PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-6

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2015 Fisheries Management Survey Report

Cisco Reservoir

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July 31, 2016

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Cisco Reservoir were surveyed by electrofishing and trap netting in 2015 and gill netting in 2016. Anglers were surveyed from June 2014 through May 2015 with a creel survey. Historical data are presented with the recent 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:** Cisco Reservoir is a 1,050-acre impoundment constructed in 1928 on Sandy Creek, in the Brazos River Basin. The reservoir's functions are municipal water supply and recreation, and it is controlled by the City of Cisco. The reservoir has a history of extreme water level fluctuations. From 1999 to 2016, the water level fluctuated between 11 to 23-feet below conservation pool (CP). As of May 2016, the reservoir was full. Fish habitat during the most recent survey consisted primarily of rock, flooded terrestrial vegetation, boat docks, buttonbush, *Chara* sp., and smartweed. Boater access consisted of one public boat ramp. Bank fishing access was limited to the boat ramp area.

- **Management History:** Important sport fish include Largemouth Bass, White Crappie, and catfishes. Redbreast Sunfish, Redear Sunfish, and White Bass are also present. Attempts to establish a Smallmouth Bass population in the 1990's was unsuccessful. Florida Largemouth Bass were last stocked in 2012. Sport fish are managed with statewide harvest regulations.

- **Fish Community**
  - **Prey species:** Electrofishing catch of prey species was low and consisted primarily of Bluegill. Other species were also available as prey. Sunfish species were of sizes that were available to most sport fish. Low abundance of Gizzard Shad ≤ 7 inches could have negative implications on some predator species.

  - **Catfishes:** Channel and Flathead Catfish were present in the reservoir but catch rates were low. No Blue Catfish were sampled since 2012. However, anglers reported catching Blue Catfish.

  - **White Bass:** White Bass relative abundance in 2016 was low, and all fish sampled were harvestable size. Creel survey results indicate that all legal-sized White Bass were harvested.

  - **Largemouth Bass:** Largemouth Bass relative abundance and number of large fish increased. Mean relative weight of Largemouth Bass was good. Nearly 50% of all anglers at Cisco Reservoir targeted Largemouth Bass. Harvest of Largemouth Bass was low.

  - **White Crappies:** White Crappie relative abundance was poor and has decreased compared to previous years. Body condition was adequate. There were few legal-size fish available to anglers. Creel survey results indicate that all legal-sized White Crappie caught were harvested.

Management Strategies: Largemouth Bass and White Crappie will be surveyed in fall 2017. Trap netting, electrofishing, tandem hoop netting, and low-frequency electrofishing will be conducted in 2019-2020 to determine relative abundance and size structure of important sport fish. Access and habitat surveys will be conducted in summer 2019. Florida Largemouth Bass stockings will be requested when suitable littoral habitat is available. Inform the public of the threat and impact of invasive species.

INTRODUCTION

This document is a summary of fisheries data collected from Cisco Reservoir in 2015-2016. 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 fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2015-2016 data for comparison.

Reservoir Description

Cisco Reservoir is a 1,050-acre impoundment constructed in 1928 on Sandy Creek, in the Brazos River Basin. The reservoir is located in Eastland County, approximately 5 miles north of the town of Cisco, and it is controlled by the City of Cisco. The reservoir was built primarily for municipal water supply and recreation. The reservoir has been subjected to extreme water level fluctuations. Cisco Reservoir experienced long periods of reduced water level broken by occasional heavy rain events that raised the water level in 2005, 2007, 2013, 2015, and 2016 (Figure 1). Littoral habitat consists primarily of rock and some aquatic vegetation during higher water level. Other descriptive characteristics for Cisco Reservoir are in Table 1.

Angler Access

Cisco Reservoir boat access consisted of one public boat ramp. Bank fishing access was limited to the boat ramp area. Additional boat ramp characteristics are located in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from previous survey report (Dumont 2012) included:

1. Advertise the underutilized Redear Sunfish fishery to anglers.
   Action: A newspaper article was written about fishing for sunfishes and published in the *Abilene Reporter News*.
2. Stock Florida Largemouth Bass when water level rises and once a substantial increase in littoral habitat has occurred.
   Action: Florida Largemouth Bass were stocked in 2012 and 2016. Genetic analysis was conducted in 2015.
3. Educate the public about the threats of invasive species.
   Action: Press releases were distributed to local and statewide media. Signage was posted at Cisco Reservoir to notify users of the potential threats of invasive species.

Harvest regulation history: All sport fish are regulated with statewide harvest regulations (Table 3).

Stocking history: Blue Catfish were stocked in 1980 and 2001. Over 100,000 Smallmouth Bass were stocked from 1994 to 1997 although no viable population became established. Florida Largemouth Bass were first stocked in 1991 and were most recently stocked in 2016. The complete stocking history is located in Table 4.

Vegetation/habitat management history: Prior to 2016, Cisco Reservoir had no history of structural habitat or vegetation management. In 2016, the City of Cisco and Still Waters Bass Club collaborated with Texas Parks and Wildlife Department to create 10, 10-tree brush piles by using recycled Christmas trees. The project was intended to increase structural fish habitat and increase angler catch rates in the reservoir. The GPS coordinates and a printable map of the brush piles sites were made accessible to the general public via the Texas Parks and Wildlife Department website and social media.

Water transfer: No interbasin transfers are known to exist.

METHODS

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Cisco Reservoir (TPWD unpublished). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected and all surveys were conducted according to the TPWD Fisheries Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (in 2013 for 1.0 hour at 12, 5-minute stations and in 2015 for 1.5 hours at 18, 5-minute stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined by using otoliths from all fish ≥ 8 inches.

Trap Netting – White Crappie were collected using trap nets (in 2013 for 10 net nights at 10 stations and in 2015 for 15 net nights at 15 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Otoliths were collected from 22 White Crappie ranging from 9.0-11.9 inches for estimating age and growth.

Gill netting – In 2016, Channel Catfish, White Bass, and Flathead Catfish were sampled by gill netting (5 net nights at 5 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Genetics – Genetic analysis of Largemouth Bass was conducted in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Micro-satellite DNA analysis was used to determine genetic composition of individual fish from 2005 through 2015 and by electrophoresis for previous years.

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 (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). 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 statistics.

Creel survey – A year-long roving creel survey was conducted from June 1, 2014 through May 31, 2015. Angler interviews were conducted on at least 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). Average surface acre for each quarter within a creel period was determined. Derived surface area was used to determine the directed effort/acre and harvest/acre in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Percent released was estimated as the number of legal-sized fish released of all the legal-sized catfish caught.

Habitat – In August 2015, habitat composition was determined by conducting a survey using the random point method assessing the habitat at 149 random stations distributed throughout the reservoir. Plants and habitat types were identified at or below the waterline and marked as “1” for present or “0” for absent. Percent occurrence (% = [# stations present / total stations sampled] X 100) and associated 95% confidence intervals were calculated for habitat. No structural habitat survey was conducted in 2015-2016 since structural features have not changed since the 2011 sampling period.

Water level – Source for water level data was the United States Geological Survey (USGS 2016).

RESULTS AND DISCUSSION

Habitat: Water level at the time of the habitat survey was 7.6-feet below conservation pool (CP). Structural habitat was present in the reservoir with large boulders being the largest occurrence followed by bedrock, cobble, docks, small boulders, the reservoir dam, and pebbles (Table 6). Vegetation was dominated by flooded terrestrial vegetation. However, other vegetation such as common buttonbush, *Chara* sp., black willow, water primrose, and smartweed were present. Most of the reservoir consisted of non-descriptive or featureless bank. Standing timber was also present (Table 7). Vegetation was not observed during the habitat survey conducted in 2011 (Dumont 2012).

Creel: Directed fishing effort by angers was greatest for Largemouth Bass (49.8%), White Crappie (20.3%), and fishing for anything (17.6%; Table 8). Anglers surveyed at Cisco Reservoir reported fishing for a total of 14,852 hours and spending $74,352 on fishing trip expenditures (Table 9).

Prey species: The prey base primarily consisted of Gizzard Shad, Threadfin Shad, and Bluegill. Catch rate of Gizzard Shad in 2015 (36.0/h) was similar to 2013 (40.0/h), but greatly decreased since 2011 (78.7/h). Gizzard Shad IOV remained low in all survey years, ranging from 22-37, indicating most fish were not available as prey (Figure 2). Threadfin Shad catch rate has decreased since 2013 (381.0/h) to 2015 (112.7/h). Bluegill CPUE has nearly tripled in 2015 (325.3/h) compared to 2013 (119.0/h) and 2011 (83.3/h; Figure 3). The increase in Bluegill relative abundance could be attributed to an increase of suitable habitat after rise in water level. Size structure of Bluegill consisted primarily of fish 2-4 inches. Most Bluegill were of adequate prey size for sport fish (Figure 3). Redbreast Sunfish and Redear Sunfish were also present (Appendix A) and were of sizes available for most sport fish. Survey results indicated abundant prey base for sport fish and that availability of prey should not be a limiting factor to the growth and condition of sport fish in the reservoir.

Sunfishes: Large Redbreast Sunfish and Redear Sunfish (≥ 7 inches) have been present at Cisco Reservoir and have provided a fishery that has been underutilized. Redbreast Sunfish catch rate declined from 202.7/h in 2011 to 95.0/h in 2013 to 29.3/h in 2015 (Figure 4). Redear Sunfish relative abundance has been variable. In 2015, catch rate of Redear Sunfish increased (37.3/h) from 2013 (3.0/h) and decreased from 2011 (97.3/h; Figure 5). There were limited stock-size Redear Sunfish (≥ 7 inches) sampled at Cisco Reservoir, and additional sampling to increase the sample size to achieve monitoring objectives was not warranted. Some larger Redear and Redbreast sunfish (i.e., ≥7 inches) were present that could provide a sunfish fishery if anglers so desired. Percent directed fishing effort by anglers for sunfishes was 2.8% (Table 8). Total angler catch rate of sunfishes was 1.2/h and total harvest was 479.1 fish (Table 10). Anglers reported harvesting sunfishes 3-6 inches in length (Figure 6).

Blue Catfish: Relative abundance data suggest Blue Catfish were not abundant in the reservoir and support a small proportion of the overall catfish fishery. In 1993, catch rate was 0.4/nn (5 stations; RSE=61), 0.8/nn in 2004 (5 stations; RSE=100), and 1.0/nn in 2012 (5 stations; RSE=45). No Blue Catfish were captured using gill nets in 2008 or in 2016.

Channel Catfish: Channel Catfish catch rates in gill net surveys were variable from 1.0/nn in 2008, to 5.2/nn in 2012, and to 2.8/nn in 2016 (Figure 7). Catch rates of fish ≥ 12 inches also varied from 2008 (1.0/nn), to 2012 (3.8/nn), and 2016 (0.8/nn). Few fish in 2016 were of harvestable size. The number of Channel Catfish sampled with gill nets was too few and sampling objectives could not be obtained with reasonable sampling efforts. Estimated total catfish harvest was 151.7 fish and 28.3 percent of legal-sized fish were released (Table 11).

Flathead Catfish: Few Flathead Catfish have been sampled using gill nets in Cisco Reservoir. Catch rates were low in 2016 (0.6/nn) and 2012 (0.6/nn). No Flathead Catfish were sampled in 2008.

