PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-31

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2005 Survey Report

Lake Athens

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SURVEY AND MANAGEMENT SUMMARY

The Lake Athens fish community was surveyed from June 2005 - May 2006 using electrofishing, gill nets, and trap nets. A habitat and vegetation survey was conducted in August 2005. Angler use and harvest information was collected using a roving-creel survey, which was conducted from March-May 2004. 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 bridge crossings and parking at the bridge crossings is limited. There are no handicap-specific facilities but the convenience pier at the marina may allow limited wheelchair use. The reservoir contains a diversity of littoral habitat types.

- **Management history:** Important sport fish include sunfishes (*Lepomis spp*.), largemouth bass (*Micropterus salmoides*), white bass (*Morone chrysops)*, channel catfish (*Ictalurus punctatus)*, and black crappie (*Pomoxis nigromaculatus)*. The management plan from 2001 included stockings of Florida largemouth bass (*M. s. floridanus)* to increase Florida alleles in the population. Stockings were done in 2003-2005. The length limit was changed in 1996 to a 14-21 inch slot-length limit. Monitoring of largemouth bass growth rate has continued. A harvest regulation modification was considered for largemouth bass, but was not implemented. The popularity of the sunfish fishery has increased due to news releases. Channel catfish size distribution and growth has been continually monitored. Boat access and angling access is available, and improvements have been recommended, but not implemented. Vegetation surveys have identified hydrilla (*Hydrilla verticilata)* and waterhyacinth (*Eichhornia crassipes)* in the system. Hydrilla is currently managed by herbicides, while the water hyacinth continues to be manually removed.

- **Fish Community**
  - **Prey species:** Threadfin shad (*Dorosoma petenense)* continue to be present in the reservoir. Electrofishing catch rate of gizzard shad (*D. cepedianum*) was low, and few gizzard shad were available as prey to most sport fish. Despite low shad catch rates, sunfish (≤4inch) catch rates were adequate to provide non-limiting forage for piscivorous sportfishes. Sunfish provide an excellent fishery at Lake Athens where catch rates and growth rates exceed the normal.

  - **Catfishes:** The channel catfish population size structure has improved from previous years. Catch rates of stock-length fish were higher than previously documented. Angling effort for channel catfish in Lake Athens was minimal.

  - **Temperate basses:** White bass are present in the reservoir. Size structure and body condition are exceptional at Lake Athens, with white bass to 18 inches collected in gill net samples. The fishery does not appear to be entirely consumptive with 55% of legal fish captured released.

  - **Largemouth bass:** Size distribution of largemouth bass indicates a balanced population. Electrofishing catch rates of stock-length fish were higher than the previous sampling period. Size structure has improved over previous surveys. Growth rates of protected fish show no improvement. Anglers appear to be harvesting few fish, releasing 90% of legal length fish. The percent of pure Florida largemouth bass has remained constant since 2001.

- **Black crappie:** Trap net catches continue to be variable, with low sample sizes. Collected fish were of preferred sizes, and in good condition. The fishery is harvest-oriented. Crappie reach legal length by age 2.

- **Management Strategies:** Largemouth bass (*Micropterus salmoides*), are of high importance in this system, therefore, additional monitoring of their growth rates and size distribution will be conducted in fall of 2007. The sampling will also provide fish for electrophoretic analysis. Channel catfish recruitment and population structure will continue to be monitored in 2010 sample. The increasing abundance of exotic vegetation warrants annual vegetation surveys through 2010.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Athens in 2005-2006. 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 is presented with the 2005-2006 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. Being nutrient poor, Lake Athens is one of 10 oligotrophic reservoirs in Texas, exhibiting a mean TSI *chl-a* of XX.XX (Texas Commission on Environmental Quality 2002). The shoreline at Lake Athens is primarily featureless or a combination of featureless/bulkhead and boat docks. Bank erosion is minimal with less than 1% of the total shoreline eroded. Native emergent and submersed vegetation are present in the system inhabitating approximately 5% of the total surface area, however non-native hydrilla (*Hydrilla verticillata*) and waterhyacinth (*Eichhornia crassipes)* were discovered in 1995 and 2005, respectively.

Boat access is adequate (1 ramp), but public bank angling access is limited to the marina area and bridge crossings and parking at the bridge crossings is limited. There are no handicap-specific facilities but the convenience pier at the marina may allow limited wheelchair use. Other descriptive characteristics from Lake Athens are found in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Bister and Ott 2002) included:

1. Increase Florida largemouth bass (*Micropterus salmoides floridanus)* alleles in population.
   Action: Florida largemouth bass fingerlings were stocked in 2003, 2004, and 2005. Allele frequencies were monitored with electrophoresis sampling in fall of 2003.
2. Monitor size distribution and growth rates of largemouth bass (*Micropterus spp.)* in the protected slot-length range.
   Action: Continued monitoring size distribution and growth through 2005. Additional electrofishing was conducted in 2003. Slot-length limit change was considered, but was not recommended due to angler responses during the spring 2004 creel survey.
3. Angler uncertainty concerning regulations.
   Action: Lake-specific regulation posters were provided to vendors of angling-oriented businesses serving the Lake Athens vicinity. Additional signs were provided to controlling authority to post at access sites.
4. Increase awareness of underutilized sunfish (*Lepomis spp.*), fishery.
   Action: News releases provided information educating and encouraging anglers to pursue quality-size sunfishes. Additional age-and-growth assessment of sunfish was considered, but was not completed.
5. Channel catfish population showed evidence of improved reproduction and recruitment.
   Action: Continued monitoring of channel catfish (*Ictalurus punctatus)* size distribution and growth.
6. Improve bank angling access and parking.
   Action: Consulted City of Athens concerning this issue, but progress is limited due availability of public lands.

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: The initial stockings of Lake Athens began in 1973 with channel catfish fingerlings. The channel catfish population post-stock is self-sustaining. 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 to the present to manipulate allele frequencies of the population when necessary to achieve target goals of 20% pure Florida bass. Walleye (S*ander vitreum*) and blue catfish (*I. furcatus*) were stocked, but they are not currently present in the system. A complete stocking history is provided in Table 3.

Vegetation/habitat history: Lake Athen's aquatic vegetation community has changed little since 1995. The relative abundance of submergent and emergent vegetation has remained stable over the years at approximately 20% and 35% respectively. In 1995, the assemblage of submergent plants shifted from dominance by chara *(Chara vulgaris)* to an association of coontail and pondweed species. The emergent species diversity has remained relatively unchanged, consisting of American lotus *(Nelumbo lutea)* , maidencane *(Panicum hemitomon)*, giant cutgrass *(Zizaniopsis miliacea)*, white water-lily *(Nymphaea odorata)* square-stem spike rush *(Eleocharis quadrangulata)*, water primrose, and cattail. The physical habitat types present at Lake Athens have remained constant over the years (Ott and Storey 1995; Ott and Bonds 1998; Bister and Ott 2002).

Non-native species can be invasive and interfere with boat or bank angling access. Hydrilla, waterhyacinth, and alligator weed (*Alternanthera philoxeroides)* have all been identified at Lake Athens. Of these species hydrilla and water hyacinth both have the propensity to interfere with boat and angling access. A trace amount of hydrilla was first document in 1995, consequently its status has been closely monitored. Identified again in 2002, hydrilla had grown to cover approximately one acre. Herbicide treatment was recommended to the Athens Municipal Water Authority, however the Board of Directors decided not to conduct a treatment. City personnel did manually remove some hydrilla. In 2004, hydrilla still covered one surface acre, but this time upon recommendation the hydrilla was treated with herbicide. The exotic vegetation present at Lake Athens has been monitored closely and prompt action has been taken thus far to decrease the opportunity of these exotics to spread and negatively impact reservoir users.

METHODS

Fishes were collected by electrofishing (1 hour at 12, 5-min stations), gill netting (4 net nights at 4 stations), and trap netting (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 gill and trap 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 Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], 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. Ages were determined using otoliths from 13 specimens with lengths ranging from one inch below to one inch above the legal length limit. Source for water level data was the United States Geological Survey (USGS) website.

RESULTS AND DISCUSSION

Habitat: The vegetation survey in 2005 documented <1 acre of hydrilla. Despite the decline in abundance, treatment was again recommended and conducted in August of 2005. Water hyacinth and

alligator were first discovered during the 2005 survey. Texas Parks and Wildlife staff, in cooperation with the Athens Municipal Water Authority during the fall of 2005, manually removed the water hyacinth. Alligatorweed does not appear to have the potential to negatively interfere with angling or recreational activities, therefore no action was taken. Littoral zone physical habitat features were not surveyed. Information concerning these abiotic features can be found in Ott and Bister (1998). Native emergent and submergent vegetation were also present (Table 4.). Low water conditions during fall resulted in undesirable electrofishing sites. In order to obtain depths adequate for sampling, sites were shifted away from shoreline. However, the lake was at full conservation pool at the time of gill net sampling (Figure 1).

Creel: Directed fishing effort by anglers was highest for largemouth bass (64%), followed by anglers fishing for sunfishes (14%) (Table 5). Total fishing effort for all species at Lake Athens was 13,188 angler hours from March to May 2004, and anglers spent an estimated $46,447 on direct expenditures.

