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

Lake Athens

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SURVEY AND MANAGEMENT SUMMARY

The Lake Athens fish community was surveyed from June 2009 through May 2010 using electrofishing and gill netting. A vegetation survey was conducted in July 2009. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Athens is a 1,799-acre reservoir on Flat Creek, a tributary of the Neches River, Texas, built to provide water for municipal and industrial purposes. Boat access is adequate, but public bank angling access is limited to the marina area, and parking at bridge crossings is limited. There are no handicap-specific facilities but the convenience pier at the marina allows limited wheelchair use. The reservoir contains a diverse aquatic plant community.

- **Management History:** Important sport fish include sunfishes, largemouth bass, white bass, channel catfish, and black crappie. The length limit for largemouth bass was changed in 1996 from the statewide 14-inch minimum length to a 14- to 21-inch slot-length limit. Monitoring of the largemouth bass growth rate has continued. Boat access and angling access are available and improvements have been recommended, but not implemented. Invasive aquatic plant species, hydrilla, water hyacinth, and alligatorweed are present in the system and are under management by the controlling authority.

- **Fish Community**
  - **Prey species:** Threadfin shad continue to be present in the reservoir. Electrofishing catch rate of gizzard shad remained low, and few gizzard shad were available as prey to most sport fish. Despite low shad catch rates, sunfish (≤4 inches) catch rates were adequate to provide forage for sport fishes.

  - **Catfishes:** Channel catfish gill net catch rates were lower than in previous surveys. A declining trend in catch rates may indicate limited production in recent years.

  - **Temperate basses:** White bass were present in the reservoir, although gill net catch rates have declined.

  - **Largemouth bass:** Size distribution of largemouth bass indicates a balanced population, and size structure has improved over previous surveys. Growth rates of fish within the protected slot-limit are still slow. The percentage of Florida largemouth bass alleles has increased since 2003, yet no pure Florida Bass were collected.

  - **Crappie:** White crappie and black crappie have been collected in the reservoir in the past. Sampling for these species was not conducted in 2009 due to historically low sampling efficiency.

- **Management Strategies:** Largemouth bass are of high importance in this system, therefore, additional monitoring of their growth rates and size distribution will be conducted in fall of 2011. The sampling will also provide fish for microsatellite DNA analysis. Channel catfish recruitment and population structure will continue to be monitored in 2014.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Athens from June 2009 through May 2010. The purpose of this 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 are presented with the 2009-2010 data for comparison.

Reservoir Description

Lake Athens is a 1,799-acre reservoir constructed in 1962 on Flat Creek, a tributary of the Neches River, Texas, built to supply water for municipal and industrial purposes. The lake is located in Henderson County and is operated and controlled by the Athens Municipal Water Authority. Lake Athens is eutrophic, exhibiting a mean TSI *chl-a* of 49.5 (Texas Commission on Environmental Quality 2008). The shoreline at Lake Athens is primarily featureless or a combination of featureless/bulkhead and boat docks. A diverse native emergent and submersed aquatic plant community forms a beneficial fringe around the reservoir. Invasive aquatic plants, hydrilla (*Hydrilla verticillata*) and water hyacinth (*Eichhornia crassipes)* were discovered in 1995 and 2005, respectively. Alligatorweed (*Alternanthera philoxeroides*) is also present.

Boat access is limited to one boat ramp (no fee required), and public bank angling access is restricted to the marina area and bridge crossings. Parking at bridge crossings is limited. There are no handicap-specific facilities but the convenience pier at the marina allows limited wheelchair use. Other descriptive characteristics from Lake Athens are recorded in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Beck and Ott 2006) included:

1. Continue monitoring Florida largemouth bass (*Micropterus salmoides floridanus)* alleles in the population.
   Action: Florida largemouth bass fingerlings were stocked in 2005, and 2008-2010. Genetic analysis was conducted with microsatellite DNA analysis in fall of 2009, and stockings of surplus fry and fingerling Florida largemouth bass in 2009.
2. Monitor size distribution and growth rates of largemouth bass (*Micropterus spp.)* in the protected slot-length range.
   Action: Continued monitoring of size distribution and growth through 2009. Additional electrofishing was conducted in 2007.
4. Continue monitoring of channel catfish (*Ictalurus punctatus*) population.
   Action: Continued monitoring of channel catfish size distribution and abundance in 2010 using gill nets.
5. Continue monitoring exotic vegetation (i.e. hydrilla, water hyacinth, and alligatorweed).
   Action: Vegetation surveys have been conducted by TPWD and the AMWA, and treatment has been recommended as needed. Herbicide treatments of hydrilla and manual removal of water hyacinth was recommended to, and completed by, the Athens Municipal Water Authority. Alligatorweed has not required treatment.

Harvest regulation history: Sport fishes in Lake Athens are currently managed with statewide regulations with the exception of largemouth bass (Table 2). From 1985 to 1995, largemouth bass were managed with a 14-inch minimum length limit. A 14- to 21-inch slot length limit was implemented in 1996 to improve the population size structure and growth rates.

Stocking history: Initial stockings of Lake Athens began in 1973 with channel catfish fingerlings. Florida largemouth bass fingerlings were first stocked at 3 fish/acre in 1978; however their contribution to the spawning population was presumably minimal. In 1993, Florida largemouth bass fingerlings were

stocked at a higher rate of 83 fish/acre. Florida largemouth bass stockings have continued through 2010. Walleye (*Sander vitreum*) and blue catfish (*I. furcatus*) were stocked, but they did not persist. A complete stocking history is provided in Table 3.

