

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

**Granbury Reservoir**

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## TABLE OF CONTENTS

Survey and management summary .....	2
Introduction.....	3
Reservoir description.....	3
Management history.....	3
Methods.....	4
Results and discussion.....	4
Fisheries management plan.....	7
Literature cited.....	9
Figures and Tables.....	10-29
Water level (Figure 1).....	10
Reservoir Characteristics (Table 1).....	11
Harvest regulations (Table 2).....	12
Stocking history (Table 3).....	13
Habitat survey (Table 4).....	15
Gizzard shad (Figure 2).....	16
Bluegill (Figure 3).....	17
Longear (Figure 4).....	18
Blue catfish (Figure 5).....	19
Channel catfish (Figure 6).....	20
White bass (Figure 7).....	21
Striped bass (Figure 8).....	22
Largemouth bass (Figure 9; Table 5).....	23
Proposed sampling schedule (Table 6).....	25
Appendix A	
Catch rates for all species from all gear types .....	26
Appendix B	
Historical catch rates for targeted species by gear type.....	27
Appendix C	
Map of 2009-2010 sampling locations .....	28

## SURVEY AND MANAGEMENT SUMMARY

Fish Populations in Granbury Reservoir were surveyed in 2009 with a boat electrofisher and in 2010 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Granbury Reservoir is an 8,700-acre impoundment located within the Brazos River system in Hood County, Texas. Near constant water level is maintained by a spillway consisting of 16 tainter gates and 2 sluice gates; retention time has been estimated at 260 days. Primary water uses include storage of flood and storm waters, municipal water supply, power plant cooling, and recreation. Granbury Reservoir has only moderate productivity yet the fishery has been hampered by golden algae since 2001. Habitat features were dominated by extensive bulk heading and natural shoreline.
- **Management history:** Sportfishes in Granbury Reservoir are currently managed with statewide regulations with the exception of a 16-inch minimum length limit on largemouth bass. Important sport fish include largemouth bass and striped bass. Both have been affected by nearly annual, toxic golden alga blooms since 2001. Efforts to mitigate these losses have included collection of biannual fisheries data, annual striped bass stockings, and Florida largemouth bass stockings.
- **Fish Community**
  - **Prey species:** The prey base is currently stronger than ever, with numbers and catch rates of all species at or near an all-time high.
  - **Catfishes:** Blue catfish were collected in good numbers for the first time since their original stocking in 1991. The channel catfish population looked better than ever, with individuals from 5 to 25-inches represented, and in good condition. Flathead catfish, although few in number, were also observed at higher frequencies than past surveys.
  - **Temperate basses:** The white bass catch rate improved over previous surveys, while population size structure and condition varied. The striped bass population looked better than it has in over a decade with both good numbers of fish being recruited and good numbers of fish in the 18 to 25-inch size range. Condition indices were excellent.
  - **Largemouth bass:** The largemouth bass catch rate was slightly higher than previous surveys. Although population structure was good, no fish were collected over 18-inches, and condition indices were noticeably lower.
  - **White crappie:** White and black crappie are present in the reservoir in low numbers, but trap netting was not conducted in 2009. Recent anecdotal information suggested anglers were catching good numbers of legal-sized fish during spring 2010.
- **Management Strategies:** Sample the reservoir with electrofishing and gill netting every two years and continue assisting with golden alga research. Sample white crappie with trap netting and obtain a tier 3 or tier 4 largemouth bass age and growth sample in 2013. Adjust the annual striped bass stocking rate as needed. Inform controlling authorities about new exotic species threats to Texas waters, and work with those authorities to display appropriate signage, educate constituents, and understand appropriate enforcement actions.

## INTRODUCTION

This document is a summary of fisheries data collected from Granbury Reservoir in 2009-2010. 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 species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data is presented with the 2009-2010 data for comparison.

### *Reservoir Description*

- Granbury Reservoir is an 8,700-acre impoundment of the Brazos River, located between Possum Kingdom and Whitney reservoirs in Hood County. It was constructed in 1969 and is operated and controlled by the Brazos River Authority (BRA). Primary water uses include storage of flood and storm waters, municipal water supply, power plant cooling, and recreation. Granbury Reservoir is moderately eutrophic with a mean and maximum depth of 18.0 and 75.0 feet respectively. Near constant water level is maintained by a spillway consisting of 16 tainter gates and 2 sluice gates; retention time has been estimated at 260 days. Habitat features were dominated by extensive bulk heading and natural shoreline. Native aquatic plants present are cattail and bulrush. Boat access is adequate and consists of five public boat ramps and several private boat ramps. Bank fishing access is poor. Other descriptive characteristics for Granbury Reservoir are in Table 1.

### *Management History*

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

1. Sample the reservoir biannually for the next four years using electrofishing, gill netting, and trap netting.  
**Action:** Biannual sampling was maintained on Granbury with the exception of trap netting; trap netting became an optional sampling gear in 2009. Full electrofishing surveys were conducted in 2007 and 2009 while full gill netting surveys were conducted in 2008 and 2010.
2. Stock striped bass at 15/acre annually; adjust stocking rate as needed.  
**Action:** Striped bass were stocked at 15/acre in 2007 and 2008; however the annual stocking rate was changed to 5- fish/acre in 2009 due to perceived low usage of the fishery.
3. Request stocking of Florida largemouth bass at 25/acre in spring 2007.  
**Action:** Florida largemouth bass fingerlings were stocked at 25/acre in 2008.
4. Make fishery data available to agencies researching golden alga, and aid with this research when necessary.  
**Action:** Trend data for important sportfish and prey species were presented at the second International Golden Alga Symposium held in Fort Worth during 2009. Additionally, these data have been shared with members of the Golden Alga Task Force, and are currently being used by a variety of agencies conducting research on golden alga and affected reservoirs.
5. Perform a physical habitat survey prior to the next report using current technology.  
**Action:** A complete physical habitat survey was conducted on Granbury using a combination of remote and ground-truthing techniques in spring 2010.
6. Publicize the healthy catfish population to constituents, local angler groups, etc.  
**Action:** The healthy catfish population, and other positive trends in Granbury's fishery, have been shared with numerous user groups and interested constituents through a variety of media outlets since 2006.

**Harvest regulation history:** Sportfishes are currently managed with statewide regulations with the exception of a 16-inch minimum length limit on largemouth bass (Table 2).

