PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-1

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2010 Survey Report

# Sam Rayburn Reservoir

*Prepared by:*

Todd Driscoll, District Management Supervisor
and
Dan Ashe, Assistant District Management Supervisor

Inland Fisheries Division
District 3D, Jasper, Texas



Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

July 31, 2011

TABLE OF CONTENTS

SURVEY AND MANAGEMENT SUMMARY

Fish populations in Sam Rayburn Reservoir were surveyed in 2010 using electrofishing and in 2011 using gill netting. Anglers were surveyed from June 2010 through May 2011 with a creel survey. This report summarizes the results of the surveys and contains a management plan for the reservoir.

- **Reservoir description:** Sam Rayburn Reservoir is an 111,422-acre impoundment of the Angelina River in Angelina, Jasper, Nacogdoches, Sabine, San Augustine, and Tyler counties in southeast Texas. Water level fluctuations average 6 to 7 feet annually. Aquatic habitat consisted of aquatic vegetation (primarily hydrilla and American lotus) and standing timber.

- **Management history:** The black bass fishery is the most popular at Sam Rayburn Reservoir (69 - 80% of annual angling effort, which includes over 400 bass tournaments per year). Approximately 10 - 15% of anglers target crappie and 5 - 10% target catfish. Angler interest in more restrictive length limits for largemouth bass and potential biological and economic impacts of bass tournaments prompted research in 2004 to 2009. Results indicated that the proportion of the largemouth bass population harvested was relatively low (9%) and more restrictive length limits would provide little benefit. In addition, impacts of tournaments on the largemouth bass population were low (only 5% of population retained by tournament anglers) but tournament expenditures were high (73% of total). Florida largemouth bass (FLMB) have been stocked annually since 1994 to increase abundance of large bass (>8 pounds). In 2008, giant salvinia was found in the reservoir. Numerous introductions via boat trailers have occurred. Giant salvinia persists in several locations (<5 total acres) and additional spread is likely.

- **Fish community**
  - **Prey species:** Gizzard shad, threadfin shad, and bluegill were the most abundant prey species and provided ample forage for sport fish**.**

  - **Catfishes:** The relative abundance of blue and channel catfish was stable compared to previous years. Angler catch rates averaged 2.8/hour. Blue and flathead catfish provided trophy opportunities for anglers.

  - **Temperate basses:** Historically, white bass abundance was low, but gill net catch increased in 2010. Palmetto bass stockings were discontinued after 2000 and few fish remain. During the last three survey years, no anglers targeted temperate bass.

  - **Black basses:** Spotted bass were present in low numbers. Largemouth bass abundance decreased over the last three survey years, but was still relatively high ($\geq$ 200 fish/hour). Size structure and fish condition were favorable. The black bass fishery was most popular (76% of anglers targeted bass). The angling catch rate was high (1.2/hour).

  - **Crappie:** White and black crappie were present in the reservoir. Angler catch (2.6/hour) and total annual harvest (89,586 fish) reflected an abundant crappie population.

- **Management strategies:** Stock FLMB annually to maintain and improve large fish abundance. Monitor largemouth bass population with annual electrofishing and biennial creel surveys. Continue tournament monitoring program to more effectively monitor abundance of larger fish. Maintain information signs, conduct annual aerial vegetation surveys, and apply herbicides when appropriate to minimize impacts of giant salvinia. Monitor the crappie fishery via biennial creel surveys. Publish results of economic impact research. Monitor the catfish populations with biennial creel and gill net surveys. Publish monthly articles in the Lakecaster highlighting TPWD activities. Monitor angler access every four years.

# INTRODUCTION

This document is a summary of fisheries data collected from Sam Rayburn Reservoir from June 2010 through May 2011. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2010-2011 data for comparison.

## *Reservoir Description*

Sam Rayburn Reservoir is an impoundment of the Angelina River in Angelina, Jasper, Nacogdoches, Sabine, San Augustine, and Tyler counties in southeast Texas. The U.S. Army Corps of Engineers (USACE) constructed the reservoir in 1966 for flood control, generation of hydroelectric power, and for municipal, industrial, agricultural, and recreational uses. At conservation pool, Sam Rayburn Reservoir is 111,422 surface acres, has a shoreline length of 750 miles, and a mean depth of 20 feet. Water level fluctuations average 6 to 7 feet annually (Figure 1). The reservoir was eutrophic with a mean Trophic State Index chl-*a* of 47.7 (Texas Commission of Environmental Quality 2008). Angler and boat access was excellent with 24 boat ramps present. Habitat at time of sampling consisted of aquatic vegetation (primarily hydrilla and American lotus) and standing timber. Most of the land around the reservoir is used for timber production and agriculture. Other descriptive characteristics for Sam Rayburn Reservoir are in Table 1.

## *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Driscoll and Ashe 2009) included:

1. Stock FLMB annually ($\geq$ 500,000 fingerlings) to maintain and improve the trophy largemouth bass population.
   **Action:** FLMB were stocked in 2010 and 2011.
2. Conduct annual electrofishing and creel surveys to monitor status of largemouth bass population and examine growth every four years.
   **Action:** Electrofishing surveys were conducted in 2009 and 2010. Creel frequency was reduced to biennial surveys and an annual survey was conducted in 2010/2011. Growth was examined in 2010.
3. Continue black bass tournament-monitoring program to increase information on relative abundance of large fish (> 20 inches).
   **Action:** Since 2009, data from 65 tournaments were entered and summarized in Appendix C.
5. Conduct annual vegetation surveys to monitor hydrilla abundance and locate giant salvinia coverage suitable for herbicide treatments.
   **Action:** Annual surveys were conducted in 2009 and 2010.
6. Conduct gillnetting surveys every two years to monitor the status of catfish populations and examine growth every four years to ensure the 12-inch minimum length limit is appropriate.
   **Action:** Surveys were conducted in 2009 and 2011. Growth was examined in 2011.
7. Complete final report related to November 2007 – October 2008 economic research and publish results in a peer-reviewed journal.
   **Action:** The final report was completed in March 2010 (Driscoll et al. 2010). A draft manuscript has been forwarded to coauthors for review.
8. Promote fish handling procedures that minimize tournament-related mortality, impacts on largemouth bass population, and conflicts with non-tournament anglers.
   **Action:** Discussions with numerous tournament organizers and presentations for several bass clubs promoted optimum fish care in livewells and at weigh-ins. Advice was provided

to Texas Black Bass Unlimited and the Cassels-Boykin Park Board regarding construction of permanent fish holding/hospital tanks and a fish release tube.

9. Minimize giant salvinia introductions and overall plant coverage.
   **Action:** The Aquatic Habitat Enhancement office has led giant salvinia monitoring and control efforts. Educational signs at access sites were maintained. In 2009 and 2010, annual aerial surveys and monthly access point surveys were conducted. Plant control methods employed include containment booms, manual removal, herbicide treatments, and salvinia weevil releases.
10. Publish monthly popular articles in the Lakecaster, a newsletter distributed to 30 counties in Texas and Louisiana.
    **Action:** Articles highlighting TPWD activities at Sam Rayburn Reservoir have been published monthly since 2000.

**Harvest regulation history:** Historically, all sport fishes in Sam Rayburn Reservoir have been managed with statewide regulations (Table 2).

**Stocking history:** Since 1994, Sam Rayburn Reservoir has received annual stockings of FLMB (Table 3). From 2000 to 2008, FLMB were stocked in 5,000-acre embayments (Caney Creek or Ayish Bayou) at a rate of 100 fingerlings/acre to maximize stocking influence. The Caney Creek embayment was stocked from 2000 to 2002. Embayment sampling during the fall of 2002 indicated that the FLMB genotype was 33%, which exceeded the embayment goal of 20%. The Ayish Bayou embayment was selected for stocking in 2003 to 2008. FLMB genotypes were 23% in 2007. Embayment stockings were discontinued in 2009. From 1991 to 2000, palmetto bass were stocked annually but were discontinued after 2000 due to low directed angler effort and harvest. The complete stocking history is in Table 3.

**Vegetation/habitat history:** Historically, aquatic vegetation coverage at Sam Rayburn Reservoir (primarily hydrilla) has approached 20,000 surface acres and included over 25 plant species. Since 2000, hydrilla coverage has ranged from 3,584 (2010) to 14,695 surface acres (2000). Low water level during 2010 was likely the primary cause of hydrilla decline. Although hydrilla is an exotic, invasive species and is listed on the TPWD list of prohibitive plants, hydrilla has historically been considered beneficial habitat at Sam Rayburn Reservoir, as coverage has never been problematic or created access problems. Nuisance exotic species include common salvinia, giant salvinia, and water hyacinth. Common salvinia and water hyacinth have persisted in shallow backwaters of creeks and embayments and caused few problems. Giant salvinia was first documented in 2008. Numerous introductions via boat trailers have been manually removed, but giant salvinia persists in numerous backwater locations (<5 total acres) and additional spread is likely.

**Water transfer:** Nearly 1,000,000 acre-feet of water rights are annually appropriated from Sam Rayburn Reservoir. The Lower Neches Valley Authority (LNVA) is the local sponsor of the reservoir and shared initial construction costs as well as annual reservoir operation expenses with the USACE. The LNVA has rights to 820,000 acre-feet annually to provide water via releases through the reservoir powerhouse. Municipal, agricultural, and industrial water is pumped from the lower Neches River and Pine Island Bayou and delivered to Jefferson, Chambers, and Liberty counties via a 400-mile canal system. The LNVA also contracts with Westvaco Corporation to provide their appropriated 50,000 acre-feet of water annually. The City of Lufkin has 56,000 acre-feet of water rights from Sam Rayburn Reservoir for future municipal and industrial use, but no infrastructure exists to pump water. The USACE has a contractual agreement with Southwest Power Corporation to produce hydropower throughout the year, independent of water rights.

## METHODS

Fishes were collected by electrofishing (2 hours at 24, 5-min stations during October) and gill netting (15 net nights at 15 stations during February). 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 nets as the number of fish per net night (fish/nn). All survey sites were randomly selected and surveys 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 weights ($W_r$)] 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 and for creel statistics and SE was calculated for structural indices and IOV. Average ages of 14-inch (13.5 – 14.5 inches) largemouth bass and 12-inch (11.5 - 12.5 inches) channel catfish were determined from otoliths. A sample of 30 age-0 largemouth bass were collected by electrofishing in fall 2010 and subjected to genetic analysis using DNA microsatellite analysis in accordance with Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). Water level data were obtained from the USACE website.

A roving creel survey (36 days; 9 days per quarter) was conducted from June 2010 through May 2011 to assess angler use and catch in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). Total angler catch of largemouth bass $\geq$ 4, 7, and 10 pounds was also estimated. Anglers were asked if released fish were within weight categories. Harvested fish lengths were converted to weights for classification (19 inches = 4 pounds; 23 inches = 7 pounds; 25 inches = 10 pounds).

An aquatic vegetation survey was conducted in 2010 via an aerial flight. Coverages were calculated for all prevalent species. An angle access survey was also conducted in 2010.

Results of largemouth bass tournaments used to supplement population information collected from electrofishing and creel surveys are included in Appendix C.

