PERFORMANCE REPORT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2015 Fisheries Management Survey Report

Lake Fork

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Fork were surveyed in 2014, 2015 and 2016 using electrofishing, and in 2016 using gill netting. Anglers were surveyed with an access point creel survey from June 2014 to May 2015 and from June 2015 to May 2016. Historical data are presented with the 2014-2016 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Fork is a 27,264-acre impoundment located on Lake Fork Creek, a tributary of the Sabine River, approximately five miles northwest of Quitman, Texas and approximately 70 miles east of Dallas, Texas.

- **Management History:** Important sport fishes include Largemouth Bass, crappies (White and Black), and Channel Catfish. The management plan from the 2014 survey report included continued stocking of Florida Largemouth Bass (FLMB). The 16- to 24-inch slot-length limit continues to be evaluated through annual electrofishing surveys, and an access creel survey. In November 2015, 3.25 acres of giant salvinia was documented in Chaney Branch. Subsequent control actions have included closing boat ramps, installing oil-spill boom across the cove to inhibit spread of plants, physical removal, and several chemical treatments. By May 2016 significant progress had been made in reducing the coverage of giant salvinia and no additional infestations were detected in the reservoir. Water hyacinth abundance and distribution has been monitored through annual vegetation surveys. Increasing reservoir elevations in 2015 have facilitated germination of water hyacinth seed stock in the hydrosoil which will necessitate chemical treatment.

- **Fish Community**
  - **Prey species:** Abundant shad (Threadfin and Gizzard) and sunfish populations were the primary prey for sport fishes. Size structure of prey populations was suitable size for most predators.

  - **Catfishes:** Catfishes are an important species group sought by anglers at Lake Fork. Channel Catfish are the dominant species in gill net sampling and in creel surveys, although Flathead Catfish, Blue Catfish, and Yellow Bullheads are also present. The majority of Channel Catfish collected in gill nets were large enough to be legally retained.

  - **Temperate basses:** White Bass, Yellow Bass, White x Yellow Bass hybrids, and Palmetto Bass were all present in the reservoir. The White Bass population has become more abundant as evidenced by periodic increases in gill net catches, harvest in creel surveys, and increased directed fishing effort. Yellow Bass harvest was also observed during creel surveys.

  - **Largemouth Bass:** Largemouth Bass are the most popular game fish in Lake Fork, accounting for the majority of total angler effort. Catch rates in the most recent fall and spring samples have increased in response to improvements in available aquatic habitat.

  - **Crappies:** Crappies continue to be an important component to the overall fishery, typically ranking second in total directed angler effort. However, in 2015-2016, directed angler effort for crappies tapered slightly and crappies were the third most sought species group. Despite fluctuations in directed effort, total harvest remained high.

- **Management Strategies:** Annual actions include: stocking FLMB; spring and fall electrofishing to monitor the Largemouth Bass population, an access point creel survey to monitor angler effort, catch, and harvest rates; annual vegetation surveys of giant salvinia and water hyacinth to monitor distribution and abundance.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Fork June 2014 through May 2016. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. The most recent report was a biennial update to fisheries information completed in July 2014 (Storey and Bennett 2014). While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Relevant historical data are presented for comparison.

Reservoir Description

Lake Fork is a 27,264-acre reservoir impounded in 1980 on Lake Fork Creek and Caney Creek. It is located approximately five miles northwest of Quitman, Texas, in Wood, Rains and Hopkins Counties. It is operated and controlled by the Sabine River Authority (SRA) primarily as a municipal water supply and for recreation. The reservoir was hypereutrophic with a Carlson's Trophic State Index (TSI) chl-a of 55.4 µg/L (Texas Commission on Environmental Quality 2011). Structural habitat features consisted of featureless bank, standing timber, boat docks, eroded bank and concrete (Storey and Jubar 2008). Water hyacinth is present in the reservoir and giant salvinia was found for the first time in Chaney Branch in November 2015. Reservoir water elevation declined steadily in 2014 to a minimum of 7.4 ft below conservation pool elevation (CPE) (Figure 1). Lake Fork returned to CPE in May 2015, five years since the last time it attained this level. For the past year, elevation has remained within two feet of CPE. During the preceding drought, emergent woody species such as buttonbush and black willow became established and these plants have persisted since elevation has increased providing abundant aquatic shoreline habitat. Other descriptive characteristics for Lake Fork are shown in Table 1.

Angler Access

Lake Fork has five public boat ramps and numerous privately-owned boat ramps with launch fees. Bank fishing access is limited to areas near public boat ramps, the Sabine River Authority day-use park and at a number of private access areas. Additional characteristics of free public boat ramps are presented in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Storey and Bennett 2014) included:

1. Management of the Largemouth Bass fishery.
   Actions:
   - FLMB fingerlings were stocked in 2015 (317,924), and 2016 (317,345).
   - Genetic analysis was conducted on a sample of Largemouth Bass
   - Electrofishing sampling was conducted in fall 2014 and 2015 and in spring 2015 and 2016.
   - An augmented age and growth sample (N=123) was collected to estimate length-at-age of Largemouth Bass.
   - Annual access point creel surveys were conducted.

2. Management of aquatic invasive species (AIS).
   Actions:
   - Since 2014, nuisance vegetation surveys have been conducted, primarily to monitor distribution and abundance of water hyacinth and giant salvinia.
   - District staff worked with representatives of the Sabine River Authority (SRA), local businesses and private property owners to close commercial and private ramps in Chaney Branch to boat traffic to reduce the probability of transfer of giant salvinia.
   - District staff worked with employees from SRA and the Tyler South District office to physically remove giant salvinia plants from shoreline areas in Chaney Branch.
   - District staff worked with employees from SRA to install an oil-spill boom across Chaney Branch to isolate the infestation.
   - TPWD Aquatic Habitat Enhancement (AHE) staff treated giant salvinia once in 2015 and on three occasions in 2016. Post-treatment surveys were conducted after each treatment to evaluate treatment effectiveness.
   - Reports of unusual or unknown aquatic plants in Lake Fork by anglers and homeowners were

investigated in person or through photographs submitted by text or email in a prompt fashion.
- Continued efforts to educate the public on identification of invasive aquatic plants and consequences of their introductions into public water.
- Signs advising boaters about the presence of Giant Salvinia and "Clean, Drain, and Dry" were posted at all public boat ramps and many private boat ramps.
- District office had extensive contact with the media and the general public about the threats caused by AIS as a result of the introduction of giant salvinia into Chaney Branch.
- All public presentations to constituent and user groups included information on the threats caused by AIS to aquatic ecosystems.
- A single zebra mussel veliger was collected in November 2015 in the ongoing monitoring program which required updating Lake Fork's status on TPWD's zebra mussel presence classification system into the "Suspect" category.
- Reviewed aquatic vegetation treatment proposals submitted by Lake Fork homeowners to control problematic aquatic vegetation. Several treatment proposals were approved.

3. Habitat enhancement

Actions:

- Worked cooperatively with the Lake Fork Sportsmen Association (LFSA) to promote the PVC fish attractor project. Sixty Georgia-style attractors were constructed and deployed using funding from the Reservoir Fisheries Habitat Partnership (RFHP) and the TPWD Kills and Spills Restitution fund. Fish attractors were deployed in groups of five at 12 sites and a map showing the location of GPS coordinates of each site was distributed to the public.
- Supported the cooperative project between LFSA and Yantis High School (YHS) to raise potted buttonbush plants in the school's greenhouse. Volunteers from LFSA, YHS and TPWD planted between 450 and 500 plants at five sites in 2014.
- District staff secured funding from the TPWD Kills and Spills Restitution fund to purchase a greenhouse at Yantis High School expressly for the Lake Fork habitat enhancement project.
- District staff purchased 500 potted buttonbush plants in March 2015 from a commercial producer using money from the TPWD Kills and Spills Restitution fund and planted them at six sites with assistance for other TPWD staff.
- Staff initiated project to plant buttonbush in inundated areas by staking them in place using wooden stakes. Planting was postponed as a result of high lake elevations throughout fall 2015 when planting was originally scheduled.
- Initiated pilot project to establish native emergent and submersed species in 2015. Two submersed species (Illinois pondweed and wild celery) as well as three species of emergent species (American waterwillow, giant bulrush, and pickerelweed) were planted.

4. Increase angler awareness of the fisheries resources at Lake Fork

Actions:

- Continued to provide posters detailing fisheries regulations in effect at Lake Fork to local fishing-related businesses (tackle stores and marinas) that serve the Lake Fork area.
- Disseminated news releases to local and statewide media outlets promoting the fisheries resources and the threats posed by AIS at Lake Fork.
- Co-sponsored a "State of the lake" meeting with the LFSA in February 2016 to present data on the status of fisheries in Lake Fork.
- Assisted with promotion and staffing of the Toyota Texas Bass Classic in May 2015.
- Continued efforts to educate the public on identification of invasive aquatic plants and consequences of their introductions into public water.
- Provided information on identification of zebra mussels, and encouraged reporting of any suspicious cases.

- Economic assessment of recreational fisheries resources in Lake Fork

Actions:

- District staff collected contact information from 961 anglers during routine creel surveys and supplemental surveys to compile database for Lake Fork Economic Survey from June 2014 through May 2015

- Provided historic data on angler effort and angler zip code distribution from previous creel surveys to researchers at Mississippi State University.
- Provided input to staff at Mississippi State University on first draft of "A social and economic study of the Lake Fork Reservoir recreational fishery".

Harvest regulation history: Sport fishes in Lake Fork are managed with statewide regulations with the exception of Largemouth Bass and crappies (Table 3). A detailed harvest regulation history was provided in a previous report (Storey and Jubar 2008).

Stocking history: Lake Fork was stocked with a mixture to FLMB fry, advanced fingerlings and adults prior to 1995 but since that time the reservoir has received annual stockings of FLMB fingerlings. Over the reservoir's history in excess of 13 million FLMB have been stocked. Limited numbers of ShareLunker Largemouth Bass fingerlings were stocked between 2006 and 2014. Other species (e.g., Spotted Bass, Channel Catfish, Blue Catfish, Flathead Catfish, Bluegill, and Redear Sunfish) were stocked on one to four occasions prior to 1985. A detailed stocking history is provided in Table 4.

Vegetation/habitat management history: Lake Fork has traditionally supported a diverse mix of aquatic vegetation species, consisting of native submersed and emergent types, and invasive species such as hydrilla, Eurasian watermilfoil, water hyacinth, and alligatorweed. A total area of 318.5 acres of water hyacinth and alligatorweed was treated using 2,4-D herbicide in summer 2010 by an independent spray contractor (Storey 2012) and a further 55 acres of water hyacinth was treated by TPWD AHE staff in summer 2012. Reduced lake elevation, as a result of prolonged drought through December 2014, limited the incidence of water hyacinth and prevented its spread. Hydrilla colonies in Lake Fork fluctuated in distribution and abundance. Stockings of alligatorweed fleabeetles in 2009 and 2010 had no appreciable impact on alligatorweed. This is the most common aquatic species targeted by homeowners through the aquatic vegetation treatment proposal process. The Lake Fork Sportsman's Association (LFSA) has worked in cooperation with TPWD staff to plant buttonbush (bare root and potted plants) along exposed shorelines since 2011 to enhance littoral habitat. Since 2013 LFSA volunteers in conjunction with students at Yantis High School have grown out plants for planting in the school's greenhouse. District staff planted waterwillow harvested from Lake Holbrook in 2012 and 2014 to encourage establishment of native emergent species.

Water transfer: Lake Fork is a municipal water supply and the following entities withdraw water directly from the reservoir; Dallas Water Utilities, City of Quitman, and Bright Star Salem Supply Corporation. Water that is withdrawn from Lake Fork is pumped directly to the respective treatment plants and there are no inter-basin transfers. In addition, contracts exist with the cities of Henderson, Kilgore, Longview and Texas Eastman for municipal withdrawal downstream in the Sabine River.

METHODS

All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Ages for Largemouth Bass were determined using otoliths (N=123) from specimens collected by electrofishing in October 2014 (range 7.1 to 22.6 inches).

Electrofishing – Largemouth Bass, Sunfishes, Gizzard Shad, and Threadfin Shad were collected by fall electrofishing (2.0 hour at 24, 5-min stations) in 2014 and 2015. Additional electrofishing for Largemouth Bass was conducted in spring 2015 and 2016 (2.0 hour at 24, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Genetics – Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Micro-satellite DNA analysis was used to determine genetic composition of 30 individual fish of multiple ages.

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and

IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Creel survey – Annual access-point creel surveys were conducted from 2014 through 2016. The creel period was June through May. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

An aquatic vegetation survey was performed according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015) utilizing a Lowrance HDS 8 with StructureScan HD. Shoreline distances and areas of vegetation were estimated using ArcView GIS software. Angler access surveys were conducted in conjunction with the vegetation survey and elevations at the end of boat ramps were measured using sonar equipment.