Vegetation/habitat history: The relative abundance of submersed and emergent vegetation has remained stable over the years at approximately 3.6% and 1.5% surface area coverage, respectively (Bister and Ott 2002, Beck and Ott 2006). In 1995, the assemblage of submersed plants shifted from dominance by chara *(Chara vulgaris)* to an association of coontail (*Ceratophyllum demersum*) and pondweed (*Potamogeton spp.*) species (Beck and Ott 2006). Emergent species consisted primarily of American lotus *(Nelumbo lutea)*, maidencane *(Panicum hemitomon)*, giant cutgrass *(Zizaniopsis miliacea)*, white water-lily *(Nymphaea odorata)*, water pennywort (*Hydrocotyle spp.*), cattail (*Typha spp.*), and the invasive exotic Alligator weed (*Alternanthera philoxeroides*).

Non-native species can be invasive and interfere with boat or bank angling access. Hydrilla, water hyacinth, and alligatorweed have all been identified at Lake Athens. Of these species hydrilla and water hyacinth both have the potential to interfere with boat and angling access. A trace amount of hydrilla was first document in 1995; consequently its status has been closely monitored. In recent years, herbicide treatments were conducted by the City of Athens, which have successfully limited the spread of hydrilla. Water hyacinth has been manually removed or treated with herbicides by city personnel when identified. The invasive aquatic vegetation present at Lake Athens has been monitored closely and prompt action has been taken thus far to decrease the chances of these exotics spreading and negatively impacting reservoir users.

METHODS

Fishes were collected by electrofishing (1 hour at 12, 5-min stations) and gill netting (5 net nights at 5 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (# of fish/h) of actual electrofishing and, for gillnets, as the number of fish per net night (# of fish/nn). All survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and condition indices [relative weight (Wr)] 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. For largemouth bass, ages were determined from 12 specimens with lengths ranging from 13.0-14.6 inches. Source for water level data was the United States Geological Survey website (USGS 2010).

RESULTS AND DISCUSSION

Habitat: The vegetation survey in 2009 documented a trace amount of hydrilla. Recommended treatments conducted by the City of Athens have been successful at restricting the spread of this species. Water hyacinth and alligatorweed were first documented during the 2005 survey. Periodic manual removal of the water hyacinth has been conducted by staff from Athens Municipal Water Authority. Alligatorweed has not, yet, negatively impacted angling or recreational activities, therefore no action was taken. Native emergent and submersed vegetation were also present and covered approximately 5% of reservoir surface area (Table 4.)

Prey species: Gizzard shad *(Dorosoma cepedianum*) and threadfin shad (*D.petenense)* were collected at Lake Athens; however, catch rates have remained low since 2001. Combined catch rate for both species was low (34/h), and the IOV indicated only 8% of gizzard shad were available as forage for sport fish. This was considerably lower than the 2007 IOV estimate of 67% (Figure 2). An abundant sunfish community provides the majority of the prey base with combined catch rates of bluegill, redear, and

redbreast sunfish of 720/h. Green sunfish (*Lepomis cyanellus*) and warmouth (*Lepomis gulosus*) were also present. The majority of sunfish were available as forage and availability did not appear to be a limiting factor for sport fish growth considering high relative weights. Sunfish were also found to be the second most sought after fish by anglers at Lake Athens during a 2004 creel survey (Beck and Ott 2006). Bluegill catch rates increased markedly from previous years (535/h) (Figure 4). Redear sunfish (*L. macrolophus*) were more abundant than redbreast sunfish (*L. auritus*) with catch rates of 150/h and 35/h, respectively (Figures 5 and 3). As in previous years, bluegill up to 8 inches in length and redear up to 9 inches were collected (Figures 4 and 5). Body condition was adequate for bluegill and redear.

Channel catfish: Gill net catch rate of channel catfish was 0.8/nn in 2010 (Figure 6), and has declined since 2006. The apparent decrease in the number of stock-length (>11 inches) fish from 2002 (3.6/nn) and 2006 (3.8/nn) to 2010 (0.8/nn) surveys is indicative of a population with limited reproduction and recruitment (Figure 6). The channel catfish population has historically been self-sustaining; however the low abundance and limited production have been a result of limited habitat due to low water levels in 2005-2006 or predation by largemouth bass on juvenile fish.

White bass: The gill net catch rate of white bass *(Morone chrysops*) was 1.2/nn in 2010 (Figure 7). White bass have not historically accounted for a large fishery, and abundance has declined since 2002 (4.0/nn) and 2006 (4.5/nn). Only six fish were collected in 2010, however all fish were of legal length and body condition was excellent (W_r > 95).

Largemouth bass: Size distribution of largemouth bass was within the range for a balanced population (PSD=56) and was consistent with previous surveys in 2005 (PSD=50) and 2007 (PSD=51). A successful year class as a result of high water levels following drought conditions in 2005-2006 is apparent in 2007 catch rates of sub-stock (<8 inches) largemouth bass. Electrofishing catch rates of stock-length fish increased from 2007 (49 fish/hour) to 2009 (62 fish/hour). Body condition of largemouth bass was moderate (W_r>80), although declined slightly for some size classes since previous surveys (Figure 8). As implied in previous reports (Bister and Ott 2002, Beck and Ott 2006), there is concern about decreased growth rates of fish within the protected-slot limit. Fish typically require 4 years to grow through the protected slot (Beck and Ott 2006). In 2009 surveys, average age of largemouth bass at 14 inches (range = 13.0-14.6 inches) was 2.3 years (N=12, range = 2-5). The poor trend in growth of protected fish has persisted despite a change in length limits in 1996. Modification of the slot limit may be considered; however, the creel in spring 2004 indicated that 90% of legal fish caught were released; suggesting that any changes in the slot limit may be ineffective. Largemouth bass fishing accounted for 64% of the directed effort in the spring creel of 2004 (Beck and Ott 2006) and most anglers approved of the harvest regulations that are currently in effect at this reservoir.

The percentage of FLMB alleles in the population increased from 58% in 2003 to 68% in 2009 (Table 5). Genetic analysis of largemouth bass collected in 2009 showed that no pure Florida bass were collected in 2009.

