

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-35

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2009 Survey Report

**Dunlap Reservoir**

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July 31, 2010

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## SURVEY AND MANAGEMENT SUMMARY

During the 2006-2010 survey period, fish populations in Lake Dunlap were surveyed in fall 2005, 2007, and 2009 using electrofishing and trap nets and spring 2006 and 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:** Lake Dunlap is a 410-acre impoundment located on the Guadalupe River in Guadalupe County and is regulated by the Guadalupe-Blanco River Authority (GBRA). The reservoir, impounded in 1928, is used for water supply, hydroelectric generation, and recreation. Lake Dunlap is classified as a mainstream reservoir and has a fairly constant water level. Substrate in the upper section is composed primarily of rock and gravel, while the middle and lower sections of the reservoir are composed of clay, sand, and silt. Habitat features include boat docks, rocks, and native floating and emergent vegetation.
- **Management History:** Important sport fish include channel catfish, largemouth bass, and crappie species. The management plan from the 2006 survey report focused on fish habitat improvement, largemouth bass genetics, nuisance aquatic vegetation, and implementing a creel survey. The proposed habitat improvement plan was to construct brushpiles under boat docks and piers of cooperating lake-front property owners, however, the plan was not implemented due to concerns of the brushpiles breaking loose and damaging structures downstream and a decline in interest. Largemouth bass were not stocked. Nuisance aquatic vegetation presence/absence was noted on all fisheries and habitat surveys. The proposed creel survey was to be completed by a university; however, funding for this survey was not available.
- **Fish Community**
  - **Prey species:** Electrofishing catch rates of shad and sunfish species increased substantially since the 2006 report. Prey species populations were comprised primarily of small size classes; benefitting most predatory fish species. Redear and redbreast sunfish provided anglers with excellent angling opportunities.
  - **Catfishes:** Blue, channel, and flathead catfish were present in the reservoir, with blue catfish being the predominant species. The relative abundance of flathead catfish appears to be increasing. Proportion of harvestable-sized catfish in the populations was good as the majority of fish sampled were greater than legal length limits.
  - **Black basses:** Smallmouth, spotted, largemouth, and Guadalupe bass were present in the reservoir, with largemouth being the predominant species. Largemouth bass relative abundance increased substantially and they exhibited good body condition and growth to legal size. Several largemouth bass over 20" were collected during the electrofishing survey.
  - **Crappie:** White and black crappie were present in the reservoir, with white crappie being the predominant species. Trap net catches of crappie were again low but, 33 adult crappie were collected in the spring 2010 gill net survey.
- **Management Strategies:** Continue to manage the fisheries under current regulations, refine crappie sampling, continue to monitor the reservoir for nuisance aquatic vegetation, and publicize the sunfish, catfish, and largemouth bass fisheries through media sources local to the reservoir and through the district Facebook page.

## INTRODUCTION

This document is a summary of fisheries data collected from Lake Dunlap in 2006-2010. 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. Management strategies are included to address existing problems or opportunities. Historical data are presented with the 2009-2010 data for comparison.

### *Reservoir Description*

Lake Dunlap is a 410-acre impoundment located on the Guadalupe River in Guadalupe County and is regulated by the Guadalupe-Blanco River Authority (GBRA). The reservoir, impounded in 1928, is used for water supply, hydroelectric generation, and recreation. The reservoir is mainstream and maintains a fairly constant water level. Substrate in the upper section is composed primarily of rock and gravel, while the middle and lower sections of the reservoir are composed of clay, sand and silt. Land around the reservoir has been heavily developed for residential use. Shoreline habitat was comprised of bulkhead and cutbank. Littoral habitat consisted of native aquatic plant species, including American lotus, spatterdock, and water willow. Hydrilla and water hyacinth were not observed in the 2009-2010 survey period but *Hygrophila* sp., a nuisance exotic plant, was present in the reservoir. *Hygrophila* sp. has been present in the Comal River (upstream) for many years but has yet to become problematic in Lake Dunlap. The public boat ramp at Lake Dunlap provided the only access to the reservoir. Shoreline access was limited to the boat ramp area and there were no facilities for the physically challenged at the boat ramp. Additional descriptive characteristics of Lake Dunlap can be found in Table 1.

### *Management History*

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

1. Continue to work with GBRA on a habitat enhancement project for the reservoir. The project was to build brushpiles under boat docks and piers of cooperating lake-front property owners.  
**Action:** District staff met with GBRA staff and lake groups in November 2006 to discuss the project and gather interest and input. Initially, general interest in the project was positive but there were concerns of the brushpiles breaking loose and damaging structures downstream.
2. The FLMB genotype at Lake Dunlap has fallen below the 20% threshold for reservoirs with a history of producing trophy largemouth bass. Largemouth bass reach trophy status in Lake Dunlap as evidenced by the 14.94 pound water body record for this reservoir.  
**Action:** Largemouth bass were not stocked.
3. Nuisance aquatic vegetation, hydrilla and water hyacinth, caused access and recreational problems in the reservoir in the mid-1990s. Hydrilla and water hyacinth have not been observed in the reservoir since 1996. *Hygrophila* sp. colonies were documented in the reservoir in 2004.  
**Action:** Hydrilla and water hyacinth were not observed during any of the fisheries or vegetation surveys. Floating *Hygrophila* sp. fragments were observed during fisheries and vegetation surveys but no rooted colonies were documented in the 2009 vegetation survey.
4. There are currently no creel data for Lake Dunlap. This reservoir has redear and redbreast sunfish that reach greater than 8 inches total length but there are no data to quantify angling effort, or catch and harvest rates of these two species. Additionally, Guadalupe bass are present in this reservoir and angling effort, catch and harvest data would be important for this endemic species. This survey was proposed to be conducted by a university should funding be obtained.  
**Action:** A creel survey was not conducted as funding was not available.

**Harvest regulation history:** Sportfishes in Lake Dunlap have always been managed with statewide regulations (Table 2).

**Stocking history:** Lake Dunlap has not been stocked since 2001 (blue catfish). Triploid grass carp were stocked in 1995 and 1996 for hydrilla control and have been collected during electrofishing surveys. Florida largemouth bass have not been stocked since 1984. A complete stocking history can be found in Table 3.

**Vegetation/habitat management history:** Prior to 1996, Lake Dunlap had a severe hydrilla problem. Through herbicide treatments and the introduction of triploid grass carp, hydrilla was no longer present in the reservoir as of 2005. Water hyacinth was also present in Lake Dunlap prior to 1996 but has not been observed since. *Hygrophila* sp., an exotic and potentially nuisance species, was documented actively growing in Lake Dunlap in 2004. This plant has been present in the Comal River (upstream of Lake Dunlap) for many years. *Hygrophila* sp. fragments began appearing in Lake Dunlap during the summer 2004 and were probably linked to recreational tubing activities in the Comal River during this same time period. Although this species has become established in Lake Dunlap, it is not expected to cause any access problems due to the limited areas for growth.

## METHODS

Fishes were collected by electrofishing (1.0 hour at 12 5-minute stations), trap nets (5 net nights at 5 stations), and gill nets (5 net nights at 5 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 trap and gill nets as the number of fish caught in one net set overnight (fish/nn). The habitat (shoreline) survey was collected in 2005 and the vegetation survey was conducted in July 2009. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009).