## RESULTS AND DISCUSSION

**Habitat:** A habitat survey conducted in 2002 indicated the littoral zone included primarily indescript bank, overhanging brush, and dead timber (Driscoll and Parks 2003). Approximately 24,000 acres of standing timber were present. Abundant areas of torpedograss, buttonbush, and *Salix* spp. are inundated when water level is above 164 feet MSL. Prevalent beneficial aquatic vegetation includes hydrilla, American lotus, and pondweed (Table 4). Low lake level caused all three species to decline in coverage in 2010. Giant salvinia was first documented in 2008. Floating booms were erected in an effort to contain and eradicate it. Since giant salvinia was first discovered it has continued to be introduced into the reservoir via boat trailers, persists in several locations, and is likely to spread to other areas of the reservoir.

**Creel:** Similar to previous survey years, fishing effort at Sam Rayburn Reservoir was primarily directed at black basses (76.4%) and crappies (11.6%) (Table 5). Total fishing effort for all species was 350,874 hours; lower than in previous years (Table 6). Total directed expenditures ($4,295,993) also declined. However, these expenditures estimated from creel surveys from the last three survey years were much lower than total annual expenditures derived from economic research in 2008 ($32,259,314).

**Prey species:** Primary prey species included gizzard shad, threadfin shad, and bluegill. Gizzard shad catch rates and IOV increased in 2010 (Figure 2). Historically, threadfin shad catch rates have been highly variable and likely not reflective of population status. The catch rate in 2010 was 2,740.5/h (Appendix A). During the last three survey years, bluegill catch rates ranged from 295.5/h (2010) to 391.5/h (2009). Prey species abundance was adequate, as relative weights of sport fish were within desired ranges. No anglers targeted sunfish in 2010/2011 (Table 7).

**Catfish:** Since 2005, blue catfish recruitment has been relatively stable. Catch rates ranged from 4.3 to 6.0/nn (Figure 5). Although few blue catfish >25 inches were collected, anecdotal information indicates

passive gear anglers frequently catch fish >30 pounds. Channel catfish recruitment also appeared stable, and catch rates ranged from 5.1 (2009) to 6.5/nn (2011) (Figure 6). Average age of 12-inch channel catfish (11.5 - 12.5 inches) was 3.9 years (N = 12; range = 3 – 4 years).

Directed rod and reel angler effort and catch rates of catfishes were similar from 2007 to 2011 (Table 8). Catfish anglers accounted for 7 to 12% of the total fishing effort during the three survey years. Total estimated harvest was 54,251 fish in 2010/2011; 98% of harvested fish were channel catfish (Figure 8).

**White and palmetto bass:** Since 2004, white bass catch rates from gill net surveys were $\leq$1.5/nn, indicating a low population density in the reservoir. In 2011, catch rates increased to 6.3/nn, reflecting an increase in recruitment (Figure 9). From 1995 through 2000, palmetto bass fingerlings were stocked annually at low rates (~ 5/acre), but no fish have been stocked since 2000. As expected, catch rates were low in 2005, 2007, and 2009 ($\leq$1.2/nn). No fish were collected in 2011. During the last three survey years, no fishing effort was directed towards temperate basses (Table 9).

**Black bass:** Historically, electrofishing catch rates of spotted bass have been low. Catch rates were <8.0/h from 2008 to 2010 (Figure 13). Few spotted bass >10 inches were collected. Estimated angler harvest was 2,890 fish in 2010/2011 (Figure 15).

Fall electrofishing catch rates of largemouth bass from 2008 to 2010 reflected relatively high recruitment rates (range = 200.0 - 293.0/h; Figure 14). Population size structure was similar across years (PSD range = 49 - 60; PSD-14 range = 23 – 28). Relative weights ranged from 83 to 108, indicating largemouth bass were in good condition. Growth of largemouth bass was adequate; average age at 14 inches (13.5 - 14.5 inches) was 2.7 years (N = 21; range = 2 – 4 years).

The black bass fishery accounted for the majority of annual fishing effort (76.4%; Table 5). During the last three survey years, total angler directed effort and harvest decreased. Angler catch rates remained high and stable (range = 1.05 to 1.20 fish/h) (Table 10). The majority of harvested fish were 14 to 16 inches in length (Figure 16) and 70% of all harvested fish were retained during tournaments. The total annual catch of largemouth bass $\geq$ four pounds declined in conjunction with the reduction in directed fishing effort during the last three survey years. However, the annual relative contribution of each category was similar. Fish from 4 to 6.9 pounds comprised 2.9 to 3.3% of catch, and 7 to 9.9 pound fish comprised 0.3% of the catch each year.

Although the reservoir has been stocked with FLMB annually since 1994 (Table 3), reservoir-wide FLMB influence has remained low and relatively stable. Since 2006, FLMB alleles ranged from 43 to 51% and genotype ranged from 0 to 3% (Table 11).

A tournament-monitoring program was implemented in June 2003 to increase information on fish $\geq$ 14 inches and provide greater insight regarding large (> 20 inches) fish abundance (Appendix C). Overall, most tournament variables were favorable and similar across years. The percent of anglers catching 5-fish limits was over 48% for the majority of years, indicating high and stable numbers of fish $\geq$ 14 inches. Average big bass weight was >8 pounds for all but one year, and average weight to win events ranged from 18.9 to 25.1 pounds, reflecting relatively high and stable numbers of large fish. Similarly, results of Sealy Outdoors McDonald's Big Bass Splash tournaments also suggested high and stable numbers of large bass.

**Crappie:** Creel data indicated that 11.6% of the total fishing effort was directed at crappie (Table 5). Directed effort declined during the last three survey years (Table 12). However, total harvest remained similar and angler catch rates increased to 2.6 fish/h, reflecting an abundant crappie population.

**Fisheries management plan for Sam Rayburn Reservoir, Texas**

Prepared – July 2011

**ISSUE 1:** Creel surveys indicate most sportfishing effort at Sam Rayburn Reservoir is for largemouth bass. The economic contribution of the largemouth bass fishery to the local area is high, as the total economic value of the recreational fishery was estimated at $47.1 million. The reservoir also hosts over 400 bass tournaments per year with an economic value of $31.0 million (Driscoll et al. 2010). The reservoir has also demonstrated the potential for producing trophy fish.

MANAGEMENT STRATEGIES

1. Continue annual stocking of FLMB (500,000 fingerlings/year) to maintain and improve the trophy largemouth bass population.
2. Continue the tournament monitoring program to increase information on fish $\geq$ 14 inches.
3. Conduct annual electrofishing and biennial creel surveys to monitor status of largemouth bass population.
4. Examine largemouth bass growth every four years.
5. Continue to promote fish handling procedures that minimize tournament-related mortality to minimize impacts on largemouth bass population and reduce conflicts with non-tournament anglers.

**ISSUE 2:** In 2008, giant salvinia was found in Sam Rayburn Reservoir. Although numerous introductions via boat trailers have been confined and removed, plants persist in several areas (< 5 acres total coverage).

MANAGEMENT STRATEGIES

1. Maintain all educational signs posted at Sam Rayburn Reservoir to minimize effects and potential transport to other waters.
2. Utilize all available control methods (i.e., containment booms, manual removal, herbicides, and salvinia weevils) when applicable to minimize coverage and related effects.
3. Conduct an annual reservoir-wide aerial survey and monthly supplemental surveys adjacent to access points by boat to monitor for giant salvinia coverage.

**ISSUE 3:** Historically, the crappie fishery at Sam Rayburn Reservoir was productive and popular. Directed effort and harvest has exceeded 3.0 h/acre and 400,000 fish, respectively. Since 2007, directed effort was < 0.7 h/acre and total harvest was < 100,000 fish.

MANAGEMENT STRATEGIES

1. Conduct biennial creel surveys to monitor the crappie fishery, as trap netting at Sam Rayburn Reservoir is not effective.
2. If funds are available, place brushpiles near access points to increase angler catch rates. Provide locations via maps and coordinates and publish on the TPWD web site and in local media.

**ISSUE 4:** A considerable catfish fishery also exists. Although the rod and reel catfish fishery is negligible, the majority of the actual directed catfish effort is likely due to passive gear anglers.

MANAGEMENT STRATEGY

1. Conduct gillnetting surveys every two years to monitor catfish populations and examine growth every four years.

**ISSUE 6:** Area constituents are interested in TPWD activities and management actions related to Sam Rayburn Reservoir and need to be informed.

MANAGEMENT STRATEGY

1. Continue to publish monthly popular articles on TPWD activities in the Lakecaster, a newsletter distributed to approximately 30 counties in Texas and Louisiana.

**ISSUE 7:** Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. The financial costs of controlling and/or eradicating invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters and literature so they can educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Discuss invasive species when presenting to constituent and user groups.
5. Document existing and future inter-basin water transfers to facilitate potential invasive species responses.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes annual electrofishing and biennial creel surveys to monitor the largemouth bass fishery (Table 13). Biennial creels are also needed to monitor the crappie fishery due to ineffectiveness of trap nets. Gill net surveys will be conducted every two years to adequately monitor catfish populations. Growth of largemouth bass and catfish will be examined every four years. Angler access surveys will be conducted every four years.

LITERATURE CITED

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

Driscoll, M. T, and J. O. Parks. 2003. Statewide freshwater fisheries monitoring and management program survey report for Sam Rayburn Reservoir, 2004. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Driscoll, M. T and D. E. Ashe. 2009. Statewide freshwater fisheries monitoring and management program survey report for Sam Rayburn Reservoir, 2008. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

Driscoll, T., J. Leitz, and R. Myers. 2010. Annual economic value of tournament and non-tournament angling at Sam Rayburn Reservoir. Texas Parks and Wildlife Department, Management Data Series No. 256, Austin.

Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional Size Distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7):348.

Texas Commission on Environmental Quality. 2008. Trophic Classification of Texas Reservoirs: 2008 Water Quality Inventory and 303(d) List. 15pp.

