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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2016 Fisheries Management Survey Report

Clyde Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Clyde Reservoir were surveyed in 2016 by electrofishing. This report summarizes the results of the survey and contains a management plan for the reservoir based on the findings. Historical data are presented for comparison.

Reservoir Description: Clyde reservoir is a 449-acre impoundment of the north prong of Pecan Bayou created in 1970. It is located 15 miles southeast of Abilene and is controlled by the City of Clyde. Primary water uses are municipal water supply and recreation. In 2016, shoreline habitat consisted of flooded terrestrial vegetation, *Chara* sp., buttonbush, black willow, duckweed, exotic torpedograss, and exotic salt cedar. Severe, prolonged drought conditions from 2007-2016 caused the reservoir to nearly go dry. In spring 2016, substantial rainfall refilled the reservoir to above conservation level. A fee is required to access the two public boat ramps and bank.

- **Management History:** Clyde Reservoir historically supported a quality Largemouth Bass fishery. The current lake record Largemouth Bass is 14.8 pounds and was caught 2001. Fathead Minnows and Bluegill were stocked in 2016 to re-establish forage for sportfish. Florida Largemouth Bass were stocked in 2004, 2005, 2016, and 2017 to re-establish the previously existing quality fishery. Channel Catfish were stocked in 2016 and 2017 to help re-establish the fishery devastated by severe drought conditions.

- **Fish Community:** Fisheries were not sampled from 2008-2016 because of extreme drought conditions and low water level. Following substantial rainfall and water level increase in spring 2016, a fall exploratory electrofishing survey was conducted to determine statuses of the existing fisheries. Largemouth Bass, White Crappie, Bluegill, Green Sunfish, and Gizzard Shad were observed in the survey. Gizzard Shad and Green Sunfish were the dominant prey species observed. Largemouth Bass had relatively high abundance, and most fish were under legal size.

Management Strategies: Electrofishing and trap netting surveys will be conducted during fall 2018 and fall 2020. Tandem hoop netting will be conducted summer 2020 to monitor for Channel Catfish. Meet with City of Clyde to discuss fish habitat enhancement and establishment, as well as invasive species establishment and their control measures.

INTRODUCTION

This document is a summary of the conditions of fisheries at Clyde Reservoir from 2016-2017. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fisheries. While information on other fishes was collected, this report deals primarily with the major sport fishes and important prey species. Historical data are presented with the 2016-2017 data for comparison.

Reservoir Description

Clyde reservoir is a 449-acre impoundment of the north prong of Pecan Bayou in the Colorado River Basin, and it was created in 1970. The reservoir is located 15 miles southeast of Abilene and is controlled by the City of Clyde. Primary water uses are municipal water supply and recreation. Severe drought conditions from 2007-2016 reduced the water level in the reservoir to nearly dry. In spring 2016, substantial rainfall refilled the reservoir to over conservation pool elevation. Addition reservoir characteristics are displayed in Table 1.

Angler Access

Clyde Reservoir has two public boat ramps that can be accessed with a park entrance fee. The reservoir has no private boat ramps. Additional boat ramp characteristics are in Table 2. Approximately 30% of the shoreline is available to public access.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Munger and Dumont 2013) included:

1. Conduct species surveys as soon as water level is suitable for boater access.
   Action: Fisheries were last surveyed in 2008, and scheduled surveys during the last two survey periods were not able to be completed due to low water level. During fall 2016, an electrofishing survey was conducted to determine statuses of fisheries.

2. Re-stock predator and prey fishes once water level increases.
   Action: Largemouth Bass and Channel Catfish fingerlings were stocked in 2016 and 2017. Bluegill and Fathead Minnows were stocked to restore forage for sport fishes in 2016. Gizzard Shad and sunfish species were also present in the reservoir and sampled during 2016 electrofishing survey.

3. Discuss extension of boat ramps and grant information with City of Clyde.
   Action: Boat ramp extensions were discussed with City of Clyde during July 2017. Both the City of Clyde and TPWD Inland Fisheries – Abilene District agreed that ramp extension may not be feasible because of lack of deep water and concerns with the ramp grade.

