

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-32

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

Lake Fork Reservoir

Prepared by:

Kevin W. Storey and Aaron K. Jubar
Inland Fisheries Division
District 3B, Tyler, Texas



Robert L. Cook
Executive Director

Phil Durocher
Director, Inland Fisheries

July 31, 2007

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Fork Reservoir were surveyed in 2006 using electrofishing and trap netting and in 2007 using electrofishing. Anglers were surveyed from June 2006 to May 2007 with an access point creel survey. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Lake Fork Reservoir is a 27,264-acre impoundment located on Lake Fork Creek, a tributary of the Sabine River, approximately 5 miles northwest of Quitman, Texas. Water levels reached an historic low level of 5.3 feet below conservation pool elevation during December 2006 as a result of a prolonged drought. Total coverage of hydrilla in summer 2006 accounted for 3.8% of the lake surface area, down from 4.8% in 2005.
- **Management history:** Important sport fishes include largemouth bass, crappie (white and black), and channel catfish. The management plan from the 2005 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 annual access creel survey. District staff continue to promote the Lake Fork Trophy Bass Survey. Waterhyacinth abundance and distribution is monitored through annual vegetation surveys and recommendations are made to the Aquatic Habitat Enhancement staff to continue annual spraying to control its spread.
- **Fish community**
 - **Prey species:** Abundant clupeid (threadfin and gizzard shad) and sunfish populations provide plentiful prey for largemouth bass and crappie. Gizzard shad size structure is optimal with the majority of individuals available as prey for adult largemouth bass. The majority of bluegill and redear sunfish collected in 2006 were less than 4 inches in length, making them available prey for most size classes of bass.
 - **Catfishes:** The quality of the catfish fishery continues to be good and accounts for 5.9% of total angler effort. Channel catfish is the predominant species although flathead catfish, blue catfish and yellow bullheads were also present.
 - **Temperate basses:** White bass, yellow bass and white x yellow bass hybrids are all present in the reservoir. There is a limited fishery for yellow bass. Anglers report increasingly frequent catches of white bass. This species has been collected in gill net sampling in spring 2004 and fall 2005, although abundances are low.
 - **Largemouth bass:** Largemouth bass are the dominant game fish in Lake Fork and in 2006 – 2007 the fishery received over 80% of total angler effort. Size distribution of the population remains consistent with previous years and relative weights continue to be high. Between three and four years of age, largemouth bass grow into the protected 16- to 24-inch slot-length limit.
 - **Crappie:** Crappie were the second most sought game fish accounting for 12.6% of total directed effort. Black crappie accounted for 82.6% of crappie observed in creel surveys. The winter quarter (December 2006-February 2007) was responsible for 63% of the entire year's harvest of crappie.
- **Management strategies:** Stock FLMB to enhance largemouth bass genetics. Continue to monitor the 16 to 24 inch slot length limit. Conduct annual vegetation surveys of waterhyacinth

and recommend chemical control as needed. Continue to promote the Lake Fork Trophy Bass Survey. Conduct electrofishing surveys in fall 2007 and spring 2008 and continue annual access point creel survey.

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INTRODUCTION

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

Reservoir Description

Lake Fork Reservoir is a 27,264-acre reservoir on Lake Fork Creek and Caney Creek that was impounded in 1980. It is located approximately 5 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. Habitat observed during the most recent survey consisted mainly of featureless shoreline and standing timber resulting from low lake elevation. Boat docks (5.2%), eroded bank (4.7%) and concrete (3.6%) in combination with other habitat types added to the diversity of shoreline habitat in the reservoir. Total coverage of hydrilla in summer 2006 accounted for 3.8% of the lake surface area, down from 4.8% in 2005. Water levels reached an historic low of 5.3 feet below conservation pool elevation (cpe) during December 2006 as the result of a prolonged drought (Figure 1). Boat access consists of four public boat ramps and numerous private boat ramps. Bank fishing access at Lake Fork is limited to public boat ramps, an SRA day use area, and pay facilities at a number of private marinas. Other descriptive characteristics for Lake Fork Reservoir are shown in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Storey and Jubar 2005) included:

1. Stock FLMB fingerlings (25/acre) annually.
Action: Annual stockings of FLMB have been conducted in Lake Fork since 1995. From 1995 through 1999, fish were stocked at a rate of 25/acre throughout the reservoir. From 2000 to 2005 stockings were conducted at 100/acre in a 5,000-acre embayment north of Highway 154. Since 2006, fingerlings have been stocked in suitable habitat throughout the lake because embayment stockings did not have any detectable influence on population genetics. FLMB allele frequency of age-0 fish in fall 2006 was 48.0%, within the range observed since 1989 (32–58%; Table 9). No pure FLMB were collected in the 2006 sample, and all of the fish were integrades (F1 and/or Fx).
2. Continue to evaluate the 16 to 24-inch slot length limit.
Action: Annual electrofishing surveys are conducted in fall and spring to monitor the largemouth bass population, and an annual access point creel survey is employed to monitor directed angler effort, catch and harvest. The Lake Fork Trophy Bass Survey has yielded some of the most valuable information on the effectiveness of the slot limit in maintaining the quality of the largemouth bass fishery. Since March 2003, 32% of fish reported as measured were 24 inches or longer. The 2005-2006 creel survey estimated catch rate of fish in this size range of 0.003/hr.
3. Conduct annual aquatic vegetation surveys for waterhyacinth and recommend treatment if necessary.
Action: Waterhyacinth was first documented in Lake Fork in 1993 and an herbicide treatment was conducted in 1996. Imposition of a moratorium on spraying of aquatic vegetation by TPWD staff allowed the spread of this plant outside the Glade Creek area in 1998. Plant colonies were observed in 2000 in Lake Fork Creek and Little Caney Creek. Aquatic vegetation surveys have been conducted annually to monitor waterhyacinth

abundance and distribution since 1998. Herbicide applications were resumed in 2001 and since that time have been conducted annually by Aquatic Habitat Enhancement staff using chemicals purchased by the Sabine River Authority.

4. Promote the Lake Fork Trophy Bass Survey.

Action: The Lake Fork Trophy Bass Survey was started as a cooperative project of TPWD, the Lake Fork Chamber of Commerce and the Lake Fork Sportsmans' Association in March 2003. The survey provided an opportunity for anglers to report their catches of largemouth bass ≥ 7 pounds as well as fish ≥ 24 inches. District biologists provided monthly summaries of catches by weight class to participating marinas, outdoor writers, and Division administrators. News releases summarizing survey results have been distributed through media contacts as appropriate. From March 2003 through May 2007, 7,633 trophy largemouth bass were reported to the survey.

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

Action: District staff provided laminated posters on Lake Fork fishing regulations and the Lake Fork Trophy Bass Survey for display at boat ramps and local businesses. A special poster showing regulations and identification characteristics of white bass and yellow bass was created by District staff in response to concerns expressed by anglers. These posters were displayed at boat ramps and marinas. Biologists provided information on fisheries resources of Lake Fork through telephone interviews and written news releases to interested outdoor writers. Information on Lake Fork recreational facilities was provided to anglers by mail, e-mail, or by telephone. Jubar providing information on habitat and fishing techniques to Fishing Hotspot Maps to assist with the development of a new Lake Fork fishing map that will benefit anglers.

6. Update ramp use probabilities to more effectively sample anglers based on seasonal ramp use patterns

Action: In June 2006, ramp use probabilities for the creel survey were recalculated based on observed numbers of surveys conducted at each ramp from June 2001 to May 2006. These revised estimates were used in the generation of creel schedules beginning on September 1, 2006.

Harvest regulation history: Sport fishes in Lake Fork Reservoir are managed with statewide regulations with the exception of largemouth bass and crappie (Table 2). From 1980 to 1985, largemouth bass were managed with a 14-inch minimum length limit, 5 fish daily bag limit. A 14 to 18-inch slot length limit, 5 fish daily bag limit was implemented in September 1985 to improve the population size structure. In September 1993, the slot limit was modified to a 14 to 21-inch slot length limit, 3 fish daily bag limit, with one fish over 21 inches. In September 1995 the bag limit was relaxed to 5, to make largemouth bass bag limits consistent across the state. In September 1998 the slot length limit was increased to a 16 to 22-inch slot, 5 fish daily bag with 1 fish over 22. This encouraged harvest of fish under the slot and provided heavier fish for tournament weigh-ins. Over the next 2 years the upper end of the slot increased by 1 inch each year until in September 2000, the limit became the current 16 to 24-inch slot, 5 fish daily bag with 1 fish over 24.

In 1985, a 10-inch minimum length limit, 25 fish daily bag limit was imposed for white and black crappie. In September 1991, the current length limit waiver from December 1 through the last day of February was imposed. Anglers are required to keep the first 25 fish caught, regardless of size. This regulation was instituted as a result of angler concerns about the death of crappie caught in deep water during winter months.

Stocking history: Lake Fork Reservoir has a long history of FLMB stockings. Prior to 1995, fish of various sizes (fry, fingerlings, advanced fingerlings, and adults) were stocked in Lake Fork (Table 3). Since 1995, annual stockings of fingerling FLMB have been conducted. From 2000 to 2005 stockings of

FLMB were conducted at 100/acre in a 5,000-acre embayment north of Highway 154. During that time no detectable change in population genetics was observed so lakewide stockings were resumed in 2006. Spotted bass adults were stocked prior to impoundment in 1979, but there are no records of these fish surviving. Blue catfish fingerlings were stocked on three occasions between 1980 and 1985 and channel catfish fingerlings were stocked on four occasions between 1977 and 1984. Flathead catfish were introduced in 1979, and redear sunfish and coppernose bluegill in 1981.

Vegetation/habitat history: Lake Fork Reservoir supports a diverse mix of aquatic vegetation species including invasive species such as hydrilla, Eurasian watermilfoil, and waterhyacinth. Hydrilla distribution is cyclical, probably in response to drought events. This plant has never caused the access problems observed in many other systems and it has always been considered beneficial habitat. Waterhyacinth was first documented in Lake Fork in 1993 and an herbicide treatment was conducted in 1996. The plant spread outside the Glade Creek area in 1998 as a result of a moratorium on spraying of aquatic vegetation by TPWD staff. By summer 2000, plant colonies had spread to Lake Fork Creek and Little Caney Creek. By the following year colonies were observed in Birch Creek.

METHODS

Fishes were collected by electrofishing (2 hours at 24 5-min stations) in spring and fall, and trap netting in fall (30 net nights at 30 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for trap nets, as the number of fish per net night (fish/nn). Survey sites were randomly selected.

Aquatic vegetation and littoral habitat surveys were performed according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005). Shoreline distances and areas of vegetation were estimated using ArcView GIS software.