Water elevation data was obtained from the Texas Water Development Board (TWDB 2016)

RESULTS AND DISCUSSION

Habitat: Since the previous management report (Storey and Bennett 2014), reservoir elevation steadily declined to 7.4 ft below CPE in December 2014 followed by a rapid increase to CPE in May 2015. Since that time, reservoir elevation has remained within two feet of conservation pool. During the drought, terrestrial and marginal species were afforded the opportunity to germinate on the exposed shoreline areas. These plants persisted as reservoir elevation increased providing enhanced aquatic habitat and subsequent improved shelter and food resources for predator and prey species alike. In November 2015, 3.25 acres of giant salvinia was detected in Chaney Branch, prompting the SRA to close two commercial boat ramps in the cove and TPWD staff installed 1,000 feet of oil-spill boom to isolate the infestation. Texas Parks and Wildlife Department AHE staff conducted herbicide treatments of giant salvinia on four occasions between November 2015 and May 2016. Post-treatment surveys were conducted to evaluate treatment effectiveness. Shoreline surveys coupled with investigations of suspected sightings have not detected additional infestations. Rewetting the hydrosoil has enabled water hyacinth seeds to germinate and this species has increased in abundance and distribution. A recommendation was submitted to initiate chemical control through application of herbicide in summer 2016.

Creel: Directed fishing effort for Largemouth Bass continued to dominate the fishery with rates in excess of 70% over the past nine survey years. Crappies had traditionally been the second most sought species group on Lake Fork but in 2015-2016 (7.8%) it was surpassed by angling for catfish (8.3%) (Table 6). The Temperate Bass fishery (White Bass and Yellow Bass) has become the focus of increased angler effort; anglers have become accustomed to the presence of White Bass and have started to target them with increasing frequency. Although this species group represented less than 2% of total effort, it is at the highest level of effort observed over the past nine creel survey years. Total fishing effort for all species has increased steadily over the past three creel years presumably as a result of improved aquatic habitat facilitated by increased reservoir elevations (Table 7). As littoral habitat has improved total directed expenditures have increased. In the spring 2015 creel quarter, after lake elevations returned to CPE, directed expenditures accounted for 54% of the annual total. The highest value of total directed expenditures, $15.3 million, was recorded in 2008-2009. The value in 2015-2016 (>$10.9 million) was the second highest value observed over the past nine annual creel surveys. Quarterly estimates of directed expenditures during that survey ranged from 16-29%. Anglers interviewed in creel surveys from June 2014 - May 2015 (N=872) and June 2015 – May 2016 (879) were overwhelmingly from Texas (83.7% and 84.2% respectively) with the majority residing in areas lying between the Dallas/ Ft. Worth Metroplex and East Texas. (Appendix C)

Prey species: Lake Fork contains a diverse prey fish base, the most abundant of which are Gizzard Shad, Threadfin Shad, Bluegill, and Redear Sunfish. The favorable relative weights of Largemouth Bass (Figure 10 and Figure 11) are reflective of the abundant prey populations in Lake Fork. Catch rate of Gizzard Shad in fall electrofishing in 2015 (163.0/h) was higher than in 2012 (103.5/h) but lower than in 2013 (204.5/h). The Index of vulnerability (IOV) showed the majority of Gizzard Shad (60%) were available to most existing predators (Figure

2) and this population was enhanced by the presence of Threadfin Shad (97.5/h) (Appendix A). Catch rate of Bluegill (214.5/h) was similar to 2013's rate (Figure 3) but Redear Sunfish CPUE (51.5/h) was lower than in 2013 (135.0/h) despite improved aquatic habitat at the time of sampling (Figure 4). The majority of Bluegill collected in surveys were 4 inches or less in length, a suitable prey size for adult Largemouth Bass (Figure 3). The modal size class of the Redear Sunfish population in 2015 was 5 inches, with fish observed up to 8 inches (Figure 4). Directed effort for Bluegill and Redear Sunfish was low (Table 6).

Catfishes: Gill net CPUE for Channel Catfish in 2016 (11.4/nn) was higher than the previous two surveys in 2014 (9.6/nn) and 2012 (9.4/nn) although size distribution was consistent. Samples were again dominated by legal-length fish and 67% of fish collected in 2015 were in this size category (Figure 5). Body condition of fish was excellent and fish up to 32 inches were collected. Although Channel, Blue, and Flathead Catfishes are encountered in Lake Fork, Channel Catfish were the dominant species observed in creel and gill net surveys. The Channel Catfish fishery was second in magnitude of directed angler effort (8.3%) after Largemouth Bass in 2015-2016 (Table 6). Directed effort for Catfish (89,679h) and harvest (195,990) were highest in 2014-2015 (Table 8) and in the following year, harvest declined by over 50% (80,225) although directed effort (78,168h) was similar (Table 8, Figure 6). Total angler catch rate declined in 2015-2016 (1.24/h) outside from the range of 1.73/h – 2.06/h observed in the six previous surveys (Table 8). Anglers released between 26-39% of legal-sized catfish caught during the last two creel surveys (Table 8)

Temperate basses: White Bass, Yellow Bass, White x Yellow bass hybrids, and Palmetto Bass were present in the reservoir. The presence of Palmetto Bass was an anomaly since these fish have never been stocked by TPWD and this record was presumably the result of an illegal angler stocking. White Bass have established a self-sustaining population through reported introduction by anglers. A lake record was established in 2001 and they were first detected in population sampling in 2004 (Storey and Myers 2004). Gill net CPUE for White Bass in 2016 (0.9/nn) was reduced as compared with the highest recorded catch rate observed in 2014 (2.9/nn) (Figure 7). Despite a modest increase in directed effort for Temperate Bass (White Bass and Yellow Bass combined) (Table 6), the harvest of White Bass in creel surveys declined substantially since 2012-2013 (53,519 fish) (Figure 8). These patterns in abundance and harvest are reflective of the apparent inconsistent recruitment of White Bass in Lake Fork identified in a previous management report (Storey and Bennett 2014)

Largemouth Bass: Total CPUE of Largemouth Bass in fall electrofishing in 2015 (179.5/h) was appreciably higher than in 2013 (100.0/h) or 2014 (96.5/h) (Figure 9). The 2015 survey was dominated by fish less than 10 inches, a product of strong cohorts from 2014 and 2015. Improved littoral habitat, created by higher lake elevations following the prolonged drought (Figure 1), created conditions which led to increased abundance of these year classes. The presence of large numbers of stock-sized fish resulted in depressed PSD and PSD-P values. However, it is anticipated over time these abundant year classes will result in improved catch rates of fish that recruit into the fishery. Relative weights (Wr) for most inch classes of Largemouth Bass were good, ranging from 90 to 100, an indication the lake's prey populations provided an adequate food supply (Figure 9).

Total CPUE of Largemouth Bass in 2016 spring electrofishing (91.1/h) showed a similar increased abundance trend observed in fall samples. Previous spring surveys in 2014 (40.5/h) and 2015 (59.5/h) (Figure 10) collected markedly fewer fish. The 2016 sample was also dominated by smaller size classes produced from the successful spawns of 2014 and 2015 which likely occurred due to improved aquatic habitat. The 2016 survey produced the first fish over 24 inches collected in a spring sample since 2010 and only the sixth over-slot fish collected in spring electrofishing since 1990.

Angler catch rate of Largemouth Bass in 2015-2016 (0.38/h) was slightly higher than in the previous year (0.31/h) but similar to rates observed from June 2006 - May 2009 and June 2012 – May 2013 (0.40-0.42/h) (Table 9). Directed angler effort for Largemouth Bass has increased for the past four creel surveys from 440,552 in 2011-2012 to 768,940 in 2015-2016 invariably as a result of improved aquatic habitat since early 2015. To further demonstrate this, lake elevation in spring 2015 returned to CPE for the first time in five years, and during the spring creel quarter directed angler effort for Largemouth Bass represented 54% of the annual total. Total numbers of Largemouth Bass released by weight groups in 2011-2012 and 2012-2013 were similar (262,700 and 263,314 respectively) but they declined to less than half this amount in 2014-2015 (109,252).

During the creel survey from 2015-2016, the number of released fish increased to its highest level (417,809) observed since this information began to be collected in June 2011 (Table 9). Released fish less than 4 lbs in weight represented 90% of all released fish, a reflection of the abundant cohorts of fish spawned in 2015 and 2016. During the three previous creel surveys, this size group represented from 69 – 77% of released fish.

The growth rate of Largemouth Bass was investigated as a result of a suspected decline in recent years (Storey and Bennett 2014). Growth to 16 inches (N=17, range 15.20 – 16.97 inches, mean 16.1 inches), the lower end of the protective slot-limit, took an average of 3.4 years (range 2-6 years) (Figure 11), within the range of estimates of 3.2 years and 3.8 years recorded in 2009 (Storey 2010) and 2008 (Storey and Jubar 2009.

Live-release tournament effort in 2015-2016 (422,529 h) was the highest observed in the past nine annual creel surveys and accounted for 55% of the annual directed effort for Largemouth Bass (Table 9). An estimated 55,624 Largemouth Bass were retained by live-release tournament participants, the third highest observed since June 2006 (Table 9). The vast majority of Largemouth Bass observed in creel surveys at Lake Fork were fish retained by live-release tournament anglers which are subsequently released (Figure 12). Actual harvest (fish kept for consumption) of Largemouth Bass continues to be low. Catch and release practices were high as evidenced by 93-99% of legal-sized fish caught by non-tournament anglers in the past nine creel surveys being released (Table 9).

Genetic analysis of Largemouth Bass of various sizes collected during fall electrofishing in 2015 yielded an FLMB allele frequency of 52%, a value consistent with prior assessments. The sample contained second or higher generation intergrades (Fx) 52% of which had greater FLMB influence than NLMB (Table 10).

Crappies: Crappies have historically been the second most popular sport fish group sought at the reservoir, representing between 8.8 and 20.9% of total angler effort in the preceding eight creel surveys. In 2015-2016, directed effort of this group was 7.8% ranking third in angling effort (Table 6). Directed effort for crappie fluctuated over the past five creel surveys alternately increasing and decreasing by approximately 30% each year although total harvest has remained relatively stable despite a moderate increase in 2014-2015 (Table 11). The seasonal allocation of angler effort for Crappie changed somewhat in the past two creel surveys. In the 2014-2015 creel survey the majority of effort was observed in fall 2014 (50%) and winter 2015 (31%) whereas in 2015-2016 survey effort was concentrated in spring 2016 (41%) and summer 2015 (36%). Angling success, indexed by angler catch rate increased steadily over the past three years from 0.91/h in 2012-2013 to 1.63/h in 2015-2016 (Table 11).

In the past five creel surveys quarterly allocation of harvest was inconsistent. In the 2010-2011 survey the majority of harvest was concentrated in fall (57%), although the following year it was observed in winter (50%), followed by a shift to fall in the next year (34%) and by 2014-2015 the winter quarter was responsible for 64% of harvest. In the 2015-2016 survey the summer quarter recoded the highest harvest (39%) followed by spring (34%). No harvest of Crappie was recorded in the winter quarter of the most recent creel survey. Although Black Crappie are usually the dominant species harvested in creel surveys, their relative abundance decreased from 56% to 47% of all Crappie harvested in the past two creel surveys. In 2010-2011 and 2011-2012 this species accounted for 81% and 79% of total harvest, respectively (Storey 2012).

The 10-inch class was the most frequently-harvested size (Black and White crappie combined), accounting for 31% of fish harvested in 2014-2015 and 35% in 2015-2016. These values are within the range of 25% to 40% observed in previous surveys (Storey 2012, Storey and Bennett 2014). Angler compliance with the 10-inch minimum length limit in effect from March through November was high; Illegal fish accounted for 0.7% of harvest during 2014-2015 and no illegal harvest was observed in 2015-2016. During the winter quarter (December through February) when no minimum length limit is in effect, crappies smaller than 10 inches accounted for 17% of the total harvest for the year in 2014-2015 but no harvest was observed during winter in 2015-2016 (Figure 13).

Fisheries management plan for Lake Fork, Texas

Prepared – July 2016.

ISSUE 1: Lake Fork has a long and impressive history of producing trophy Largemouth Bass. This lake has held the state record of 18.18 pounds since 1992 and has contributed 46% of all entries into the ShareLunker program since its inception in 1986. Since the last management report was prepared in 2012, 7 entries have been added to the ShareLunker program, 28.6% of which were pure FLMB. To date, 7 of the top 10, 13 of the top 20, and 25 of the 40 heaviest documented largemouth bass in Texas were caught in Lake Fork. Total annual trip expenditures at Lake Fork were estimated in 1996 at over $28 million and total economic value of the reservoir for fishing was valued at $38.9 million. TPWD has managed the Lake Fork Largemouth Bass fishery under restrictive regulations since it was opened to the public in 1980 and as part of its commitment to enhancing the quality of the bass population the agency's hatcheries have stocked in excess of 13 million FLMB into the lake. The Lake Fork largemouth bass fishery will continue to be managed and monitored intensively.