Harvest regulation history: Sportfishes in Clyde Reservoir have been managed with statewide regulations (Table 3).

Stocking history: Historical stockings have included Threadfin Shad, Blue Catfish, Channel Catfish, Largemouth Bass, and Walleye. Prior to 2016, the reservoir had not been stocked since a 2005 stocking of Florida Largemouth Bass. In 2016, reservoir was stocked with species including Bluegill, Fathead Minnows, Channel Catfish, and Florida Largemouth Bass to re-establish fisheries. Channel Catfish and Florida Largemouth Bass fingerlings were stocked in 2017. A complete stocking history is presented in Table 4.

Vegetation/habitat management history: Clyde Reservoir has no vegetation/habitat management history.

Water Transfer: No interbasin transfers are known to exist.

METHODS

Traditional monitoring was not feasible because of prolonged drought and inaccessibility attributed to water level. However, exploratory electrofishing was conducted during fall 2016 to monitor the statuses of fisheries after the reservoir caught substantial water (Appendix A).

Electrofishing – Evening, exploratory electrofishing was conducted in fall 2016 for a total of one hour at 12, 5-minute randomly selected stations for all fish species encountered during the survey. Catch per unit effort (CPUE) was recorded as the number of fish caught per hour (fish/hour) of actual electrofishing.

Genetics – Genetic analysis 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). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics.

Habitat – A vegetation and structural habitat survey was conducted in August 2016. The habitat survey was conducted by selecting 150 random points throughout the reservoir, and presence/absence was determined for vegetative and structural habitat types identified at or below the waterline at all stations. Thirteen stations were discarded because they could not be sampled. Percent occurrence (% = [# stations habitat present / total stations sampled] X 100) and associated Wilson 95% confidence intervals (AusVet 2017) were calculated for each habitat feature type (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

RESULTS AND DISCUSSION

Clyde Reservoir's fisheries were not surveyed from 2008-2016 because of extreme prolonged drought and low water level; the reservoir was nearly dry by 2015. Prior to the most recent prolonged drought, Clyde Reservoir had ample prey populations and provided a quality sport fishery for Largemouth Bass. The lake record Largemouth Bass was caught in 2001 and was 14.8 lbs and 27.0 inches. Blue Catfish were considered to have low relative abundance in gill net surveys, but they provided a fishery for anglers. The lake record Blue Catfish was caught in 2009 and was 36.9 lbs and 38.5 inches. The reservoir also previously supported a productive White Crappie population.

Habitat: A habitat survey was last conducted in summer 2016 (Table 5). Approximately 44% of the points sampled were featureless. However, flooded terrestrial vegetation such as inundated willow baccharis, cottonwood, and *Sesbiana* sp. occurred at 52.6% of the points sampled. Other vegetation observed was *Chara* sp. (27.7%), buttonbush (15.3%), and inundated black willow (5.8%). Structural habitat observed included cobble (13.9%), small boulders (4.4%), bedrock (2.9%), and pebbles (2.9%).

Prey species: Gizzard Shad and sunfishes (i.e., Green Sunfish and Bluegill) were the most relatively abundant prey observed during fall 2016 exploratory electrofishing survey. Gizzard Shad were the dominant prey species sampled, with a catch rate of 1,338.0 fish/hour (RSE=32; Figure 1). Gizzard Shad caught in the survey ranged from 2-13 inches, and IOV was 99; most individuals were optimal prey sizes for sport fish. Bluegill were caught at 63.0 fish/hour (RSE=23), and individuals ranged from 1-6 inches (Figure 2). Green Sunfish were caught at a rate of 268.0 fish/hour (RSE=32), and fish ranged from 1-7 inches, most being 2-4 inches (Figure 3).

Catfishes: One Channel Catfish and five Black Bullheads were caught during fall 2016 exploratory electrofishing. Other historically occurring catfishes such as Flathead Catfish and Blue Catfish were not observed in the survey.