White Bass: White Bass catch rates in gill net surveys were variable from 4.0/nn in 2008, 7.6/nn in 2012, and 1.8/nn in 2016 (Figure 9). Angling effort for White Bass was low (0.3h/acre). Estimated harvest was 490.6 fish and anglers harvested individuals ranging from 12 to 14 inches in length (Figure 10).

Largemouth Bass: Electrofishing total catch rate for Largemouth Bass was 175.3/h in 2015, which was higher than in 2013 (54.0/h) and in 2011 (116.0/h; Figure 11). Relative abundance of Largemouth Bass ≥ stock-size (≥ 8 inches) was variable throughout the sampling period, with catch rates from 34.0/h in 2015, 30.0/h in 2013, and 101.3/h in 2011 (Figure 11). Relative abundance of Largemouth Bass ≥ 14 inches remained low from 2011-2015, with catch rates ranging from 1.0/h in 2013 to 2.7/h in 2015. Mean relative weight values ranged from the low 90's to high 100's for most inch groups in 2015 (Figure 11), suggesting condition was fair to good. The estimated amount of angler effort per acre was 12.8h/acre; however, the only harvest of Largemouth Bass encountered during the creel survey period was two, 15-inch fish (Figure 12). No tournament anglers were interviewed during the creel survey. All fish ≥ 8 inches were sampled for age-and-growth. Most of the fish sampled for age-and-growth analysis were ages 1 and 2. Age-1 fish were on average 10.6 inches (N = 17, range 9.2-12.4 inches) and age-2 were on average 12.3 inches (N = 20; Range = 8.0-14.6 inches). These growth rates were similar to those observed in 2007 (Table 14). Historically, there have been very few pure Florida Largemouth Bass in Cisco Reservoir. During the 2015 electrofishing survey no pure Florida Largemouth Bass were sampled despite a stocking in 2012. All fish collected in 2015 were intergrades (Table 15).

White Crappie: White Crappie catch rate in the trap net surveys decreased from 10.8/nn in 2013 to 2.7/nn in 2015; 2013 catch rate was similar to that reported in 2011 (9.5/nn). Similarly, catch of stock-size White Crappie (≥ 5 inches) decreased from 10.8/nn in 2013 to 2.7/nn in 2015 (Figure 13). In 2015, White Crappie PSD was 80 and the size structure was comprised of fish ≥ stock-size (Figure 13). In the 2015 survey, catch of legal-sized White Crappie was 1.0/nn. Estimated total harvest was highest for White Crappie (1,127.0 fish) compared to other species. There was no release of legal-sized White Crappie by anglers at Cisco Reservoir (Table 16). Fish were caught and harvested from 10 to 13 inches in length (Figure 14). Growth rates of White Crappie have increased from 1999 to 2015. In 2015, mean age of 10-inch White Crappie was 2.1 years (N = 22; range = 2-3 years), 3.9 years in 2011 (N = 30; range = 2-7 years), 3.8 years in 2003 (N = 22; range = 2-7 years), and 4.4 years in 1999 (N = 9; range = 3-8; Table 17).

Fisheries management plan for Cisco Reservoir, Texas

Prepared – July 2016

ISSUE 1: Largemouth Bass and White Crappie support the most popular fisheries at Cisco Reservoir.

MANAGEMENT STRATEGIES

1. Continue to monitor sport fishes and forage populations to determine trends in relative abundance, size structure, and body condition by conducting electrofishing for prey species and Largemouth Bass and trap netting for White Crappie.
2. Stock Florida Largemouth Bass when suitable habitat is available.
3. Continue to monitor Florida Largemouth Bass influence by collecting genetic samples from Largemouth Bass in 2019.
4. Investigate ways to improve fish habitat at low water level that would increase relative abundance of centrarchid species.

ISSUE 2: Angler access for boaters could be improved. During periods of low water, boat prop wash creates hazardous conditions at the end of the ramp. Also, the boat dock is in need of repairs. When Cisco Reservoir is at CP, there is limited parking at the boat ramp.

MANAGEMENT STRATEGY

1. Contact The City of Cisco and discuss needed improvements that could be made to the boat ramp and the boat dock.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) 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 (*Salvinia molesta*) 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 were significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate users about invasive species, and provide them with posters, literature, and other informative materials so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituents.
5. Map existing and future interbasin water transfers to facilitate potential invasive species responses.

Objective-Based Sampling Plan and Schedule

Sport fish, forage fish, and other important fishes: Sport fishes in Cisco Reservoir include Blue Catfish, Channel Catfish, Flathead Catfish, White Bass, sunfishes, Largemouth Bass, and White Crappie. Known important forage fish are Gizzard Shad, Threadfin Shad, and Bluegill.

Low-density fisheries:

Blue Catfish: Blue Catfish were stocked into Cisco Reservoir in 1980 and 2001, and the population has been managed with the 12-inch minimum length limit (MLL) and 25-fish (in combination with Channel Catfish) daily bag limit. Blue Catfish in the reservoir have been monitored with periodic gill netting surveys. However, relative abundance of Blue Catfish has been low. In 1993, CPUE-Total was 0.4/nn (5 stations; RSE=61); in 2004, CPUE-Total was 0.8/nn (5 stations; RSE=100); and in 2012, CPUE-Total was 1.0/nn (5 stations; RSE=45). No Blue Catfish were sampled in gill nets in 2016. Relative abundance data suggest Blue Catfish are not abundant in the reservoir and support a small proportion of the overall catfish fishery.

White Bass: White Bass were first discovered in the reservoir in 2004, and the population has since been managed with the statewide 10-inch MLL and 25-fish bag limit. The 2014-2015 creel survey results indicated that directed angling effort towards White Bass was the lowest of any species (1.0% of the directed angling effort). Gill net catch of White Bass has increased in recent years from 1.8/nn in 2004 (5 stations; RSE=48), to 4.0/nn in 2008 (5 stations; RSE=52), to 7.6/nn in 2012 (5 stations; RSE=58). In 2016, catch declined to 1.8/nn (5 stations; RSE=67); all fish collected were of legal-size.

Survey objectives, fisheries metrics, and sampling objectives

Prey species: Bluegill are the primary forage in Cisco Reservoir in 2015. Gizzard Shad and Threadfin Shad, were also present and available as prey. Historically, some species of sunfishes (e.g. Redear Sunfish and Redbreast Sunfish) have provided an opportunity for anglers to catch larger sunfishes. However, number of larger sunfishes (≥ 7 inches) had declined in relative abundance likely due to fluctuating water level and reduced amount of littoral habitat. The catch rate of Gizzard Shad has decreased from 78.7/h in 2011 to 36.0/h in 2015. Many of the Gizzard Shad were ≥ 7 inches in length with an IOV ranging from 22-37 indicating that many were not available as food and may be the reason for lower than optimal body condition of Largemouth Bass in years prior to 2015. Catch rate of Bluegill has increased from 83.3/h in 2011, to 119.0/h in 2013, to 325.3/h in 2015. All of the Bluegill were ≤ 6 inches. Trend data on CPUE and size structure of prey species have been collected at least every four years with occasional biennial sampling. A survey objective for these species is to monitor for large-scale changes in relative abundance and size structure. Data will be collected for forage species during the fall 2019 electrofishing (Table 18). Sampling will be conducted at 18, 5-minute stations (1.5 hours total) in conjunction with Largemouth Bass sampling, and a target RSE ≤ 25 will be attempted for relative abundance data (i.e, CPUE-Total) for Gizzard Shad, Redbreast Sunfish, Bluegill, and Redear Sunfish. Prey availability (IOV) will be calculated for Gizzard Shad. At least 50 fish ≥ stock-size will be collected for size structure estimation (PSD) for Redbreast Sunfish, Bluegill, and Redear Sunfish. No additional effort will be conducted if objectives for prey species are not met during designated Largemouth Bass sampling. Instead, Largemouth Bass body condition can provide information on prey vulnerability to predation and prey relative abundance.

Channel Catfish: Channel Catfish are present in the reservoir and have been managed with the 12-inch MLL (in combination with Blue Catfish) daily bag limit. The 2014-2015 creel survey results indicated that directed angling effort towards the catfishes group was 8.4% of the overall directed effort. Channel Catfishes have been traditionally monitored with routine spring gill netting surveys. Channel Catfish appear to be the most abundant catfish species in Cisco Reservoir. In 2012, Channel Catfish CPUE-Total was 5.2/nn (5 stations; RSE=19), which was an increase from the 1.0/nn in 2008 (5 stations; RSE=45) and 1.0/nn in 2004 (5 stations; RSE=32), but declined in 2016 to 2.8/nn (5 stations; RSE 47); a similar trend was found for CPUE-12. Monitoring once every four years to detect any changes in the Channel Catfish population is appropriate for management of the population. Due to the high number of net nights

needed to achieve a RSE ≤ 25 for CPUE-Total (an estimated 20 net nights) or RSE ≤ 25 for CPUE-Stock (an estimated 20 net nights), exploratory Channel Catfish monitoring for presence/absence will be conducted by using tandem hoop netting in summer 2019 (Table 18) at 9 random stations.

Flathead Catfish: Flathead Catfish were present in the most recent gill netting sample in 2016 but in low relative abundance (CPUE-Total=0.6/nn; 5 stations). The 2014-2015 creel survey results indicated that directed angling effort towards the catfishes group was 8.4% of the overall directed effort. Flathead Catfish may support the catfish fishery. Utility of low-frequency electrofishing to sample Flathead Catfish has not been evaluated at Cisco Reservoir and may yield better representation of individuals in the population than what has been observed during gill net sampling. Exploratory low-frequency electrofishing will be conducted during summer 2019 (Table 18) to obtain baseline data for relative abundance, size structure, and body condition of Flathead Catfish. Sampling will be conducted at 20, 3-minute random shoreline stations. Data collected from this survey will aid in management of the population as well as could be used to market any existing fishery to anglers.

Largemouth Bass: Largemouth Bass are relatively abundant and support the most popular sport fishery in Cisco Reservoir (nearly 50% of angler directed effort). Largemouth Bass are managed with the statewide 14-inch MLL and 5-fish daily bag limit. In the past, Largemouth Bass relative abundance has been variable. Electrofishing catch of Largemouth Bass has remained similar from 144.0/h in 2007 (1.3 h; RSE=13), to 116.0/h in 2011 (1.5 h; RSE=12), to 54.0/h in 2013 (1.0 h; RSE=23), to 175.3/h in 2015 (1.5 h; RSE=24). However, there were very few fish of legal-size (≥ 14 inches) surveyed since 2007. In 2013, mean relative weights were low, ranging from 76 to 91, but they improved and ranged from 90 to 109 for most inch groups in 2015. Continuation of electrofishing is necessary to monitor trends of Largemouth Bass relative abundance and size structure. Electrofishing will be conducted at 18 random, 5-minute stations in fall 2017 and fall 2019; the 2017 sampling event will be a bass-only sampling event (Table 18). A target RSE for CPUE-Total and CPUE-Stock of ≤ 25% will be attempted. A target of at least 50 fish ≥ stock-size will be sampled to achieve an estimate of size structure, and at least 10 fish per inch group ≥ stock-size will be measured and weighed for body condition. If desired level of precision (i.e., RSE) and other sampling objectives are not met for Largemouth Bass and if objectives can be attained feasibly, additional sampling up to one hour (12, 5-minute stations) may be added to improve data quality. Fin clips from a random sample of 30 Largemouth Bass will be collected for microsatellite DNA genetic analysis. Otoliths will be collected from a sample of 13 fish, 13-14.9 inches to assess age at legal length. If additional specimens are needed for genetics and/or age and growth additional daytime bass-only electrofishing may be conducted if deemed feasible.