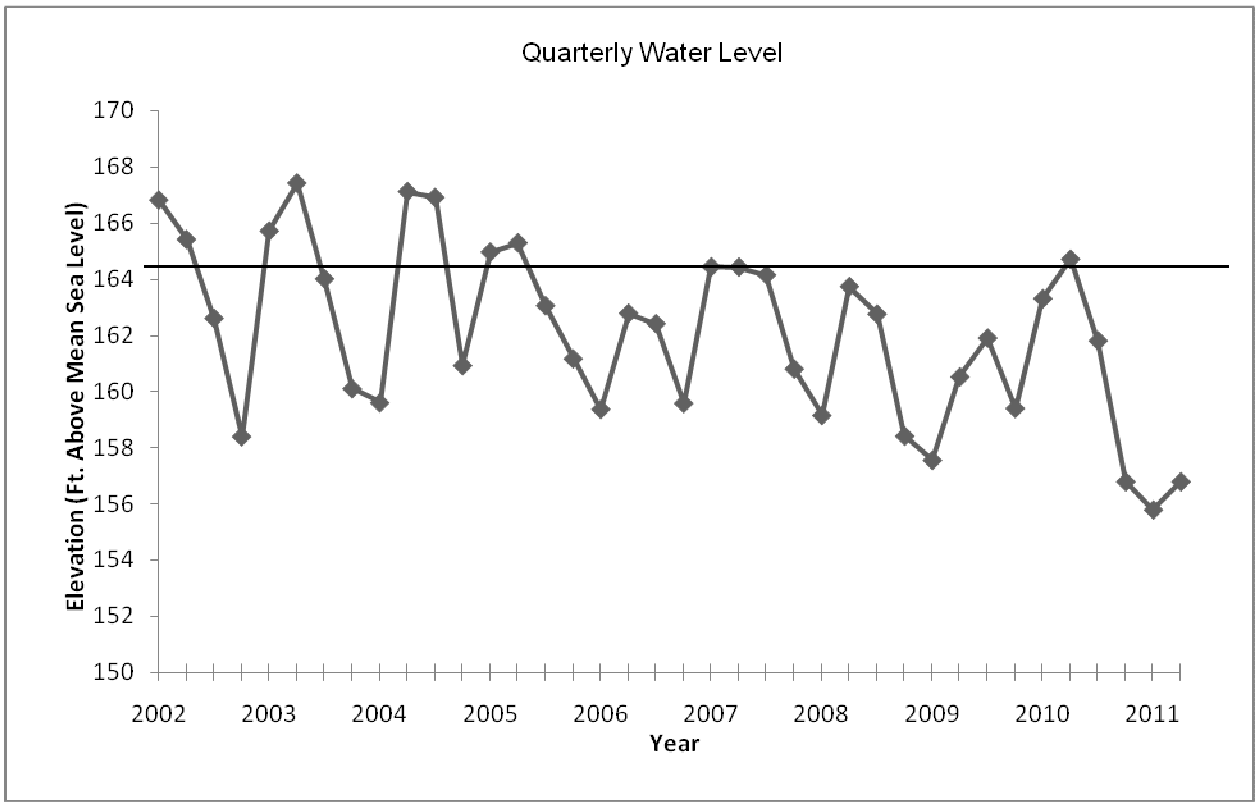



Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Sam Rayburn Reservoir, Texas.

Table 1. Characteristics of Sam Rayburn Reservoir, Texas.

| Characteristic | Description |
|---|---|
| Year constructed | 1966 |
| Controlling authority | U.S. Army Corps of Engineers |
| Counties | Angelina, Jasper, Nacogdoches, Sabine, San Augustine, and Tyler |
| Reservoir type | Mainstream |
| Shoreline Development Index (SDI) | 16.25 |
| Conductivity | 120 umhos/cm |

Table 2. Harvest regulations for Sam Rayburn Reservoir.

| 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[a] | 14 - No Limit |
| Bass, spotted | 5[a] | No Limit - No Limit |
| Crappie: white and black crappie, their hybrids and subspecies | 25 (in any combination) | 10 - No Limit |

[a]Bag limit for largemouth and spotted bass is 5 in the aggregate.

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

| Species | Year | Number | Life Stage | Mean TL (in) |
|---|---|---|---|---|
| Blue catfish | 1966 | 105,100 | UNK | UNK |
| | 1987 | 199,870 | FGL | 2.0 |
| | Total | 304,970 | | |
| Channel catfish | 1966 | 74,600 | AFGL | 5.9 |
| | 1966 | 6,100 | FGL | 2.0 |
| | 1973 | 110,000 | AFGL | 7.9 |
| | Total | 190,700 | | |
| Florida largemouth bass | 1975 | 25,000 | FRY | 1.0 |
| | 1976 | 60,000 | FRY | 1.0 |
| | 1977 | 60,000 | FRY | 1.0 |
| | 1978 | 165,000 | FGL | 2.0 |
| | 1978 | 47,000 | FRY | 1.0 |
| | 1980 | 361,840 | FGL | 2.0 |
| | 1983 | 1,200 | AFGL | 5.0 |
| | 1983 | 37,700 | FGL | 2.0 |
| | 1987 | 249,660 | FRY | 1.0 |
| | 1990 | 1,000 | AFGL | 6.0 |
| | 1994 | 159,360 | FGL | 1.2 |
| | 1994 | 782,966 | FRY | 0.7 |
| | 1995 | 232,392 | FGL | 1.1 |
| | 1996 | 948,017 | FGL | 1.1 |
| | 1996 | 276,051 | FRY | 0.9 |
| | 1997 | 317,729 | FRY | 0.5 |
| | 1998 | 229,200 | FGL | 1.3 |
| | 1999 | 1,329,160 | FGL | 1.3 |
| | 2000 | 510,735 | FGL | 1.4 |
| | 2001 | 500,783 | FGL | 1.5 |
| | 2001 | 273,407 | FRY | 0.7 |
| | 2002 | 42 | ADL | 12.0 |
| | 2002 | 1,066,781 | FGL | 1.5 |
| | 2003 | 1,033,318 | FGL | 1.5 |
| | 2003 | 291,008 | FRY | 0.6 |
| | 2004 | 523,648 | FGL | 1.6 |
| | 2005 | 1,026,943 | FGL | 1.5 |
| | 2006 | 499,858 | FGL | 1.5 |
| | 2007 | 500,033 | FGL | 1.6 |
| | 2008 | 501,382 | FGL | 1.6 |

| Species | Year | Number | Life Stage | Mean TL (in) |
|---|---|---|---|---|
| | 2009 | 1,284,341 | FGL | 1.6 |
| | 2009 | 377,936 | FRY | 0.6 |
| | 2010 | 500,100 | FGL | 1.6 |
| | 2011 | 952,285 | FGL | 1.6 |
| | Total | 16,117,215 | | |
| Largemouth bass | 1965 | 364,000 | FGL | 2.0 |
| | 1966 | 97,000 | FGL | 2.0 |
| | 1988 | 21 | ADL | 10.4 |
| | Total | 461,021 | | |
| Longear sunfish | 1965 | 40,000 | | 2.0 |
| | Total | 40,000 | | |
| Paddlefish | 1990 | 3,581 | | 7.6 |
| | 1991 | 16,741 | | 7.6 |
| | 1992 | 43,584 | | 8.1 |
| | 1995 | 46,529 | | 3.1 |
| | Total | 110,435 | | |
| Palmetto bass (striped X white bass hybrid) | 1979 | 571,400 | FRY | 0.4 |
| | 1981 | 447,528 | FRY | 0.4 |
| | 1982 | 1,000,000 | FRY | 0.4 |
| | 1985 | 1,000,000 | FRY | 0.4 |
| | 1987 | 1,500,000 | FRY | 0.4 |
| | 1988 | 1,100,000 | FRY | 0.4 |
| | 1989 | 279,748 | FGL | 1.5 |
| | 1989 | 1,130,036 | FRY | 0.4 |
| | 1991 | 1,111,683 | FRY | 0.4 |
| | 1992 | 1,347,961 | FRY | 0.4 |
| | 1993 | 1,140,000 | FRY | 0.4 |
| | 1994 | 1,175,000 | FRY | 0.4 |
| | 1995 | 943,903 | FGL | 1.5 |
| | 1995 | 1,469,882 | FRY | 0.4 |
| | 1996 | 116,000 | FGL | 1.7 |
| | 1997 | 186,577 | FGL | 1.3 |
| | 1998 | 406,229 | FGL | 1.2 |
| | 1998 | 168,428 | FRY | 0.9 |
| | 1999 | 289,974 | FGL | 1.2 |
| | 2000 | 290,990 | FGL | 1.4 |
| | Total | 15,675,339 | | |
| Redear sunfish | 1966 | 1,400 | | UNK |
| | 1967 | 530,000 | | 2.0 |

| Species | Year | Number | Life Stage | Mean TL (in) |
|---|---|---|---|---|
| | Total | 531,400 | | |
| ShareLunker largemouth bass | 2008 | 2,604 | FGL | 1.5 |
| | Total | 2,604 | | |
| Striped bass | 1976 | 115,108 | UNK | UNK |
| | 1977 | 843,161 | UNK | UNK |
| | 1978 | 182,800 | UNK | UNK |
| | 1979 | 215,490 | UNK | UNK |
| | 1983 | 1,000,000 | UNK | UNK |
| | Total | 2,356,559 | | |
| Walleye | 1973 | 426,000 | FRY | 0.2 |
| | 1974 | 349,400 | FRY | 0.2 |
| | 1975 | 378,376 | FRY | 0.2 |
| | 1976 | 220,000 | FRY | 0.2 |
| | Total | 1,373,776 | | |
| Warmouth | 1965 | 80,000 | | 2.0 |
| | 1966 | 800 | | UNK |
| | Total | 80,800 | | |
| White crappie | 1965 | 7,000 | FGL | 2.0 |
| | Total | 7,000 | | |

Table 4. Aerial survey of prevalent aquatic vegetation species, Sam Rayburn Reservoir, Texas, September 2006 - 2010. Acreage of each species and percent of total surface area coverage (in parentheses) are presented.

| Species | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| American lotus | 3,573 (3) | 2,008 (2) | 2,609 (2) | 1,959 (2) | 1,970 (2) |
| Common salvinia | 680 (1) | 299 (<1) | 26 (<1) | 10 (<1) | trace |
| Giant salvinia | 0 (0) | 0 (0) | trace | trace | trace |
| Hydrilla | 9,112 (8) | 5,317 (5) | 10,185 (9) | 7,193 (6) | 3,584 (3) |
| Pondweed | 89 (<1) | trace | 449 (<1) | 2,394 (2) | trace |
| Water hyacinth | 132 (<1) | 693 (1) | trace | trace | 0 (0) |

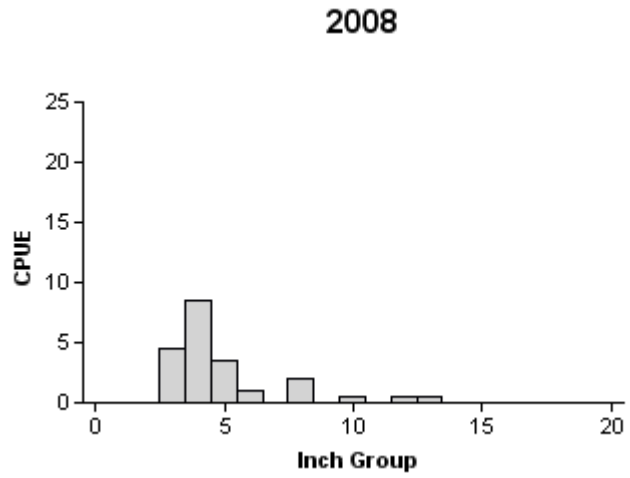
Table 5. Percent directed angler effort by species for Sam Rayburn Reservoir, Texas, 2007 – 2011.

| Species | Year | | |
|---|---|---|---|
| | 2007/2008 | 2008/2009 | 2010/2011 |
| Catfishes | 6.8 | 11.6 | 9.8 |
| Black basses | 80.2 | 68.9 | 76.4 |
| Temperate basses | | 0.6 | |
| Crappies | 11.8 | 13.7 | 11.6 |
| Anything | 1.2 | 5.1 | 2.3 |