Genetic composition of largemouth bass was determined by using Micro-satellite DNA analysis in 2005 and 2009 and by electrophoresis in previous years.

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)] and relative weight ( $W_r$ ) was calculated for target fishes according to Anderson and Neumann (1996). The Index of Vulnerability (IOV) was calculated for gizzard shad according to DiCenzo et. al. (1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. Mean age at length data for largemouth bass was determined using otoliths from 13 individuals between 13 and 14.9 inches total length.

## RESULTS AND DISCUSSION

**Habitat:** In 2009, littoral zone habitat consisted of bulkhead, cutbank, native floating vegetation (spatterdock), native emergent vegetation (water willow), and native submersed vegetation (strap-leaf sagittaria) (Table 4). *Hygrophila* sp. was not observed during the vegetation survey; however, floating fragments were seen during fisheries surveys. Total vegetation coverage for Lake Dunlap was 3.9% down from the 2005 survey (7.1%).

**Prey species:** Electrofishing catch rates for all prey species increased. Gizzard shad catch rate was 218.0/h, a substantial increase from 100.0/h in 2005 and 11.0/h in 2007 (Figure 1). The 2009 gizzard shad IOV was 83, similar to 85 in 2005 and higher than 9 in 2007 (Figure 1), indicating that a high percentage (83%) of the gizzard shad sampled were suitably-sized prey for most predatory fishes. The 2009 threadfin shad catch rate was 297.0/h.

Redbreast sunfish, bluegill, and redear sunfish catch rates in 2010 were 239.0/h, 318.0/h, and 44.0/h, respectively (Figures 2, 3, and 4). Catch rates of these three sunfish species increased from

previous years and the majority of these populations were comprised of sizes available to most predatory fishes. Redbreast and redear sunfish grow to a large size in the reservoir ( $\geq 8$  inches).

**Blue catfish:** The gill net catch rate for blue catfish in 2010 was 3.6/nn, higher than 0.4/nn in 2002 and 2006 (Figure 5). The 2010 sample was comprised of larger individuals as indicated by the PSD of 89. Until 2010, blue catfish gill net catch rates were low ( $<1.0$ /nn), however, it appears the population was growing. Body condition of blue catfish was excellent as  $W_r$  values generally exceeded 100.

**Channel catfish:** The gill net catch rate for channel catfish in 2010 was 4.2/nn, lower than 10.0/nn in 2002 and 7.0/nn in 2006 (Figure 6). The majority of channel catfish sampled were greater than the 12-inch minimum length limit. Mean relative weights of stock size and greater channel catfish reflect excellent condition, with most  $W_r$  values over 120 (Figure 6).

**Flathead catfish:** The gill net catch rate for flathead catfish in 2010 was 1.2/nn, similar to 1.0/nn in 2006 and 0.4/nn in 2002 (Figure 7). Gill net catch rates of flathead catfish have increased slightly but remain low.

**Largemouth bass:** The electrofishing catch rate for largemouth bass in 2009 was 159.0/h, substantially higher than 73.0/h in 2005 and 43.0/h in 2007 (Figure 8). PSD in 2009 was 52 indicating a balanced population. Proportional size distribution decreased as would be expected from the result of excellent year class survival and recruitment. Mean relative weights indicated condition of largemouth bass was good as  $W_r$  values were near 100 for most size classes (Figure 8). Legal-sized largemouth bass ( $\geq 14$  inches) were more abundant in 2009 than in previous years. Largemouth bass growth was excellent as mean age at 14 inches (range 13.0 to 14.9 inches) was 1.5 years in 2009 (N=15; range 1-3) compared to 2.7 years in 2005 (N=13; range 1-3). Genetic data for largemouth bass are in Table 5.

**White crappie:** Historically trap net catch rates of white crappie have been low ( $<1.0$ /nn) using both standard (Figure 9) and non-standard trap net surveys (Figure 10). In fall 2005 random and non-random (biologist-selected sites) trap net surveys were conducted simultaneously. No white crappie were collected from the random survey and only four were collected from the non-random survey. A dual-cod trap net survey was conducted in the fall 2009, collecting only four white crappie. However, 2010 gill net catches indicated more abundant white crappie population, as 33 individuals were collected (Appendix A).

## Fisheries management plan for Lake Dunlap, Texas

Prepared – July 2010.

**ISSUE 1:** Trap net catch rates of crappie are low (generally less than 1.0/nn) using both standard and non-standard sets in the fall resulting in minimal population information for this species. Greater numbers of crappie have been collected in the spring by other gear types such as gill nets (6.6/nn in 2010).

### MANAGEMENT STRATEGIES

1. Conduct both random and non-random trap net surveys in the spring 2012.

**ISSUE 2:** Exotic vegetation has been problematic in this reservoir in the past. Currently, *Hygrophila* is the only exotic species in the reservoir but has yet to become problematic. Both rooted stands and floating fragments of Hydrilla were found in Lake McQueeney (downstream of Lake Dunlap) and could possibly be transported to Lake Dunlap via boat trailers.

### MANAGEMENT STRATEGIES

1. Continue to monitor the reservoir bi-annually for the expansion of *Hygrophila* sp. and possible return of hydrilla.
2. Work with GBRA on control measures as necessary.

**ISSUE 3:** The largemouth bass and blue catfish populations increased in recent years and provide anglers with excellent fishing opportunities.

### MANAGEMENT STRATEGIES

1. Write and distribute press releases through media outlets local to the reservoir as well as on the district facebook page.

### **SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes routine electrofishing and trap netting in the fall 2011, random and non-random trap netting in the spring 2012, and electrofishing, trap netting, gill netting in 2013-2014 to monitor the sport fisheries, and a Federal Aid report will be prepared in 2014 (Table 6).

## 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 2nd edition. American Fisheries Society, Bethesda, Maryland.
- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relationships between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- Findeisen, J and T. Neahr. 2006. Statewide freshwater fisheries monitoring and management program survey report for Lake Dunlap, 2005. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.
- 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 32(7):348.



Table 1. Characteristics of Lake Dunlap, Texas.

Characteristic	Description
Year constructed	1928
Controlling authority	Guadalupe-Blanco River Authority
County	Guadalupe
Reservoir type	Mainstream
Shoreline Development Index	2.25
Conductivity	450-550 umhos/cm
Access: Boat	Good, 1 Public ramp
Bank	Poor, limited due to private property
Handicapped	Poor, none

Table 2. Harvest regulations for Lake Dunlap, 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, striped	5	18 – No Limit
Bass, palmetto	5	18 – No Limit
Bass, largemouth	5	14 – No Limit
Bass, spotted and Guadalupe	5 (in any combination)	No Limit – No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 – No Limit

Table 3. Stocking history of Lake Dunlap, Texas. Size categories are: FGL = 1-3 inches and ADL = adults.