MANAGEMENT STRATEGIES

1. Stock FLMB (1,000/km) annually to influence genetics and maintain trophy Largemouth Bass catch potential.
2. Monitor genetic composition of Largemouth Bass population by assessing allele frequency from samples collected during fall electrofishing in 2019.
3. Continue to monitor the Largemouth Bass population relative abundance, size structure, and condition with electrofishing surveys in fall 2017 and spring 2018.
4. Initiate annual access-point creel survey in June 2016 through May 2017 to monitor the fishery and collect data on catch, harvest, and fishing effort. Continue to collect data on numbers of released bass in the following size ranges; 4-6.9 lbs, 7-9.9 lbs and $\geq$10 lbs.
5. Age Largemouth Bass collected by LFSA's Live Release Boat that died during fishing tournaments to gather information on growth rates of fish over 24 inches

ISSUE 2: 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. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of 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

Giant salvinia and Water hyacinth currently pose the most serious threat of any invasive aquatic plants present in Lake Fork. Lake Fork contains three additional invasive aquatic plants: hydrilla, Eurasian watermilfoil and alligatorweed. Although hydrilla is listed as an invasive aquatic plant, it has not created access problems on Lake Fork and it is generally considered beneficial habitat. Eurasian watermilfoil is not considered problematic but it does appear to be displacing hydrilla from certain areas. Alligatorweed has expanded as water levels increased following drought. Landowners submit aquatic vegetation treatment proposals more frequently for alligatorweed than for any other species.

MANAGEMENT STRATEGIES

1. Conduct vegetation surveys in order to map distribution and acreage of giant salvinia and water hyacinth in Lake Fork as appropriate.
2. Recommend treatment of giant salvinia using foliar applications of appropriate herbicides by AHE staff.
3. Maintain presence of oil-spill boom across Chaney Branch and boat ramp closures within the enclosed area until giant salvinia infestation is under control
4. Recommend treatment of water hyacinth using foliar applications of 2,4-D-based herbicides by contract herbicide applicators or AHE staff.
5. Conduct post-treatment vegetation surveys to evaluate effectiveness of herbicide applications.

6. Investigate reports of unusual or unknown aquatic plants in Lake Fork by anglers and homeowners at the earliest possible opportunity.
7. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
8. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc. so they can communicate these messages to their customers.
9. Educate the public about invasive species through the use of media and the Internet.
10. Make a speaking point about invasive species when presenting to constituent and user groups.
11. Continue to support zebra mussel sampling being conducted by contractors and provide assistance with dissemination of test results.
12. Provide information on identification of zebra mussels, and encourage reporting of any suspicious cases.
13. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.
14. Work cooperatively with TPWD Austin and Aquatic Habitat Enhancement staff, the Sabine River Authority, and the LFSA to develop management plans and to explore opportunities to underwrite recommended courses of action.
15. Update "Nuisance aquatic vegetation management plan for Lake Fork" as necessary.
16. Continue to review aquatic vegetation treatment proposals submitted by Lake Fork homeowners for control of noxious aquatic vegetation.

ISSUE 3: During the protracted drought of mid-2010 through 2011, reservoir water elevations decreased to record low levels exposing shorelines that were devoid of any fish habitat structure. LFSA partnered with TPWD staff on two projects to improve aquatic habitat by planting 1,000 bare-root buttonbush plants in March 2011 and 400, 2-year-old plants in November 2011 along exposed shorelines. LFSA has demonstrated a continued interest in making improvements to the aquatic habitat at Lake Fork by becoming a Chapter member of the Friends of Reservoirs (www.waterhabitatlife.org) of the Reservoir Fisheries Habitat Partnership (RFHP). In 2013, the LFSA partnered with students at Yantis High School to grow out buttonbush from bare root stock in the school greenhouse and the first batch were planted in 2014. TPWD staff secured funding from the Kills and Spills Restitution Fund to purchase a kit to construct a 20' x 48' greenhouse in October 2015 at Yantis High School expressly for the Lake Fork habitat enhancement project.

MANAGEMENT STRATEGIES

1. Work cooperatively with LFSA to continue to develop and foster habitat enhancement initiatives.
2. Support cooperative project between LFSA and Yantis High School in raising potted buttonbush plants. Assist with site selection and planting activities in Lake Fork.
3. Expand pilot project to establish emergent and submersed species of native aquatic plants at select sites in the reservoir.

ISSUE 4: Angler awareness of the fisheries resources at Lake Fork other than Largemouth Bass could be enhanced. There is an opportunity to inform anglers of the significant fisheries for Channel Catfish, White Bass, Common Carp and Smallmouth Buffalo. Fisheries regulations need to be prominently displayed and clearly communicated to anglers. District staff will continue efforts to educate resource users about identification of invasive aquatic species and the consequences of introductions of new species such as giant salvinia and zebra mussels

MANAGEMENT STRATEGIES

1. Continue to provide posters detailing fisheries regulations in effect at Lake Fork to local fishing-related businesses that serve the Lake Fork area, for display in stores and at boat ramps.
2. Continue to produce news releases promoting the fisheries resources of Lake Fork for distribution to local lake papers and other media outlets.
3. Co-sponsor additional "State of the lake" meetings with local interested parties as needs arise.
4. Continue efforts to educate the public on identification of invasive aquatic plants and consequences of their introductions into public water.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual electrofishing sampling in spring and fall to monitor the Largemouth Bass population (Table 12), spring gill netting surveys to monitor Catfish species and Temperate Basses will be conducted every two years beginning in 2018, and an annual access creel survey to monitor the lake's fisheries will resume in June 2016. Giant salvinia and water hyacinth distribution and abundance will continue to be monitored through an annual vegetation survey. An access survey will be conducted in 2018.

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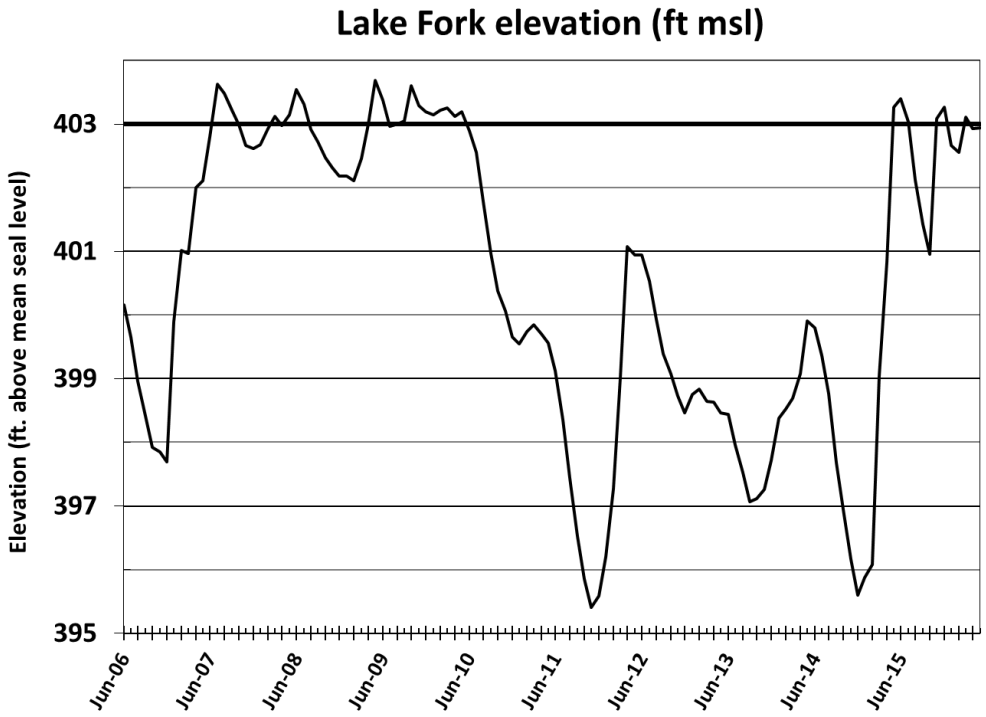


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Lake Fork, Texas, June 2006 through May 2016. Bold horizontal line indicates conservation pool elevation (CPE); 403 ft. msl.

Table 1. Characteristics of Lake Fork, Texas.

Characteristic	Description
Year constructed	1980
Controlling authority	Sabine River Authority
Surface area	27,264 acres
Counties	Wood (location of dam), Hopkins, Rains
Reservoir type	Mainstream
Mean depth	12.0 ft.
Maximum depth	70.0 ft.
Shoreline development index (SDI)	12.18
Conductivity	135 µmho / cm
Secchi disc range	4 – 6 ft.
Watershed area	490 mi^2

Table 2. Characteristics of public boat ramp for Lake Fork, Texas, July, 2015. Reservoir elevation at time of survey was estimated at 397.6 ft msl.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Rainswood	32.9037 -95.6587	Y	30	393.85	Excellent, no access issues
Highway 17	32.8787 -95.6329	Y	60	392.35	Excellent, no access issues
Highway 154	32.8527 -95.5289	Y	50	393.25	Excellent, no access issues
Highway 515 East	32.8951 -95.5356	Y	50	391.35	Excellent, although sand occasionally accumulates on ramp limiting access
Boardtree Creek	32.8976 -95.6739	Y	15	385.2	Excellent, no access issues

Table 3. Harvest regulations for Lake Fork, Texas.

Species	Bag limit	Length limit
Catfishes, Channel and Blue, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5 (1 fish 24 inches or longer)	16- to 24-inch slot
Crappies, White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum [1]

[1]The minimum length limit is waived from December 1 to the last day of February each year. Anglers must harvest the first 25 crappie caught, regardless of size, with no catch-and-release or culling.

Table 4. Stocking history of Lake Fork, Texas. Size categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

Year	Number	Size
	Blue Catfish	
1980	268,423	FGL
1984	29,676	FGL
1985	253,464	FGL
	551,563	
	Channel Catfish	
1977	37,787	FGL
1978	80,130	FGL
1980	137,545	FGL
1984	102,103	FGL
	357,565	
	Flathead Catfish	
1979	4,800	FGL & ADL
	4,800	
	Redear Sunfish	
1981	36,000	FGL
	36,000	
	Coppernose Bluegill	
1981	633,911	FGL
	633,911	
	Spotted Bass	
1979	41	ADL
	41	
	Florida Largemouth Bass	
1978	103	ADL
1979	740,815	FGL
1979	561	ADL
1980	330,800	FRY
1980	300	ADL
1982	49	ADL

Year	Number	Size
	Florida Largemouth Bass	
1987	250	AFGL
1995	692,281	FGL
1996	697,731	FGL
1997	698,037	FGL
1998	694,211	FGL
1999	710,761	FGL
2000	510,737	FGL
2001	218,240	FGL
2002	692,258	FGL
2003	732,049	FGL
2004	515,041	FGL
2005	705,986	FGL
2006	501,313	FGL
2007	501,174	FGL
2008	501,220	FGL
2009	682,702	FGL
2010	513,224	FGL
2011	685,049	FGL
2012	683,531	FGL
2013	518,953	FGL
2014	502,318	FGL
2015	317,924	FGL
2016	317,345	FGL
	13,664,963	
	ShareLunker Largemouth Bass	
2006	4,800	FGL
2008	2,897	FGL
2009	3,000	FGL
2010	2,220	FGL
2011	39,872	FGL
2012	10,205	FGL
2013	4,559	FGL
2014	15,709	FGL
	83,262	

Table 5. Survey of aquatic vegetation, Lake Fork, Texas, 2004, 2008-2010, 2012, 2013, and 2013. Surface area (acres) is listed with percent of total reservoir surface area in parentheses. Individual native species observed during surveys are listed in footnotes. Total acreage includes native and non-native species combined.

Vegetation	2004	2008	2009	2010	2012	2013	2015
Native emergent	145.4 (0.5)[1]					130.0 (0.5)[3]	
Native submersed	1,278.1 (4.7)[2]					1,069.4 (3.9)[4]	
Sub-total Native sp.	1,423.5 (5.2)					1,119.4 (4.4)	
Non-native							
*Alligatorweed (Tier III)**						3.0 (<0.1)	
*Eurasian watermilfoil (Tier III)**	58.0 (0.2)						
*Hydrilla (Tier III)**	2,156.2 (7.9)					1,372.0 (5.0)	
*Water hyacinth (Tier II)**	48.6 (0.2)	39.0 (0.1)	400.0 (1.5)	5.0 (<0.1)	35 (0.1)	4.0 (<0.1)	
Giant salvinia (Tier 1)							3.25 (<0.1)
Total	3,686.4 (13.5)					2,578.4 (9.5)	

*Tier I is immediate Response, Tier II Maintenance, and Tier III is Watch Status

[1] *American lotus, cattail, maidencane, spikerush*
[2] *Muskgrass, stonewort*
[3] *American lotus, cattail, waterprimrose*
[4] *American pondweed, coontail, muskgrass, stonewort*

Table 6. Percent directed angler effort by species for Lake Fork, Texas, from 2006 through 2013 and 2014 through 2016. Survey periods were from June 1 through May 31.