Prey species: Gizzard shad *(Dorosoma cepedianum*) and threadfin shad (*D.petenense)* were collected at Lake Athens; however, catch rates continue to decline since 2001. A combined catch rate of 39.0 fish/hour is low, but in 1998 catch rates were even lower (7 fish/h). In addition, the IOV of gizzard shad was poor, indicating only 28% of gizzard shad were available to predators. This is considerably lower than the 2003 IOV estimate of 63% (Figure 2). Sunfish species appear to provide the majority of the prey base with catch rates of fishes ≤4 inches over 400 fish/h. Forage availability does not appear to be a limiting factor for sportfish growth. Sunfish species provide forage, but additionally provide a highly valuable fishery, as indicating in the 2004 spring creel ranking sunfishes as the second most sought after fish at Lake Athens (Table 5). Bluegill (*Lepomis macrohirus*) catch rates were higher than in 2003, but lower than 2001(Figure 4). Redbreast (*L. auritus*) and redear sunfish (*L. macrolophus*) catch rates declined from previous years, however size distributions of these two species show a decline in abundance at all sizes (Figure 3). Low water levels during the time of sampling may be a possible explanation for the low CPUE, which may not be representative of the actual population abundance. As in previous years, bluegill, redear, and redbreast up to 9 inches were collected (Figures 4 and 5). Age and growth analyses for sunfishes were not conducted in 2005; however, historical growth rates of all three species are well above ecosystem averages. Bluegill, redear, and redbreast sunfish exceed 6 inches by age 2 (Ott and Bonds 1998).

Channel catfish: Gill net catch rate of channel catfish was 3.8/nn in 2006, similar to 2002 (Figure 7). The channel catfish population continued to have low relative abundance with an apparent increase in the number of stock-length fish in 2005 (3.8 fish/hour) compared to the 2002 (3.6 fish/hour) and 1998 (0.4 fish/hour) surveys (Figure 7). Age and growth data was not collected on channel catfish in 2006. The multi-modal length distribution of the sample, and lack of stocking, indicates some reproduction and recruitment. The fishery appears to have stabilized since 2002. Directed fishing effort, catch per hour, and total harvest for channel catfish showed a minimal catfish fishery for the spring survey (Table 8). Channel catfish anglers were harvest-oriented, as all legal fish caught were harvested. Harvest estimates documented during the spring creel may not be indicative of the actual yearly harvest, with harvest possibly increasing dramatically during the summer and fall.

White bass: The gill net catch rate of white bass *(Morone chrysops*) was 4.5/nn in 2005 (Figure 9). White bass do not comprise a large portion of the fishery; however, fish present are in great condition and are grow to 18 inches. The PSD (100) and RSD-P (94) values exceeded expectations for this fishery. The abundance of white bass in this system is limited by spawning habitat. Despite the lack of major instream flow, anecdotal evidence suggests some spawning occurs on wind swept points and riprap. The spring creel in 2004 estimated directed effort to be minimal for this species at Lake Athens, and catch per hour is low (Table 9). The white bass fishery at Lake Athens is not entirely consumptive, with 55% of legal fish captured released (Table 9).

Largemouth bass: Size distribution of largemouth bass was within the range for a balanced population. Electrofishing catch rates of stock-length fish increased from 2003 (34 fish/hour) to 2005 (47 fish/hour). The body condition (Wr>90) of largemouth bass was desirable for most size classes (Figure 11), and similar to previous surveys. Size structure for 2005 (PSD=62) improved from 2001(PSD=46) and 2003

(PSD=53), but was lower than the1998 (PSD=68) survey. The concern, as implied in previous reports (Bister and Ott 2002), is the decrease in growth rates of protected-length fish. Growth rates have not improved, with fish taking more than 4 years to grow through the protected slot (Figure 13). Sample sizes for fish in this range were low, and no fish greater than 21 inches have been sampled to date. The poor trend in growth and apparent high mortality in the protected size range has continued. Modification of the slot-size 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 of 2004 and most anglers approve of the harvest regulations that are currently in effect at this reservoir.

Annual stockings of Florida largemouth bass fingerlings at 100/acre from 1996-1998 may be responsible for the apparent increase in Florida alleles from 39% in 1992 to 59% in 2001 (Bister and Ott 2002). The percentage of pure Florida largemouth bass in the population also increased from 3% in 1992 to 13% in 2001 (Table 11). Genetic analysis of largemouth bass collected in 2003 revealed identical results, with 13% of the sample composed of pure Florida bass. Stockings were continued in 2004 and 2005, and subsequent collection and analysis are needed to document their status.

Black crappie: Trap net catches of black crappie *(Pomoxis nigromaculatus*) continue to be variable, with sample size limitations. Only 7 fish were collected in 2005 (Figure 14). The fish collected were of preferred size (RSD-P 67) and were in above average body condition (Figure. 14), with Wr's > 100. The sample consisted of primarily adult crappie. The small sample size limited analysis, and age and growth estimates were not obtained. Historical information indicates black crappie reach 10 inches by age 2 (Bister and Ott 2002). The spring creel survey of 2004 results indicated a harvest-oriented fishery, with all legal fish caught harvested. The directed effort towards springtime crappie fishing was minimal (Table 12). Catch per hour (1.13) and total harvest (1,239) by anglers was adequate.

Fisheries management plan for Lake Athens, Texas

Prepared – July 2006.

ISSUE 1: Annual stocking of Florida largemouth bass fingerlings at 100/acre from 1996-1998 may have been responsible for the apparent increase in Florida alleles from 39% in 1992 to 59% in 2001. The percentage of pure Florida largemouth bass in the samples similarly increased from 3% in 1992 to 13% in 2001. Lake Athens has 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 bass in the late 1970's and early 1980's. To maintain trophy potential, periodic restocking of Florida largemouth bass fingerlings may be required to maintain the proportion of pure Florida strain bass at or above 20%.

MANAGEMENT STRATEGY

1. Continue monitoring largemouth bass allele frequencies with electrophoresis sampling in fall of 2007.

ISSUE 2: Growth rates of largemouth bass sharply declined in 2001, particularly for age 3 and above, which corresponds to fish in the protected slot size range. It currently takes over 4 years for a fish to grow through the slot. No fish longer than 21 inches were collected in 2005.

MANAGEMENT STRATEGIES

1. Continue monitoring size distribution and growth in fall 2007.
2. If the trend in poor growth and apparent high mortality in the protected size range continues in 2007, modification of the slot-size limit should be considered.

ISSUE 3: The Lake Athens channel catfish population shows evidence of improved reproduction and recruitment compared to previous years.

MANAGEMENT STRATEGIES

1. Continue monitoring channel catfish size distribution and growth in spring 2010.

ISSUE 4: The continued and increasing presence of exotic vegetation (i.e. hydrilla and waterhyacinth) are of concern. Annual monitoring of these species is warranted. Currently the non-native vegetation is under control, but both species have the propensity to exhibit rapid growth and expansion, which could negatively impact the system.

MANAGEMENT STRATEGIES

1. Continue building and maintaining working relationships with the Athens Municipal Water Authority.
2. Conduct additional annual vegetation surveys in 2007 and 2008 to determine the status of these species.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes, additional electrofishing in 2007, and mandatory monitoring in 2009/2010 (Table 13). An additional electrofishing survey in 2007 is necessary to maintain consistent data for trend information regarding the largemouth bass fishery, and to also provide fish for electrophoresis analysis in an effort to evaluate stockings of Florida strain largemouth bass. The increased awareness of the high valued sunfish fishery warrants additional monitoring to maintain consistent trend data. Additional vegetation surveys will be conducted in 2007 and 2008 in order to monitor the status of the hydrilla and water hyacinth.

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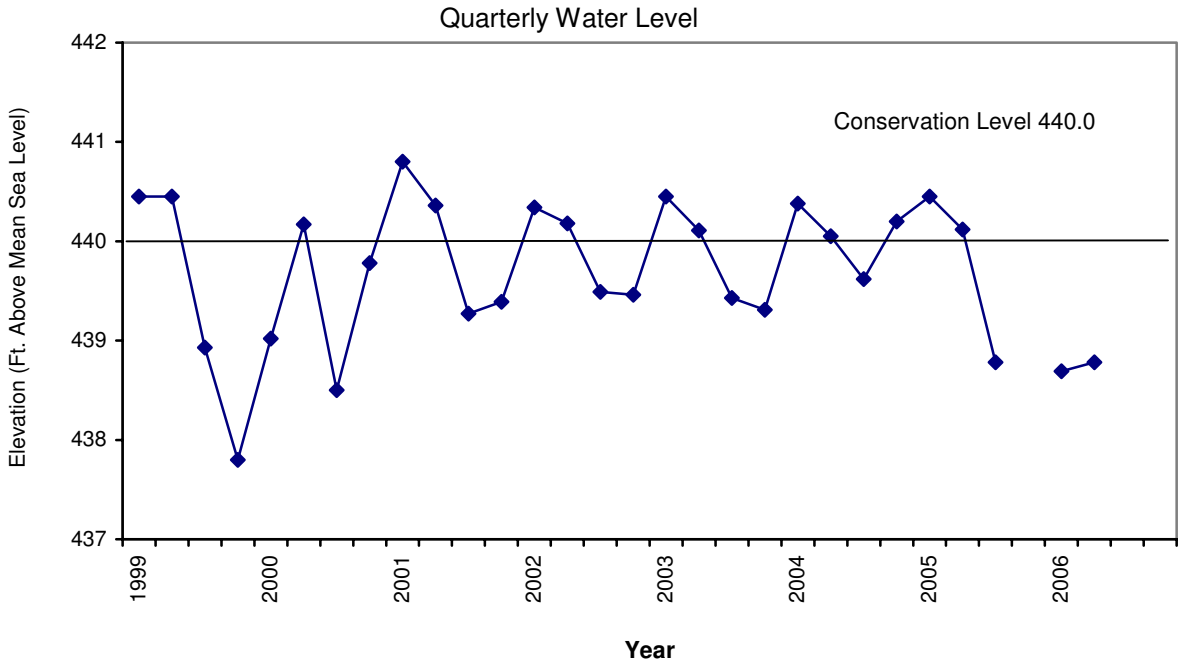


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Athens, Texas.