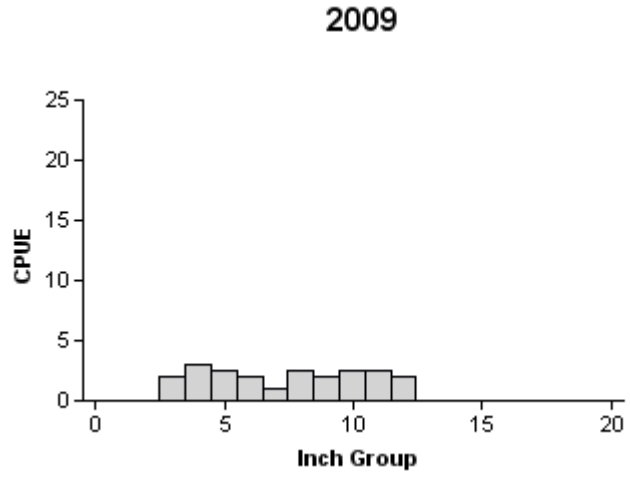
Table 6. Total fishing effort (h) for all species and total directed expenditures at Sam Rayburn Reservoir, Texas, 2007- 2011.

| Creel Statistic | Year | | |
|---|---|---|---|
| | 2007/2008 | 2008/2009 | 2010/2011 |
| Total fishing effort | 673,289 | 483,465 | 350,874 |
| Total directed expenditures | $6,958,608 | $5,066,837 | $4,295,993 |

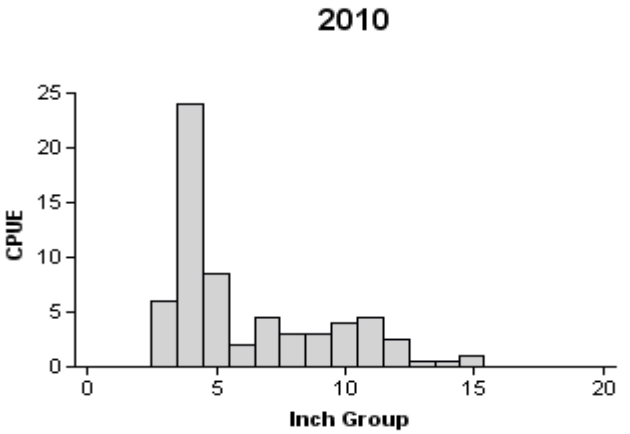
# Gizzard shad




Effort = 2.0
Total CPUE = 21.0 (57; 42)
IOV = 83 (7.6)




Effort = 2.0
Total CPUE = 22.0 (35; 44)
IOV = 48 (8.9)




Effort = 2.0
Total CPUE = 64.0 (32; 128)
IOV = 70 (6.3)

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, Sam Rayburn Reservoir, Texas, 2008, 2009, and 2010.

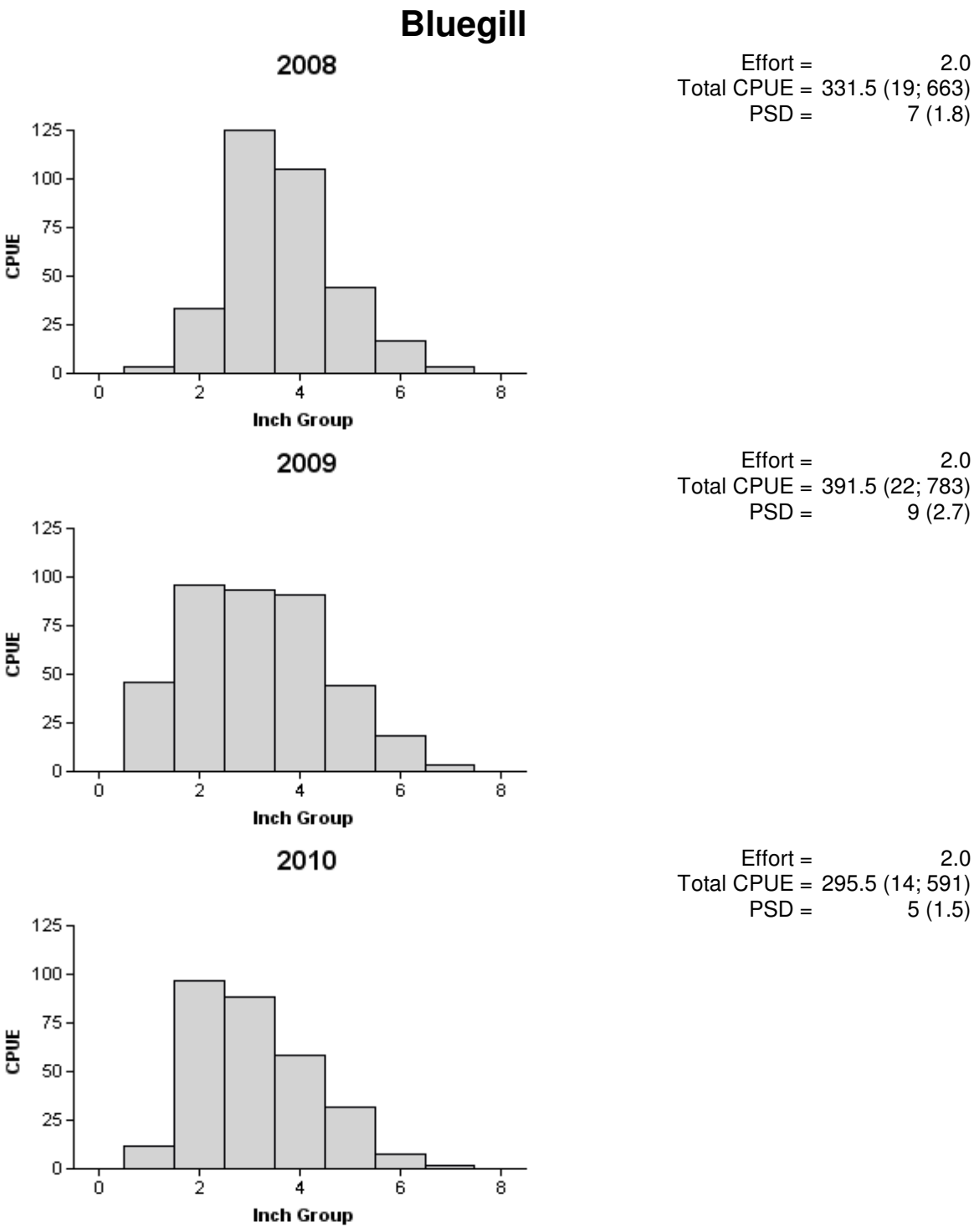



Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2008, 2009, and 2010.

# Sunfishes

Table 7. Creel survey statistics for sunfishes at Sam Rayburn Reservoir from June 2007 through May 2008, June 2008 through May 2009, and June 2010 through May 2011, where total catch per hour is for anglers targeting sunfishes and total harvest is the estimated number of sunfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel Survey Statistic | Year | | |
|---|---|---|---|
| | 2007-2008 | 2008-2009 | 2010-2011 |
| Directed effort (h) | 381.02 (119) | 2,921.88 (54) | |
| Directed effort/acre | <0.01 (119) | 0.03 (54) | |
| Total catch per hour | 15.54 (.) | 0.00 (.) | |
| Total harvest | 1,740 (345) | 1,389 (549) | 2,102 (356) |
| Harvest/acre | 0.02 (345) | 0.01 (549) | 0.02 (356) |
| Percent legal released | 72 | 48 | 3 |

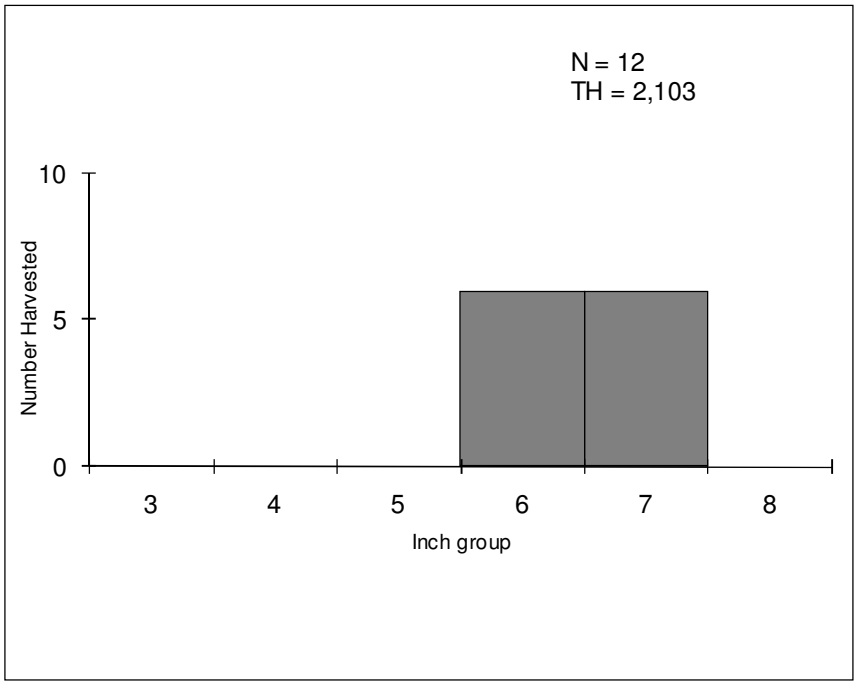



Figure 4. Length frequency of harvested bluegill observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2010 through May 2011, all anglers combined. N is the number of harvested bluegill observed during creel surveys, and TH is the total estimated harvest for the creel period.