White Crappie: White Crappie are present and have been managed under the statewide 10-inch MLL and 25-fish daily bag limit. The 2014-2015 creel results indicated that White Crappie support a popular, harvest-oriented fishery and that directed angling effort towards them was 20.3%. Since White Crappie support a popular fishery, sampling should occur biennially in fall 2017 and 2019. In 2013, CPUE was 10.8/nn (10 stations; RSE=42) and was greater than 9.5/nn in 2011 (10 stations; RSE=36). In 2015, catch rate decreased to 2.7/nn (15 stations; RSE=27). Biennial fall trap netting to maintain trend data will allow for determination of any large-scale changes in the crappie population (Table 18). Based on past data, to achieve a CPUE-Total and CPUE-Stock RSE ≤ 25, sampling at least 10 random stations will need to be conducted during fall 2017 and fall 2019. A target of at least 50 fish ≥ stock-size will be collected to monitor trends in size structure (PSD), and at least 10 fish per inch group ≥ stock-size (≥ 5 inches) will be measured and weighed for estimation body condition. In 2019, otoliths will be collected from 13 fish 9-10.9 inches to estimate age at legal length. Up to 5 additional random stations may be sampled if objectives are not met and if additional sampling is deemed feasible.

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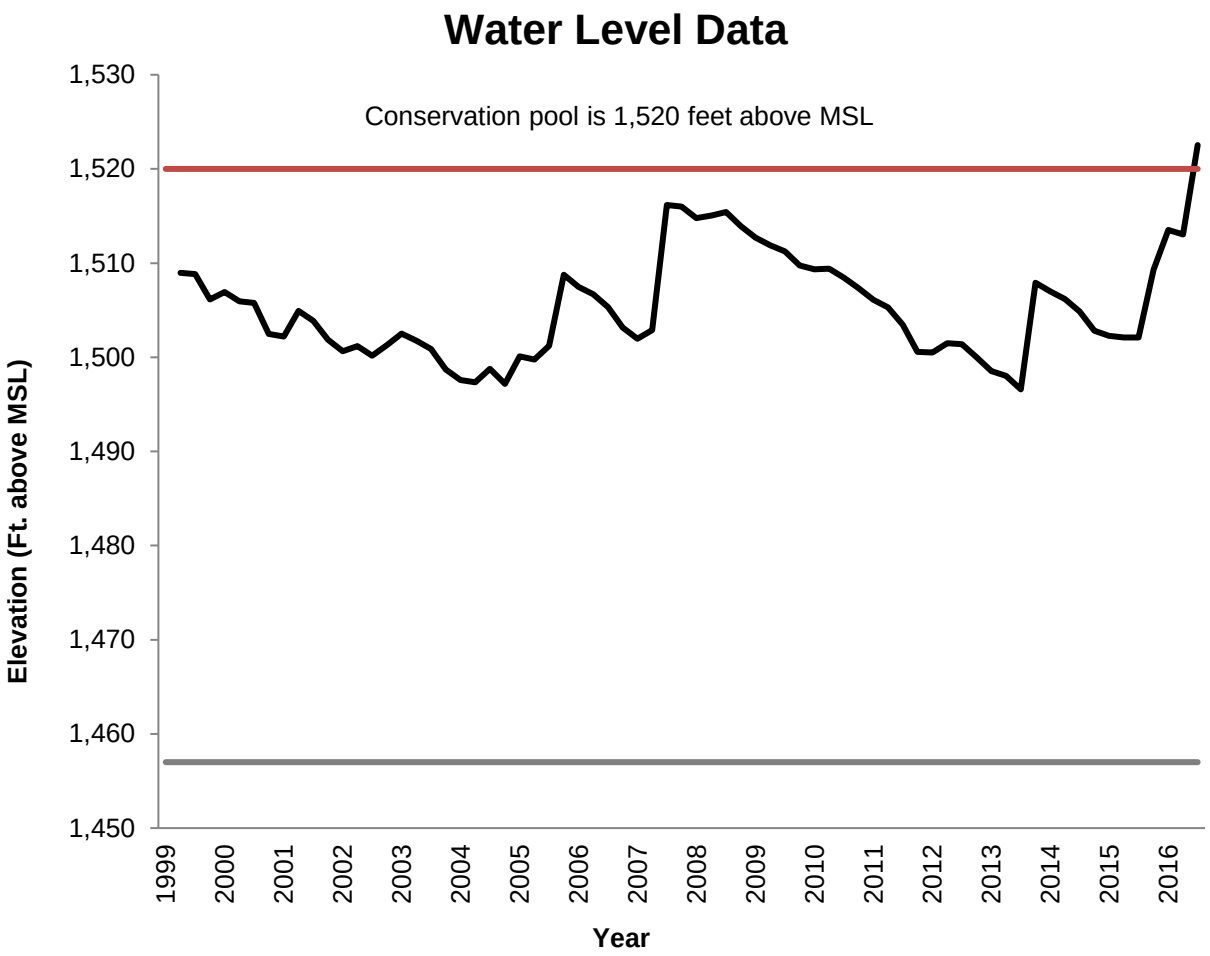


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Cisco Reservoir, Texas, shown in black. Conservation pool is 1,520 feet above mean sea level, shown in red. Dead pool is approximately 1,457 feet above mean sea level, shown in gray.

Table 1. Characteristics of Cisco Reservoir, Texas.

Characteristic	Description
Year constructed	1928
Conservation pool	1,520 feet above mean sea level
Dead pool	1,457 feet above mean sea level
Controlling authority	City of Cisco
County	Eastland
Reservoir type	Tributary
River basin	Brazos River Basin
Shoreline Development Index	4.99
USGS 8-Digit HUC Watershed	12060105
Conductivity	220-310 µS/cm

Table 2. Boat ramp characteristics for Cisco Reservoir, Texas, April, 2016. Reservoir elevation at time of survey was 1,512.85 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Main ramp	32.437439 -99.001790	Y	15	1,502	Accessible

Table 3. Harvest regulations for Cisco Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: 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	14-inch minimum
Crappie: White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Cisco Reservoir, Texas. Size categories were: FRY = < 1 inch; FGL = (fingerling) 1-3 inches; ADL = adults; UNK = unknown.

Species	Year	Number	Size
Threadfin Shad	1983	2,100	UNK
	1984	1,000	UNK
	Total	3,100	
Blue Catfish	1980	26,030	UNK
	2001	2,604	FGL
	Total	28,634	
Channel Catfish	1970	60,000	UNK
	1979	16,350	UNK
	2000	1,240	FGL
	2001	18,874	FGL
	Total	96,464	
Palmetto Bass	1980	11,376	UNK
	1982	10,000	UNK
	Total	21,376	
Largemouth Bass	1970	100,000	UNK
Florida Largemouth Bass	1991	17,219	FGL
	1991	7,747	FRY
	1994	44,500	FGL
	1995	44,899	FGL
	2012	128,770	FGL
	2016	83,525	FGL
	Total	326,660	
Smallmouth Bass	1984	4,000	FGL
	1987	30	ADL
	1988	13	ADL
	1994	26,386	FGL
	1995	11,970	FGL
	1995	14,250	FRY
	1996	26,309	FGL
	1997	26,900	FGL
	Total	109,858	
Walleye	1981	2,000,000	UNK
	1983	2,887,000	UNK
	Total	4,887,000	

Table 5. Objective-based sampling plan components for Cisco Reservoir, Texas 2015-2016.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE – Total	RSE-Total ≤ 25
	Abundance	CPUE – Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 14 inches	N = 13, 13.0 – 15.9 inches
	Condition	W_r	10 fish/inch group (max)
	Genetics	% FLMB	N = 30, any age
Gizzard Shad [a]	Abundance	CPUE – Total	RSE-Total ≤ 25
	Size structure	Length frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50
Bluegill [a]	Abundance	CPUE – Total	RSE-Total ≤ 25
	Abundance	CPUE – Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
Redbreast Sunfish [a]	Abundance	CPUE – Total	RSE-Total ≤ 25
	Abundance	CPUE – Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
Redear Sunfish [a]	Abundance	CPUE – Total	RSE-Total ≤ 25
	Abundance	CPUE – Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
Trap netting			
White Crappie	Abundance	CPUE – Total	RSE-Total ≤ 25
	Abundance	CPUE – Stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 10 inches	N = 13, 9.0 – 11.9 inches
	Condition	W_r	10 fish/inch group (max)
Gill netting			
Channel Catfish	Abundance	CPUE – Total	RSE-Total ≤ 25
	Abundance	CPUE – 12	RSE-12 ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
White Bass	Abundance	CPUE – Total	Exploratory monitoring
	Abundance	CPUE – Stock	Exploratory monitoring

[a] No additional effort will be expended to achieve prey species survey objectives if sampling objectives not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Comparison of the percent occurrence and associated 95% confidence levels for habitat sampled at randomly selected stations throughout the reservoir (N=149) in Cisco Reservoir, Texas, 2015. Size categories were: pebbles 0.01-2.5 inches, cobble 2.5-10.0 inches, small boulders 10.0-24.0 inches, and large boulders ≥ 24.0 inches. Water level at time of survey was approximately 7.6-feet below conservation pool.

Structural habitat type	Percent Occurrence	Lower CL	Upper CL
Large boulders	9.4	4.7	14.1
Bedrock	8.7	4.2	13.3
Cobbles	6.7	2.7	10.7
Docks	6.0	2.2	9.9
Small boulder	3.4	0.5	6.2
Dam	1.3	0.0	3.2
Pebbles	0.7	0.0	2.0

Table 7. Comparison of the percent occurrence and associated 95% confidence levels for vegetative species/habitat types sampled at randomly selected stations throughout the reservoir (N=149) in Cisco Reservoir, Texas, 2015. Water level at time of survey was approximately 7.6-feet below conservation pool.

Vegetative species/ habitat type	Percent Occurrence	Lower CL	Upper CL
Non-descriptive/featureless	70.5	63.1	77.8
Flooded terrestrial vegetation	24.2	17.3	31.0
Common buttonbush	18.1	11.9	24.3
Black willow	12.8	7.4	18.1
Chara sp.	13.4	8.0	18.9
Standing timber	2.0	0.0	4.3
Water primrose	0.7	0.0	2.0
Smartweed	0.7	0.0	2.0

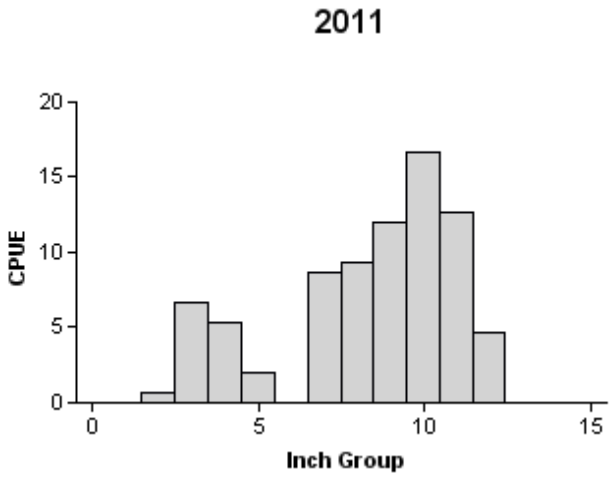
Table 8: Total directed effort (hours) and percent (%) directed angler effort by species or species group for Cisco Reservoir, Texas from June 1, 2014 through May 31, 2015. Relative standard error is in parenthesis.

