total	103,172	
Largemouth bass	1969	6,000	
	Total	6,000	
Paradise bass (Yellow bass X Striped bass)	1977	40,000	
	Total	40,000	
Redbreast sunfish	1985	3,438	
	Total	3,438	
Threadfin shad	1982	2,600	
	Total	2,600	

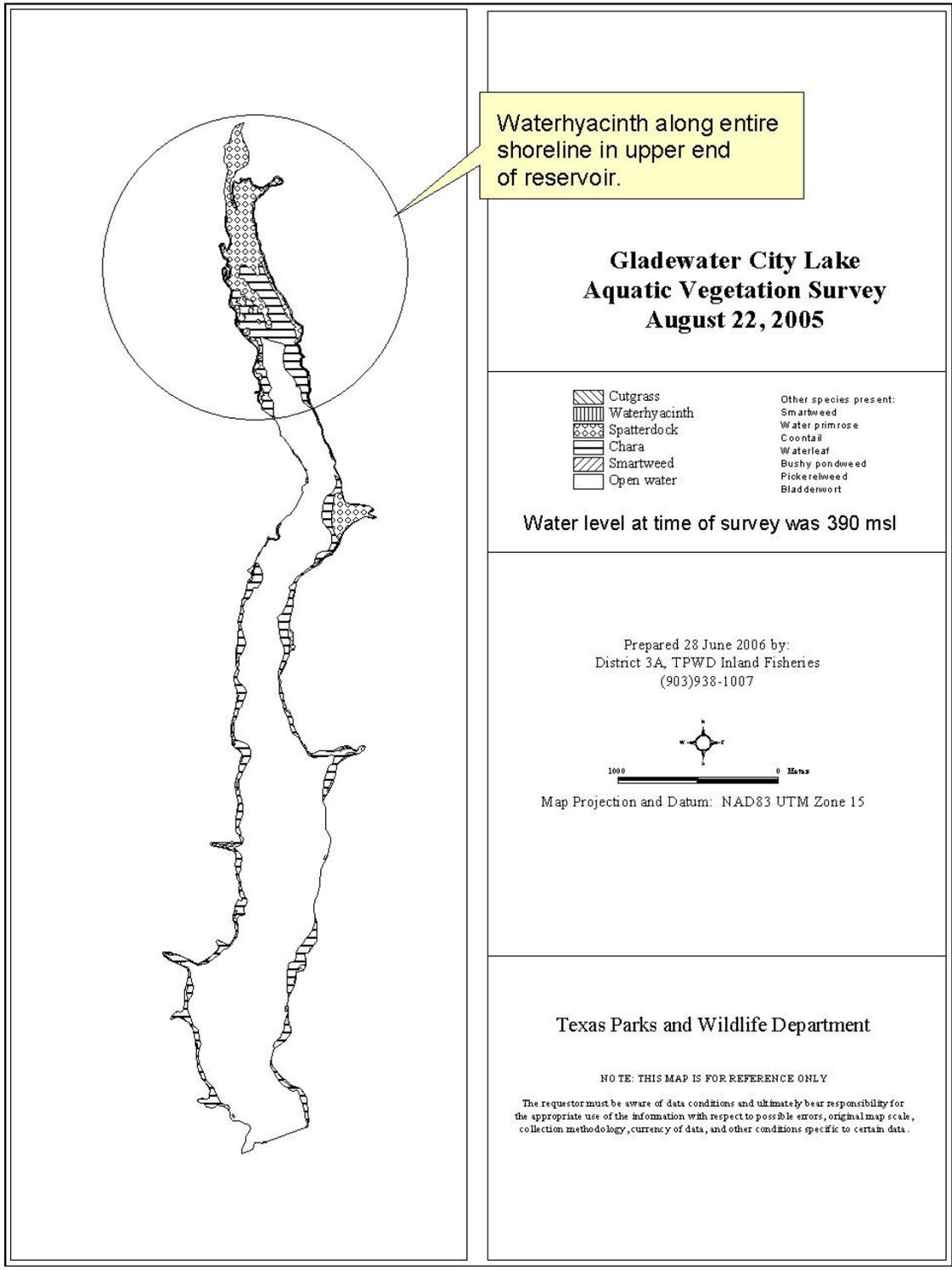


Figure 2. Results of 2005 summer survey of aquatic vegetation in Gladewater City Lake. Only the dominant species are represented on this map.

Table 4. Survey of aquatic vegetation, Gladewater City Lake, Texas, 2005. Surface area (acres) and percent of reservoir surface area was determined for dominant aquatic vegetation species.

