Sulphur Springs Reservoir

2017 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in Sulphur Springs Reservoir were surveyed in 2017 using low-frequency electrofishing, daytime electrofishing, and trap netting and in 2018 using gill netting. A vegetation survey was conducted in August 2017. Historical data are presented with the 2017-2018 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: Sulphur Springs Reservoir is a 1,340-acre impoundment located in Hopkins County, Texas, on White Oak Creek, a tributary of the Sulphur River. It was constructed by the City of Sulphur Springs in 1973 as a municipal water supply. Habitat consists primarily of featureless banks with a variety of native emergent and inundated terrestrial or marginal species. Water clarity in the reservoir is extremely low due to high levels of suspended, colloidal particles.

Management History: Important sport fishes include Largemouth Bass, White Crappie, Blue Catfish, and Flathead Catfish. Turbid conditions in the reservoir have limited the fishery and the effectiveness of management activities. Fingerling Blue Catfish and Channel Catfish were stocked in 2015. A genetics sample of Largemouth Bass collected in 2013 indicated the population had a high incidence of Northern Largemouth Bass (NLMB), 29 of 30 fish sampled, despite a single stocking of Florida Largemouth Bass in 1978. In October 2015, 84 Largemouth Bass were collected from the reservoir as potential NLMB broodfish for TPWD's hatchery system.

Fish Community

- **Prey species:** Electrofishing catch of Gizzard Shad was low, but most fish were available as prey to sport fish. No Threadfin Shad were collected in surveys. Electrofishing catch of Bluegill was low and all fish were under 5-inches in length. High turbidity in the reservoir likely impairs visibility of fish thereby reducing electrofishing catch rates.
- **Catfishes:** The Blue Catfish population has improved in abundance presumably influenced by a fingerling stocking in 2015. Although Channel Catfish were stocked as well, these fish were scarce in samples. The Flathead Catfish population was sampled for the first time using low-frequency electrofishing and samples revealed a range of fish sizes from recruits to legal-sized fish.
- **Largemouth Bass:** Largemouth Bass abundance has declined since improvements seen in population in the previous sampling in 2013. High turbidity and degraded aquatic habitat limit spawning and survival of Centrarchids such as Largemouth Bass.
- **White Crappie:** White Crappie are the dominant species, but the population is overly-abundant and dominated by small fish. Growth rates are slow.

Management Strategies: Encourage the angler utilization of the catfish fisheries resources in Sulphur Springs Reservoir. Devise a strategy to reduce the over-abundance of small crappie to decrease competition and improve the fishery. Conduct general monitoring surveys with daytime electrofishing, trap netting, and gill netting 2021-2022. Access and vegetation surveys will be conducted in 2021.

Introduction

This document is a summary of fisheries data collected from Sulphur Springs Reservoir in 2017-2018. 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 2017-2018 data for comparison.

Reservoir Description

Sulphur Springs Reservoir is a 1,340-acre impoundment, created in 1973 on White Oak Creek, a tributary of the Sulphur River. The reservoir was created from the construction of a new dam merging two existing reservoirs, Century and White Oak reservoirs. It is located in Hopkins County approximately one mile northwest of Sulphur Springs, Texas, and is operated and controlled by the City of Sulphur Springs. The primary water use is for a municipal water supply. Habitat at time of sampling consisted of natural shoreline with flooded terrestrial and marginal species and native emergent vegetation. Other descriptive characteristics for Sulphur Springs Reservoir are in Table 1.

Angler Access

Sulphur Springs Reservoir has two public boat ramps. The east boat ramp provides adequate access to the reservoir extending to a depth of six feet below conservation pool elevation. The west ramp extends less than three-feet below conservation pool elevation, and although the ramp could be extended to improve access during drought, this project is considered infeasible because of the small size of the reservoir and limited angler utilization. Bank fishing access was fair and limited to areas around public boat ramps.

Management History

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

1. Improve water clarity.

   Action: Lab tests in 2014 resulted in flocculation and significant improvement in water clarity at a rate of 0.5 grams/liter or ~0.7 tons/acre foot of calcium sulfate (gypsum), and 0.25 grams/liter or ~0.3 tons/acre foot of aluminum sulfate (alum). A volumetric survey of the reservoir has not been conducted since 1973 and would require a new survey to estimate treatment costs. However, application and product costs (~$45 per ton gypsum; ~$425 per ton aluminum sulfate) may make treatment impractical. No action was taken on this issue.

2. Discontinue standard electrofishing sampling at night because of lake's high turbidity.

   Action: The results of daytime electrofishing sampling in 2013 were encouraging so this method was adopted as the standard in future.

3. Assess performance of low-frequency electrofishing to sample catfish populations because of low observed catch rates in gill netting. Request stockings of fingerling Channel Catfish and Blue Catfish to enhance these populations.

   Action: Low frequency electrofishing was conducted in summer 2017 and was used to sample the Blue Catfish and Flathead Catfish populations. Fingerling Blue Catfish and Channel Catfish were stocked in 2015. This method was ineffective at sampling Channel Catfish so spring gill netting was conducted in 2018.

Harvest regulation history: Sport fishes in Sulphur Springs Reservoir are currently managed with statewide regulations (Table 3).

Stocking history: Saugeye were stocked in Sulphur Springs Reservoir from 1993 to 1997 but survival was poor. Largemouth Bass and Florida Largemouth Bass, Blue and Channel Catfish, and Palmetto Bass were introduced during the 1970s. Blue Catfish and Channel Catfish were stocked again in 2015. A complete stocking history is found in Table 4.

Vegetation/habitat management history: Sulphur Springs Reservoir does not have a history of any invasive species and submersed aquatic vegetation is limited by the reservoir's high turbidity. American lotus was historically abundant in the upper reaches of the reservoir, but control efforts were never initiated.

Water transfer: No inter-basin 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 Sulphur Springs 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 Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, sunfishes, and Gizzard Shad were collected by daytime electrofishing (1 hour at 12, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths from 12 randomly-selected fish (range 13.0 to 14.9 inches).

Trap netting – Crappie were collected using trap nets (5 net nights at 5 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Ages for crappie were determined using otoliths from 10 randomly-selected fish (range 6.1 to 9.7 inches) since an insufficient sample of fish close to the minimum length limit were collected.

Gill netting – Blue Catfish and Channel Catfish were collected by gill netting (10 net nights at 10 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Low-frequency electrofishing – Blue Catfish and Flathead Catfish were collected by low-frequency electrofishing at 20, 5-minute stations. CPUE for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Fish for age and growth assessment of Blue Catfish were not collected. Low-frequency electrofishing was conducted in August 2017 to evaluate its utility as a viable alternative to gill netting which yielded moderate catch rates in previous surveys.

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 and creel statistics.

Habitat – An aquatic vegetation survey was performed according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Shoreline distances and areas of vegetation were estimated using ESRI ArcGIS software.

Water level – Source for water level data was the Texas Water Development Board (TWDB 2018).