Species or Species Group	Directed Effort (hours)	% of Directed Effort
Largemouth Bass	7,390.9 (16)	49.8
Crappie	3,019.7 (28)	20.3
Anything	2,617.0 (26)	17.6
Catfishes	1,252.2 (39)	8.4
Sunfishes	416.7 (77)	2.8
White Bass	155.5 (94)	1.0

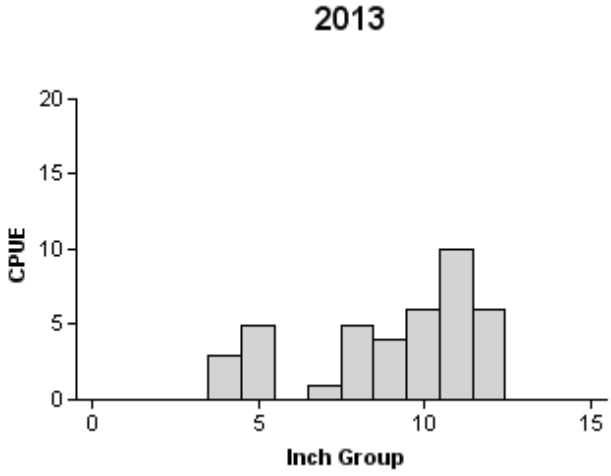
Table 9. Bank angling effort (hours), boat angling (hours), total fishing effort (hours) for all species and total directed expenditures at Cisco Reservoir, Texas from June 1, 2014 through May 31, 2015. Relative standard error is in parenthesis.

Creel Statistic	2014-2015
Bank Anglers Hours	4,777.6 (25)
Boat Anglers Hours	10,074.5 (15)
Total Effort Hours	14,852.0 (14)
Trip Expenditures	$74,352 (86)

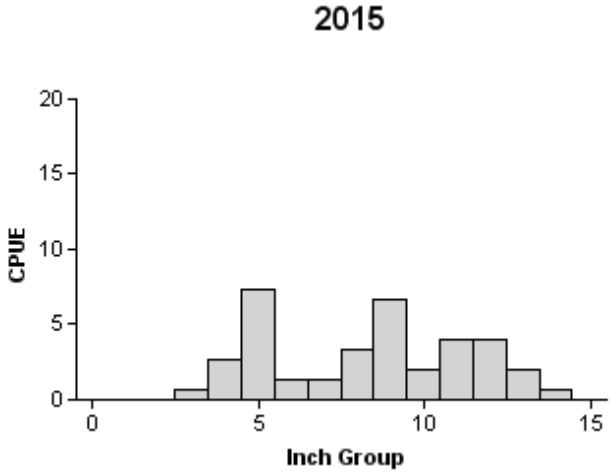
Gizzard Shad



Effort = 1.5
Total CPUE = 78.7 (24; 118)
IOV = 30 (7)



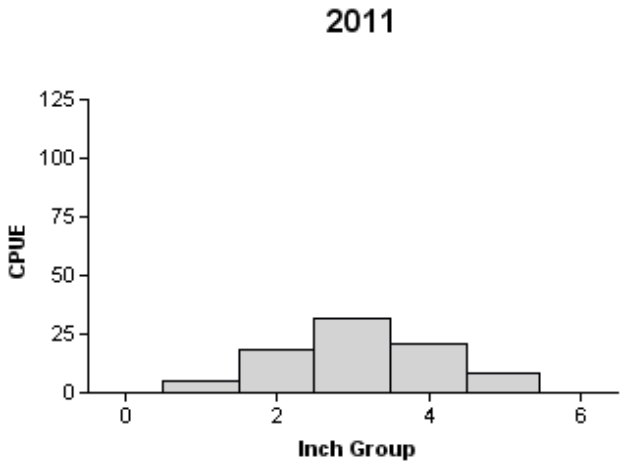
Effort = 1.0
Total CPUE = 40.0 (18; 40)
IOV = 22 (9)



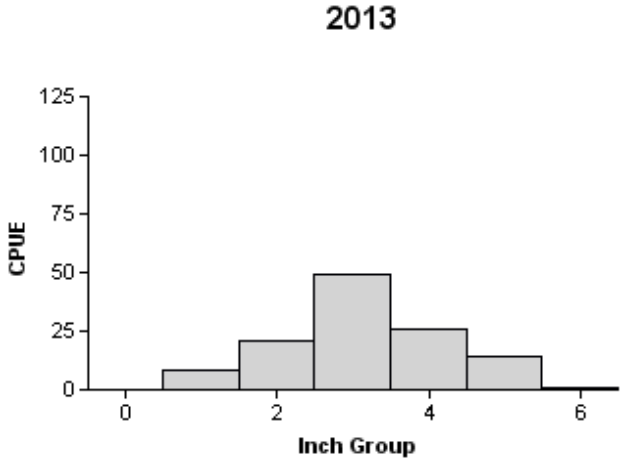
Effort = 1.5
Total CPUE = 36.0 (29; 54)
IOV = 37 (12)

Figure 2. Comparison of the number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2011, 2013, and 2015.

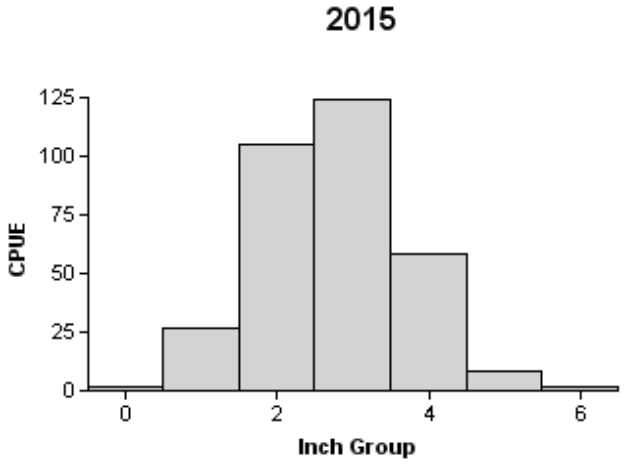
Bluegill



Effort = 1.5
Total CPUE = 83.3 (20; 125)
Stock CPUE = 60.0 (22; 90)
PSD = 0 (0)



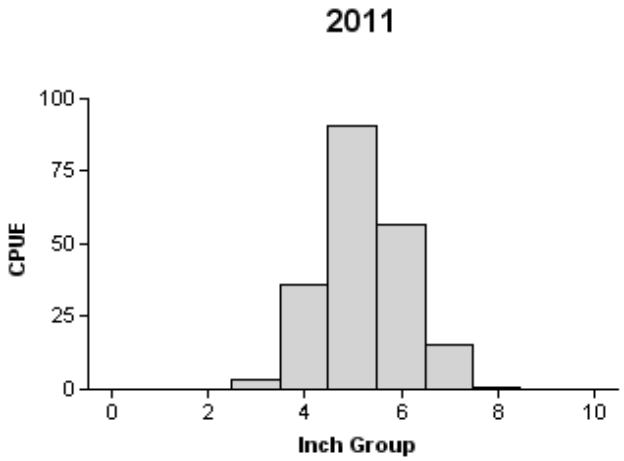
Effort = 1.0
Total CPUE = 119.0 (17; 119)
Stock CPUE = 90.0 (19; 90)
PSD = 1 (1)



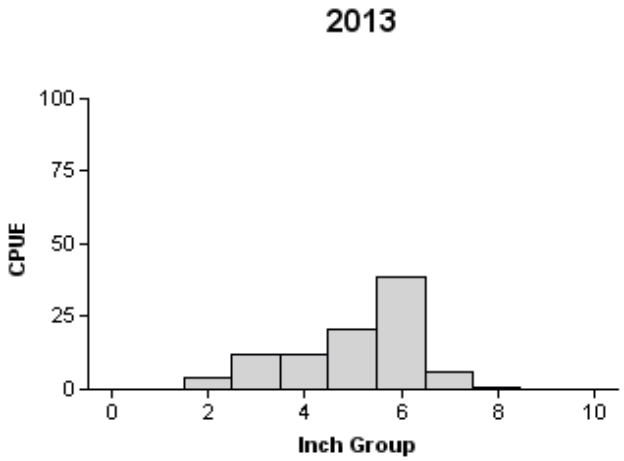
Effort = 1.5
Total CPUE = 325.3 (18; 488)
Stock CPUE = 192.0 (18; 288)
PSD = 1 (1)

Figure 3. Comparison of the number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2011, 2013, and 2015.

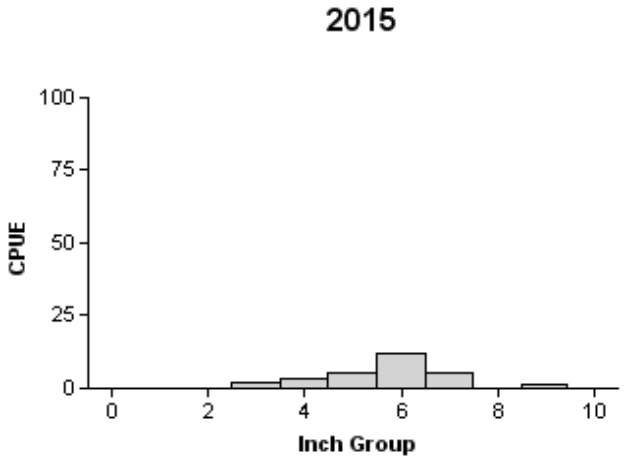
Redbreast Sunfish



Effort =	1.5
Total CPUE =	202.7 (15; 304)
Stock CPUE =	202.7 (15; 304)
CPUE-6	72.7 (15; 109)
PSD =	36 (4)



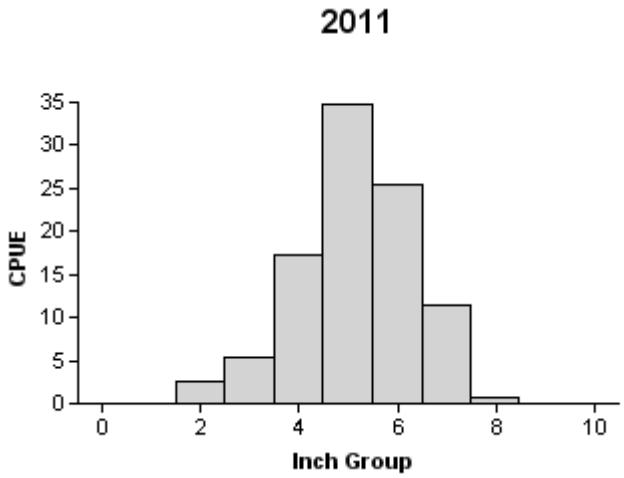
Effort =	1.0
Total CPUE =	95.0 (30; 95)
Stock CPUE =	91.0 (30; 91)
CPUE-6 =	46.0 (26; 46)
PSD =	51 (9)



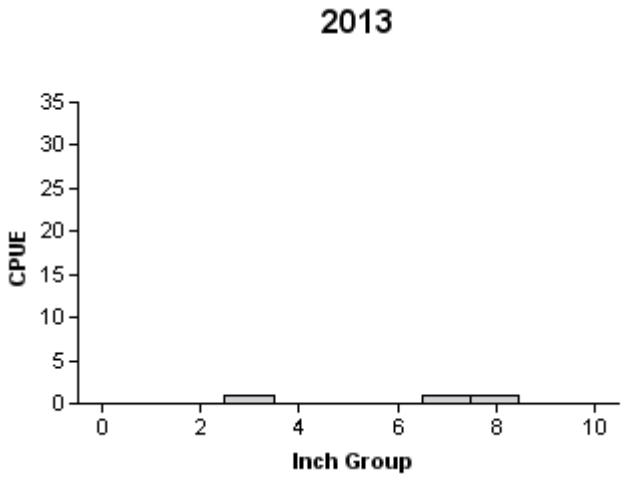
Effort =	1.5
Total CPUE =	29.3 (36; 44)
Stock CPUE =	29.3 (36; 44)
CPUE-6 =	18.7 (39; 28)
PSD =	64 (8)

Figure 4. Comparison of the number of Redbreast Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2011, 2013, and 2015.