Species	Acres	Percent of reservoir surface area
Chara	93	19
Spatterdock	50	10
Waterhyacinth	5	1
Cutgrass	3	1

Gizzard Shad

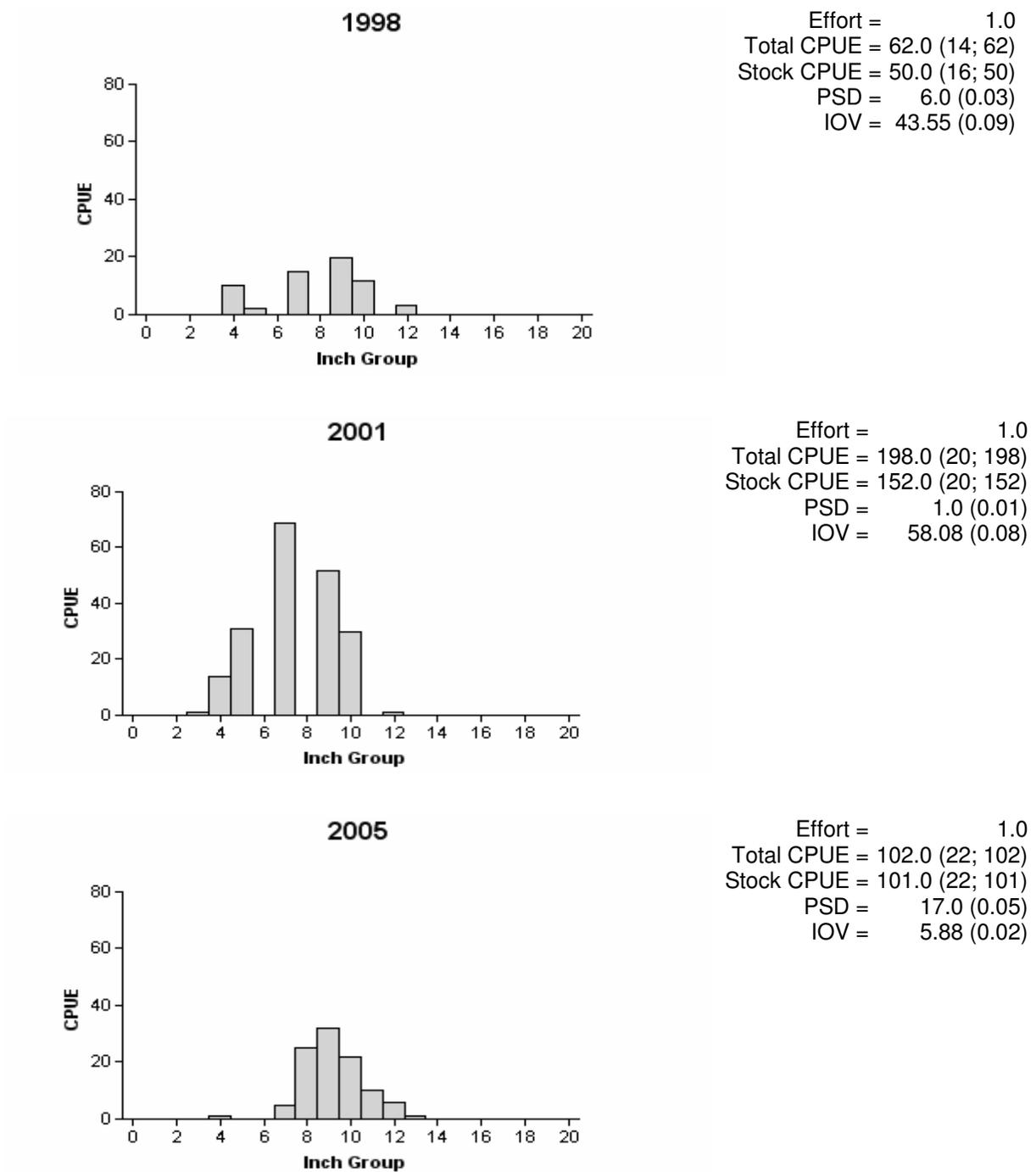
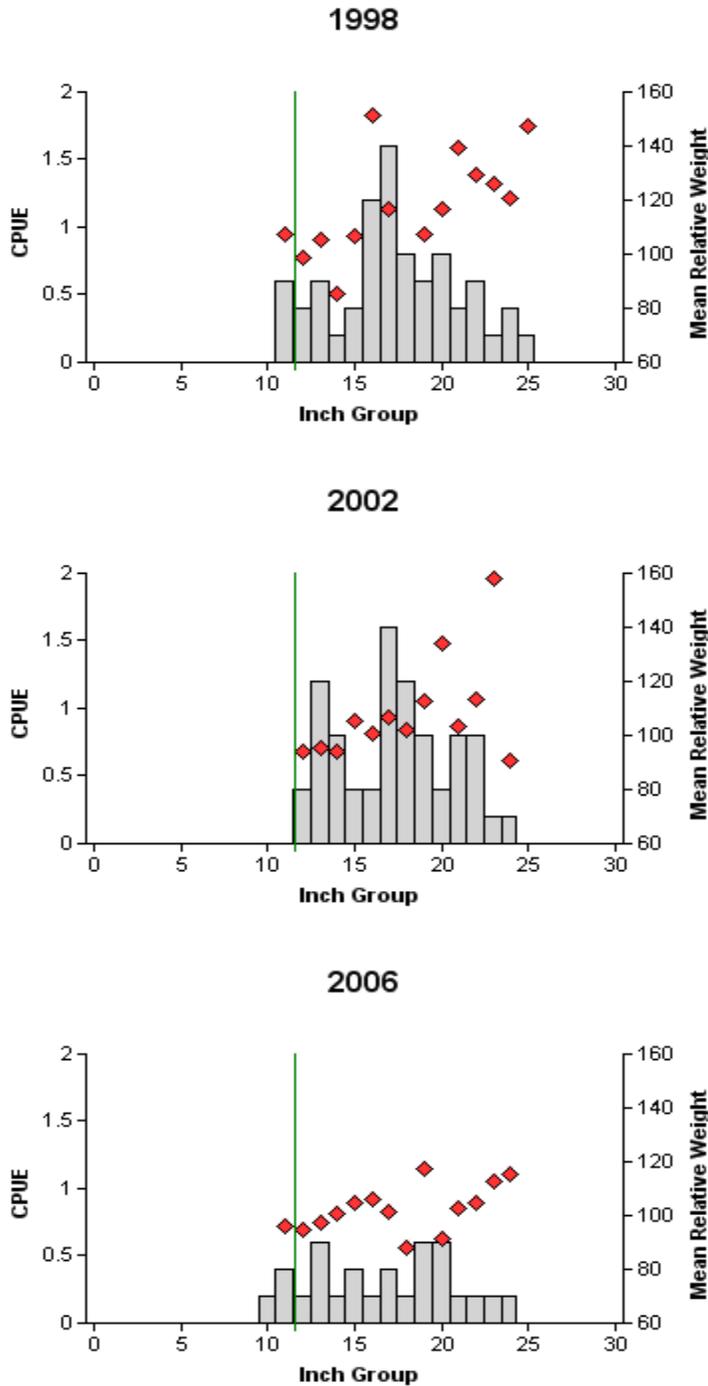