Fisheries management plan for Lake Athens, Texas

Prepared – July 2010.

ISSUE 1: Stocking of Florida largemouth bass fingerlings in 2005 may have been responsible for the increase in Florida alleles from 58% in 2003 to 68% in 2009. Lake Athens has a history of producing trophy-sized largemouth bass. The current lake record (13.81 lbs) was caught in 1989, and is probably a result of stockings of fingerling and adult Florida largemouth bass in the late 1970's and early 1980's. To maintain trophy potential, periodic restocking of Florida largemouth bass fingerlings may be required.

MANAGEMENT STRATEGY

1. Continue monitoring largemouth bass allele frequencies with microsatellite DNA analysis in fall of 2013 to monitor the impact of stockings.

ISSUE 2: The presence of exotic aquatic vegetation (i.e. hydrilla, water hyacinth, and alligatorweed) are of concern. Currently hydrilla and water hyacinth are under control, but they have the propensity to exhibit rapid growth and expansion, which could negatively impact the ecosystem. Although alligatorweed is not currently a problem, it has the potential to limit access and recreation if it continues to expand in distribution.

MANAGEMENT STRATEGIES

1. Conduct additional vegetation surveys to determine the status of these species and recommend treatment when warranted.
2. Investigate obtaining alligatorweed flea beetles for release as a control measure.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional electrofishing in 2011 and mandatory monitoring in 2013/2014 (Table 6). An additional electrofishing survey in 2011 is necessary to maintain consistent data for trend information regarding the largemouth bass fishery, and also to provide fish for microsatellite DNA analysis in an effort to evaluate stockings of Florida strain largemouth bass. The increased awareness of the sunfish fishery warrants additional monitoring to maintain consistent trend data. Additional vegetation surveys will be conducted as necessary in order to monitor the status of hydrilla, water hyacinth, and alligatorweed.

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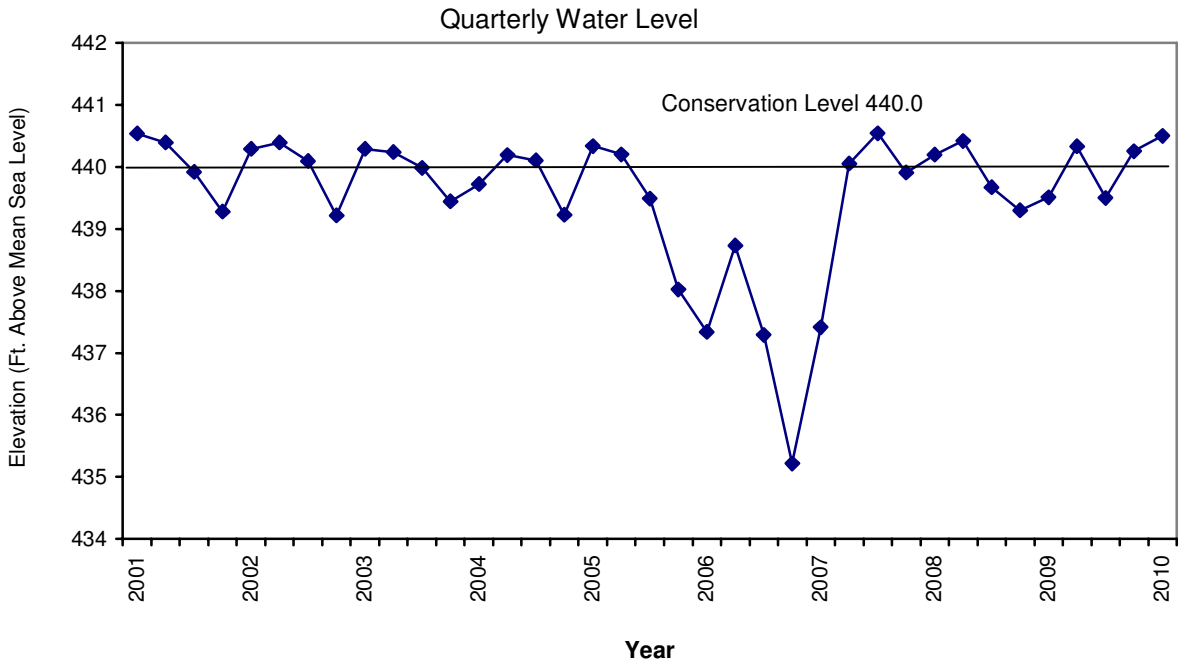


Figure 1. Mean quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Athens, Texas.

Table 1. Characteristics of Lake Athens, Texas.

Characteristic	Description
Year constructed	1962
Controlling authority	Athens Municipal Water Authority
Counties	Henderson
Reservoir type	City lake
Shoreline Development Index (SDI)	1.8
Conductivity	80 umhos/cm

Table 2. Harvest regulations for Lake Athens.

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 (no more than 1 > 21 inches)	14-21 slot length limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

Table 3. Stocking history of Lake Athens, Texas. Size Categories are: FRY =<1 inch; FGL = 1-3 inches, and ADL = adults.