Species	Year								
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2014-2015	2015-2016
Catfishes	5.90	3.91	3.03	4.95	3.95	5.19	4.28	12.58	8.29
Temperate Bass	-	-	-	-	-	0.38	0.05	-	1.59
Sunfish	1.08	-	-	-	1.19	-	0.05	-	0.16
Largemouth Bass	80.32	84.37	87.15	73.53	81.22	73.17	82.51	70.24	81.53
Crappies	12.61	11.15	8.75	20.85	11.07	17.66	11.94	14.54	7.83
Anything	-	0.56	1.06	0.67	2.58	3.60	1.17	2.64	0.60

Table 7. Total fishing effort (h) for all species and total directed expenditures (and associated RSEs in parentheses) at Lake Fork, Texas, from 2006 through 2013 and 2014 through 2016. Survey periods were from June 1 through May 31.

Species	Year								
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2014-2015	2015-2016
Total fishing effort	807,892 (12)	874,230 (14)	1,128,269 (16)	709,457 (17)	588,692 (17)	602,127 (15)	601,912 (20)	712,724 (13)	943,149 (20)
Total directed expenditures	$7,858,137 (17)	$10,909,542 (22)	$15,338,593 (24)	$7,569,111 (28)	$7,139,132 (28)	$7,250,375 (27)	$10,206,736 (27)	$9,556,450 (22)	$10,978,715 (25)

Gizzard Shad

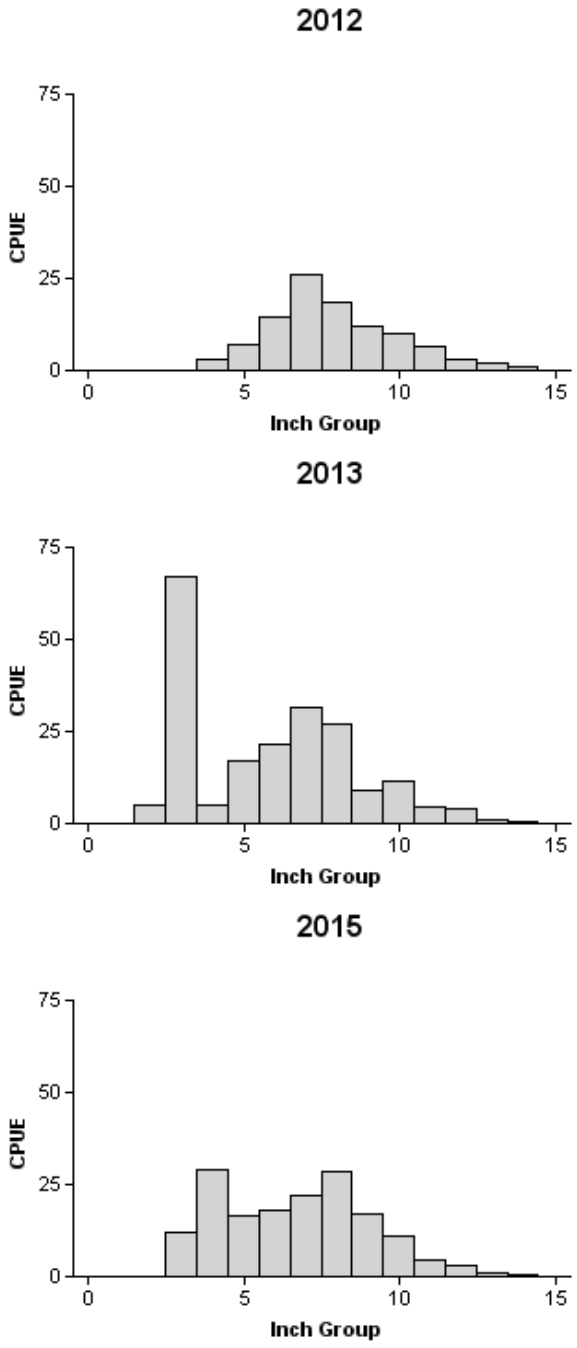


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for structural index and IOV are in parentheses) for fall electrofishing surveys, Lake Fork, Texas, 2012, 2013, and 2015.

Bluegill

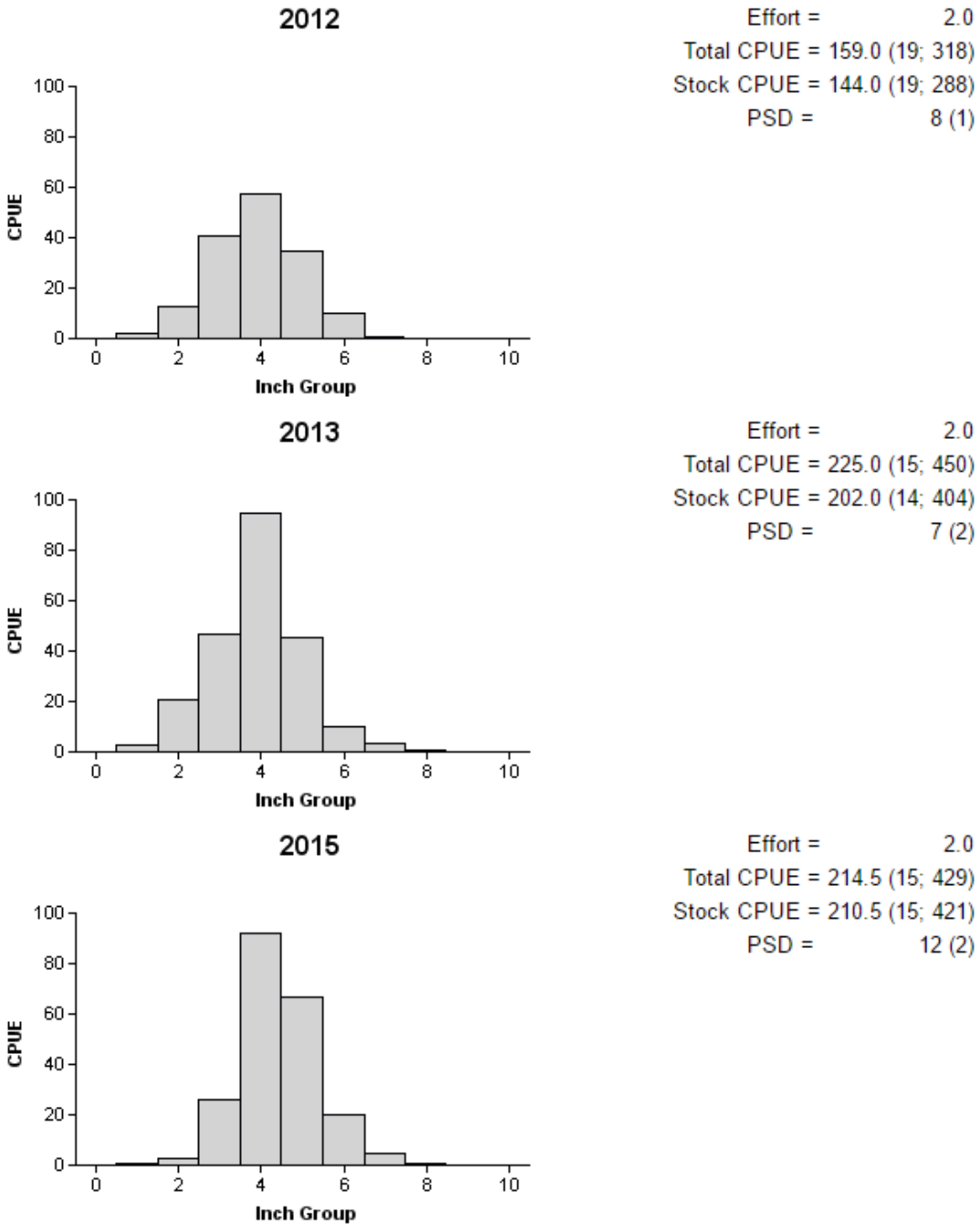


Figure 3. Number of Bluegill caught per hour (CPUE, bars), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork, Texas, 2012, 2013, and 2015.

Redear Sunfish

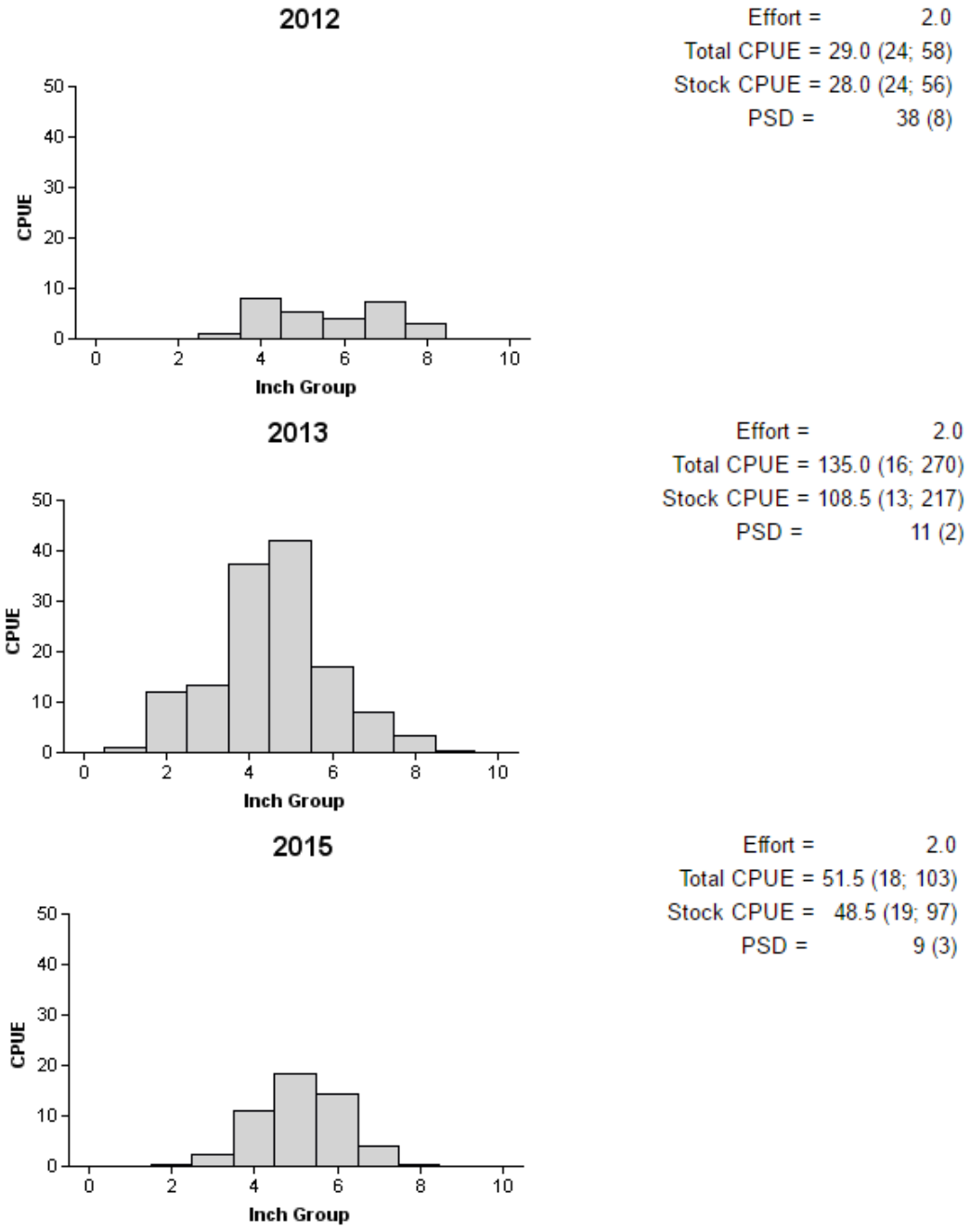


Figure 4. Number of Redear Sunfish caught per hour (CPUE, bars), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork, Texas, 2012, 2013, and 2015.