Figure 3. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for PSD and IOV are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 1998, 2001, and 2005.

Channel Catfish



Effort = 5.0
 Total CPUE = 9.0 (19; 45)
 Stock CPUE = 9.0 (19; 45)
 PSD = 76.0 (0.07)
 RSD-P = 7.0 (0.04)

Effort = 5.0
 Total CPUE = 9.2 (18; 46)
 Stock CPUE = 9.2 (18; 46)
 PSD = 70.0 (0.03)
 RSD-P = 2.0 (0.02)

Effort = 5.0
 Total CPUE = 4.8 (15; 24)
 Stock CPUE = 4.6 (15; 23)
 PSD = 61.0 (0.05)
 RSD-P = 4.0 (0.04)

Figure 4. Number of channel catfish caught per net night (CPUE), relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Gladewater City Lake, Texas, 1998, 2002, and 2006. Vertical line indicates minimum length limit.

Bluegill

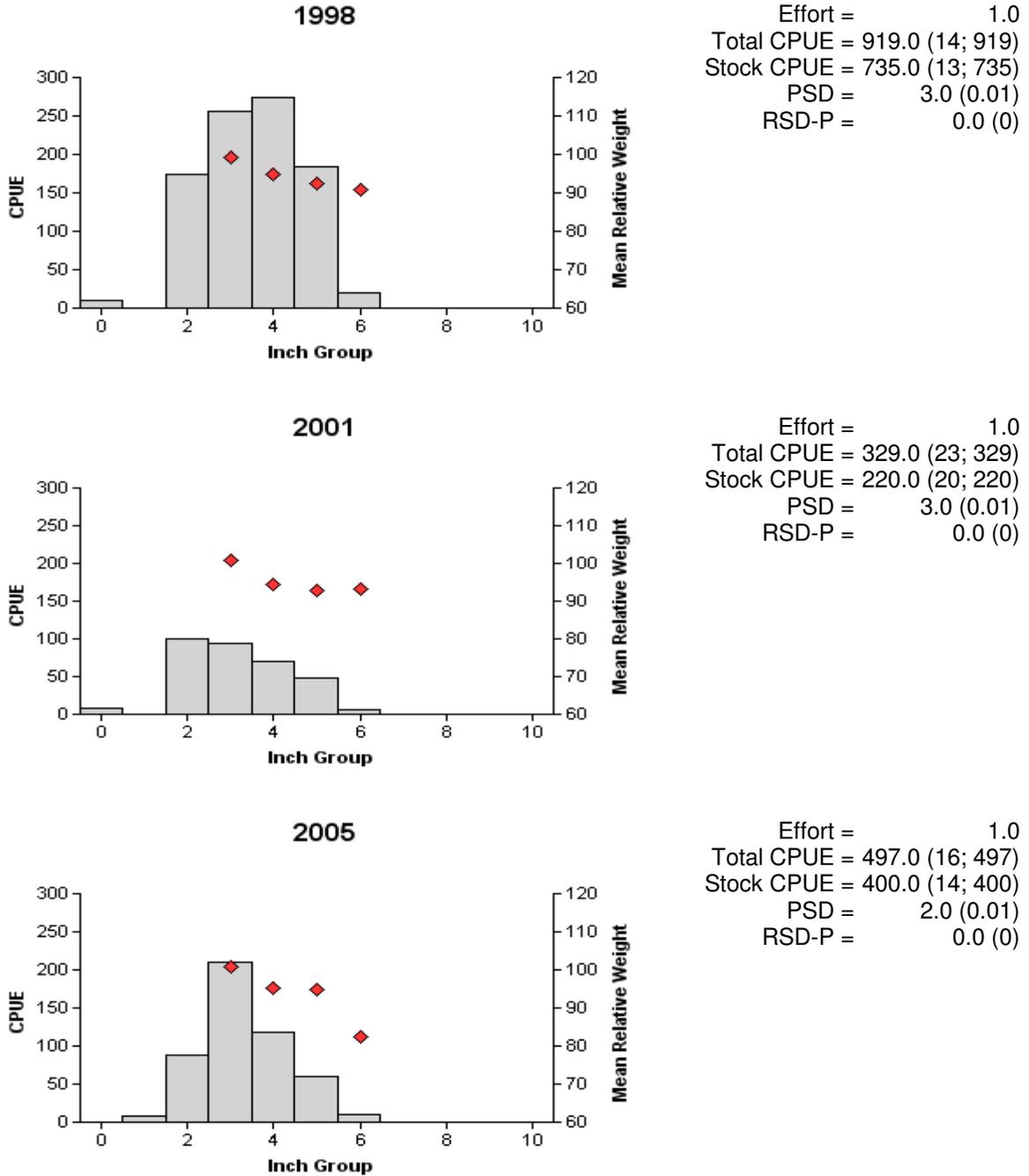


Figure 5. Number of bluegill caught per hour (CPUE), relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 1998, 2001, and 2005.