Year	Number	Size
<u>Blue catfish</u>		
1988	16	ADL
1995	41,000	FGL
1996	34,400	FGL
1997	41,553	FGL
2001	34,308	FGL
Species Total	151,277	
<u>Channel catfish</u>		
1968	2,000	FGL
1973	6,000	FGL
Species Total	8,000	
<u>Coppernose bluegill</u>		
1983	15,000	FGL
<u>Florida largemouth bass</u>		
1966	8,400	FGL
1967	10,000	FGL
1984	20,200	FGL
Species Total	38,600	
<u>Triploid grass carp*</u>		
1995	25	ADL
1996**	3	ADL
Species Total	28	

\* Radio-tagged fish

\*\* Replace dead radio-tagged fish

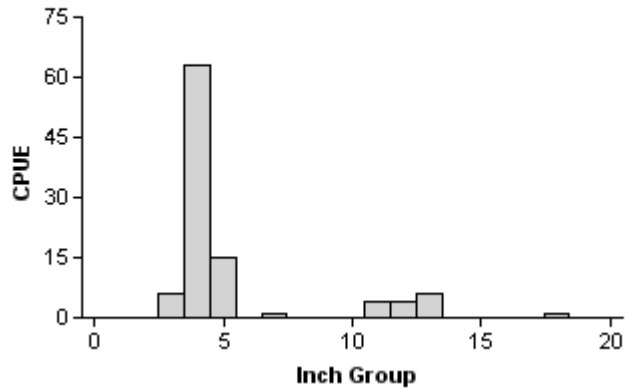
Table 4. Survey of littoral zone and physical habitat types, Lake Dunlap, Texas, 2005. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation identified during the August 2009 vegetation survey.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Bulkhead	8.67	51.9		
Concrete	0.07	0.4		
Cutbank	<u>7.98</u>	<u>47.7</u>		
Total	16.72	100		
Boat docks	6.89	41.2		
Water willow			0.05	0.01
Spatterdock			15.90	3.88
Strap-leaf sagittaria			0.15	0.04

## Gizzard Shad

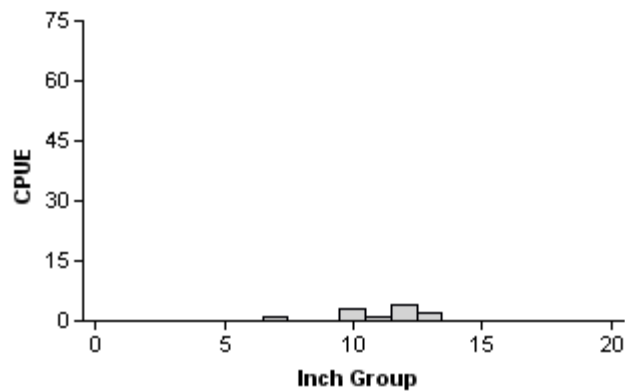
2005

Effort = 1.0  
Total CPUE = 100.0 (33; 100)  
IOV = 85 (6)



2007

Effort = 1.0  
Total CPUE = 11.0 (25; 11)  
IOV = 9 (8)



2009

Effort = 1.0  
Total CPUE = 218.0 (22; 218)  
IOV = 83 (9)

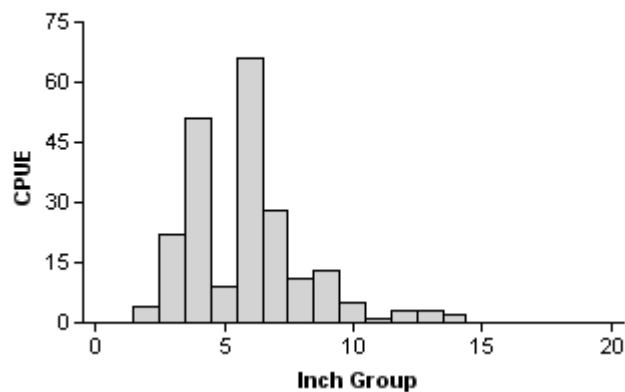
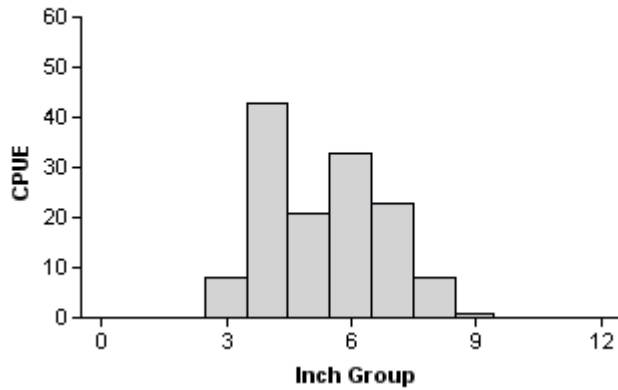


Figure 1. Number of gizzard shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Dunlap, Texas, 2005, 2007, and 2009.

## Redbreast Sunfish

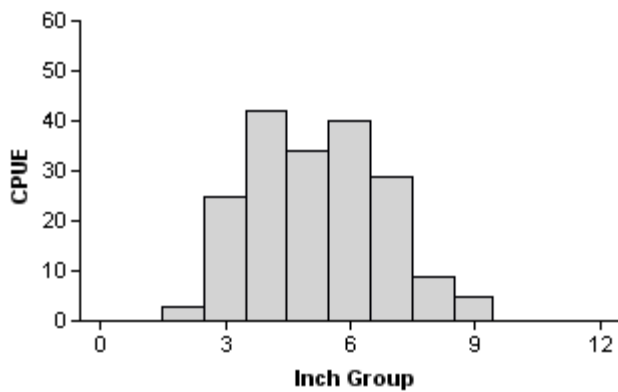
2005

Effort = 1.0  
Total CPUE = 137.0 (32; 137)  
PSD = 47 (6)



2007

Effort = 1.0  
Total CPUE = 187.0 (24; 187)  
PSD = 45 (8)



2009

Effort = 1.0  
Total CPUE = 239.0 (25; 239)  
PSD = 38 (6)

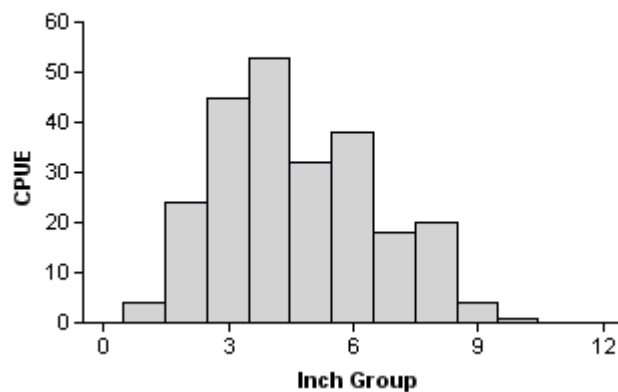
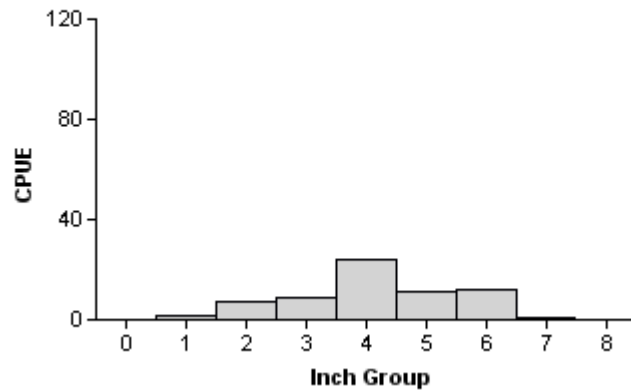


Figure 2. Number of redbreast sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for PSD are in parentheses) for fall electrofishing surveys, Lake Dunlap, Texas, 2005, 2007, and 2009.