Channel Catfish

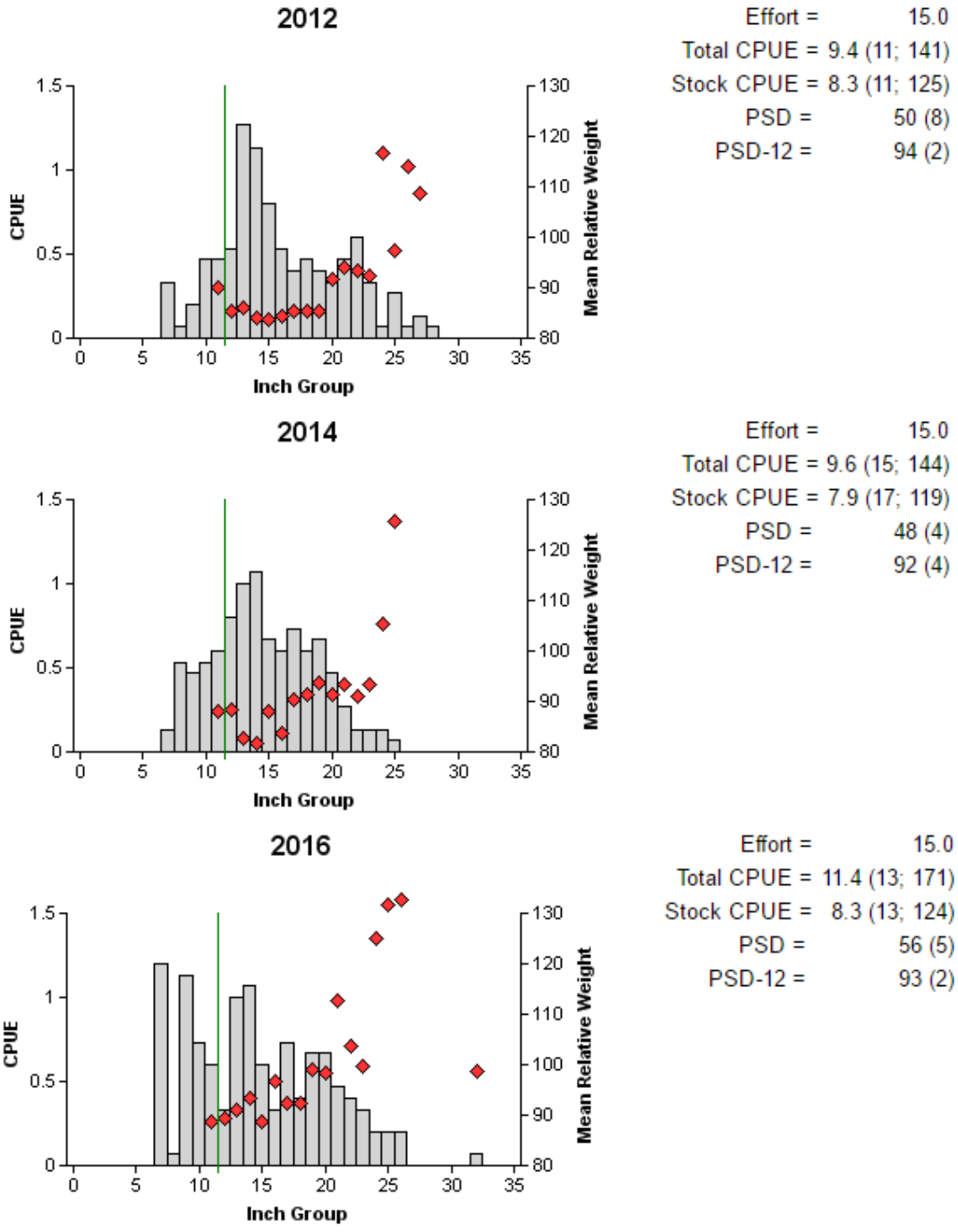


Figure 5. Number of Channel Catfish caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Fork, Texas, 2012, 2014, and 2016. Vertical lines indicate minimum length limit at time of survey.

Table 8. Creel survey statistics for Catfish (Channel, Blue, and Flathead catfish combined) at Lake Fork from 2006 through 2013 and 2014 through 2016. Survey periods were from June 1 through May 31. Total catch per hour is for anglers targeting Catfish and total harvest is the estimated number of Catfish harvested by all anglers. [RSE for directed effort and total harvest is the same as directed effort/acre and total harvest/acre, respectively]

Creel Survey Statistic	Year								
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2014-2015	2015-2016
Surface area (acres)	24,001	26,889	26,178	26,889	24,510	23,007	23,741	23,792	24,001
Directed effort (h)	50,621 (18)	36,165 (26)	34,221 (32)	35,112 (31)	23,225 (35)	31,262 (30)	25,733 (32)	89,679 (19)	78,168 (23)
Directed effort/acre	2.11 (18)	1.35 (26)	1.31 (32)	1.31 (31)	0.95 (35)	1.36 (30)	1.08 (32)	3.77 (19)	3.26 (23)
Total catch per hour	1.35 (24)	1.01 (24)	1.86 (36)	1.73 (55)	1.91 (70)	1.98 (46)	1.91 (38)	2.06 (25)	1.24 (34)
Total harvest	63,586 (64)	76,341 (44)	244,077 (67)	68,724 (84)	52,678 (48)	62,873 (50)	57,565 (47)	195,990 (34)	80,225 (50)
Harvest/acre	2.65 (64)	2.84 (44)	9.32 (67)	2.56 (84)	2.15 (48)	2.73 (50)	2.42 (47)	8.24 (34)	3.34 (50)
Percent legal released	20	66	27	49	20	22	50	26	39

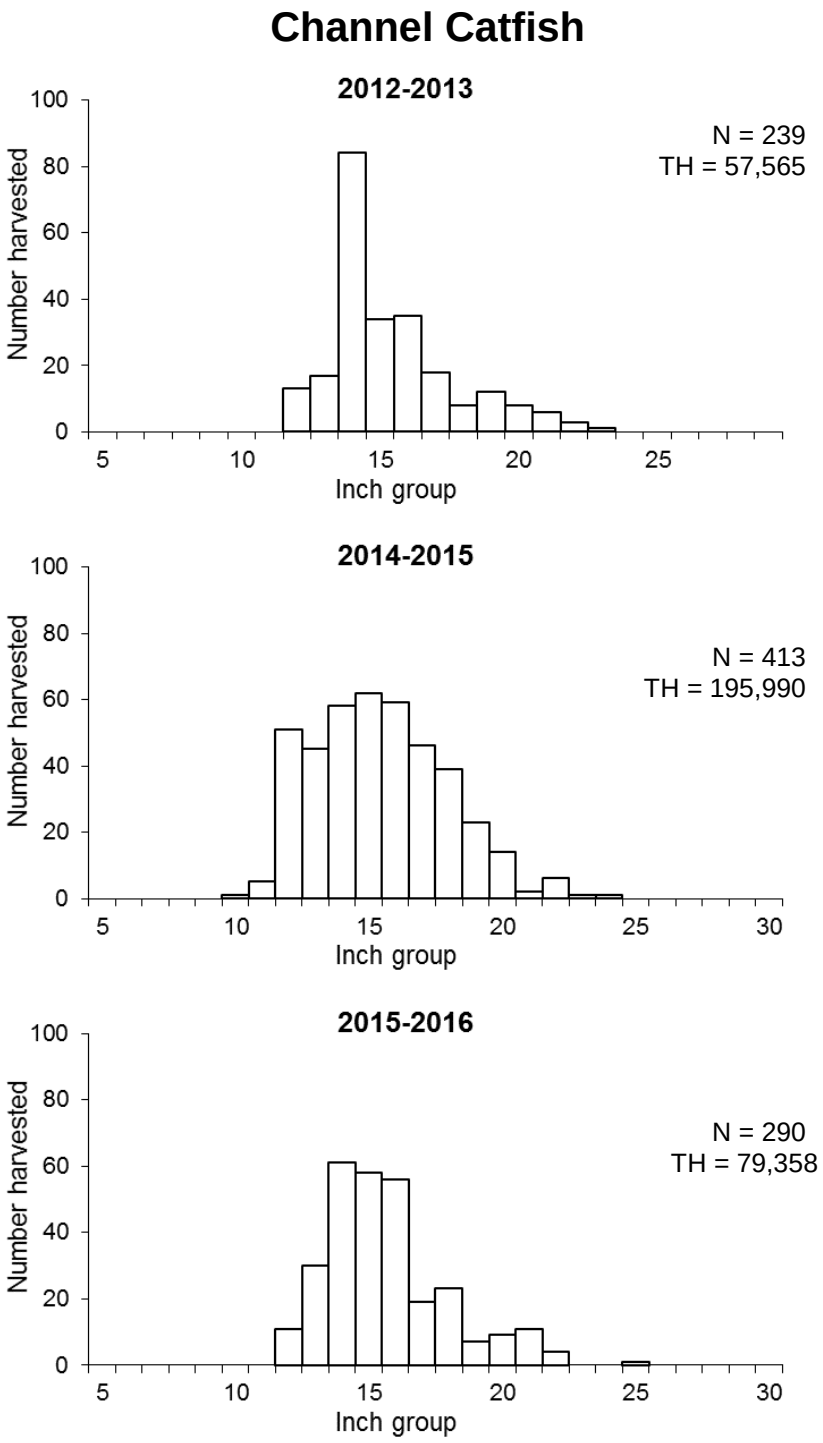


Figure 6. Length frequency of harvested Channel Catfish observed during creel surveys at Lake Fork, Texas, , June 2012 to May 2013, June 2014 to May 2015 and June 2015 to May 2016, all anglers combined. N is the number of harvested Channel Catfish (few Blue or Flathead Catfish were observed) observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass

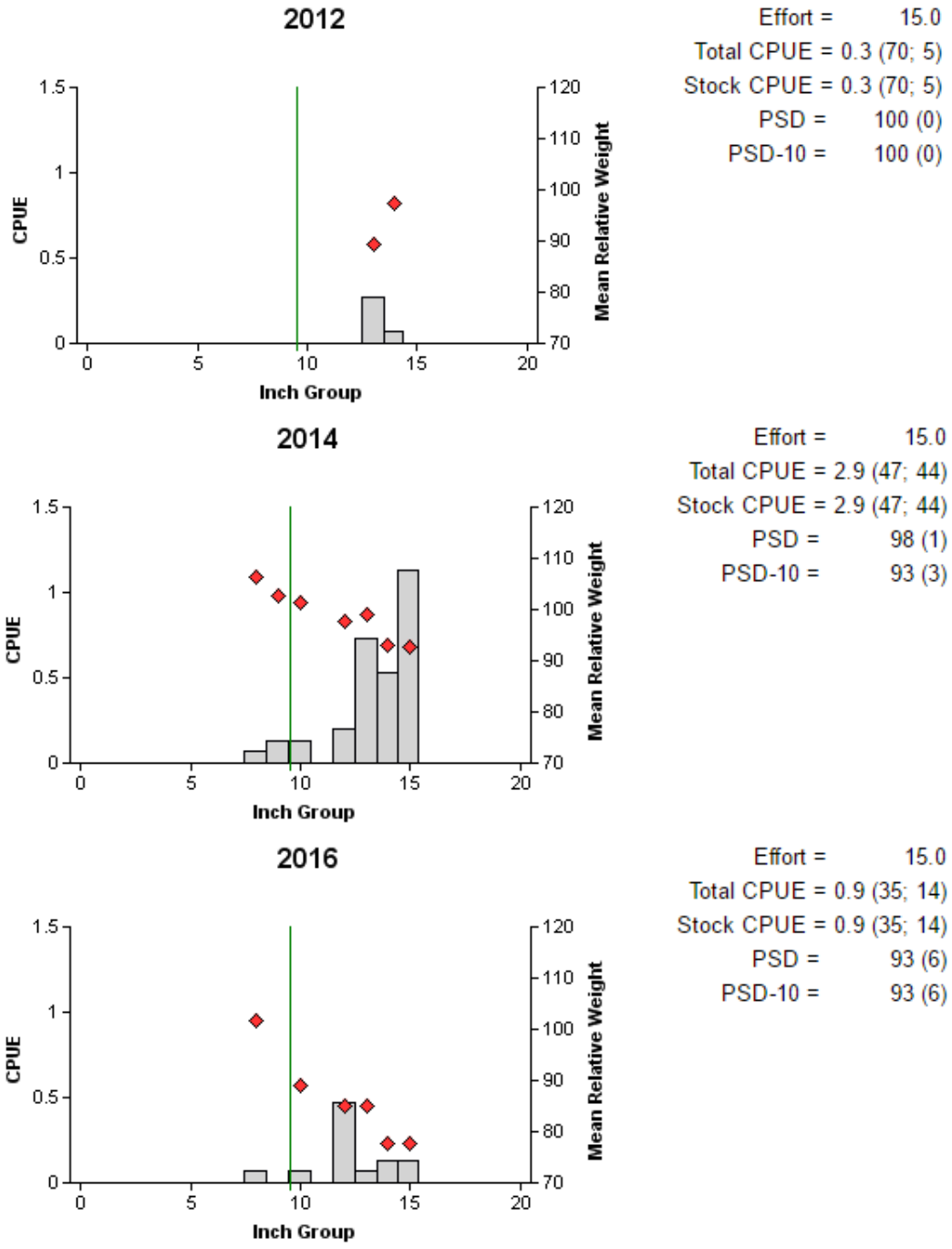


Figure 7. Number of White Bass caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Fork, Texas, 2012, 2014 and 2016. Vertical lines indicate minimum length limit at time of survey.