Redear Sunfish

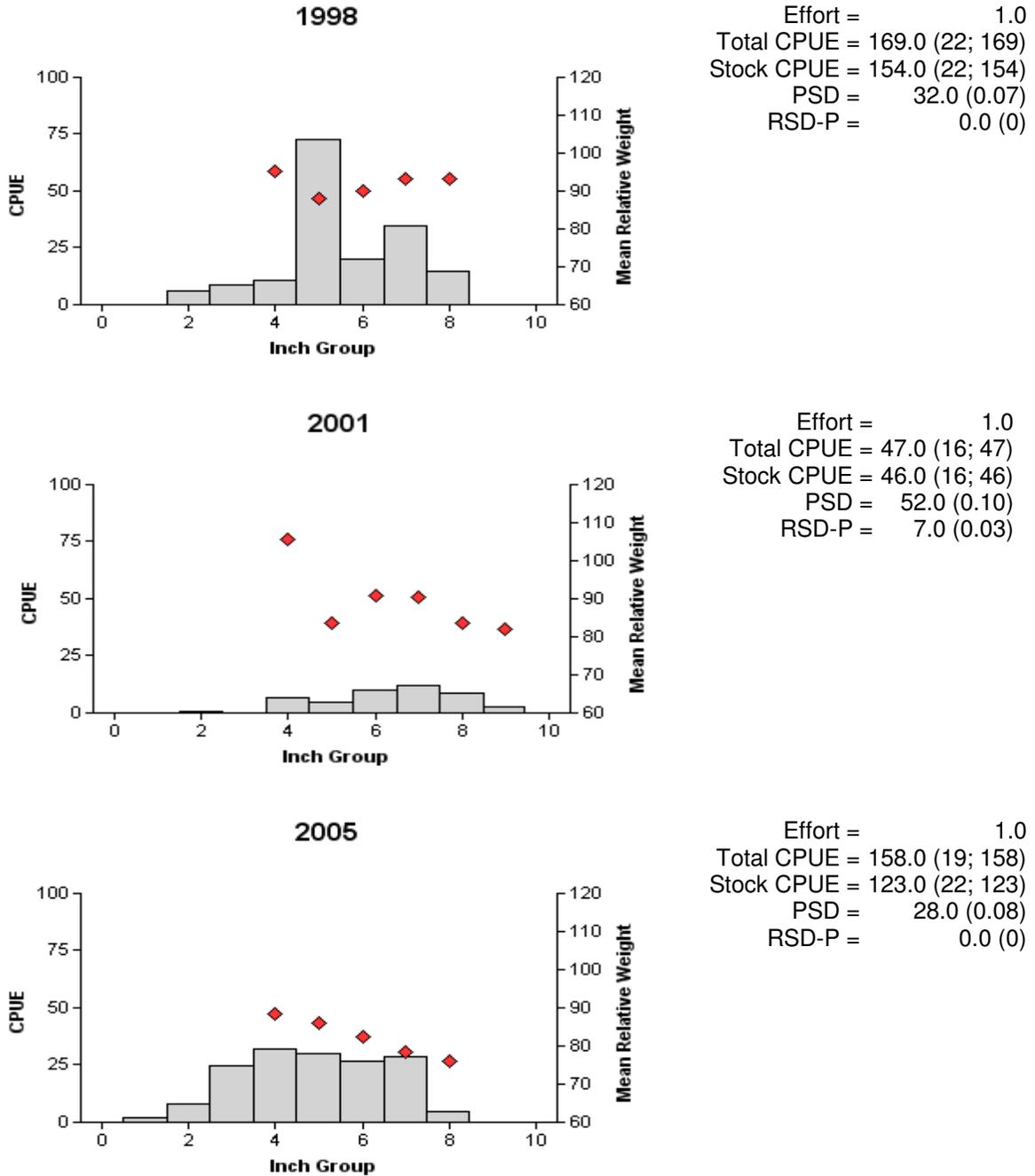


Figure 6. Number of redear sunfish caught per hour (CPUE), relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 1998, 2001, and 2005.