An access point angler creel survey consisting of 72 survey days (3 weekdays, 3 weekend days per month) was conducted from June 2006 to May 2007 to estimate angler catch and harvest rates and angling effort in accordance with Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and relative weight (W_r) were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error ($RSE = 100 \times [SE \text{ of the estimate} / \text{estimate}]$) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Largemouth bass electrofishing catch rate data was evaluated to determine if abundance was significantly different across years. Catch at individual stations (5 minutes of sampling at each station was used to calculate mean catch rates (MCPE) for each year and season. Analysis of variance (ANOVA) was used to test for significant difference across years. If ANOVA revealed a significant difference ($P < 0.05$), the Tukey-Kramer multiple range test (controlled for an overall error rate) was used to separate significantly different means.

Ages were determined from otoliths of largemouth bass from 14 specimens with lengths ranging from one inch below to one inch above the lower end of the slot length limit (16 inches). Ages were determined from otoliths of white crappie collected in trap netting from 14 specimens with lengths ranging from one inch below to one inch above the minimum length limit.

A sample of 30 age-0 largemouth bass were collected by electrofishing in fall 2006 and subjected to genetic analysis using DNA microsatellite analysis in accordance with Fishery Assessment Procedures

(TPWD, Inland Fisheries Division, unpublished manual revised 2005).

In March 2003, Texas Parks and Wildlife Department instituted the Lake Fork Trophy Bass Survey in conjunction with the Lake Fork Area Chamber of Commerce and the Lake Fork Sportsman's Association. This voluntary reporting survey is designed to document catches of largemouth bass 7 pounds and larger and catches of fish over 24 inches. Actual weights and lengths or estimated values are accepted. Anglers can record their catches at thirteen reporting stations around the lake. At the beginning of each month, district personnel collect ledgers and analyze the data and distribute monthly summaries electronically.

Water elevation data (Figure 1) was obtained from the Sabine River Authority (SRA) website at http://www.sra.dst.tx.us/basin/lake_fork_monthly.asp.

RESULTS AND DISCUSSION

Habitat: Total coverage of hydrilla in summer 2006 (Table 4) accounted for 3.8% of the lake surface area as compared with 4.8% in 2005 (Storey and Jubar 2005). Waterhyacinth coverage was estimated at 10.2 acres. Native submerged vegetation species (primarily coontail) accounted for 2.0% of the reservoir surface area in 2006, American lotus accounted for 1.3%, and native emergent species represented less than 0.1% of the surface area. Total aquatic vegetation coverage was estimated at 7.9% of reservoir surface area. Habitat observed during the most recent survey consisted mainly of featureless shoreline and standing timber as a result of low lake elevation. Boat docks (5.2%), eroded bank (4.7%) and concrete (3.6%) in combination with other habitat types added to the diversity of shoreline habitat in the reservoir. Water levels reached an historic low level of 5.3 feet below cpe during December 2006 as a result of a prolonged drought (Figure 1).

Creel: Directed fishing effort by anglers was highest for largemouth bass (80.3%), followed by crappie (12.6%), and catfish (5.9%), similar to levels observed in 2005-2006 (Table 5). Total fishing effort for all species at Lake Fork Reservoir was 807,892 h from June 2006 to May 2007, and anglers spent an estimated \$7,858,137 in direct expenditures (Table 6). Effort and expenditures were within the ranges observed in the previous 5 years. As expected, the highest effort (403,614 h) and trip expenditures (\$4,072,897) were observed during the spring quarter (March to May).

Relative standard errors (RSE) of fishing effort and directed expenditure estimates were lower than the target level (20%) for monitoring trends set by Fisheries Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005) (Table 6). In addition RSEs of directed effort for catfish (Table 7), largemouth bass (Table 8) and crappie (Table 10), and angler catch rate of largemouth bass were all lower than the target level.

Prey species: Lake Fork contains abundant clupeid and sunfish populations. Gizzard shad size structure was optimal with the majority of fish available as prey for adult largemouth bass. The index of vulnerability (IOV) indicated 50% of gizzard shad were available to existing predators (Figure 2). Threadfin shad were also present and they provided prey for bass and crappie. The majority of bluegill and redear sunfish collected in 2006 fall electrofishing samples were less than 4 inches in length. Electrofishing catch rates of gizzard shad, bluegill and redear sunfish were 103.0/h, 204.0/h and 138.5/h respectively. Few sunfish were observed in the creel survey and 1.1% of total angler effort was directed to sunfish (Table 5).

Channel catfish: Catfish were the third most popular group in terms of directed angler effort. Fishing effort in 2006-2007 was the highest observed from 2000-2007 (Table 5). Anglers targeting catfish harvested 67% of fish caught in 2006-2007. During the same time period, 20% of legal sized fish caught by all anglers were released, but 68% of all catfish caught were harvested. Observed harvest from June 2006 to May 2007 showed good angler compliance (100%) with the length limit, and harvested fish ranged

in length from 12 to 31 inches (Figure 5). Other catfish species, including blue catfish, flathead catfish, and yellow bullhead were present in the reservoir but contributed little to the total fishery.

Temperate basses: White bass, yellow bass and white x yellow bass hybrids are present in the reservoir. There is a limited fishery with low directed effort for yellow bass (Table 5). There is an expanding population of white bass that were probably introduced into the lake by anglers. A few fish have been collected in gill netting in previous years (Storey and Jubar 2005). Anglers report occasional catches of this species and two fish were harvested in the creel survey. In response to angler concerns, District staff created posters showing regulations and identification characteristics of white bass and yellow bass and displayed these at boat ramps and marinas.

White x yellow bass hybrids are periodically caught and submitted as world record yellow bass, but after genetic testing they have all been identified as hybrids. The current lake record is 4.75 pounds. Temperate bass populations in Lake Fork are unlikely to negatively impact existing fish populations and they have the potential to provide alternative fisheries resources, but they may provide identification challenges to anglers and law enforcement.

Largemouth bass: The largemouth bass population has remained stable and continues to provide a high quality fishery. Statistical testing of electrofishing catch rate data (analysis of variance) in both spring (1997-2007) and fall (1996-2006) revealed no significant difference ($P < 0.05$) among years. Population size structure has remained stable with PSD in spring samples ranging from 64-75 (Figure 6) and estimates from fall samples ranging from 32-50 (Figure 7) during the past five electrofishing surveys. Body condition was above average indicating the presence of abundant and readily available prey fish populations. Mean relative weight of all sizes of fish within the protected slot limit were above 90 in both spring and fall. Average age at 16 inches (mean = 16.4 inches, range = 15.2 – 17.8 inches) was 2.6 years ($N = 14$; range = 2 - 5 years), which indicates largemouth bass in Lake Fork grow to the lower end of the protected slot length limit, between three and four years of age.

Lake Fork continues to receive high directed angler effort for largemouth bass. In 2006-2007, largemouth bass angling effort accounted for 80.3% of total fishing effort. The effort in 2006-2007 (23.80 h/acre) was higher than all previous years except 2000-2001. The spring creel quarter (March to May) received the highest percentage of total effort for largemouth bass (55.5%), followed by summer (June to August) (20.5%), fall (September to November) (14.2%) and winter (December to February) (9.8%). Total directed expenditures in 2006-2007 were estimated at \$7,858,137, the highest observed since 2000-2001.

Catch rate for anglers targeting largemouth bass during 2006-2007 (0.40/h) was similar to other years (range 0.27-0.45/h) and the estimated number of bass caught (11.54/acre) has remained similar for the past three years (Table 8). In 2006-2007, fish within the protected slot limit (16-24 inches) accounted for 42.7% of released largemouth bass, which is at the upper end of the range observed for the past five years (26-43%). Fish below the slot limit accounted for 58.0% of releases, within the previously observed range (55-71%). In 2006-2007, largemouth bass harvest was 0.02/hour, a rate which includes anglers possessing fish for live release tournament weigh-ins.

Standard fisheries sampling methods do not effectively sample fish above the upper end of the slot length limit (≥ 24 inches), which makes evaluation of the 16-24 inch slot limit difficult. Catch rate of largemouth bass 24 inches or longer reported in creel surveys by anglers targeting largemouth bass was low (0.002/h), and accounted for 0.5% of bass released by all anglers. Since spring 1990, District staff have conducted 69 hours of electrofishing and collected 7,158 stock-sized fish only five of which were ≥ 24 inches. The Lake Fork Trophy Bass Survey (see Appendix E) has provided an alternative method of collecting data on trophy-sized fish and it provides evidence that the slot limit is enabling anglers to catch large numbers of fish over 24 inches. Since March 2003, a total of 7,633 largemouth bass have been

reported in the Lake Fork Trophy Bass Survey by anglers from 47 states. Anglers measured 62.9% of their entries, and 32.1% of these were ≥ 24 inches. Fish in the 22 and 23-inch classes were most abundant of the measured entries, representing 29.5% and 30.0% of the total, respectively. Anglers weighed 82.4% of their entries, and of these fish, 16.2% were ≥ 10 pounds. By far, the vast majority of entries were 7 pound (40.4%) and 8 pound fish (29.1%). The top 5 states of reporting-angler origin were Texas (62.1%), Oklahoma (6.5%), Missouri (6.2%), Louisiana (4.9%), and Arkansas (3.9%). As expected, most trophy fish catches occurred during spring.

Annual stockings of Florida strain largemouth bass (FLMB) have maintained the FLMB allele frequency above 30% (Table 9). In 2006, FLMB allele frequency of age-0 fish was 48.0%, within the range observed since 1989 (32–58%). Unlike previous years, no pure Florida bass were observed in the sample of age-0 fish collected in fall 2006. The method of genetic analysis changed in 2005 to DNA microsatellite analysis which is more accurate and this may explain the absence of pure Florida bass in the 2006 sample.

Crappie: Fall trap net catches of white crappie (Figure 10) were higher than black crappie (Figure 12) in fall 2006 (1.3/nm vs. 0.2/nm). Trap net catches on Lake Fork tend to be variable and are often quite low. Crappie mean relative weights exceeded 90 for all size classes in 2006 samples. Average age at 10 inches (mean = 10.5 inches, range = 9.2 – 11.9 inches) was 1.36 years (N = 14; range = 1 - 2 years), which indicates white crappie grew to legal size by two to three years of age. Too few black crappie were collected for age and growth determination.

Crappie were the second most popular sport fish at Lake Fork (Table 5). From 2006-2007 directed effort for crappie was 101,904 h, higher than in 2005-2006 but lower than all years previous back to 2000-2001. Total crappie catch rates (black and white combined) (1.69/h) were also similar to the previous year (1.62/h) but lower than other years (range 2.03-2.76). The estimated number of crappie caught during 2006-2007 (10.96/ac) has increased to the level observed in 2004-2005 (11.05/ac). Total estimated crappie harvest (172,981) has increased to the highest level since 2001-2002 (196,042).