## Bluegill

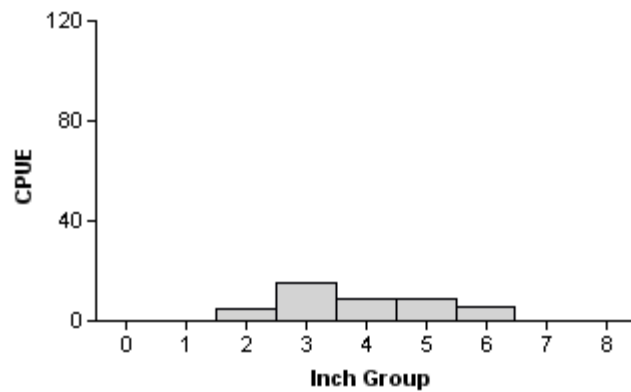
2005

Effort = 1.0  
Total CPUE = 66.0 (31; 66)  
PSD = 23 (0)



2007

Effort = 1.0  
Total CPUE = 44.0 (39; 44)  
PSD = 15 (4)



2009

Effort = 1.0  
Total CPUE = 318.0 (12; 318)  
PSD = 15 (3)

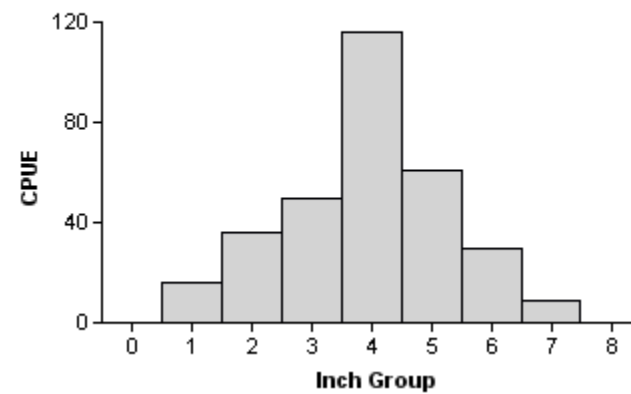
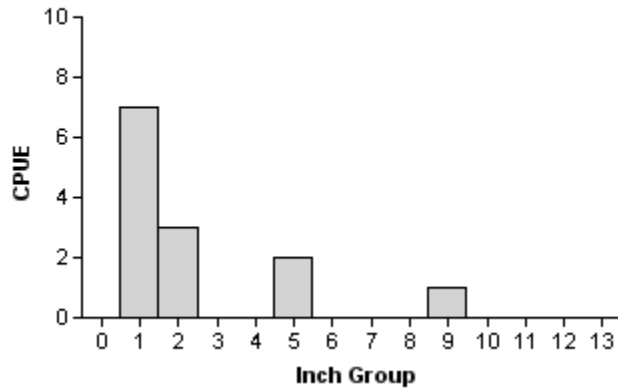


Figure 3. Number of bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for PSD are in parentheses) for fall electrofishing surveys, Lake Dunlap, Texas, 2005, 2007, and 2009.

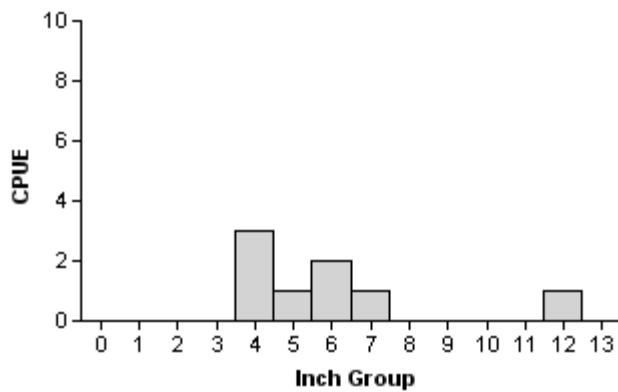
## Redear Sunfish

2005



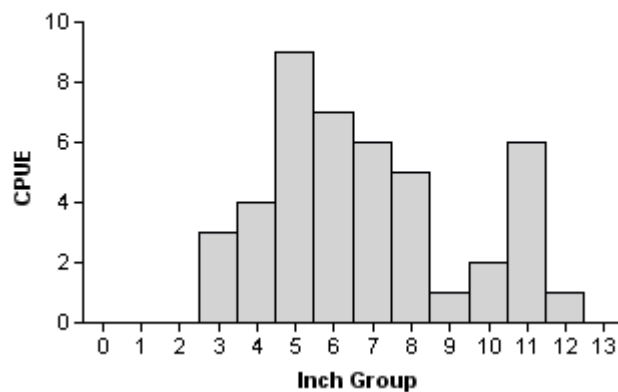
Effort = 1.0  
 Total CPUE = 13.0 (70; 13)  
 Stock CPUE = 3.0 (72; 3)  
 PSD = 33 (33)

2007



Effort = 1.0  
 Total CPUE = 8.0 (50; 8)  
 Stock CPUE = 8.0 (50; 8)  
 PSD = 25 (20)

2009

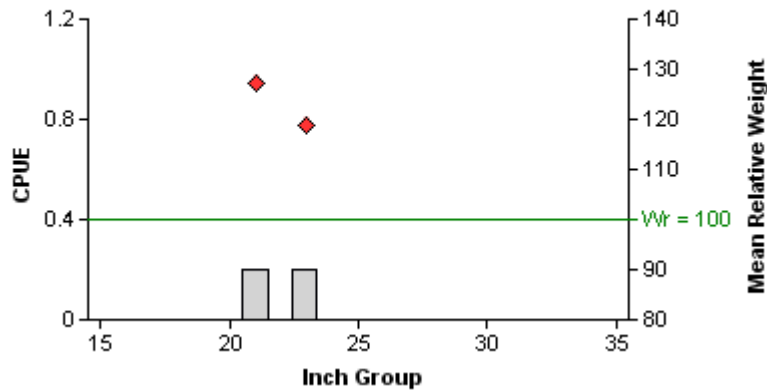


Effort = 1.0  
 Total CPUE = 44.0 (25; 44)  
 Stock CPUE = 41.0 (25; 41)  
 PSD = 51 (7)

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

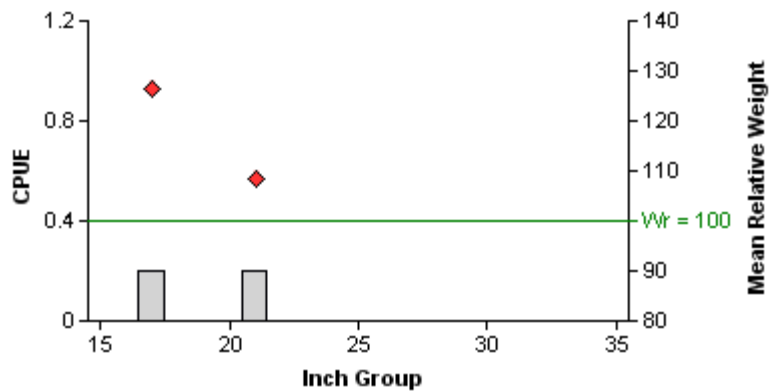
## Blue Catfish

2002



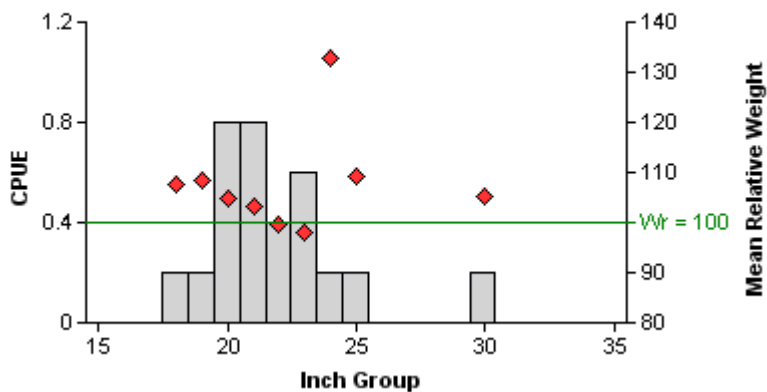
Effort = 5.0  
 Total CPUE = 0.4 (100; 2)  
 Stock CPUE = 0.4 (100; 2)  
 PSD = 100 (0)