Spotted Bass

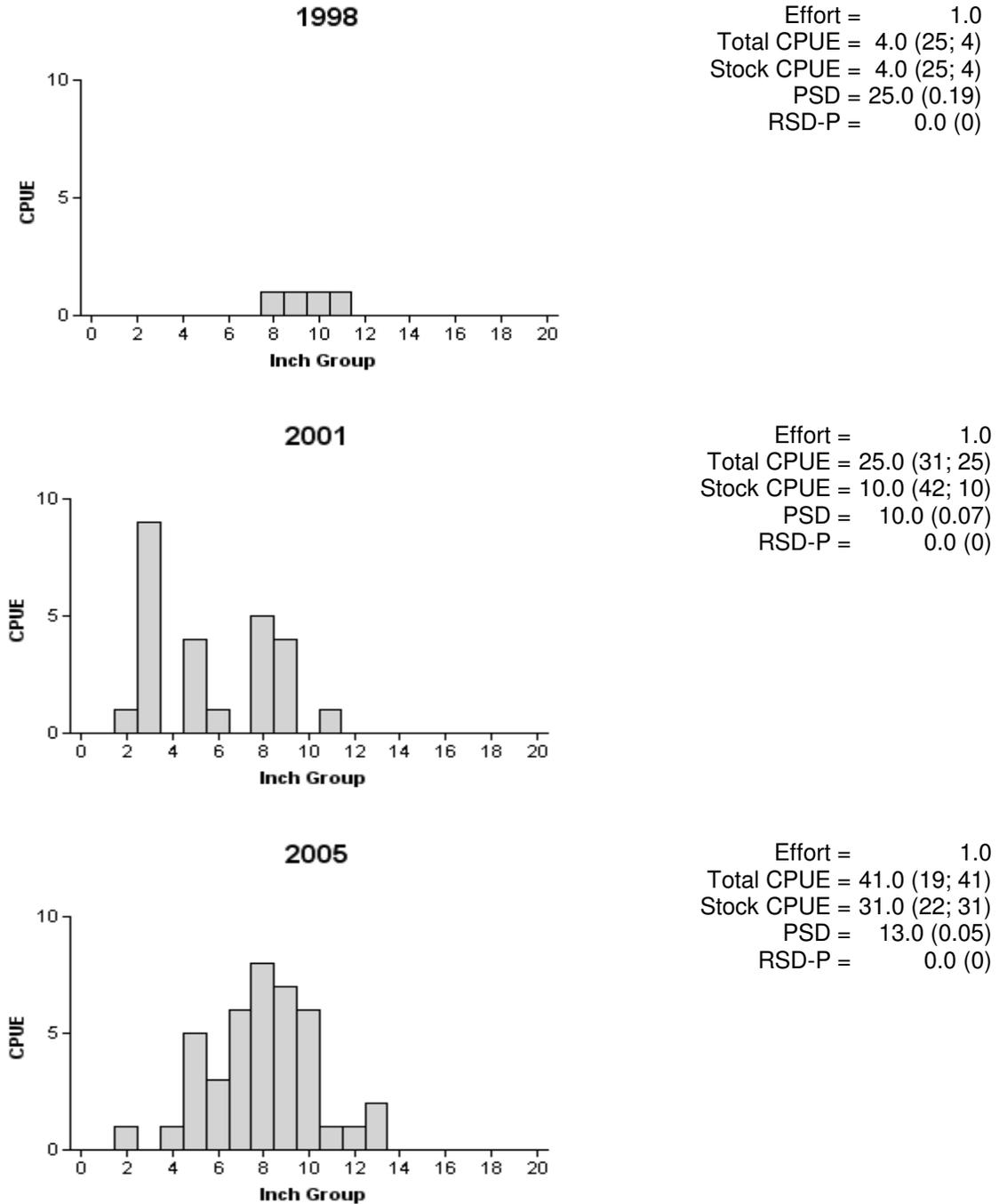


Figure 7. Number of spotted bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 1998, 2001, and 2005.