Largemouth Bass: Largemouth Bass total catch rate was 191.0 fish/hour (RSE=15), and the catch rate of stock-sized bass was 132.0 fish/hour (RSE=20) during 2016 exploratory sampling (Figure 4). The PSD was 2 (SE=2), most individuals were small, and recruitment appeared adequate. Mean relative weights for stock-sized fish ranged from 107-130 which suggested body conditions were optimal. Prevalence of Florida Largemouth Bass alleles was 42.5%. Five pure Florida Largemouth Bass, seven pure Northern Largemouth Bass, and 18 intergrade fish comprised the sample.

White Crappie: Seven White Crappie ranging from 4-6 inches were sampled during the fall 2016 exploratory electrofishing survey (CPUE-Total = 7.0 fish/hour; RSE=45).

Fisheries management plan for Clyde Reservoir, Texas

Prepared – July 2017

ISSUE 1: Clyde Reservoir has been subjected to periods of long-term drought and extreme fluctuations in water level. The reservoir went nearly dry by spring 2015, and important fisheries were devastated. In 2016, various prey species were stocked. In both 2016 and 2017, Channel Catfish and Florida Largemouth Bass were stocked to re-establish fisheries. However, additional stockings may be necessary to restore the quality fisheries that once existed.

MANAGEMENT STRATEGIES

1. Request and stock Channel Catfish fingerlings at 15 fish/ac in 2018 and 2020.
2. Conduct a management stocking of adult White Crappie in fall 2017.
3. Conduct electrofishing in 2018 and 2020, tandem hoop netting in 2020, and trap netting in fall 2020 to assess recovery of the sportfish populations.

ISSUE 2: Salt cedar (*Tamarix* sp.) has been documented at Clyde Reservoir.

MANAGEMENT STRATEGIES

1. Map the extent of salt cedar coverage at the reservoir.
2. Meet with City of Clyde and TPWD invasive species experts to discuss salt cedar establishment, possible problems, monitoring options, potential control measures.

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 the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate City of Clyde staff about invasive species, and provide them with posters, literature, etc… so that they can educate their customers.
3. Educate the public about invasive species by use of media and the internet.
4. Discuss invasive species when presenting to constituents and user groups.
5. Keep track of (i.e, map) existing and future interbasin transfers to facilitate potential invasive species responses.

Objective-Based Sampling Plan and Schedule

Sport fish, prey fish, and other important fishes: Historically important sport fisheries included Largemouth Bass, White Crappie, Blue Catfish, and Channel Catfish. Important prey species in the reservoir included Gizzard Shad, Bluegill, and Green Sunfish. As a result of the devastating effects of the prolonged drought and low water level on prey and sportfish populations in the reservoir, re-establishment efforts included stockings of Bluegill, Fathead Minnows, Channel Catfish, and Florida Largemouth Bass.

Low-density Species

Blue and Flathead Catfish: Blue and Flathead Catfish previously existed in the reservoir. As a result of the previous prolonged drought and low water level, Blue Catfish and Flathead Catfish are considered as extirpated from the reservoir. Historically, catch of both species in gill netting surveys was low. Monitoring of presence/absence of these fishes will be conducted through other scheduled surveys. Relative abundance (i.e., CPUE-Total) will be determined for each species if they are encountered during surveys, but there will be no target levels of precision for sampling objectives.

Survey objectives, fisheries metrics, and sampling objectives

Prey species: Recovery of prey species will be assessed by electrofishing at 12 randomly-selected, 5-minute stations for a duration of 1.0 hour during fall 2018 and 2020 (Table 5). Sunfishes (i.e., Bluegill and Green Sunfish) and Gizzard Shad are currently the primary prey species at Clyde Reservoir. Monitoring surveys for prey have traditionally been conducted biennially while sampling for Largemouth Bass. Trend data for CPUE and size structure will be collected during fall 2018 and 2020 electrofishing surveys. During sampling, target precision will be RSE ≤ 25% for CPUE-Total. A target of ≥ 50 stock-sized fish will be sampled to calculate PSDs to evaluate size structure. Index of vulnerability will be calculated for Gizzard Shad to assess the relative proportion of individuals in the population that are of suitable prey sizes for sport fish. Additional sampling to meet objectives for prey species will occur only if additional sampling for Largemouth Bass is needed. Otherwise, Largemouth Bass body condition will be used as a means of evaluating forage abundance, vulnerability, or both. Sampling schedule from 2017-2021 is displayed in Table 7.