Results and Discussion

Habitat: A habitat survey was last conducted in 2013 at which time shoreline habitat was composed of flooded terrestrial and native emergent vegetation (Bennett and Storey 2014). Habitat at that time consisted primarily of flooded terrestrial and native emergent vegetation. Reservoir elevation has been relatively stable within the past four years generally remaining within 1.5 ft of cpe (Figure 1). Aquatic vegetation is limited to a fringe of emergent, marginal and terrestrial species. Total estimated area in 2017 was 216 acres which was primarily composed of extensive areas of giant cutgrass (Table 6). In previous surveys (2005 and 2009) American lotus was the dominant species in Sulphur Springs Reservoir (Table 6) but in 2017, this species only represented 0.2% of reservoir surface area.

Prey species: Primary prey species consisted of low-density populations of Gizzard Shad and Bluegill (Appendix A). Although daytime electrofishing CPUE of Gizzard Shad, 136.0/h, was higher than in the previous survey, 59.0/h, catch rates are still relatively low (Figure 2). The Gizzard Shad population consisted primarily of small individuals and were readily available as forage to adult predators (IOV=90)

(Figure 2). CPUE of Bluegill, 21.0/h, is lower than in 2013, 32.0/h, indicating low abundance (Figure 3). No Threadfin Shad were collected in 2017.

Catfishes: The Blue Catfish population was sampled using low-frequency electrofishing (Figure 4) and gill netting (Figure 5). Low-frequency electrofishing sampled a range of Blue Catfish from 2-inches to 28-inches in length with CPUE of 15.6/h (Figure 4). The catch of small individuals (<8 inches), not evident in gill net samples, may represent either natural recruitment or survival of 148,493 fingerlings stocked in 2015. Gill net sampling on the other hand produced a higher CPUE, 10.5/nn, than in previous surveys (Figure 5). Body condition was good with average relative weights of all size classes exceeding 90. Fish of Legal size accounted for 88% of the fish collected with fish $\geq$20 inches representing 12% of the catch. CPUE of Channel Catfish in gill netting, 0.3/nn, is consistently low and catches are sporadic with no fish being collected in surveys between 2002 and 2018 (Figure 6). Although 109,635 fingerling Channel Catfish were stocked in 2015 (Table 4), they have had no detectable impact on the population.

Low-frequency electrofishing sampling in August 2017 was also used to collect Flathead Catfish (Figure 7). Total CPUE of this species was 13.8/h and a wide range of fish sizes was collected, 2-inches to 44-inches.

Largemouth Bass: Total CPUE of Largemouth Bass in daytime electrofishing, 15.0/h, declined from the previous survey conducted in 2013, 45.0/h. The population is characterized by low abundance with inconsistent recruitment and missing year classes. The age and growth sample was composed of three- and five-year old fish (Figure 9), and the growth rate was poor with fish requiring an average of 3.5 years to reach a length of 14-inches (Range: 13.0 – 14.8, average; 14.0 inches). In previous assessments, the lake's high turbidity and lack of suitable vegetative and woody cover have been identified as likely factors limiting the success of the Largemouth Bass population (Jubar and Storey 2010).

Crappie: The trap net catch rate of White Crappie, 91.0/nn, continued to be high and dominated by individuals smaller than 5-inches (Figure 10). Few fish of legal length were collected, so the 2017 sample was comprised of a randomly-selected sample of fish in the range of 6.0 to 9.7 inches. Mean length of fish in the sample was 7.1-inches and mean age was 1.7 years. The sample contained fish from age classes 1 through 3 (Figure 11). There was little difference in the mean length of each age class indicating poor growth.

Fisheries Management Plan for Sulphur Springs Reservoir, Texas

Prepared – July 2018

ISSUE 1: Population sampling on Blue Catfish using low frequency electrofishing and gill netting showed a wide size range from recruits to fish ≥ 25 inches. Gill net samples in 2018 were dominated by fish of legal length (88%). Assuming an estimate of length-at-maturity of 16 inches, then 40% of the fish collected were sexually mature and this is anticipated to increase recruitment into the fishery and subsequently improve angling opportunities in the future. Flathead Catfish were also collected in low frequency electrofishing and these samples also included recruits through fish in excess of 40 inches. These fisheries resources offer the potential for exploitation by anglers.

MANAGEMENT STRATEGY

1. Promote the Blue and Flathead Catfish fisheries through a variety of outlets such as news releases and social media posts to encourage angler utilization of these fisheries resources.

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 (*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 the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners 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.

Objective-Based Sampling Plan and Schedule (2018–2022)

Sport fish, forage fish, and other important fishes

Sport fishes in Sulphur Springs Reservoir include Blue Catfish, Channel Catfish, Flathead Catfish, Largemouth Bass, and White Crappie. Gizzard Shad and Bluegill are the primary prey species for sport fishes.

Low-density fisheries

Channel Catfish: Channel Catfish catches in gill netting surveys are sporadic and catch rates are low. In the 2018 survey three fish were collected despite a stocking of 148,643 fingerlings in 2015. The Channel Catfish population will be assessed as for Blue Catfish (see below) in 2022 using 10 randomly-selected stations. No additional effort will be expended.

Flathead Catfish: Low-frequency electrofishing was used to sample Flathead Catfish in summer 2017 but total CPUE was low (13.9/h) which makes it impractical to continue sampling the population using this gear.

Largemouth Bass: The Largemouth Bass population is characterized by low abundance and inconsistent recruitment. Analysis of data from the electrofishing survey in 2017, predicts obtaining a sample of 50 stock-sized Largemouth Bass at the 80th percentile would require sampling more than 60 stations. In view of the minimal angling effort and low-density population, population sampling will be discontinued.

White Crappie: Crappie in Sulphur Springs Reservoir are limited to White Crappie. Catch rates are variable, the population is dominated by small fish and growth rates are poor. No practical fisheries management options exist to alleviate the imbalance in the population size structure so population sampling will be discontinued.

Survey objectives, fisheries metrics, and sampling objectives

Blue Catfish. Catches per unit effort (CPUE) of Blue Catfish from gill netting surveys conducted in 2006, 2010, 2014 and 2018 were 6.0/nn, 3.4/nn, 2.8/nn and 10.5/nn respectively representing an increase in abundance. Analysis of 2018 data predicted a sample of 50 stock-sized Blue Catfish could be obtained at the 80th percentile by sampling 8 stations. To yield an RSE <25 would require sampling 16 stations. Gill netting will be conducted at 10 randomly-selected stations in spring 2022 to evaluate whether stocking of Blue Catfish fingerlings in 2015 had any long-term impact on the population.

Literature Cited

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Bennett, D. L. and K.W. Storey. 2014. Statewide freshwater fisheries monitoring and management program, Sulphur Springs Reservoir, Texas Parks and Wildlife Department, Federal Aid in Sport Fish Restoration, Performance Report, Project F-221-M-4, Job A, 24 pages.

DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between reservoir trophic state and Gizzard Shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7): 348.

Jubar, A., and K. Storey. 2010. Statewide freshwater fisheries monitoring and management program survey report for Sulphur Springs Reservoir, 2009. Texas Parks and Wildlife Department, Federal Aid Report F-30-R-35, Austin.

Texas Water Development Board (TWDB). 2018. Water data for Texas: Web interface. Available: https://waterdatafortexas.org/reservoirs/individual/sulphur-springs (July 2018).

Tables and Figures

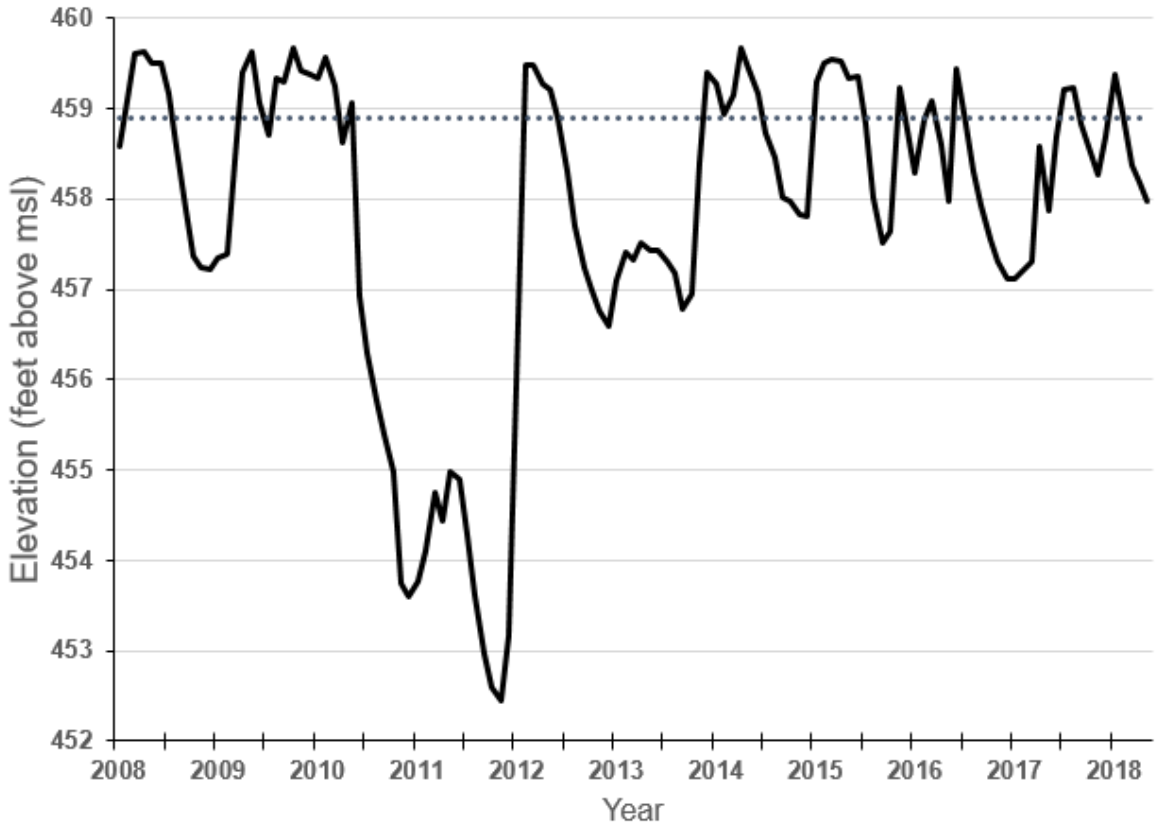


Figure 1. Mean monthly water level elevations in feet above mean sea level (MSL) recorded for Sulphur Springs Reservoir, Texas, 2008 to 2018. Dotted horizontal line represents conservation pool elevation at 458.9 above mean sea level (msl).

Table 1. Characteristics of Sulphur Springs Reservoir, Texas.

Characteristic	Description
Year constructed	1973
Controlling authority	City of Sulphur Springs
Surface area	1,340 acres
Counties	Hopkins
Reservoir type	City impoundment
Mean depth	10.5 ft.
Maximum depth	28.0 ft.
Shoreline Development Index (SDI)	2.16
Conductivity	80 µmho / cm
Secchi depth	10 inches
Watershed area	55 mi^2

Table 2. Boat ramp characteristics for Sulphur Springs Reservoir, Texas, August 2017. Reservoir elevation at time of survey was at conservation pool elevation (458.9 feet above msl).

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft. msl)	Condition
East Ramp	33.16837 -95.61021	Y	30	451	Excellent.
West Ramp	33.18177 -95.62967	Y	40	456	Shallow ramp. Extension is feasible.

Table 3. Harvest regulations for Sulphur Springs Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, Largemouth	5	14-inch minimum
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Sulphur Springs Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults.

Species	Year	Number	Size
Threadfin Shad	1990	7,000	ADL
	1991	14,400	ADL
	Total	21,400	
Blue Catfish	1978	29,680	FGL
	2015	148,493	FGL
	Total	178,173	
Channel Catfish	1973	76,400	FGL
	1974	18,000	FGL
	2015	109,635	FGL
	Total	94,400	
Palmetto Bass	1978	33,680	FGL
	1979	33,600	FGL
	1982	14,028	FGL
	Total	81,308	
Green X Redear Sunfish	1973	15,000	FGL
	1974	25,000	FGL
	Total	40,000	
Largemouth Bass	1972	1,000	AFGL
	1973	36,250	FGL
	Total	37,250	
Florida Largemouth Bass	1978	37,080	FGL
	Total	37,080	
Saugeye	1993	67,100	FGL
	1994	69,302	FGL
	1995	40,305	FGL
	1996	67,242	FGL
	1997	75,009	FGL
	Total	318,958	

Table 5. Objective-based sampling plan components for Sulphur Springs Reservoir, Texas 2017–2018.

Gear/ target species	Survey objective – Monitor trend in:	Metrics	Sampling objective
Low frequency electrofishing – August 2017- (Effort = 20 stations)			
Blue Catfish	Abundance	CPUE– stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Category 2	Estimate mean age of 12-inch fish
Daytime Electrofishing – Fall 2017 - (Effort =12 stations, biologist-selected)			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Genetics	% NLMB	N = 30, any age
	Age-and-growth	Category 2	Estimate mean age of 14-inch fish
Bluegill [a]	Abundance	CPUE – Total	
	Size structure	PSD, length frequency	
Gizzard Shad [a]	Size structure	PSD, length frequency	
	Prey availability	IOV	
Trap netting – Fall 2017 - (Minimum effort = 5 nn)			
White Crappie	Abundance	CPUE– stock	
	Size structure	PSD, length frequency	
	Condition	Wr	
	Age-and-growth	Category 2	Estimate mean age of 10-inch fish
Gill netting – Spring 2018 - (Effort = 5 nn)			
Blue Catfish	Abundance	CPUE	
	Size structure	PSD, length frequency	Assess impact of fingerling stocking in 2015
Channel Catfish	Abundance	CPUE	
	Size structure	PSD, length frequency	Verify survival of fingerling stocking in 2015

[a] No sampling objectives have been set for prey species so no additional sampling effort beyond that designated for Largemouth Bass will be conducted. Largemouth Bass body condition can also be used to make inferences on forage availability.