**Stocking history:** Striped bass fingerling have been stocked, with few exceptions, on an annual basis since 1972 (Table 3). The striped bass stocking rate was changed from 15 to 5/acre in 2009 due to a perceived low usage by anglers in response to chronic golden alga fish kills. Channel catfish were stocked twice: once in 1969 at 43/acre, and again with 300 adults in 1993. Blue catfish were stocked at 10/acre, with limited success, in 1991. Largemouth bass were originally stocked at 15/acre in 1969, and in the early 1970's at varying densities. A small stocking of Florida largemouth bass occurred in 1986 (i.e., 8178 fish), and heavy stockings of nearly 50/acre in 1989, 1994, and 1995. A large (208,273) number of Florida largemouth bass were stocked in 2008 to mitigate cumulative losses from fish kills associated with golden alga.

**Vegetation/habitat history:** Granbury Reservoir supports limited aquatic vegetation. A few upper reservoir areas hold emergent species like cattail (*Typha* spp.), bulrush (*Scirpus* spp.) and water willow (*Justicia* spp.). The Brazos River Authority (BRA) recently requested a permit to treat cattail along two popular shoreline areas of the reservoir in an effort to improve access for bank anglers. Few submerged species of vegetation exist in the reservoir, and noxious vegetation is not currently a problem.

**Water Transfer:** Granbury Reservoir is primarily used for storage of flood and storm waters, municipal water supply, power plant cooling, and recreation. There are currently two major pumping stations on the reservoir which transfer water to other sites. The first is operated by Luminant, formally known as TXU Electric Company, which uses untreated water from Granbury for nuclear power plant operations on Squaw Creek. The other is operated by the Authority's Lake Granbury Surface Water and Treatment System (SWATS), which supplies treated water to several municipalities in Hood and Johnson Counties. No additional diversions are known at this time; however the Squaw Creek nuclear facility has applied for two additional reactors, which may change future needs for untreated water from Granbury.

## METHODS

Fishes were collected by electrofishing (1.5 hours at 18 5-min stations) and gill netting (10 net nights at 10 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/hr) of actual electrofishing and, for gill 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 Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (unpublished, revised manual 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 weights ( $W_i$ )] 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 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Fish aging became optional in 2004, and no new age and growth data were collected from the 2009/2010 survey. The most recent age and growth information for Granbury Reservoir can be found in Tibbs and Baird (2002). Source for water level data was the United States Geological Survey (USGS) website and Brazos River Authority.

## RESULTS AND DISCUSSION

**Habitat:** Littoral zone habitat consisted primarily of extensive bulk heading, boat docks, standing timber, dead trees and stumps, and limited amounts of rock riprap and natural bluff. The number of boat docks/piers was estimated at 2,896 via remote sensing and later ground-truthed. A physical habitat survey was conducted this year (Table 4).

**Creel:** No creels were conducted during this survey period.

**Prey species:** The prey base is currently stronger than ever, with numbers and catch rates of all species at or near an all-time high. Prey species and catch rates included: bluegill (279/hr), gizzard shad (241/hr), longear sunfish (83/hr), threadfin shad (30/hr), green sunfish (25/hr), redear sunfish (10/hr), and warmouth (6/hr) (Figures 2, 3, and 4; Appendices A and B). Index of vulnerability (IOV) was excellent with 95% of the gizzard shad population available as prey for predators (DiCenzo et al. 1996).

**Catfishes:** Blue catfish were originally stocked in 1991 at 10/acre (Table 3). Catch rates have been historically poor for the species until this year, when blues were collected at a rate of 2.3 fish/nn; none were collected in 2006 and 2008. The population size structure was good with recent recruitment and plenty of fish greater than 16-inches for anglers. Overall condition was good with some size classes having excellent condition indices (Figure 5; Table 3; Appendices A and B).

The channel catfish sample collected in 2010 (22/nn; n= 220) is the best on record. The population structure is excellent with historically high recruitment and legal-sized fish up to 25-inches. In addition, Relative weights ( $W_r$ ), an index of condition or plumpness, averaged well over 100 (Figure 6; Appendices A and B). No age and growth work was done on channel catfish during this survey period; additional information on this species can be found in Tibbs and Baird (2002).

Flathead catfish, although few in number, were also observed at higher frequencies than past surveys: (0.2 in 2003, 0.4 in 2004, 0.0 in 2006, 0.3 in 2008, and 0.7 in 2010) (Appendices A and B).

The positive trend seen in the catfishes during a time when golden alga is hampering other fisheries, is interesting, and may be worthy of broader research. Stocking catfishes into golden alga-plagued reservoirs might prove to be a useful management tool to mitigate losses to other fisheries.

**Temperate basses:** White bass catch rates have remained relatively stable over the last three surveys and this year's rate was slightly improved (2.7/nn in 2006, 2.1/nn in 2008, and 3.8/nn in 2010). The population structure, however, has been unbalanced as evidenced by dynamic Proportional Size Distribution (PSD) and PSD-12 values from recent surveys; balanced sportfish populations tend to have a PSD below 60 and consistent PSD-X values. White bass PSD and PSD-12 values were 96 and 63 in 2006, 37 and 0 in 2008, and 74 and 34 in 2010 respectively. The current population size structure should benefit anglers if it remains consistent (Figure 7; Appendices A and B). No age and growth work was done on white bass during this survey period; additional information on this species can be found in Tibbs and Baird (2002).

The 2010 striped bass catch rates were the highest recorded for Granbury at 2.9/nn. The population looked better than it ever has with both good numbers of fish being recruited to the gear and good numbers of fish in the 18 to 25-inch size range. The PSD values for the last three surveys have been stable; 50 in 2006 and 2008, and 45 in 2010. Condition indices were also excellent, presumably in response to a good forage base and a gizzard shad population with a high IOV. Annual stocking rates were changed from 15 to 5/acre in 2009 so biannual monitoring of this population will be important to help determine what, if any, effects the change in stocking rate has had on the population. (Figure 8; Table 3; Appendices A and B). No age and growth work was done on striped bass during this survey period; additional information on this species can be found in Tibbs and Baird (2002).

**Largemouth bass:** The largemouth bass catch rate was relatively low when compared to other district reservoirs, yet very close to average for Granbury. Catch rates from the past three surveys (31/hr in 2005, 21/hr in 2007, and 41/hr in 2010) are also well below pre-golden alga catches - this despite good stockings of Florida largemouth bass in 2003 (50/acre), 2004 (25/acre), and 2008 (25/acre). Although the current population size structure looks good (PSD=44; PSD-14= 27), no fish were collected over 18-inches, and condition indices decreased a lot over the previous two surveys. Largemouth bass genetics were not analyzed this survey period since no stockings are planned for the immediate future, however Florida

largemouth bass influence has remained relatively constant and Florida alleles ranged from 45 to 51% in the previous three surveys (Figure 9; Tables 3 and 5; Appendices A and B). No age and growth work was done on largemouth bass during this survey period; additional information on this species can be found in Tibbs and Baird (2002).