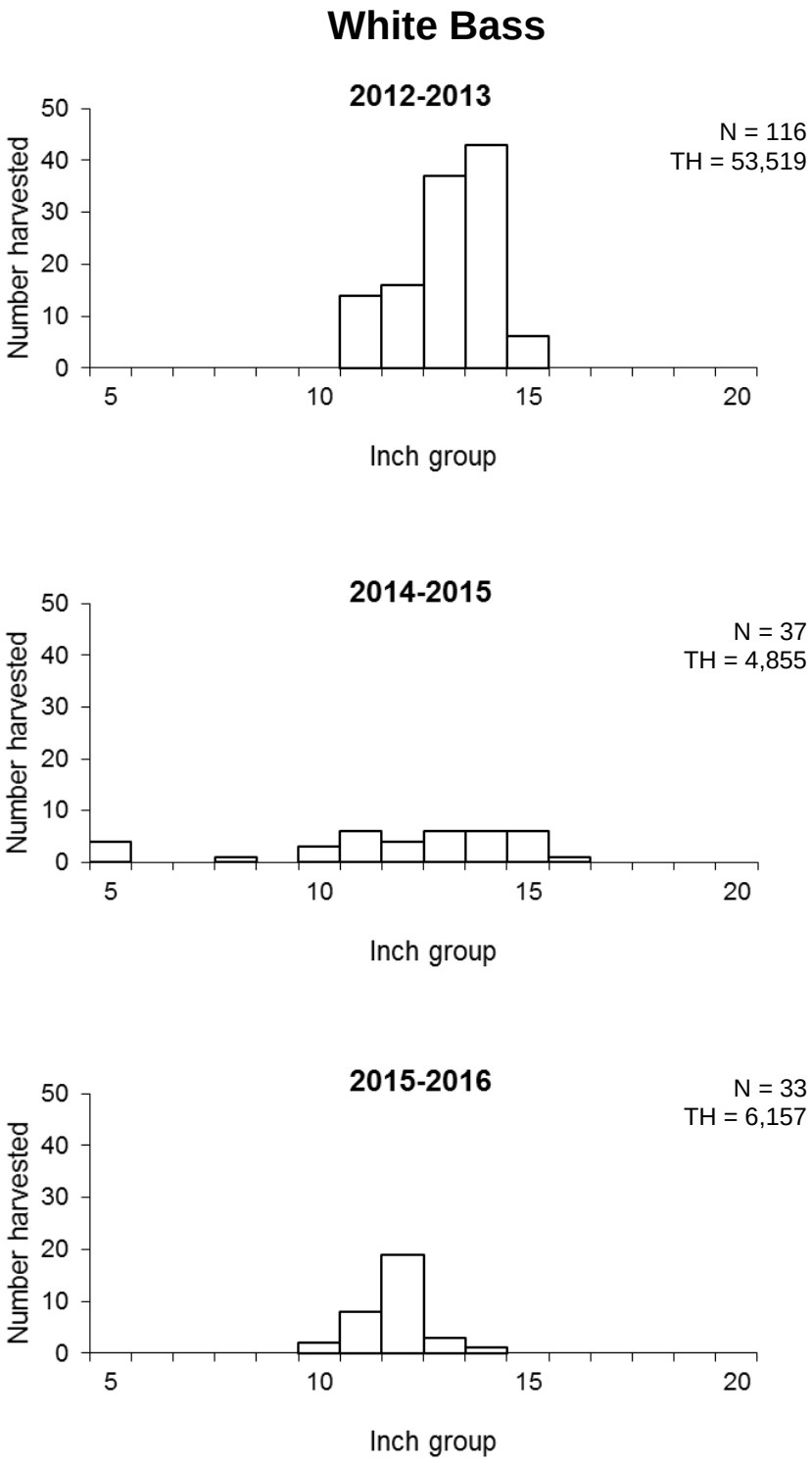


Figure 8. Length frequency of harvested White Bass observed during creel surveys at Lake Fork, Texas, June 2012 to May 2013, June 2014 to May 2015 and June 2015 to May 2016, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass - fall

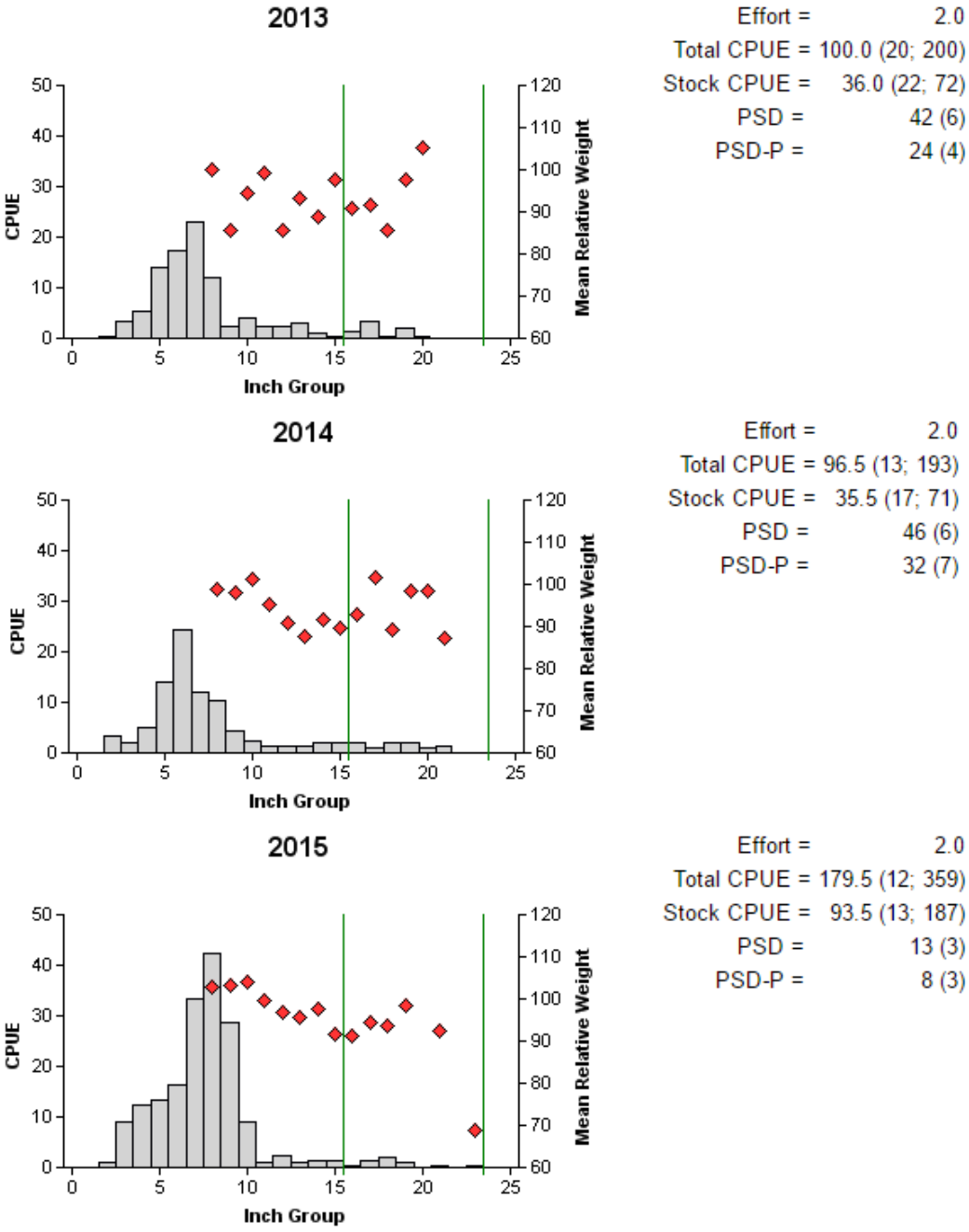


Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork, Texas, 2013 through 2015. Vertical lines indicate the lower and upper bounds of the protected slot length limit at time of survey.

Largemouth Bass - spring

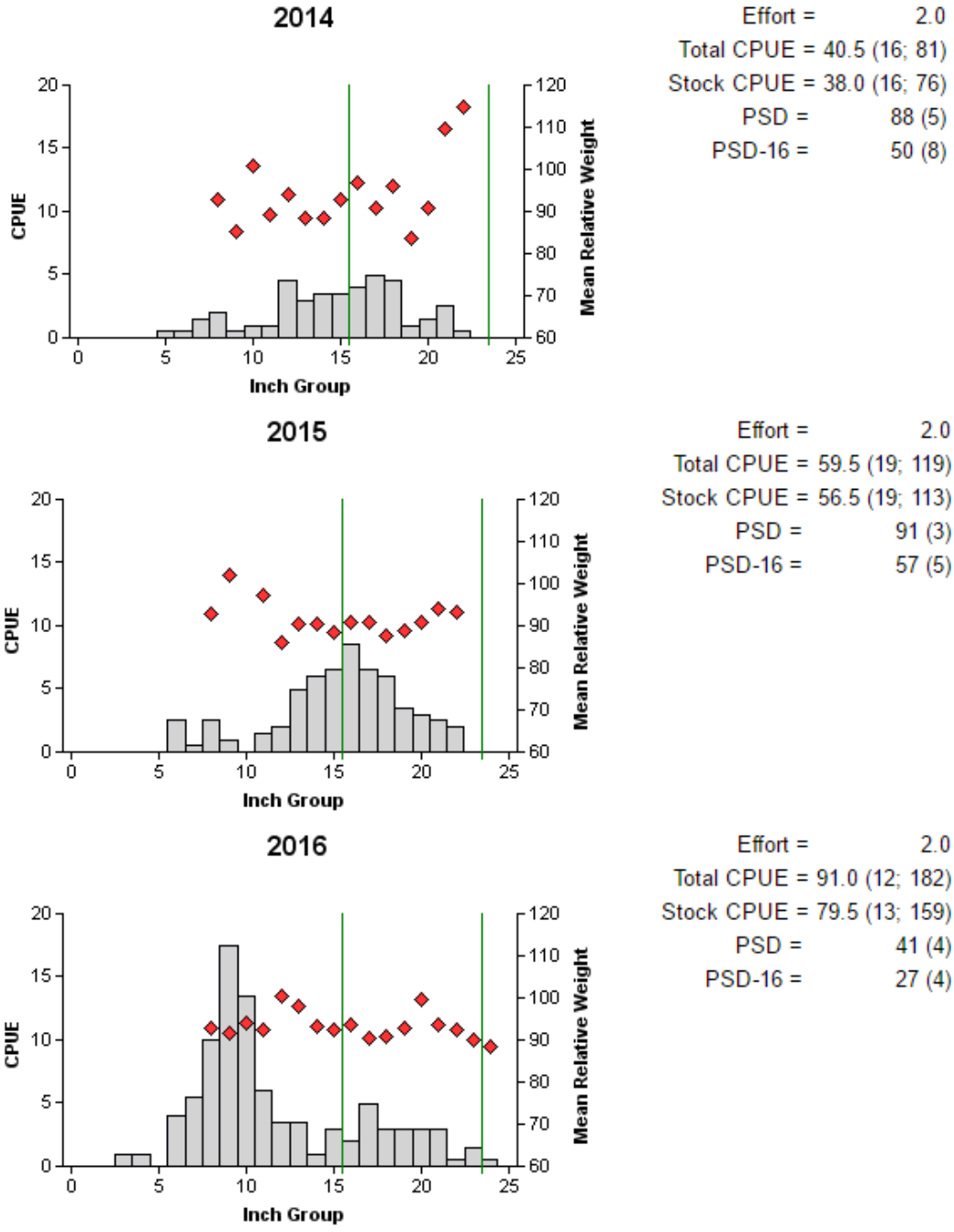
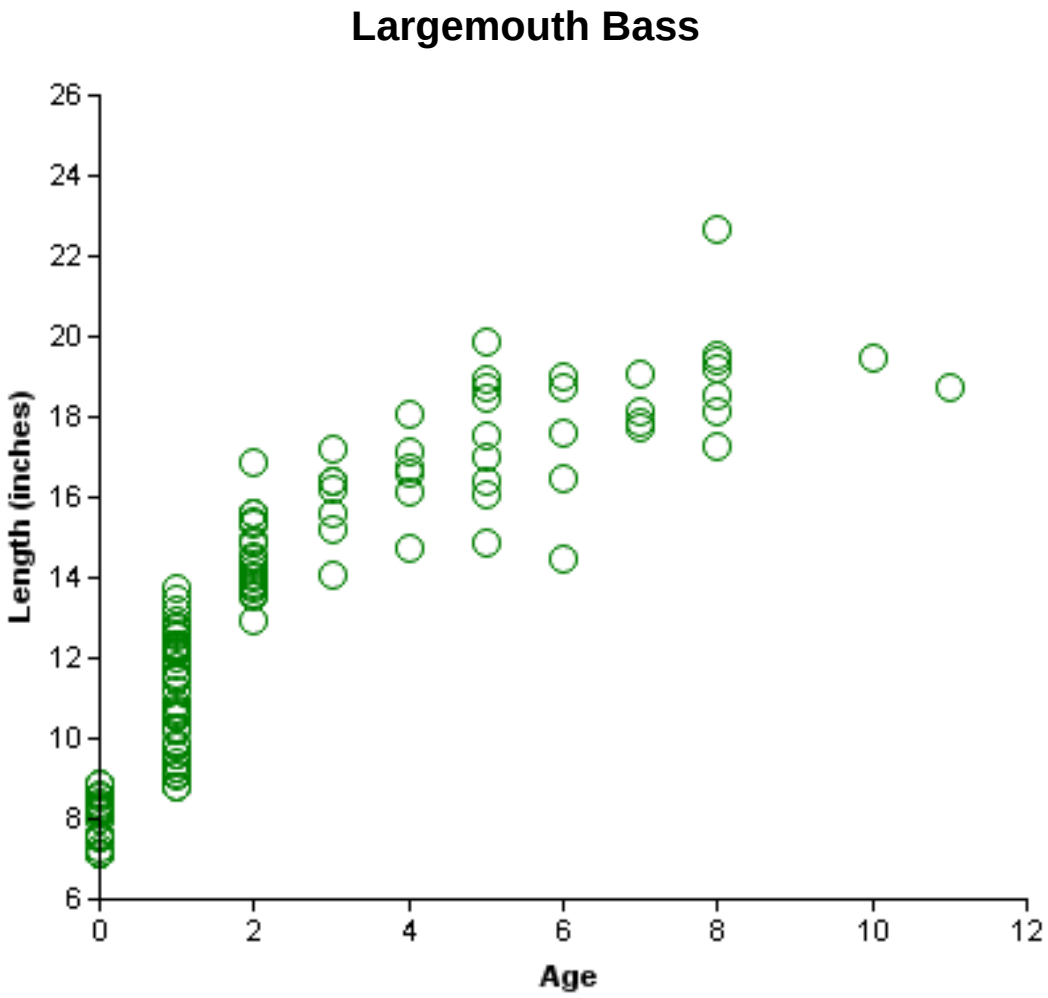