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
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; AFGL = 8 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	255	ADL
	2003	10,041	FGL
	2004	76,955	FGL
	2004	292,159	FRY
	2005	90,022	FGL
	2005	87,643	FRY
	Total	1,111,766	
Walleye	1978	6,000,050	FRY
	1979	4,581,680	FRY
	1980	6,688,000	FRY
	Total	17,269,730	

Table 4. Survey of littoral zone and physical habitat types, Lake Athens, Texas. Abiotic habitat survey was conducted in 2001. Biotic habitat survey of littoral zone vegetation was conducted 2004. 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 found.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Bulkhead[1]	1.0	3.5		
Bulkhead and boat dock[1]	5.7	20		
Eroded bank[1]	0.1	0.2		
Rip rap[1]	0.4	1.3		
Featureless[1]	14.4	50.8		
Featureless and boat dock[1]	6.8	24.1		
Native emergent			53.95	3.0
Native submersed			39.49	2.20
Hydrilla			0.18	<1.0
Alligator weed			0.17	<1.0
Water hyacinth			0.16	<1.0
No vegetation			1705	94.78

[1]Abiotic habitat feature

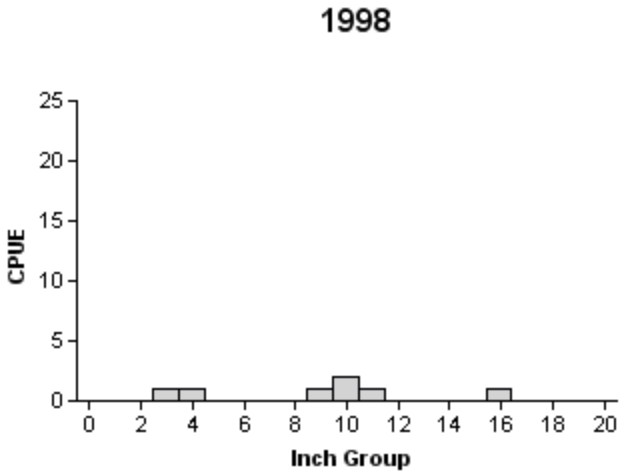
Table 5. Percent directed angler effort by species for Lake Athens, Texas, March-May 2004.

Species	Year
	2004
Channel catfish	2.6
White bass	0.6
Sunfishes	14.4
Largemouth bass	64.0
Black crappie	6.8
Anything	11.7

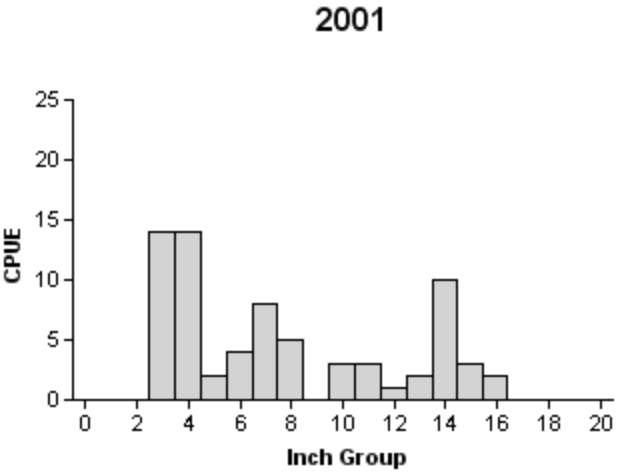
Table 6. Total fishing effort (h) for all species and total directed expenditures at Lake Athens, Texas, March – May 2004.

Creel Statistic	Year
	2004
Total fishing effort	13,188
Total directed expenditures	$46,447

Gizzard Shad



Effort = 1.0
Total CPUE = 7.0 (43; 7)
Stock CPUE = 5.0 (76; 5)
IOV = 28.57 (0.26)



Effort = 1.0
Total CPUE = 71.0 (29; 71)
Stock CPUE = 37.0 (30; 37)
IOV = 59.15 (0.1)

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, 1998 and 2001.
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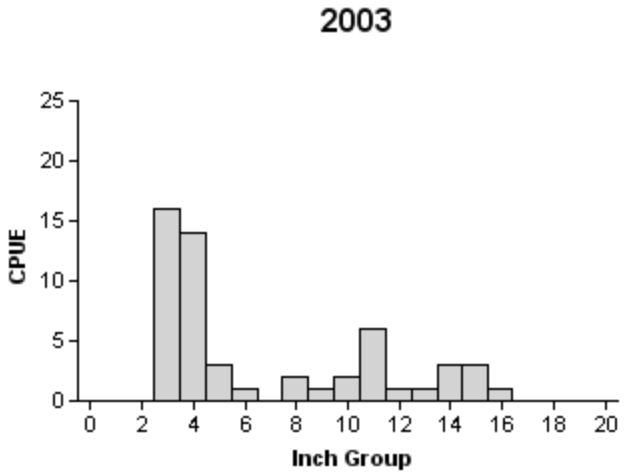
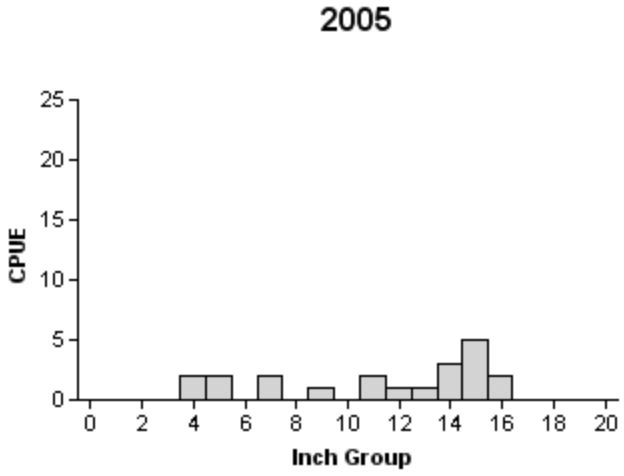
Gizzard Shad



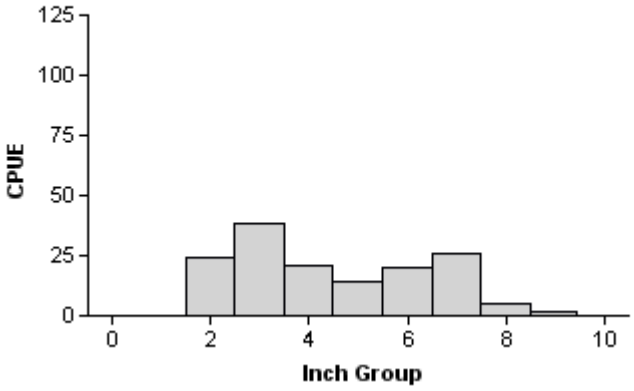
Effort = 1.0
Total CPUE = 54.0 (15; 54)
Stock CPUE = 20.0 (29; 20)
IOV = 62.96 (0.09)



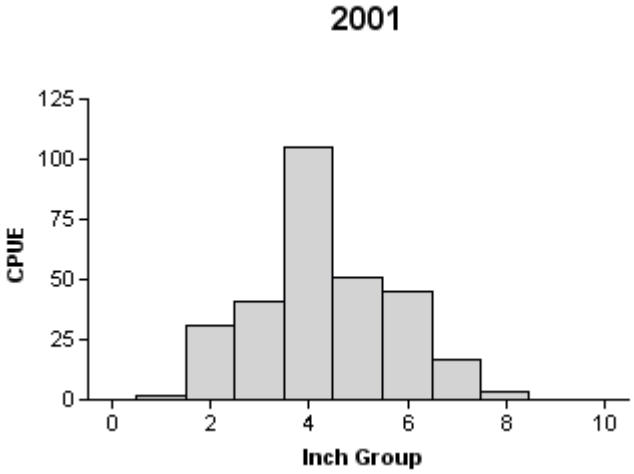
Effort = 1.0
Total CPUE = 21.0 (28; 21)
Stock CPUE = 17.0 (36; 17)
IOV = 28.57 (0.2)

Figure 2 cont... 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, 2003 and 2005.