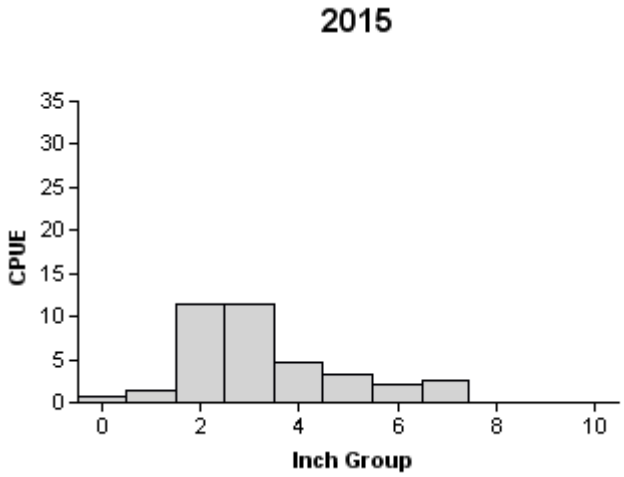
Redear Sunfish



Effort =	1.5
Total CPUE =	97.3 (21; 146)
Stock CPUE =	89.3 (21; 134)
CPUE-7 =	12.0 (30; 18)
PSD =	13 (4)



Effort =	1.0
Total CPUE =	3.0 (52; 3)
Stock CPUE =	2.0 (67; 2)
CPUE-7 =	2.0 (67; 2)
PSD =	100 (0)



Effort =	1.5
Total CPUE =	37.3 (16; 56)
Stock CPUE =	12.7 (32; 19)
CPUE-7 =	2.7 (58; 4)
PSD =	21 (10)

Figure 5. Comparison of the number of Redear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2011, 2013, and 2015.

Sunfishes

Table 10. Creel survey statistics for sunfishes at Cisco Reservoir, Texas, from June 1, 2014 through May 31, 2015. Total catch per hour was for anglers targeting sunfishes and total harvest was the estimated number of sunfishes harvested by all anglers. Percent legal release was the percent of estimated legal-sized fish released of the estimate of all fish caught. Relative standard errors (RSE) are in parenthesis.

Creel survey statistic	2014/2015
Average surface area (acres)	
Summer 2014	622.7
Fall 2014	575.0
Winter 2014	563.3
Spring 2015	558.3
Directed angling effort (h)	416.7 (77)
Angling effort/acre	0.7 (77)
Total catch per hour (number/h)	1.2 (14)
Total harvest	479.1 (63)
Bluegill	459.65 (64)
Redbreast Sunfish	0.0 (0)
Redear Sunfish	19.5 (327)
Total harvest/acre	0.8 (63)
Bluegill	0.8 (64)
Redbreast Sunfish	0.0 (0.0)
Redear Sunfish	0.03 (327)
Percent legal released of all sunfishes caught	56.2

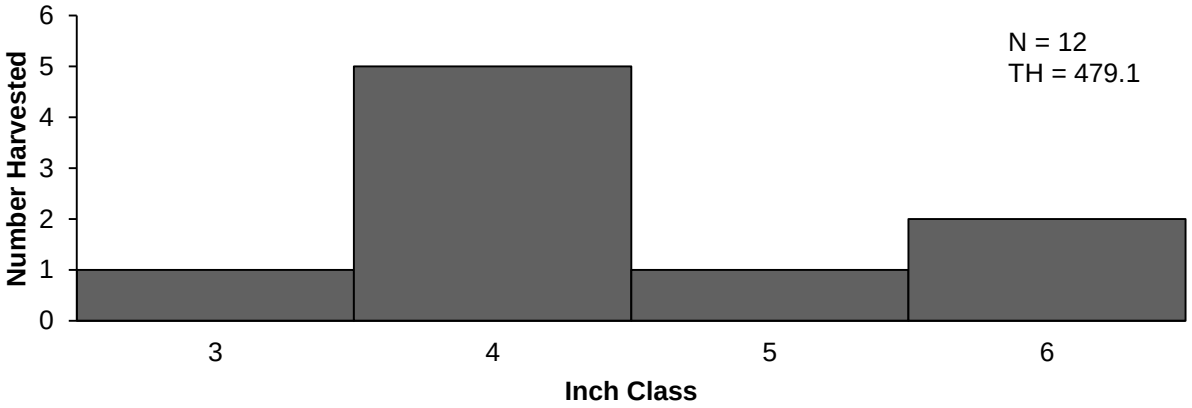
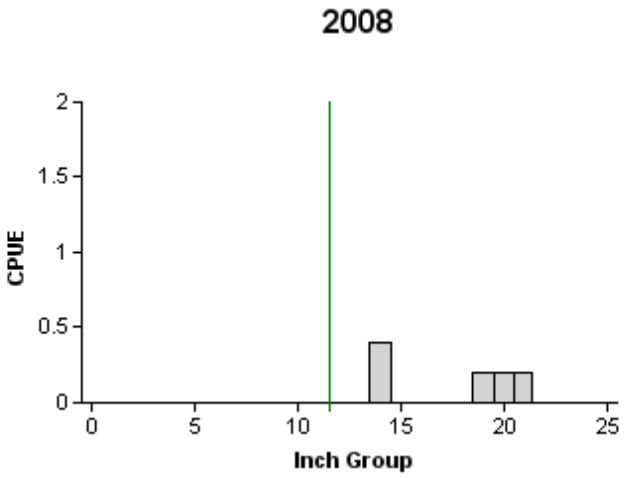
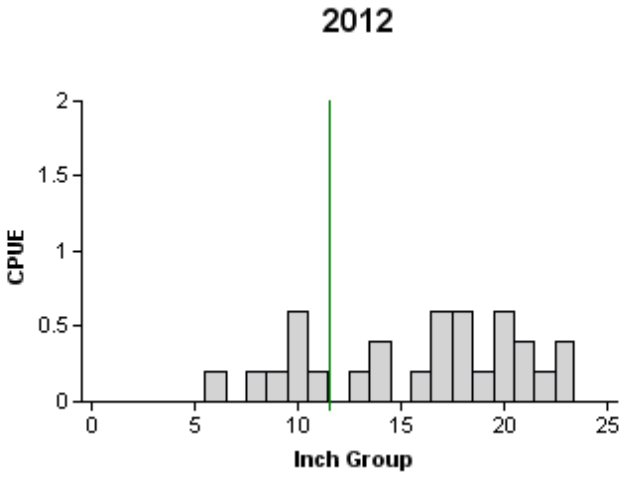


Figure 6. Length frequency of harvested sunfishes observed during creel surveys at Cisco Reservoir, Texas, June 2014 through May 2015, all anglers combined. N is the number of harvested sunfishes observed during creel surveys, and TH is the total estimated harvest for the creel period.

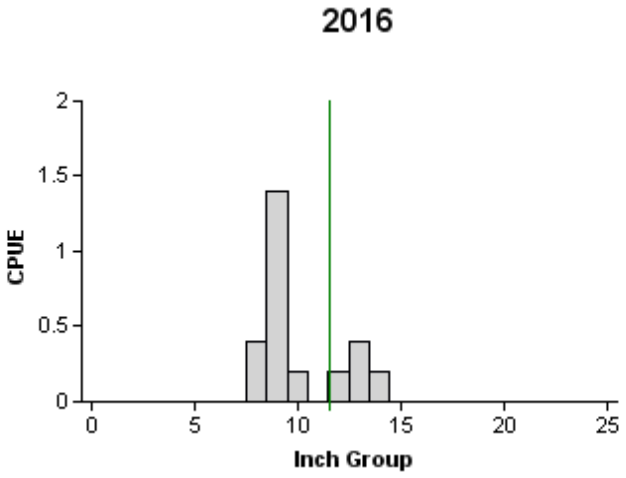
Channel Catfish



Effort =	5.0
Total CPUE =	1.0 (45; 5)
CPUE-12 =	1.0 (45; 5)
PSD =	60 (23)



Effort =	5.0
Total CPUE =	5.2 (19; 26)
CPUE-12 =	3.8 (32; 19)
PSD =	80 (14)



Effort =	5.0
Total CPUE =	2.8 (47; 14)
CPUE-12=	0.8 (47; 4)
PSD =	0 (0)

Figure 7. Comparison of the number of Channel Catfish caught per net night (CPUE) and populations indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cisco Reservoir, Texas, 2008, 2012, and 2016. The vertical line denotes the 12-inch minimum length limit.

Catfishes

Table 11. Creel survey statistics for catfishes at Cisco Reservoir, Texas, from June 1, 2014 through May 31, 2015. Total catch per hour was for anglers targeting catfishes and total harvest was the estimated number of catfishes harvested by all anglers. Percent legal released was the estimate of legal-sized fish released of all the legal-sized fish caught. Relative standard errors (RSE) are in parenthesis.