**White crappie:** Trap netting became an optional gear in 2009, and since the two most recent crappie surveys have failed to collect useful sample sizes, trap netting was not conducted during this survey period. White and black crappie are still present in the reservoir in low numbers however, and recent anecdotal information suggested anglers were catching good numbers of legal-sized fish during spring 2010. This is not surprising, as piers, boat docks, and woody habitat are plentiful in the reservoir. Based on this new information and a further review of historical district catch rates for the species, trap netting will be conducted in 2013.

## Fisheries management plan for Granbury Reservoir, Texas

Prepared – July 2010

**ISSUE 1:** Golden alga continues to kill significant numbers of fish in the reservoir during winter and early spring months.

### MANAGEMENT STRATEGIES

1. Sample the reservoir with electrofishing and gill netting every two years. Supplementary monitoring may be required if golden alga blooms cause additional severe mortality.
2. Make fishery data available to agencies researching golden alga, and cooperate with research when necessary.

**ISSUE 2:** Largemouth bass are the most popular sport fish species in the reservoir, and age and growth information is eight years old. Chronic golden alga issues and fish kills have prevented age and growth samples from being conducted.

### MANAGEMENT STRATEGY

1. Pending the number and severity of golden alga fish kills over the next three years, obtain either a tier 3 or tier 4 age and growth sample in 2013.

**ISSUE 3:** White crappie were not surveyed in 2009 since trap netting is now optional.

### MANAGEMENT STRATEGY

1. Sample white crappie in winter 2013.

**ISSUE 4:** The annual striped bass stocking rate was changed from 15 to 5/acre in 2009. The 2010 striped bass catch rate was the highest ever recorded for Granbury. These improved catch rates need to be maintained if possible.

### MANAGEMENT STRATEGIES

1. Monitor the striped bass catch rate with gill netting in 2012 and 2014.
2. Adjust striped bass stocking rates if necessary due to golden alga kills.

**ISSUE 5:** Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant Salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

### MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.

5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes electrofishing in 2011 and 2013, trap netting in 2013, and gill netting in 2012 and 2014 (Table 6). The 2011 and 2012 surveys are necessary to evaluate and monitor the continual effects of golden alga-related fish kills on the reservoir. The 2013 and 2014 surveys are regularly scheduled surveys.

## LITERATURE CITED

- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.
- 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.
- Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional Size Distribution (PSD): A Further Refinement of Population Size Structure Index Terminology. Fisheries volume 32, number 7: 348
- Tibbs, J. and M. S. Baird. 2002. Statewide freshwater fisheries monitoring and management program survey report for Granbury Reservoir, 2002. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- Tibbs, J. and M. S. Baird. 2006. Statewide freshwater fisheries monitoring and management program survey report for Granbury Reservoir, 2006. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

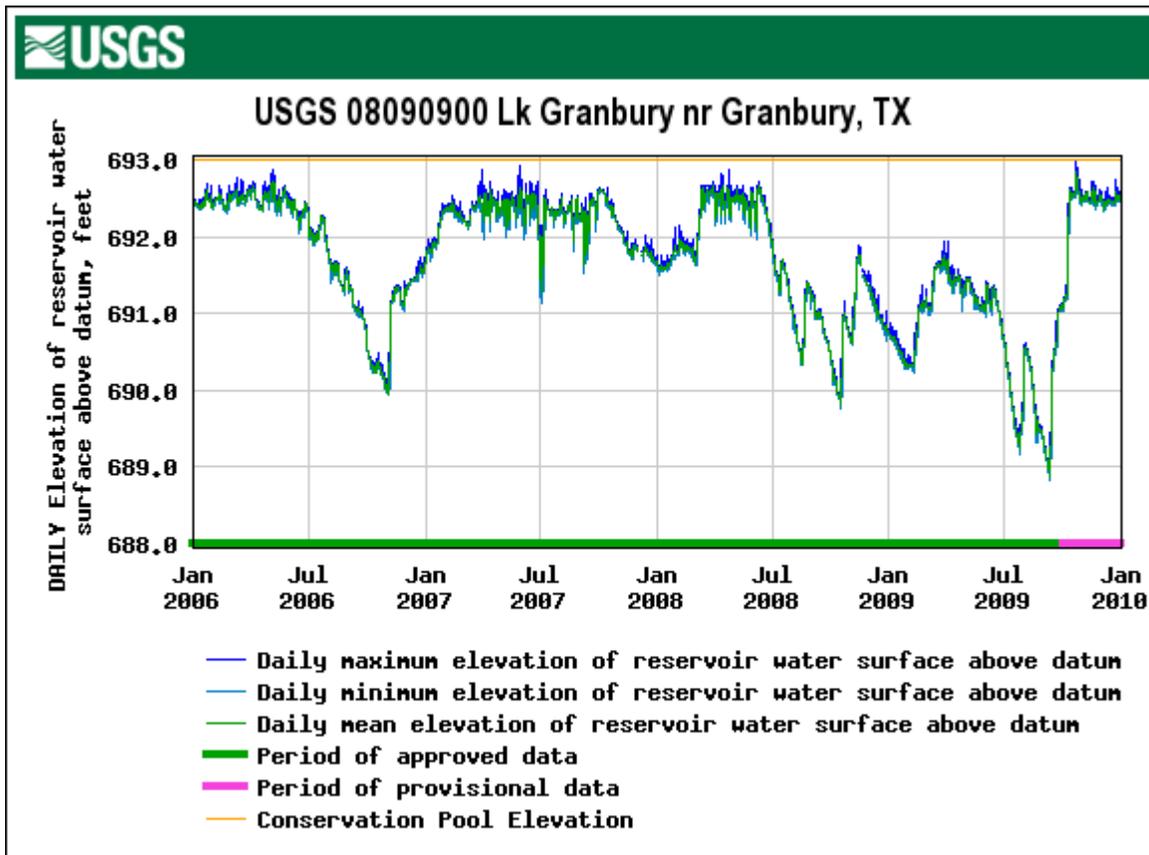


Figure 1. Daily mean water levels for Granbury Reservoir, from January 1, 2006 through January 1, 2010. Conservation pool level (693 feet above mean sea level).

Table 1. Characteristics of Granbury Reservoir, Texas.