Redbreast sunfish



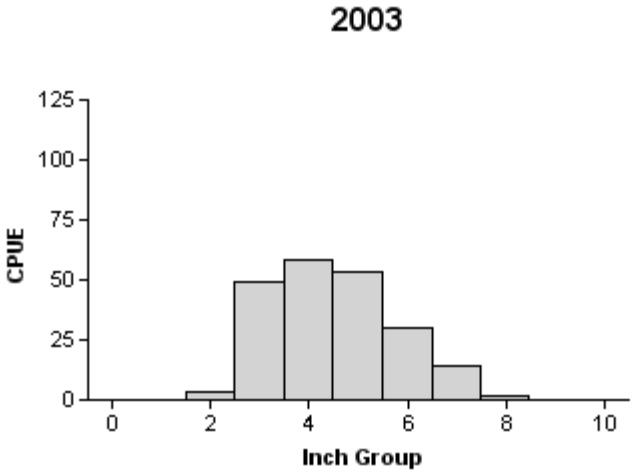
Effort = 1.0
Total CPUE = 150.0 (16; 150)
Stock CPUE = 126.0 (18; 126)
PSD = 42.0 (0.07)



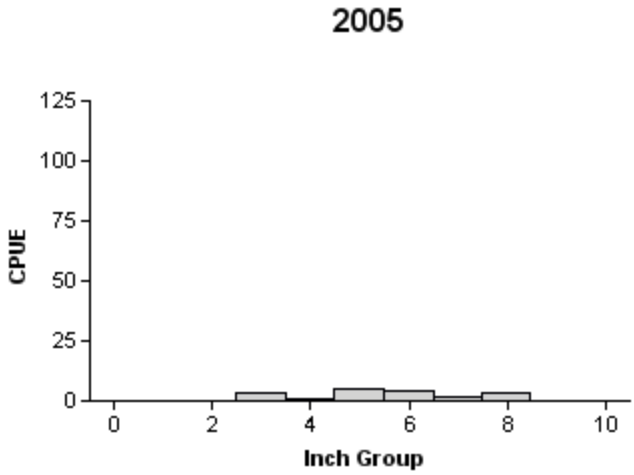
Effort = 1.0
Total CPUE = 295.0 (20; 295)
Stock CPUE = 262.0 (18; 262)
PSD = 25.0 (0.05)

Figure 3. Number of redbreast sunfish caught per hour (CPUE), (RSE and N for CPUE are in parentheses) for fall electrofishing surveys, Lake Athens, Texas 1998 and 2001. Continued next page …

Redbreast Sunfish



Effort = 1.0
Total CPUE = 209.0 (33; 209)
Stock CPUE = 206.0 (33; 206)
PSD = 22.0 (0.04)

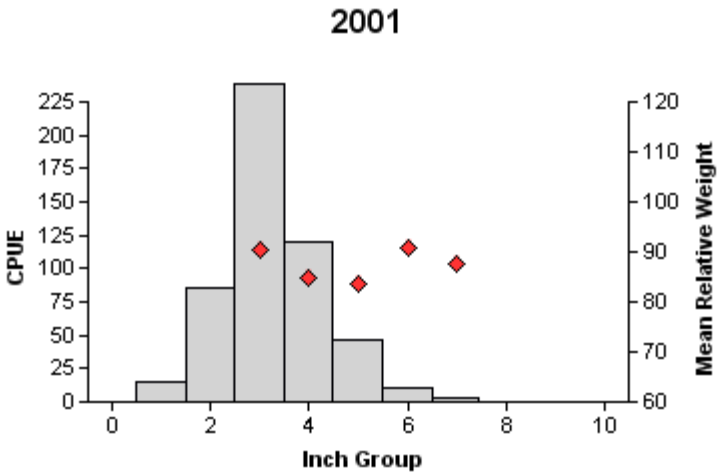


Effort = 1.0
Total CPUE = 18.0 (29; 18)
Stock CPUE = 18.0 (29; 18)
PSD = 50.0 (0.11)

Figure 3 cont... Number of redbreast sunfish caught per hour (CPUE), (RSE and N for CPUE are in parentheses) for fall electrofishing surveys, Lake Athens, Texas 2003 and 2005.

Bluegill

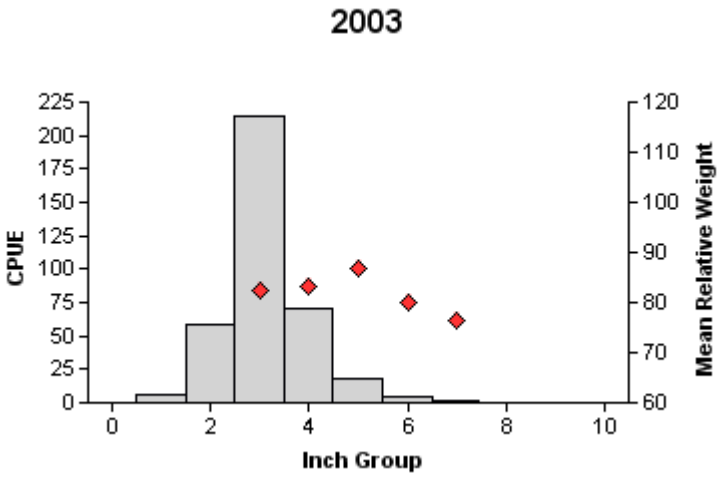
Effort = 1.0
Total CPUE = 355.0 (15; 355)
Stock CPUE = 329.0 (15; 329)
PSD = 4.0 (0.01)



Effort = 1.0
Total CPUE = 519.0 (16; 519)
Stock CPUE = 419.0 (15; 419)
PSD = 3.0 (0.01)

Figure 4. 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, Lake Athens, Texas 1998 and 2001. Continued next page…

Bluegill

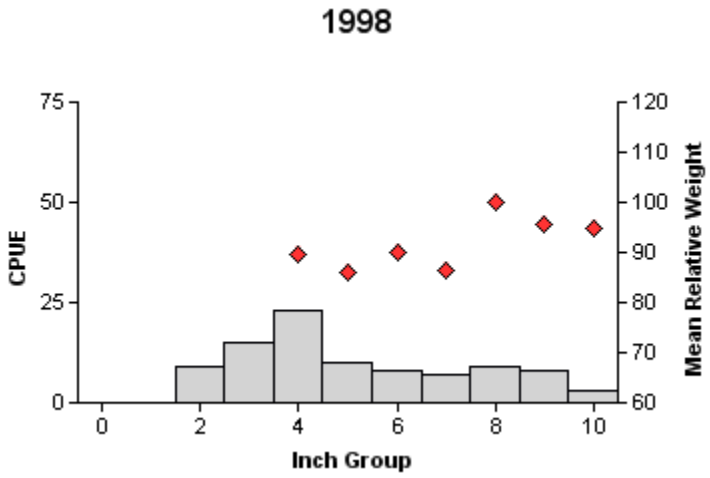


Effort = 1.0
Total CPUE = 376.0 (12; 376)
Stock CPUE = 311.0 (10; 311)
PSD = 2.0 (0.01)

Effort = 1.0
Total CPUE = 402.0 (14; 402)
Stock CPUE = 329.0 (15; 329)
PSD = 5.0 (0.01)

Figure 4 cont… 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, Lake Athens, Texas 2003 and 2005.

Redear sunfish

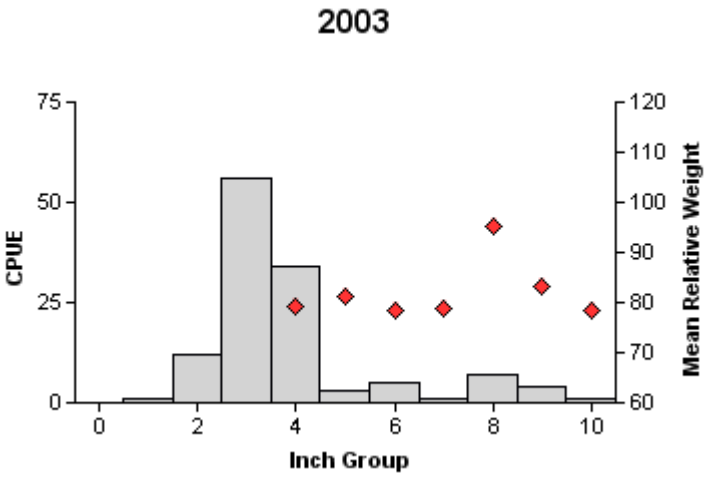


Effort = 1.0
Total CPUE = 92.0 (13; 92)
Stock CPUE = 68.0 (18; 68)
PSD = 40.0 (0.05)

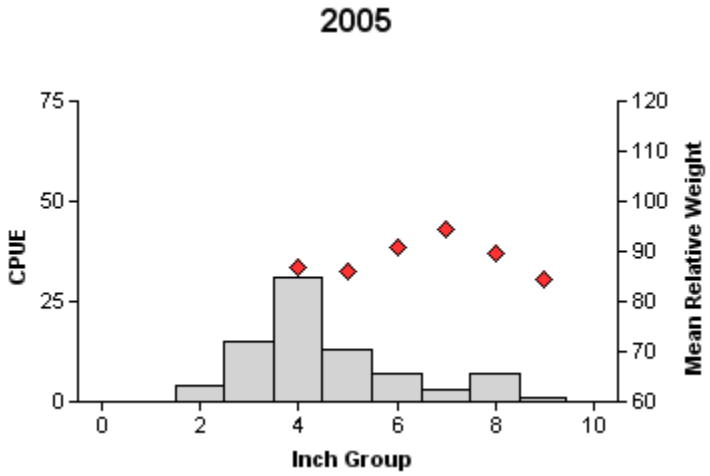
Effort = 1.0
Total CPUE = 155.0 (19; 155)
Stock CPUE = 107.0 (16; 107)
PSD = 11.0 (0.03)

Figure 5. Number of redear 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, Lake Athens, Texas 1998 and 2001. Continued next page …

Redear Sunfish



Effort = 1.0
Total CPUE = 124.0 (25; 124)
Stock CPUE = 55.0 (31; 55)
PSD = 24.0 (0.07)



Effort = 1.0
Total CPUE = 81.0 (21; 81)
Stock CPUE = 62.0 (21; 62)
PSD = 18.0 (0.09)

Figure 5 cont... Number of redear 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, Lake Athens, Texas 2003 and 2005.

