

PERFORMANCE REPORT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2015 Fisheries Management Survey Report

Cooper Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Cooper Reservoir were surveyed using electrofishing and trap netting in 2015 and gill netting in 2016. An aquatic vegetation survey was conducted in summer 2015. Historical data are presented with the 2015-2016 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Cooper Reservoir is located in Delta and Hopkins Counties, Texas, on the Middle and South Forks of the Sulphur River. It was constructed by the U. S. Army Corps of Engineers for water supply and flood control. Within the past two years, reservoir elevation has increased from a minimum of 12.6 ft. below conservation pool elevation (cpe) in December 2014 to a level six feet above cpe, 12 months later. This event caused flooding in the Doctor's Creek and South Sulphur Units of Cooper Lake State Park. In 2016 elevation has remained above cpe.
- **Management History:** Important sport fishes at Cooper Reservoir include Hybrid Striped Bass (Palmetto Bass and Sunshine Bass combined), White Bass, Blue Catfish, Channel Catfish, Largemouth Bass and White Crappie. Annual requests are made to stock Hybrid Striped Bass (Palmetto Bass and/or Sunshine Bass) at a rate of 10/acre.
- **Fish Community**
 - **Prey species:** No assessments were made of prey fish populations on Cooper Reservoir but body condition of game fish populations was good indicating adequate availability of prey species.
 - **Catfishes:** Cooper Reservoir continued to sustain a quality population of Blue Catfish and a less abundant population of Channel Catfish. Sub-stock sized fish of both species were collected, indicating successful reproduction. Harvestable-size Blue Catfish occurred in high numbers and exhibited good body condition.
 - **Temperate basses:** Ample open water habitat and a sufficient prey base allow Cooper Reservoir to support populations of White Bass and Hybrid Striped Bass (Palmetto Bass and Sunshine Bass combined). Cooper Reservoir has received annual stockings of Hybrid Striped Bass since 2002 with the exception of 2010 and 2012.
 - **Largemouth Bass:** Largemouth Bass abundance has historically been limited, indicating low population density. The length frequency distribution of fish collected in 2015 was dominated by fish smaller than stock size (8 inches) and no legally-retainable fish were sampled.
 - **Crappie:** White Crappie were the only species collected in 2015 and the sample was dominated by fish less than 5-inches in length. Few legal fish were collected in sampling.
- **Management Strategies:** Annual stockings of Hybrid Striped Bass (Palmetto Bass and/or Sunshine Bass) should continue at a rate of 10/acre to maintain the fishery. General monitoring with trap netting, and gill netting surveys will be repeated in 2019-2020. Aquatic vegetation and access surveys will be conducted in 2019.

INTRODUCTION

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

Reservoir Description

Cooper Reservoir is an impoundment of the Sulphur River in Delta and Hopkins Counties, Texas. The reservoir was constructed by the U. S. Army Corps of Engineers in 1991 for water supply, recreation, and flood control. At conservation pool elevation (cpe), 440.0 feet above mean sea level, Cooper Reservoir is 19,280 surface acres, has a shoreline length of 125 miles, and a mean depth of 15 feet. Since the previous management report, lake elevations declined gradually and reached 13.4 ft. below cpe in November 2013 followed by a slight recovery and another decline to 12.6 ft. below cpe in December 2014 (Figure 1). Since spring 2015, lake elevation has steadily increased as a result of a series of rainfall events which caused flooding at Cooper Lake State Park. Elevation on Cooper Reservoir has remained above cpe in 2016. The reservoir was eutrophic with a Carlson's Trophic State Index (TSI) chl-a of 53.12 µg/L (Texas Commission on Environmental Quality 2005). Other descriptive characteristics for Cooper Reservoir are in Table 1.

Angler Access

Cooper Reservoir has five public boat ramps and no private boat ramps. There are two units of Cooper Lake State Park, the South Sulphur Unit and Doctor's Creek Unit each with public ramps and shoreline access areas and fishing piers available to customers paying the entry fee. Although public ramps at Tira and John's Creek are not located physically within state park boundaries they are administered by Cooper Lake State Park and subject to launch fees. There is limited shoreline access available at these boat ramps. During periods of extreme drought boat ramps have been inaccessible because of low lake elevation. Additional boat ramp characteristics are in Table 2.

Management History

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

1. Enhancement of Hybrid Striped Bass fishery.
Action: Annual requests for stocking of Hybrid Striped Bass at a rate of 10/acre were submitted and Palmetto Bass were stocked in 2013 (172,684), 2014 (76,204), and 2016 (92,536), and Sunshine Bass were stocked in 2015 (147,174). Gill netting was conducted in 2016 to monitor the Hybrid Striped Bass population.
2. Enhancement of the largemouth bass population and fishery.
Action: A daytime electrofishing survey using biologist-selected stations was conducted in 2015 and a 30-fish sample of fish of various ages was collected for genetics analysis. An attempt was made to collect an age sample (Category 2) but only age 0 (N=14) and age 1 (N=3) fish were collected, insufficient for assessment.
3. Management of aquatic invasive species (AIS).
Action: Hydrilla was observed during a vegetation survey conducted in summer 2015 but no action was taken because it did not create any access issues and it has never been problematic in Cooper Reservoir.
4. Increase angler awareness of the fisheries resources at Cooper Reservoir.
Action: District staff were periodically contacted by outdoor reporters inquiring about the

status of Cooper Reservoir's fisheries for White Bass and Hybrid Striped Bass.

Harvest regulation history: Sport fishes in Cooper Reservoir are currently managed with TPWD statewide regulations with the exception of Largemouth Bass (Table 3). The minimum length limit for largemouth bass has been 18 inches with a five fish daily bag limit from the time the lake was opened to fishing.

Stocking history: Cooper Reservoir has received annual stockings of Palmetto Bass since 1998, with the exception of 2000, 2001, 2010, 2012 and 2015. In 2015 Sunshine Bass were substituted for Palmetto Bass (Table 4). Florida largemouth bass were most recently stocked in 2009 and 2010. Blue Catfish were stocked in 1991 and 1992. The complete stocking history is listed in Table 4.

Vegetation/habitat history: A habitat enhancement project was initiated on Cooper Reservoir in 1999, but low water conditions in 2003 to 2004 limited the success of plantings. Hydrilla has been present in the reservoir for many years but its abundance fluctuates and it has never created any access issues which would warrant the use of control measures.

Water transfer: Cooper Reservoir provides water supply storage for the North Texas Municipal Water District, the Sulphur River Municipal Water District, and the City of Irving. This water supply storage exists in the conservation pool between elevations 415.5 ft. msl and 440.0 ft. msl. The water intake structure is located on the south shore of the lake, which provides anywhere from 2.0 million gallons per day of water in the winter months to 5.0 million gallons per day in the summer months.

METHODS

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Cooper Reservoir (TPWD unpublished), except for electrofishing: it was decided that biologist-selected sites would be more efficient in collecting samples for Largemouth Bass age and growth assessment and genetic analysis. Primary components of the OBS plan are listed in Table 5. Survey sites in trap netting and gill netting surveys were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, were collected by daytime electrofishing (2.2 hour at 7 stations of variable durations) to determine size structure of the population. Ages for Largemouth Bass were to be determined using otoliths from randomly-selected fish in the length range 13.0 to 14.9 inches. No fish were collected in this size range.

Trap netting – Crappie were collected using trap nets (10 net nights at 10 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). The OBS plan specified a sampling effort of 15 net nights but since low numbers of fish were collected after sampling 10 stations a decision was made that sampling with five additional stations was unlikely to meet target criteria.

Gill netting – Blue Catfish, Channel Catfish, White Bass, and Hybrid Striped Bass (Palmetto Bass and Sunshine Bass combined) were collected by gill netting (15 net nights at 15 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). Ages for Blue Catfish were determined using otoliths from 12 randomly-selected fish (range 11.3 to 12.4 inches). Ages for White Bass were determined using otoliths from 18 randomly-selected fish (range 9.5 to 10.9 inches).

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

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). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). Standard error (SE) was calculated for structural indices and IOV. Relative standard error ($RSE = 100 \times SE$ of the estimate/estimate) was calculated for all CPUE statistics.

Habitat – A vegetation survey was conducted in 2015. Acreage estimates were assessed using the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

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

RESULTS AND DISCUSSION

Habitat: Within the past two years, reservoir elevation increased from 12.6 ft. below cpe in December 2014 to 6 ft. above cpe, 12 months later. This event caused flooding in the Doctor's Creek and South Sulphur Units of Cooper Lake State Park. Elevation has remained above cpe in 2016. Terrestrial and marginal species established along shoreline areas during periods of exposure and when reservoir elevations increased, these species provided limited aquatic habitat. In 2007 and 2015 extensive areas of smartweed developed when the reservoir elevation returned to conservation pool following prolonged drought episodes. In 2015, growth of buttonbush and black willow was also significant although the total vegetated coverage accounted for less than 2% of reservoir surface area (Table 6). Small quantities of hydrilla (1.1 ac) and alligatorweed (0.2 ac) were observed but neither species warranted control.

Prey species: No assessments were made of prey species (Gizzard Shad, Threadfin Shad, Bluegill) in Cooper Reservoir in fall 2015. Body condition of game fish populations such as Blue Catfish, White Bass and Largemouth Bass were good overall indicated by most size classes of these species having Relative Weights exceeding 90 which inferred adequate prey fish availability. The protocol for electrofishing sampling, which is used to assess important prey species, was changed to target Largemouth Bass at biologist-selected stations. Abundance estimates of prey species would have been inappropriate because of the subjective nature of station selection.

Catfishes: Blue Catfish were the most numerous catfish species collected in gill netting on Cooper Reservoir. Gill net CPUE of Blue Catfish in 2016 (7.4/nn) was similar to 2008 (8.0/nn) but almost half of the rate in 2012 (14.6/nn) (Figure 2). Although CPUE decreased in the most recent sample, PSD and PSD-P were consistent and 76% of fish collected in 2012 and 2016 were longer than the minimum length limit. Mean relative weights for all inch groups were good, ranging from 87 to 99. Blue Catfish in Cooper Reservoir grew to the minimum length limit (data range: 11.3 to 12.4 inches, average 11.9 inches) in 3.2 years ($N = 12$; age range 3-4 years). CPUE of Channel Catfish in 2016 (2.1/nn) was higher than in 2012 (1.7/nn) or 2008 (1.1/nn) but this species is apparently being out-competed by Blue Catfish. Prior gill net sampling showed catches of Blue Catfish started to exceed catches of Channel Catfish in 2004 (Myers and Storey 2004). The sampling goal of 50 stock-sized fish for the OBS plan was not met as only 32 fish of this size were collected. An age and growth assessment was not conducted because an adequate number of fish were not collected.

White Bass: White Bass CPUE in gill nets in 2016 (4.4/nn) was lower than in 2012 (5.1/nn) or 2008 (8.1/nn) (Figure 4). Most White Bass collected (53%) were of harvestable size (≥ 10 inches) and body condition of all size classes was excellent with relative weights ranging from 98 to 129, a clear indication of abundant prey fish availability. Growth of White Bass in Cooper Reservoir was fast with fish growing to the minimum length limit (data range: 9.5 to 10.9 inches, average 10.2 inches) in 1.0 years ($N = 18$; all

fish collected were 1-year-old).

Hybrid Striped Bass: Cooper Reservoir has a long history of stocking Palmetto Bass. Sunshine Bass were stocked in 2015 and future population sampling will combine these two hybrids under the combined classification of Hybrid Striped Bass. Gill net CPUE in 2016 (0.9/nn) was the lowest of any year within the last three surveys, down from 2012 (2.3/nn) and 2008 (5.1/nn). Although abundance was low, body condition of all size groups was excellent with relative weights ranging from 108 to 122. Missed stockings of Palmetto Bass in 2010 and 2012 and reduced stocking rates in 2009, 2011, and 2014 (Table 5) could be influencing the declining abundance of Hybrid Striped Bass over time. Flooding of the reservoir in late 2015 into early 2016 may have resulted in the loss of some fish downstream over the spillway (Figure 1). No data on age and growth was obtained in 2016 as a result of inadequate sample size. The sampling goal of 50 stock-sized fish for the OBS plan was not met as only 14 fish in the target size range were collected.

Largemouth Bass: The length frequency distribution of the Largemouth Bass population (Figure 6) was dominated by fish less than stock size (8 inches) and the largest fish collected was only 13 inches long so no fish were collected in the target length range for age and growth assessment (17.0 to 18.9 inches). In fall 2015, the FLMB allele frequency was 36%, pure NLMB comprised 30% of the sample, and the remainder of the fish were second or higher generation hybrids (F_x) between FLMB and NLMB (Table 7). Of these hybrids, 52% had a higher influence of FLMB than NLMB. Florida Largemouth Bass were most recently stocked in 2009 and 2010 but did not have a discernable impact on the population considering the decline in FLMB alleles between samples taken prior to stocking, 2007, and the most recent sample in 2015. Historic data from spring 2003 indicated Largemouth Bass grew to 18 inches (length range 16.4 – 20.5 inches) on average in 5.5 years (age range 3 – 9 years) (Myers and Storey 2004). Despite sampling for 2.2 hours, the paucity of data collected makes it impossible to make an assessment of the status of Cooper Reservoir's Largemouth Bass population.

Crappie: Populations of both White and Black Crappie are found in the reservoir, but White Crappie are the more abundant species (Jubar and Storey 2008). Trap net sampling in 2015 only collected White Crappie. White Crappie CPUE in 2015 (5.6/nn) was lower than previous surveys in 2007 (10.4/nn) and 2003 (17.3/nn). The sample was dominated by fish less than 5-inches in length and legal fish represented only 5% of the sample. The sampling goal of 50 stock-sized fish for the OBS plan was not achieved as only 6 fish of this size were collected in 10 net nights of sampling. Insufficient fish were collected in the target size range for age and growth assessment. Although the sampling protocol specified sampling effort of 15 net nights, it was decided that the sampling goal would not be attained and that an additional sampling trip was not warranted.

Fisheries management plan for Cooper Reservoir, Texas

Prepared – July 2016

ISSUE 1: Palmetto Bass have supported a high-quality fishery in Cooper Reservoir since the late 1990s. Sunshine Bass were introduced in 2015 and future stockings could potentially include either or both of these hybrids. These stockings are necessary to maintain fishable populations.

MANAGEMENT STRATEGIES

1. Continue annual stockings of Hybrid Striped Bass (Palmetto Bass or Sunshine Bass, alone or in combination) at a rate of 10 fish/acre to maintain the fishery.
2. Conduct spring gill net surveys every four years to monitor the Hybrid Striped Bass population.

ISSUE 2: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

Hydrilla has been documented in Cooper Reservoir but it has never created access problems for anglers. This plant is unlikely to create problems as a result of the reservoir's turbidity, but it would be prudent to monitor its distribution, especially in the vicinity of public boat ramps. Giant salvinia has become established in some northeast Texas lakes such as Lake Fork and is often spread between reservoirs via boat trailers.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate state park staff about invasive species, and provide them with posters, literature, etc. 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 constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.
6. Conduct vegetation surveys as appropriate for hydrilla and giant salvinia.
7. Conduct comprehensive vegetation and habitat surveys every 4 years.

ISSUE 3: Increased awareness of Cooper Reservoir's fisheries resources would provide additional fishing opportunities to anglers. Dissemination of information describing the sport fish harvest regulations on Cooper Reservoir would serve as a helpful public service.

MANAGEMENT STRATEGIES

1. Post regulation posters detailing fisheries regulations in effect at Cooper Reservoir in both state park units and at all boat ramps.
2. Promote fisheries resources of Cooper Reservoir through news releases whenever opportunities arise.

Objective-Based Sampling Plan and Schedule for 2016 - 2020

Sport fish, forage fish, and other important fishes

Sport fishes in Cooper Reservoir include Hybrid Striped Bass (Palmetto Bass and Sunshine Bass), White Bass, Blue Catfish, Channel Catfish, Crappie and Largemouth Bass. Important forage species include Gizzard and Threadfin Shad. Sunfish are present, but catch rates are low.

Negligible/ Low-density fisheries

Largemouth Bass: Cooper Reservoir produced four ShareLunker entries between 1998 and 2000; the likely remnants of adult Florida Largemouth Bass stocked immediately following impoundment. Despite these early successes, the Largemouth Bass population has historically been very difficult to sample and electrofishing CPUEs have generally been low. The highest catch rate recorded in the past 20 years was 20.5 fish/h observed in 2001 (Storey and Myers 2002). With such low numbers of fish, it is impractical to continue sampling. Anecdotal evidence indicates directed effort is low so there is no feasible way to collect information on catch of larger fish in order to justify additional stocking of FLMB.

Survey objectives, fisheries metrics, and sampling objectives

Blue Catfish: Blue Catfish were stocked in Cooper Reservoir in 1991 and 1992 and have become the dominant catfish species collected in gill netting. Catch per unit effort (CPUE) of Blue Catfish from gill netting surveys in 1999, 2002, 2004, 2006, 2008, 2012, and 2016 were 1.3/nn, 1.3/nn, 9.1/nn, 10.2/nn, 8.0/nn, 14.6/nn, and 7.4/nn respectively. Continuation of trend data in this reservoir with spring gillnetting will allow for determination of any large-scale changes in the Blue Catfish population that may spur further investigation. Abundance, population size structure, body condition, and growth will be assessed in 2019 and 2020. Low-frequency electrofishing will be employed between July and early fall in 2019 to collect a Category 3 age and growth sample subsampled at 5 fish per 10 mm strata to calculate mean length-at-age estimates of age classes. A minimum of 15 gill nets will be set at randomly-selected sites in spring 2020 but sampling will continue at random sites until 50 stock-sized fish are collected with an RSE of $CPUE-S \leq 25$. Based on analysis of the 2016 data, the anticipated effort to meet both sampling objectives is 11 stations with 80% confidence. Specimens collected in gill netting will be used to augment the age and growth sample.

Channel Catfish: Channel Catfish were stocked in 1991 in Cooper Reservoir and became the most abundant catfish species in the reservoir. Since 2004, however, the Blue Catfish population has become the dominant species and catches of Channel Catfish have declined. Catch per unit effort (CPUE) of Channel Catfish from gill netting surveys in 1999, 2002, 2004, 2006, 2008, 2012, and 2016 were 7.4/nn, 4.2/nn, 4.1/nn, 2.7/nn, 1.1/nn, 1.7/nn, and 2.1/nn respectively. Based on analysis of the 2016 gill netting data, the anticipated effort required to collect 50 stock-sized fish with 80% confidence would be in excess of 50 net nights. Sampling employing 15 gill nets, set at randomly-selected sites, will be conducted in spring 2020 to continue monitoring long-term trends in size structure and any large-scale changes in the Channel Catfish population.

Hybrid Striped Bass: Anecdotal information suggests Hybrid Striped Bass provide a popular fishery at Cooper Reservoir. Palmetto Bass have been stocked regularly since 1996 although in six of the intervening years no fish were stocked. Catch per unit effort (CPUE) of Hybrid Striped Bass from gill netting surveys in 2004, 2006, 2008, 2012, and 2016 were 18.7/nn, 11.9/nn, 5.1/nn, 2.3/nn, and 0.9/nn

respectively. Annual stockings are preferable to maintain the fishery and stocking requests are submitted every year by District staff. In 2015, Sunshine Bass were stocked in lieu of Palmetto Bass. Based on analysis of the 2016 gill netting data, the anticipated effort required to collect 50 stock-sized fish with 80% confidence would be in excess of 50 net nights. Consequently, stocking success of Hybrid Striped Bass will be evaluated by using a minimum of 15 gill nets set at randomly-selected sites in spring 2020 to determine size structure and relative frequencies of age classes. A sample of Hybrid Striped Bass subsampled at 5 fish per inch class strata will be used to calculate mean length-at-age estimates of age classes.

White Bass: White Bass are typically abundant in Cooper Reservoir and provide a popular fishery. White Bass are frequently targeted and harvested by anglers also seeking Hybrid Striped Bass. Catch per unit effort (CPUE) of White Bass from gill netting surveys in 2004, 2006, 2008, 2012, and 2016 were 10.4/nn, 1.7/nn, 8.1/nn, 5.1/nn, and 4.4/nn respectively. Continuation of trend data in this reservoir with spring gillnetting will allow for determination of any large-scale changes in the White Bass population that may spur further investigation. A minimum of 15 gill nets will be set at randomly-selected sites in spring 2020 but sampling will continue at random sites until 50 stock-sized fish are collected and the RSE of CPUE-S ≤ 30 . Based on analysis of the 2016 data, the anticipated effort required to collect the sampling objective of stock-sized fish is 15 stations with 80% confidence. In order to attain an RSE of CPUE-S ≤ 30 with 80% confidence would take approximately 20 net nights. A sample of 13 fish in the length range between 9 and 10.9 inches will be collected to calculate growth rate to minimum length limit.

Crappie: Both White and Black crappie are present in Cooper Reservoir; however, Black Crappie are low in abundance. Catch rates for Black Crappie have only been sufficient to determine species presence. Catch per unit effort (CPUE) of White Crappie from trap netting surveys in 2001, 2003, 2007, and 2015 were 67.5/nn, 17.3/nn, 10.4/nn, and 5.6/nn respectively. Sampling employing 15 single-cod, shoreline trap nets, set at randomly-selected sites, will be conducted in fall 2019 to continue monitoring long-term trends in size structure and any large-scale changes in the White Crappie population. A sample of 50 stock-size white crappie is desirable, but no additional trap nets will be set if objective is not met.

Shad Species: No sampling of shad populations will occur. Estimates of shad relative abundance and vulnerability to predators will be determined using body condition of Blue Catfish, White Bass and Hybrid Striped Bass as proxies for prey fish abundance.

Objective-based sampling plan components for Cooper Reservoir, Texas for 2016 – 2020.

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Low-frequency electrofishing 2019</i>			
(July to early fall)			
Blue Catfish	<i>Determine age-and-growth</i>	Category 3: mean length at age	N = 200, subsampled at 5 fish per 10 mm strata
<i>Trap netting 2019</i>			
(Effort = 15nn)			
Crappie	<i>Monitor trend in:</i> Size structure	PSD, length frequency	
<i>Gill netting 2020</i>			
(Minimum effort = 15nn)			
Blue Catfish	<i>Monitor trend in:</i> Abundance Size structure	CPUE – stock PSD, length frequency	RSE-Stock \leq 25 N = 50
Channel Catfish	<i>Monitor trend in:</i> Size structure	PSD, length frequency	
White Bass	<i>Monitor trend in:</i> Abundance Size structure Age-and-growth	CPUE – stock Length frequency Age at 12 inches	RSE-Stock \leq 30 N \geq 50 stock N = 13, 11.0 – 12.9 in
Hybrid Striped Bass	<i>Determine stocking success</i>	Length frequency, age structure	

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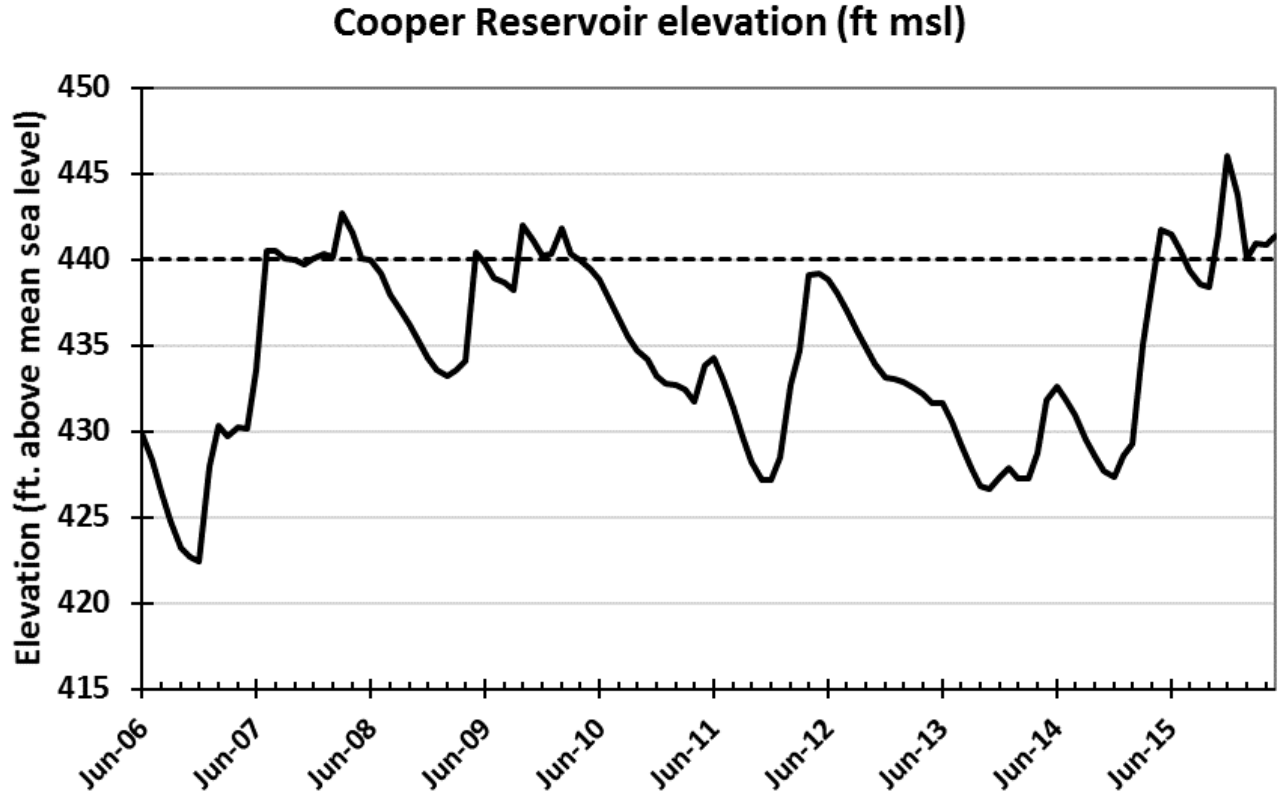


Figure 1. Monthly water level elevations in feet above mean sea level (MSL recorded for Cooper Reservoir from June 2006 through May 2016. Dashed line represents conservation pool elevation at 440.0 ft msl.

Table 1. Characteristics of Cooper Reservoir.

Characteristic	Description
Year constructed	1991
Controlling authority	U. S. Army Corps of Engineers
Counties	Delta and Hopkins
Reservoir type	Mainstream
Shoreline development index (SDI)	6.42
Conductivity	150 umhos/cm

Table 2. Boat ramp characteristics for Cooper Reservoir, Texas, August 2015. Reservoir elevation at time of survey 440.46 ft msl, 0.46 ft above conservation elevation.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft msl)	Condition
Tira	33.31181 -95.61077	Y	93	431	Excellent, no access issues
Doctor's Creek	33.34318 -95.66298	Y	87	428	Excellent, no access issues
John's Creek	33.32413 -95.73598	Y	32	432	Excellent, no access issues
Honey Creek	33.29000 -95.67619	Y	43	430	Excellent, no access issues
Gull's Bluff	33.29421 -95.65205	Y	111	430	Excellent, no access issues

Table 3. Harvest regulations for Cooper Reservoir, Texas.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: Channel and Blue Catfish	25 (in any combination)	12 - No Limit
Catfish, Flathead	5	18 - No Limit
Bass, White	25	10 – No Limit
Bass, Palmetto and Sunshine Bass	5	18 – No Limit
Bass: Largemouth	5	18 - No Limit
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

Table 4. Stocking history of Cooper Reservoir, Texas. Size categories are: FGL = 1-3 inches, and ADL = adults.

Species	Year	Number	Size
Blue Catfish	1991	3,500	FGL
	1992	482,075	FGL
	Total	485,575	
Channel Catfish	1991	12,500	FGL
	Total	12,500	
Bluegill	1991	41,600	FGL
	Total	41,600	
Palmetto Bass	1996	193,665	FGL
	1998	146,573	FGL
	1999	97,749	FGL
	2002	96,410	FGL
	2003	95,100	FGL
	2004	167,717	FGL
	2005	190,388	FGL
	2006	142,178	FGL
	2007	188,931	FGL
	2008	192,522	FGL
	2009	90,775	FGL
	2011	104,070	FGL
	2013	172,684	FGL
	2014	76,204	FGL
	2016	92,536	FGL
Total	2,047,502		
Sunshine Bass	2015	147,174	FGL
	Total	147,174	
Florida Largemouth Bass	1991	5,142	FGL
	1991	151	ADL
	1992	1,929,012	FGL
	1992	192	ADL
	1993	681,829	FGL
	1993	30	ADL
	1997	482,879	FGL
	1998	482,084	FGL
	1999	484,695	FGL
	2000	9,132	FGL
	2002	489,878	FGL
	2003	477,289	FGL
	2009	475,672	FGL
	2010	365,041	FGL
	Total	5,883,026	

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

Gear/target species	Survey objective	Metrics	Sampling objective
<i>Electrofishing</i>			
Largemouth Bass	Age-and-growth	Age at 18 inches	N = 13, 17.0 – 18.9 in
	Genetics	% FLMB	N = 30, any age
Bluegill ^a	Abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Gizzard Shad ^a	Size structure	PSD, length frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50
<i>Gill netting</i>			
Blue Catfish	Abundance	CPUE – stock	RSE-Stock ≤ 23
	Size structure	PSD, length frequency	N = 50
	Age-and-growth	Age at 12 inches	N = 13, 11.0 – 12.9 in
Channel Catfish	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 12 inches	N = 13, 11.0 – 12.9 in
White Bass	Abundance	CPUE – stock	RSE-Stock ≤ 31
	Size structure	Length frequency	N ≥ 50 stock
	Age-and-growth	Age at 12 inches	N = 13, 11.0 – 12.9 in
Hybrid Striped Bass	Abundance	CPUE – stock	RSE-Stock ≤ 49
	Size structure	Length frequency	N ≥ 50 stock
	Age-and-growth	Age at 18 inches	N = 13, 17.0 – 18.9 in
<i>Trap netting</i>			
Crappie	Abundance	CPUE – stock	RSE-Stock ≤ 36
	Size structure	PSD, length frequency	N = 50
	Age-and-growth	Age at 10 inches	N = 13, 9.0 – 10.9 in

^a No additional effort will be expended to achieve an RSE ≤ 25 for CPUE of Bluegill and Gizzard Shad if 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. Survey of aquatic vegetation, Cooper Reservoir, Texas, 2007 and 2015. Vegetated areas were estimated using ArcGIS software employing the Digital Shapefile Method. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation type	2007	2015
Native emergent		
American lotus		<0.1
Buttonbush		114.1
Buttonbush/ Smartweed		5.1
Buttonbush/ Black willow		26.7
Smartweed		98.2
<i>Sub-total</i>	3,457.2	244.1
Non-native		
Hydrilla (Tier III)*	16.0	1.1
Alligatorweed (Tier III)*		0.2
Total area	3,473.2	245.5
	(18.0%)	(1.3%)

* Tier III is Watch Status

Blue Catfish

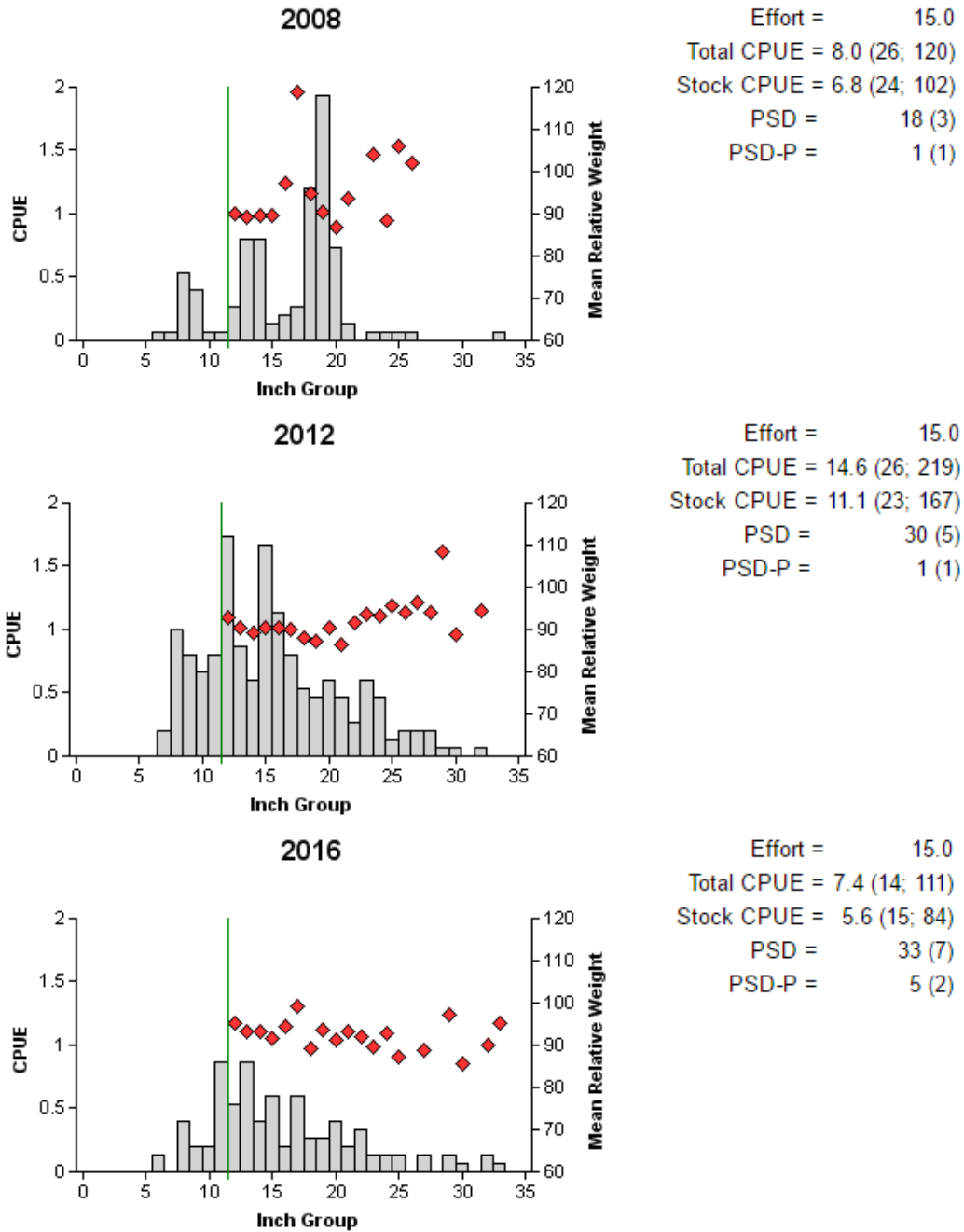


Figure 2. Number of Blue Catfish caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cooper Reservoir, Texas, 2008, 2012, and 2016. Vertical lines represent minimum length limit at time of survey.

Channel Catfish

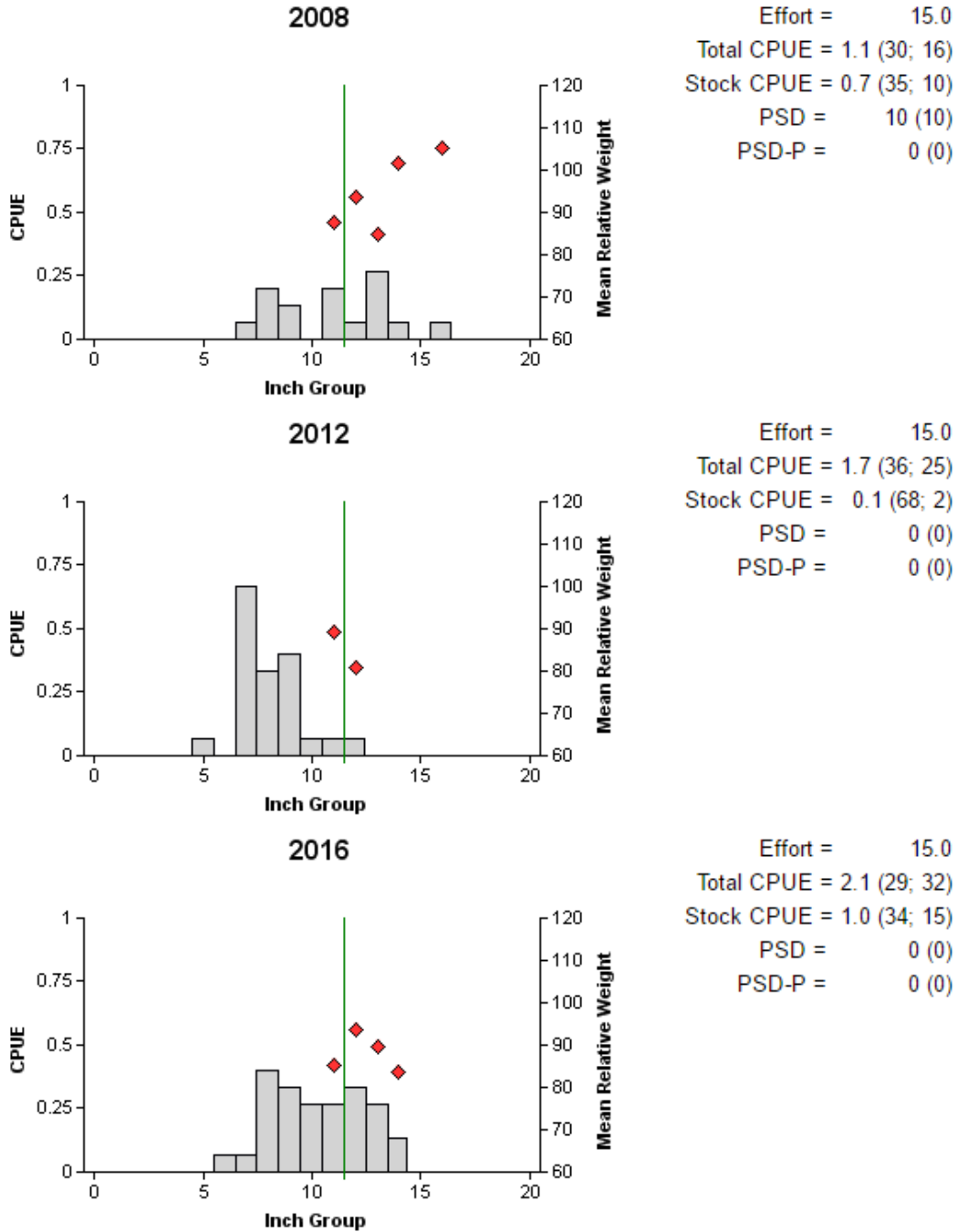


Figure 3. Number of Channel Catfish caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cooper Reservoir, Texas, 2008, 2012, and 2016. Vertical lines represent minimum length limit at time of survey.

White Bass

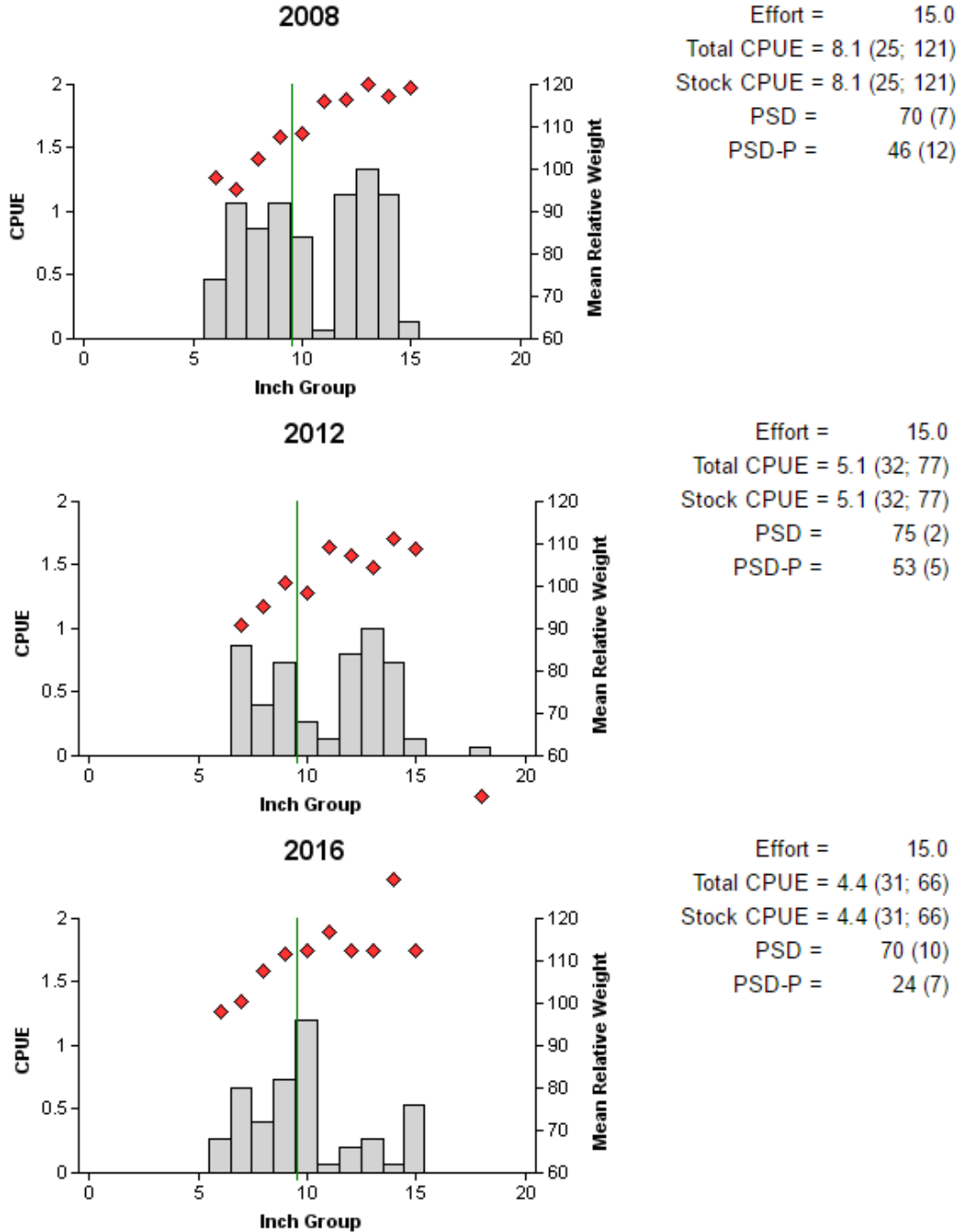


Figure 4. Number of White Bass caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cooper Reservoir, Texas, 2008, 2012, and 2016. Vertical lines represent minimum length limit at time of survey.

Hybrid Striped Bass

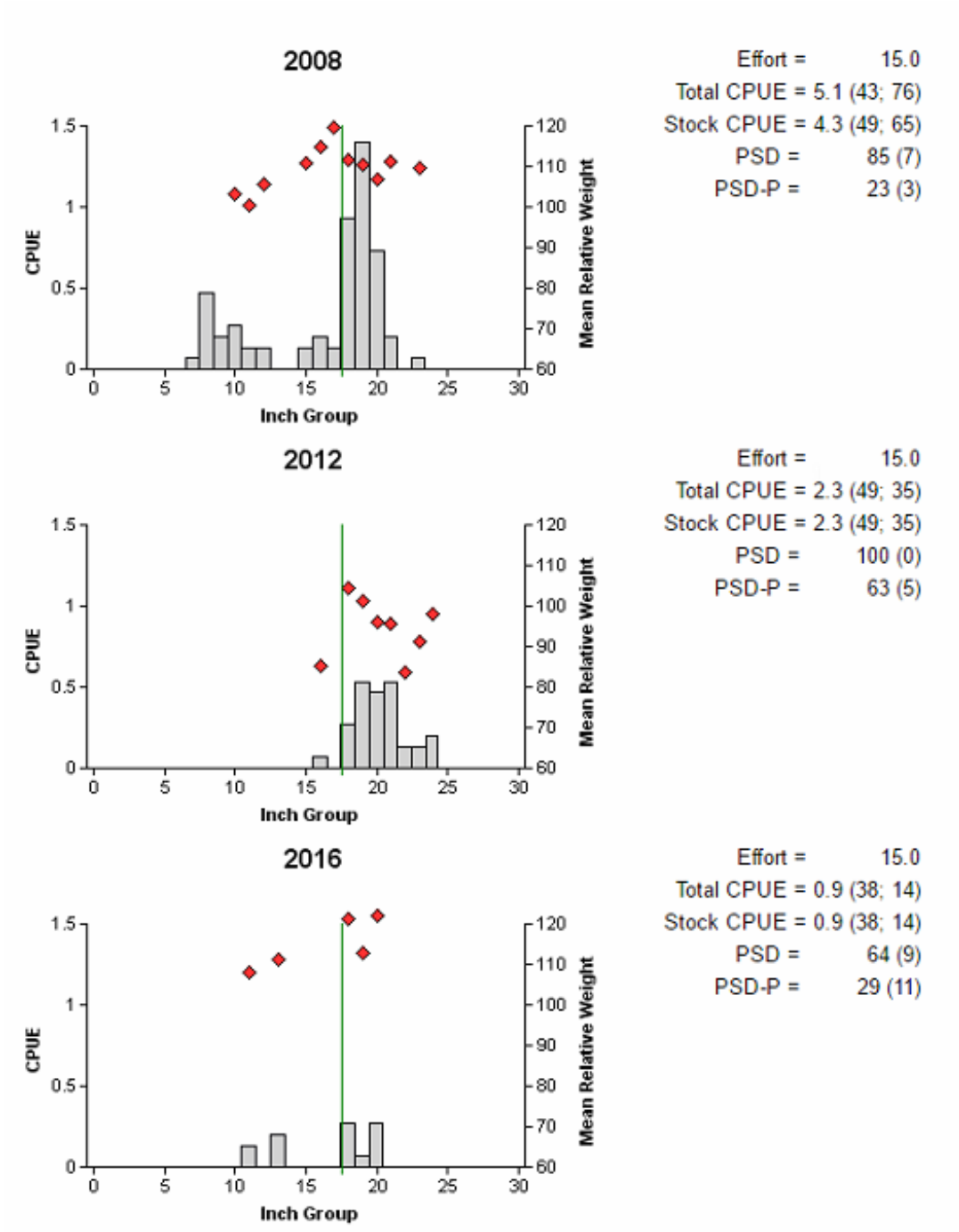


Figure 5. Number of Hybrid Striped Bass (Palmetto Bass and Sunshine Bass combined) caught per net night (CPUE), mean relative weights (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Cooper Reservoir, Texas, 2008, 2012, and 2016. Vertical lines represent minimum length limit at time of survey.

Largemouth Bass

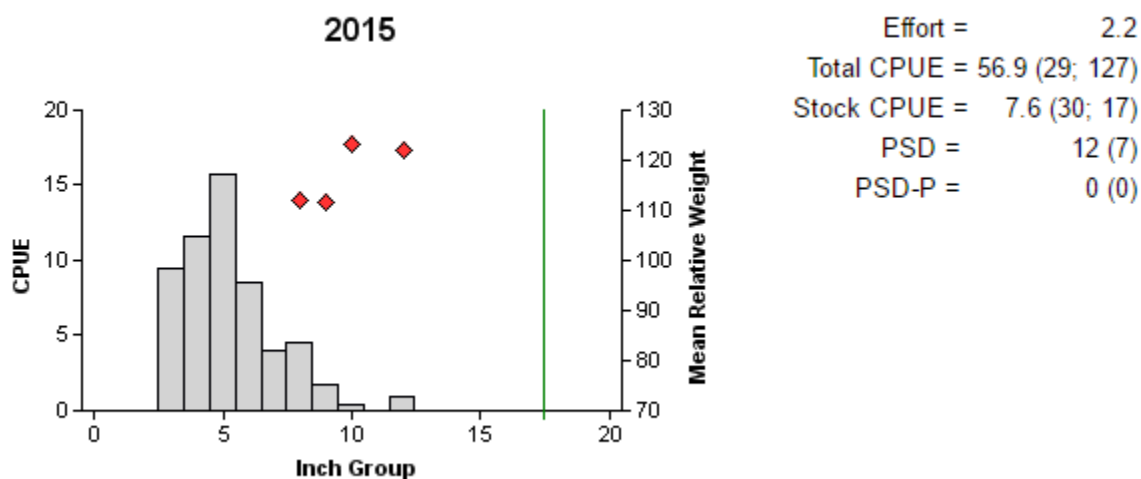


Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall daytime electrofishing survey, Cooper Reservoir, Texas, October 2015. Vertical line represents minimum length limit at time of survey.

Table 7. Results of genetic analysis of largemouth bass collected by fall electrofishing, Lake Hawkins, Texas, 2007 and 2015. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB. Genetic composition was determined with micro-satellite DNA analysis.

Year	Sample size	Genotype					% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	Combined hybrids	NLMB		
2007	30	3	^a	^a	27	3	62.1	10.0
2015	30	0	0	21	21	9	36.0	0.0

^aAnalysis did not distinguish between F1 from Fx hybrids

White Crappie

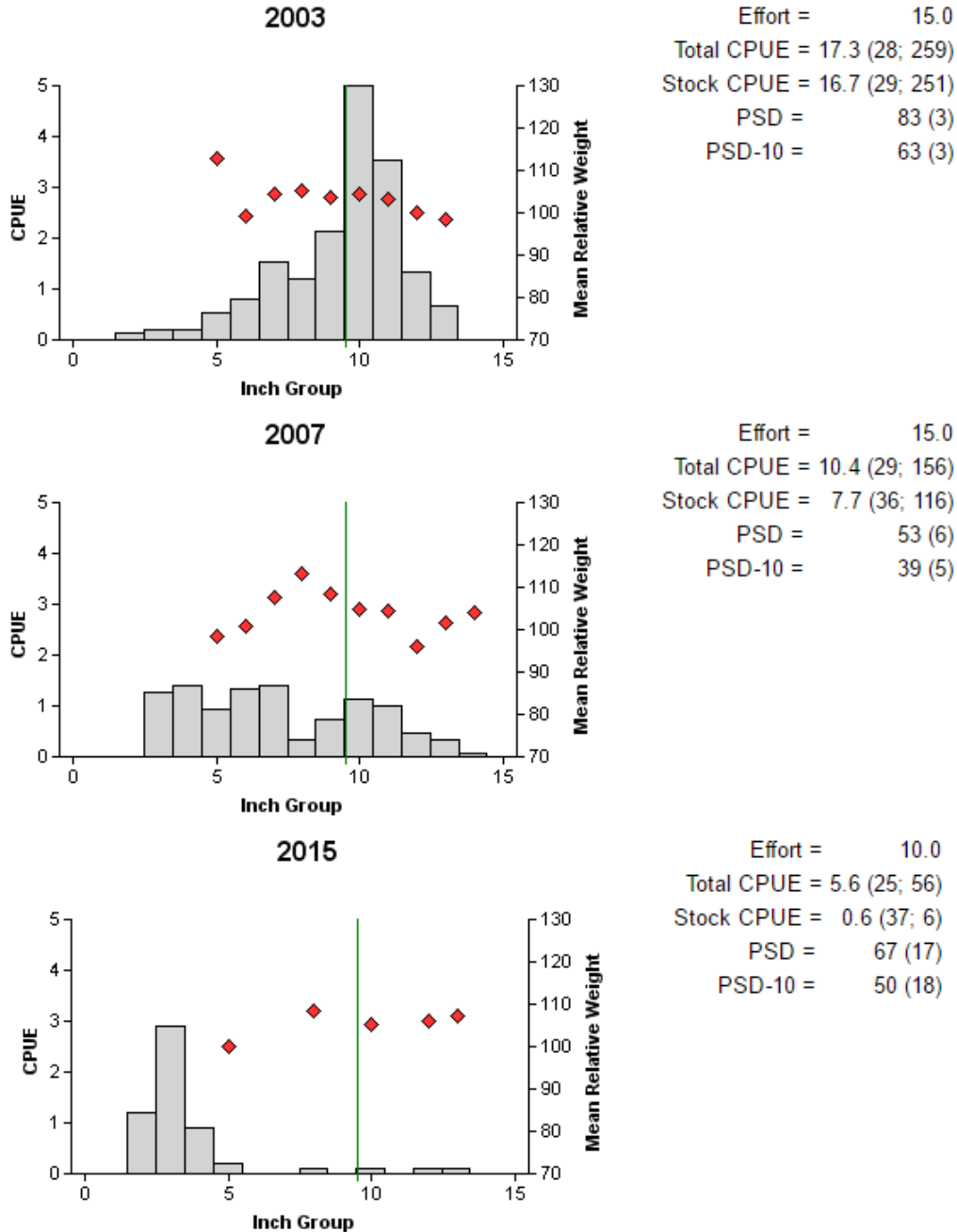


Figure 7. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Cooper Reservoir, Texas, 2003, 2007, and 2015. Vertical lines indicate minimum length limit at time of survey.

Table 8. Proposed sampling schedule for Cooper Reservoir, Texas. Gill netting surveys are conducted in the spring, while trap netting is conducted in the fall. Standard surveys denoted by S and additional surveys denoted by A.

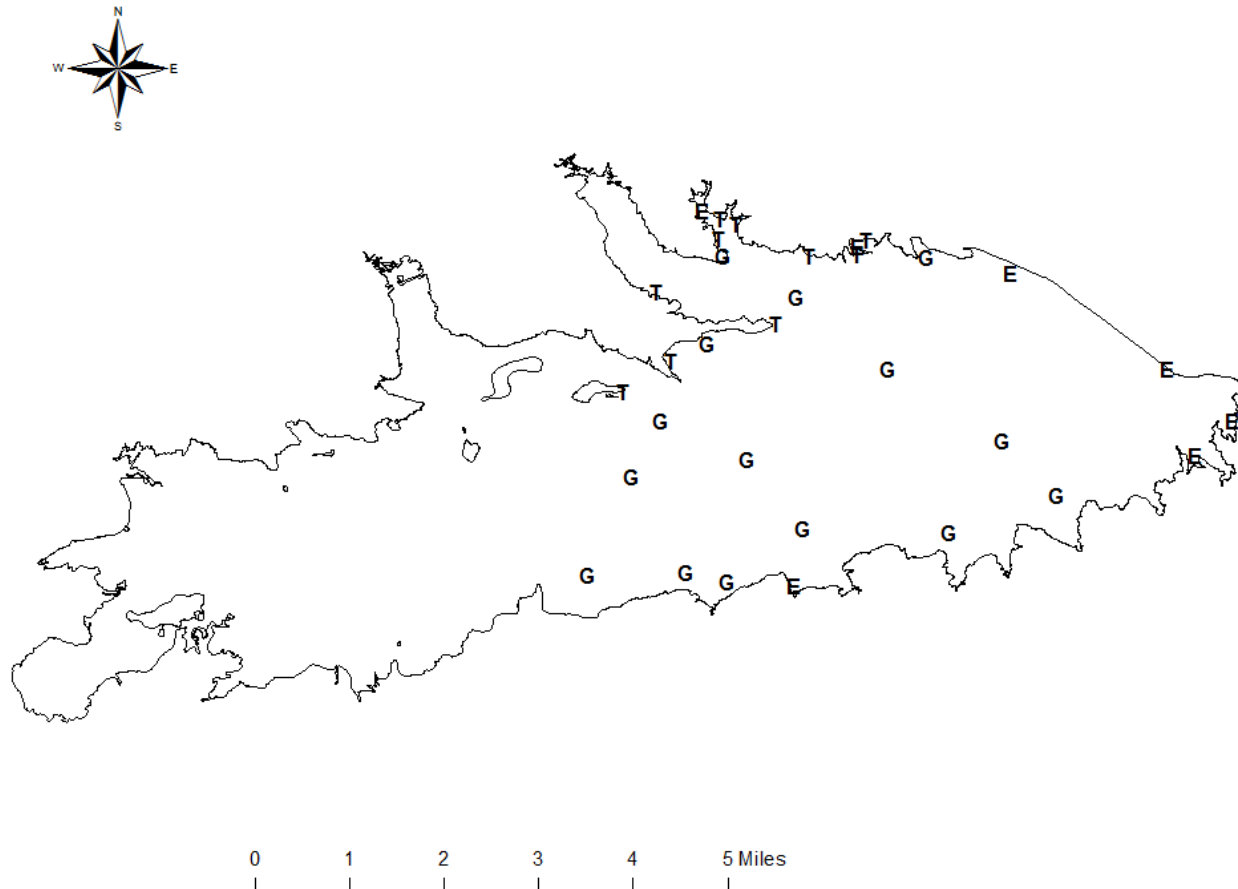
Survey Year	Vegetation	Access	Low Frequency Electrofishing	Trap Net	Gill Net	Report
2016-2017						
2017-2018						
2018-2019						
2019-2020	S	S	A	A	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from gill netting and electrofishing, Cooper Reservoir, Texas, 2015-2016.

Species	Gill Netting		Electrofishing		Trap netting	
	N	CPUE	N	CPUE	N	CPUE
Blue Catfish	111	7.4				
Channel Catfish	32	2.1				
White Bass	77	4.4				
Hybrid Striped Bass	35	0.9				
Largemouth bass			125	56.9		
White crappie					56	5.6

APPENDIX B



Location of fall electrofishing (E), fall trap netting (T) and spring gill netting sites (G), Cooper Reservoir, Texas, 2015-2016. Lake elevation was 1.6 feet below cpe during electrofishing, 1.5 feet above cpe during trap netting and 0.9 feet above cpe during gill netting.