PERFORMANCE REPORT

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STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

# Oak Creek Reservoir


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July 31, 2007

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Oak Creek Reservoir were surveyed in 2006 using electrofisher and trap nets, and in 2007 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:** Oak Creek Reservoir is a 2,375-acre impoundment at conservation pool (2,000 feet above MSL) and located 45 miles north of San Angelo in the northeast corner of Coke County, Texas, in the Colorado River drainage basin. Primary uses included municipal water supply, recreation, and until 2002, cooling water for a power plant. The water level declined 34 feet from August 1997 to May 2003, severely limiting fish production and angler use. Although reservoir water level rebounded slightly in 2003, 2005, and 2007, reservoir surface area totaled only 870 acres in May 2007. Habitat features consisted of flooded saltcedar and black willow and rocks. One boat ramp provided access, but a decrease in water level of only a few feet would leave it unusable.

- **Management History:** Important sport fish include largemouth bass, white crappie, and catfishes. The management plan from the 2002 survey report recommended waiting until the reservoir caught enough water to allow boat access before conducting evaluations of fish populations. A variety of fish species have been stocked in the reservoir including threadfin shad, channel and blue catfishes, largemouth bass, and smallmouth bass.

- **Fish Community**
  - **Prey species:** Threadfin shad were collected in low numbers as recently as 2004. Electrofishing catch of gizzard shad was moderately high, and approximately one third of the fish were available as prey to most sport fish. Electrofishing catch of bluegill was moderate, and most were less than 6 inches.

  - **Catfishes:** Blue and channel catfish were stocked in the reservoir in the 1970s and again in 2003 (blue) and 2004 (channel). Blue catfish were the most abundant and exhibited the broadest size distribution compared to other catfishes. Channel catfish were moderately abundant, but few legal-sized fish were present. Flathead catfish were present in the reservoir.

  - **White bass:** White bass were low in abundance.

  - **Largemouth bass:** Florida largemouth bass were initially stocked in the 1980s. Additional stockings were made in 2003 and 2004 to take advantage of rising water levels and increased habitat. Largemouth bass were moderately abundant. Size structure continued to improve over recent years, but remained poor. Body condition and growth of largemouth bass was adequate.

  - **Smallmouth bass:** Smallmouth bass were present in low numbers prior to the onset of falling water levels in 1998. The population was negatively impacted by low water levels and has not recovered.

  - **White crappie:** Abundance, size distribution, growth, and body condition of white crappie were good.

- **Management Strategies:** Conduct electrofishing surveys in 2007, 2008 and 2010. Stocking threadfin shad in April 2008 is contingent on 2007 largemouth bass (<15 inches) relative weights and shad (<6 inches) electrofishing CPUE. Conduct trap netting surveys in 2008 and 2010. Conduct habitat and access surveys in 2010. Conduct gill netting survey in 2011.

# INTRODUCTION

This document is a summary of fisheries data collected from Oak Creek Reservoir in 2006-2007. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. Although 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 2006-2007 data for comparison.

## *Reservoir Description*

Oak Creek Reservoir is a 2,375-acre impoundment constructed in 1952. Located in Coke county approximately 45 miles north of San Angelo, the reservoir is operated and controlled by the City of Sweetwater. Primary uses included municipal water supply, recreation, and until 2002, cooling water for a power plant. Habitat at time of sampling consisted of rocks and flooded terrestrial vegetation. The water level remained within 10 feet of conservation pool from 1981 through 1997, but declined 34 feet from August 1997 to May 2003 (Figure 1). Water level increased over ten feet in 2003 then fluctuated within five feet until a six-foot rise in May 2007 brought the reservoir surface area up to 870 acres. Three boat ramps were available, but only one was usable due to low water. Under frequent low-water-level conditions no ramps were available, but it is possible to launch a boat from the dam. Bank fishing access was limited. Other descriptive characteristics for Oak Creek Reservoir are in Table 1.

## *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Van Zee 2003) included:

1. Wait until water levels rise sufficiently to allow boat access to the reservoir; at which time, conduct an evaluation of fish populations.

   **Actions:** Fish populations were surveyed with electrofishing and trap netting in 2003, 2004, and 2006, and gill netting in 2007. Blue catfish were stocked in 2003 and channel catfish were stocked in 2004. Florida largemouth bass were stocked in 2003 and 2004.

**Harvest regulation history:** Sportfishes in Oak Creek Reservoir are currently and have historically been managed with statewide regulations (Table 2) except for smallmouth bass. From 1994 through 2001, smallmouth bass were managed with an 18-inch minimum length limit and 3-fish bag. This regulation was rescinded after failing to increase smallmouth bass abundance.

**Stocking history:** Threadfin shad were stocked in 1980. Channel and blue catfish were stocked multiple times in the 1970s and again in 2003 (blue) and 2004 (channel). Smallmouth bass were stocked in 1984 and 1985 but failed to produce a quality fishery. Largemouth bass were first stocked in 1973. Florida largemouth bass were introduced in 1980 and stocked in 1986, 1987, 2003, and 2004. In 1994, 180 adult largemouth bass (<14 inches) from Lake Fork were stocked. The complete stocking history is in Table 3.
**Vegetation/habitat history:** In recent years (<8 years), Oak Creek Reservoir has not supported aquatic vegetation due to considerable water level fluctuation. Anecdotal reports indicate Eurasian watermilfoil *Myriophyllum spicatum* was present in the reservoir during the 1990s. Shoreline habitat consisted mainly of flooded live and dead saltcedar *Tamarix sp*. and black willow *Salix nigra* and rocks (Table 4).

# METHODS

Fishes were collected by electrofishing (1.0 hour at 12, 5-min stations), gill netting (5 net-nights at 5 stations), and trap netting (6 net-nights at 6 stations). Additional electrofishing (2.0 hours of pedal time) was conducted to collect largemouth bass for genetic and age sampling. Additional trap netting was conducted using standard trap nets set offshore (6 net nights at 6 stations) and tandem trap nets (6 net

nights at 6 stations) set as paired units (2 nets with facing throats and sharing a common lead) and set offshore as part of a special study investigating alternative sampling strategies for collecting crappie. 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). Separate CPUE estimates were calculated for each of the three trap-net deployment strategies. 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) except for off-shore standard and tandem trap nets which were deployed according to procedures developed for the special study. Microsatellite DNA analysis was used to determine largemouth bass genetic composition. Prior to 2005, genetic analysis was done by electrophoresis.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight ($W_r$)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics. Ages were determined using otoliths for white bass, largemouth bass, and white crappie. We collected 13 largemouth bass (13.0 – 14.9 inches) and 16 white crappie (9.0 – 10.9 inches) for aging. All white bass collected were aged. Source for water level data was the United States Geological Survey website.