Characteristic	Description
Year Constructed	1969
Controlling authority	Brazos River Authority (BRA)
Counties	Hood
Reservoir type	Mainstem
Shoreline Development Index (SDI)	8.4
Conductivity	2400 umhos/cm

Table 2. Harvest regulations for Granbury Reservoir, Texas.

Species	Bag Limit	Length limit (inches)
Catfish: Channel and Blue	25 (any combination)	12" minimum
Catfish, Flathead	5	18 " minimum
Bass, White	25	10 " minimum
Bass, Striped	5	18 " minimum
Bass: Largemouth	5 (any combination)	16" minimum
Bass: Spotted	5 (any combination)	No minimum
Crappie: White and Black	25 (any combination)	10" minimum

Table 3. Stocking history of Granbury, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Life Stage</b>	<b>Mean TL (in)</b>
Blue catfish	1991	86,343	FGL	2.5
	Total	86,343		
Channel catfish	1969	374,675	AFGL	7.9
	1993	300	AFGL	4.9
	Total	374,975		
Florida Largemouth bass	1986	8,178	FRY	0.9
	1989	212,290	FGL	1.3
	1989	212,234	FRY	0.9
	1994	435,331	FGL	1.1
	1995	435,924	FGL	1.4
	2003	425,723	FGL	1.3
	2004	214,164	FGL	1.6
	2008	208,273	FGL	1.5
Total	2,152,117			
Largemouth bass	1969	126,640	UNK	UNK
	1970	1,700,000	FRY	0.7
	1972	30,160	UNK	UNK
	1993	200	AFGL	4.9
	Total	1,857,000		
Striped bass	1972	27,250	FGL	1.7
	1973	172,970	FGL	1.7
	1974	85,000	FGL	1.7
	1975	39,998	UNK	UNK
	1976	86,154	UNK	UNK
	1979	85,791	UNK	UNK
	1981	100,502	UNK	UNK
	1983	176,332	UNK	UNK
	1989	87,000	FGL	1.5
	1990	93,315	FGL	1.5
	1994	143,656	FGL	1.2
	1995	43,807	FGL	1.3
	1997	87,068	FGL	1.3
	1998	88,206	FGL	1.3
	1999	88,121	FGL	1.4
	2000	44,000	FGL	1.4
2001	2,100,000	FRY	0.8	
2002	174,657	FGL	1.6	

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Life Stage</b>	<b>Mean TL (in)</b>
	2003	85,444	FGL	1.5
	2004	43,271	FGL	1.5
	2005	125,155	FGL	1.7
	2006	127,280	FGL	1.6
	2007	125,278	FGL	1.4
	2008	126,079	FGL	1.8
	2009	44,864	FGL	1.8
	Total	4,401,198		

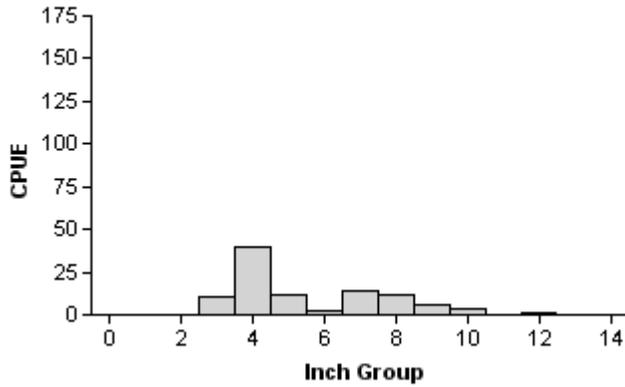
Table 4. Survey of littoral zone and physical habitat types, Granbury Reservoir, Texas, 2010. Linear shoreline distance (miles) and percent of linear shoreline distance was recorded for each habitat type. Native emergent shoreline vegetation was also given an acreage estimate. Percent of total shoreline distance is blank for boat docks/piers, Exotic, Non-prohibited, and native emergents because they were dually coded with adjacent habitat.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of surface area
Bulkhead	81.48	48.67		
Gravel shoreline (rocks < 4")	0.08	0.05		
Rocky shoreline (rocks > 4")	24.90	14.88		
Rock bluff	1.51	0.90		
Natural shoreline	61.86	36.96		
Boat docks/Ramps	6.79			
Exotic, Non-prohibited	5.09			
Native emergents	8.26		20.28	0.23

**Gizzard Shad**

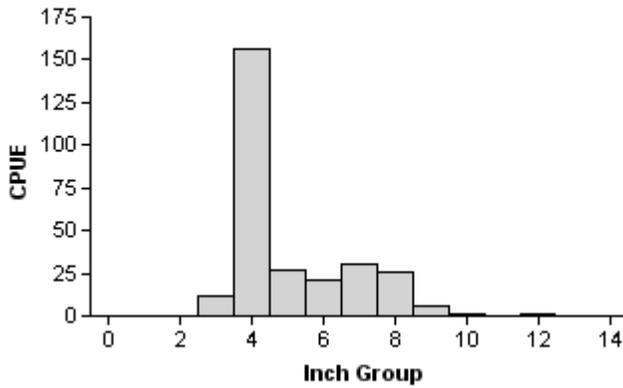
**2005**

Effort = 1.5  
 Total CPUE = 99.3 (31; 149)  
 Stock CPUE = 35.3 (41; 53)  
 IOV = 78.52 (4.8)



**2007**

Effort = 1.5  
 Total CPUE = 279.3 (36; 419)  
 Stock CPUE = 62.0 (36; 93)  
 IOV = 88.54 (7.6)



**2009**

Effort = 1.5  
 Total CPUE = 240.7 (18; 361)  
 Stock CPUE = 28.7 (28; 43)  
 IOV = 95.01 (1.8)

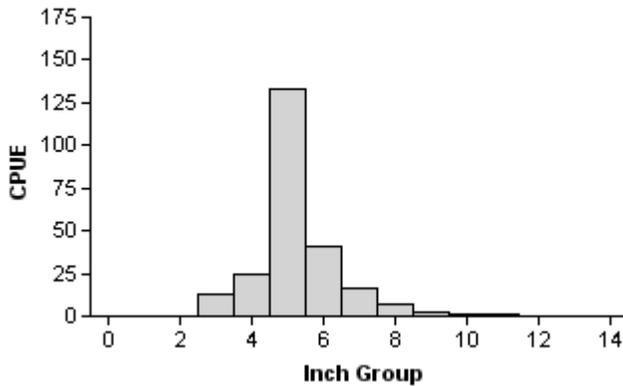


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas, 2005, 2007, and 2009.