Largemouth Bass: Given the historical importance of Largemouth Bass as a quality fishery, more frequent monitoring is necessary to monitor trends in the population to better inform fisheries biologists on the status of the fishery and to disseminate this information to constituents. Biennial electrofishing will be conducted in fall 2018 and fall 2020 for 1 hour at 12, 5-minute randomly selected stations. Target precision will be RSE ≤ 25 for CPUE-Total, Stock CPUE, and CPUE-14. A target sample of ≥ 50 stock-sized fish will be sampled to calculate PSD to evaluate size structure. Lengths and weights will be measured from a target of 5 fish per represented inch group > stock-size to calculate mean relative weights and assess body conditions. During 2020, fin clips will be collected from a random sample of 30 fish to evaluate prevalence of Florida Largemouth Bass and Northern Largemouth Bass alleles. If objectives are not achieved, then up to 1.0 hour of additional electrofishing may be conducted to improve data precision and/or sample size.

Channel Catfish: Exploratory tandem hoop netting will be conducted during summer 2020 for Channel Catfish to assess stocking success. Baited tandem hoop nets will be set over two nights at 6 randomly selected stations for a total of 6 tandem series sets. Series will be set at depths ≤ 12 feet to avoid potentially anoxic conditions. Relative abundance (i.e., CPUE-Total, Stock CPUE, and CPUE-12) will be calculated and length data will be recorded. No target for data precision will be pursued for relative abundance.

White Crappie: White Crappie supported a fishery at the reservoir prior to the recent drought. The lake record White Crappie was caught in 1992, and the fish was 2.6 lbs. and 15.75 inches. Currently, White Crappie are considered to be a low-density species. Adult White Crappie will be management stocked during fall 2017. In fall 2020, exploratory trap netting will be conducted to obtain estimates of baseline relative abundance (CPUE-Total and Stock CPUE), size structure, and body condition. Trap netting will

be conducted at 5 randomly selected stations for a total of 5 net nights. No additional sampling will be conducted to improve data precision for relative abundance, PSD, or body condition.

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Table 1. Characteristics of Clyde Reservoir, Texas.

Characteristic	Description
Year Constructed	1970
Controlling Authority	City of Clyde
County	Callahan
Reservoir Type	Mainstem
River Basin	Colorado
Shoreline Development Index	2.3
Conservation Pool Level (ft. above mean sea level)	1,872
USGS 8-Digit Hydrologic Unit Code for Watershed	12090107 (Pecan Bayou)

Table 2. Boat ramp characteristics for Clyde Reservoir, Texas, April, 2017.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Ramp #1	32.31463° -99.47263°	Y	15	1,858	Accessible
Ramp #2	32.31531° -99.47217°	Y	15	1,863	Accessible

Table 3. Harvest regulations for Clyde Reservoir, Texas.

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

Table 4. Stocking history of Clyde Reservoir, Texas. FGL = Fingerlings; AFGL=Advanced Fingerlings; ADL = Adult; UNK=Unknown.