Table 6. Survey of aquatic vegetation, Sulphur Springs Reservoir, Texas, 2005, 2009, 2013, and 2017. Surface area in acres is listed with percent coverage in parentheses.

Vegetation	2005	2009	2013	2017
Native emergent	2.3 (<0.1)[a]	11.6 (0.7) [a]	92.0 (7.0)[a]	213.7 (15.0)[b]
American lotus	132.7 (9.0)	315.0 (21.3)	<1.0 (<1.0)	2.4 (0.2)
Alligatorweed				<0.01

[a] Cattail, Giant bulrush, Maidencane
[b] Black willow, Buttonbush, Cattail, Giant bulrush, Giant cutgrass, Maidencane, Smartweed, Waterwillow

Gizzard Shad

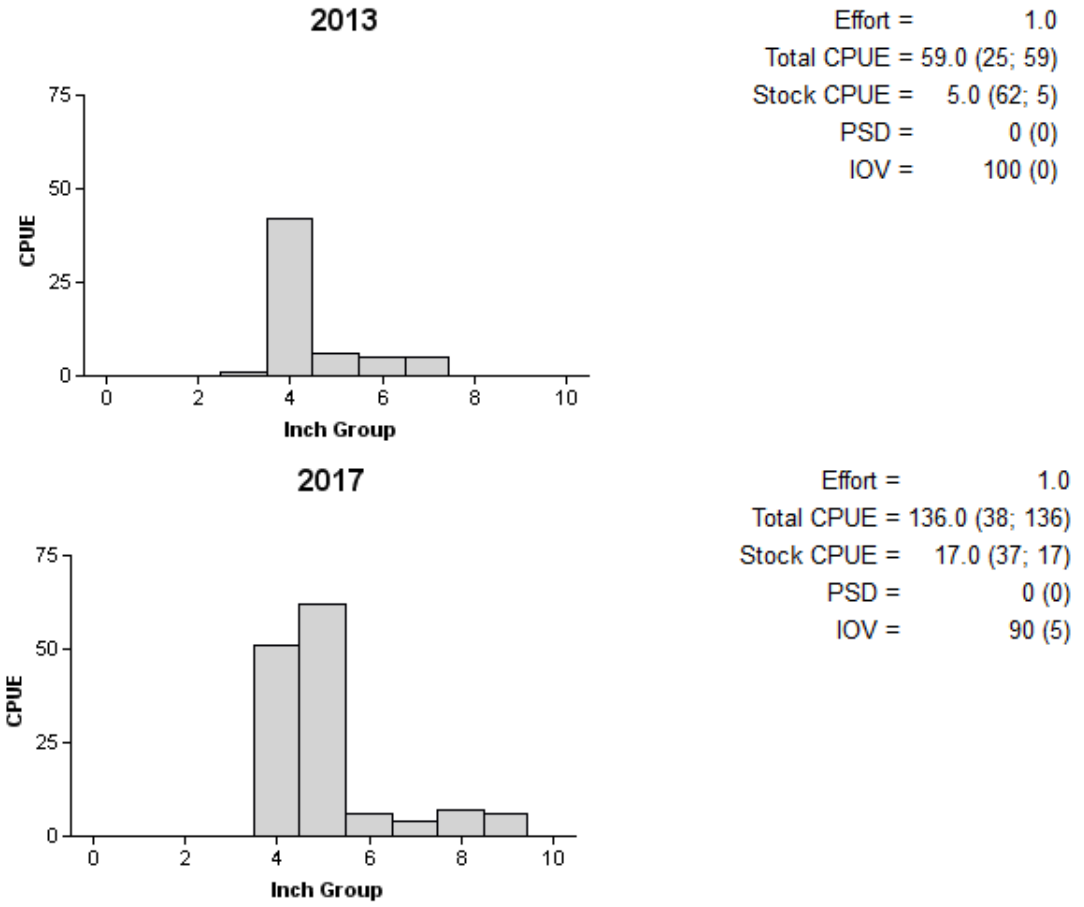


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall daytime electrofishing surveys, Sulphur Springs Reservoir, Texas, 2013, and 2017.

Bluegill

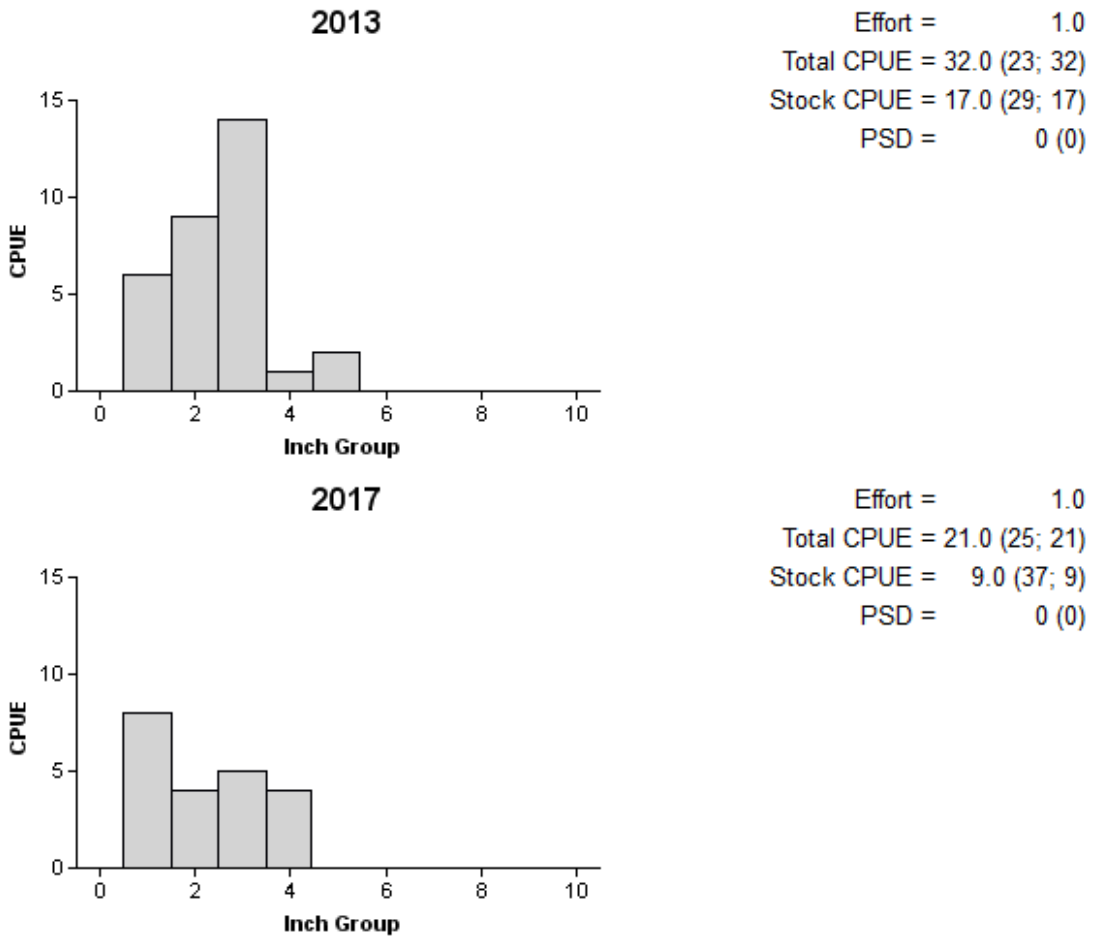
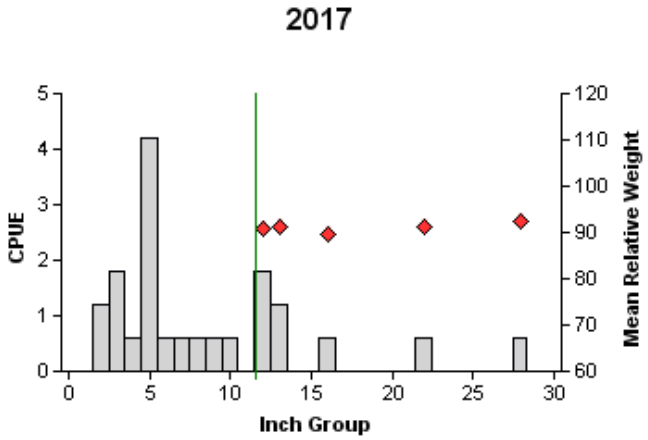