Species	Year	Number	Size
Blue catfish	1987	15,117	FGL
Channel catfish	1973	5,500	FGL
Largemouth bass	1982	25	ADL
Florida largemouth bass	1978	6,000	FGL
	1982	627	ADL
	1993	149,670	FGL
	1995	190	ADL
	1996	91,934	FGL
	1997	155,184	FGL
	1998	151,055	FGL
	1999	31	ADL
	2000	253	ADL
	2003	10,041	FGL
	2004	76,955	FGL
	2004	292,159	FRY
	2005	90,022	FGL
	2005	87,643	FRY
	2008	91,196	FGL
	2009	46,063	FRY
	2009	180,524	FGL
	2010	15,198	FRY
	Total	1,444,745	
Walleye	1978	6,000,050	FRY
	1979	4,581,680	FRY
	1980	6,688,000	FRY
	Total	17,269,730	

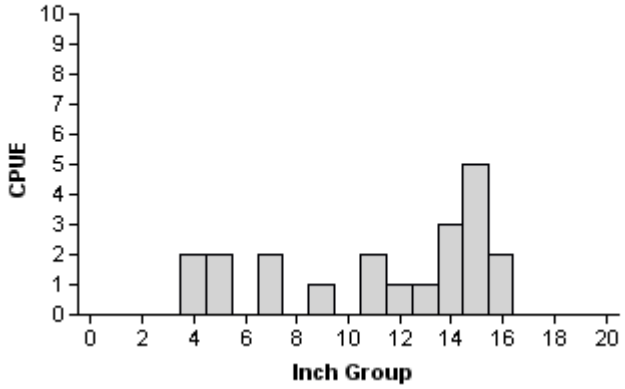
Table 4. A survey of littoral zone vegetation was conducted 2009. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

Shoreline habitat type	Surface Area	
	Acres	Percent of reservoir surface area
Native emergent	26.6	1.5
Native submersed	65	3.6
Hydrilla	<1	<1
Alligatorweed	0.6	<1
Water hyacinth	<1	<1

Gizzard shad

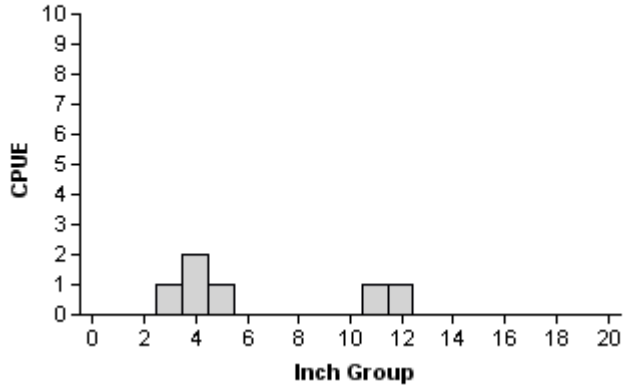
2005

Effort = 1.0
Total CPUE = 21.0 (35; 21)
PSD = 82 (14.3)
IOV = 29 (19.6)



2007

Effort = 1.0
Total CPUE = 6.0 (30; 6)
PSD = 100 (0.0)
IOV = 67 (20.1)



2009

Effort = 1.0
Total CPUE = 26.0 (27; 26)
PSD = 79 (10.7)
IOV = 8 (5.7)

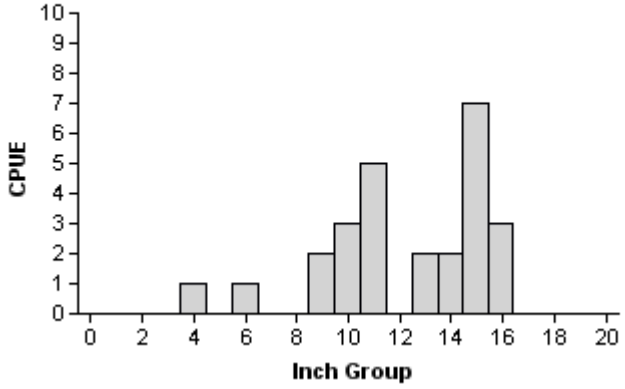
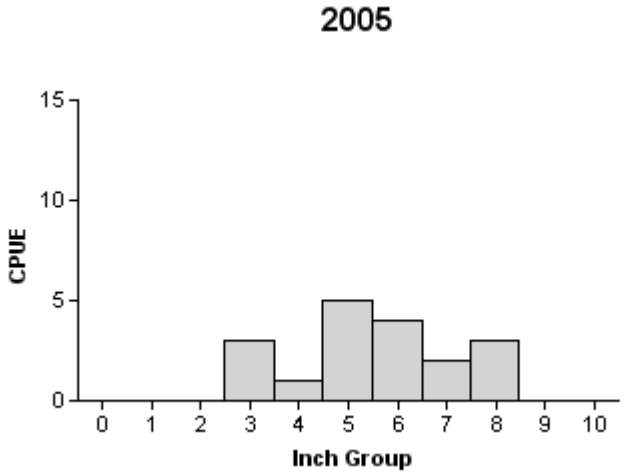
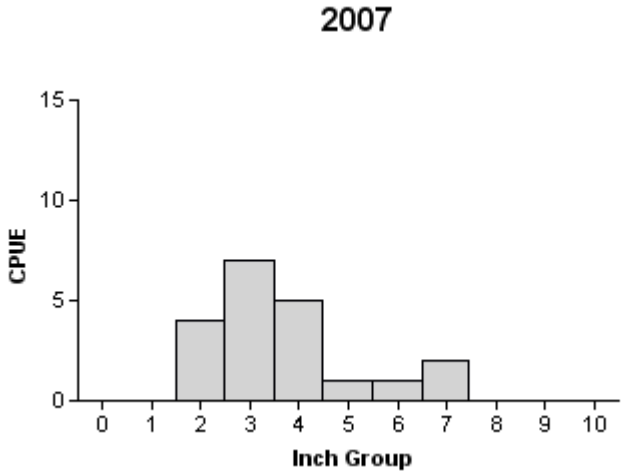


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2005, 2007, and 2009.