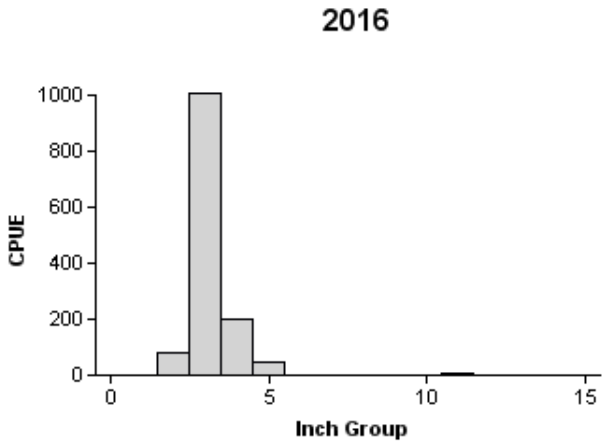
Species	Year	Number	Size
Threadfin Shad	1984	1,000	ADL
	1990	2,343	ADL
	1991	2,812	ADL
	Total	6,155	
Blue Catfish	1980	6,800	UNK
	1997	50,800	FGL
	1998	50,839	FGL
	Total	108,439	
Channel Catfish	1980	12,000	ADL
	1981	28,015	ADL
	1991	12,548	AFGL
	2004	21,957	ADL
	2016	37,174	FGL
	2017	45,417	FGL
	Total	157,111	
Bluegill	2016	15,811	FGL
Largemouth Bass	1976	10,000	UNK
Florida Largemouth Bass	1979	2,500	AFGL
	1988	50,784	FGL
	1997	50,428	FGL
	2004	45,277	FGL
	2005	45,398	FGL
	2016	15,986	FGL
	2017	49,350	FGL
	Total	257,223	
Fathead Minnow	2016	4,167	ADL
Walleye	1979	900,000	FRY

Table 5. Percent occurrence with lower and upper 95% confidence limits (CL) of habitat features at 137 random points in Clyde Reservoir, Texas, August 2016. Water level at the time was at conservation pool elevation.

Structural habitat type	Percent occurrence	Lower CL	Upper CL
Featureless	43.8	35.8	52.2
Vegetation			
Flooded Terrestrial Vegetation	52.6	44.2	60.7
Chara sp.	27.7	20.9	35.8
Buttonbush	15.3	10.2	22.3
Black Willow	5.8	3.0	11.1
Duckweed	4.4	2.0	9.2
Torpedograss*	1.5	0.4	5.2
Salt Cedar*	0.7	0.1	4.0
Structural Habitat Features			
Cobble (2.5-10.0 in.)	13.9	9.1	20.6
Small Boulders (10.0-24.0 in.)	4.4	2.0	9.2
Pebbles (<2.5 in.)	2.9	1.1	7.3
Bedrock	2.9	1.1	7.3
Boat Dock	0.7	0.1	4.0
Large Boulders (> 24.0 in.)	0.7	0.1	4.0
Fence	0.7	0.1	4.0

*Exotic species

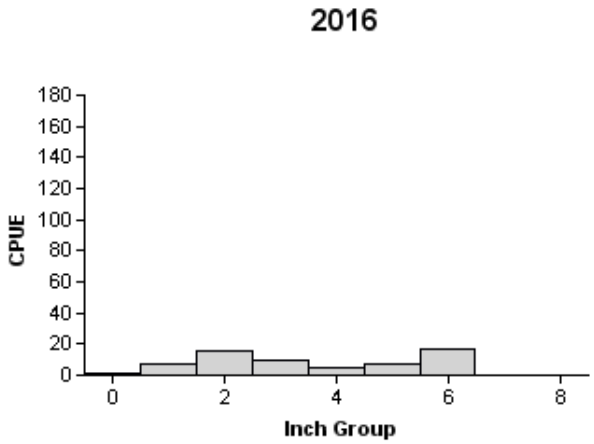
Gizzard Shad



Effort =	1.0
Total CPUE =	1,338.0 (32; 1,338)
IOV =	99 (0)

Figure 1. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for Index of Variability are in parentheses) during the 2016 fall electrofishing survey, Clyde Reservoir, Texas.