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall daytime electrofishing surveys, Sulphur Springs Reservoir, Texas, 2013, and 2017.

Blue Catfish



Effort =	1.7
Total CPUE =	15.6 (33; 26)
Stock CPUE =	4.8 (33; 8)
PSD =	25 (14)
PSD-12 =	100 (0)

Figure 4. Number of Blue Catfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for summer low-frequency electrofishing surveys, Sulphur Springs Reservoir, Texas, 2017. Vertical line indicates minimum length limit.

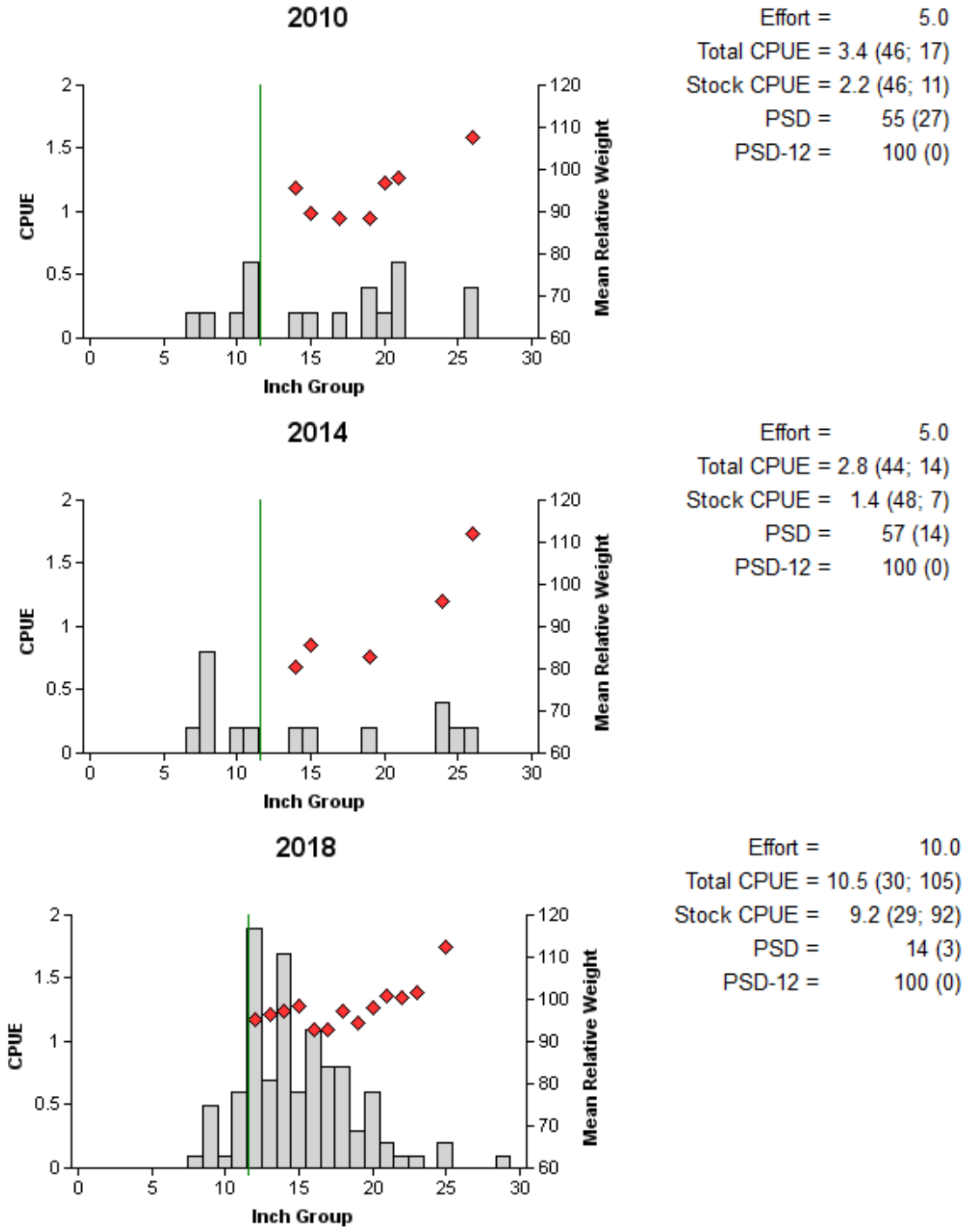


Figure 5. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Sulphur Springs Reservoir, Texas, 2010, 2014, and 2018. Vertical lines indicate minimum length limit.