Largemouth Bass

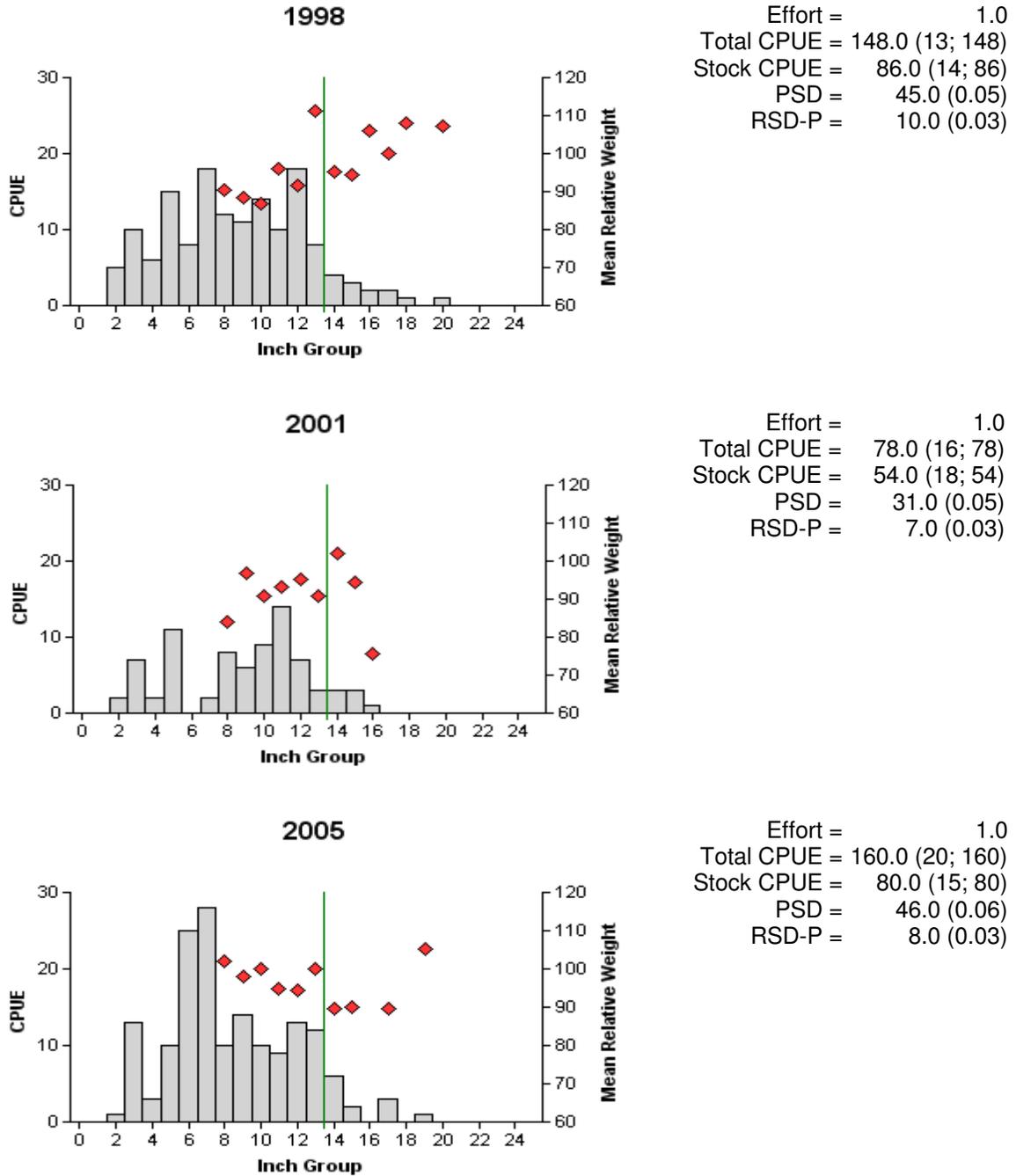


Figure 8. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Gladewater City Lake, Texas, 1998, 2001, and 2005. Vertical line denotes minimum length limit.

Table 5. Results of genetic analysis of age-0 largemouth bass collected by fall electrofishing, Gladewater City Lake, Texas, 1991, 1992, 1995, 1998, 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		
1991	30	1	3	8	18	20.0	3.3
1992 ^a	87	5	15	33	34	57.0	5.7
1995	30	2	13	8	1	45.3	6.7
1998	17	1	3	7	6	26.0	5.9
2005	35	0	0	26	9	23.0	0

^a Florida largemouth bass were stocked during the year of electrophoretic analysis.

White Crappie

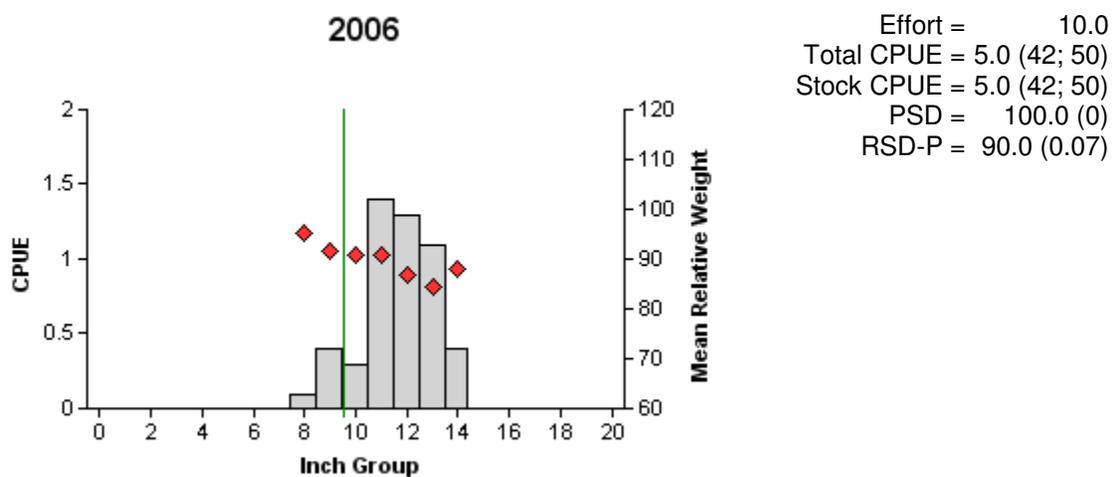


Figure 9. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring trap net surveys, Gladewater City Lake, Texas, 2006.