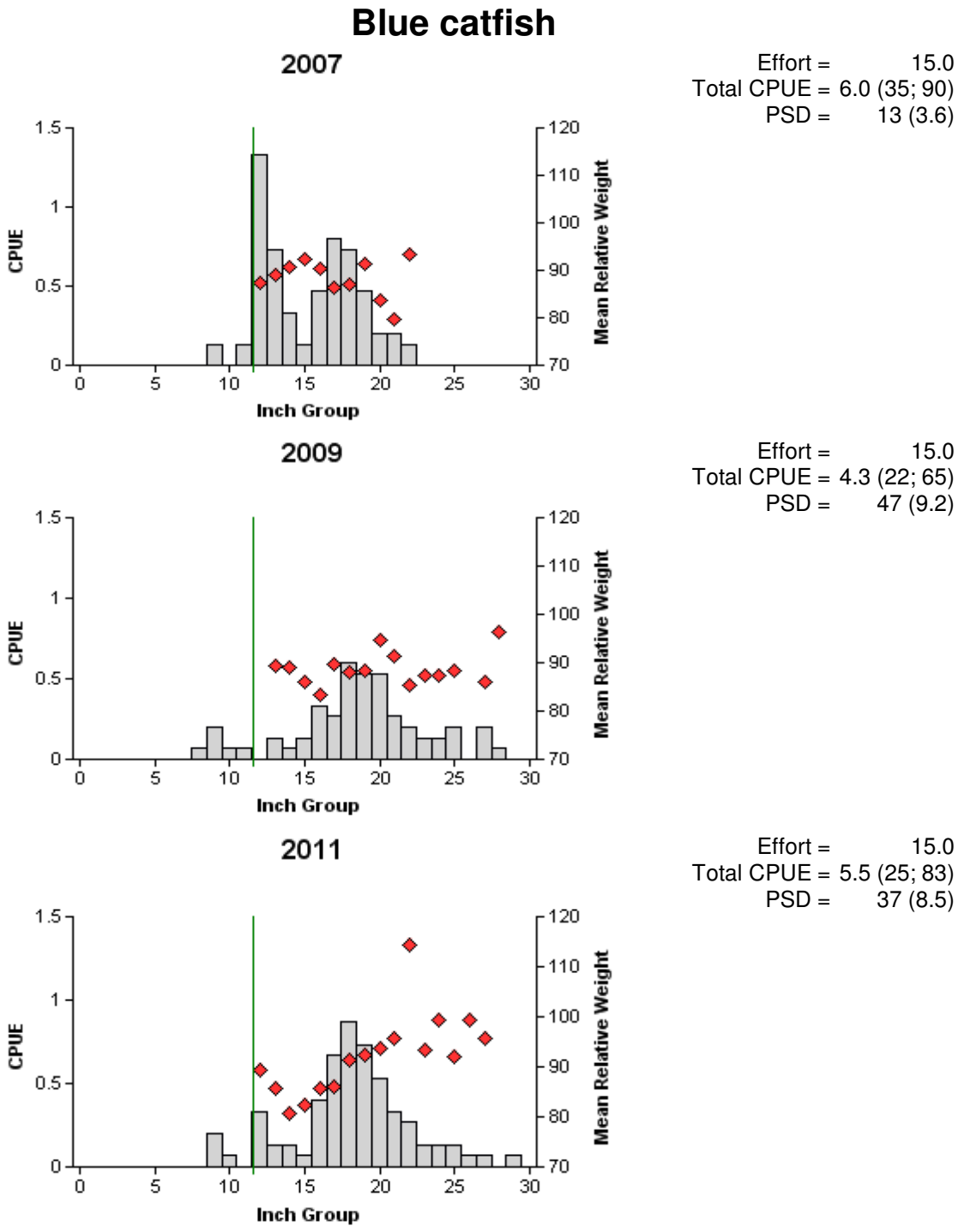



Figure 5. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2007, 2009, and 2011. Vertical lines indicate minimum length limit at time of survey.

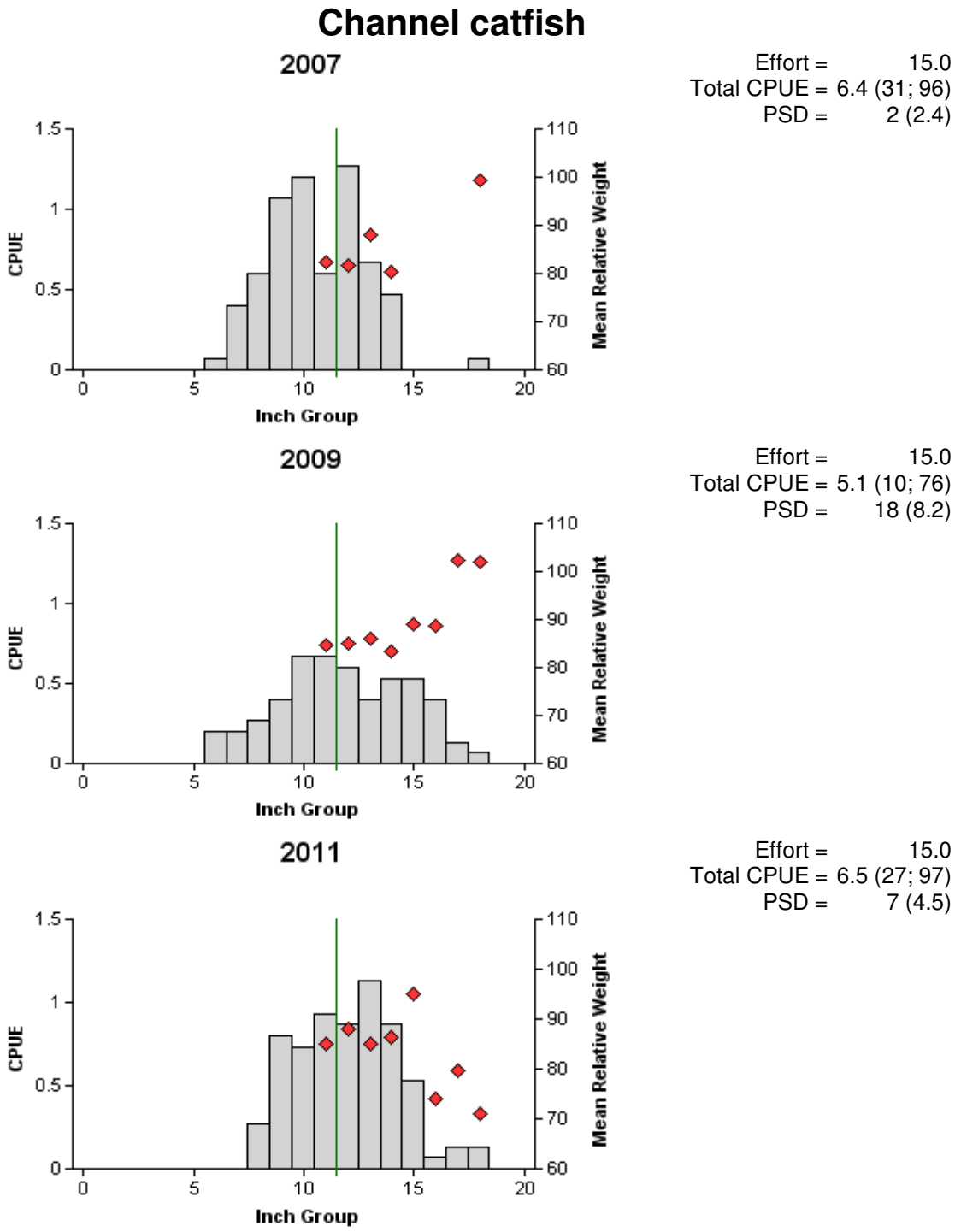



Figure 6. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2007, 2009, and 2011. Vertical lines indicate minimum length limit at time of survey.

# Catfishes

Table 8. Creel survey statistics for catfishes at Sam Rayburn Reservoir from June 2007 through May 2008, June 2008 through May 2009, and June 2010 through May 2011, where total catch per hour is for anglers targeting catfishes and total harvest is the estimated number of catfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel Survey Statistic | Year | | |
|---|---|---|---|
| | 2007-2008 | 2008-2009 | 2010-2011 |
| Directed effort (h) | 45,876.27 (20) | 56,072.80 (23) | 34,190.95 (25) |
| Directed effort/acre | 0.40 (20) | 0.49 (23) | 0.31 (25) |
| Total catch per hour | 2.27 (35) | 2.92 (35) | 2.81 (27) |
| Total harvest | 59,323 (19) | 112,484 (36) | 54,250 (38) |
| Harvest/acre | 0.52 (19) | 0.98 (36) | 0.47 (38) |
| Percent legal released | 1 | 1 | 1 |

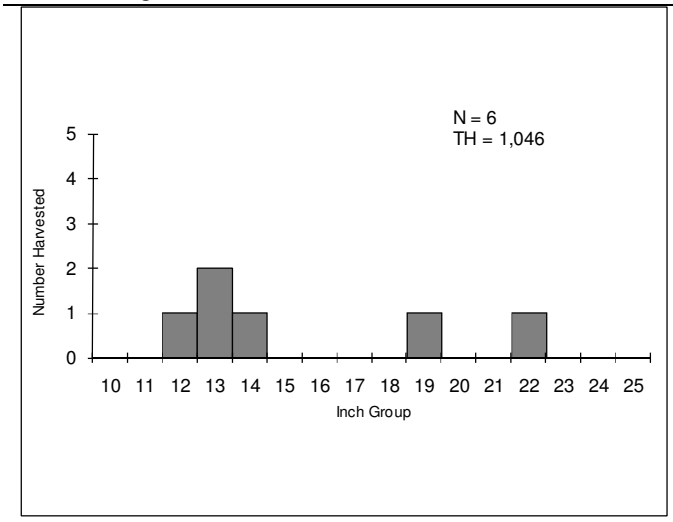



Figure 7. Length frequency of harvested blue catfish observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2010 through May 2011, all anglers combined. N is the number of harvested blue catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

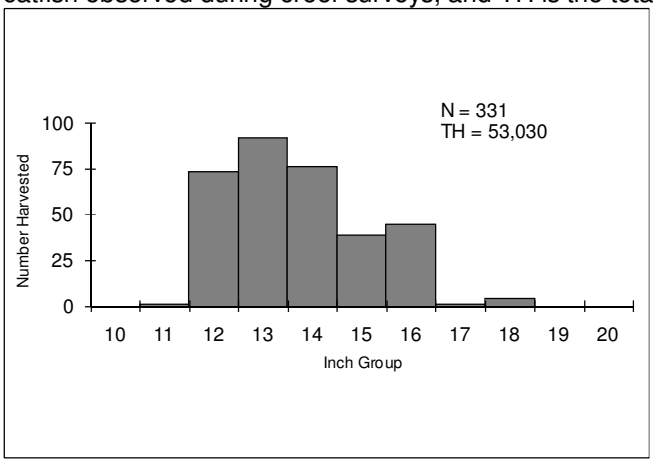



Figure 8. Length frequency of harvested channel catfish observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2010 through May 2011, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