Channel Catfish

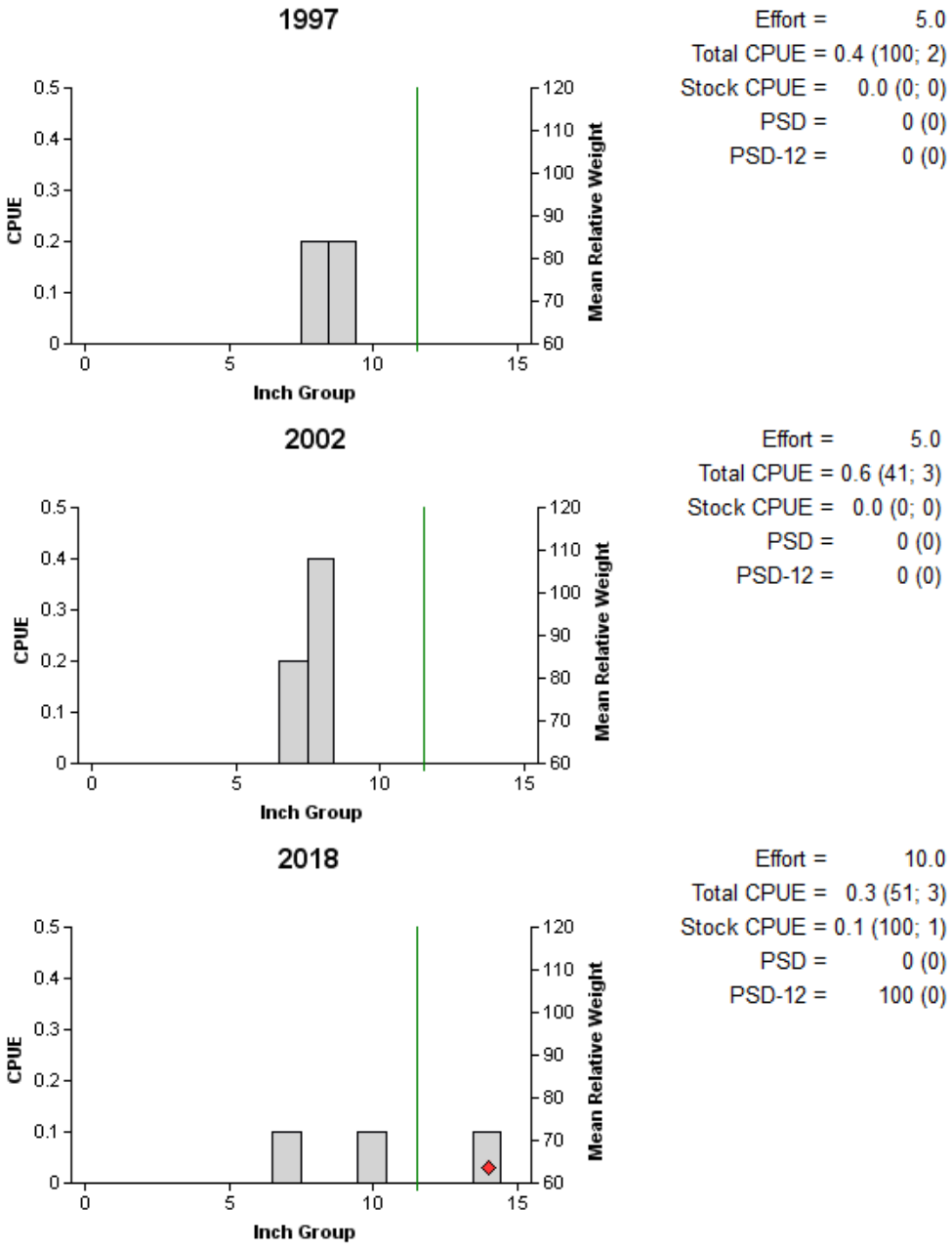
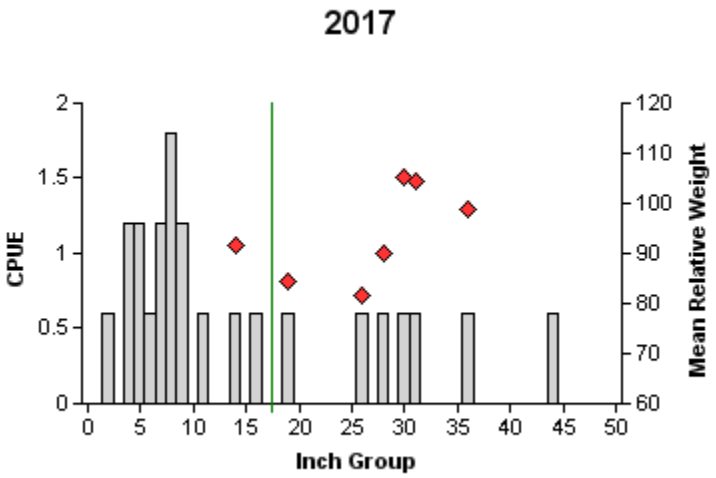


Figure 6. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Sulphur Springs Reservoir, Texas, 1997, 2002, and 2018. Vertical lines indicate minimum length limit.

Flathead Catfish



Effort =	1.7
Total CPUE =	13.8 (42; 23)
Stock CPUE =	5.4 (44; 9)
PSD =	67 (12)
PSD-P =	56 (9)

Figure 7. Number of Flathead Catfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for summer low-frequency electrofishing surveys, Sulphur Springs Reservoir, Texas, 2017. Vertical line indicates minimum length limit.