## RESULTS AND DISCUSSION

**Habitat:** Oak Creek Reservoir supported no aquatic vegetation species. Much (>75%) of the reservoir shoreline has been invaded by non-native saltcedar. Although flooded saltcedar offer limited fish habitat, this species can exacerbate evaporative water loss from the reservoir and can increase water salinity through the excretion of salt (DeLoach 1991). Other habitat features included rocks and flooded black willow.

**Prey species:** No threadfin shad were collected in 2006, but have been collected in recent surveys (2004 = 5.0/h, 2003 = 88.0/h). Electrofishing catch rates of gizzard shad and bluegill were 264.0/h and 126.7/h, respectively. Total CPUE of gizzard shad was lower compared to 2003 and 2004, and size structure shifted toward larger fish (Figure 2). Total CPUE of bluegill in 2006 was lower than 2004, but similar to 2003 (Figure 3). Bluegill size structure in 2006 remained dominated by fish less than six inches (Figure 3).

**Blue catfish:** Blue catfish were restocked in 2003 following a significant water level rise. Stocking may have assisted in boosting blue catfish numbers from 1.4/nn in 1997 to 9.4/nn in 2007 (Figure 4). Size structure also improved, evidenced by the increased range in size in 2007 (9 – 24 inches) compared to 1997 (16 – 20 inches). $W_r$ values were generally above 90 and typically increased with size.

**Channel catfish:** Channel catfish were stocked in 2004, but failed to impact population abundance compared to blue catfish. The gill net catch rate (5.82/nn) of channel catfish in 2006 was consistent with 1997 (6.8/nn) (Figure 5). $W_r$ values were generally above 90.

**Flathead catfish:** Flathead catfish were present in low (0.2/nn) numbers. Only one 25-inch fish was captured in the 2007 gill-net survey.

**White bass:** The gill net catch rate of white bass was 1.2/nn in 2007 which was much lower than in 1997 (9.4/nn) (Figure 6). All white bass collected in 2007 measured in the 12-inch group and were age-3. White bass reproductive success and recruitment have been related to springtime reservoir inflows (DiCenzo and Duval 2002). Low reservoir inflow during drought years may have limited white bass production in this reservoir.

**Largemouth bass:** Florida largemouth bass were stocked in 2003 and 2004 to take advantage of increased habitat resulting from a water level rise in 2003. The electrofishing catch rate of stock-length (≥ 8 inches) largemouth bass was 108.0/h in 2006, representing a substantial increase since 2003 (13.3/h) (Figure 7). Electrofishing catch rate of fish greater than 14 inches (11.0/h) has also improved over 2003 (2.7/h) and 2004 (2.0/h). Size structure has improved over recent years, but still remained poor (PSD = 25, RSD-14 = 10). Growth of largemouth bass was moderate. Average age at 14 inches (13.0 – 14.9 inches) was 2.5 years (N = 13, range = 2 – 3 years).

Body condition for smaller fish (8 - 12 inches) decreased as abundance increased from 2003 ($W_r$ = 114.1) to 2004 ($W_r$ = 77.1) (Table 5). Body condition of largemouth bass measuring less than 15 inches was generally below average ($W_r$ < 86) in 2006. Larger fish (>15 inches) were in excellent shape ($W_r$ 90 – 110).

Florida largemouth bass influence remained moderately high in Florida alleles (56%), but Florida genotype was 0% despite stockings in 2003 and 2004 (Table 6).

**Smallmouth bass:** Smallmouth bass were stocked in 1984 and 1985. Smallmouth bass were present in low numbers prior to the onset of falling water levels in 1998. No smallmouth bass have been collected since 2000 (1.0/h). The population was negatively impacted by low water levels and has not recovered.

**White crappie:** The trap net catch rate of white crappie was 11.0/nn in 2006, lower than in 2003 (15.6/nn) and 2004 (25.8/nn) (Figure 8). Average age at 10 inches (9.3 – 10.7 inches) was 2.3 years (N = 16, range = 2 – 4 years) in 2006 compared to 1.7 years (N = 30, range 1 – 3) in 2004. Body condition generally declined with fish length in 2006 (Figure 8).

Two alternative trap-net deployment strategies (tandem trap nets and standard trap nets set offshore) were experimentally utilized to sample white crappie in 2006. Tandem trap nets caught greater numbers of white crappie than other deployment strategies, collected sub-stock-length (<5 inches) white crappie more effectively, and decreased sampling variability of total CPUE compared to other deployment methods (Figure 9). Standard trap nets set offshore performed poorly.

**Fisheries management plan for Oak Creek Reservoir, Texas**

Prepared – July 2007

**ISSUE 1:** Shad production is dynamic across years as evidenced by variable electrofishing catch rates for both gizzard and threadfin shad. Production may be impacted by water level fluctuations as fall electrofishing for shad (both species combined) measuring less than 6 inches was high (400.0/h) in 2003 following a significant water-level increase and low (48.0/h) in a dry year (2006). Relative weights in 2006 were below average for sub-preferred-size (<15 inches) largemouth bass, white bass, and declined with size for white crappie. White crappie averaged 0.6 years older at 10 inches in 2006 compared to 2004. Declines in sport fish growth could reduce fishing quality for anglers.

MANAGEMENT STRATEGIES

1. Conduct electrofishing surveys in 2007, 2008 and 2010 to monitor largemouth bass growth and body condition and CPUE of small (<6 inches) shad.
2. Stock threadfin shad in April 2008 if largemouth bass less than 15 inches exhibit average relative weight less than 85 and if small shad (<6 inches) electrofishing CPUE is less than 100/h.

**ISSUE 2:** Blue catfish have become the most numerous catfish species in the reservoir and offer anglers a broader range of sizes available to harvest compared to channel catfish. Anglers may not be aware of the quality blue catfish fishery in Oak Creek Reservoir.

MANAGEMENT STRATEGY

1. Promote the blue catfish fishery through appropriate media outlets and educate anglers on specific angling techniques for targeting this species.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes additional electrofishing in 2007, a standard electrofishing survey in 2008, standard trap net sampling in 2008, and mandatory monitoring in 2010/2011 (Table 7). Additional electrofishing surveys are necessary to collect largemouth bass growth and body condition information and to evaluate shad production dynamics following water level rise. If sub-quality-size (<15 inches) largemouth bass body condition and small shad (<6 inches) CPUE are low based on the 2007 electrofishing survey, threadfin shad will be stocked in April 2008. Additional trap net sampling in 2008 is necessary to monitor white crappie population changes following water level increase. Gill net surveys are only necessary every four years at this point to monitor for changes in population parameters for blue catfish, channel catfish, flathead catfish, and white bass.