2006



Effort = 5.0  
 Total CPUE = 0.4 (100; 2)  
 Stock CPUE = 0.4 (100; 2)  
 PSD = 50 (0)

2010

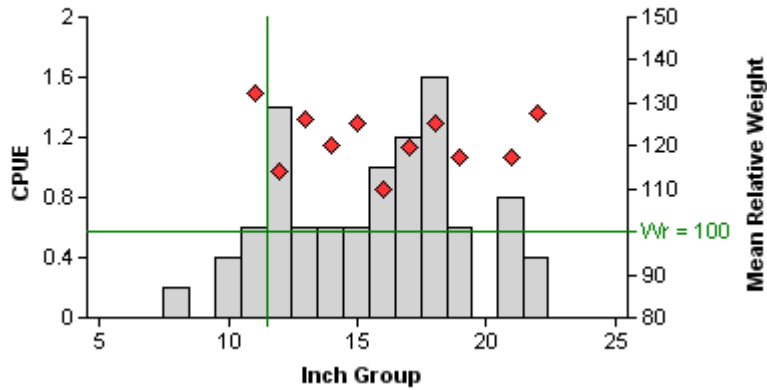


Effort = 5.0  
 Total CPUE = 3.6 (14; 18)  
 Stock CPUE = 3.6 (14; 18)  
 PSD = 89 (11)

Figure 5. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for population indices are in parentheses) for spring gill net surveys, Lake Dunlap, Texas, 2002, 2006, and 2010. Horizontal line denotes Wr of 100.

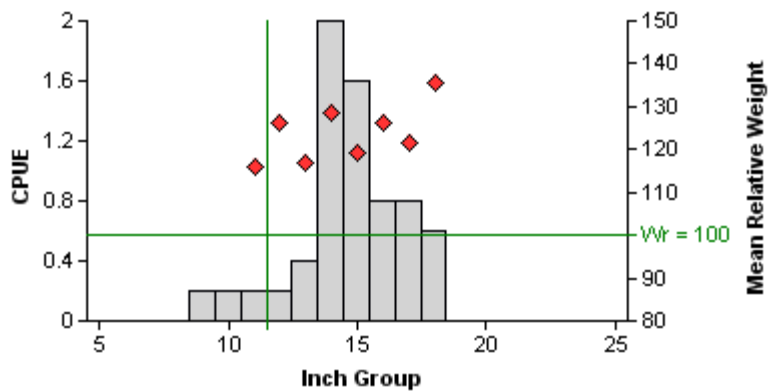
## Channel Catfish

2002



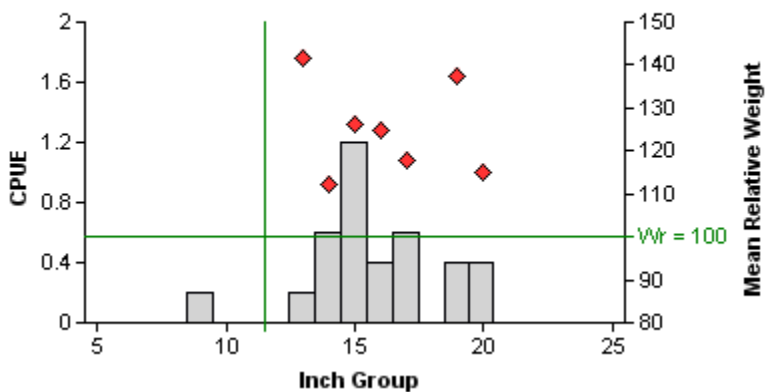
Effort = 5.0  
 Total CPUE = 10.0 (24; 50)  
 Stock CPUE = 9.4 (25; 47)  
 PSD = 60 (17)

2006



Effort = 5.0  
 Total CPUE = 7.0 (34; 35)  
 Stock CPUE = 6.6 (37; 33)  
 PSD = 47 (9)

2010



Effort = 5.0  
 Total CPUE = 4.2 (20; 21)  
 Stock CPUE = 3.8 (26; 19)  
 PSD = 47 (12)

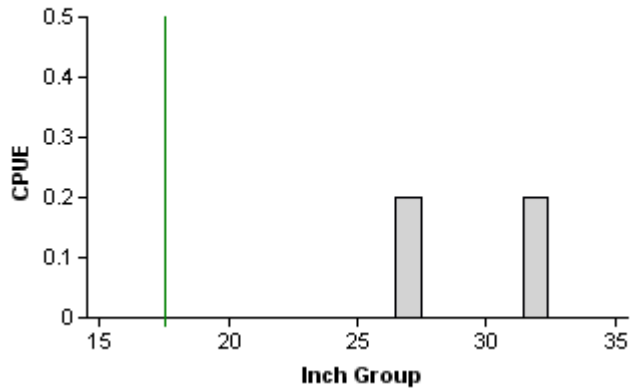
Figure 6. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for population indices are in parentheses) for spring gill net surveys, Lake Dunlap, Texas, 2002, 2006, and 2010. The vertical line denotes 12-inch minimum length limit and the horizontal line denotes Wr of 100.



## Flathead Catfish

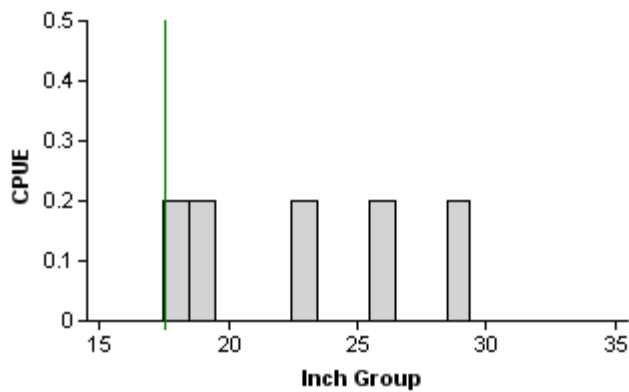
2002

Effort = 5.0  
Total CPUE = 0.4 (61; 2)



2006

Effort = 5.0  
Total CPUE = 1.0 (55; 5)



2010

Effort = 5.0  
Total CPUE = 1.2 (31; 6)