Largemouth Bass

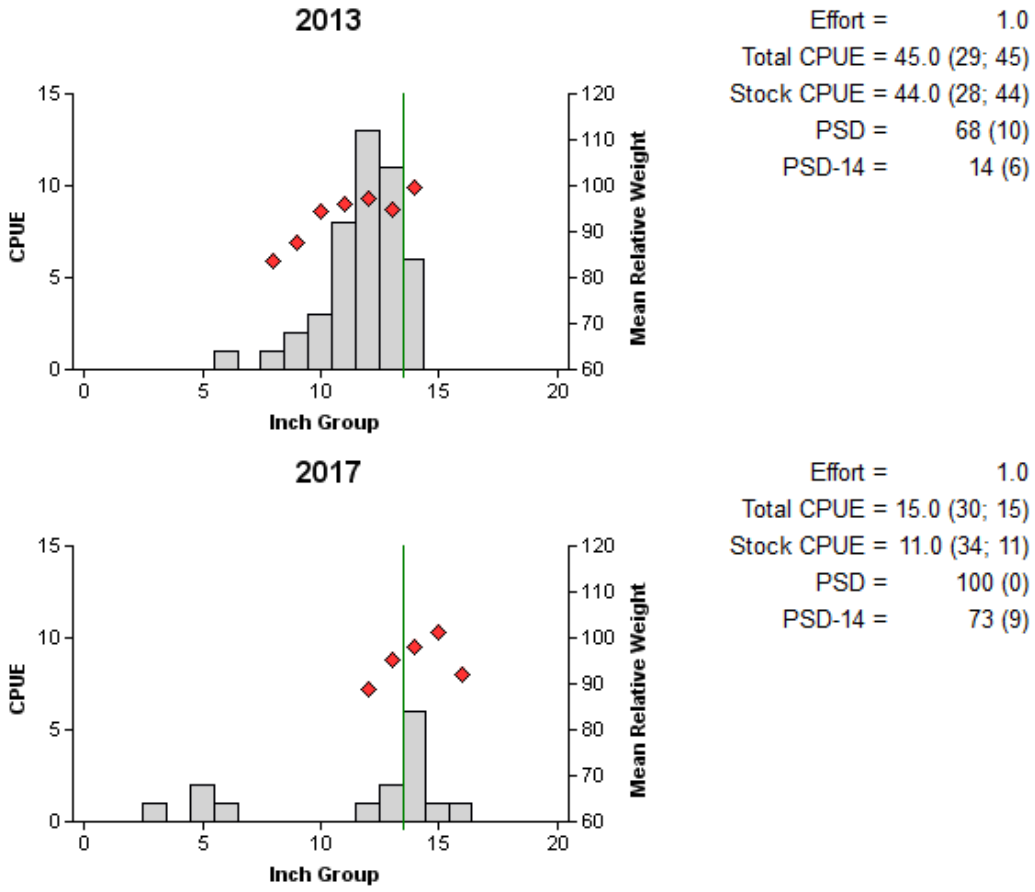
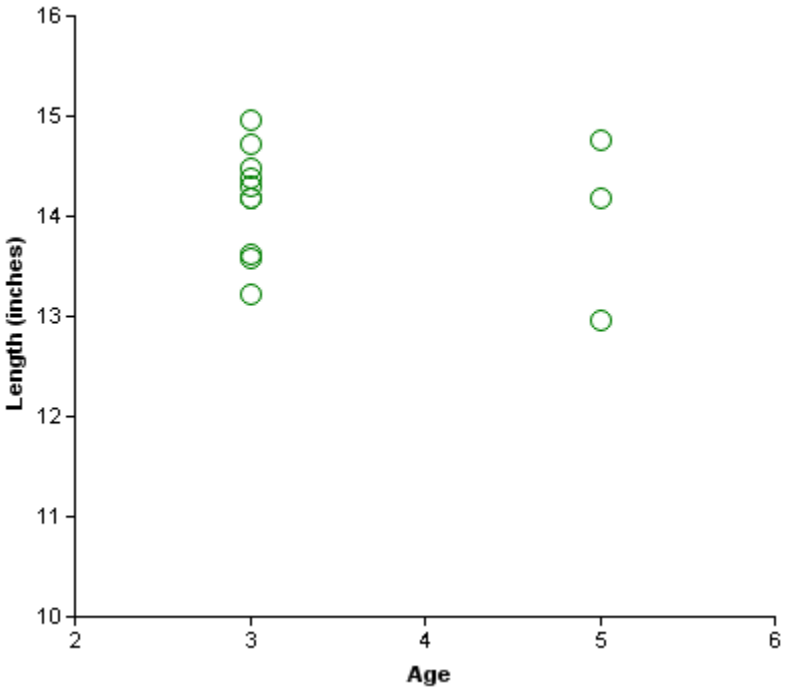


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall daytime electrofishing surveys, Sulphur Springs Reservoir, Texas, 2013, and 2017. Vertical lines indicate minimum length limit.



Age Class	3	5
Average Length (in)	14.2	14.0
N	10	3

Figure 9. Length-at-age for Largemouth Bass collected from daytime electrofishing at Sulphur Springs Reservoir, Texas, October 2017.

White Crappie

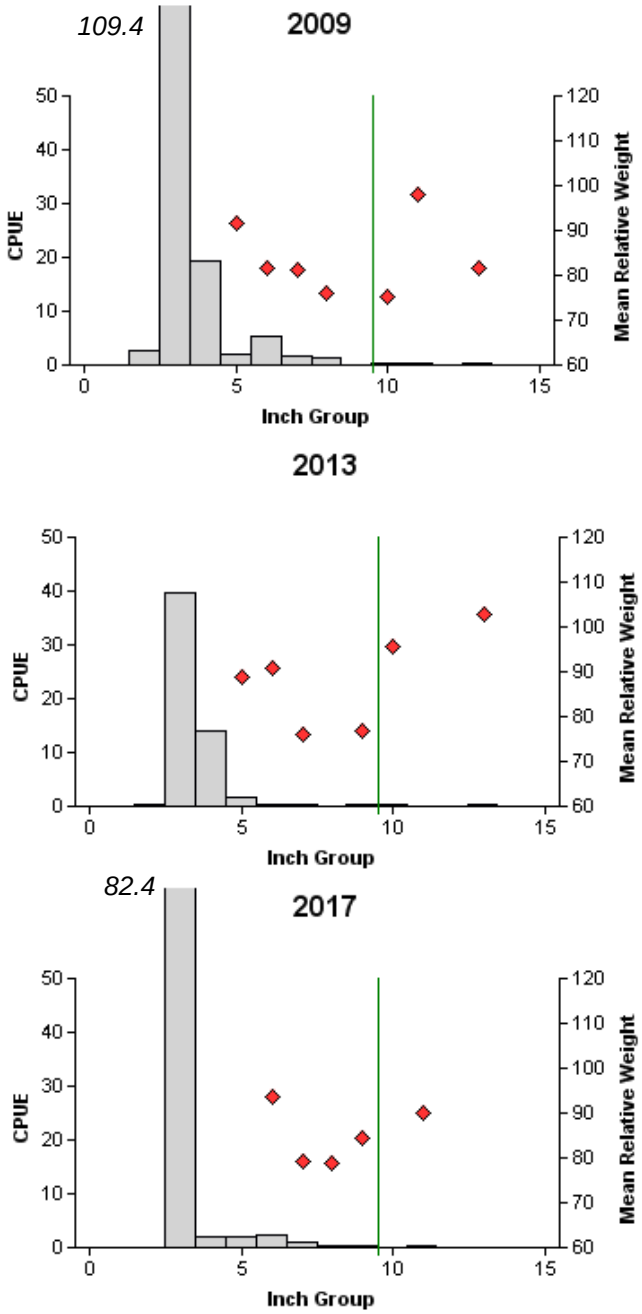
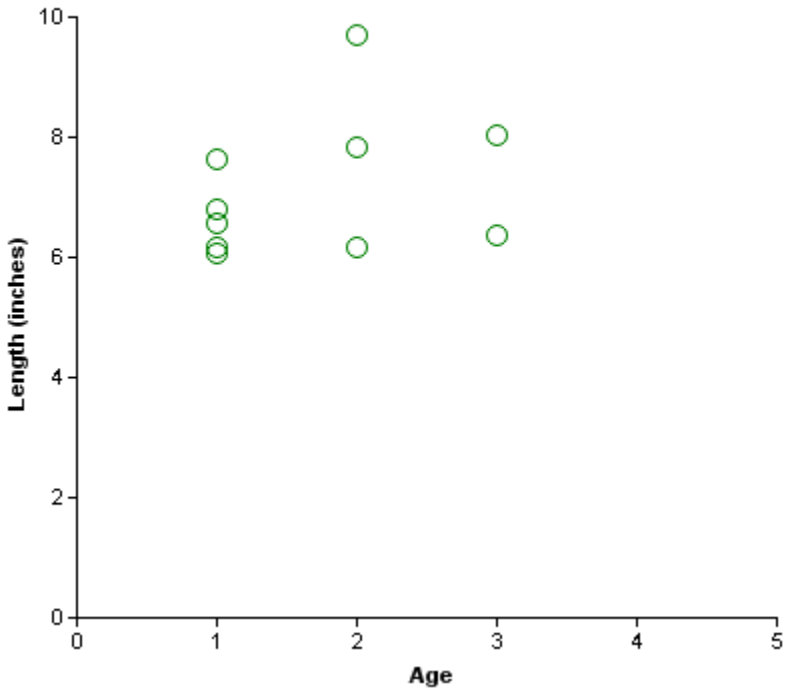


Figure 10. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Sulphur Springs Reservoir, Texas, 2009, 2013, and 2017. Vertical lines indicate minimum length limit.