Sunfish

Table 7. Creel survey statistics for all sunfish at Lake Athens from March through May 2004, where total catch per hour is for anglers targeting sunfish and total harvest is the estimated number of sunfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2004
Directed effort (h)	1,888 (34)
Directed effort/acre	1.05 (.14)
Total catch per hour	3.1
Total harvest	3,251 (377)
Harvest/acre	1.80 (0.2)
Percent legal released	0

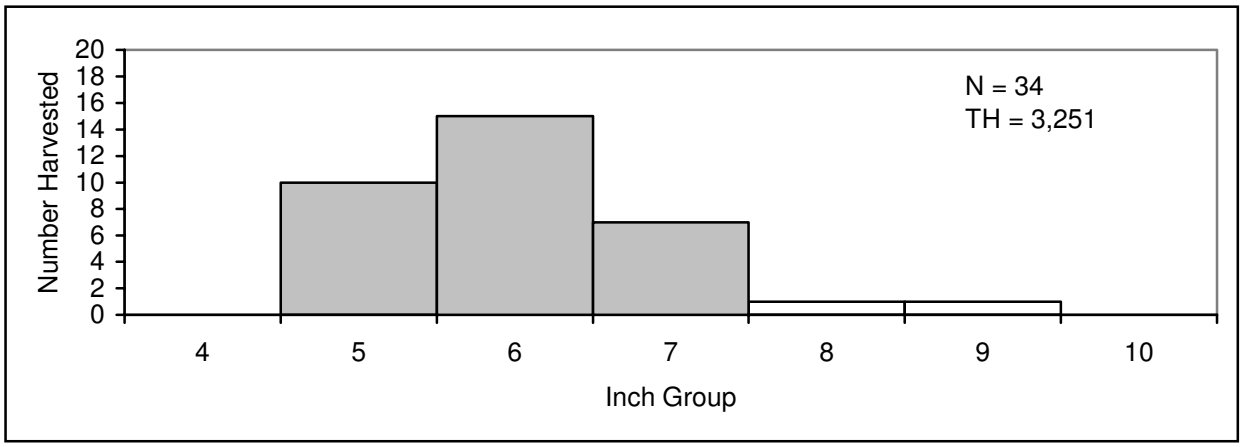
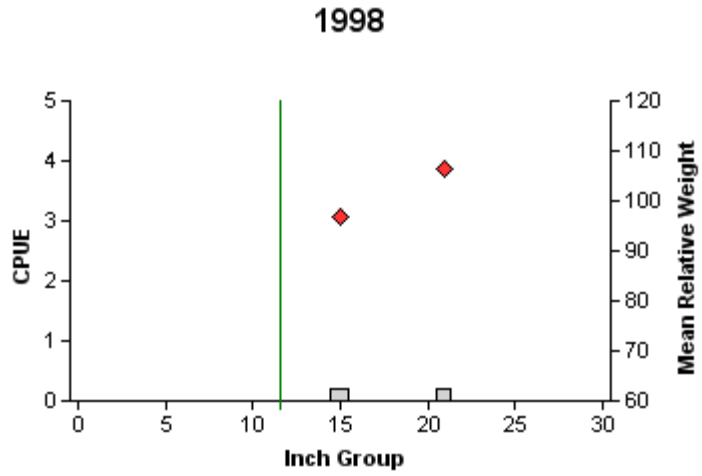
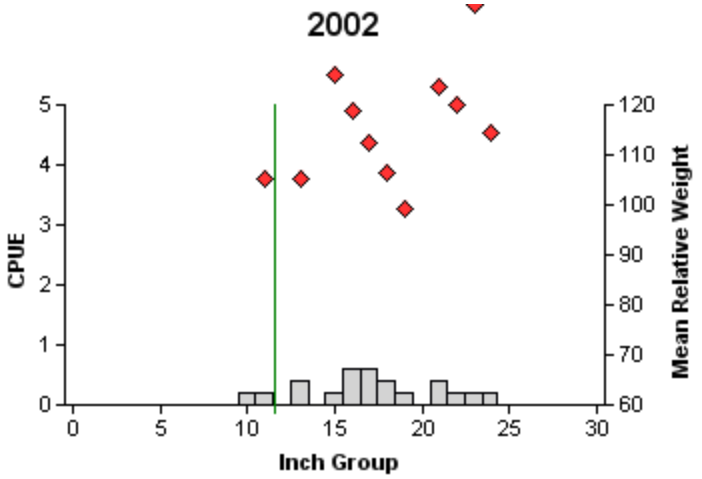


Figure 6. Length frequency of harvested sunfish (species combined) observed during creel surveys at Lake Athens, Texas, March through May 2004, all anglers combined. N is the number of harvested sunfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

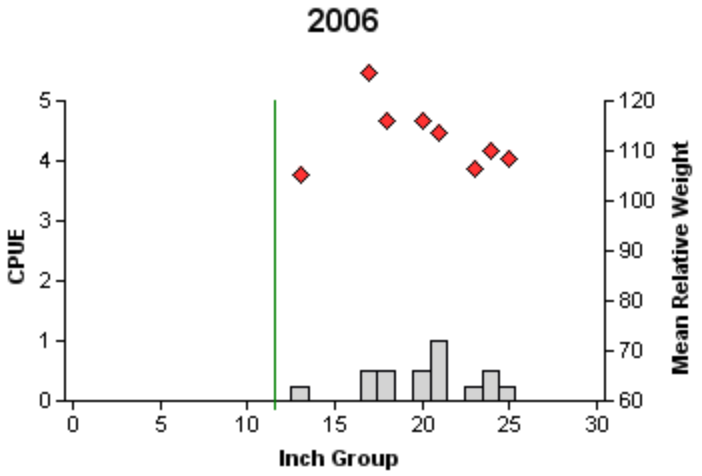
Channel Catfish



Effort = 5.0
Total CPUE = 0.4 (0; 2)
Stock CPUE = 0.4 (0; 2)
PSD = 50.0 (0.5)
RSD-P = 0.0 (0)



Effort = 5.0
Total CPUE = 3.8 (35; 19)
Stock CPUE = 3.6 (33; 18)
PSD = 78.0 (0.11)
RSD-P = 6.0 (0.07)



Effort = 4.0
Total CPUE = 3.8 (25; 15)
Stock CPUE = 3.8 (25; 15)
PSD = 93.0 (0.06)
RSD-P = 20.0 (0.14)

Figure 7. 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, Lake Athens, Texas, 1998, 2002, and 2006.

Channel Catfish

Table 8. Creel survey statistics for channel catfish at Lake Athens from March through May 2004, where total catch per hour is for anglers targeting channel catfish and total harvest is the estimated number of channel catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2004
Directed effort (h)	252.15 (81)
Directed effort/acre	0.14 (81)
Total catch per hour	2.0
Total harvest	88.52 (522)
Harvest/acre	0.05 (522)
Percent legal released	0