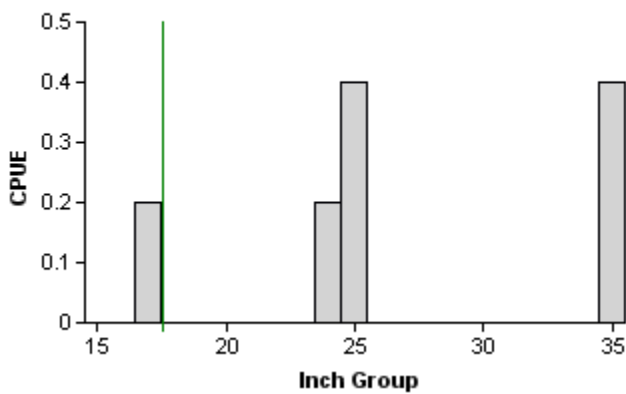
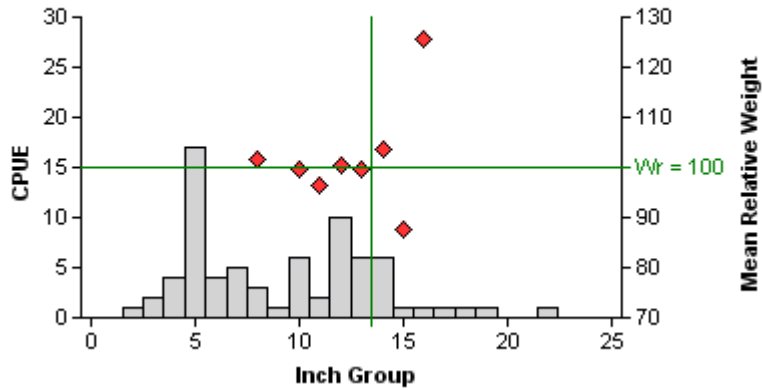


Figure 7. Number of flathead catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Lake Dunlap, Texas, 2002, 2006, and 2010. The vertical line denotes 18-inch minimum length limit.

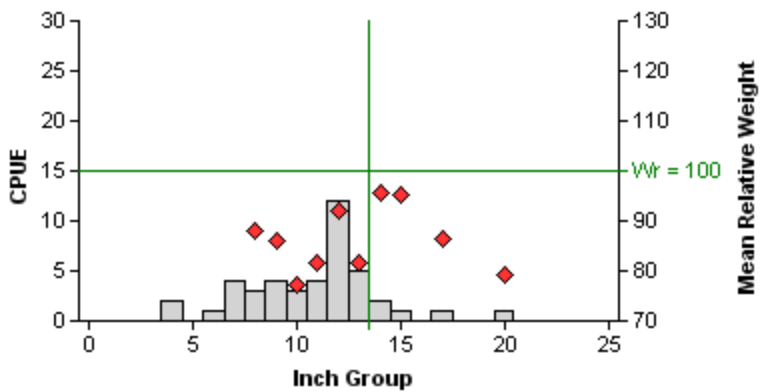
## Largemouth Bass

2005



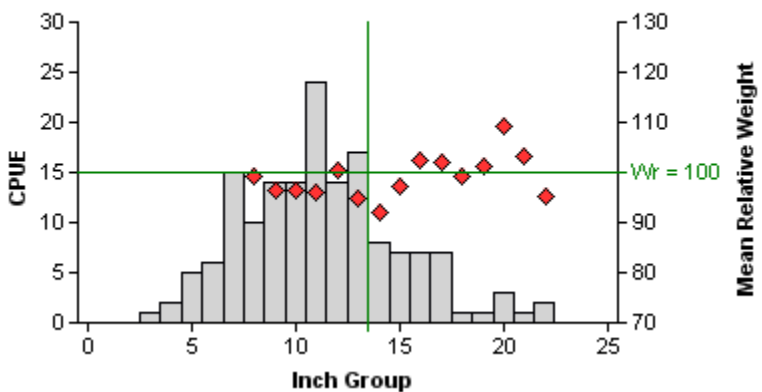
Effort = 1.0  
Total CPUE = 73.0 (23; 73)  
Stock CPUE = 40.0 (23; 40)  
PSD = 70 (9)

2007



Effort = 1.0  
Total CPUE = 43.0 (18; 43)  
Stock CPUE = 36.0 (18; 36)  
PSD = 61 (8)

2009



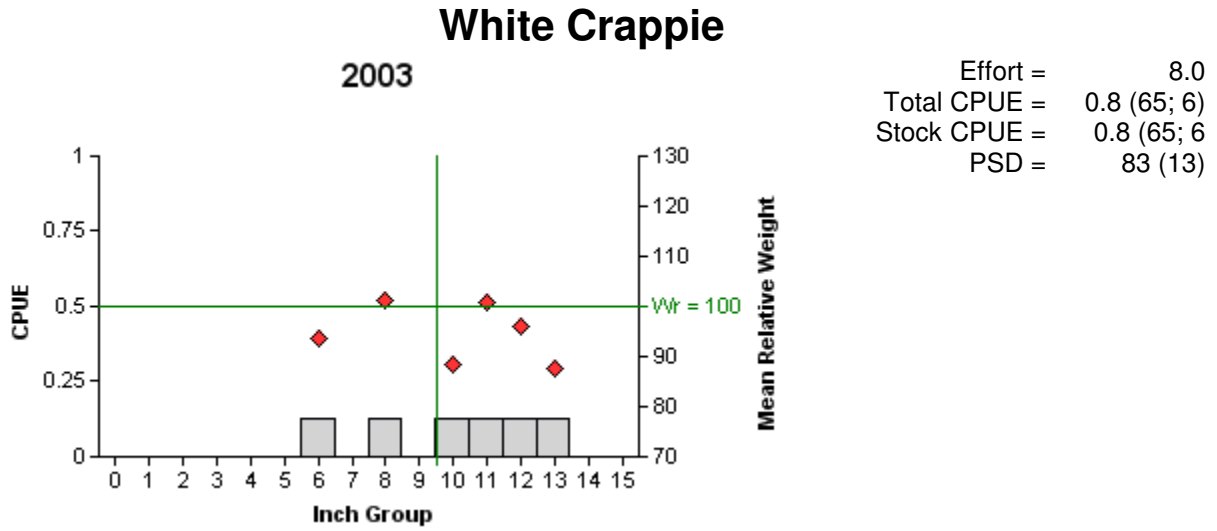
Effort = 1.0  
Total CPUE = 159.0 (15; 159)  
Stock CPUE = 130.0 (15; 130)  
PSD = 52 (5)

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 population indices are in parentheses) for fall electrofishing surveys, Lake Dunlap, Texas, 2005, 2007, and 2009. The vertical line denotes 14-inch minimum length limit and the horizontal line denotes Wr of 100.

## Largemouth Bass

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Lake Dunlap, Texas 2003, 2005, and 2009. Electrophoresis analysis was used to determine genetic composition in 2003 and micro-satellite DNA analysis was used in 2005 and 2009. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation intergrade between a FLMB and a NLMB, Fx = second or higher generation intergrade between a FLMB and a NLMB.

Year	Sample size	Genotype				% FLMB alleles	% Pure FLMB
		FLMB	F1	Fx	NLMB		
2003	30	8	5	15	2	70.8	Unknown
2005	30	5	1	24	0	66.4	17
2009	16	0	0	15	1	60.0	0



Effort = 5.0  
 Total CPUE = 0.0

No white crappie were collected using randomly set trap nets in 2005.