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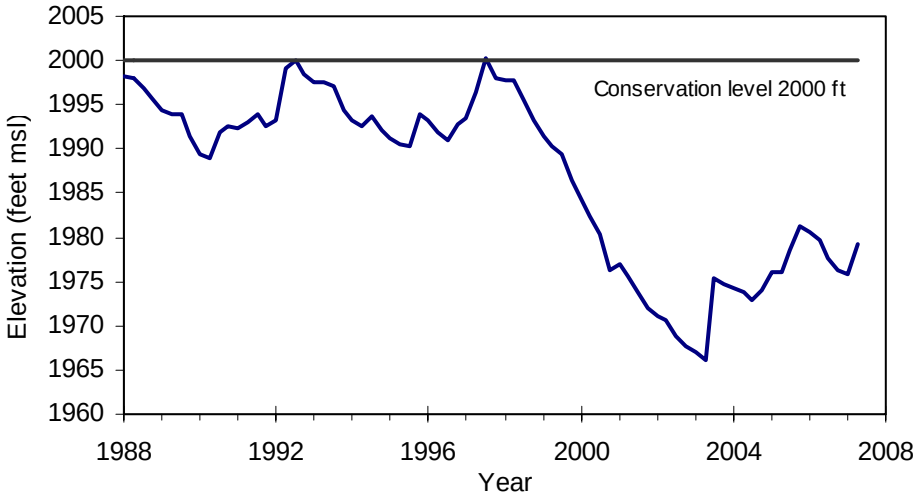



Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Oak Creek Reservoir, Texas, 1988 - 2007.

Table 1. Characteristics of Oak Creek Reservoir, Texas.

| Characteristic | Description |
|---|---|
| Year constructed | 1952 |
| Controlling authority | City of Sweetwater |
| County | Coke |
| Reservoir type | Offstream |
| Shoreline Development Index | 4.72 |
| Conductivity | 1,150 umhos/cm |

Table 2. Harvest regulations for Oak Creek Reservoir, Texas.

| Species | Bag Limit | Minimum-Maximum Length (inches) |
|---|---|---|
| Catfish: channel and blue catfish, their hybrids and subspecies | 25 (in any combination) | 12 - No Limit |
| Catfish, flathead | 5 | 18 - No Limit |
| Bass, white | 25 | 10 - No Limit |
| Bass, largemouth and smallmouth | 5 (in any combination) | 14 - No Limit |
| Crappie: white and black crappie, their hybrids and subspecies | 25 (in any combination) | 10 - No Limit |

Table 3. Stocking history of Oak Creek Reservoir, Texas. Size categories are: FRY =<1 inch, FGL = 1-3 inches, ADL = adults, and UNK = unknown.

| Year | Number | Size | Year | Number | Size |
|---|---|---|---|---|---|
| | Threadfin shad | | | Smallmouth bass | |
| 1980 | 2,000 | UNK | 1984 | 5,000 | FGL |
| | | | 1985 | 12,000 | FGL |
| | Golden shiner | | Species Total | 17,000 | |
| 1980 | 59 | UNK | | | |
| | | | | Largemouth bass | |
| | Blue catfish | | 1973 | 30,000 | UNK |
| 1976 | 43,000 | UNK | | | |
| 1977 | 29,600 | UNK | | Florida largemouth bass | |
| 1978 | 26,000 | UNK | 1980 | 40 | ADL |
| 1979 | 26,446 | UNK | 1986 | 99,500 | FRY |
| 2003 | 77,124 | FGL | 1987 | 90,000 | FGL |
| Species Total | 202,170 | | 2003 | 71,789 | FGL |
| | | | 2004 | 62,048 | FGL |
| | Channel catfish | | Species Total | 323,377 | |
| 1971 | 16,750 | UNK | | | |
| 1974 | 15,000 | UNK | | Lake Fork largemouth bass | |
| 1975 | 20,000 | UNK | 1994 | 180 | ADL |
| 2004 | 42,399 | FGL | | | |
| Species Total | 94,149 | | | | |

Table 4. Survey of littoral zone and physical habitat types, Oak Creek Reservoir, Texas, 2007. A linear shoreline distance (miles) was recorded for each habitat type found. Flooded dead and live terrestrial consisted primarily of saltcedar and black willow.

| Littoral habitat type | Shoreline Distance | |
|---|---|---|
| | Miles | Percent of total |
| Boulder | 1.4 | 10.4 |
| Flooded dead terrestrial | 1.8 | 13.4 |
| Flooded live terrestrial | 9.4 | 69.4 |
| Rock bluff | 0.1 | 0.8 |
| Rocky/gravel | 0.8 | 6.0 |