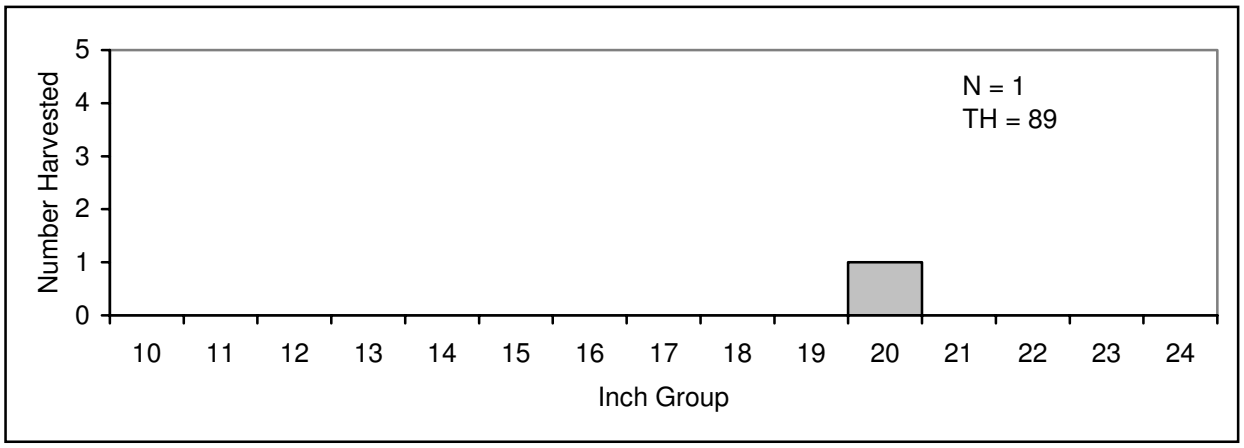
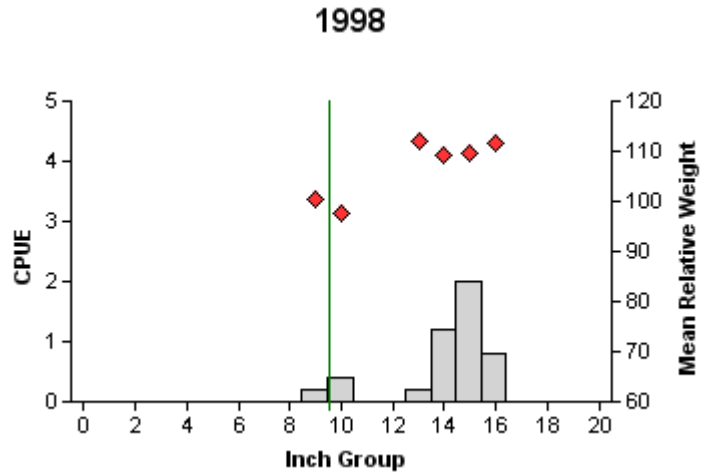
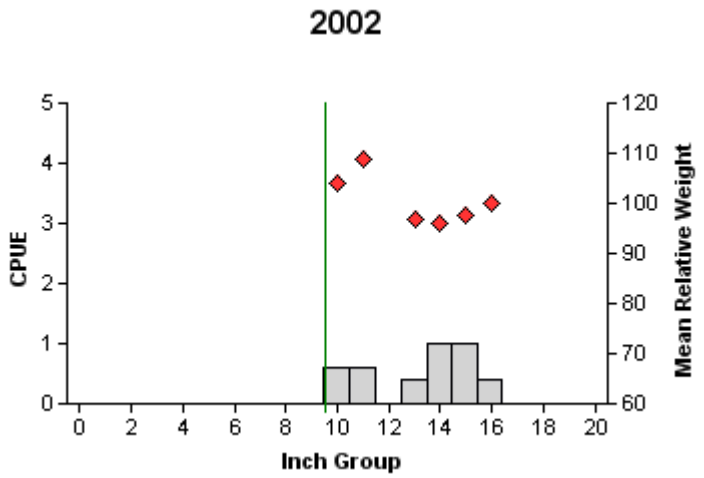


Figure 8. Length frequency of harvested channel catfish observed during creel surveys at Lake Athens, Texas, March through May 2004, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

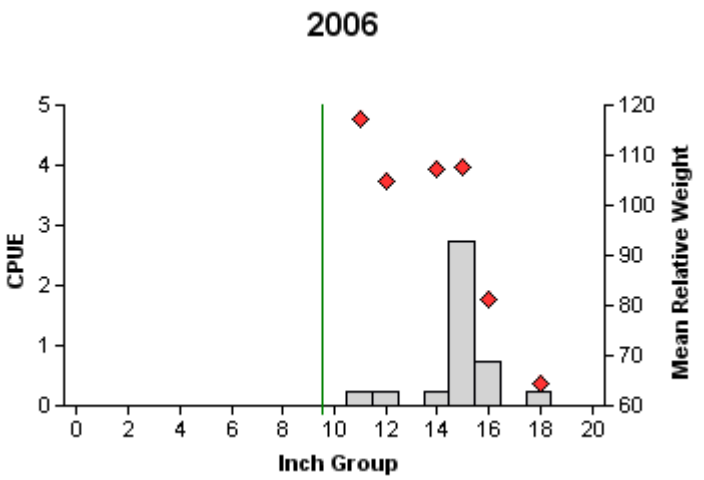
White Bass



Effort = 5.0
Total CPUE = 4.8 (67; 24)
Stock CPUE = 4.8 (67; 24)
PSD = 100.0 (0)
RSD-P = 88.0 (0.04)



Effort = 5.0
Total CPUE = 4.0 (47; 20)
Stock CPUE = 4.0 (47; 20)
PSD = 100.0 (0.00)
RSD-P = 70.0 (0.15)



Effort = 4.0
Total CPUE = 4.5 (71; 18)
Stock CPUE = 4.5 (71; 18)
PSD = 100.0 (0)
RSD-P = 94.0 (0.01)

Figure 9. Number of white bass caught per net night (CPUE) and population indices (RSE and N are in parentheses) for spring gill net surveys, Lake Athens, Texas, 1998, 2002, and 2006.

White Bass

Table 9. Creel survey statistics for white bass at Lake Athens from March through May 2004, where total catch per hour is for anglers targeting white bass and total harvest is the estimated number of white bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2004
Directed effort (h)	75.66 (166)
Directed effort/acre	0.04 (166)
Total catch per hour	0.33
Total harvest	177 (194)
Harvest/acre	0.10 (194)
Percent legal released	55

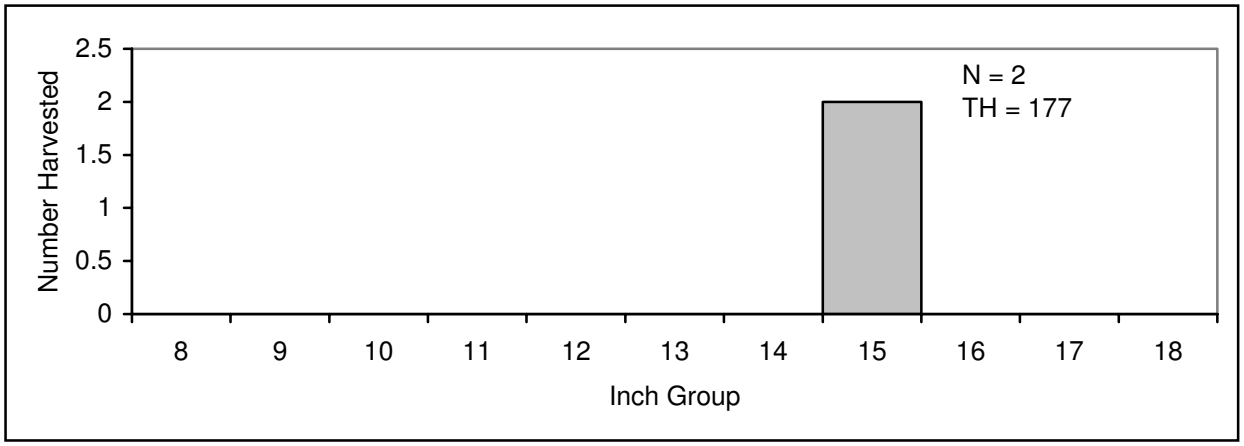
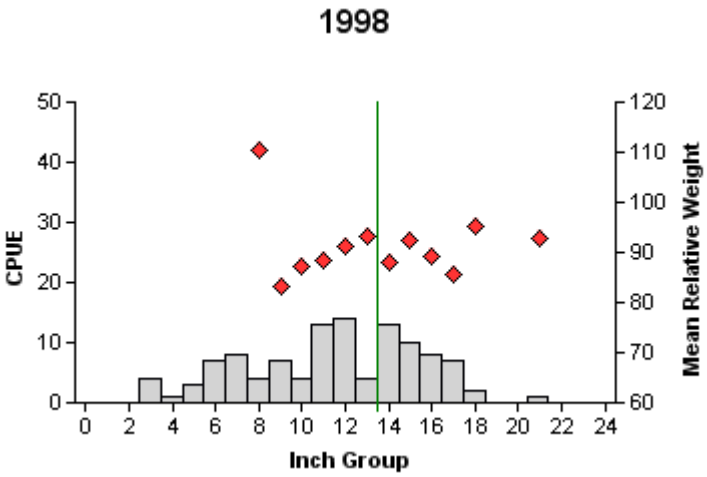
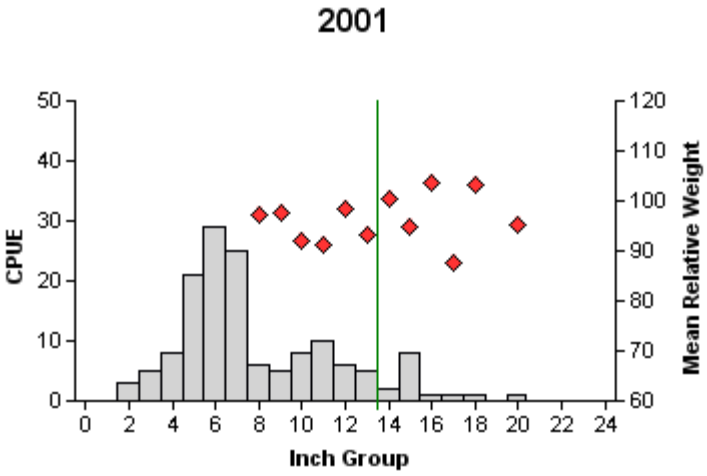