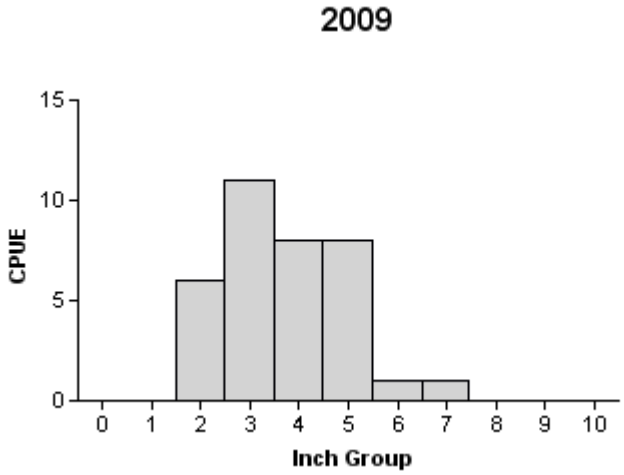
Redbreast sunfish



Effort = 1.0
Total CPUE = 18.0 (41; 18)
Stock CPUE = 18.0 (41; 18)
PSD = 50 (10.1)



Effort = 1.0
Total CPUE = 20.0 (33; 20)
Stock CPUE = 16.0 (40; 16)
PSD = 19 (7.4)



Effort = 1.0
Total CPUE = 35.0 (44; 35)
Stock CPUE = 29.0 (46; 29)
PSD = 7 (5.8)

Figure 3. Number of redbreast sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2005, 2007, and 2009.

Bluegill

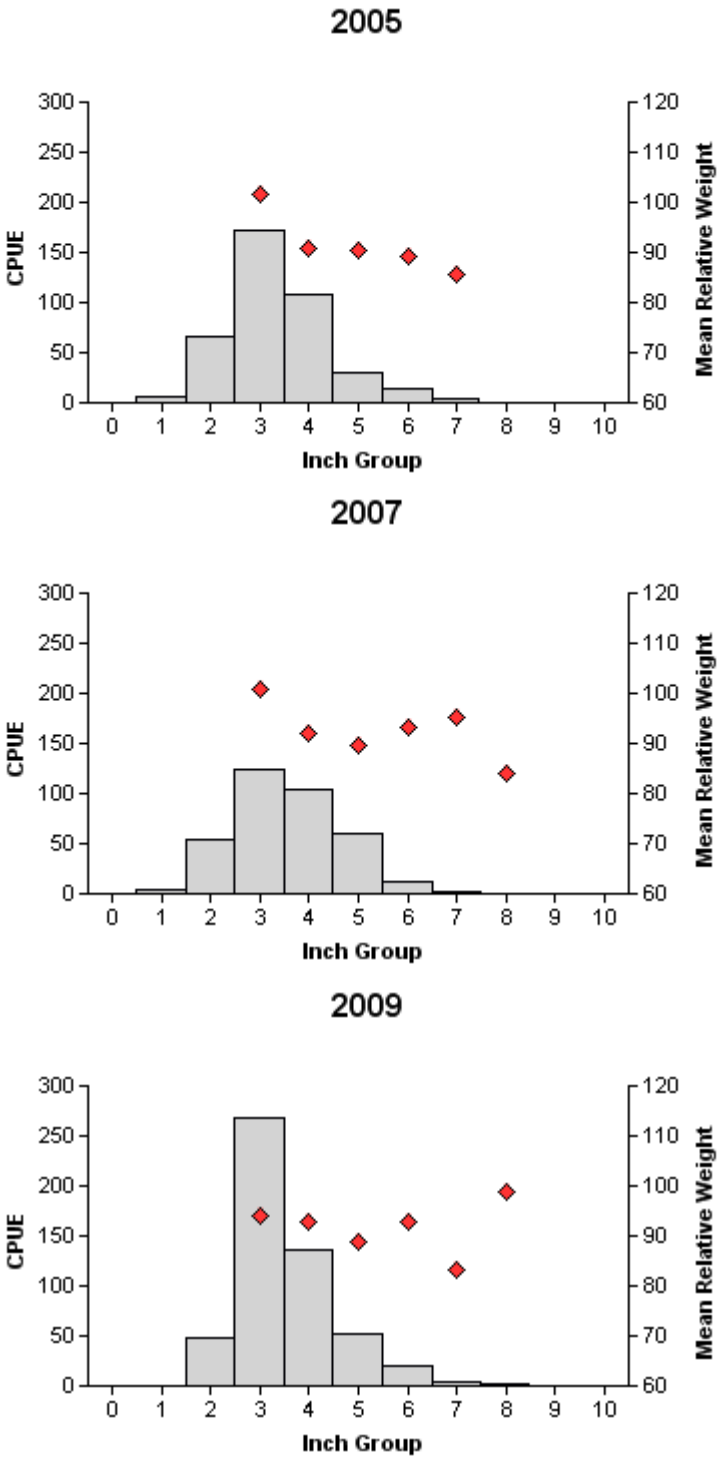
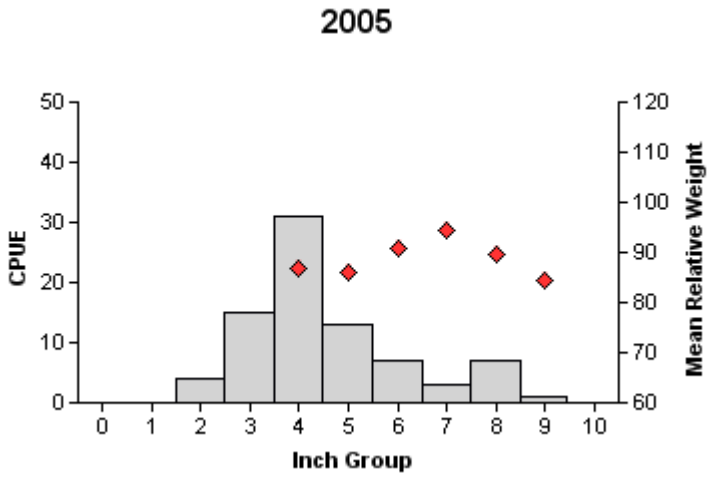
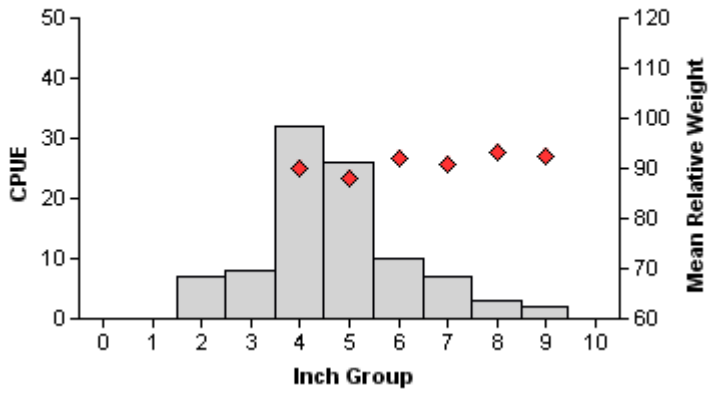


Figure 4. Number of bluegill caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2005, 2007, and 2009.