The majority of harvested fish observed in creel surveys in 2006-2007 (82.6%) were black crappie. The most abundant size class of harvested crappie (black and white combined) was the 10-inch class which accounted for 44% of fish observed in creel surveys. Angler compliance with the minimum length limit, in effect from March through November, was high with illegal harvest accounting for only 2% of all crappie harvested. During the winter quarter (December to February) when there is no minimum length limit, crappie harvested that were less than 10 inches accounted for 37% of the fish harvested, similar to the previous year (44%) but higher than the last few years (27% in 2004-2005, 19% in 2003-2004 and 8% in 2002-2003). Though the winter quarter accounted for the lowest directed effort for crappie (17,339 h), 63% (108,342) of annual harvest occurred during this time. Although directed effort was highest in fall (31,762 h), angler harvest during this period accounted for only 15% of annual harvest.

District staff had observed apparent declining trends in crappie catch rates, and directed pressure, as well as changes in size composition and seasonality of harvest of Lake Fork's crappie population. The most recent creel estimates show some signs of improvement, most likely because the survey is sampling Lake Fork anglers more effectively. Recalculation of ramp use probabilities enables more effective sampling of anglers based on seasonal ramp use patterns. This was most noticeable during the winter quarter when harvest of crappie was highest.

Fisheries management plan for Lake Fork Reservoir, Texas

Prepared – July 2007.

ISSUE 1: Continue annual FLMB stocking. The percentage of FLMB alleles in samples of age-0 largemouth bass at Lake Fork have remained in the range of 30–60% for the last 17 years but the goal of 20% pure Florida largemouth bass has not been achieved.

MANAGEMENT STRATEGY

1. Stock FLMB (25/acre) annually.
2. Monitor genetic composition of age-0 largemouth bass population by assessing allele frequency from samples collected during fall electrofishing in 2007 and every four years thereafter.

ISSUE 2: Continue to monitor the largemouth bass 16 to 24-inch slot length limit. This regulation was adopted in September 2000 to enhance trophy fish production.

MANAGEMENT STRATEGY

1. Continue to monitor the largemouth bass population with biannual electrofishing surveys (spring and fall).
2. Continue to conduct annual access creel survey to monitor the fishery and collect data on catch, harvest and fishing effort.
3. Use results from the Lake Fork Trophy Bass survey to monitor angler catches of trophy bass (≥ 24 inches and/or ≥ 7 pounds).

ISSUE 3: Waterhyacinth control. Waterhyacinth was first documented in Lake Fork in 1993. By 1995 coverage had increased considerably. Herbicide treatments using 2,4-D were conducted by the TPWD Aquatic Habitat Enhancement staff (AHE) in 1996. In June 1998, the plant was reported for the first time outside the Glade Creek area, and since that time it has spread throughout the Caney Creek arm of the reservoir. In 2000, the plant had spread to Little Caney Creek and to sections of Lake Fork Creek. During a vegetation survey conducted in August 2006, the total area observed was 10.2 acres.

MANAGEMENT STRATEGIES

1. Continue annual monitoring of the distribution and acreage of waterhyacinth at Lake Fork.
2. Recommend annual spraying of waterhyacinth by AHE staff using herbicide purchased by the Sabine River Authority (SRA).

ISSUE 4: Continue to promote the Lake Fork Trophy Bass Survey, a cooperative venture of TPWD, the Lake Fork Area Chamber of Commerce, and the Lake Fork Sportsman's Association.

MANAGEMENT STRATEGIES

1. Continue the Lake Fork Trophy Bass Survey to obtain information on the catches of largemouth bass ≥ 7 pounds as well as fish ≥ 24 inches. Data gathered through this program will be used to quantify the catches of trophy bass as well as to monitor the performance of the slot limit.
2. Provide monthly summaries of catches by weight class to participating marinas and local media. Produce news releases summarizing survey results and distribute information on a statewide basis.
3. Continue to promote the program by providing laminated posters for display at public and private boat ramps and in area businesses. Provide marina ledgers to participants on a monthly basis.

ISSUE 5: Increase angler awareness of the fisheries resources at Lake Fork. There is a need to inform anglers of the significant fisheries for largemouth bass, crappie and catfish that exist in the reservoir. Fisheries regulations that govern Lake Fork's fisheries resources need to be prominently displayed and clearly communicated to anglers.

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. Continue to provide information packets on Lake Fork facilities to interested anglers by mail and e-mail.

ISSUE 6: Investigate impact of reducing creel effort on relative standard effort (RSE) of angler catch and harvest rates and angler effort estimates in order to accommodate additional access survey at Lake Tawakoni. Fishery Assessment Procedures sets target relative standard error (RSE) of creel survey estimates at 20 for monitoring trends in catch rates and angler effort.

MANAGEMENT STRATEGIES

1. Analyze 2006-2007 creel data using various levels of effort to calculate impact on RSE of catch and harvest rates, and directed effort.
2. Determine acceptable loss of precision and adjust effort accordingly.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes mandatory monitoring in 2007-2008 (Table 11), a standard ongoing annual access creel survey to monitor the lake's fisheries, electrofishing sampling in spring and fall each year to monitor the largemouth bass population, and gill netting every two years to monitor the channel catfish population as well as the expansion of the white bass population. Additional gill net sampling is scheduled in 2009-2010 as part of the monitoring of catfish and temperate bass populations. Waterhyacinth and hydrilla distribution and abundance will continue to be monitored annually through a vegetation survey. Management reports will be prepared on an annual basis.

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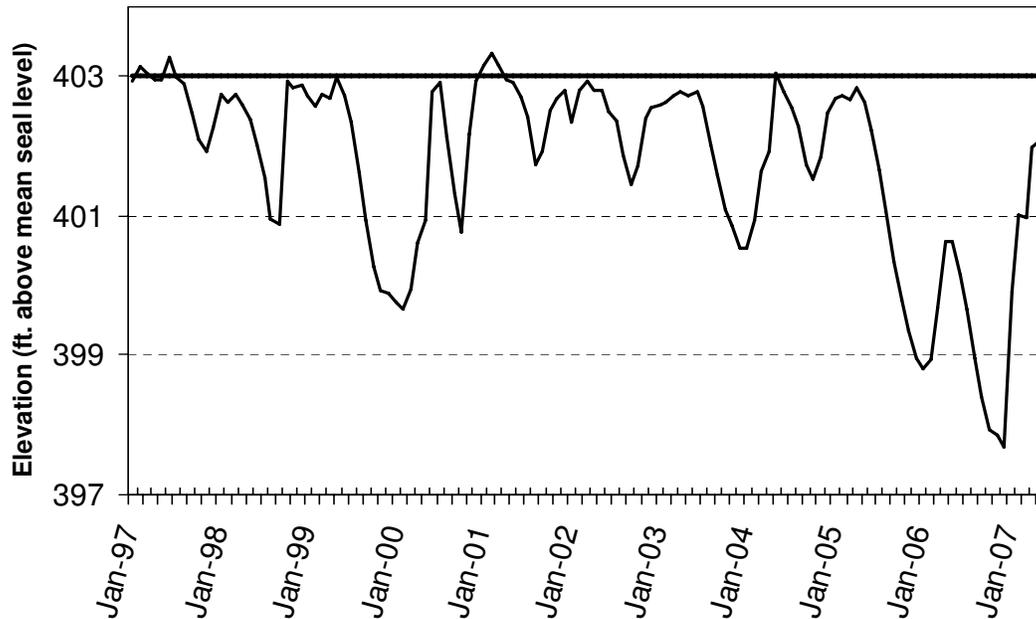


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Lake Fork Reservoir, Texas, January 1997 through May 2007. Bold horizontal line indicates conservation pool elevation; 403 ft. msl.

Table 1. Characteristics of Lake Fork Reservoir, 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)	13.5
Conductivity	135 μ mho / cm
Secchi disc range	4 – 6 ft.
Watershed area	490 mi ²

Table 2. Harvest regulations for Lake Fork Reservoir, Texas.

Species	Bag limit	Minimum-Maximum length (inches)
Catfish, channel and blue, 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 (1 fish 24 inches or longer)	16 – 24 slot length limit
Crappie, white and black, their hybrids and subspecies	25 (in any combination)	10 ¹ - No limit

¹The minimum length limit is waived from December 1st 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 3. Stocking history of Lake Fork Reservoir, Texas. Size Categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

Year	Number	Size	Year	Number	Size
<u>Blue catfish</u>			<u>Florida largemouth bass</u>		
1980	268,423	FGL	1978	103	ADL
1984	29,676	FGL	1979	740,815	FGL
1985	253,464	FGL	1979	561	ADL
	<u>551,563</u>		1980	330,800	FRY
<u>Channel catfish</u>			1980	300	ADL
1977	37,787	FGL	1982	49	ADL
1978	80,130	FGL	1987	250	FGL+
1980	137,545	FGL	1995	692,281	FGL
1984	102,103	FGL	1996	697,731	FGL
	<u>357,565</u>		1997	698,037	FGL
<u>Flathead catfish</u>			1998	694,211	FGL
1979	4,800	FGL & ADL	1999	710,761	FGL
	<u>4,800</u>		2000	510,737	FGL
<u>Redear sunfish</u>			2001	218,240	FGL
1981	36,000	FGL	2002	692,258	FGL
	<u>36,000</u>		2003	732,049	FGL
<u>Coppernose bluegill</u>			2004	515,101	FGL
1981	633,911	FGL	2005	705,986	FGL
	<u>633,911</u>		2006	506,113	FGL
<u>Spotted bass</u>			2007	501,174	FGL
1979	41	ADL		<u>8,947,557</u>	
	<u>41</u>				

Table 4. Survey of littoral zone and physical habitat types, Lake Fork Reservoir, Texas, August 2006. A linear shoreline distance (miles) was recorded for each habitat type found. The sum of shoreline distances exceeds the lake perimeter because of overlap of habitat types. Surface area (acres) and percent of reservoir surface area were determined for each type of aquatic vegetation found. Lake elevation (399.1 ft msl) was 3.9 feet below conservation pool elevation at the time of the survey.

Shoreline habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Boat dock	13.0	5.2		
Concrete	9.0	3.6		
Eroded bank	11.7	4.7		
Featureless bank	143.9	57.7		
Standing timber	194.8	78.0		
Native emergent	8.6	3.4	6.8	0.02
Native floating	40.8	16.3	363.7	1.33
Native submerged	67.0	26.8	543.3	1.99
Eurasian watermilfoil	40.4	16.2	184.1	0.68
Hydrilla	89.8	36.0	1,046.8	3.84
Waterhyacinth	1.8	0.7	10.2	0.04

Table 5. Percent directed angler effort by species for Lake Fork Reservoir, Texas, June 2000 – May 2007.