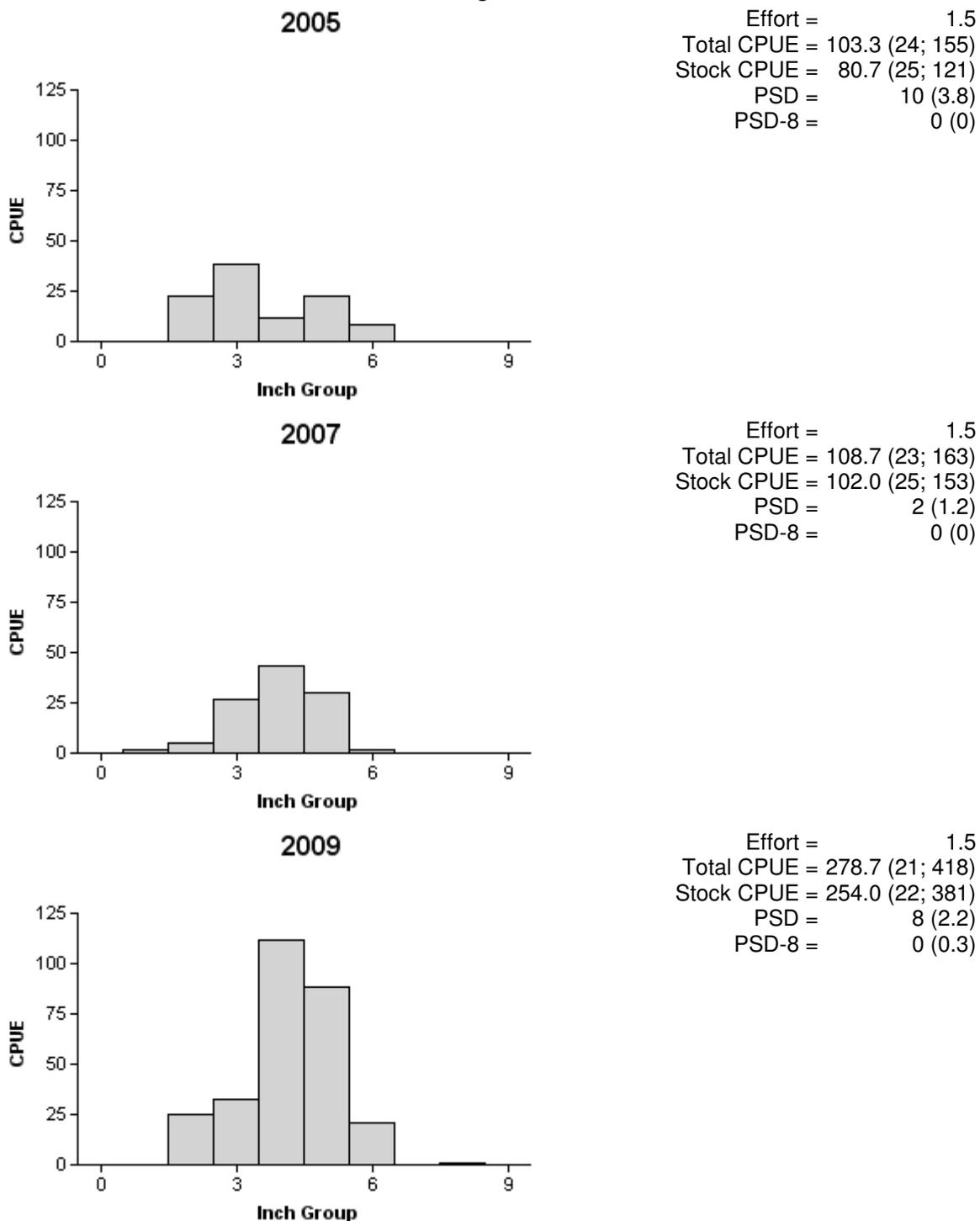
**Bluegill**

Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas, 2005, 2007, and 2009.