# Gizzard Shad

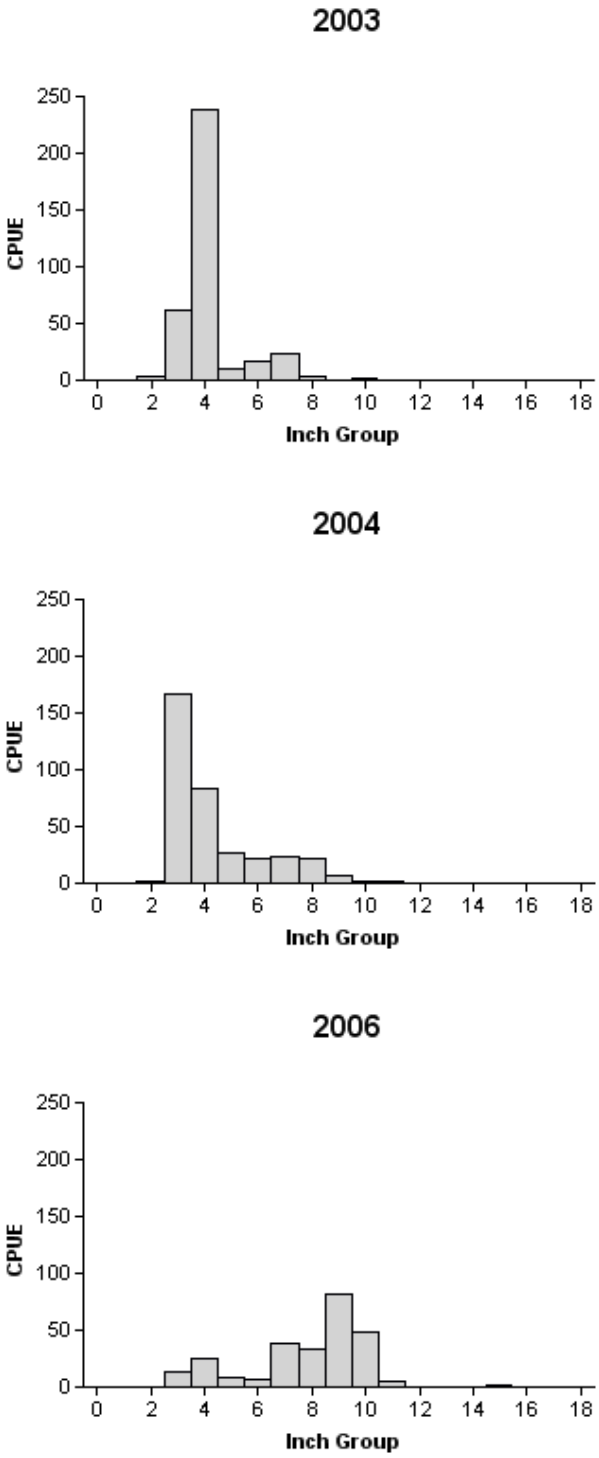
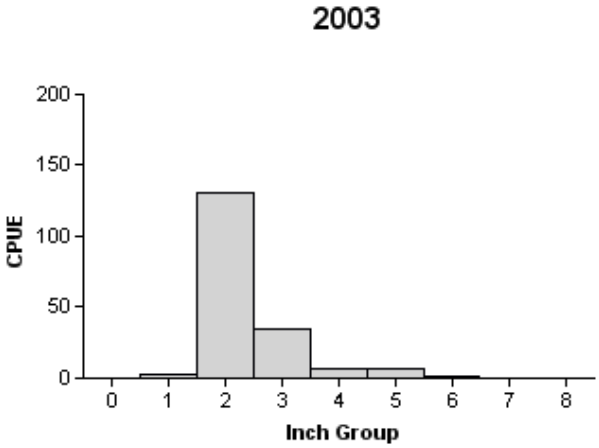
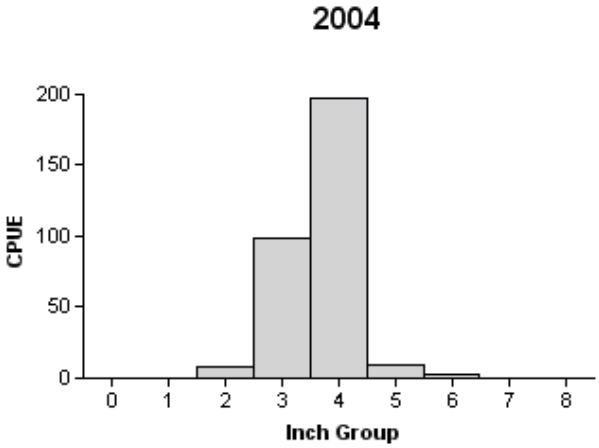



Figure 2. Number of gizzard shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Oak Creek Reservoir, Texas, 2003, 2004, and 2006.

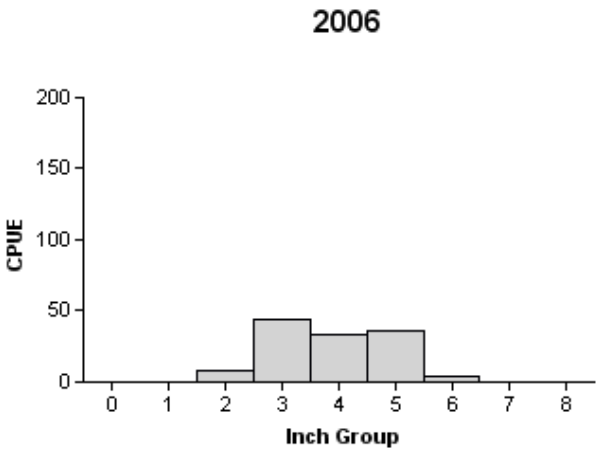
# Bluegill




Effort = 0.8
Total CPUE = 182.7 (31; 137)
PSD = 3 (3.3)




Effort = 1.0
Total CPUE = 317.0 (23; 317)
PSD = 1 (0.7)




Effort = 1.0
Total CPUE = 132.0 (18; 132)
PSD = 3 (1.8)

Figure 3. Number of bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Oak Creek Reservoir, Texas, 2003, 2004, and 2006.

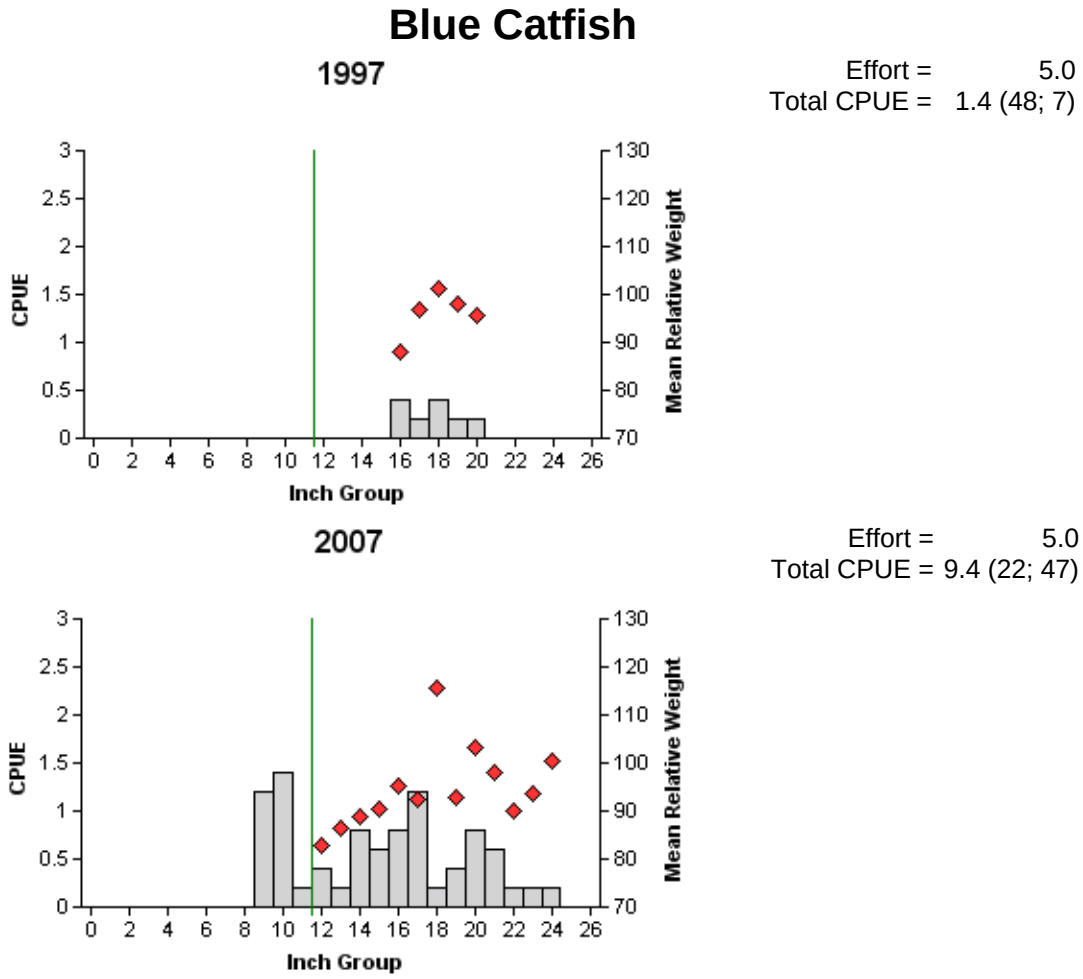



Figure 4. Number of blue catfish caught per net night (CPUE, bars) (RSE and N are in parentheses) and mean relative weight (diamonds) for spring gill net surveys, Oak Creek Reservoir, Texas, 1997 and 2007. Vertical line represents the minimum length limit.