Species	Year						
	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Catfish	4.02	7.09	4.58	6.28	4.74	6.15	5.90
Yellow bass	-	0.21	0.13	0.03	0.39	-	0.09
Sunfish	0.90	0.72	0.96	0.35	0.45	-	1.08
Largemouth bass	79.08	62.94	75.11	71.81	77.79	81.57	80.32
Crappie	15.69	28.82	18.90	20.88	16.63	12.27	12.61
Anything	0.32	0.21	0.33	0.65	-	-	-

Table 6. Total fishing effort (h) for all species and total directed expenditures (and associated RSEs in parentheses) at Lake Fork Reservoir, Texas, June 2000-May 2007.

Species	Year						
	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Total fishing effort	934,252 (21)	664,082 (12)	757,177 (13)	649,856 (10)	786,911 (16)	717,074 (11)	807,892 (12)
Total directed expenditures	\$9,626,401 (28)	\$5,396,254 (20)	\$6,295,707 (19)	\$5,307,165 (18)	\$7,143,221 (22)	\$6,339,343 (17)	\$7,858,137 (17)

Gizzard shad

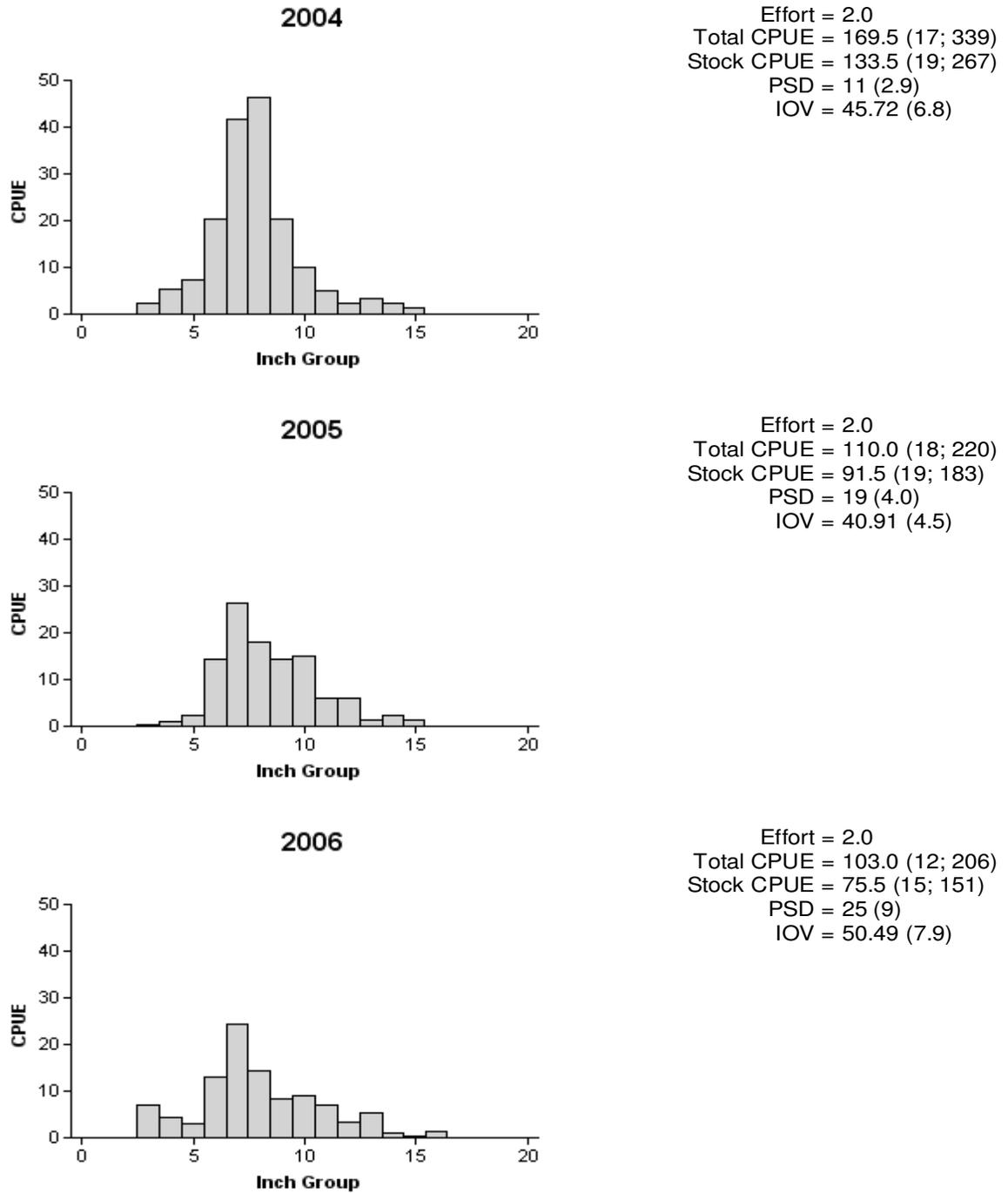


Figure 2. Number of gizzard shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for structural index and IOV are in parentheses) for fall electrofishing surveys, Lake Fork Reservoir, Texas, 2004 through 2006.

Bluegill

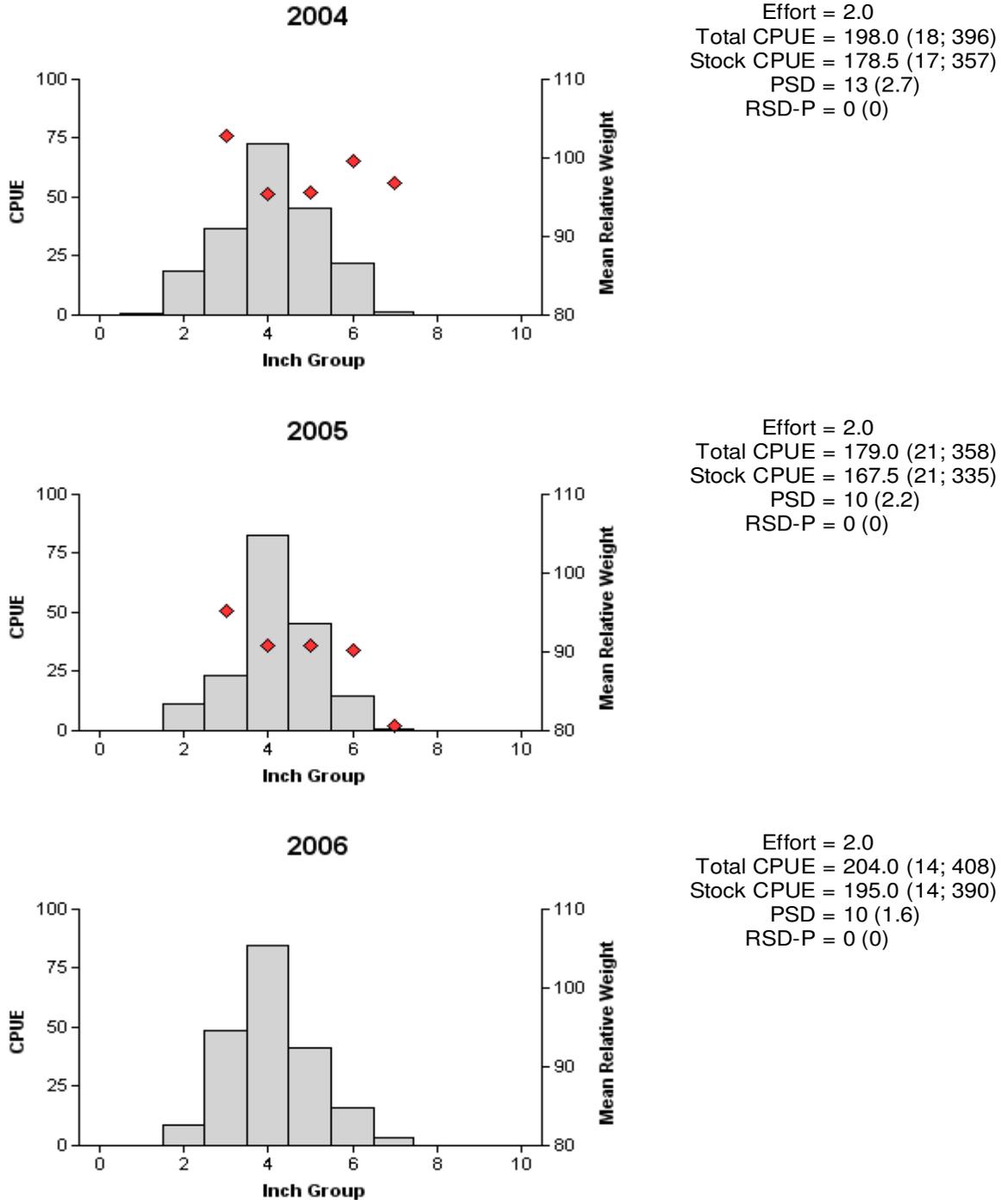


Figure 3. Number of bluegill caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork Reservoir, Texas, 2004 through 2006. No weight data were collected in 2006.