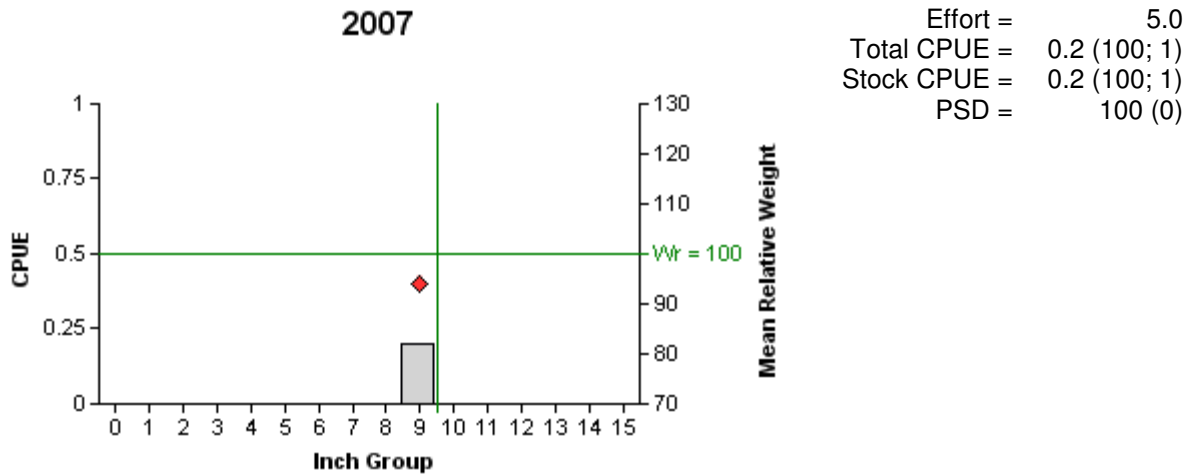
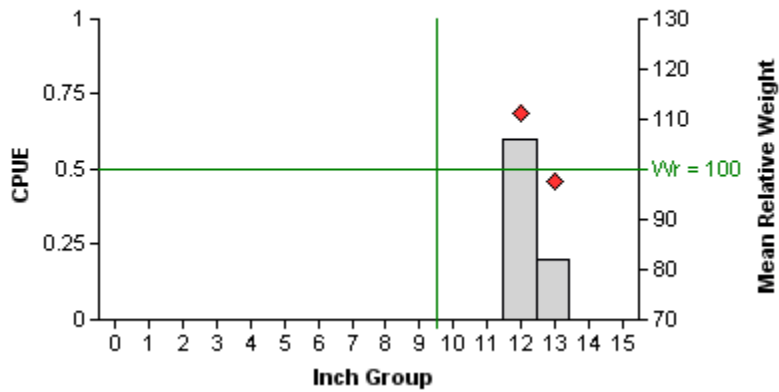


Figure 9. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for population indices are in parentheses) for fall trap net surveys, Lake Dunlap, Texas, 2003, 2005, and 2007. The vertical line denotes 10-inch minimum length limit and the horizontal line denotes Wr of 100.

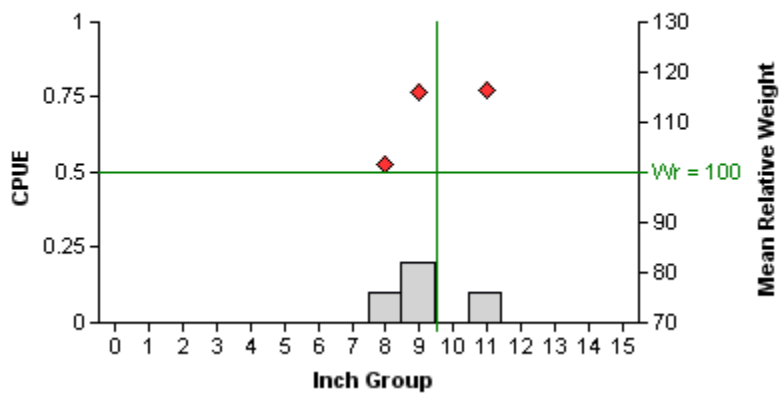
## White Crappie

2005



Effort = 5.0  
 Total CPUE = 0.8 (73; 4)  
 Stock CPUE = 0.8 (73; 4)  
 PSD = 100 (0)

2009



Effort = 10.0  
 Total CPUE = 0.4 (100; 4)  
 Stock CPUE = 0.4 (100; 4)  
 PSD = 100 (0)

Figure 10. 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 population indices are in parentheses) for the fall non-standard trap net surveys, Lake Dunlap, Texas, 2005 (biologist selected sites) and 2009 (dual-cod trap net). The vertical line denotes 10-inch minimum length limit and the horizontal line denotes Wr of 100.

Table 6. Proposed sampling schedule for Lake Dunlap, Texas. Electrofishing and trap net surveys are conducted in the fall and the gill net survey in the spring. Standard survey denoted by S and additional survey denoted by A.

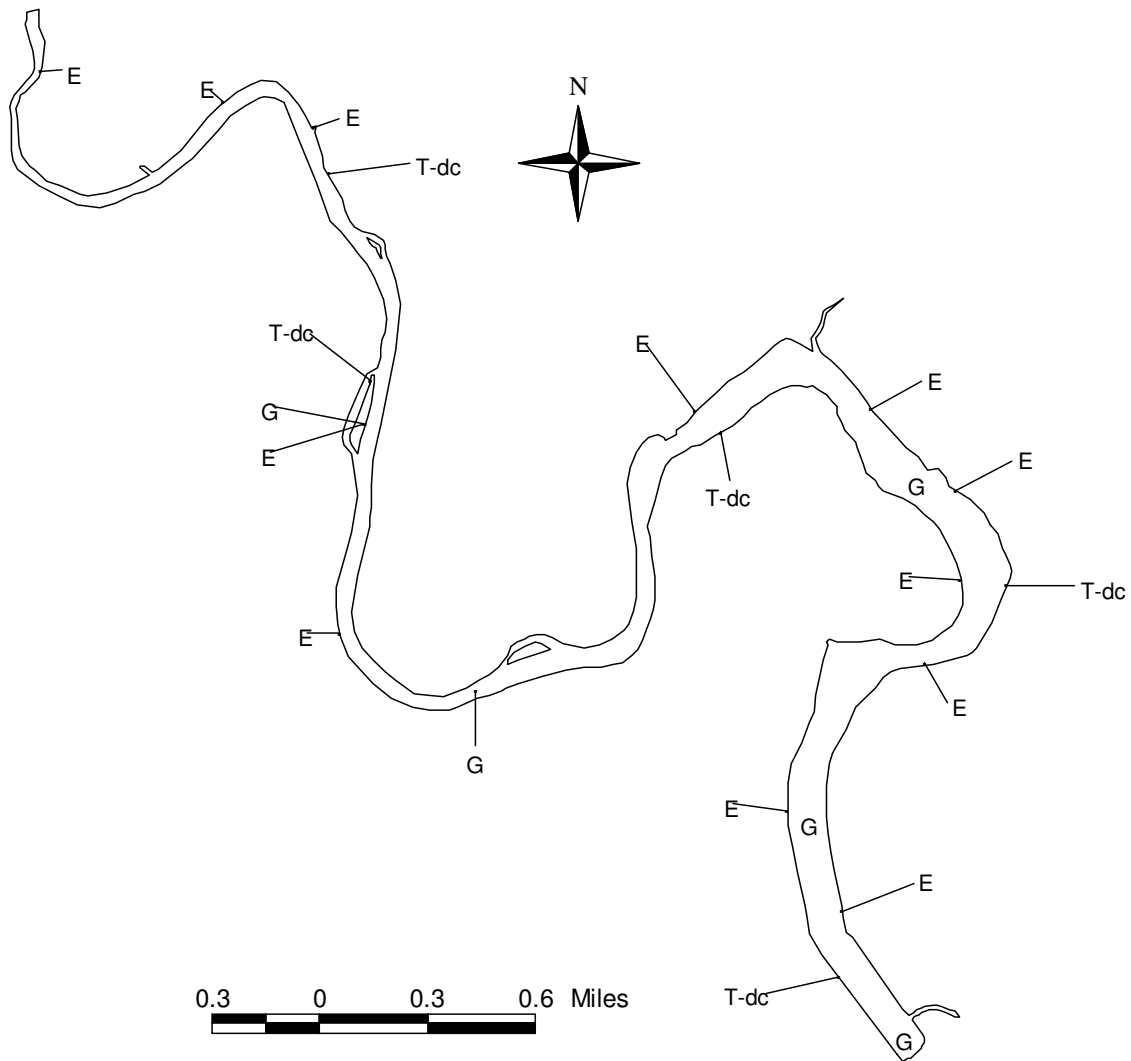
Survey Year	Electrofishing	Trap Netting	Gill Netting	Report
Fall 2010-Spring 2011				
Fall 2011-Spring 2012	A	A		
Fall 2012-Spring 2013				
Fall 2013-Spring 2014	S	S	S	S