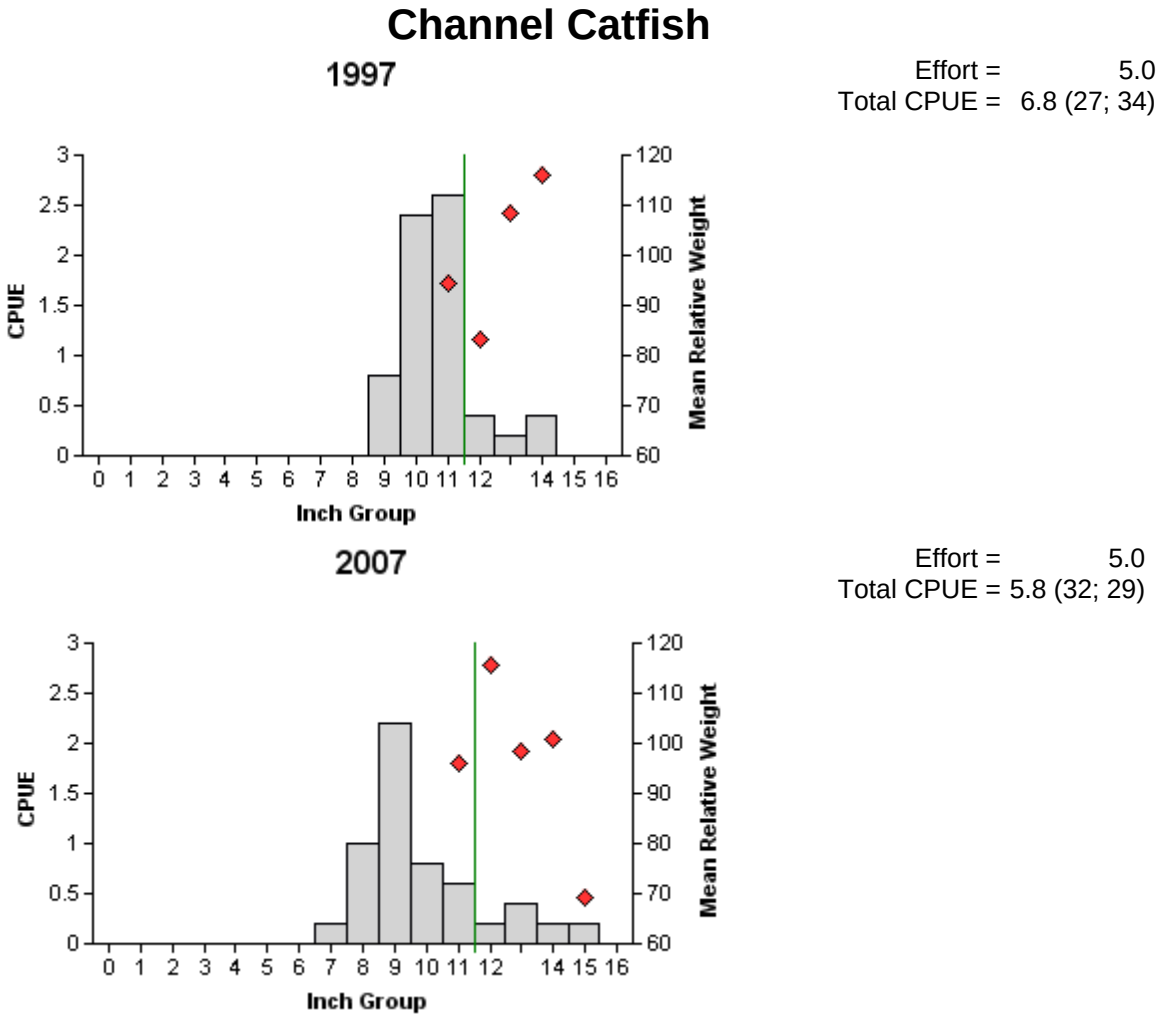



Figure 5. Number of channel catfish caught per net night (CPUE, bars) (RSE and N are in parentheses) and mean relative weight (diamonds) for spring gill net surveys, Oak Creek Reservoir, Texas, 1997 and 2007. Vertical line represents the minimum length limit.