Redear sunfish

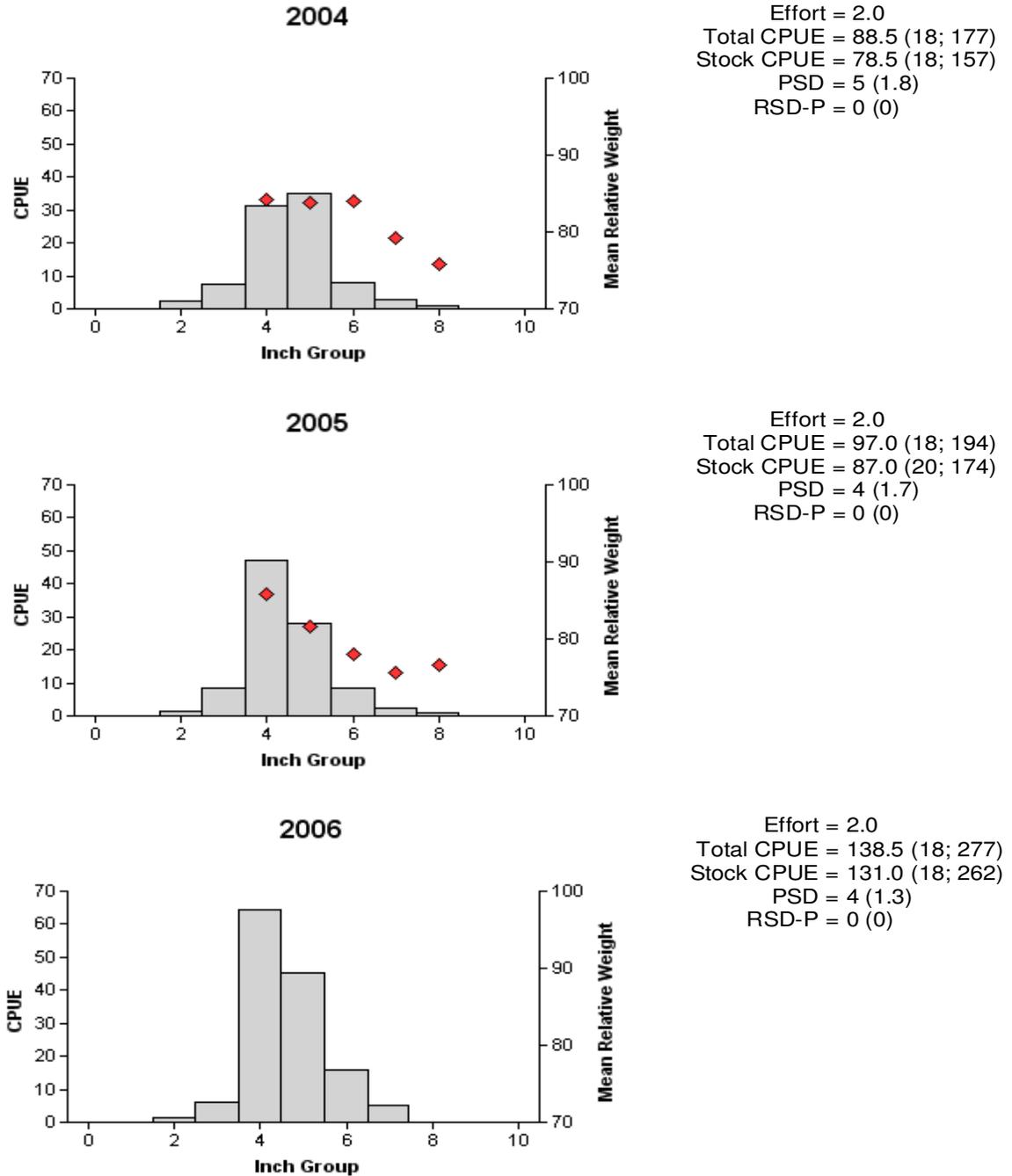


Figure 4. Number of redear sunfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork Reservoir, Texas, 2004 through 2006. No weight data were collected in 2006.

Table 7. Creel survey statistics for channel catfish at Lake Fork Reservoir from June 2000 through May 2001, to June 2006 through May 2007, where total catch per hour is for anglers targeting catfish and total harvest is the estimated number of catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year						
	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Directed effort (h)	37,518 (34)	47,071 (18)	34,657 (24)	40,809 (19)	37,311 (24)	44,109 (18)	47,663 (18)
Directed effort/acre	1.36 (34)	1.70 (18)	1.25 (24)	1.47 (19)	1.35 (24)	1.62 (18)	1.75 (18)
Total catch per hour	0.98 (17)	0.94 (26)	1.01 (33)	1.44 (24)	1.29 (37)	1.07 (27)	1.34 (24)
Catch/acre	2.44 (78)	3.68 (42)	1.90 (54)	2.87 (25)	2.74 (57)	1.90 (39)	3.21 (37)
Harvest per hour	0.72 (23)	0.53 (27)	0.65 (34)	1.44 (24)	0.84 (38)	0.78 (30)	0.89 (27)
Harvest/acre	2.42 (68)	1.14 (28)	1.30 (33)	1.82 (25)	2.01 (38)	1.14 (23)	2.18 (27)
Total harvest	67,033 (68)	31,534 (28)	36,071 (33)	50,466 (25)	55,691 (38)	31,031 (23)	59,404 (27)
Percent legal released	2.1	9.8	13.6	28.8	32.1	0.5	20.3

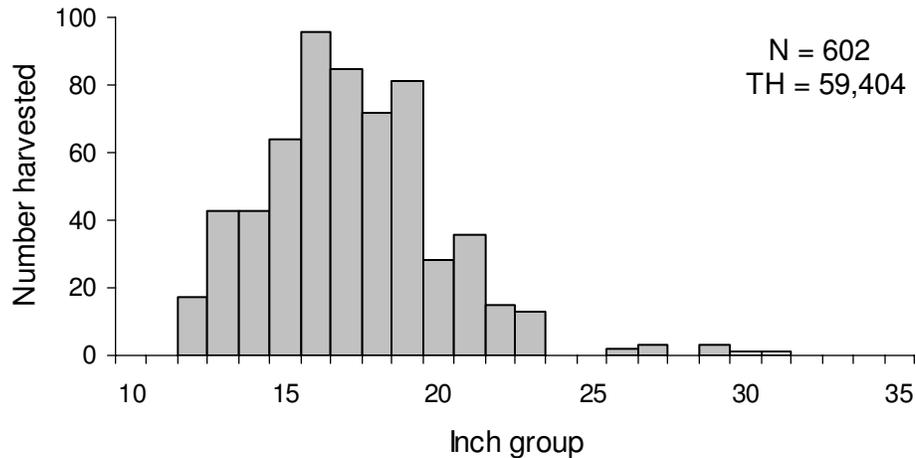


Figure 5. Length frequency of harvested channel catfish observed during creel surveys at Lake Fork Reservoir, Texas, June 2006 through May 2007, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth bass - spring

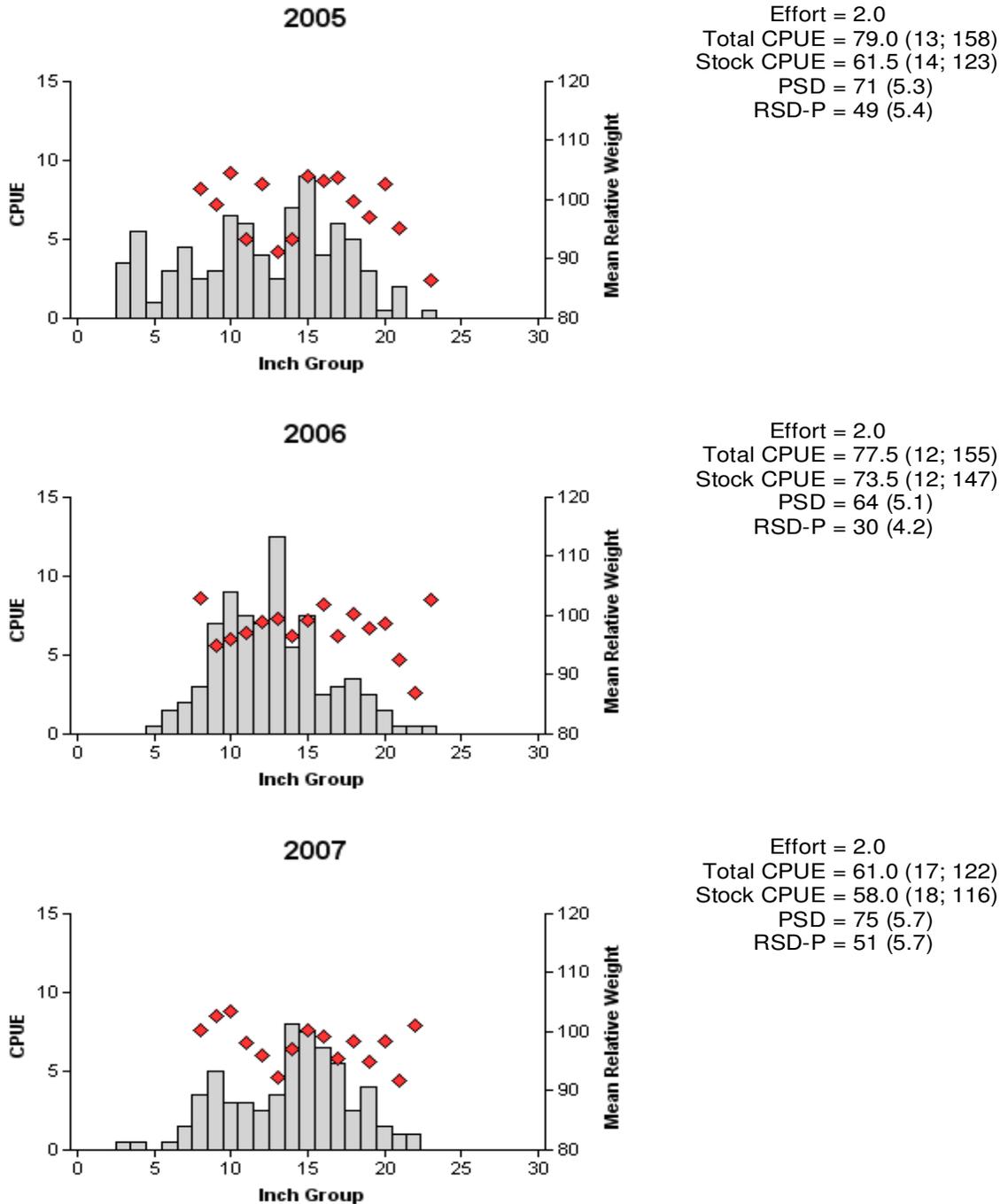


Figure 6. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for spring electrofishing surveys, Lake Fork Reservoir, Texas, 2005 through 2007. Vertical lines indicate minimum and maximum lengths of slot length limit at time of survey.