Age Class	1	2	3
Average Length (in)	6.7	7.9	7.2
N	5	3	2

Figure 11. Length-at-age for White Crappie collected from trap netting at Sulphur Springs Reservoir, Texas, November 2017.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for Sulphur Springs Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

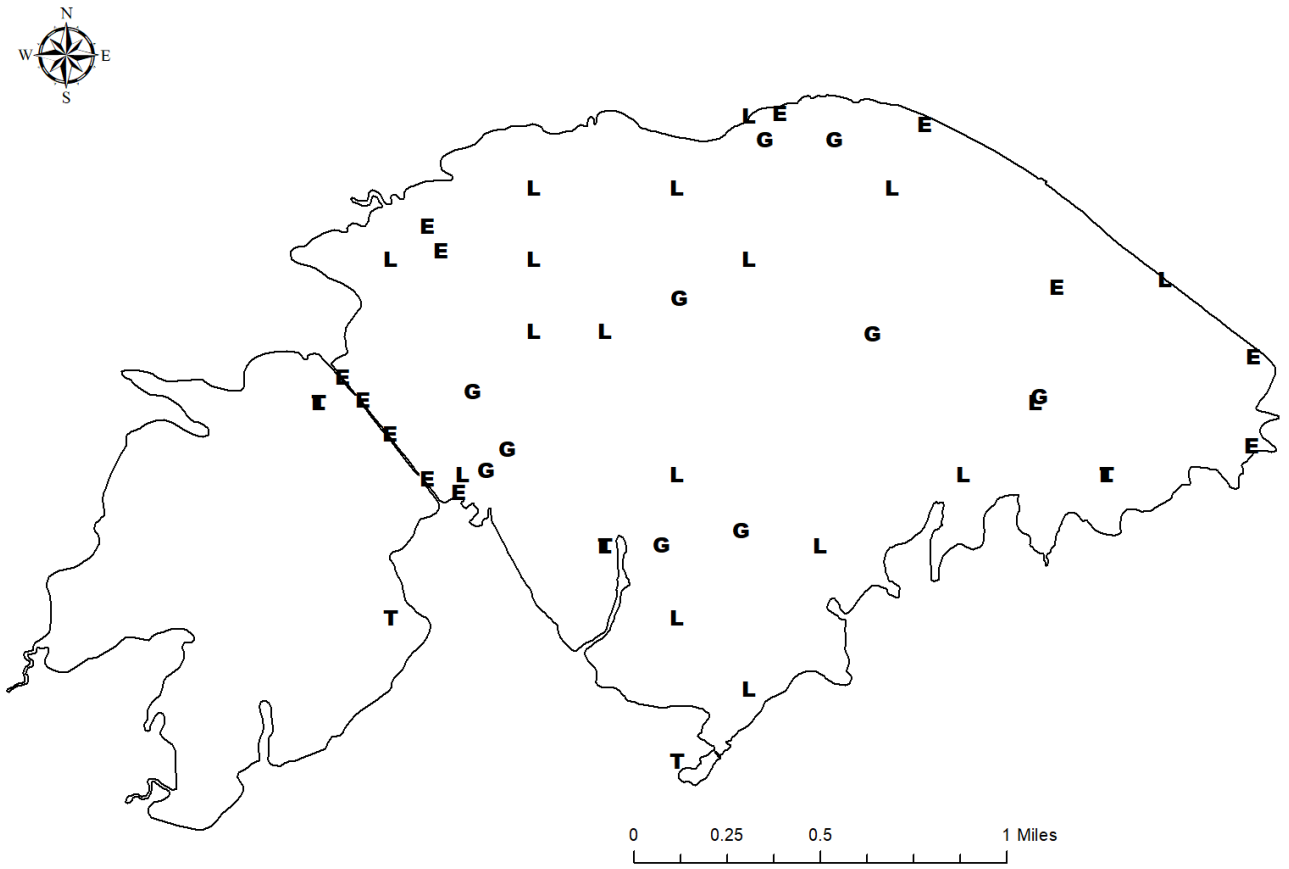
	Survey year			
	2018-2019	2019-2020	2020-2021	2021-2022
Angler Access				
Vegetation				
Electrofishing – Fall				
Trap netting				
Gill netting				S
Report				

APPENDIX A – Catch rates for all species from all gear types

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Sulphur Springs Reservoir, Texas, 2017-2018. Sampling effort was 1.67 hours for low-frequency electrofishing, 1 hour for daytime electrofishing, 5 net nights for trap netting, and 10 net nights for gill netting.

Species	Low-frequency electrofishing		Electrofishing		Trap netting		Gill netting	
	N	CPUE	N	CPUE	N	CPUE	N	CPUE
Spotted Gar							2	0.2 (67)
Gizzard Shad			136	136.0 (38)				
Smallmouth Buffalo							2	0.2 (67)
Blue Catfish	26	15.6 (33)					105	10.5 (30)
Channel Catfish							3	0.3 (51)
Flathead Catfish	23	13.8 (42)						
Green Sunfish			4	4.0 (56)				
Bluegill			21	21.0 (25)				
Dollar Sunfish			7	7.0 (39)				
Longear Sunfish			8	8.0 (59)				
Largemouth Bass			15	15.0 (30)				
White Crappie					455	91.0 (57)	4	0.4 (55)
Black Crappie					3	0.6 (67)		
Freshwater Drum							4	0.4 (41)

APPENDIX B – Map of sampling locations



Location of sampling sites, Sulphur Springs Reservoir, Texas, 2017-2018. Electrofishing, gill netting, low-frequency electrofishing, and trap netting stations are indicated by E, G, L and T, respectively. Water level was near full pool at time of sampling.

APPENDIX C – Objective-based sampling plan 2018 – 2022

Gear/ target species	Survey objective; monitor trend in…	Metrics	Sampling objective
Gill netting – Spring 2022 - (Effort = 10 nn)			
Blue Catfish	Abundance	CPUE	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
Channel Catfish	Abundance	CPUE	
	Size structure	PSD, length frequency	

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