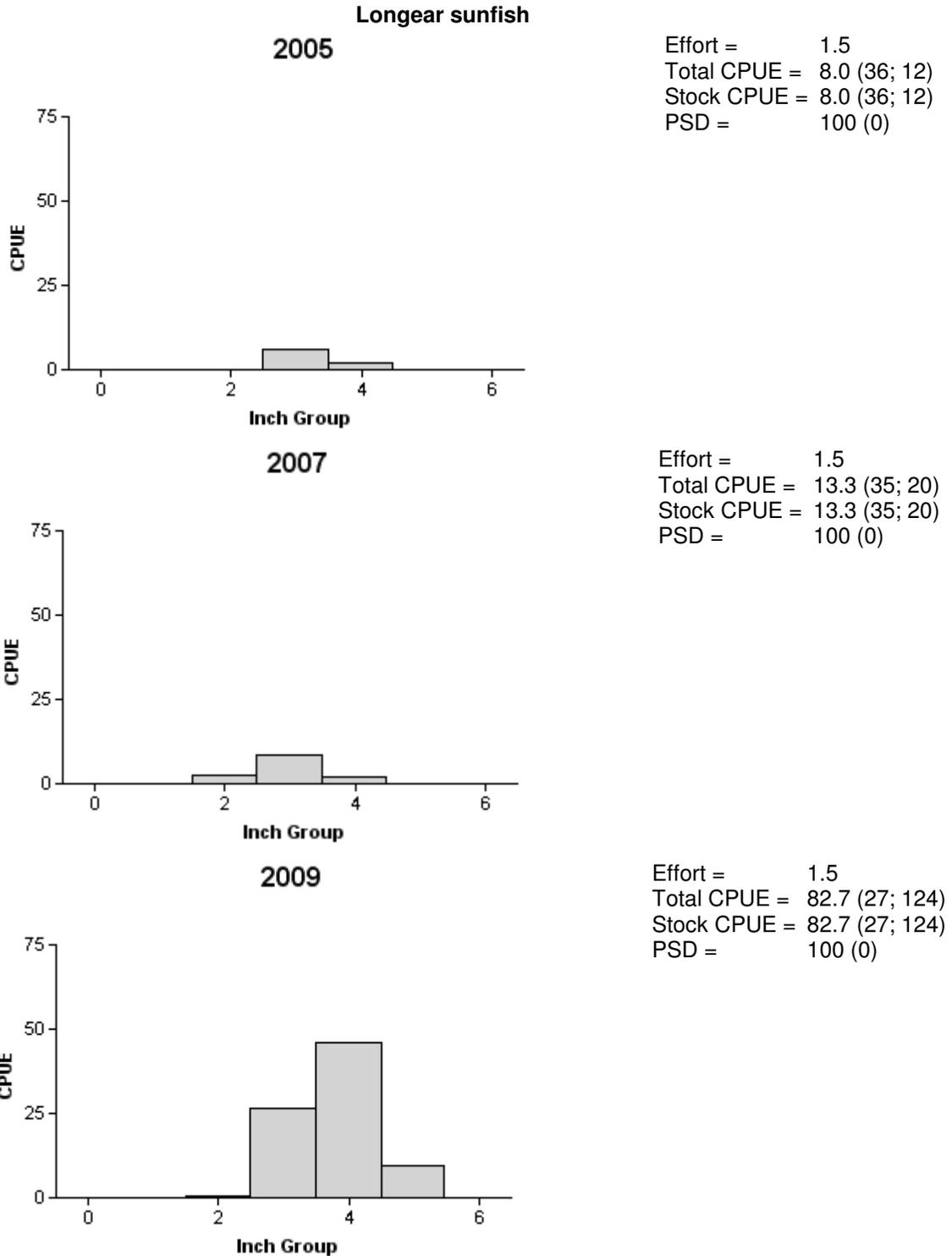


Figure 4. Number of longear sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas, 2005, 2007, and 2009.

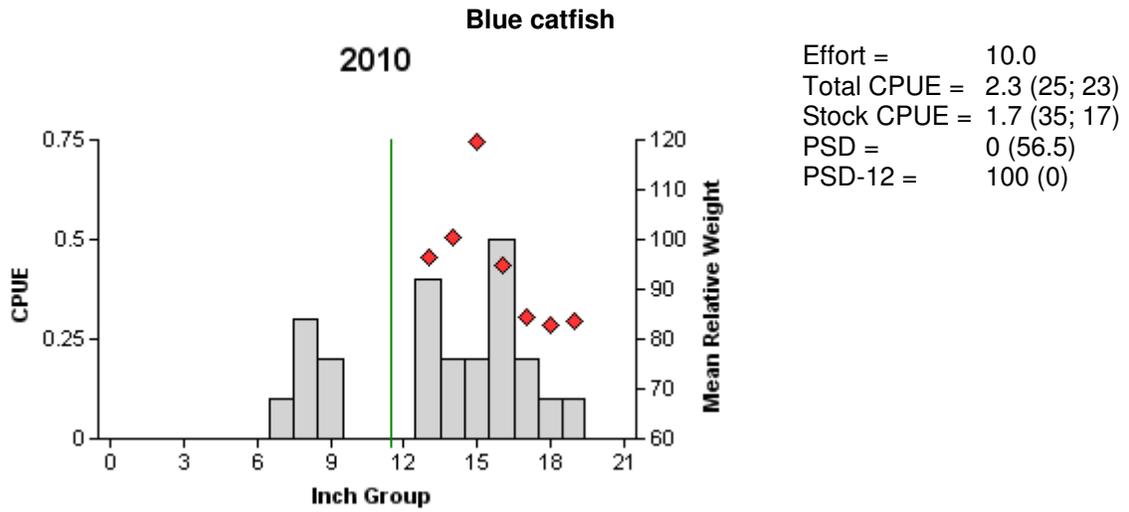
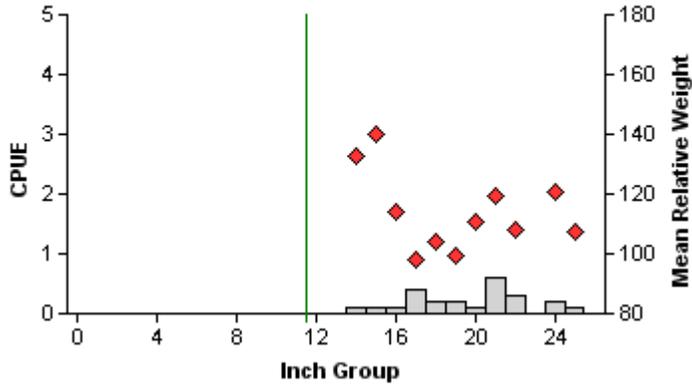


Figure 5. Number of blue catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Granbury Reservoir, Texas, 2010.

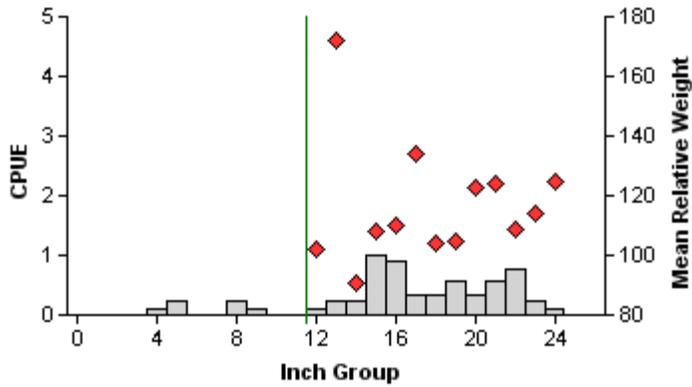
**Channel catfish**

**2006**



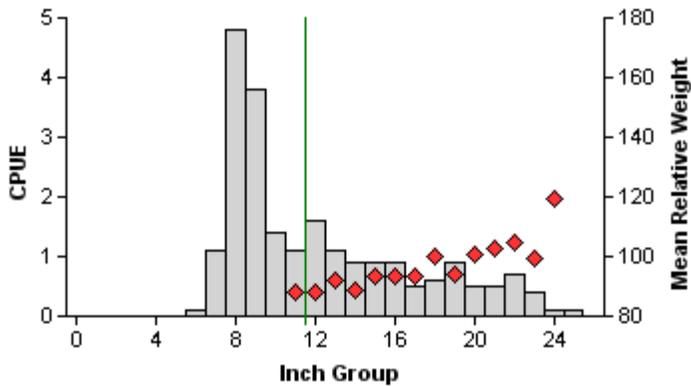
Effort = 10.0  
 Total CPUE = 2.4 (26; 24)  
 Stock CPUE = 2.4 (26; 24)  
 PSD = 92 (8.4)  
 PSD-12 = 100 (0)  
 PSD-24 = 12 (7.3)

**2008**



Effort = 9.0  
 Total CPUE = 6.3 (22; 57)  
 Stock CPUE = 5.7 (24; 51)  
 PSD = 73 (4.9)  
 PSD-12 = 100 (0)  
 PSD-24 = 2 (2)

**2010**



Effort = 10.0  
 Total CPUE = 22.0 (12; 220)  
 Stock CPUE = 10.8 (23; 108)  
 PSD = 48 (3.8)  
 PSD-12 = 90 (1.9)  
 PSD-24 = 2 (1.3)

Figure 6. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Granbury Reservoir, Texas, 2006, 2008, and 2010.