Largemouth bass - fall

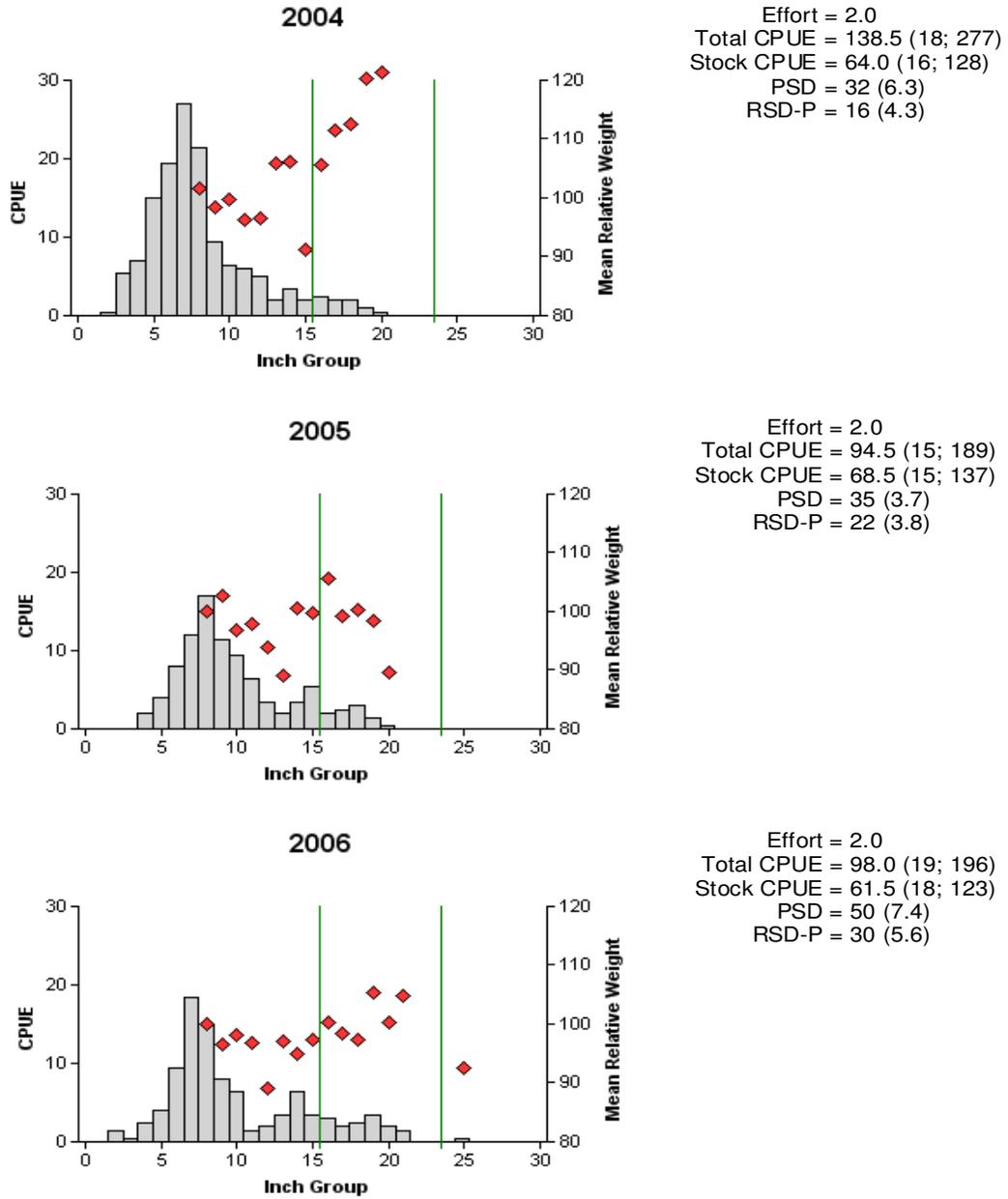


Figure 7. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork Reservoir, Texas, 2004 through 2006. Vertical lines indicate minimum and maximum lengths of slot length limit at time of survey.

Table 8. Creel survey statistics for largemouth bass at Lake Fork Reservoir from June 2000 through May 2001, to June 2005 through May 2006, where total catch per hour is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year						
	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Directed effort (h)	738,770 (21)	418,029 (13)	568,700 (14)	466,640 (12)	612,123 (17)	584,952 (12)	648,899 (13)
Directed effort/acre	26.69 (21)	15.10 (13)	20.54 (14)	16.85 (12)	22.11 (17)	21.46 (12)	23.80 (13)
Total catch per hour	0.27 (9)	0.39 (11)	0.34 (9)	0.36 (9)	0.45 (8)	0.44 (8)	0.40 (8)
Catch/acre	11.63 (43)	6.72 (18)	8.25 (18)	7.40 (15)	11.99 (21)	11.82 (18)	11.54 (17)
Harvest* per hour	<0.01 (75)	0.01 (45)	<0.01 (97)	0.01 (60)	0.03 (24)	0.01 (50)	0.02 (25)
Harvest*/acre	0.21 (94)	0.19 (43)	0.11 (49)	0.40 (38)	0.98 (12)	0.20 (27)	0.94 (9)
Total harvest*	5,864 (94)	5,333 (43)	2,925 (49)	11,140 (38)	27,184 (12)	5,346 (27)	25,545 (9)
Percent legal released	42.5	62.9	58.8	66.0	71.5	58.8	57.3

*Harvest includes traditional harvest and fish temporarily retained during live release fishing tournaments

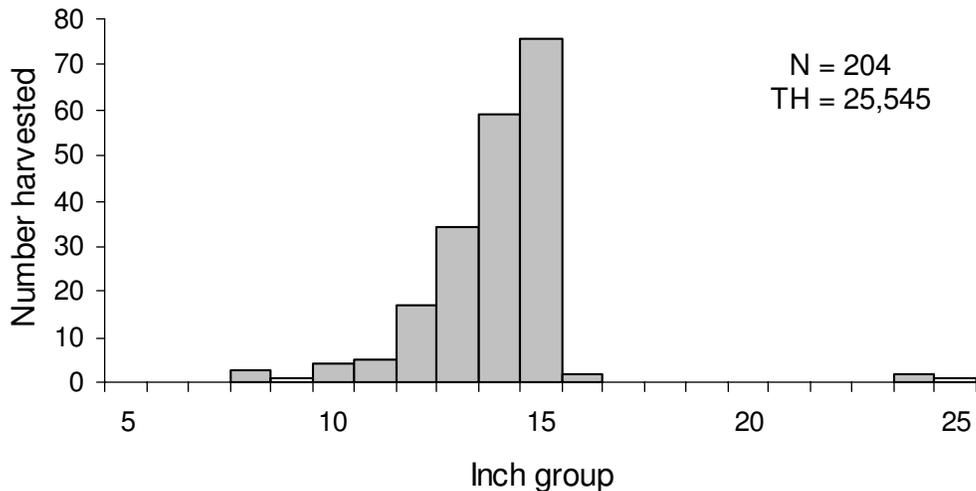


Figure 8. Length frequency of harvested largemouth bass observed during creel surveys at Lake Fork Reservoir, Texas, June 2005 through May 2006, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 9. Results of genetic analysis of Age-0 largemouth bass collected by fall electrofishing, Lake Fork Reservoir, Texas, 1989 through 2006. 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. Since 2005 analyses have been conducted using DNA microsatellite analysis. Prior to that time starch gel electrophoresis was employed.

Year	Sample size	Genotype					% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	Combined intergrades	NLMB		
1989	30	2	8	13	21	7	31.7	6.7
1990	30	1	12	15	27	2	44.2	3.3
1991	30	4	5	15	20	4	51.8	13.3
1992	35	3	11	16	27	5	39.3	8.6
1993	35	2	7	18	25	8	33.6	5.7
1994	35	1	3	23	26	8	38.6	2.9
1995	35	0	8	17	25	10	31.4	0.0
1996	35	5	7	19	26	2	53.7	14.3
1997	50	4	12	27	39	6	40.3	8.0
1998	54	1	6	37	43	10	31.9	1.8
1999	35	2	14	10	24	9	34.3	5.7
2000	55	4	15	29	44	7	50.5	7.3
2001	56	3	6	28	34	19	31.9	5.4
2002	50	6	14	28	42	2	58.0	12.0
2003	50	3	33	10	43	4	41.0	6.0
2004	50	2	13	31	44	4	54.0	4.0
2005	59	2	3	51	54	3	43.1	3.0
2006	30	0	^a	^a	30	0	48.0	0.0

^aAnalysis no longer separates F1 from Fx hybrids

White crappie

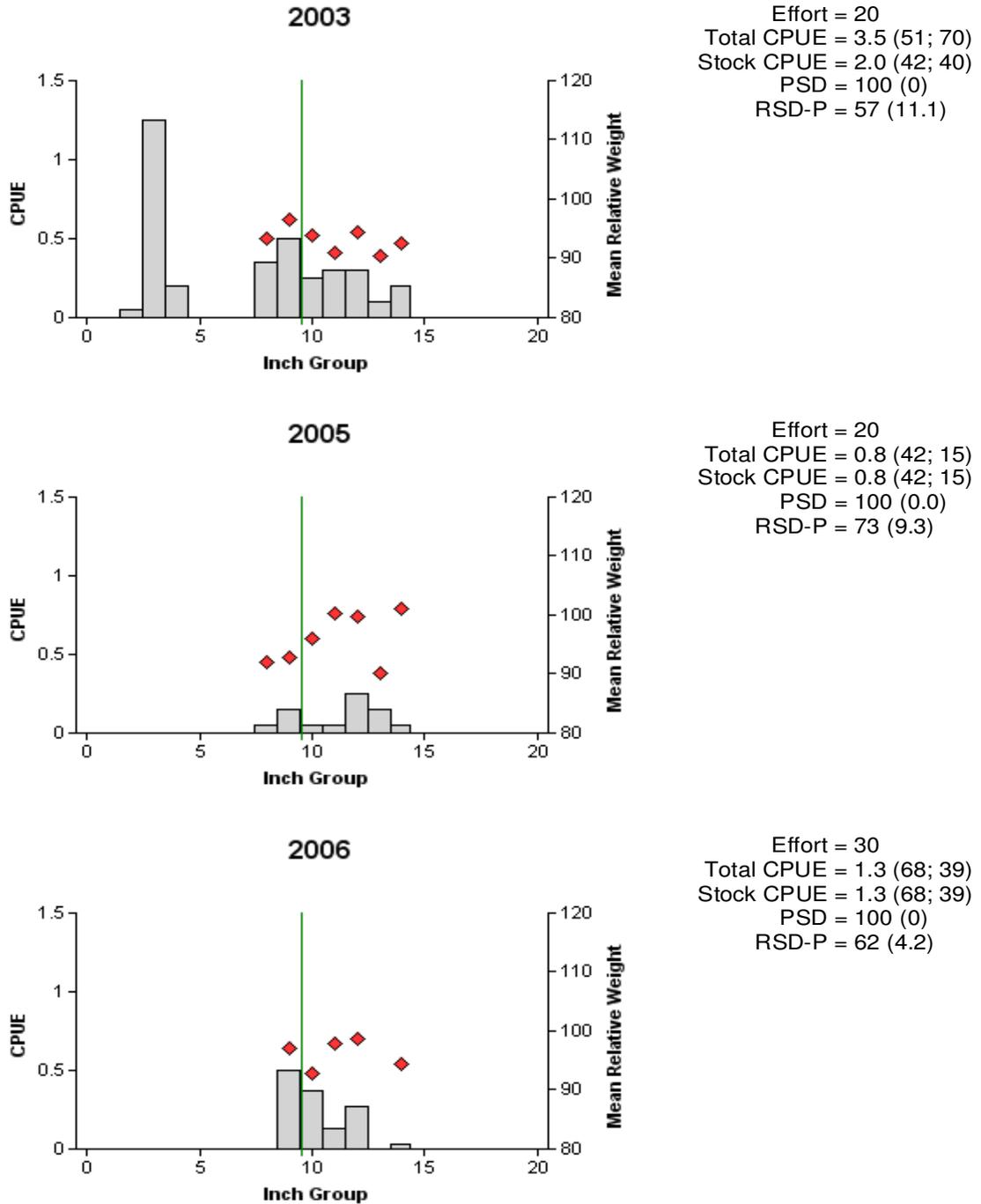


Figure 9. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall trap net surveys, Lake Fork Reservoir, Texas, 2003, 2005 and 2006. Vertical lines indicate minimum length limit at time of survey.