Figure 10. Length frequency of harvested white bass observed during creel surveys at Lake Athens, Texas, March through May 2004, all anglers combined. N is the number of harvested white bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass



Effort =	1.0
Total CPUE =	110.0 (12; 110)
Stock CPUE =	87.0 (14; 87)
PSD =	68.0 (0.06)
RSD-P =	32.0 (0.06)



Effort =	1.0
Total CPUE =	145.0 (15; 145)
Stock CPUE =	54.0 (19; 54)
PSD =	46.0 (0.07)
RSD-P =	22.0 (0.06)

Figure 11. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 1998 and 2001. Continued next page…

Largemouth Bass

Effort = 1.0
Total CPUE = 73.0 (19; 73)
Stock CPUE = 34.0 (30; 34)
PSD = 53.0 (0.12)
RSD-P = 21.0 (0.08)

Effort = 1.0
Total CPUE = 68.0 (16; 68)
Stock CPUE = 34.0 (13; 34)
PSD = 50.0 (0.07)
RSD-P = 12.0 (0.06)

Figure 11 cont... Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Athens, Texas, 2003 and 2005.

Largemouth Bass

Table 10. Creel survey statistics for largemouth bass at Lake Athens from March 2004 through May 2004, where total catch per hour is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2004
Directed effort (h)	8440.77 (19)
Directed effort/acre	4.69 (19)
Total catch per hour	0.44 (30)
Total harvest	177.04 (105)
Harvest/acre	0.10 (105)
Percent legal released	90

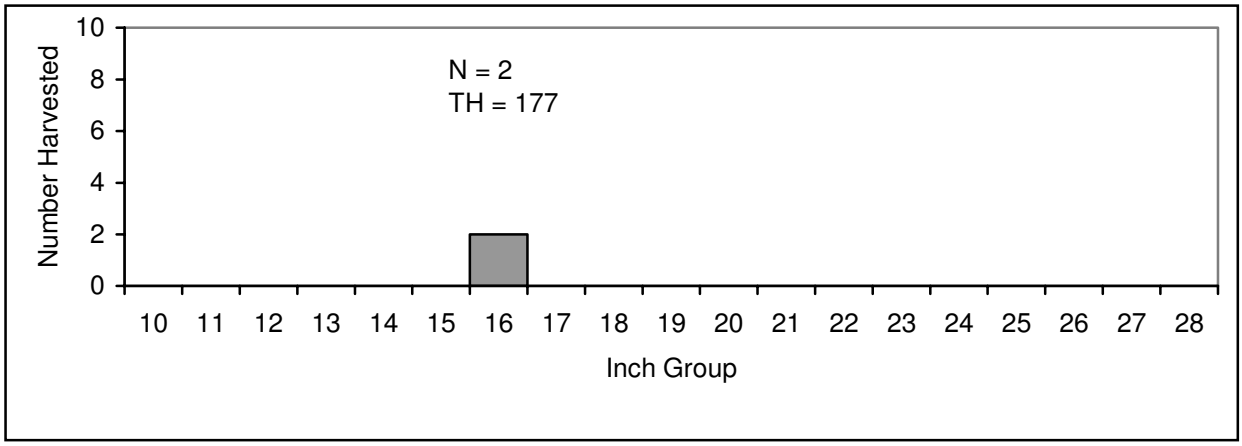


Figure 12. Length frequency of harvested largemouth bass observed during creel surveys at Lake Athens, Texas, March through May 2004, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass

Table 11. Results of genetic analysis of largemouth bass collected by fall electrofishing at Lake Athens, Texas, 1998, 2001, and 2003. 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.

		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

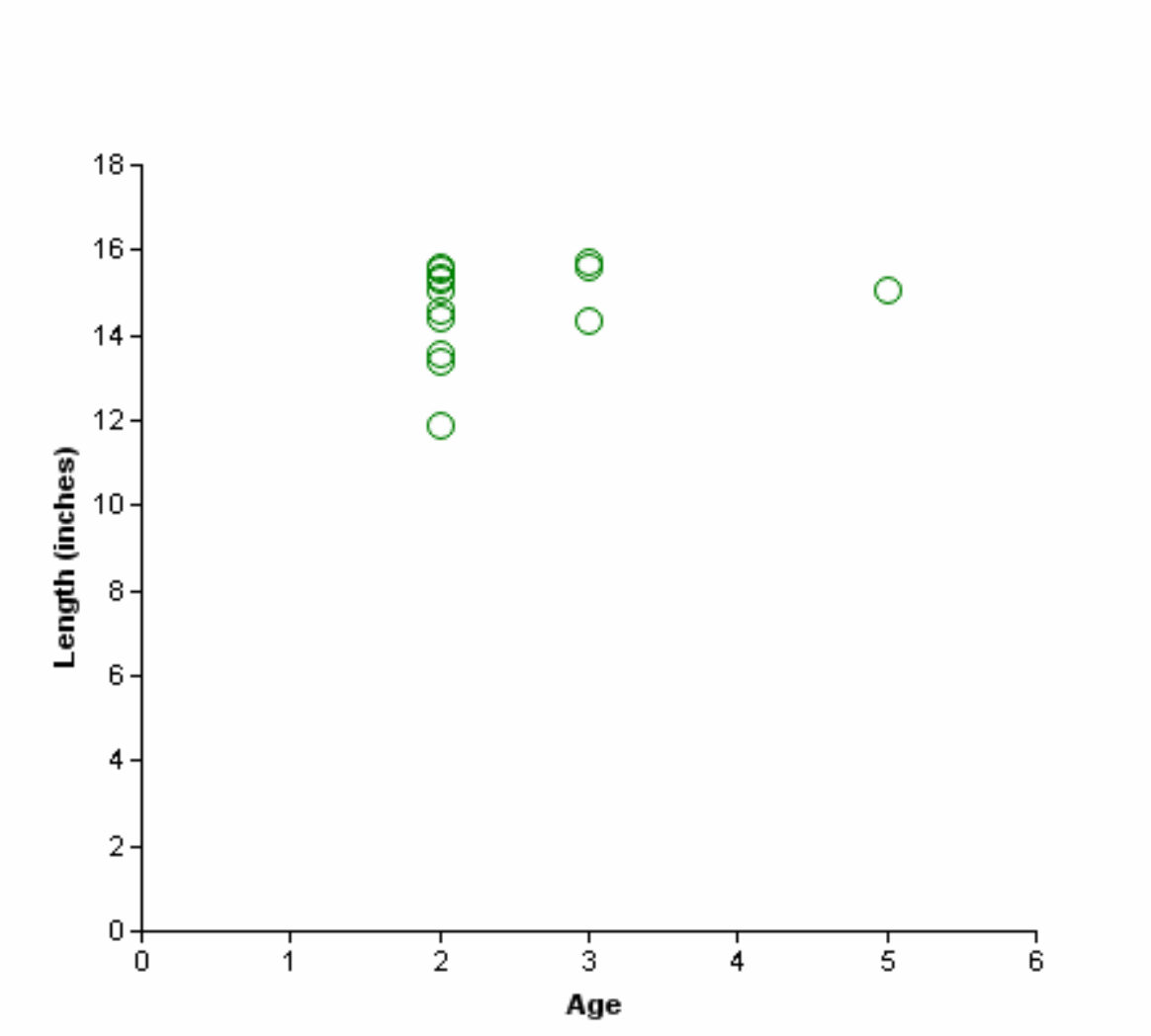


Figure 13. Length at age for largemouth bass collected from electrofishing at Lake Athens, Texas, Fall 2005.