Creel survey statistic	2014/2015
Average surface area (acres)	
Summer 2014	622.7
Fall 2014	575.0
Winter 2014	563.3
Spring 2015	558.3
Directed angling effort (h)	1,252.2 (39)
Angling effort/acre	2.2 (39)
Total catch per hour (number/h)	0.1 (0)
Total harvest	151.7 (96)
Harvest/acre	0.3 (96)
Percent legal released of all legal catfishes caught	28.3

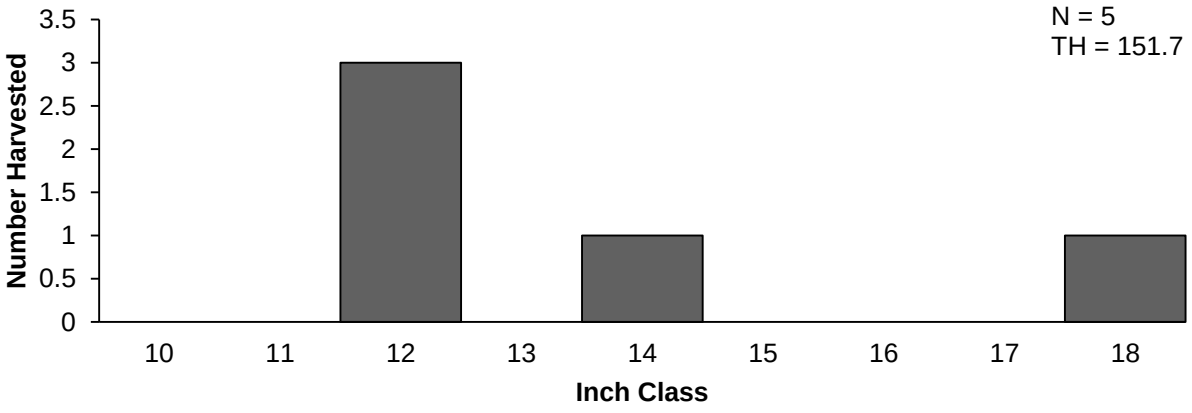
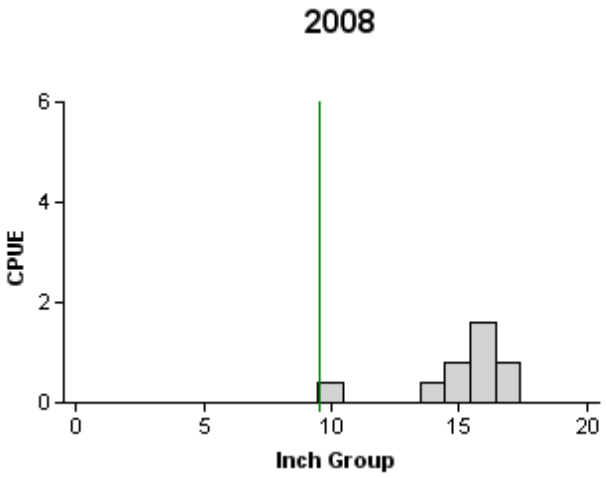
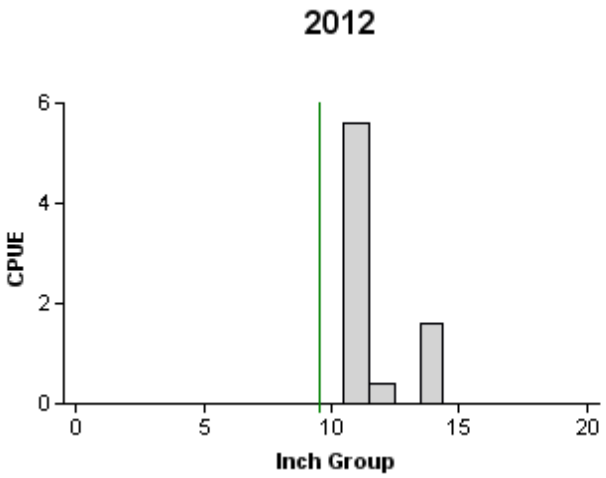


Figure 8. Length frequency of harvested catfish observed during creel surveys at Cisco Reservoir, Texas, June 2014 through May 2015, all anglers combined. N is the number of harvested catfish observed during creel surveys, and TH is the total estimated harvest for the creel period. No other catfish species were harvested during creel surveys.

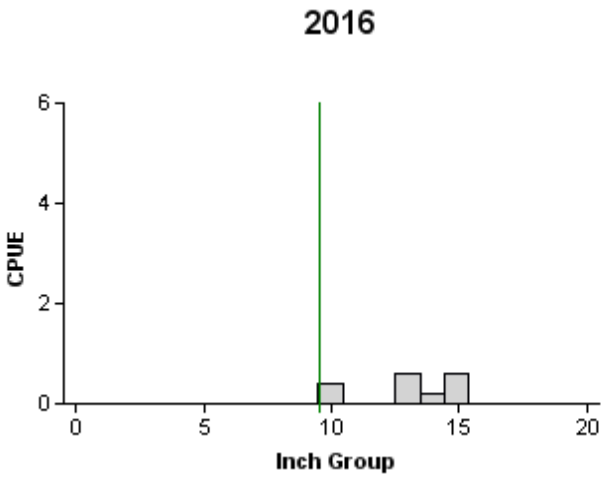
White Bass



Effort =	5.0
Total CPUE =	4.0 (52; 20)
Stock CPUE =	4.0 (52; 20)
PSD =	100 (0)



Effort =	5.0
Total CPUE =	7.6 (58; 38)
Stock CPUE =	7.6 (58; 38)
PSD =	100 (0)



Effort =	5.0
Total CPUE =	1.8 (67; 9)
Stock CPUE =	1.8 (67; 9)
PSD =	100 (0)

Figure 9. Comparison of the number of White Bass caught per net night (CPUE), and populations indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cisco Reservoir, Texas, 2008, 2012, and 2016. The vertical line denotes the 10-inch minimum length limit.

White Bass

Table 12. Creel survey statistics for White Bass at Cisco Reservoir, Texas, from June 1, 2014 through May 31, 2015. Total catch per hour was for anglers targeting White Bass and total harvest was the estimated number of White Bass harvested by all anglers. Relative standard errors (RSE) are in parenthesis.

Creel survey statistic	2014/2015
Average surface area (acres)	
Summer 2014	622.7
Fall 2014	575.0
Winter 2014	563.3
Spring 2015	558.3
Directed angling effort (h)	155.5 (94)
Angling effort/acre	0.3 (94)
Total catch per hour (number/h)	0.0 (0)
Total harvest	490.6 (77)
Harvest/acre	0.9 (77)
Percent legal released	0.0

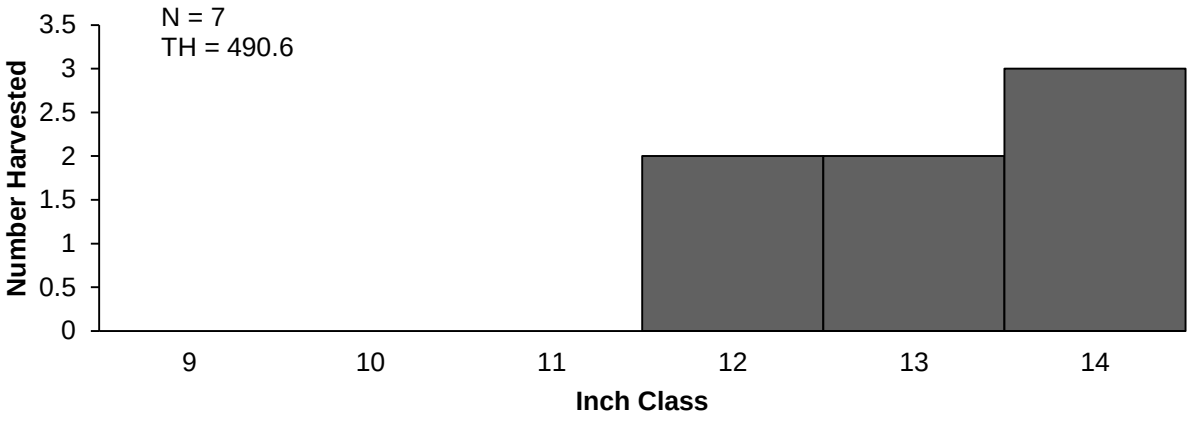
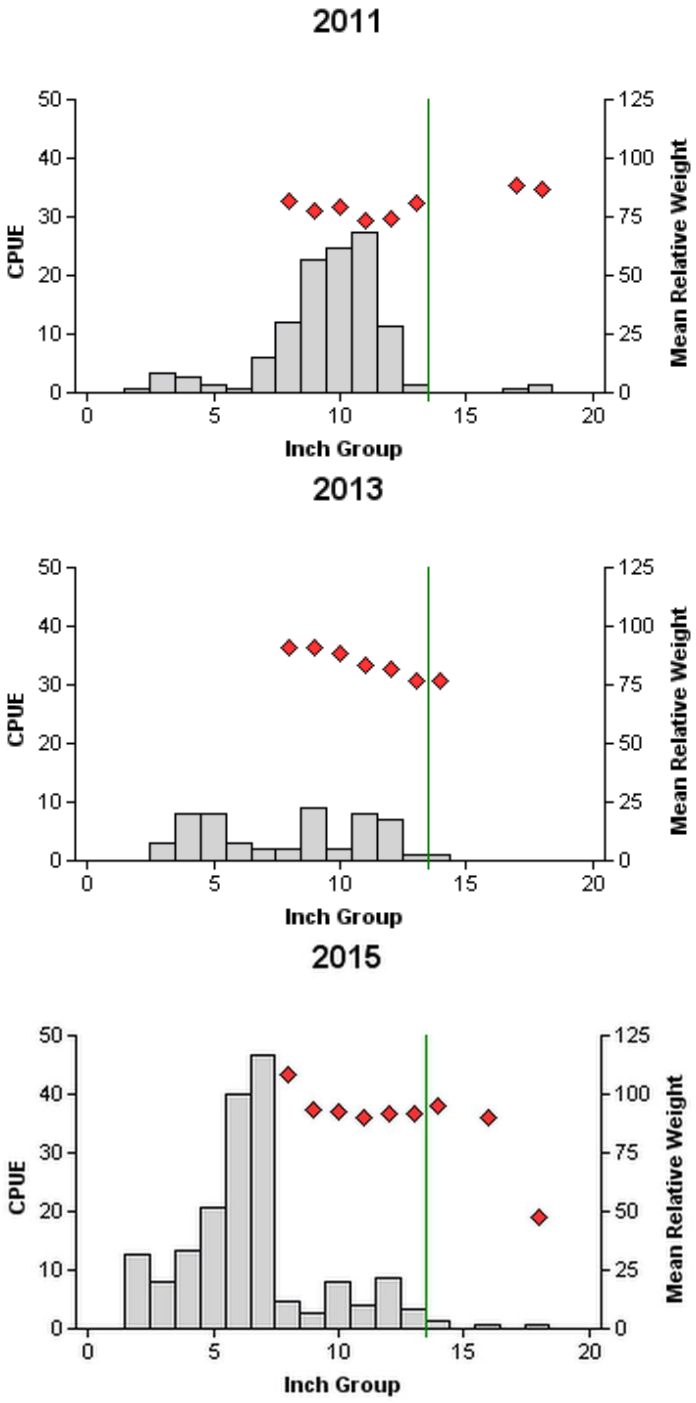


Figure 10. Length frequency of harvested White Bass observed during creel surveys at Cisco Reservoir, Texas, June 2014 through May 2015, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass



Effort =	1.5
Total CPUE =	116.0 (12; 174)
Stock CPUE =	101.3 (14; 152)
CPUE-14 =	2.0 (54; 3)
PSD =	14 (3)

Effort =	1.0
Total CPUE =	54.0 (23; 54)
Stock CPUE =	30.0 (26; 30)
CPUE-14 =	1.0 (100; 1)
PSD =	30 (7)

Effort =	1.5
Total CPUE =	175.3 (24; 263)
Stock CPUE =	34.0 (22; 51)
CPUE-14 =	2.7 (45; 4)
PSD =	43 (6)

Figure 11. Comparison of the number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Cisco Reservoir, Texas, 2011, 2013, and 2015. The vertical line denotes the 14-inch minimum length limit.