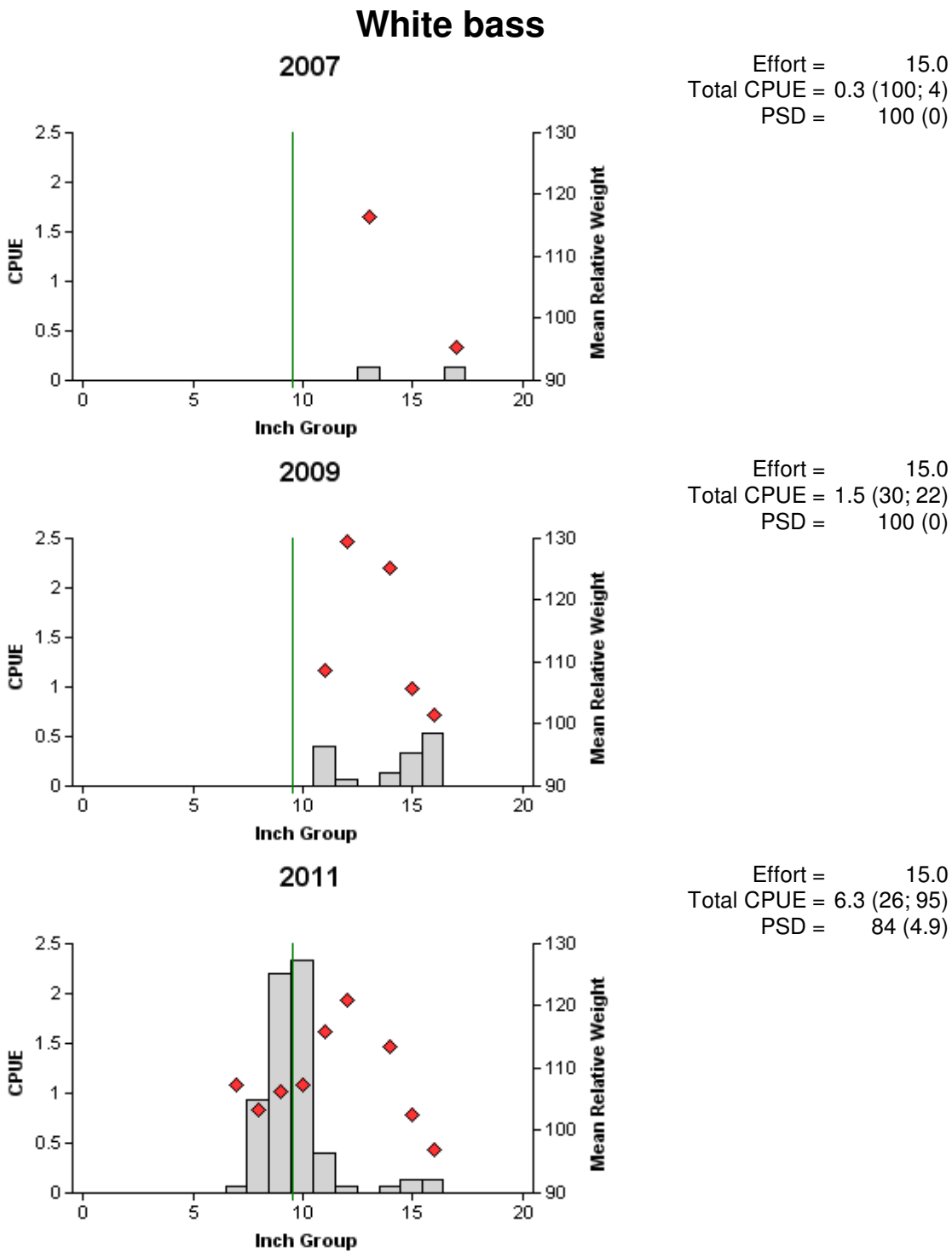



Figure 9. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2007, 2009, and 2011. Vertical lines indicate minimum length limit at time of survey.

# Temperate basses

Table 9. Creel survey statistics for temperate basses at Sam Rayburn Reservoir from June 2007 through May 2008, June 2008 through May 2009 and June 2010 through May 2011, where total catch per hour is for anglers targeting temperate basses and total harvest is the estimated number of temperate basses harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel Survey Statistic | Year | | |
|---|---|---|---|
| | 2007-2008 | 2008-2009 | 2010-2011 |
| Directed effort (h) | | | |
| Directed effort/acre | | | |
| Total catch per hour | | | |
| Total harvest | 1,168 (794) | 1,461 (550) | 483 (1029) |
| Harvest/acre | 0.01 (794) | 0.01 (550) | <0.01 (1029) |
| Percent legal released | 64 | 38 | 57 |

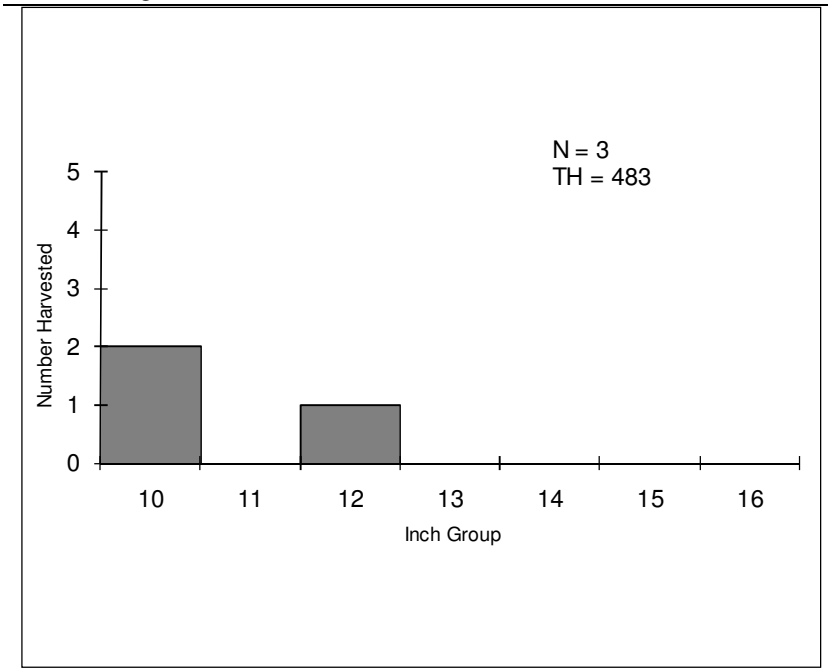



Figure 10. Length frequency of harvested white bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2010 through May 2011, all anglers combined. N is the number of harvested white bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

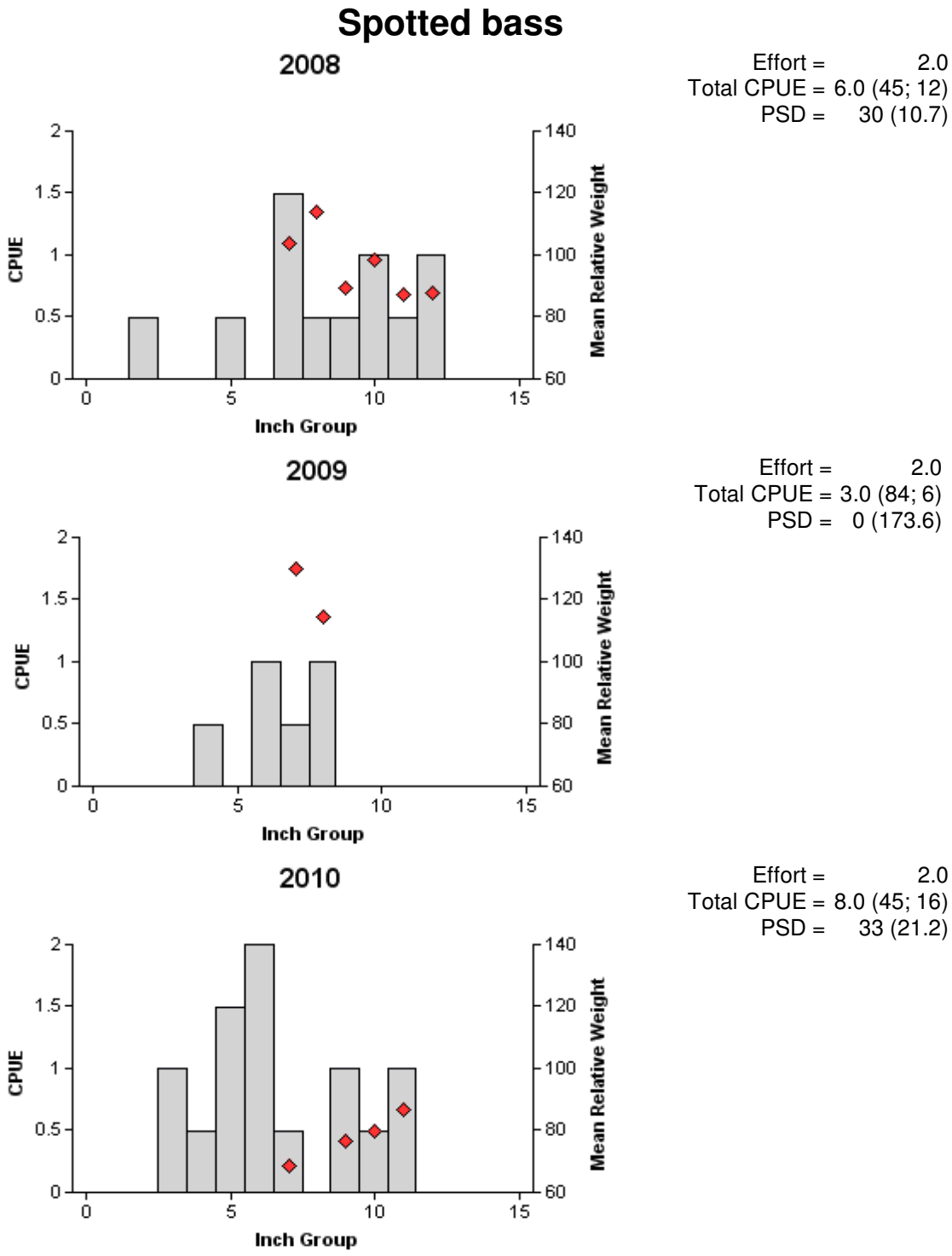



Figure 11. Number of spotted bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2008, 2009, and 2010.

# Largemouth bass

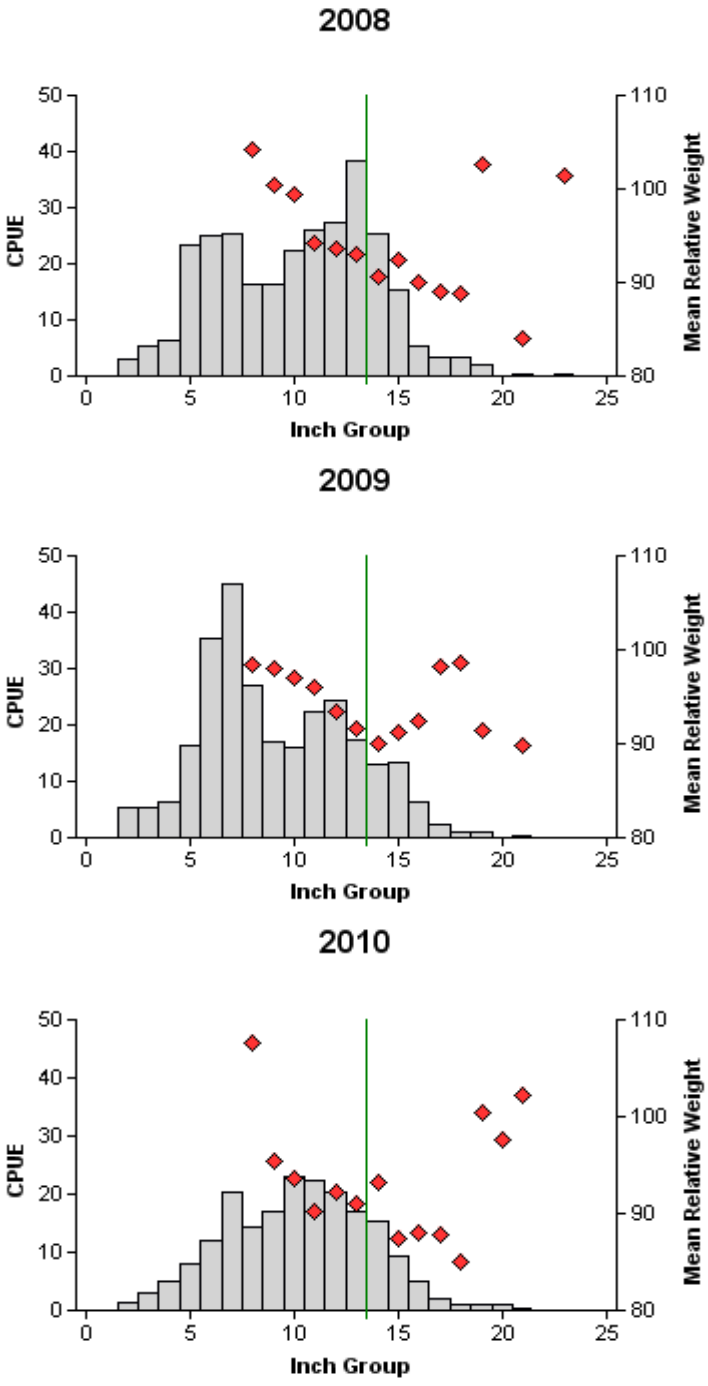



Figure 12. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2008, 2009, and 2010. Vertical lines indicate minimum length limit at time of survey.