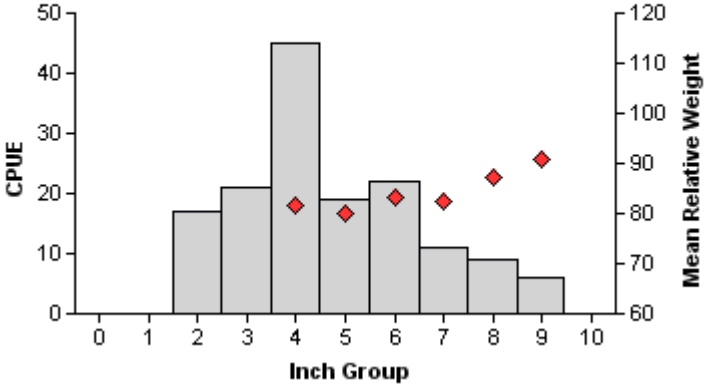
Redear sunfish



Effort = 1.0
Total CPUE = 81.0 (23; 81)
Stock CPUE = 62.0 (23; 62)
PSD = 18 (8.8)



Effort = 1.0
Total CPUE = 95.0 (16; 95)
Stock CPUE = 80.0 (15; 80)
PSD = 15 (4.8)



Effort = 1.0
Total CPUE = 150.0 (21; 150)
Stock CPUE = 112.0 (22; 112)
PSD = 23 (6.3)

Figure 5. Number of redear sunfish caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2005, 2007, and 2009.

Channel catfish

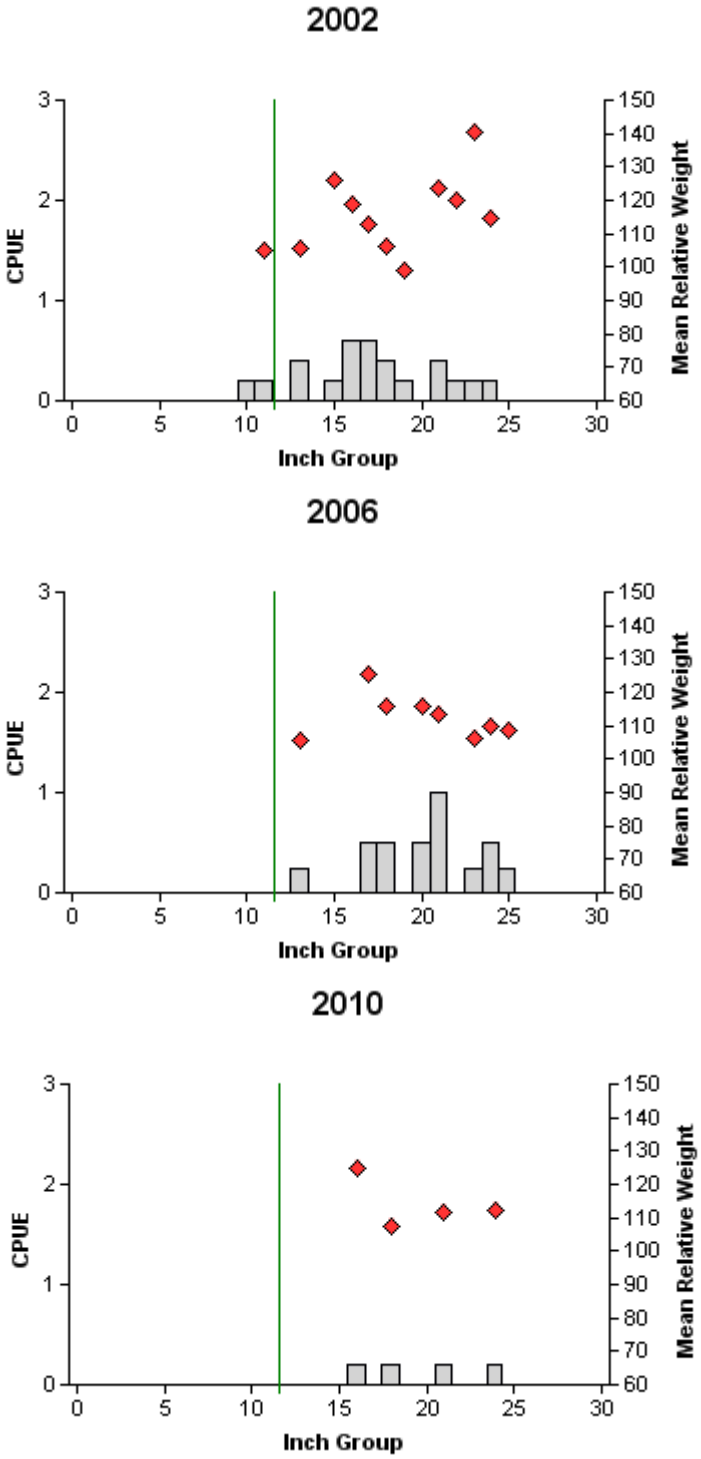


Figure 6. Number of channel catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Athens, Texas, 2002, 2006, and 2010. Vertical line represents length limit at time of survey.