Figure 10. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for spring electrofishing surveys, Lake Fork, Texas, 2014 through 2016. Vertical lines indicate the lower and upper bounds of the protected slot length limit at time of survey.



Age	Mean length (in)	N
0	7.9	21
1	11.2	43
2	14.5	19
3	15.9	7
4	16.6	6
5	17.5	9
6	17.3	5
7	18.2	4
8	19.2	7
10	19.5	1
11	18.7	1

Figure 11. Length-at-age for Largemouth Bass (sexes combined; N=123) collected from fall electrofishing at Lake Fork, Texas October 2014

Table 9. Creel survey statistics for Largemouth Bass at Lake Fork from 2006 through 2013 and 2014 through 2016. Survey periods were from June 1 through May 31. 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. *Harvest includes traditional harvest and fish temporarily retained during live-release fishing tournaments

Creel Survey Statistic	Year								
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2014-2015	2015-2016
Surface area (acres)	24,001	26,889	26,178	26,889	24,510	23,007	23,741	23,792	24,001
Directed angling effort (h)									
Live-release tournament effort	160,434 (14)	181,813 (17)	329,684 (22)	95,388 (35)	164,084 (24)	68,508 (22)	253,346 (26)	211,616 (17)	422,529 (26)
Non tournament	528,154 (14)	604,657 (16)	653,641 (16)	426,262 (16)	314,027 (17)	372,044 (16)	243,284 (20)	289,029 (14)	346,411 (25)
All bass anglers combined	688,588 (13)	786,469 (15)	983,325 (17)	521,650 (18)	478,111 (17)	440,552 (15)	496,630 (21)	500,645 (16)	768,940 (21)
Angling effort/acre	28.69 (13)	29.25 (15)	37.56 (17)	19.40 (18)	19.51 (17)	19.15 (17)	20.92 (21)	21.04 (14)	32.04 (25)
Catch rate (number/h)	0.40 (8)	0.41 (8)	0.41 (8)	0.64 (13)	0.91 (15)	0.59 (12)	0.42 (12)	0.31 (11)	0.38 (13)
Harvest									
Non-tournament harvest	4,300 (46)	2,253 53)	12,685 (61)	1,760 (89)	2,291 (79)	4,570 (60)	789 (105)	647 (226)	1,702 (107)
Tournament weigh-in and release	22,925(37)	19,933 (36)	87,927 (50)	35,818 (53)	76,496 (39)	21,186 (64)	32,064 (45)	17,121 (50)	55,624 (59)
Harvest*/acre	1.13 (29)	0.83 (31)	3.79 (47)	1.40 (49)	3.21 (37)	1.12 (52)	1.38 (43)	0.75 (42)	2.39 (57)
Release by weight									
<4.0 lbs						201,487(35)	194,171 (44)	74,985 (34)	375,969 (42)
4.0-6.9 lbs						56,343 (42)	62,275 (48)	30,148 (34)	36,899 (56)
7.0-9.9 lbs						4,660 (89)	5,778 (74)	3,824 (48)	4,568 (94)
≥10.0 lbs						210 (234)	1,090 (135)	295 (93)	373 (114)
Percent legal released (non-tournament)	97	99	93	98	98	96	98	97	98

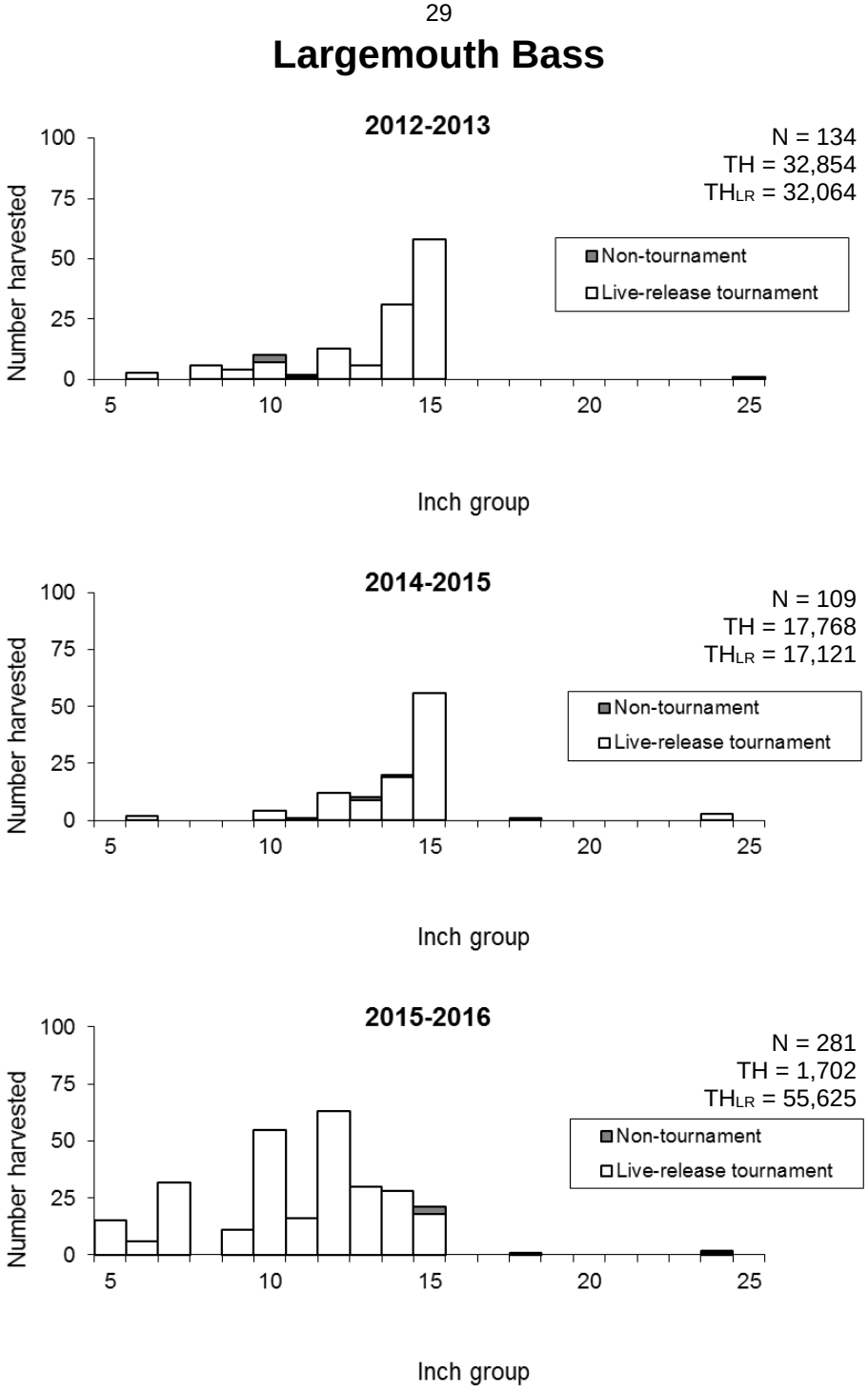


Figure 12. Length frequency of harvested Largemouth Bass observed during creel surveys at Lake Fork, Texas, June 2012 to May 2013, June 2014 to May 2015 and June 2015 to May 2016, separated by angler type. N is the number of harvested Largemouth Bass observed during creel surveys which includes fish transported to weigh-ins at live-release tournaments. TH is the total estimated harvest for the creel period and TH_{LR} is the total estimated number of fish retained by anglers participating in live-release tournaments.

Largemouth Bass

Table 10. Results of micro-satellite DNA genetic analysis of Largemouth Bass collected by fall electrofishing, Lake Fork, Texas, 2006 through 2009, 2011, 2013, and 2015. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation intergrade between an FLMB and an NLMB, Fx = second or higher generation intergrade between an FLMB and an NLMB. Samples collected prior to 2011 were composed exclusively of Age-0 fish.

		Number of fish						
Year	Sample size	FLMB	F1	Fx	Combined intergrades	NLMB	% FLMB alleles	% FLMB
2006	30	0	[a]	[a]	30	0	48.0	0.0
2007	30	0	[a]	[a]	30	0	53.4	0.0
2008	30	0	1	29	30	0	52.0	0.0
2009	30	0	0	30	30	0	48.0	0.0
2011	30	0	0	30	30	0	53.0	0.0
2013	30	2	2	26	28	0	57.0	6.7
2015	30	0	0	30	30	0	52.0	0.0

[a]Analysis did not separate F1 from Fx hybrids

Table 11. Creel survey statistics for crappies (White and Black combined) at Lake Fork from 2006 through 2013 and 2014 through 2016. Survey periods were from June 1 through May 31. 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. [RSE for directed effort and total harvest is the same as directed effort/acre and total harvest/acre, respectively]

Creel Survey Statistic	Year								
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2014-2015	2015-2016
Surface area (acres)	24,001	26,889	26,178	26,889	24,510	23,007	23,741	23,792	24,001
Directed effort (h)	108,632 (13)	103,758 (17)	98,751 (20)	147,926 (19)	65,152 (22)	106,330 (20)	71,876 (22)	103,618 (20)	73,807 (24)
Directed effort/acre	4.53 (13)	3.89 (17)	3.77 (20)	5.50 (19)	2.66 (22)	4.62 (20)	3.03 (22)	4.36 (20)	2.51 (24)
Total catch per hour	1.69 (24)	1.87 (27)	1.93 (30)	1.49 (26)	1.71 (46)	2.36 (34)	0.91 (32)	1.29 (20)	1.63 (34)
Total harvest	185,782 (32)	138,423 (32)	245,474 (48)	126,472 (44)	89,851 (53)	104,809 (49)	100,882 (56)	127,055 (40)	96,994 (53)
Harvest/acre	7.74 (32)	5.15 (32)	9.38 (48)	4.70 (44)	3.67 (53)	4.56 (49)	4.25 (56)	5.34 (40)	4.04 (53)
Percent legal released	5	7	4	7	5	4	15	19	5