**APPENDIX A**

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

Species	Electrofishing		Trap Netting		Gill netting	
	N	CPUE	N	CPUE	N	CPUE
Longnose gar					1	0.2
Gizzard shad	218	218.0			32	6.4
Threadfin shad	297	297.0				
Golden shiner	1	1.0				
Bullhead minnow	2	2.0	2	0.2		
Inland silverside	25	25.0	3	0.3		
Grey redhorse	1	1.0			27	5.4
Blue catfish					18	3.6
Channel catfish	2	2.0			21	4.2
Flathead catfish					6	1.2
Mexican tetra	34	34.0				
Suckermouth catfish	2	2.0				
Redbreast sunfish	239	239.0	14	1.4		
Warmouth	14	14.0	9	0.9		
Bluegill	318	318.0	240	24.5	7	1.4
Longear sunfish	4	4.0	18	1.8		
Redear sunfish	44	44.0	27	2.7	26	5.2
Smallmouth bass	2	2.0			8	1.6
Largemouth bass	159	159.0			56	11.2
Guadalupe bass	1	1.0				
White crappie			4	0.4	33	6.6
Rio Grande Cichlid	21	21.0	20	2.0		
Blue tilapia	4	4.0			3	0.6

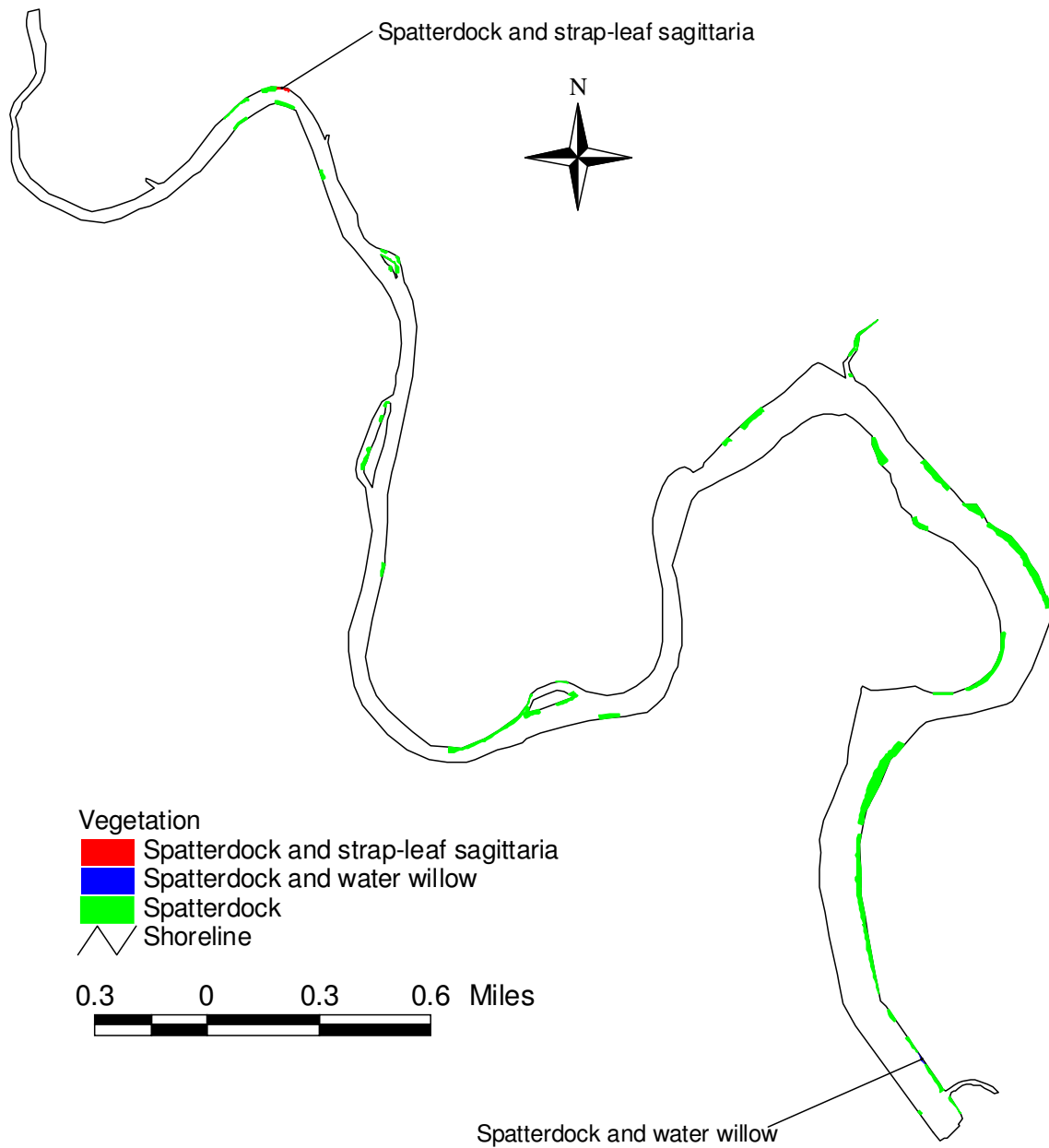
## APPENDIX B



Location of sampling sites, Lake Dunlap, Texas, 2009-2010. Electrofishing, dual-cod trap net, and gill net stations are indicated by E, T-dc, and G, respectively.



## APPENDIX C



Locations of aquatic vegetation, Lake Dunlap, Texas, 2009.