Black Crappie

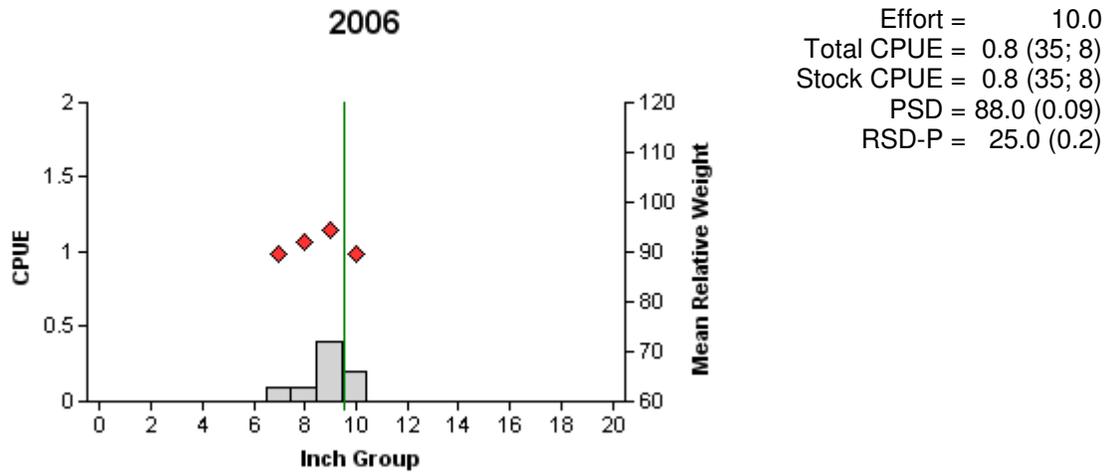


Figure 10. Number of black crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring trap net surveys, Gladewater City Lake, Texas, 2006.

Table 6. Proposed sampling schedule for Gladewater City 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				A ^a	
June 2009- May 2010	S	S	S	S		S

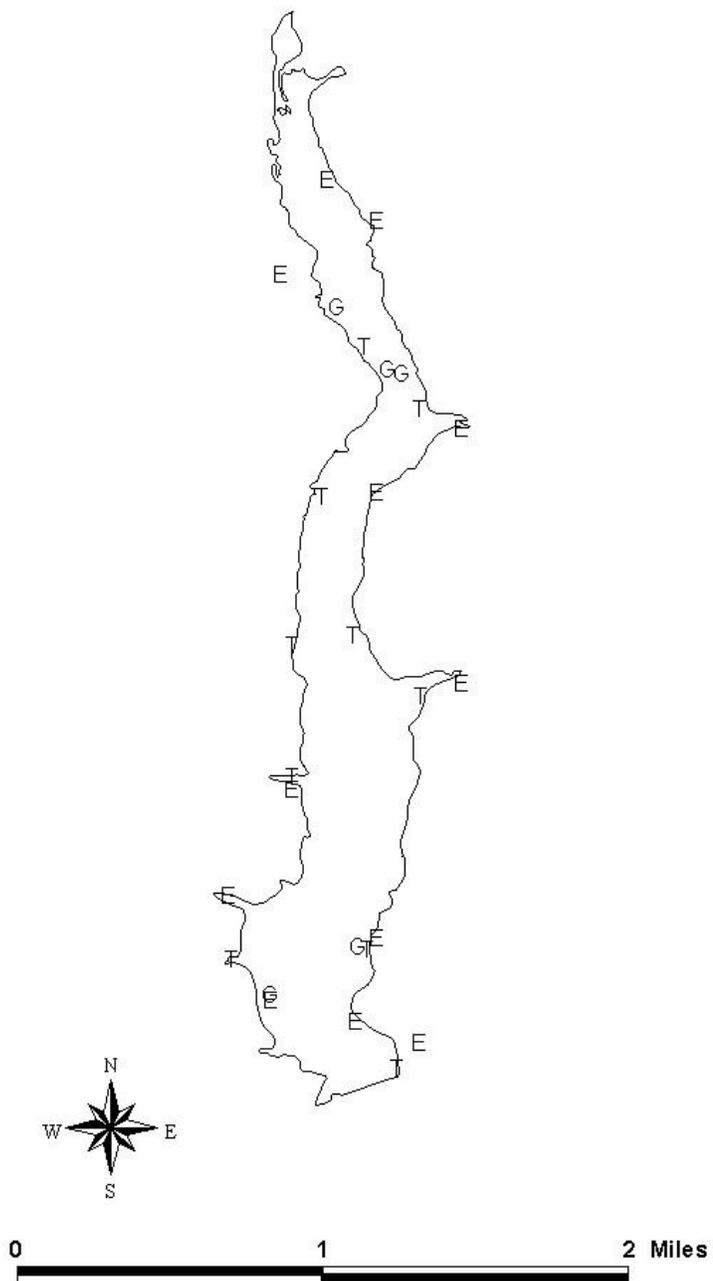
^a Spring quarter only.

APPENDIX A

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

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					102	102.0
Threadfin shad					143	143.0
Channel catfish	24	4.8				
Flathead catfish	3	0.6				
Warmouth					17	17.0
Orange spotted sunfish					11	11.0
Bluegill					497	497.0
Longear sunfish					66	66.0
Redear sunfish					158	158.0
Spotted sunfish					24	24.0
Largemouth bass					160	160.0
Spotted bass					41	41.0
White crappie			50	5.0		
Black crappie			8	0.8		

APPENDIX B



Location of sampling sites, Gladewater City Lake, 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.