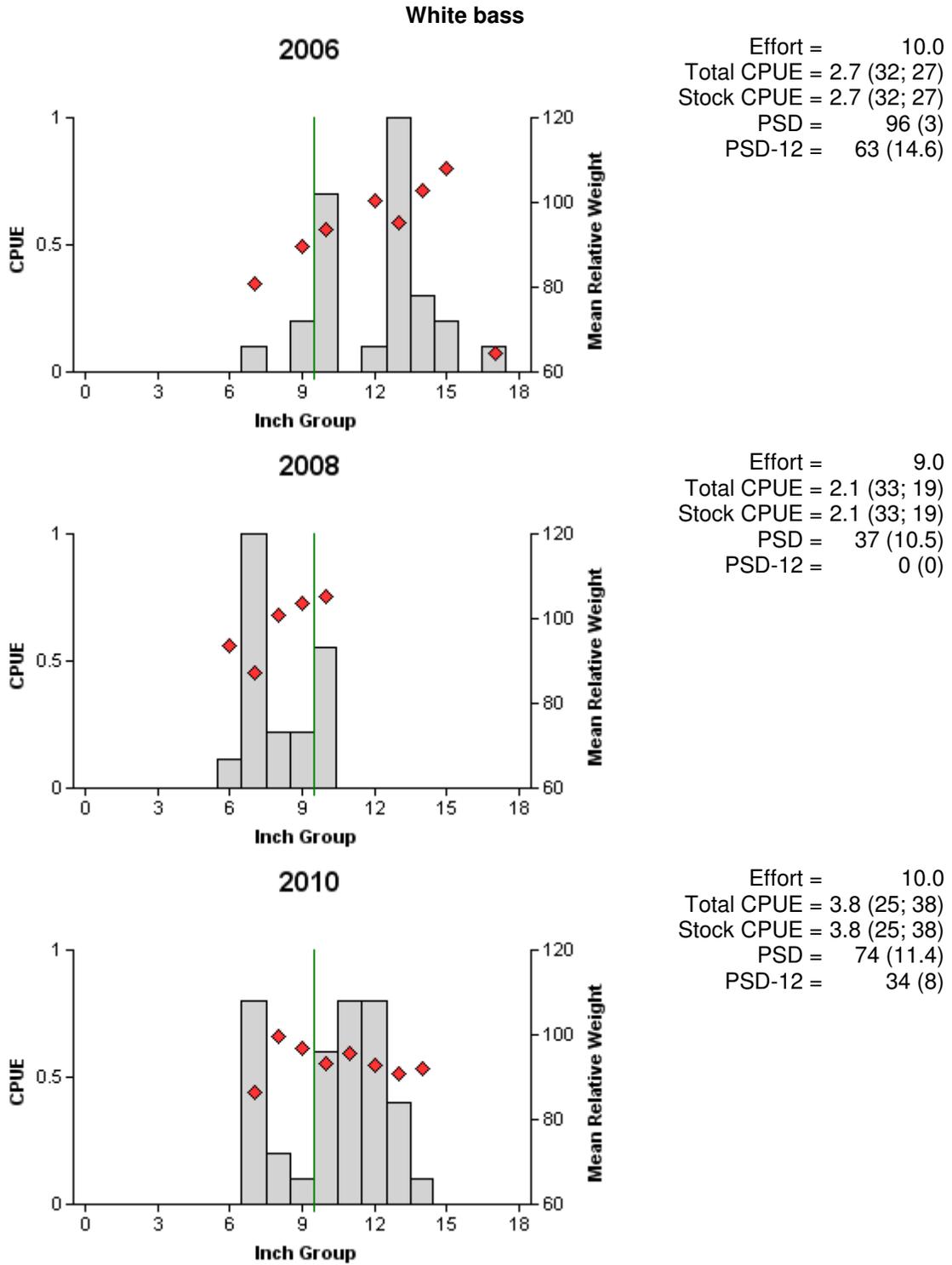


Figure 7. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Granbury Reservoir, Texas, 2006, 2008, and 2010.