Largemouth Bass

Table 13. Creel survey statistics for Largemouth Bass at Cisco Reservoir, Texas, from June 1, 2014 through May 31, 2015. Total catch per hour was for anglers targeting Largemouth Bass and total harvest was the estimated number of Largemouth Bass harvested by all anglers. Percent legal released was the estimated number of Largemouth Bass ≥ 14 inches released divided by the total number of legal-sized Largemouth Bass caught by anglers. Relative standard errors (RSE) are in parenthesis. Note: All creel statistics are for non-tournament anglers. No tournament anglers were encountered during the creel survey.

Creel survey statistic	2014/2015
Average surface area (acres)	
Summer 2014	622.7
Fall 2014	575.0
Winter 2014	563.3
Spring 2015	558.3
Directed angling effort (h)	7,390.9 (16)
Angling effort/acre	12.8 (16)
Total catch per hour (number/h)	1.1 (59)
Total harvest	19.5 (173)
Harvest/acre	0.03 (173)
Percent legal released	99.1

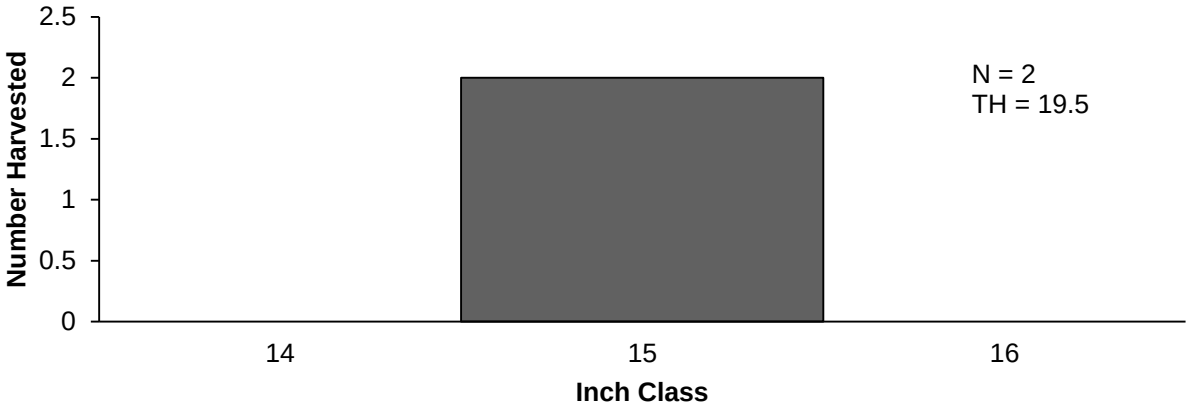


Figure 12. Length frequency of harvested Largemouth Bass observed during creel surveys at Cisco Reservoir, Texas, June 2014 through May 2015, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass

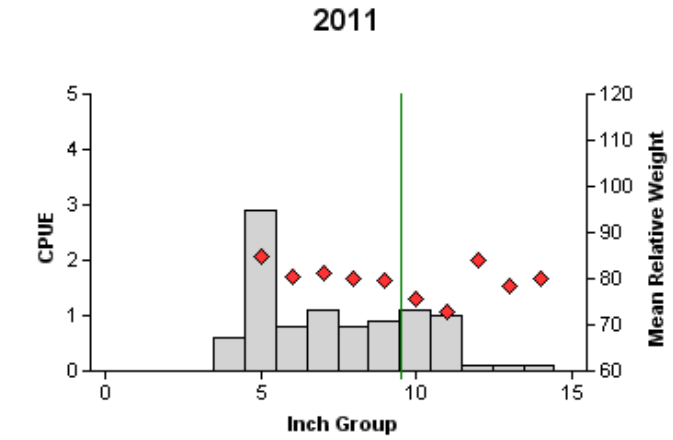
Table 14. Mean age at length of Largemouth Bass from fall electrofishing surveys in Cisco Reservoir, Texas in 2001, 2003, 2007, 2011, and 2015. Sample size for each estimate is in parentheses. In 2001 and 2015, no Largemouth Bass ≤ 8 inches were sampled for age and growth. Data for age-0 fish from 2001, 2007, 2001, and 2015 will not be reported.

Year	Age 0	Age 1	Age 2	Age 3	4	5	6	7
2001		8.6 (16)	11.0 (8)	12.5 (7)	12.6 (3)			
2003	4.8 (11)	8.0 (31)	10.5 (14)	10.5 (9)	12.5 (7)	13.2 (4)	12.6 (1)	14.8 (1)
2007		11.4 (4)	12.3 (35)	13.3 (3)		13.6 (1)		
2011				11.3 (9)	12.4 (12)			
2015		10.6 (17)	12.3 (20)	14.1 (3)		13.3 (2)		

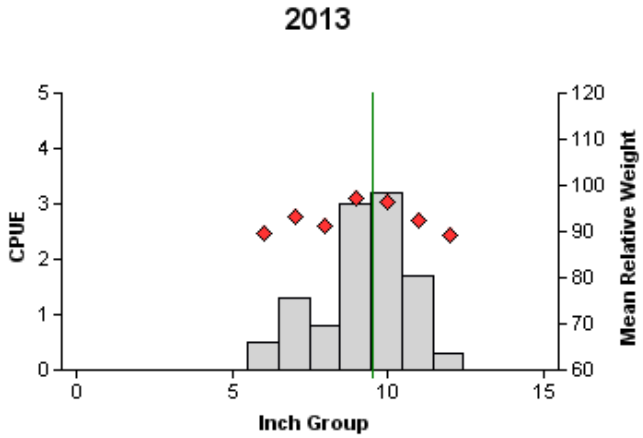
Table 15. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Cisco Reservoir, Texas,1993, 1996, 1999, 2005, 2011, and 2015. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB allele	%FLMB
1993	26	0	4	22	4.8	0.0
1996	27	1	19	7	37.0	3.7
1999	40	10	28	2	61.3	25.0
2005	30	1	26	3	45.5	3.3
2011	30	0	30	0	52.0	0.0
2015	30	0	30	0	56.0	0.0

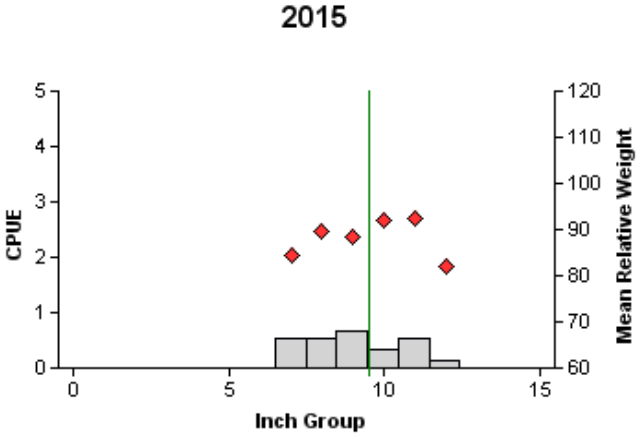
White Crappie



Effort =	10.0
Total CPUE =	9.5 (36; 95)
Stock CPUE =	8.9 (33; 89)
CPUE-10 =	2.4 (35; 24)
PSD =	46 (12)



Effort =	10.0
Total CPUE =	10.8 (42; 108)
Stock CPUE =	10.8 (42; 108)
CPUE-10 =	5.2 (33; 52)
PSD =	83 (5)



Effort =	15.0
Total CPUE =	2.7 (27; 41)
Stock CPUE =	2.7 (27; 41)
CPUE-10 =	1.0 (52; 15)
PSD =	80 (9)

Figure 13. Comparison of the 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 size structure are in parentheses) for fall trap netting surveys, Cisco Reservoir, Texas, 2011, 2013, and 2015. The vertical line denotes the 10-inch minimum length limit.

White Crappie

Table 16. Creel survey statistics for White Crappie at Cisco Reservoir, Texas, from June 1, 2014 through May 31, 2015. Total catch per hour was for anglers targeting Largemouth Bass and total harvest was the estimated number of Largemouth Bass harvested by all anglers. Percent legal released was the estimated percentage of legal-sized fish anglers released. Relative standard errors (RSE) are in parenthesis.

Creel survey statistic	2014/2015
Average surface area (acres)	
Summer 2014	622.7
Fall 2014	575.0
Winter 2014	563.3
Spring 2015	558.3
Directed angling effort (h)	3,019.7 (28)
Angling effort/acre	5.1 (28)
Total catch per hour (number/h)	0.6 (85)
Total harvest	1,127.0 (48)
Harvest/acre	1.9 (48)
Percent legal released	0.0

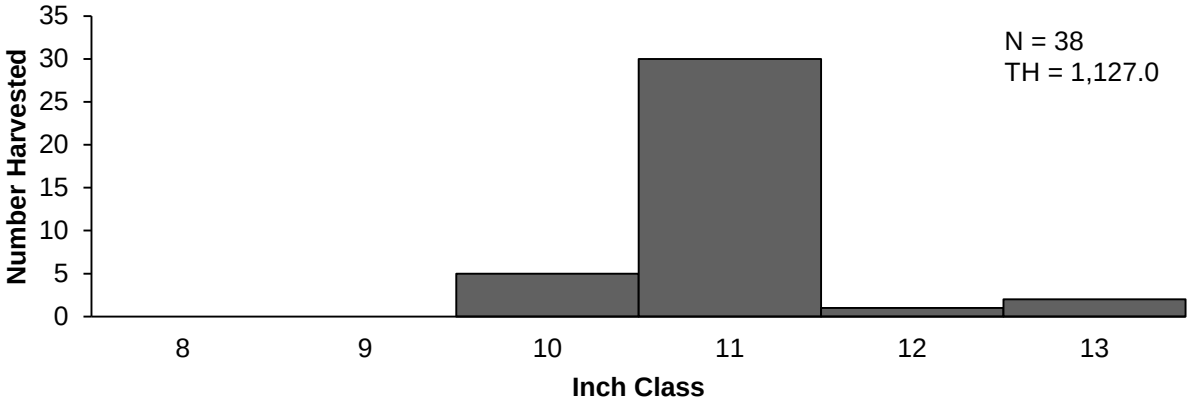


Figure 14. Length frequency of harvested White Crappie observed during creel surveys at Cisco Reservoir, Texas, June 2014 through May 2015, all anglers combined. N is the number of harvested White Crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 17. Mean age at length of White Crappie from fall trap netting surveys in Cisco Reservoir, Texas in 1999, 2003, 2011, and 2015. Size of fish ranged from 9.0-11.9 inches.

Year	Age-at-length	Sample size	Age range
1999	4.4	9	3 to 8
2003	3.8	22	2 to 7
2011	3.9	30	2 to 7
2015	2.1	22	2 to 3

Table 18. Proposed sampling schedule for Cisco Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while low-frequency electrofishing is conducted in the summer, and electrofishing and trap netting surveys are conducted in the fall. Surveys and reporting to be completed are denoted by A for additional survey and S for standard survey.