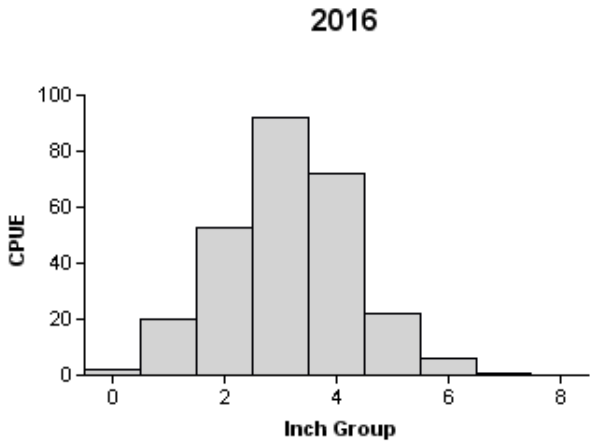
Bluegill



Effort =	1.0
Total CPUE =	63.0 (23; 63)
Stock CPUE =	39.0 (38; 39)
PSD =	44 (7)

Figure 2. Number of Bluegill caught per hour (CPUE, bars and population indices (RSE and N for CPUE and SE for size structure are in parentheses) during the 2016 fall electrofishing survey, Clyde Reservoir, Texas.

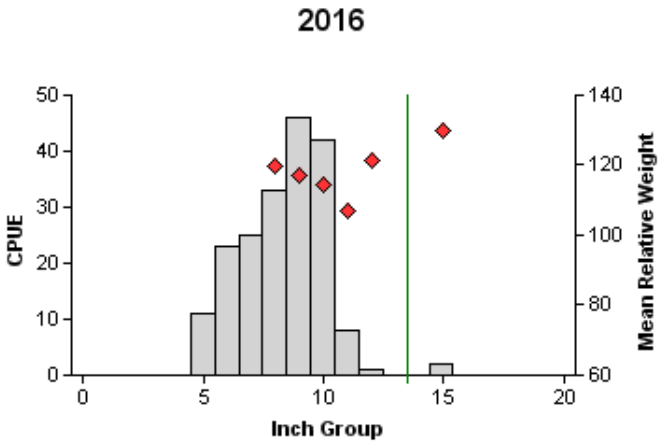
Green Sunfish



Effort =	1.0
Total CPUE =	268.0 (32; 268)
Stock CPUE =	193.0 (37; 193)
PSD =	4 (1)

Figure 3. Number of Green Sunfish caught per hour (CPUE, bars and population indices (RSE and N for CPUE and SE for size structure are in parentheses) during the 2016 fall electrofishing survey, Clyde Reservoir, Texas.

Largemouth Bass



Effort =	1.0
Total CPUE =	191.0 (15; 191)
Stock CPUE =	132.0 (20; 132)
CPUE-14 =	2.0 (67; 2)
PSD =	2 (2)

Figure 4. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weights by inch group (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) during the 2016 fall electrofishing survey, Clyde Reservoir, Texas. The vertical green line indicates the 14-inch minimum length limit.

Table 6. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Clyde Reservoir, Texas, 2016. 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.

		Number of fish					
Year	Sample size	FLMB	F1	Fx	NLMB	% FLMB alleles	% pure FLMB
2016	30	5	0	18	7	42.5	16.7

Table 7. Proposed sampling schedule for Clyde Reservoir, Texas. The survey period is June through May. Gill netting surveys are conducted in the spring, tandem hoop net surveys are conducted in the summer, and electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