Black Crappie

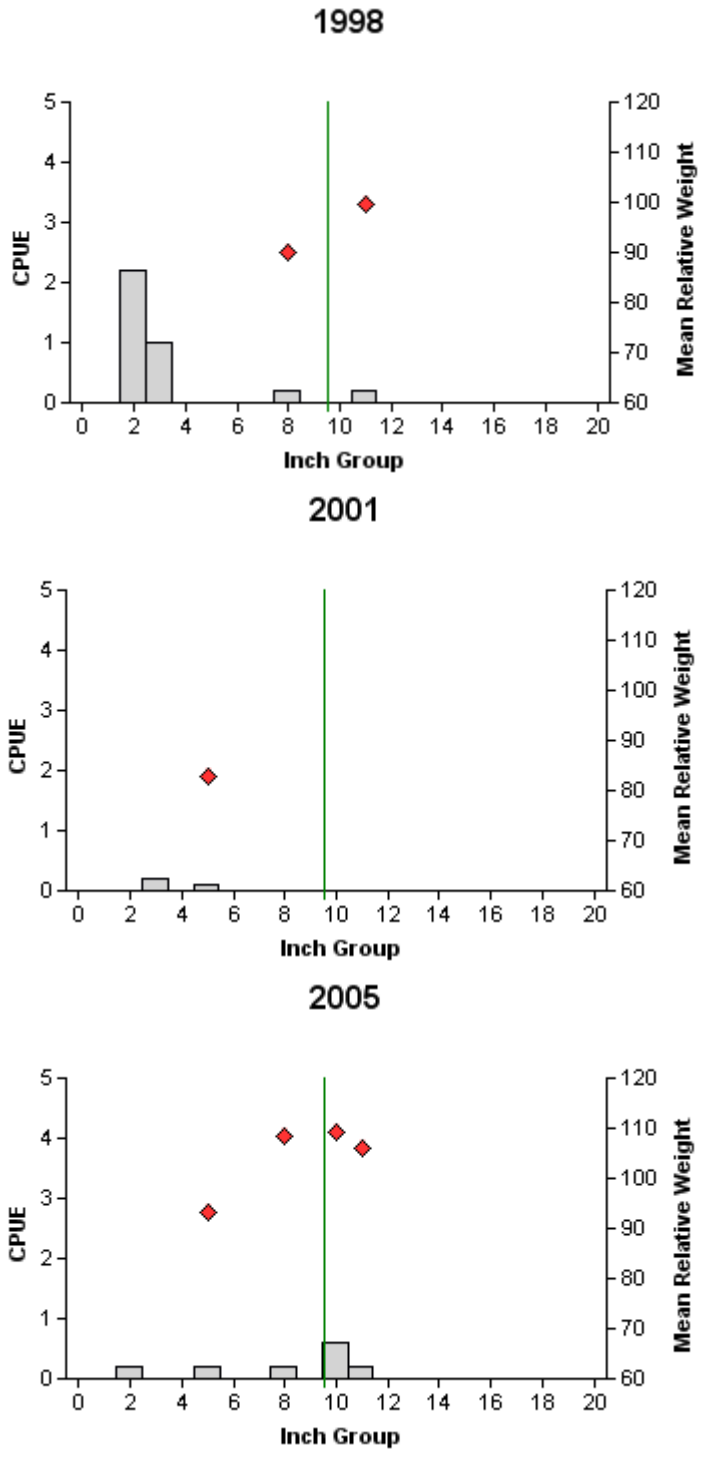


Figure 14. Number of black crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Athens, Texas, 1998, 2001, and 2005.

Black Crappie

Table 12. Creel survey statistics for black crappie at Lake Athens, Texas, from March through May 2004, where total catch per hour is for anglers targeting black crappie and total harvest is the estimated number of black crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year
	2004
Directed effort (h)	893.1 (49)
Directed effort/acre	0.50 (49)
Total catch per hour	1.13 (39)
Total harvest	1239.31 (81)
Harvest/acre	0.69 (81)
Percent legal released	0

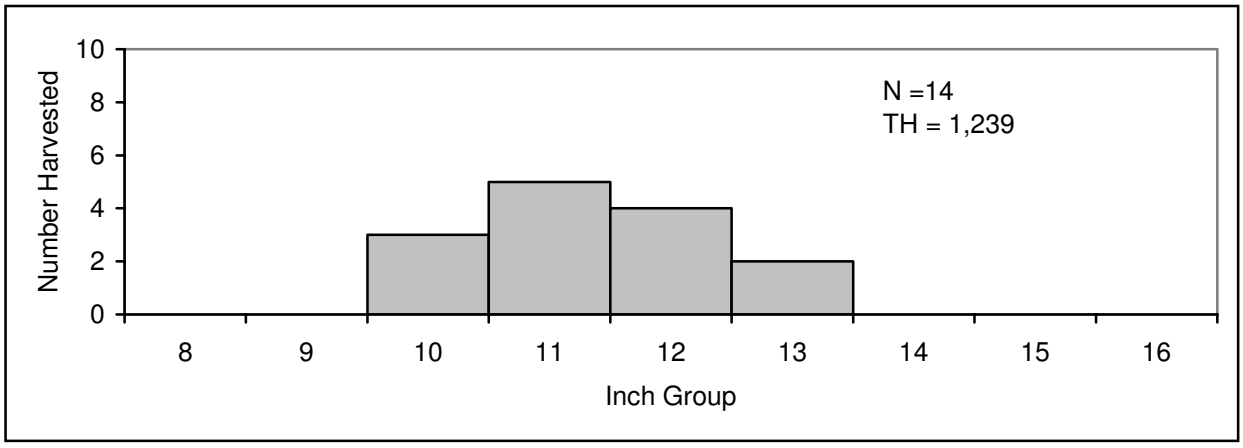


Figure 15. Length frequency of harvested black crappie observed during creel surveys at Lake Athens, Texas, March through May 2004, all anglers combined. N is the number of harvested black crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 13. Proposed sampling schedule for Lake Athens, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

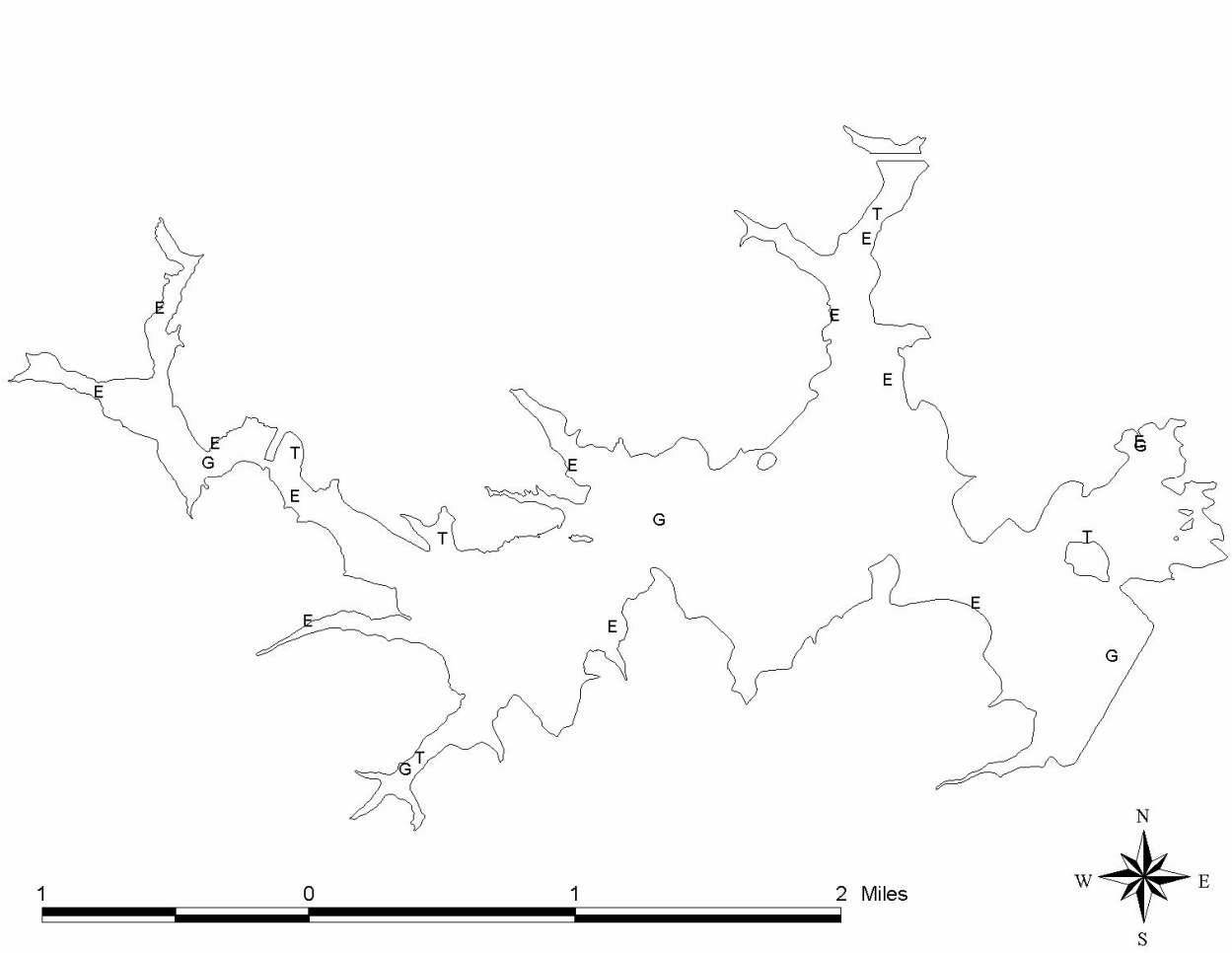
Survey Year	Electrofishing	Trap Net	Gill Net	Creel Survey	Report
Fall 2006-Spring 2007					
Fall 2007-Spring 2008	A				
Fall 2008-Spring 2009					
Fall 2009-Spring 2010	S	S	S		S

APPENDIX A

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

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad					21	21.0
Threadfin shad					18	18.0
Channel catfish	15	3.75				
White bass	18	4.50				
Redbreast sunfish					18	18.0
Warmouth					7	7.0
Bluegill					402	402.0
Longear sunfish					10	10.0
Redear sunfish					81	81.0
Largemouth bass					68	68.0
Black crappie			7	1.40		

APPENDIX B



Location of sampling sites, Lake Athens, Texas, 2005-2006. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively.