

PERFORMANCE REPORT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2014 Fisheries Management Survey Report

Squaw Creek Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Squaw Creek Reservoir were surveyed in 2015 using gill netting. This report summarizes the results of the survey and contains a management plan for the reservoir based on its findings.

- **Reservoir Description:** Squaw Creek Reservoir is a 3,272-acre impoundment located on Squaw Creek in Hood and Somervell Counties. Water level has fluctuated from two feet below to two feet above conservation pool since January 2011. The reservoir has a mean and maximum depth of 46 and 135 feet, and is considered mesotrophic, with water clarity greater than four feet. Habitat features consisted mainly of natural shoreline.
- **Management History:** Important sport fish include Largemouth Bass and Channel Catfish, which were stocked in the mid 1980s and early 1990s. Palmetto Bass were stocked for the first time in the mid 1990s, but not considered an important sport fish at that time. Management strategies and actions from the 1997 survey report (DiCenzo 1997) included discontinuing Palmetto Bass stockings, increasing the number of electrofishing sites sampled, supplementing sampling data with catch and size structure data from bass tournaments and evaluating harvest regulations when an appropriate sample size of Largemouth Bass was obtained. Actions were never taken on these strategies due to the lake closure following the 9/11 attacks from 2001 to May 2010, and inability to gain access to conduct fisheries management work. Recent management actions have included publicizing the excellent Channel Catfish fishery, eliminating electrofishing surveys, and cooperating with Luminant to post appropriate invasive species signage at the boat ramp.
- **Fish Community**
 - **Prey species:** Existing prey species include Gizzard Shad, Threadfin Shad, Bluegill, Longear Sunfish, Warmouth and Tilapia spp. however; none were effectively sampled during this survey period.
 - **Catfishes:** Channel Catfish catch rates were the third-highest on record for the reservoir at more than 15 fish per net night. Flathead Catfish were not observed.
 - **Temperate Bass:** Palmetto Bass were collected in low numbers and White Bass were not observed.
 - **Black Bass:** Largemouth Bass were collected in fair numbers using gill nets in 2015 and body condition, as measured by relative weight, was excellent.
- **Management Strategies:** Manage sport fishes at Squaw Creek with statewide regulations. Maintain invasive species efforts. Conduct a vegetation survey during summer 2018 and a general monitoring survey with gill nets in January 2019.

INTRODUCTION

This document is a summary of fisheries data collected from Squaw Creek Reservoir in 2015. 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. Limited historical data are presented with the 2015 data for comparison.

Reservoir Description

Squaw Creek Reservoir is a 3,272-acre impoundment located on Squaw Creek in Hood and Somervell Counties. The reservoir was created in 1979 by the Texas Utilities Generating Company (now Luminant Power) to serve as a cooling reservoir for the Comanche Peak Nuclear Power Station (Table 1). The reservoir was closed for security reasons on September 12, 2001, following the 9/11 attacks on the United States, and re-opened to the public in May 2010. Conservation pool is 775.0 feet above mean sea level, mean and maximum depths are 46 and 135 feet respectively, and the reservoir is considered mesotrophic. Fish habitat at time of sampling consisted almost exclusively of natural shoreline and native vegetation, including rocky substrate and flooded timber (Tables 5). Reservoir elevation was within a foot of conservation pool during 2015 sampling (Figure 1). Aquatic vegetation was scarce.

Angler Access

Squaw Creek Reservoir has one boat ramp (Squaw Creek Park). Since the reservoir is obligated to maintain cooling capacity for the power-plant, the ramp is never in danger of being unusable (Table 2). Angler access to the reservoir is limited from 7:00am to 4:00pm, Thursday through Sunday for bank fishing within the park, and Friday through Sunday for boat fishing; there is a 100-boat limit on the reservoir, but no limit for bank fisherman.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Tibbs and Baird 2010) included:

1. Preparing a news release highlighting the Channel Catfish population and angling opportunities.
Action: A news release titled "The Catfishn's hot at Squaw Creek Reservoir" was released during fall 2011.
2. Discontinuing electrofishing surveys.
Action: Electrofishing was discontinued in 2011 due to increasing conductivity in the reservoir and historically inefficient electrofishing surveys.
3. Perform future gill net surveys in mid-winter to avoid high water temperatures and increased fish mortality.
Action: The 2015 gill net survey was conducted in January, and all future gill net surveys will be conducted during mid-winter.
4. Cooperate with Luminant to post appropriate invasive species signage. Educate the public about invasive species through the use of media and the internet. Make a speaking point about invasive species when presenting to constituent and user groups. Keep track of (i.e., map) all existing and future inter-basin water transfer routes to facilitate potential invasive species responses.
Action: Invasive species signage was posted at Squaw Creek during summer 2013. District biologists have made a speaking point about invasive species, while speaking to constituent groups such as the Central Texas Flyrodders, Legacy Outfitters, and Brazos River Sportsman's Club over the past several years. Inter-basin water transfers are a

permanent fixture in this report now, and will be updated appropriately.

Harvest Regulation History: Sportfishes in Squaw Creek Reservoir have always been managed with statewide regulations (Table 3).

Stocking History: Florida Largemouth Bass were last stocked in 1991 at 50-fish/acre. Palmetto Bass were stocked in 1994 and 1996 at 15-fish/acre. The complete stocking history is in Table 4.

Water Transfer: Squaw Creek Reservoir is primarily used as a cooling reservoir for the Comanche Peak Nuclear Power Station. Currently, the only water transfer occurring is the pumping of make-up water into the reservoir from nearby Granbury Reservoir to make up for evaporative losses. Recent proposals to add additional nuclear units to the station have been suspended.

Golden alga: Squaw Creek Reservoir pumps untreated water directly from Granbury Reservoir to make up for evaporative losses from the nuclear power station. Granbury has suffered from nearly annual fish kills from the toxic golden alga since 2001, and golden alga cells have been observed in water samples collected from Squaw Creek Reservoir. Although several fish kills have occurred in the reservoir since its re-opening in May 2010, none have yet been documented to have been caused from golden alga.

METHODS

Fishes were collected by gill netting (5 net nights at 5 stations), and catch per unit effort (CPUE) was recorded as the number of fish per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014).

No annual access-point or roving creel surveys have been conducted.

A structural habitat survey was conducted in 2010. A vegetation survey was conducted in 2014. Habitat was assessed with the digital shape file method (TPWD, Inland Fisheries Division, unpublished manual revised 2014).

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_t)] were calculated for target fishes according to Anderson and Neumann (1996). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). 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 ($RSE = 100 \times SE \text{ of the estimate/estimate}$) was calculated for all CPUE statistics. Age and growth data were not collected in 2015.

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2014). Micro-satellite DNA analysis was used to determine genetic composition of individual fish from 2005 through 2014 and by electrophoresis for previous years.

Source for water level data was the United States Geological Survey (USGS 2014)

RESULTS AND DISCUSSION

Habitat: A habitat survey was last conducted in 2010 (Table 5; Tibbs and Baird 2010). No aquatic vegetation was observed during the summer 2014 survey.

Creel: No creels were conducted during this survey period.

Prey species: Historical prey species include Gizzard Shad, Threadfin Shad, Bluegill, Longear Sunfish, Warmouth and Tilapia spp. however; these species can no longer be effectively sampled due to increased conductivity and discontinuation of electrofishing (Appendices A and B). For example, during the last electrofishing survey (i.e., fall 2010), only nine forage fish were observed. Historical data on forage species, with the exception of surveys in 1997 and prior, have also been poor (Appendix B). The relative weights of Channel Catfish suggest plentiful forage in the reservoir (Figure 2).

Catfishes: Channel Catfish catch rates were the third-highest on record at 15.4/nn, and equated to 77 collected individuals (Figure 2; Appendices A and B). The PSD for Channel Catfish is defined as the percentage of 11-inch and longer individuals which are also 16-inches and longer. Proportional size distribution was much higher (i.e., 86) relative to previous years (i.e. 29 and 43), indicative of a changed, imbalanced population, perhaps caused by low recruitment and/or high harvest/mortality (Figure 2). Ninety-six percent of sampled individuals were of legal size, and individuals in the preferred (24 inch) size class were collected. Body condition (*Wr*) was excellent and improved with size (Figure 2).

Flathead Catfish were not observed (Appendices A and B).

Temperate Bass: Palmetto Bass were introduced in 1979 and supplemented occasionally thereafter however, supplemental stockings ceased after 1996 and the population died-out (Table 4; Appendix B). Luminant recently stocked Palmetto Bass into the emergency cooling reservoir in an effort to control forage species (and intake impingement issues during potential fish kill events) which threaten safe operation and cooling of the power plant. Escapement of Palmettos into the main reservoir has produced a low density fishery, and catch rates of this species were 0.4/nn, equating to two collected individuals. Body condition (*Wr*) was excellent (Figure 3; Appendices A and B).

White Bass were not observed (Appendices A and B).

Largemouth Bass: Largemouth Bass were collected by gill net at 5.4/nn in 2015; this catch rate equates to 27 individuals, and is the highest catch rate on record for the species (Figure 4; Appendices A and B). The PSD for Largemouth Bass is defined as the proportion of 8-inch and longer individuals which are also 12-inches and longer within the population. Proportional size distribution values from gill netting were good, indicating a balanced population. The proportion of individuals 14-inches and larger was also good (i.e., 30), suggesting good numbers of legal-sized individuals (Figure 4). Relative weight (*Wr*) was not calculated for bass due to the timing of the survey. Largemouth Bass genetics were analyzed in 2015 and showed excellent Florida influence (83%, Table 6).

Fisheries management plan for Squaw Creek Reservoir, Texas

Prepared – July 2015

ISSUE 1: Electrofishing was discontinued in 2011 due to increasing conductivity and a complete loss of electrofishing efficiency in the reservoir. The most recent two gill net surveys have sampled Largemouth Bass much more effectively than recent electrofishing surveys.

MANAGEMENT STRATEGIES

1. Collect length and weight data on all Largemouth Bass during future gill net surveys. Although relative weight data would not be comparable to other reservoirs because of the difference in the time of collection, comparisons over time among samples at Squaw Creek would be possible.
2. Work with tournament organizers to obtain a Category 2 Age and Growth sample (minimum 13 fish from 432- 483 mm, or 18”) between late Spring 2018 and Spring 2019.

ISSUE 2: Reliable data on forage species cannot be collected with electrofishing due to high conductivity. Although gill net collection of prey species is likely biased, comparisons over time may provide some useful trend data.

MANAGEMENT STRATEGY

1. Collect length data on all forage species from gill net surveys.

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 are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with Luminant to maintain appropriate signage at access points around the reservoir.
2. Educate the public about invasive species through the use of media and the internet.
3. Make a speaking point about invasive species when presenting to constituent and user groups. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes mandatory gill netting in 2019 and vegetation and access surveys during summer 2018.

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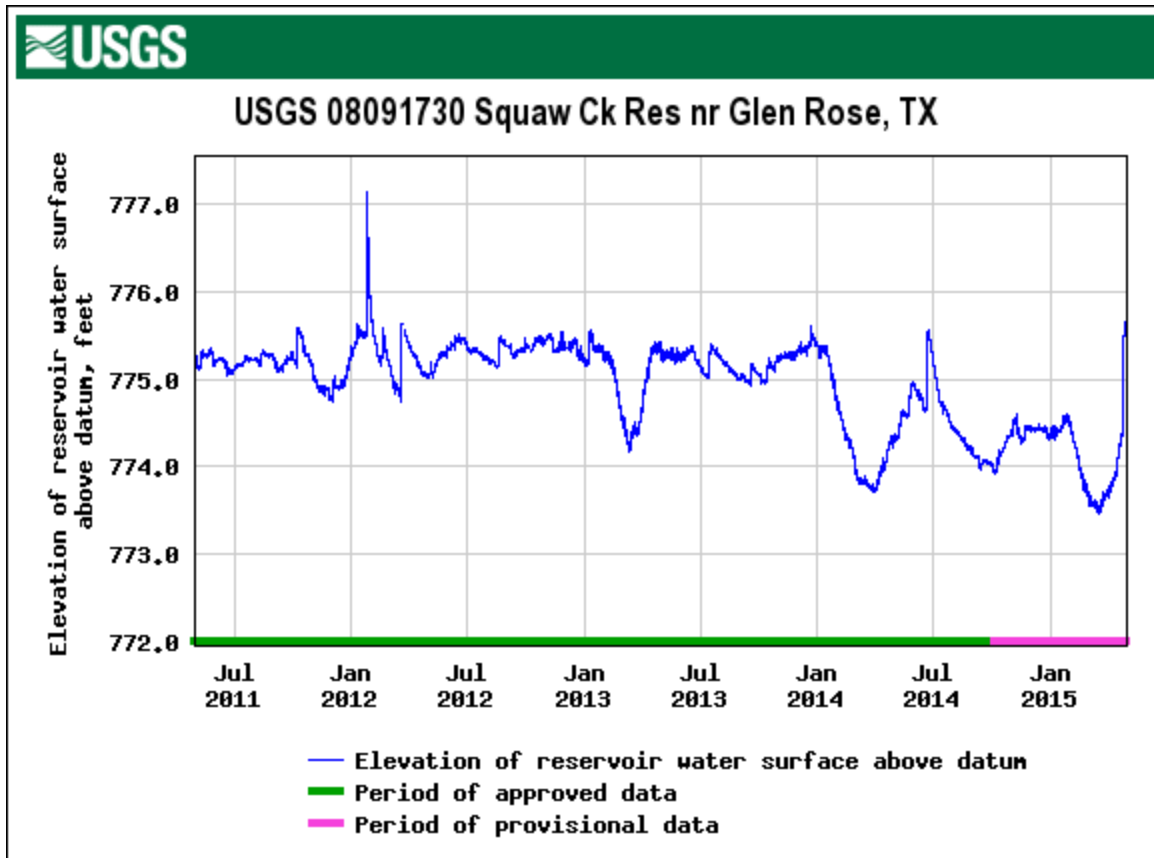


Figure 1. Daily mean water levels for Squaw Creek Reservoir from May 1, 2011 through May 1, 2015. Conservation pool level is 775.0 feet above mean sea level. Figure from the USGS website.

Table 1. Characteristics of Squaw Creek Reservoir, Texas.

Characteristic	Description
Year Constructed	1979
Controlling authority	Luminant Power
County	Hood, Somervell
Reservoir type	Tributary of the Brazos River
Shoreline Development Index (SDI)	7.0
Conductivity	4,950 μ S

Table 2. Boat ramp characteristics for Squaw Creek Reservoir, Texas, August, 2014. Reservoir elevation at time of survey was 775 feet above mean sea level.

Boat ramp	Latitude (dd)	Longitude (dd)	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Squaw Creek Park	32.32035	-97.78598	100	N/A	Good

Table 3. Harvest regulations for Squaw Creek Reservoir.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12 - No Limit
Catfish, Flathead	5	18 - No Limit
Bass, White	25	10 - No Limit
Bass, Striped and Hybrid Striped Bass (also known as Palmetto or Sunshine)	5	18 - No Limit
Bass: Largemouth and Smallmouth	5	14 - No Limit
Crappie: White	25 (in any combination)	10 - No Limit

Table 4. Stocking history of Squaw Creek, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

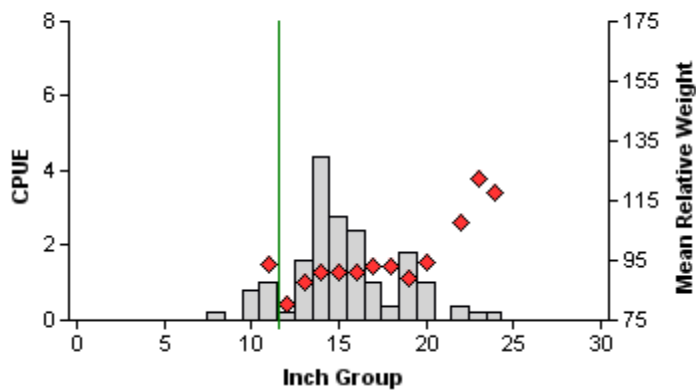
Species	Year	Number	Life Stage	Mean TL (in)
Channel Catfish	1986	17,501	AFGL	4.0
	Total	17,501		
Florida Largemouth Bass	1990	164,654	FRY	0.7
	1991	163,600	FGL	1.2
	Total	328,254		
Palmetto Bass (Striped X White Bass hybrid)	1979	99,900	UNK	UNK
	1981	100,000	UNK	UNK
	1983	99,000	UNK	UNK
	1994	50,844	FGL	1.6
	1996	51,538	FGL	1.5
	Total	401,282		
Smallmouth Bass	1979	100,000	UNK	UNK
	1980	49,955	UNK	UNK
	1982	59,875	UNK	UNK
	Total	209,830		
Threadfin Shad	1982	12,000	AFGL	2.9
	1984	3,900	AFGL	3.0
	Total	15,900		
Walleye	1979	4,860,000	FRY	0.2
	Total	4,860,000		

Table 5. Survey of structural habitat types, Squaw Creek Reservoir, Texas, 2010. Linear shoreline distance (miles) and percent of linear shoreline distance was recorded for each habitat type greater than one percent; otherwise noted as trace. Percent of total shoreline distance is blank for boat docks/piers because they were dually coded with adjacent habitat; counts are given instead. Survey was conducted using 2010 NAIP, 1-meter resolution satellite imagery.

Habitat type	Estimate	% of total
Bulkhead	trace	< 1.0
Rocky shoreline	1.4	4.0
Natural	34.4	96.0
Piers/boat docks	N = 1	

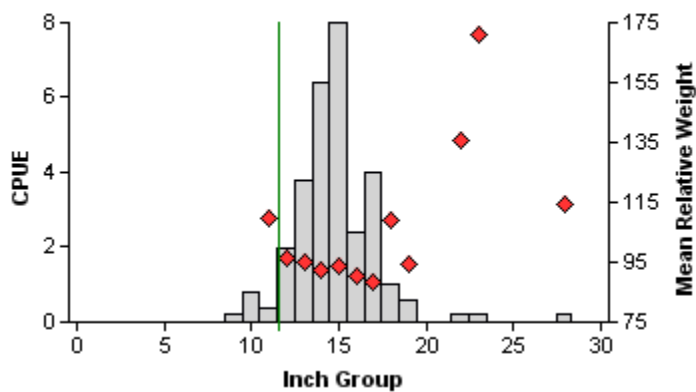
Channel Catfish

1997



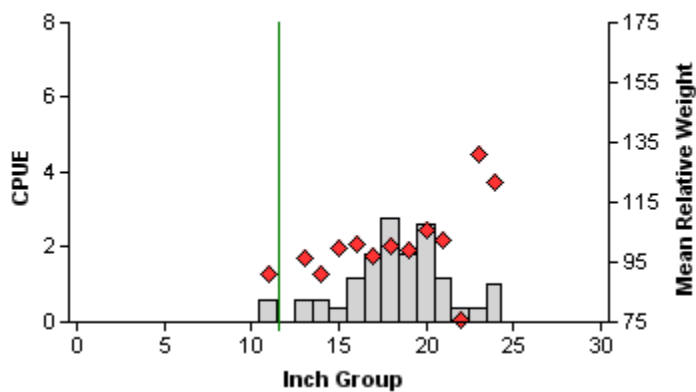
Effort = 5.0
 Total CPUE = 18.4 (11; 92)
 Stock CPUE = 17.4 (13; 87)
 PSD = 43 (4.2)
 PSD-12 = 94 (3.8)

2011



Effort = 5.0
 Total CPUE = 30.2 (8; 151)
 Stock CPUE = 29.2 (9; 146)
 PSD = 29 (7.7)
 PSD-12 = 99 (0.9)

2015



Effort = 5.0
 Total CPUE = 15.4 (17; 77)
 Stock CPUE = 15.4 (17; 77)
 PSD = 86 (2.1)
 PSD-12 = 96 (1.3)

Figure 2. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Squaw Creek Reservoir, Texas, 1997, 2011 and 2015. The 2015 survey was conducted in January.

Palmetto Bass

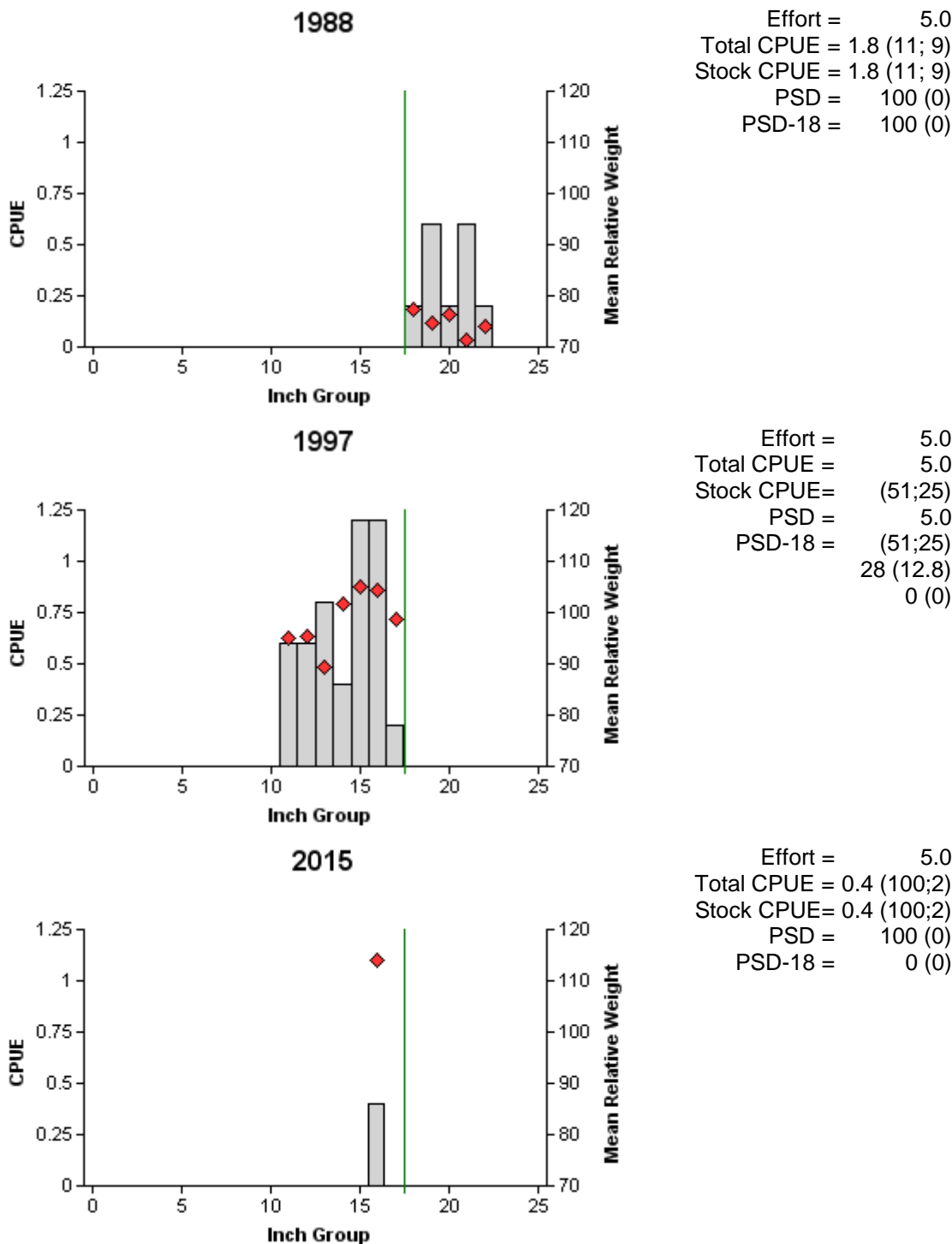


Figure 3. Number of Palmetto Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Squaw Creek Reservoir, Texas, 1988, 1997 and 2015. The 2015 survey was conducted in January.

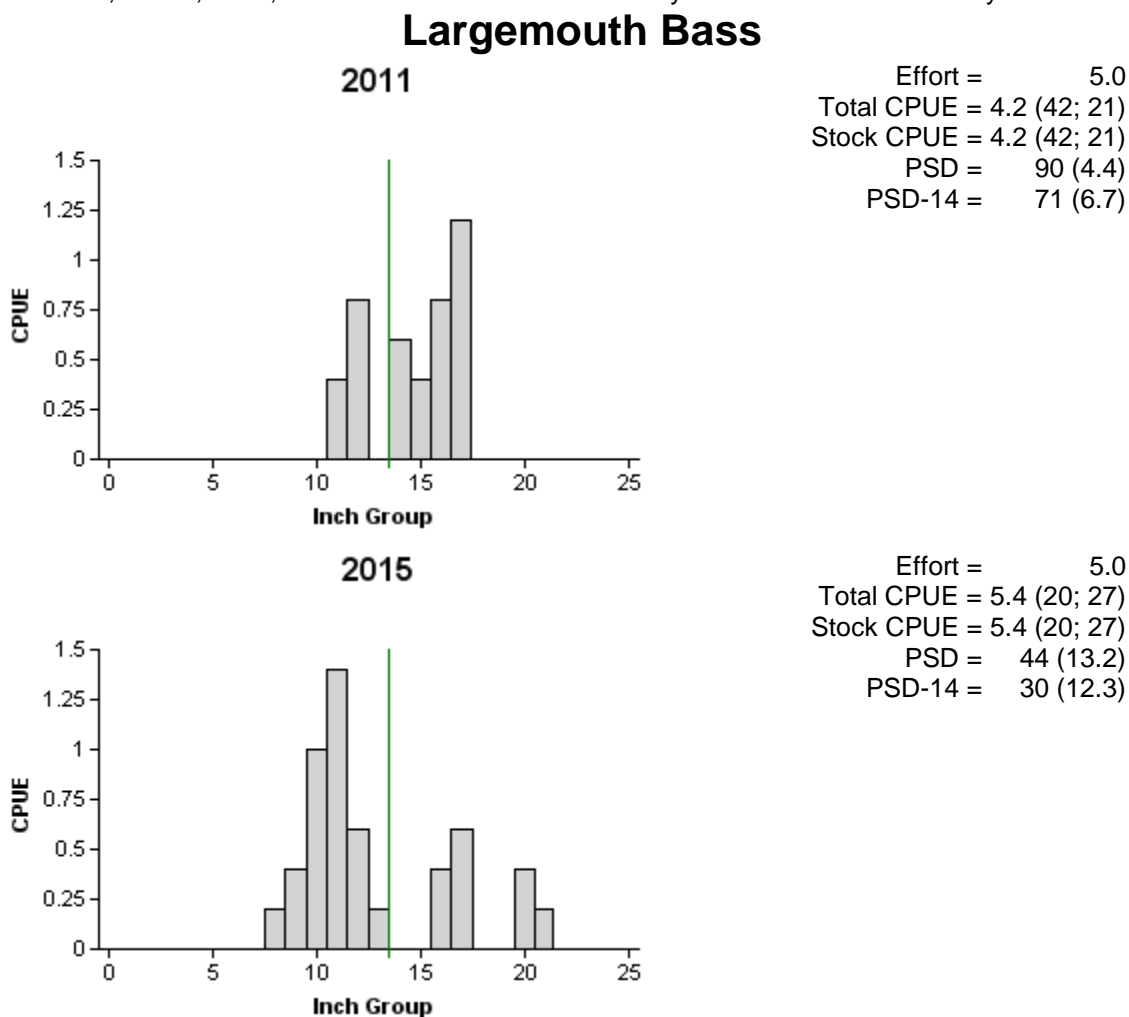


Figure 4. Number of Largemouth Bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Squaw Creek Reservoir, Texas, 2011 and 2015. The 2015 survey was conducted in January; weight data were not taken.

Table 6. Results of genetic analysis of Largemouth Bass collected from tournament fish, Squaw Creek Reservoir, Texas, 2015. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined with micro-satellite DNA analysis.

Year	Sample size	Genotype			% FLMB alleles	% Northern alleles
		%FLMB	%Hybrid	%NLMB		
2015	30	8	22	0	83	17

Table 7. Proposed sampling schedule for Squaw Creek Reservoir, Texas. Gill netting surveys are conducted in January. Standard surveys are denoted by S and additional surveys denoted by A.

Survey Year	Gill Net	Creel Survey	Vegetation Survey	Access Survey	Report
Fall 2015-Spring 2016					
Fall 2016-Spring 2017					
Fall 2017-Spring 2018					
Fall 2018-Spring 2019	S		S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected by gill nets from Squaw Creek Reservoir, Texas, 2015. *Tilapia* spp. were abundant but not enumerated.

Species	Gill Netting	
	N	CPUE
Channel Catfish	77	15.4
Palmetto Bass	2	0.4
Largemouth Bass	27	5.4

APPENDIX B

Catch rates (CPUE) of targeted species by gear type for standard surveys on Squaw Creek Reservoir, Texas, 1990 to present. Surveys prior to 1996 used biologist-selected stations, while those after 1996 used random stations. Electrofishing stations were shocked with a 5.0 Smith-Root GPP (Gas Powered Pulsator) until 2010, when a 7.5 Smith-Root GPP began being used. Electrofishing was discontinued in 2011. Species averages are in bold.

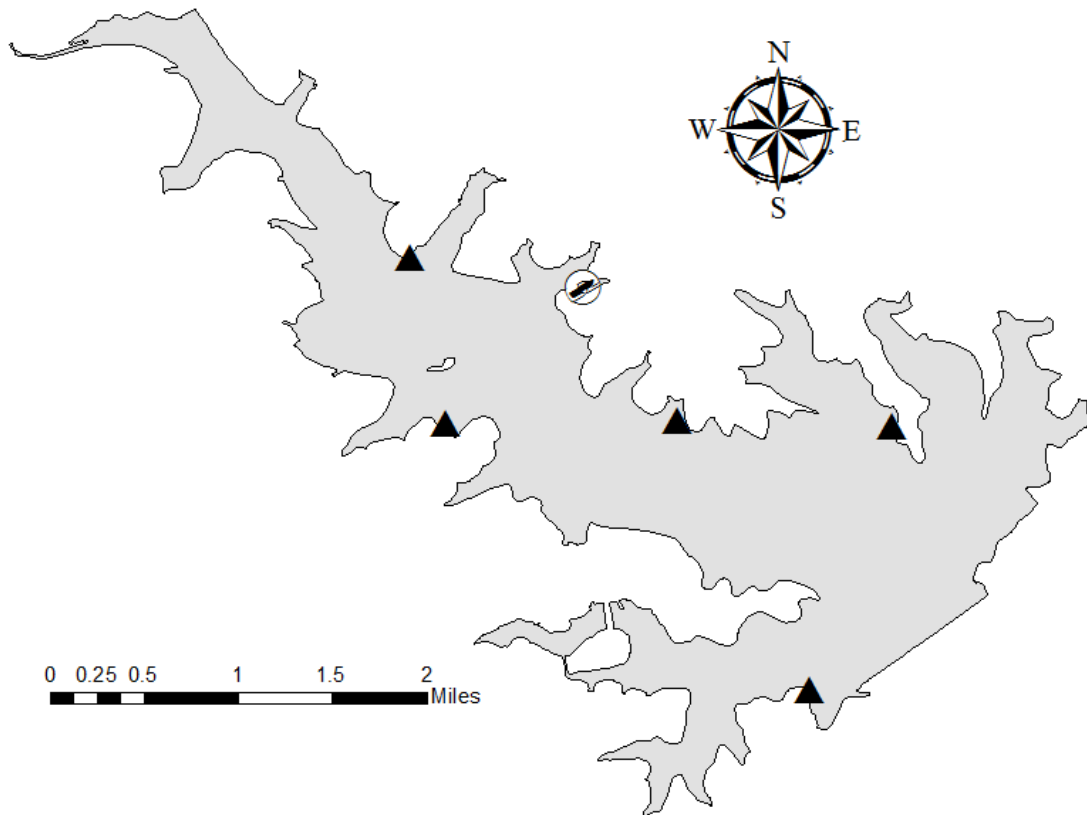
Year	Electrofishing								
	Bass		Shad		Sunfish				
	Largemouth	Smallmouth	Gizzard	Threadfin	Bluegill	Redear	Longear	Warmouth	Green
1990	2.0	0.7	6.0	0.7	15.3	0.0	6.0	2.0	18.7
1994	12.7	1.3	7.3	6.0	45.3	1.3	3.3	0.0	0.0
1997	16.0	0.0	152.0	0.0	101.0	0.0	28.0	10.0	0.0
2010	5.0	0.0	0.0	5.0	2.0	0.0	2.0	0.0	0.0
2011	-	-	-	-	-	-	-	-	-
Avg.	8.9	0.5	41.3	2.9	40.9	0.3	9.8	3.0	5.0

Year	Gill net								
	Temperate Bass		Shad		Sunfish				
	Palmetto	White	Gizzard	Threadfin	Bluegill	Redear	Longear	Warmouth	Green
1990	0.0	5.0	24.6	5.2	0.6	0.0	0.0	0.0	0.0
1994	0.0	0.8	31.6	0.0	1.8	0.2	0.0	0.2	0.0
1997	4.8	0.2	13.4	0.0	4.2	0.0	0.0	0.4	0.6
2010	-	-	-	-	-	-	-	-	-
2011	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2015	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Avg.	1.0	1.8	13.9	1.0	1.3	.04	0.0	0.1	0.1

Year	Gill net					
	Catfish		Black Bass			Tilapia
	Channel	Flathead	Smallmouth	Spotted	Largemouth	Nile/Blue
1990	4.2	0.0	0.7	3.0	2.0	0.0
1994	15.0	0.4	1.4	0.4	2.0	0.0
1997	18.4	0.0	0.0	0.0	6.0	0.0
2010	-	-	-	-	-	-

2011	30.2	0.4	0.0	0.0	1.4	0.2
2015	15.4	0.0	0.0	0.0	5.4	0.0
Avg.	16.6	0.2	0.4	0.7	3.4	.04

APPENDIX C



Location of gill netting sites, Squaw Creek Reservoir, Texas, 2015. Standard gill netting stations are indicated with triangles. Water level was within one foot of full pool at time of sampling.