White bass

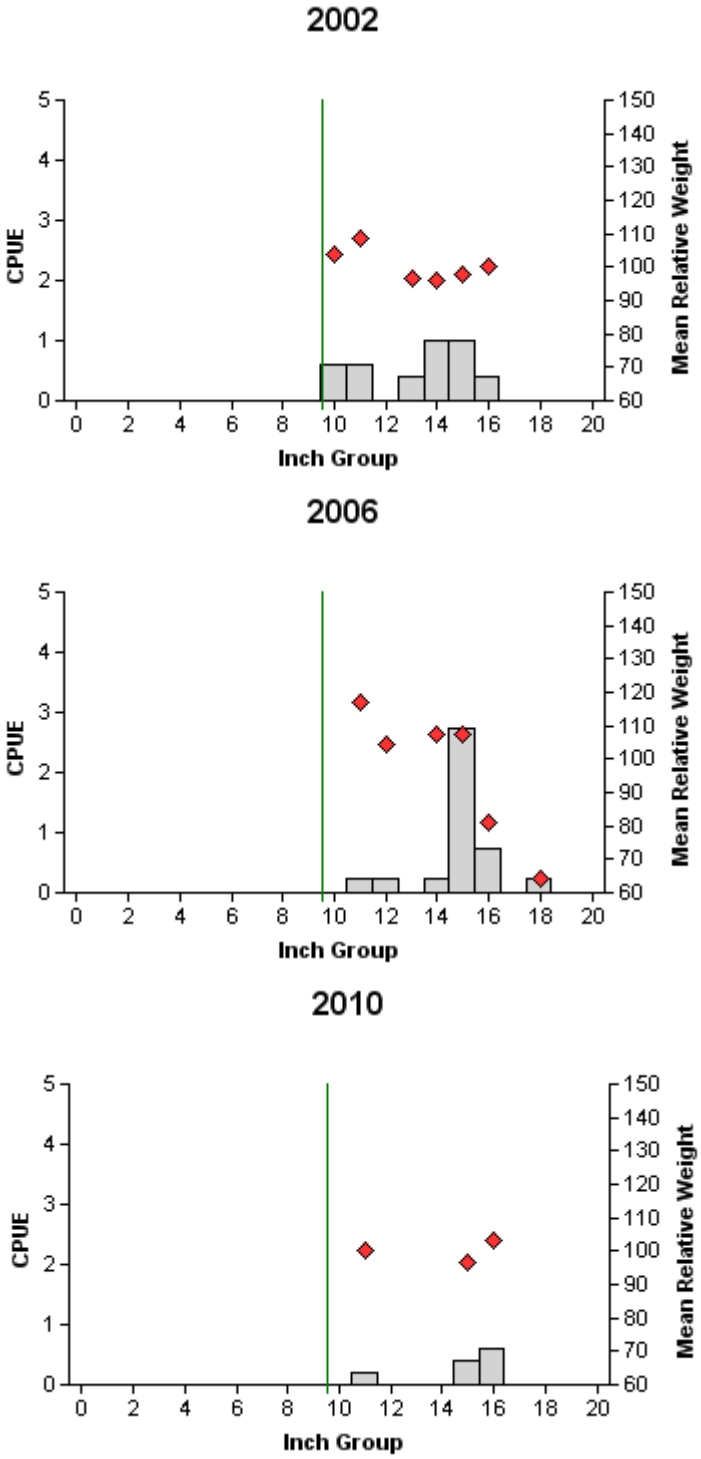


Figure 7. Number of white bass caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Athens, Texas, 2002, 2006 and 2010. Vertical line represents length limit at time of survey.