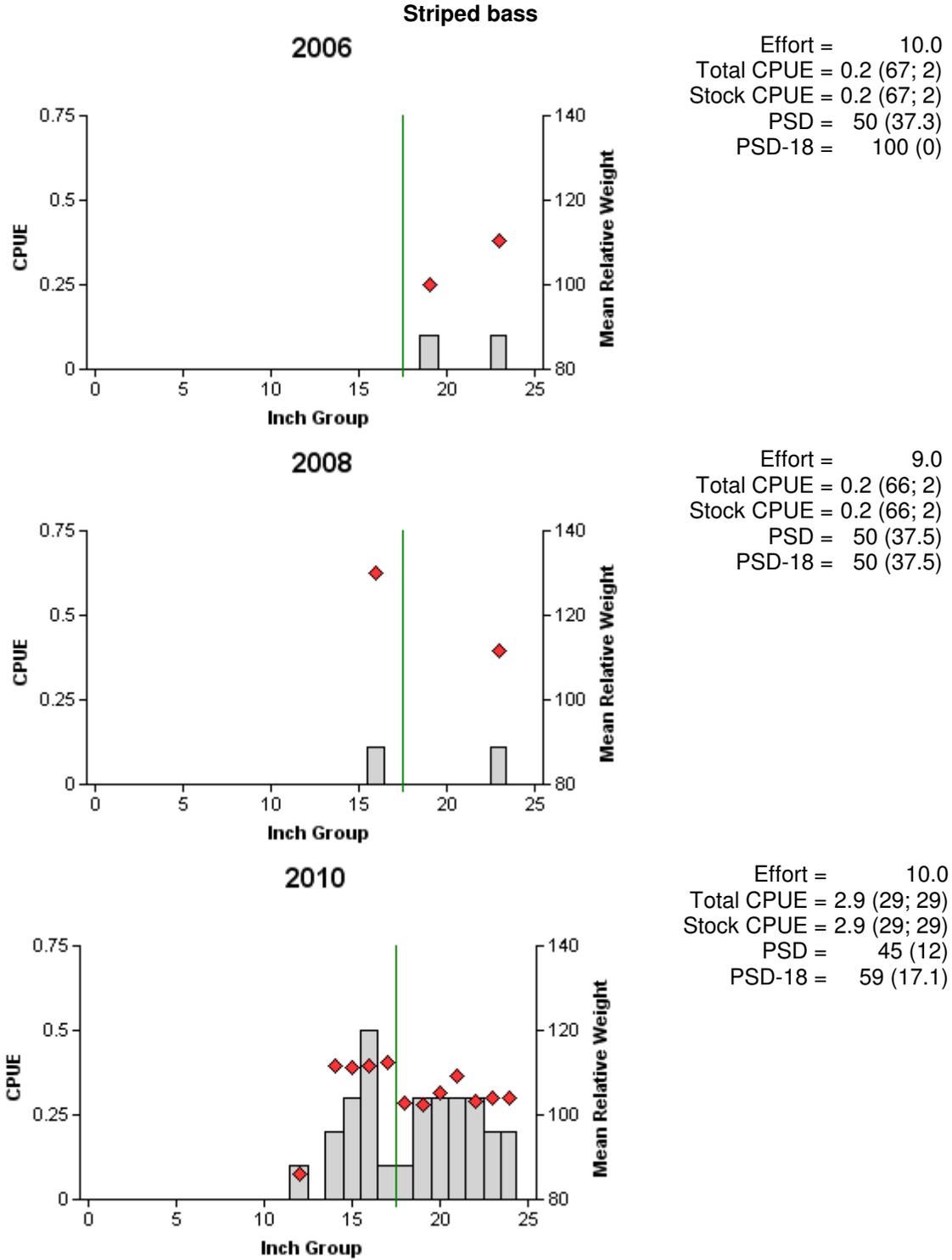


Figure 8. Number of striped bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Granbury Reservoir, Texas, 2006, 2008, and 2010.

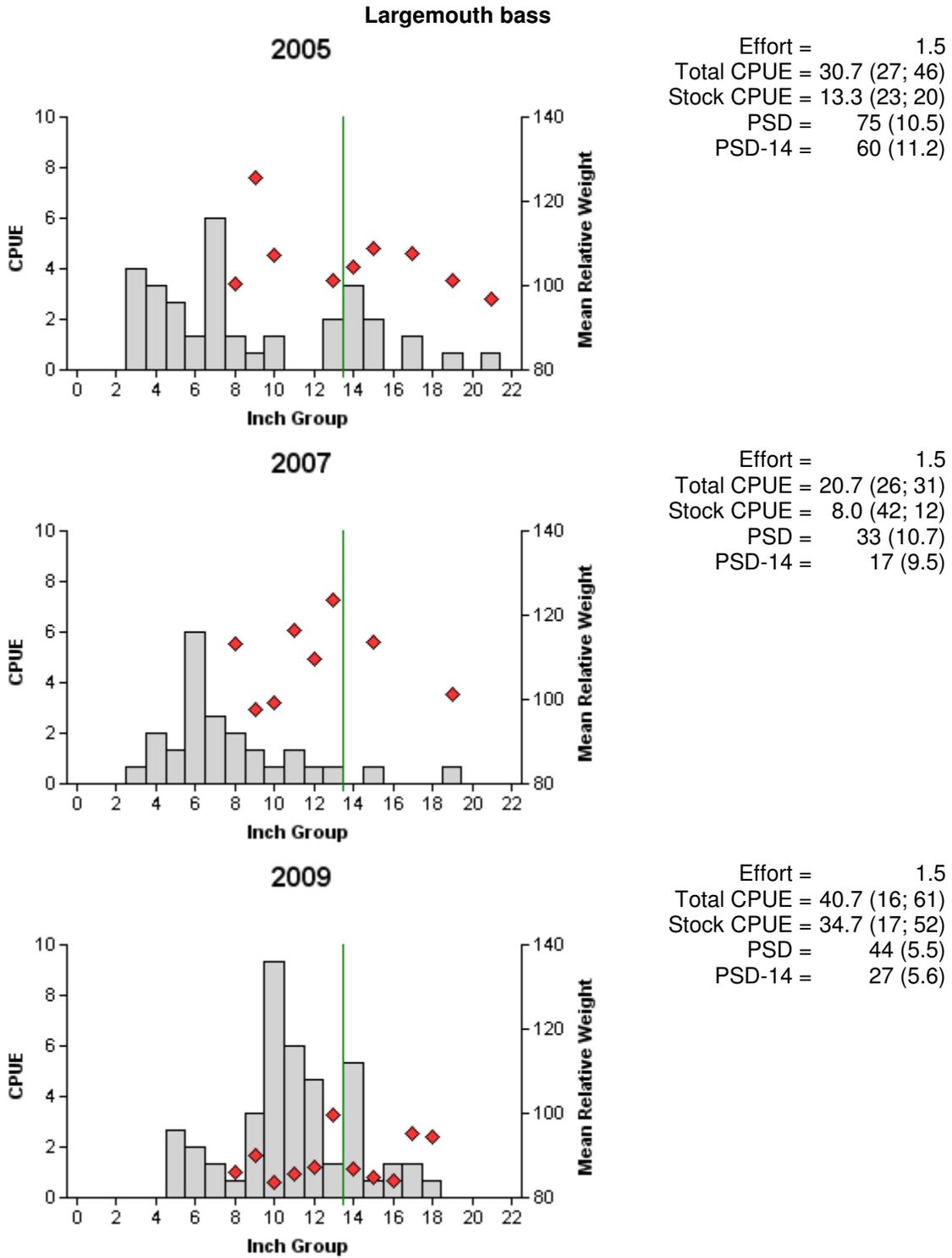


Figure 9. Number of largemouth bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Granbury Reservoir, Texas, 2005, 2007, and 2009.

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Granbury Reservoir, Texas in 2001 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	29	2	7	17	3	48.3	6.7
2005	27	1	2	23	1	50.7	4.0

Table 6. Proposed sampling schedule for Granbury Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall. Winter trap netting became optional in 2009. Standard survey denoted by S and additional survey denoted by A.

Survey Year	Electrofisher	Trap Net	Gill Net	Habitat Survey	Report
Fall 2010-Spring 2011					
Fall 2011-Spring 2012	A		A		
Fall 2012-Spring 2013					
Fall 2013-Spring 2014	S	A	S	S	S

**Appendix A**

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

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard shad			361	240.67
Threadfin shad			45	30.00
Blue catfish	23	2.30		
Channel catfish	220	22.00		
White bass	38	3.80		
Striped bass	29	2.90		
Green sunfish			38	25.33
Warmouth			9	6.00
Bluegill			418	278.67
Longear sunfish			124	82.67
Redear sunfish			15	10.00
Largemouth bass			61	40.67
White crappie				



## Appendix C



Location of sampling sites, Granbury Reservoir, Texas, 2009-2010. Gill net and electrofishing stations are indicated by triangles and circles respectively. Water level was at full pool at time of sampling.