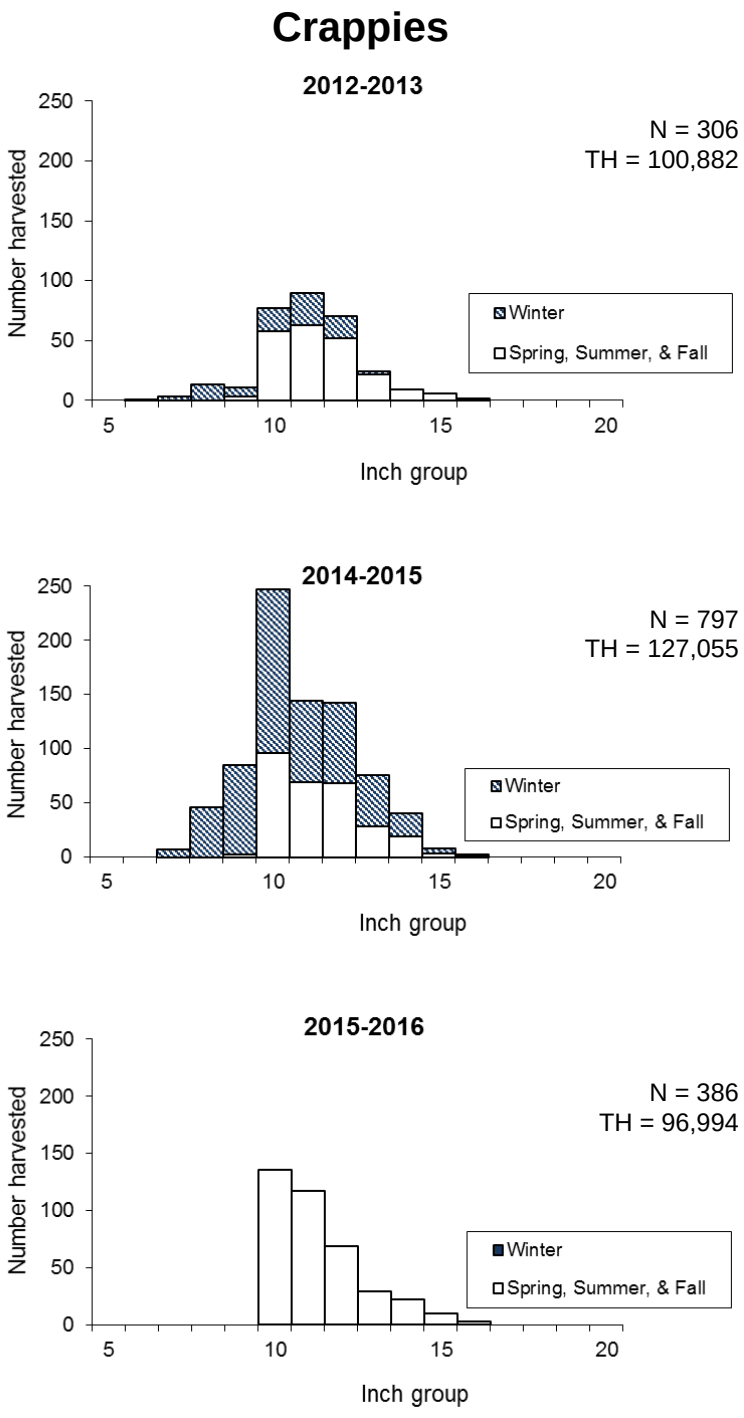


Figure 13. Length frequency of harvested Crappie (White and Black combined) observed during creel surveys at Lake Fork, Texas, June 2012 to May 2013, June 2014 to May 2015 and June 2015 to May 2016, all anglers combined separated by creel quarter. N is the number of harvested Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 12. Proposed sampling schedule for Lake Fork, 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.

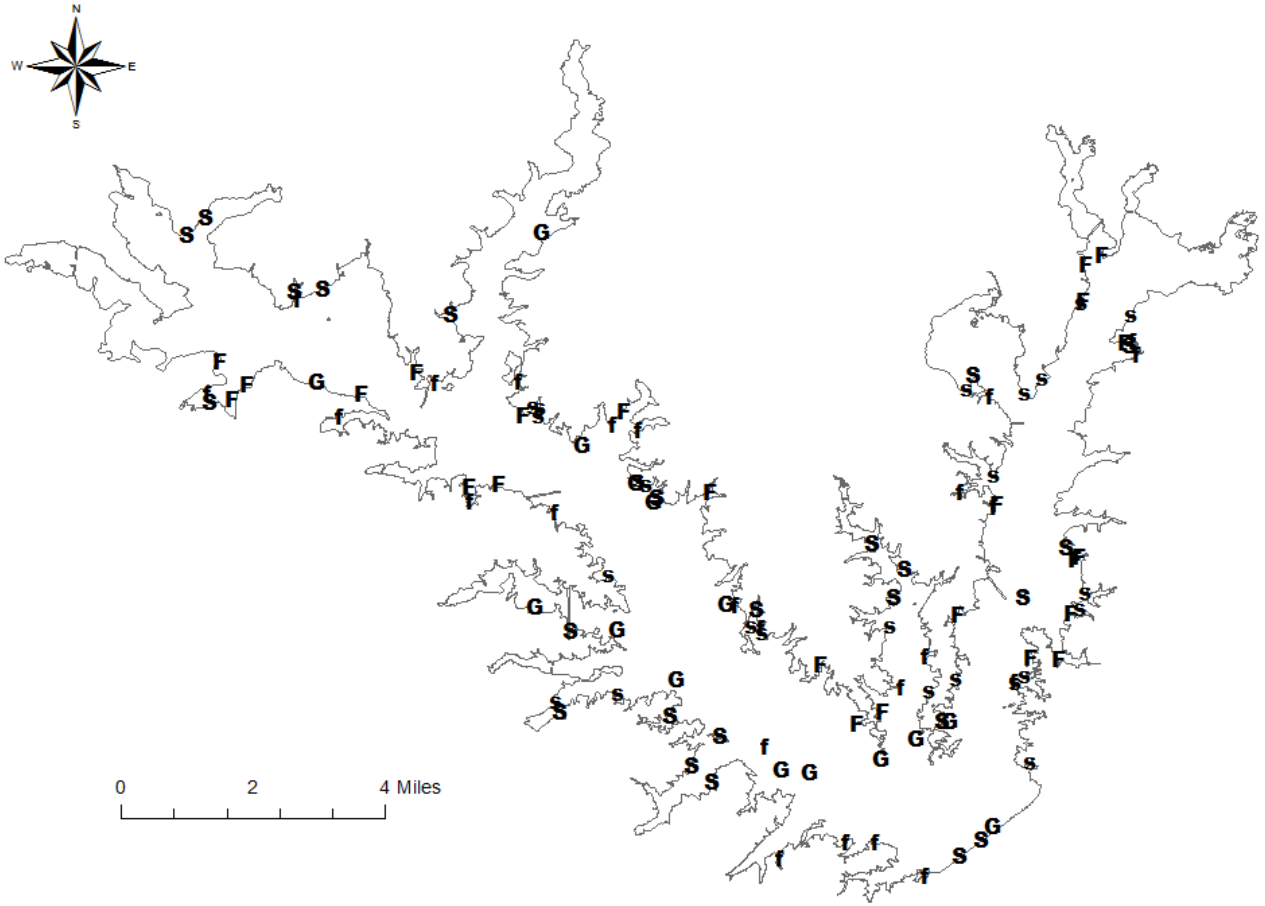
Survey Year	Electrofishing Spring/ Fall	Access survey	Gill netting	Creel survey	Vegetation survey	Report
Summer 2016-Spring 2017				A	A	
Summer 2017-Spring 2018	S/S	S	S		S	S
Summer 2018-Spring 2019				A	A	
Summer 2019-Spring 2020	S/S		A	A	A	A

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from gill netting and electrofishing, Lake Fork, Texas, 2015-2016. Sampling effort was 15 net nights for gill netting, and 2 hours for electrofishing for each sample.

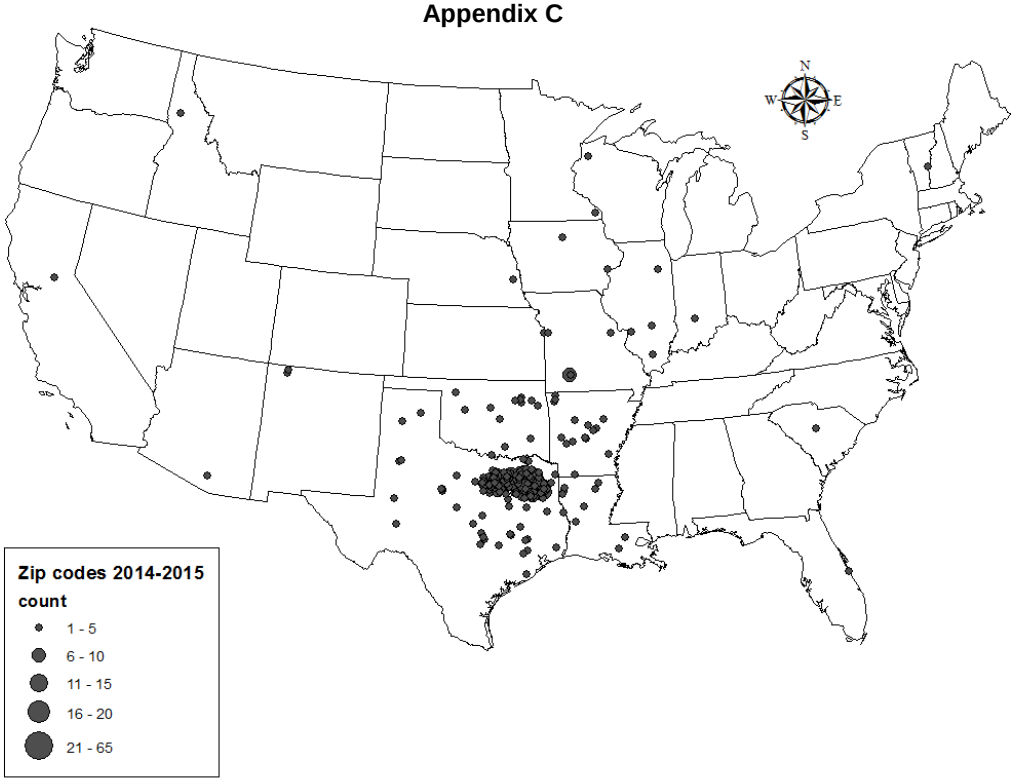
Species	Gill Netting		Electrofishing – Fall		Electrofishing - Spring	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad			326	163.00		
Threadfin Shad			65	32.50		
Channel Catfish	171	11.47				
Flathead Catfish	1	0.07				
White Bass	15	1.00				
Warmouth			15	7.50		
Bluegill			429	214.50		
Longear Sunfish			47	23.50		
Redear Sunfish			103	51.50		
Largemouth Bass			359	179.50	182	91.00

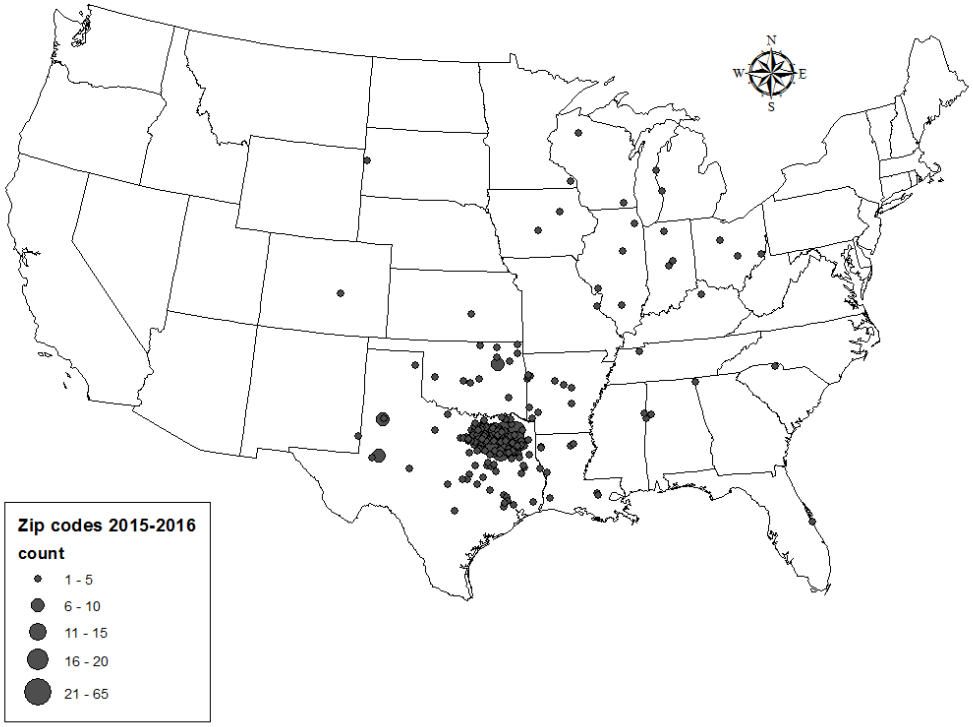
APPENDIX B



Location of sampling sites in fall electrofishing 2014 (F) and 2015 (f), spring electrofishing 2015 (S) and 2016 (s), and spring gill netting 2016 (G), Lake Fork, Texas, 2014-2016.

Appendix C





Location, by ZIP code, and frequency of anglers that were interviewed at Lake Fork, Texas, during the June 2014-May 2015 (N=872) and May 2015-June 2016 (N=879) creel surveys.