# Black basses

Table 10. Creel survey statistics for black basses at Sam Rayburn Reservoir from June 2007 through May 2008, June 2008 through May 2009, and June 2010 through May 2011, where total catch per hour is for anglers targeting black basses and total harvest is the estimated number of black basses harvested by all anglers. Relative standard errors (RSE) are in parentheses. For estimated catch of ≥4, ≥7, and ≥10-pound fish, the percentages of total catch are provided.

| Creel Survey Statistic | Year | | |
|---|---|---|---|
| | 2007-2008 | 2008-2009 | 2010-2011 |
| Directed effort (h) | 540,122.73 (14) | 333,203.43 (15) | 267,105.83 (18) |
| Directed effort/acre | 4.72 (14) | 2.91 (15) | 2.39 (18) |
| Total catch per hour | 1.05 (8) | 1.10 (11) | 1.20 (16) |
| Total catch | 591,243 (15) | 455,789 (17) | 275,415 (48) |
| ≥ 4-6.9 pound fish | 19,459 – 3.3% | 13,144 – 2.9% | 9,267 – 3.4% |
| ≥ 7-9.9 pound fish | 2,004 – 0.3% | 1,200 – 0.3% | 872 – 0.3% |
| ≥ 10 pound fish | 0 | 0 | 131 - <0.1% |
| Total harvest | 137,411 (46) | 113,944 (33) | 53,306 (30) |
| Percent harvest tournament-retained | 65 | 67 | 70 |
| Harvest/acre | 1.20 (46) | 1.00 (33) | 0.48 (30) |
| Percent legal released | 43 | 38 | 48 |

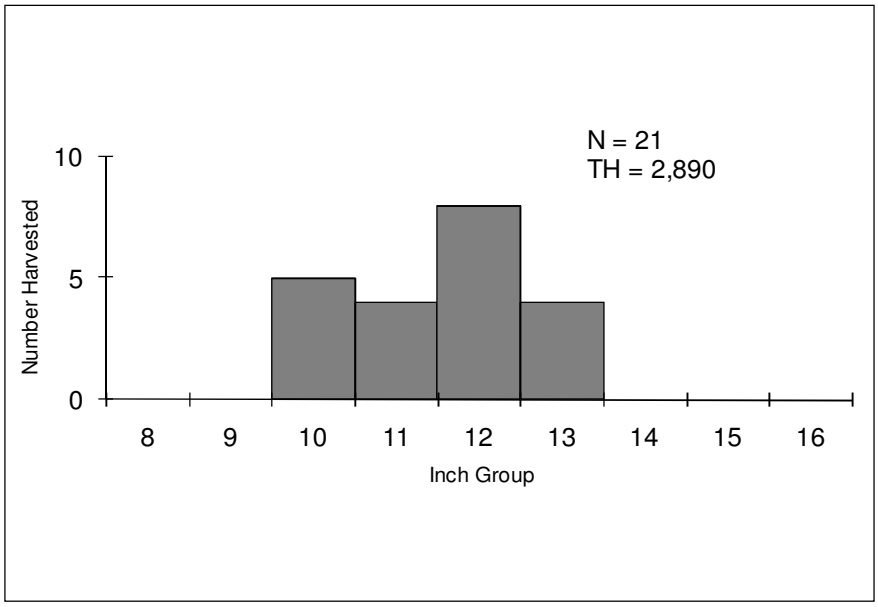



Figure 13. Length frequency of harvested spotted bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2010 through May 2011, all anglers combined. N is the number of harvested spotted bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

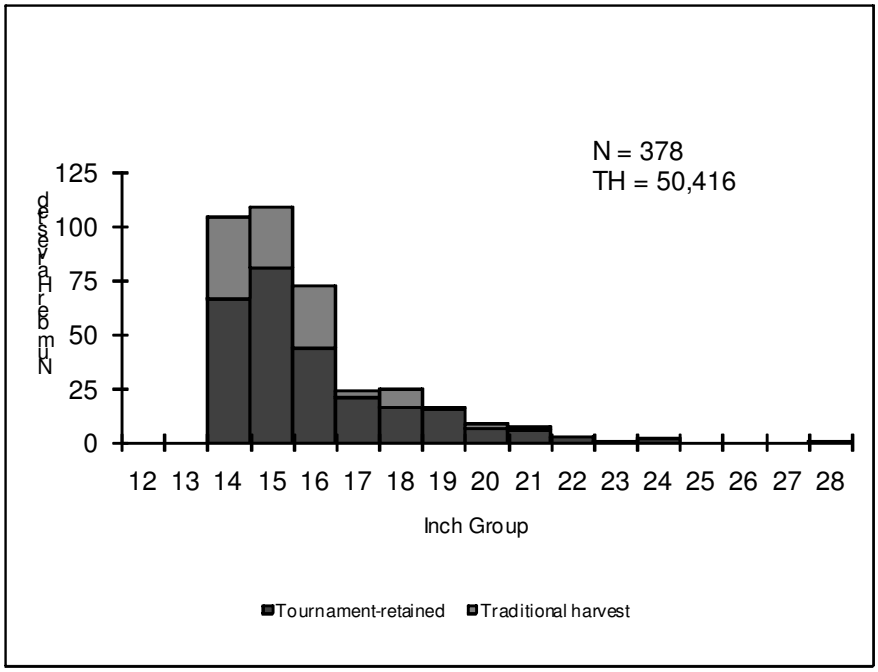



Figure 14. Length frequency of harvested largemouth bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2010 through May 2011, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 11. Results of genetic analysis of largemouth bass collected by fall electrofishing, Sam Rayburn Reservoir, Texas, 2006 - 2010. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Fx = first or higher generation hybrid between a FLMB and a NLMB.

| | | Genotype | | | | |
|---|---|---|---|---|---|---|
| Year | Sample size | FLMB | Fx | NLMB | % FLMB alleles | % pure FLMB |
| 2006 | 50 | 2 | 48 | 0 | 51 | 3.0 |
| 2007 | 30 | 0 | 27 | 3 | 53 | 0.0 |
| 2010 | 30 | 0 | 27 | 3 | 43 | 0.0 |

# Crappie

Table 12. Creel survey statistics for crappies at Sam Rayburn Reservoir from June 2007 through May 2008, June 2008 through May 2009, and June 2010 through May 2011, where total catch per hour is for anglers targeting crappies and total harvest is the estimated number of crappies harvested by all anglers. Relative standard errors (RSE) are in parentheses

| Creel Survey Statistic | Year | | |
|---|---|---|---|
| | 2007-2008 | 2008-2009 | 2010-2011 |
| Directed effort (h) | 79,147.69 (19) | 66,380.71 (18) | 40,431.86 (21) |
| Directed effort/acre | 0.69 (19) | 0.58 (18) | 0.36 (21) |
| Total catch per hour | 1.56 (24) | 1.52 (25) | 2.57 (27) |
| Total harvest | 88,023 (33) | 99,086 (18) | 89,586 (50) |
| Harvest/acre | 0.77 (33) | 0.87 (18) | 0.80 (50) |
| Percent legal released | <1 | <1 | 1 |

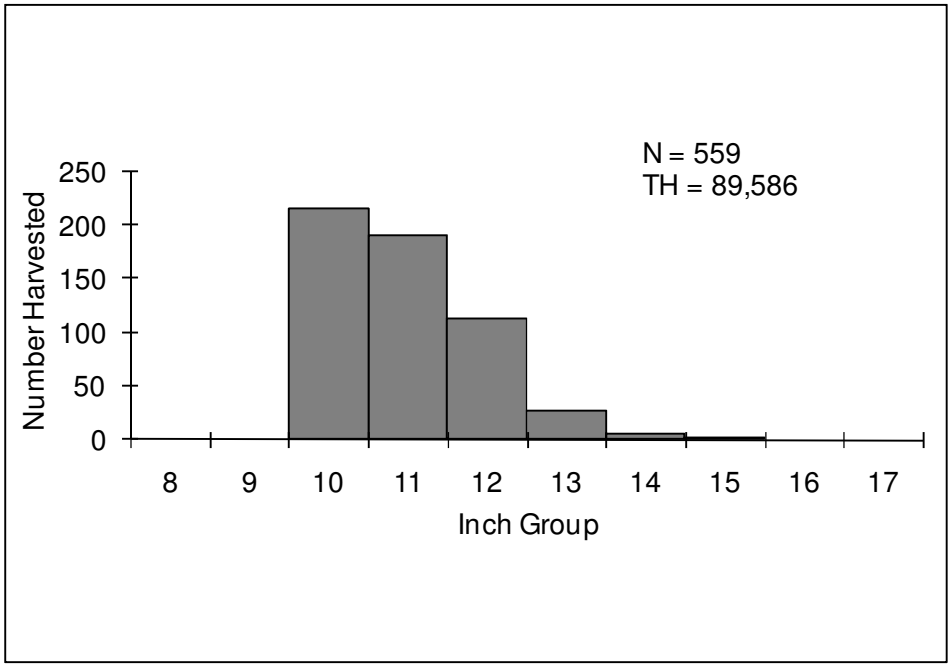



Figure 15. Length frequency of harvested crappie observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2010 through May 2011, all anglers combined. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 13. Proposed sampling schedule for Sam Rayburn Reservoir, Texas. Gill netting surveys are conducted in the winter, while electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