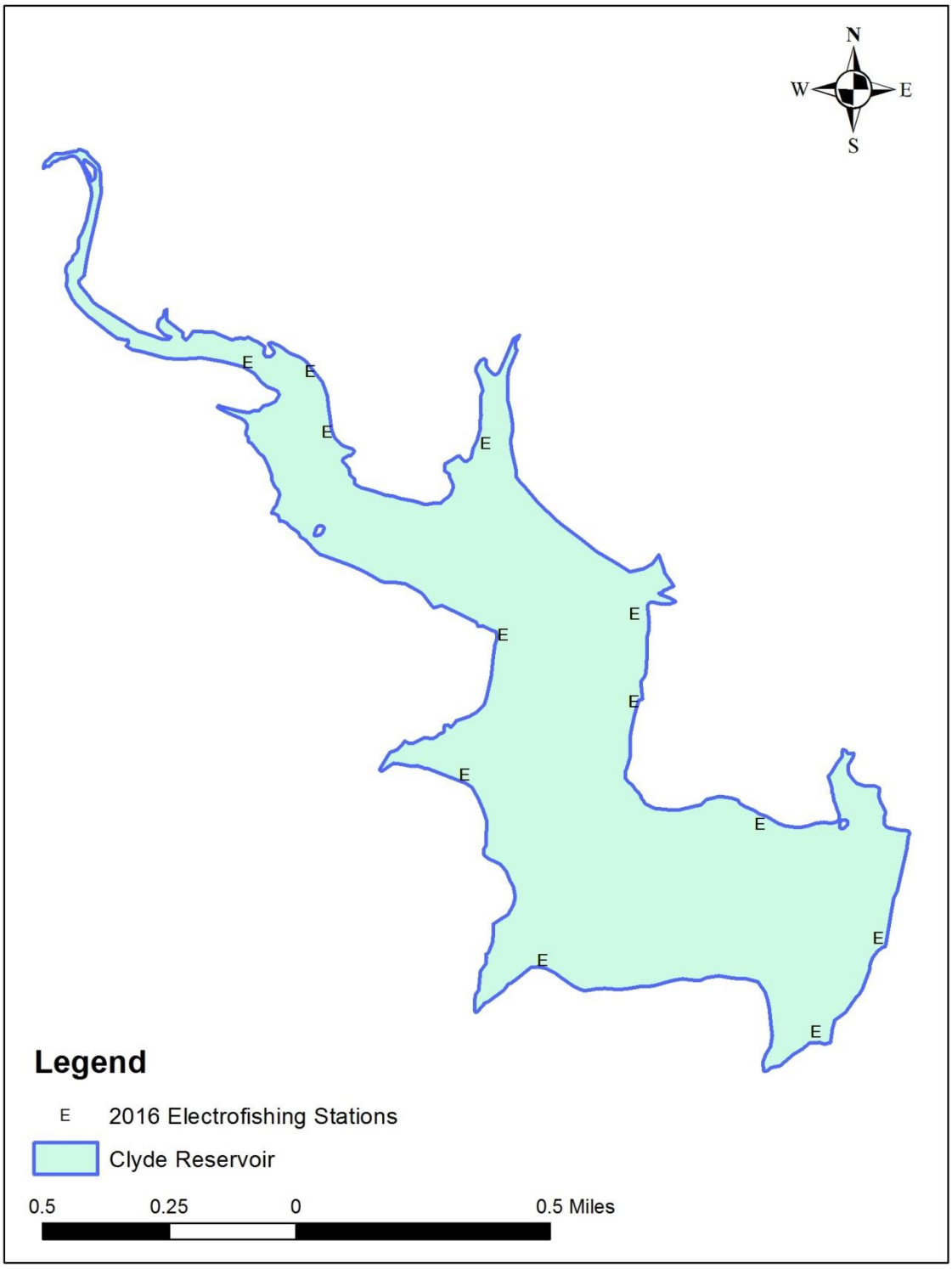
Survey year	Electrofishing	Trap net	Hoop Net	Habitat/ Vegetation	Access	Creel survey	Report
2017-2018							
2018-2019	A	A					
2019-2020							
2020-2021	S	S	A	S	S		S

Appendix A

Number (N), catch rate (CPUE), and associated relative standard error (RSE; in parentheses) for all species collected from fall 2016 exploratory electrofishing.

Species	N	CPUE (RSE)
Gizzard Shad	1,338	1,338.0 (32)
Inland Silversides	1	1.0 (100)
Black Bullhead	5	5.0 (36)
Channel Catfish	1	1.0 (100)
Green Sunfish	268	268.0 (32)
Warmouth	32	32.0 (34)
Orangespotted Sunfish	1	1.0 (100)
Bluegill	63	63.0 (23)
Longear Sunfish	4	4.0 (56)
Redear Sunfish	1	1.0 (100)
Green Sunfish x Redear Sunfish	1	1.0 (100)
Largemouth Bass	191	191.0 (15)
White Crappie	7	7.0 (45)

Appendix B



Map of fall 2016 electrofishing stations at Clyde Reservoir, Texas. Water level at the time of sampling was approximately at conservation pool elevation.