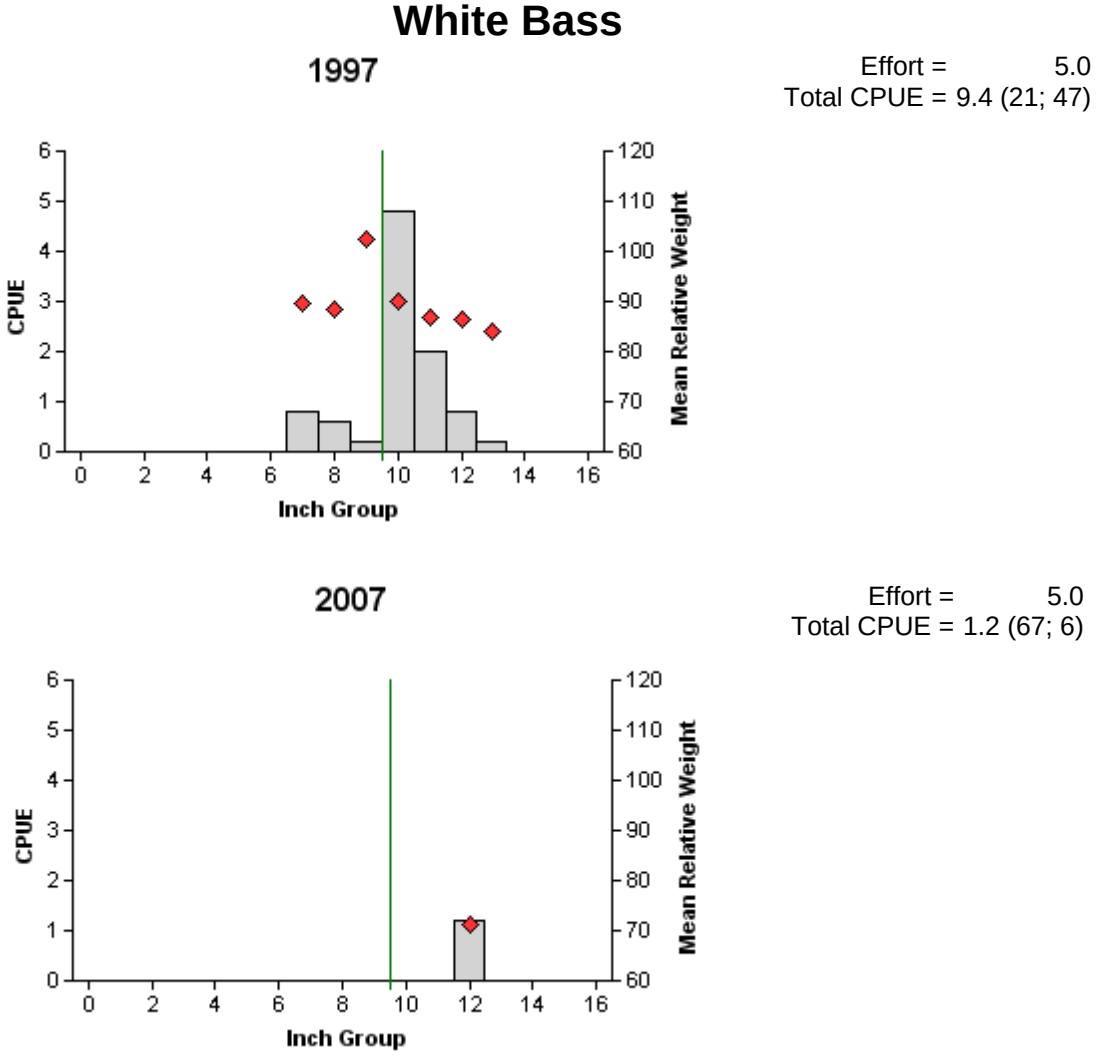
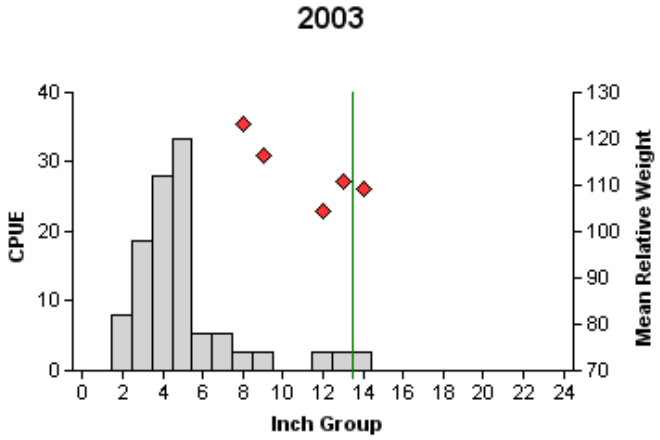
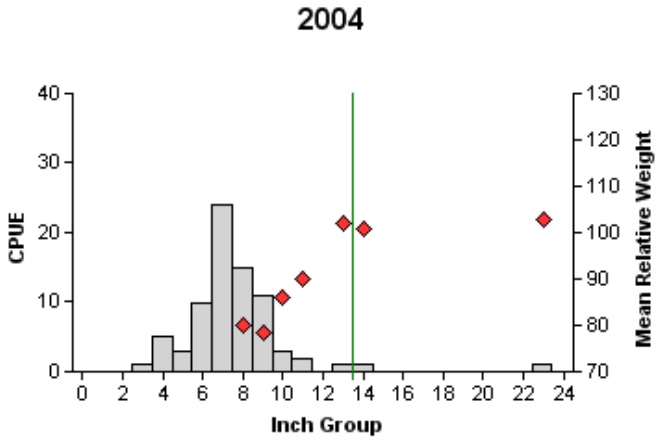



Figure 6. Number of white bass caught per net night (CPUE, bars) (RSE and N are in parentheses) and mean relative weight (diamonds) for spring gill net surveys, Oak Creek Reservoir, Texas, 1997 and 2007. Vertical line represents the minimum length limit.

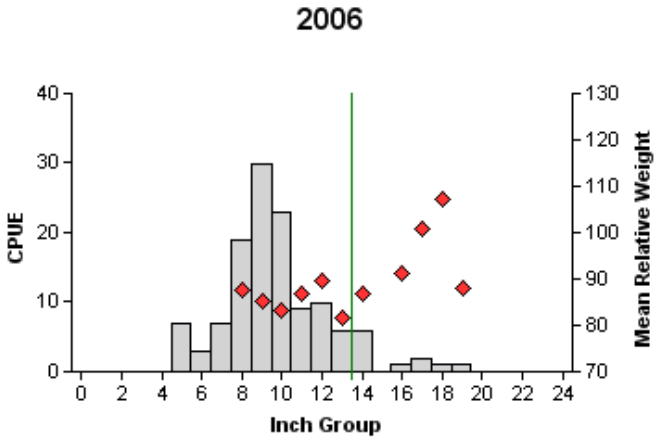
# Largemouth Bass




Effort = 0.8
Total CPUE = 112.0 (26; 84)
Stock CPUE = 13.3 (35; 10)
CPUE-14 = 2.7 (66; 2)
PSD = 60 (13.1)
RSD-14 = 20 (12)




Effort = 1.0
Total CPUE = 77.0 (19; 77)
Stock CPUE = 34.0 (28; 34)
CPUE-14 = 2.0 (67; 2)
PSD = 9 (4.3)
RSD-14 = 6 (4.1)




Effort = 1.0
Total CPUE = 125.0 (19; 125)
Stock CPUE = 108.0 (22; 108)
CPUE-14 = 11.0 (34; 11)
PSD = 25 (3.2)
RSD-14 = 10 (2.5)

Figure 7. 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, Oak Creek Reservoir, Texas, 2003, 2004, and 2006. Vertical line represents the minimum length limit.