Survey year	Electrofish	Trap net	Gill net	Low-frequency electrofish	Habitat/ Vegetation	Access	Creel survey	Report
2016-2017								
2017-2018	A*	A						
2018-2019								
2019-2020	S	S		A	S	S		S

* Bass-only electrofishing

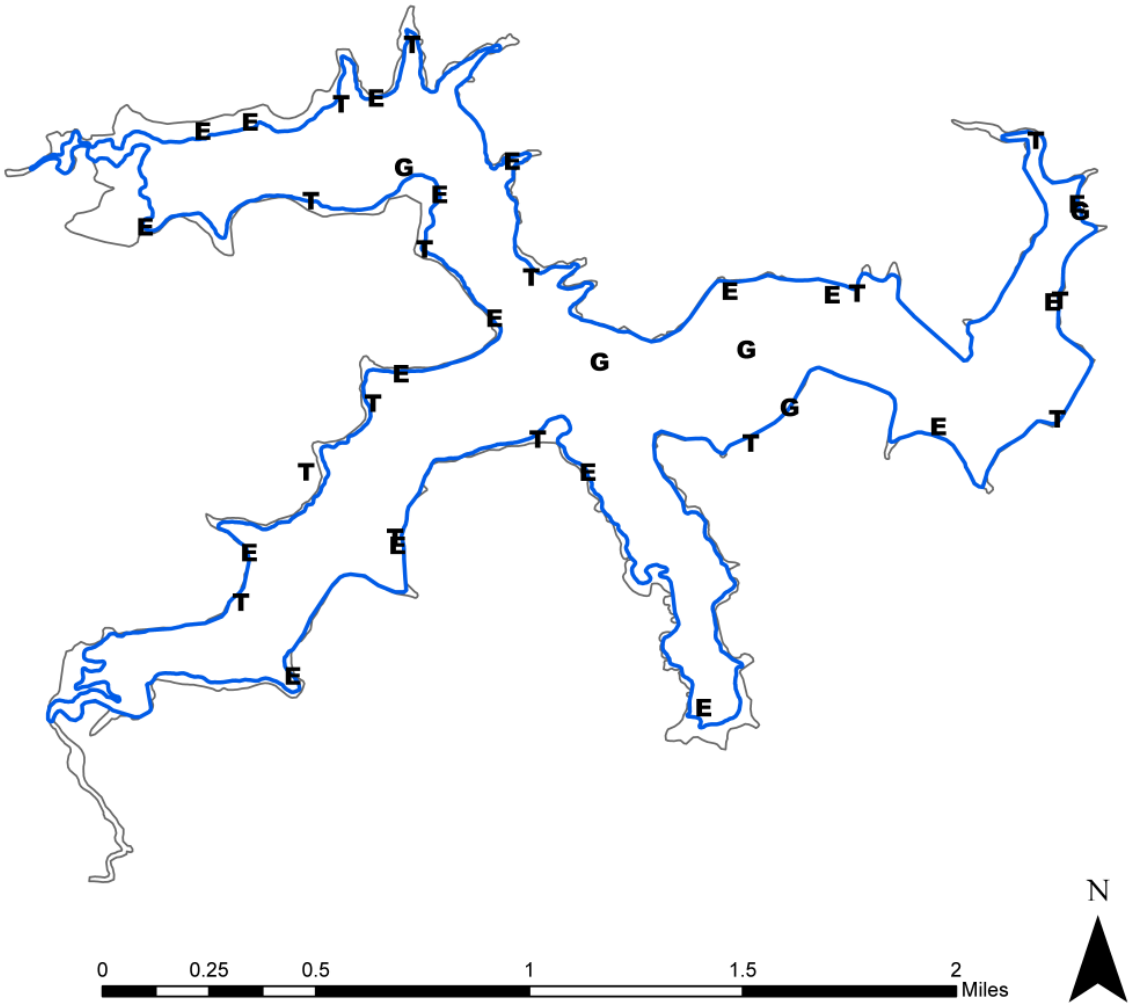
APPENDIX A

Number (N) and catch rate (CPUE) and associated relative standard error (RSE) of all target species collected from standard gear types from Cisco Reservoir, Texas, 2015-2016. Sampling effort was 1.5 hours for electrofishing, 5 net nights for gill netting, and 15 net nights for trap netting.

Species	Electrofishing		Gill Netting		Trap Netting	
	N	CPUE/RSE	N	CPUE/RSE	N	CPUE/RSE
Gizzard Shad	54	36.0/29				
Threadfin Shad	169	112.7/76				
Inland Silverside	3	2.0/73				
River Carpsucker[1]	3	2.0/73				
Blacktail Shiner	1	0.7/100				
Channel Catfish	1	0.7/100	14	2.8/47		
Flathead Catfish	2	1.3/69	3	0.6/67		
White Bass			9	1.8/67		
Redbreast Sunfish	44	29.3/36				
Green Sunfish	87	58.0/29				
Warmouth	10	6.7/44				
Bluegill	488	325.3/18				
Longear Sunfish	45	30.0/22				
Redear Sunfish	56	37.3/16				
Largemouth Bass	263	175.3/24				
White Crappie	3	2.0/54			41	2.7/27
Logperch	14	9.3/34				

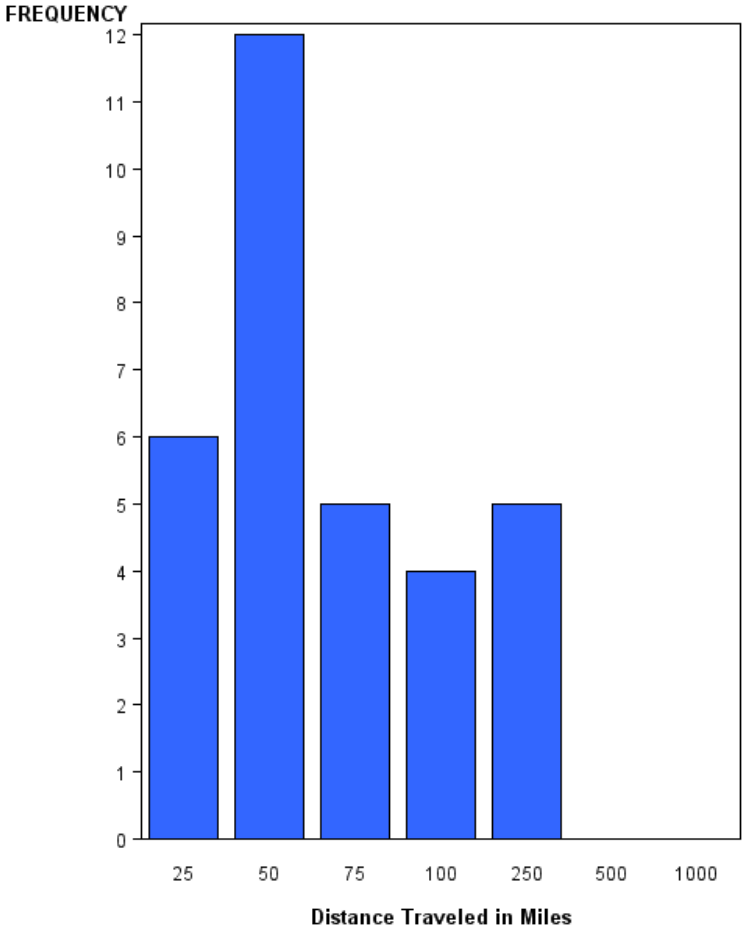
[1]Fish sampled ≤ 6 inches TL.

APPENDIX B



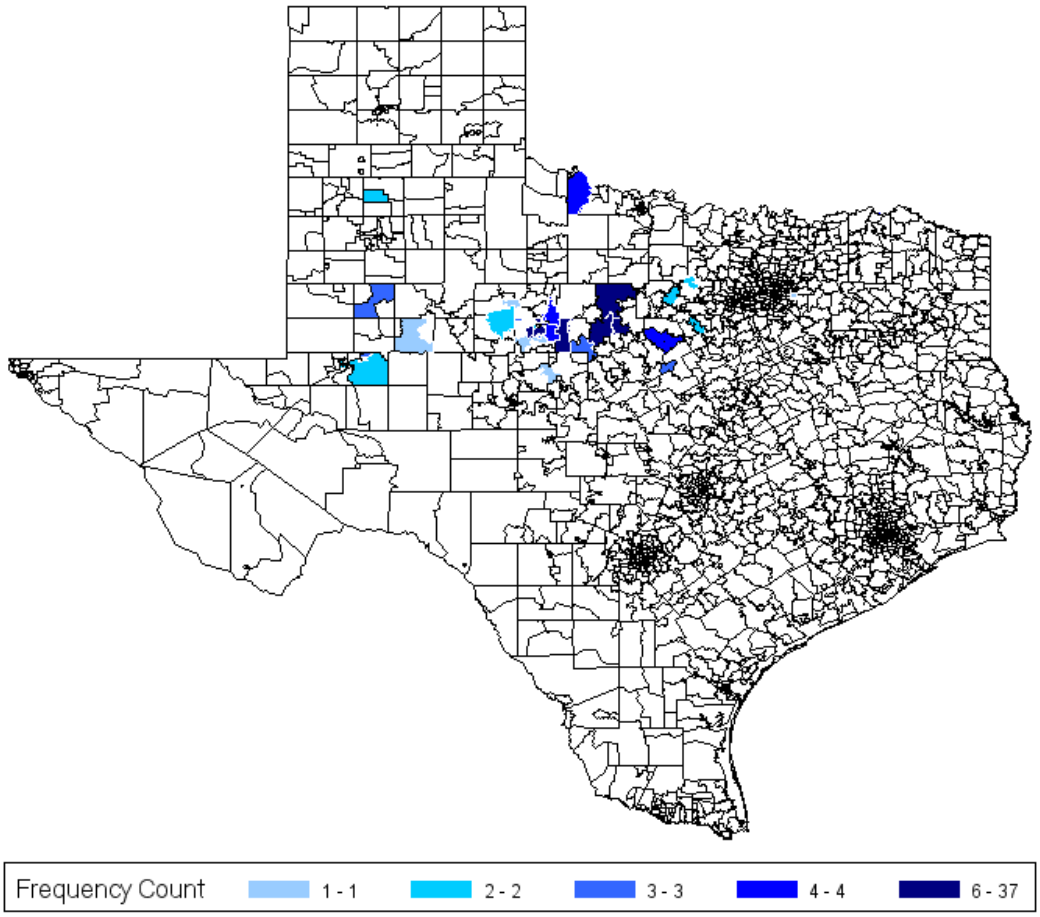
Location of sampling sites, Cisco Reservoir, Texas, 2015-2016. Electrofishing (E), gill netting (G), and trap netting (T) stations are displayed. Reservoir outline at conservation pool (gray line) and water level at time of sampling (blue line) are displayed. The reservoir was approximately 9-feet below conservation pool at time of sampling.

APPENDIX C



Frequency of anglers that traveled various distance (miles) to Cisco Reservoir, Texas as determined from the June 2014 through May 2015 creel survey.

APPENDIX D



Location, by ZIP code, and frequency of anglers that were interviewed at Cisco Reservoir, Texas during the June 2014 through May 2015 creel survey.