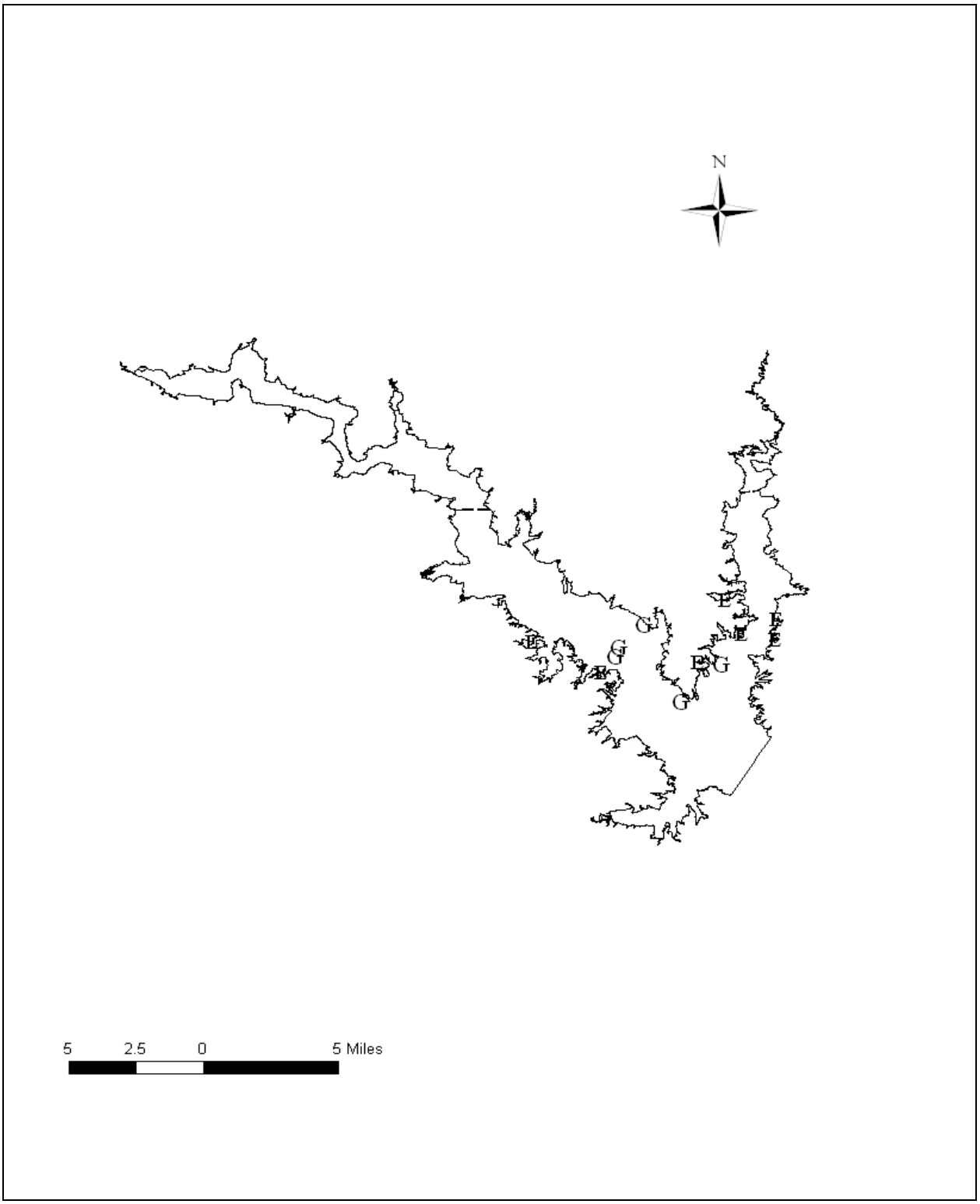
| Survey Year | Electrofisher | Gill Net | Creel Survey | Access Survey | Vegetation | Report |
|---|---|---|---|---|---|---|
| 2011-2012 | A | | | | A | |
| 2012-2013 | A | A | A | | A | A |
| 2013-2014 | A | | | | A | |
| 2014-2015 | S | S | A | S | S | S |

## APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Sam Rayburn Reservoir, Texas, 2010-2011.

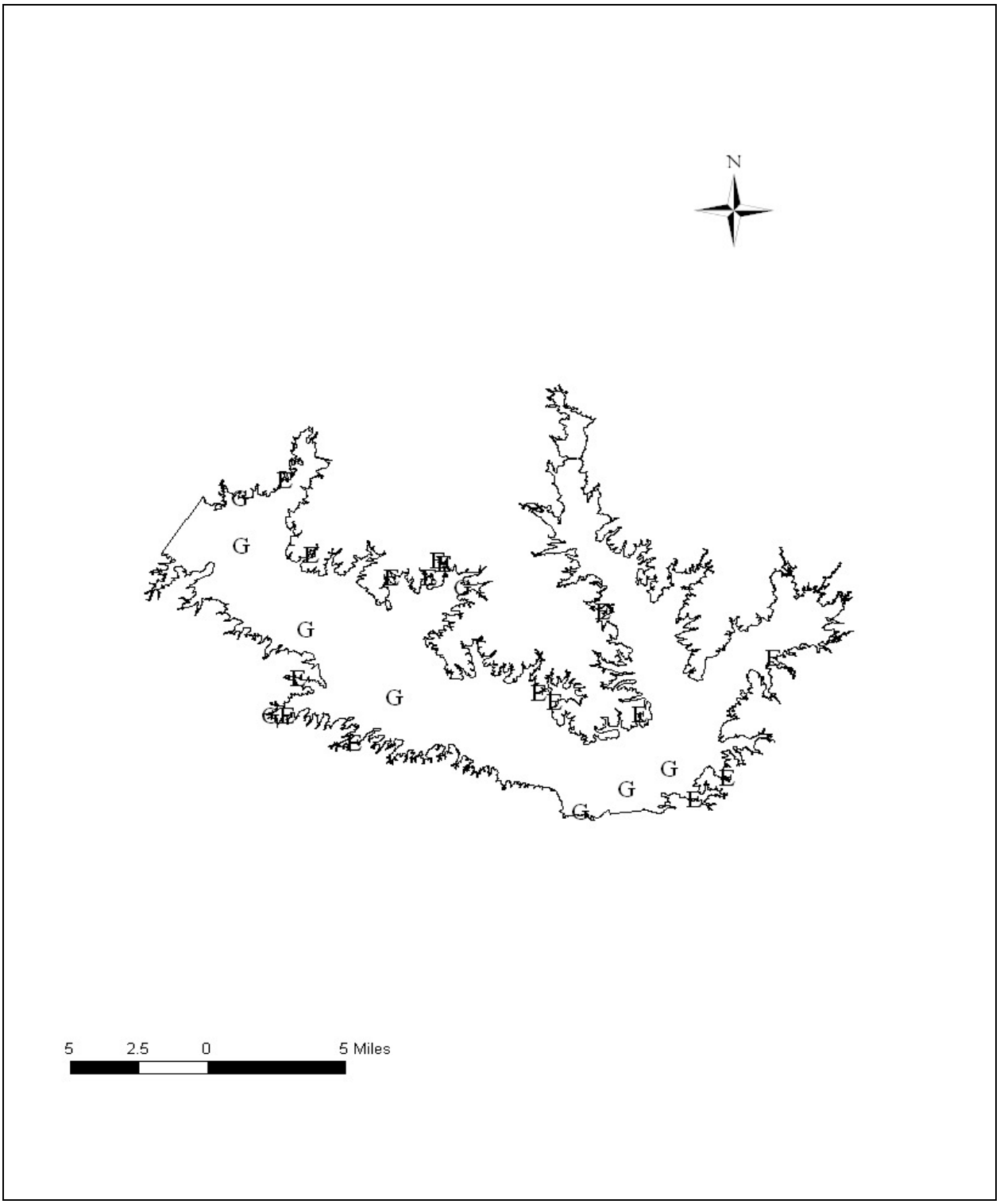
| Species | Gill Netting | | Electrofishing | |
|---|---|---|---|---|
| | N | CPUE | N | CPUE |
| Spotted gar | 4 | 0.3 | | |
| Gizzard shad | 162 | 10.8 | 128 | 64.0 |
| Threadfin shad | | | 5,481 | 2,740.5 |
| Common carp | 3 | 0.2 | | |
| Lake chubsucker | 3 | 0.2 | | |
| Smallmouth buffalo | 3 | 0.2 | | |
| Blue catfish | 83 | 5.5 | | |
| Channel catfish | 97 | 6.5 | | |
| White bass | 95 | 6.3 | | |
| Yellow bass | 82 | 5.5 | | |
| Redbreast sunfish | | | 16 | 8.0 |
| Warmouth | | | 44 | 22.0 |
| Bluegill | | | 591 | 295.5 |
| Longear sunfish | | | 28 | 14.0 |
| Redear sunfish | | | 228 | 114.0 |
| Spotted sunfish | | | 10 | 5.0 |
| Spotted bass | 5 | 0.3 | 16 | 8.0 |
| Largemouth bass | 22 | 1.5 | 400 | 200.0 |
| Black crappie | 36 | 2.4 | | |
| Freshwater drum | 28 | 1.9 | | |

**APPENDIX B**




Location of sampling sites, north Sam Rayburn Reservoir, Texas, 2010-2011. Gill net and electrofishing stations are indicated by G and E, respectively. Water level was 2 to 6 below full pool at time of sampling.

**APPENDIX B**




Location of sampling sites, south Sam Rayburn Reservoir, Texas, 2010-2011. Gill net and electrofishing stations are indicated by G and E, respectively. Water level was 2 to 6 feet below full pool at time of sampling.

## APPENDIX C

Results from individual and team format bass tournaments at Sam Rayburn Reservoir, 2006 - 2010. Only tournaments with 5-fish bag limits and > 50 participants or teams were included. Weights are expressed in pounds.

| Year | N | 1st place weight | 2nd place weight | 3rd place weight | % total weights > 15 lbs. | % catching limit | Big bass weight |
|---|---|---|---|---|---|---|---|
| | | | | **Individual** | | | |
| 2006 | 11 | 20.2 | 17.4 | 16.4 | 4.2 | 27.1 | 8.5 |
| 2007 | 10 | 23.2 | 20.0 | 19.0 | 11.5 | 51.2 | 9.5 |
| 2008 | 7 | 21.2 | 19.8 | 19.1 | 10.5 | 53.5 | 8.1 |
| 2009 | 11 | 18.9 | 17.4 | 16.1 | 5.6 | 31.0 | 8.5 |
| 2010 | 9 | 20.7 | 18.2 | 17.0 | 9.4 | 41.9 | 7.6 |
| | | | | **Team** | | | |
| 2006 | 16 | 23.4 | 20.7 | 19.6 | 7.7 | 37.7 | 8.4 |
| 2007 | 24 | 24.3 | 22.3 | 20.9 | 14.8 | 54.4 | 8.7 |
| 2008 | 24 | 23.9 | 21.9 | 20.7 | 17.8 | 57.8 | 8.9 |
| 2009 | 22 | 22.3 | 20.2 | 19.1 | 10.5 | 48.3 | 8.9 |
| 2010 | 28 | 25.1 | 22.5 | 21.3 | 21.7 | 60.6 | 8.7 |

Results of Sealy Outdoors McDonald's Big Bass Splash tournaments, Sam Rayburn Reservoir, 2007 – 2011. Weights are expressed in pounds.

| Year | Average weight of Top 10 fish/hour | Average weight of Top 10 fish/day | Average weight of overall top 10 fish | Weight of overall big fish |
|---|---|---|---|---|
| 2007 | 6.32 (240) | 8.33 (30) | 9.06 (10) | 11.08 |
| 2008 | 6.43 (240) | 8.51 (30) | 9.51 (10) | 11.30 |
| 2009 | 6.68 (240) | 9.03 (30) | 9.97 (10) | 10.90 |
| 2010 | 6.66 (240) | 8.68 (30) | 9.34 (10) | 10.60 |
| 2011 | 5.80 (240) | 8.02 (30) | 9.10 (10) | 10.74 |