Largemouth bass

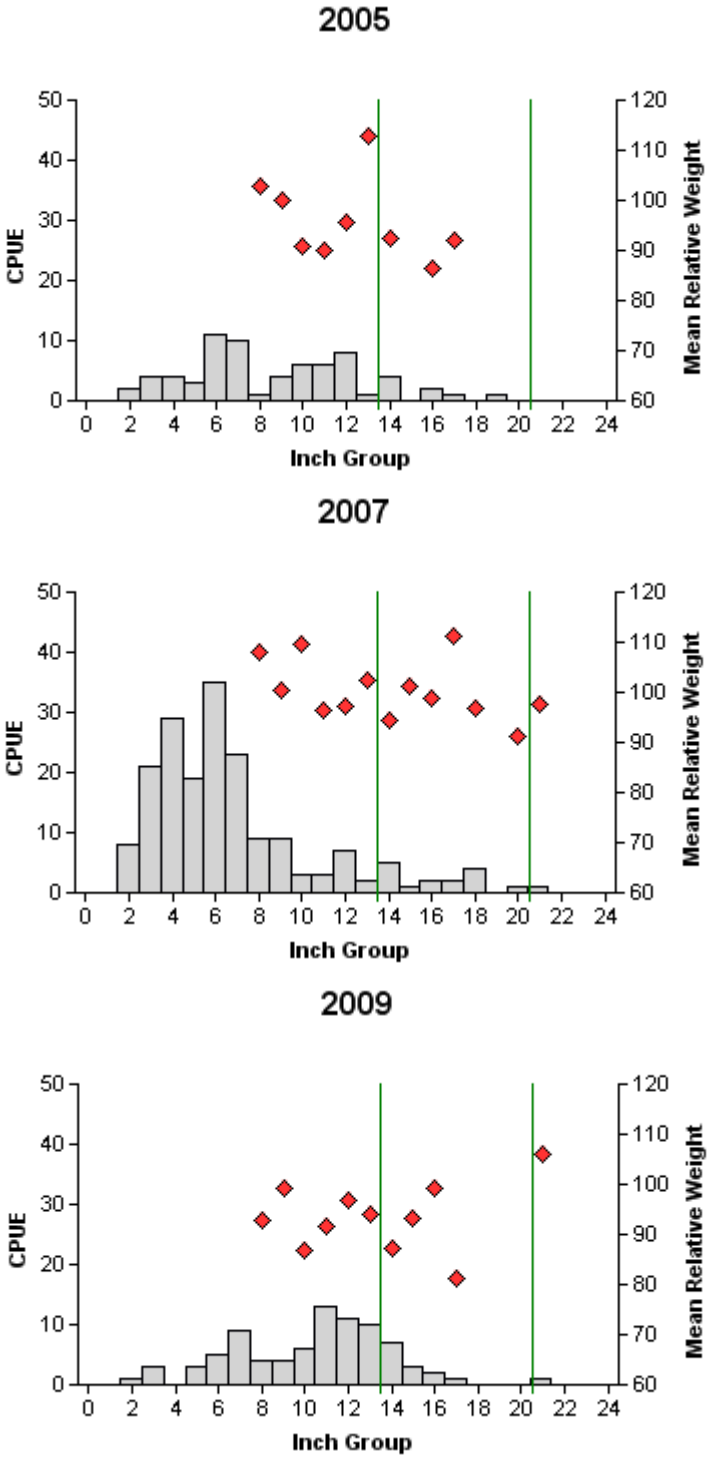


Figure 8. Number of largemouth bass caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2005, 2007, and 2009. Vertical lines indicate the lower and upper boundary of the protected slot length limit at time of survey.

Largemouth Bass

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing at Lake Athens, Texas, 1998, 2001, 2003, and 2009. 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. Samples collected between 1998 and 2003 were analyzed by electrophoresis.

		Genotype					
Year	Sample size	FLMB	F1	Fx	NLMB	% FLMB alleles	% pure FLMB
1998*	13	4	3	6	0	69	30.8
2001	30	4	7	19	0	59	13.3
2003*	30	4	6	19	1	58	13.3
2009*	26	0	1	25	0	68	0.0

*Analysis in same year fish were stocked

Table 6. Proposed sampling schedule for Lake Athens, Texas. Gill netting surveys are conducted in the spring, while electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

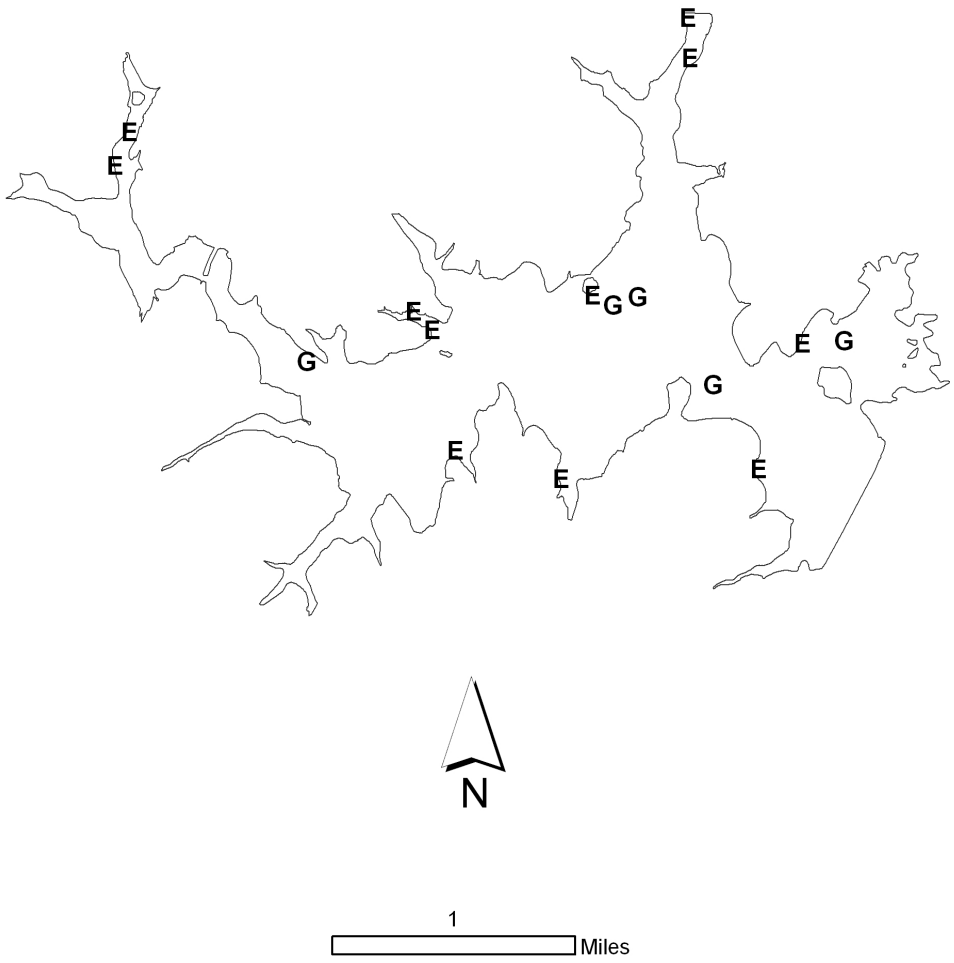
Survey Year	Electrofishing	Gill Net	Vegetation	Report
2010-2011			A	
2011-2012	A		A	
2012-2013			A	
2013-2014	S	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected by gill netting and electrofishing from Lake Athens, 2009-2010.

Species	Gill netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard shad			26	26.0
Threadfin shad			8	8.0
Channel catfish	4	0.8		
White bass	6	1.2		
Redbreast sunfish			35	35.0
Green sunfish			2	2.0
Warmouth			5	5.0
Bluegill			535	535.0
Redear sunfish			150	150.0
Spotted bass			9	9.0
Largemouth bass			83	83.0

APPENDIX B



Location of sampling sites, Lake Athens, Texas, 2009-2010. Gill net and electrofishing stations are indicated by G and E, respectively.