Black crappie

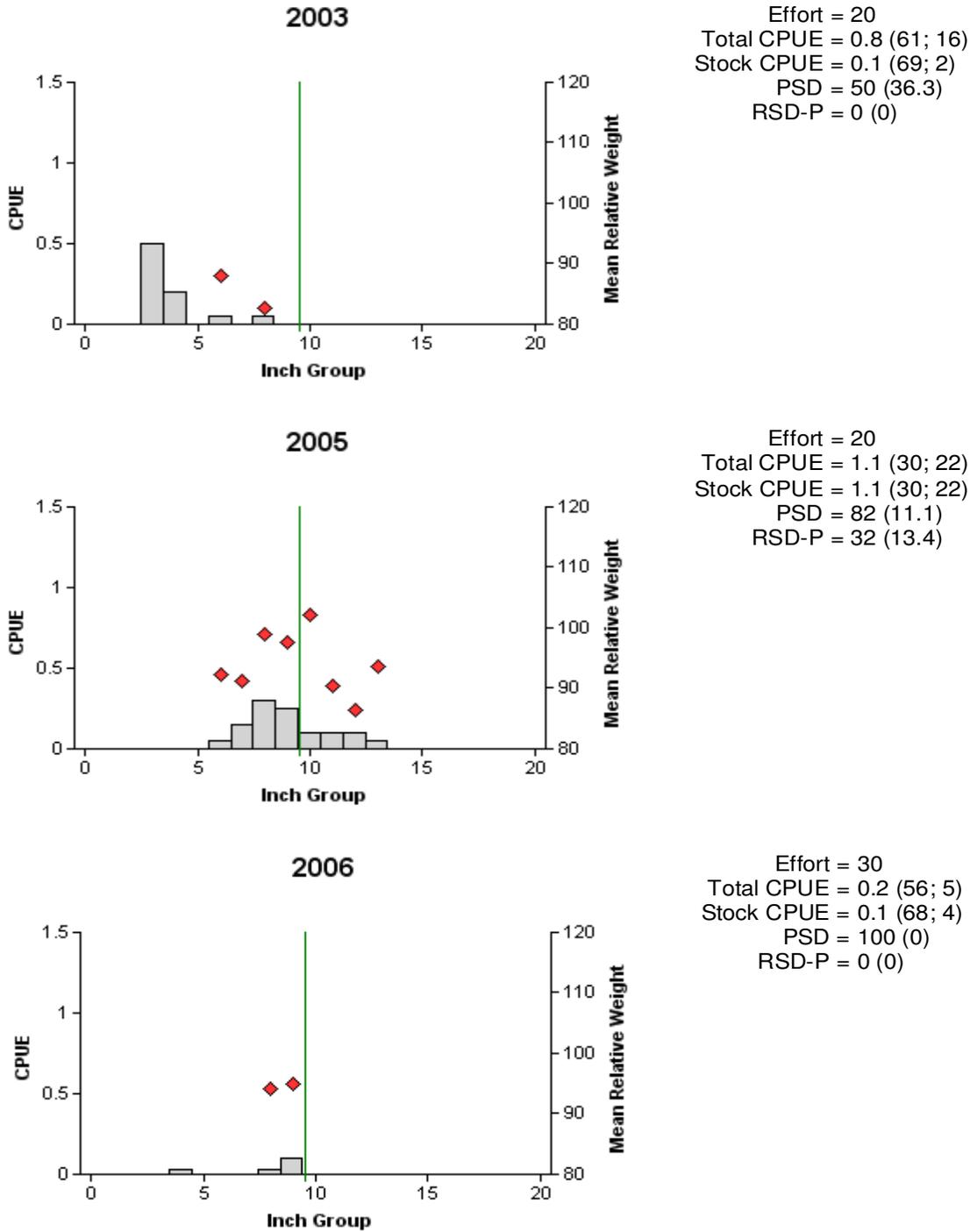


Figure 10. Number of black crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall trap net surveys, Lake Fork Reservoir, Texas, 2003, 2005 and 2006. Vertical lines indicate minimum length limit at time of survey.

Table 10. Creel survey statistics for crappie (white and black combined) at Lake Fork Reservoir from June 2000 through May 2001, to June 2006 through May 2007, where total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year						
	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Directed effort (h)	146,595 (24)	191,410 (13)	143,115 (13)	135,708 (13)	130,894 (18)	88,012 (14)	101,904 (13)
Directed effort/acre	5.29 (24)	6.91 (13)	5.17 (13)	4.90 (13)	4.73 (18)	3.23 (14)	3.74 (13)
Total catch per hour	2.76 (17)	2.66 (15)	2.37 (20)	2.17 (16)	2.03 (19)	1.62 (20)	1.69 (24)
Catch/acre	22.02 (50)	19.21 (21)	14.95 (22)	11.65 (21)	11.05 (29)	5.49 (17)	10.96 (31)
Harvest per hour	0.81 (18)	1.07 (14)	0.80 (21)	0.93 (18)	0.64 (21)	0.44 (28)	0.68 (24)
Harvest/acre	7.51 (55)	7.08 (24)	5.92 (28)	4.84 (26)	4.22 (41)	1.36 (31)	6.34 (40)
Total harvest	207,915 (55)	196,042 (24)	163,921 (28)	134,060 (26)	116,857 (41)	37,020 (31)	172,981 (40)
Percent legal released	5.0	5.1	3.5	3.6	2.0	5.4	5.1

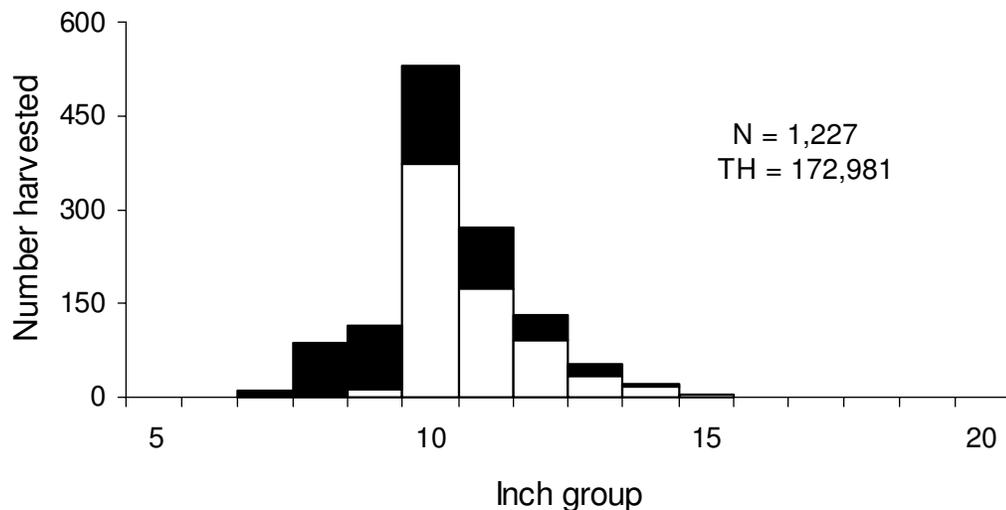


Figure 11. Length frequency of harvested crappie (white and black combined) observed during creel surveys at Lake Fork Reservoir, Texas, June 2006 through May 2007, all anglers combined. Open bars represent crappie caught in summer, fall and spring quarters and black bars represent crappie caught in winter quarter (December to February). N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 11. Proposed sampling schedule for Lake Fork Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

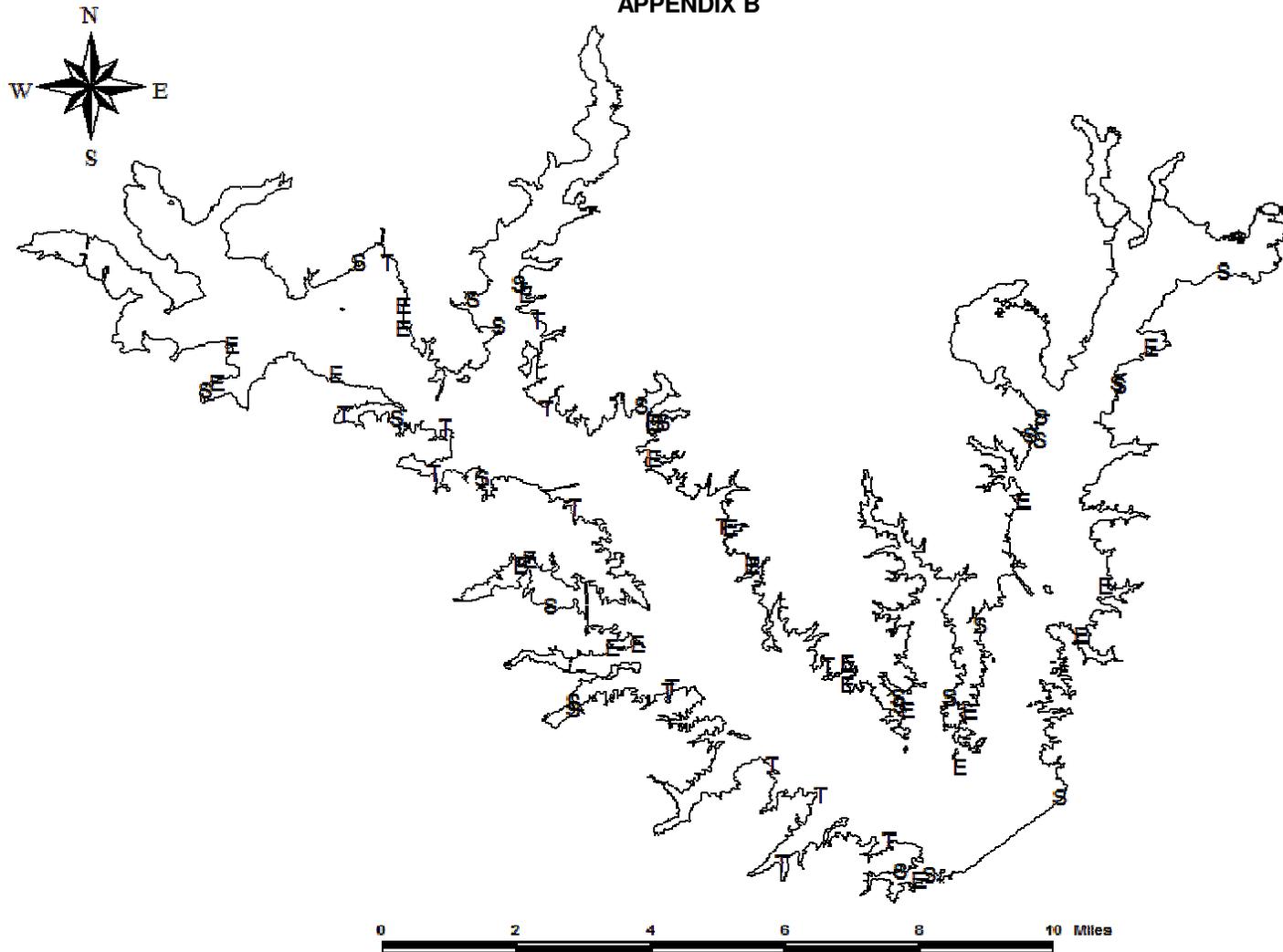
Survey Year	Electrofishing	Trap netting	Gill netting	Creel survey	Vegetation survey	Habitat survey	Report
Summer 2007-Spring 2008	S	A	S	S	S	S	S
Summer 2008-Spring 2009	A			S	A		A
Summer 2009-Spring 2010	A		A	S	A		A
Summer 2010-Spring 2011	A			S	A		A

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Fork Reservoir, Texas, 2006-2007.