Table 5. Mean relative weight and sample size (N) of largemouth bass in size-classes collected from fall electrofishing surveys, Oak Creek Reservoir, Texas, 2003, 2004, and 2006. Size classes are in inches.

| Year | Mean relative weight and number (N) in size-classes | | |
|---|---|---|---|
| | 8.0 – 11.9 | 12.0 – 14.9 | 15.0 – 20.0 |
| 2003 | 114.1 (4) | 107.0 (6) | NA (0) |
| 2004 | 77.1 (31) | 100.5 (2) | NA (0) |
| 2006 | 82.1 (81) | 85.6 (22) | 99.0 (5) |

Table 6. Results of genetic analysis of largemouth bass collected by fall electrofishing, Oak Creek Reservoir, Texas, 1997 and 2006. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, FxN = first or higher generation hybrid between a FLMB and a NLMB.

| | | Genotype | | | | |
|---|---|---|---|---|---|---|
| Year | Sample size | FLMB | FxN Hybrid | NLMB | % FLMB alleles | % pure FLMB |
| 1997 | 30 | 7 | 22 | 1 | 65.8 | 23.3 |
| 2006 | 61 | 0 | 61 | 0 | 56.7 | 0.0 |

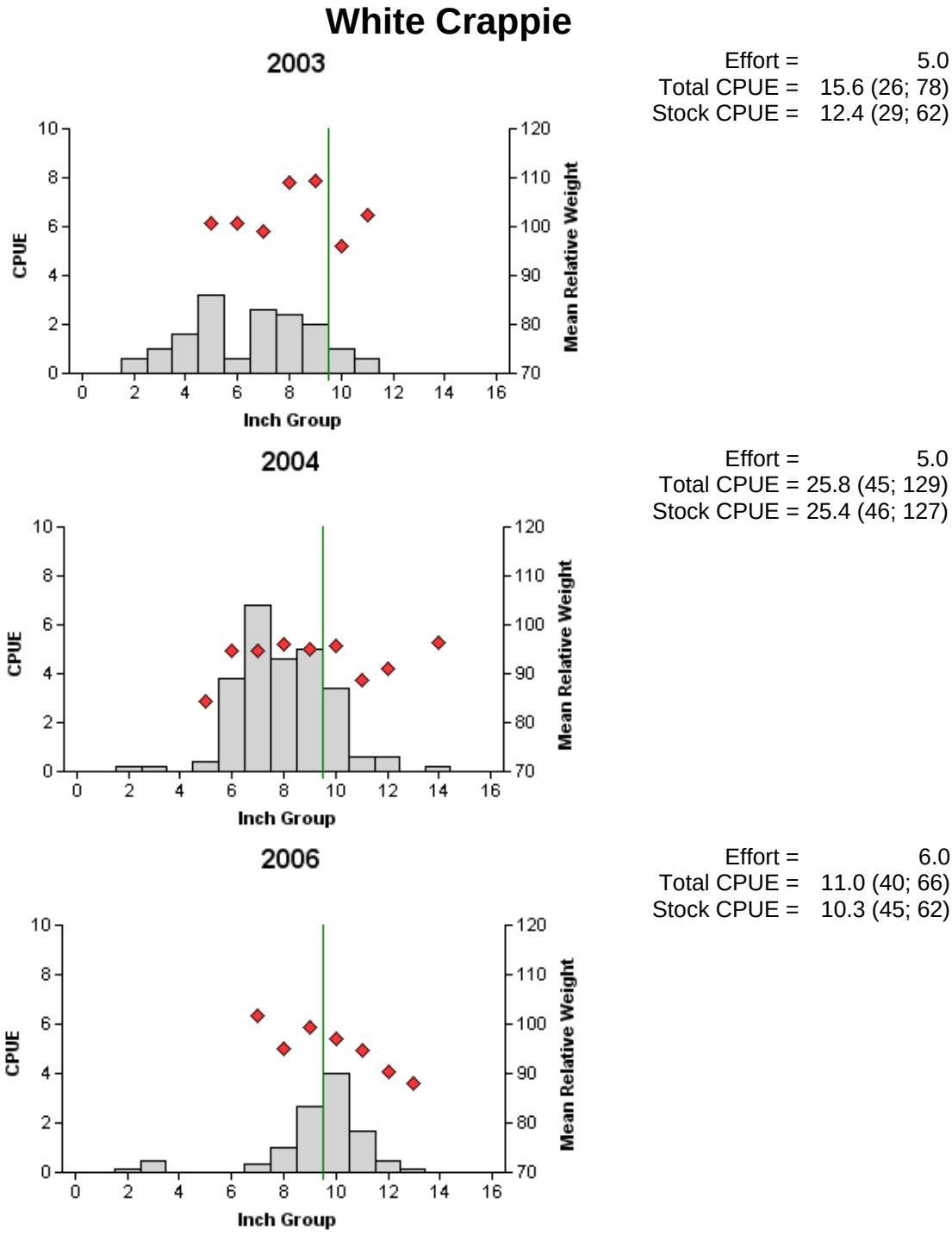



Figure 8. Number of white crappie caught per net night (CPUE, bars) (RSE and N are in parentheses) and mean relative weight (diamonds) for fall trap netting surveys, Oak Creek Reservoir, Texas, 2003, 2004, and 2006. Vertical line represents the minimum length limit.

# White Crappie

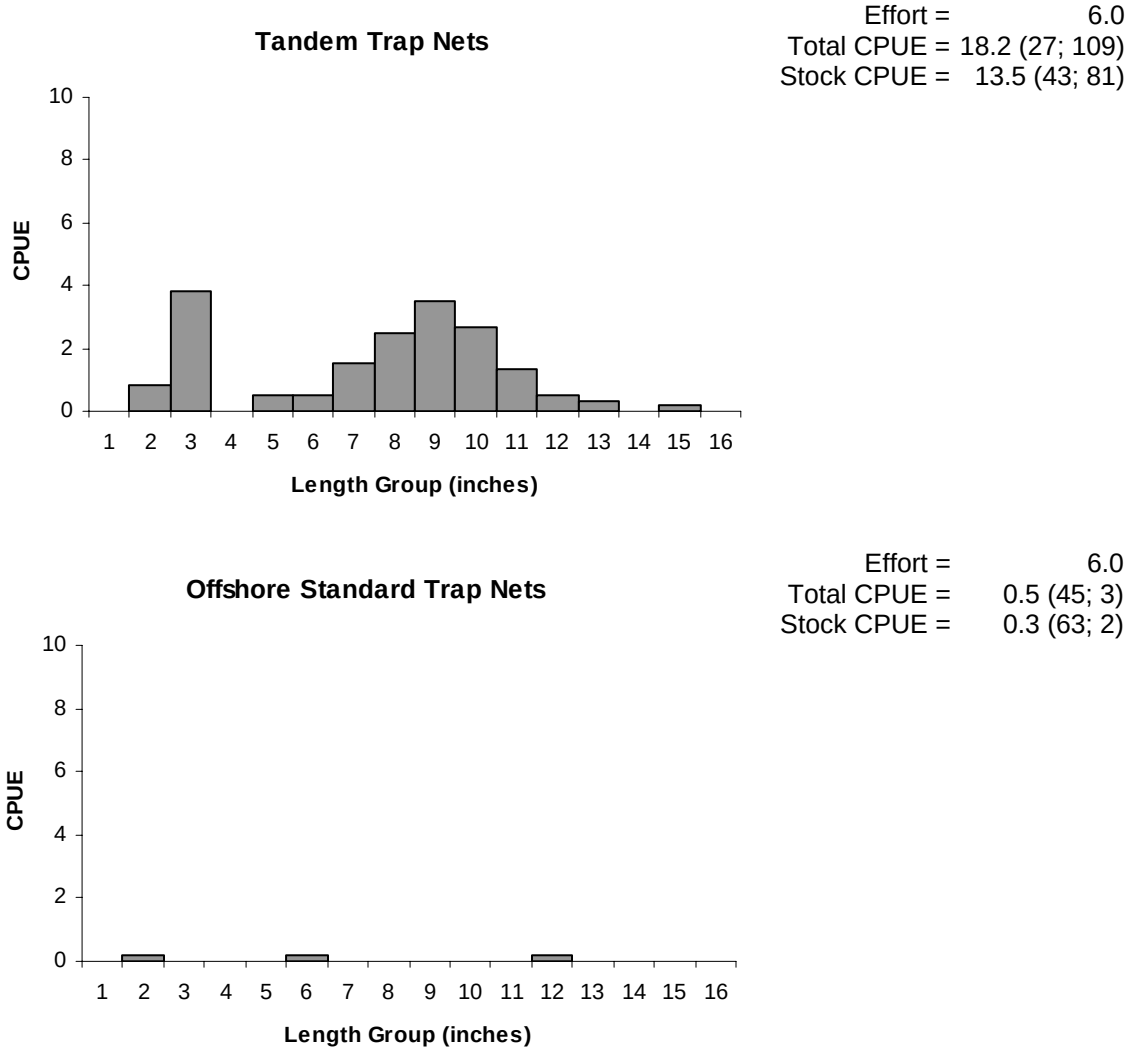



Figure 9. Number of white crappie caught per net night (CPUE, bars) (RSE and N are in parentheses) for alternative trap-net deployment strategies set concomitantly with standard 2006 fall trap netting survey, Oak Creek Reservoir, Texas.

Table 7. Proposed sampling schedule for Oak Creek Reservoir, 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.

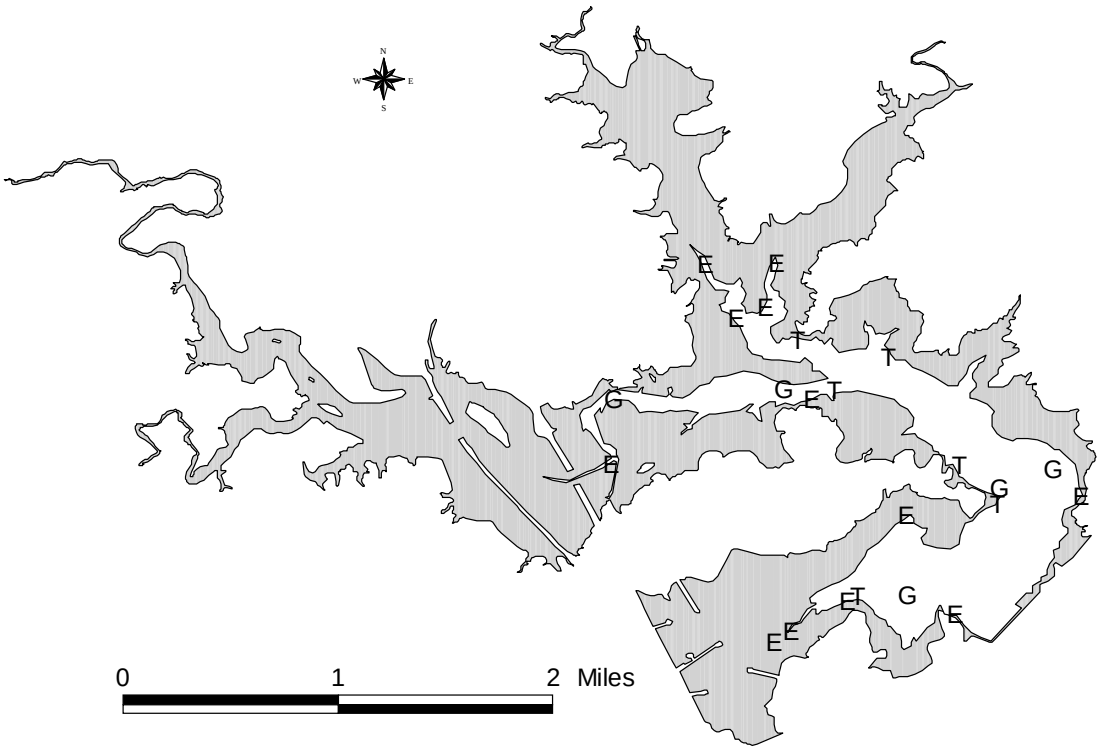
| Survey Year | Electrofisher | Trap Net | Gill Net | Creel Survey | Report |
|---|---|---|---|---|---|
| Fall 2007-Spring 2008 | A | | | | |
| Fall 2008-Spring 2009 | S | S | | | |
| Fall 2009-Spring 2010 | | | | | |
| Fall 2010-Spring 2011 | S | S | S | | S |

## APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all standard gear types from Oak Creek Reservoir, Texas, 2006-2007.

| Species | Gill Netting | | Trap Netting | | Electrofishing | |
|---|---|---|---|---|---|---|
| | N | CPUE | N | CPUE | N | CPUE |
| Gizzard shad | 157 | 31.4 | | | 264 | 264.0 |
| Common carp | 55 | 11.0 | | | | |
| River carpsucker | 32 | 6.4 | | | | |
| Blue catfish | 47 | 9.4 | | | | |
| Channel catfish | 29 | 5.8 | | | | |
| Flathead catfish | 1 | 0.2 | | | | |
| White bass | 5 | 1.2 | | | 1 | 1.0 |
| Redbreast sunfish | | | | | 6 | 6.0 |
| Green sunfish | | | | | 13 | 13.0 |
| Warmouth | | | | | 4 | 4.0 |
| Bluegill | 33 | 6.6 | | | 132 | 132.0 |
| Longear sunfish | | | | | 21 | 21.0 |
| Redear sunfish | | | | | 4 | 4.0 |
| Largemouth bass | 20 | 4.0 | | | 125 | 125.0 |
| White crappie | 16 | 3.2 | 93 | 15.5 | 4 | 4.0 |

**APPENDIX B**




Location of sampling sites, Oak Creek Reservoir, Texas, 2006-2007. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Gray shaded areas represent reservoir surface area at conservation pool elevation (2000 ft msl). The white area represents reservoir pool surface area at approximately 1975 ft msl. Water level was approximately 1976 ft msl at time of sampling.