Species	Fall electrofishing		Fall trap netting		Spring electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	206	103.0				
Threadfin shad	109	54.5				
Warmouth	4	2.0				
Bluegill	408	204.0				
Longear sunfish	34	17.0				
Redear sunfish	277	138.5				
Spotted sunfish	8	4.0				
Largemouth bass	196	98.0			122	61.0
White crappie			39	1.30		
Black crappie			5	0.17		

APPENDIX B



Location of fall electrofishing (E), trap netting (T), and spring electrofishing sites (S), Lake Fork Reservoir, Texas, 2006-2007.

Appendix C

Waterhyacinth and hydrilla surface area coverage (acres) at Lake Fork, Texas, estimated in summer (August or September) for various years.

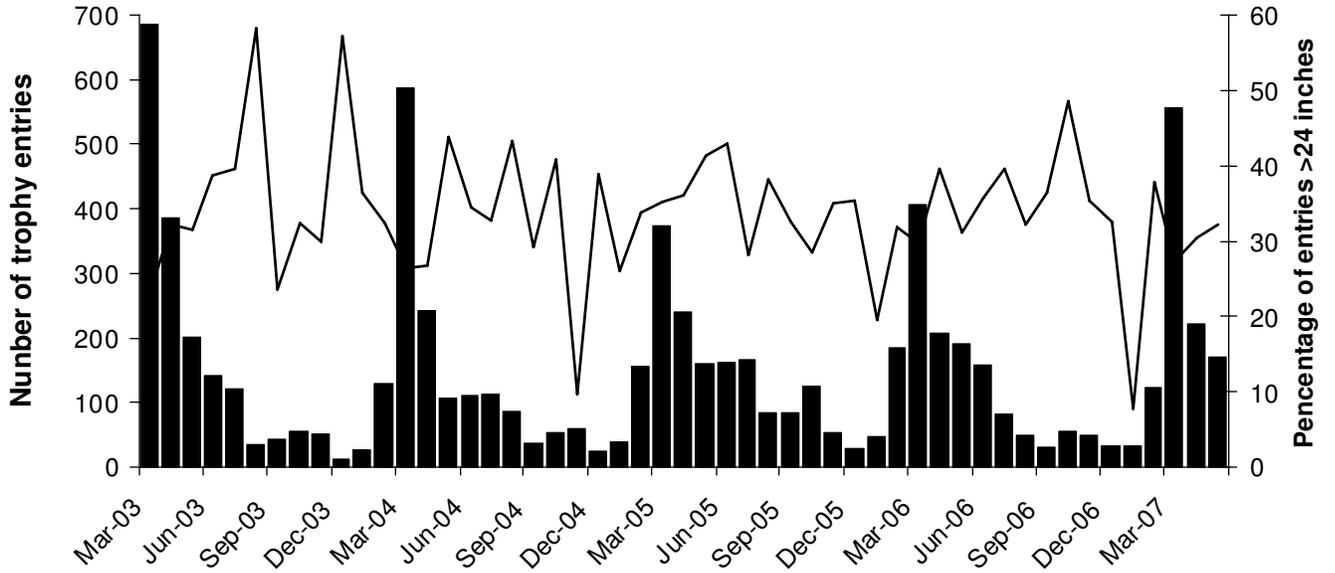
Species	Year									
	1996	1998	1999	2000	2001	2002	2003	2004	2005	2006
Waterhyacinth	40	125	7	130	50	6	3	49	74	10
Hydrilla	3,900	4,750	3,027	N/A	198	873	1,773	3,701	1,414	1,047

Appendix D

Water body records, all tackle category, for Lake Fork as of 6/28/2007

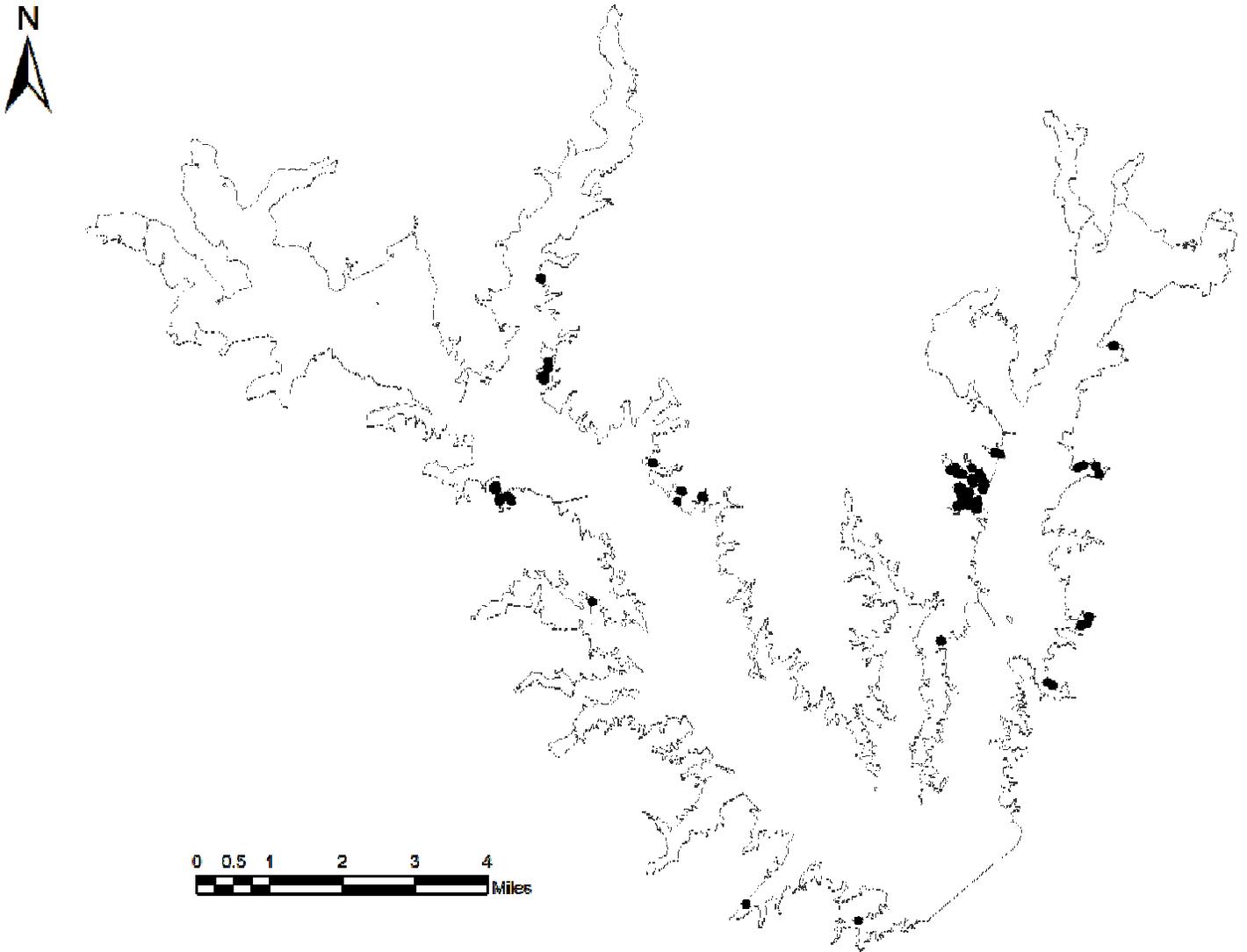
Species	Weight (lbs)	Length (inches)	Date certified	Gear
Bass, hybrid yellow	4.75	19.00	3/12/2005	Rod & reel
Bass, largemouth	18.18	25.50	1/24/1992	Rod & reel
Bass, white	3.97	18.25	2/8/2006	Rod & reel
Bass, yellow	1.37	12.25	11/19/1997	Rod & reel
Bluegill	1.61	11.50	7/9/1995	Rod & reel
Bowfin	17.65	36.50	2/21/1993	Rod & reel
Buffalo, bigmouth	36.00	33.50	10/19/1997	Rod & reel
Buffalo, smallmouth	51.50	36.25	12/4/1998	Rod & reel
Bullhead, black	2.48	16.25	2/1/1995	Cane Pole
Bullhead, yellow	3.20	16.25	3/22/1997	Rod & reel
Carp, common	36.50	36.50	4/10/1999	Trotline
Catfish, blue	89.00	49.25	3/1/2002	Trotline
Catfish, channel	17.73	31.00	3/9/2003	Rod & reel
Catfish, flathead	75.00	60.00	5/8/2007	Rod & reel
Crappie, black	3.92	18.50	4/27/2003	Rod & reel
Crappie, white	3.19	17.00	2/5/1993	Rod & reel
Drum, freshwater	14.01	27.50	6/24/1995	Rod & reel
Gar, longnose	6.40	33.50	4/18/1993	Trotline
Gar, spotted	10.31	39.00	4/19/2003	Bow & arrow
Sunfish, hybrid	0.23	6.65	9/14/1999	Fly rod
Sunfish, longear	0.48	7.50	6/1/1998	Rod & reel
Sunfish, orangespotted	0.18	6.00	11/26/2005	Rod & reel
Sunfish, redear	1.27	12.75	6/2/1995	Rod & reel
Warmouth	0.84	9.5	5/16/2004	Rod & reel

Appendix E



Monthly total numbers of largemouth bass entries reported (solid bars) in the Lake Fork Trophy Bass Survey, March 2003 – May 2007, and percentage of monthly entries that were ≥ 24 inches (line). Numbers represent combined weighed and estimated entries.

Appendix F



Distribution of waterhyacinth in Lake Fork, August 2006. Total coverage was estimated to be 10.2 acres.