Kemp 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 Kemp Reservoir were surveyed in 2017 using electrofishing and trap netting and in 2018 using gill netting. 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: Kemp Reservoir is a 15,104-acre impoundment located on the Wichita River in the Red River Basin approximately 50 miles west of Wichita Falls. It had a primarily natural and rocky shoreline. The reservoir elevation has fluctuated greatly the last four years from >25 feet below to 2 feet above conservation pool (1,144.0 mean sea level). Kemp water quality is somewhat saline and highly conductive. It has had golden alga blooms since 2002 that have had an adverse effect on the fish populations.

Management History: Historically important sport fish include Striped Bass, White Bass, Largemouth Bass, White Crappie, and catfishes. Golden alga fish kills began in 2002 and have occurred periodically since. In response, Striped Bass were stocked in 2002, 2004, and 2005 with no apparent recruitment to the fishery. Excess fry from state hatcheries were stocked in 2009. All stockings ceased after 2009 because of the severe golden alga fish kills that were occurring. After evidence that golden alga had subsided enough that fish were surviving, Striped Bass were once again stocked in 2015 and 2017. In 2005, Florida Largemouth Bass fingerlings were stocked but not a single Largemouth Bass was sampled in 2009. Channel Catfish were stocked in 2005 and 2009. Blue Catfish were stocked in 2002. Kemp has always been managed with statewide regulations.

Fish Community

- **Prey species:** The Gizzard Shad survey catch rate was slightly improved over the 2013 survey but still well below the historical average. Bluegill and other sunfishes were collected but are present in low abundance.
- **Catfishes:** The 2018 gill net survey found Channel Catfish abundance to be what it was before the golden alga fish kills first occurred in 2002. Standardized sampling had not documented any since 2004, even though they were stocked in 2005 and 2009. Blue Catfish and Flathead Catfish were not sampled in the 2018 gill net survey and have not been documented since the 2004 gill net survey, though there are probably a few individuals present in the reservoir.
- **Temperate basses:** The 2018 gill net survey resulted in the second highest Striped Bass catch rate ever documented at the reservoir. White Bass were not collected during the survey, last being documented in the 2006 gill net survey.
- **Black Basses:** Historically, Spotted Bass were the most abundant black bass species, but their presence has not been documented since golden alga blooms began in 2002. Largemouth Bass abundance was at pre-2002 numbers. Most of the sampled bass were pure northern strain Largemouth Bass which were last stocked in 1971.
- **White Crappie:** The 2017 trap net survey resulted in a catch rate that rivalled pre-2002 fish kill abundance.

Management Strategies: Conduct general monitoring with trap nets and gill nets in 2021-2022. Stock Striped Bass at a reduced rate every other year (≤5/acre). Monitor Largemouth Bass through informal angler provided information and by angling (as other District duties allow) since the water is highly conductive and thus difficult to collect a representative sample through electrofishing.

Introduction

This document is a summary of fisheries data collected from Kemp 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 species of 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

Kemp Reservoir is a 15,104-acre impoundment constructed in 1923 on the Wichita River. It is located in Baylor County approximately 50 miles west of Wichita Falls and is entirely within the Waggoner Ranch. Lake Kemp is operated and controlled by the City of Wichita Falls and Wichita County Water Improvement District No. 2. Primary uses include irrigation, flood control, municipal water supply, and recreation. Kemp has a watershed area of 2,086 mi^2. Sedimentation is a problem with 23.2% of the storage capacity and 1,183 acres of surface area being lost from 1971 to 2006 (Austin et al. 2006). In addition, when the reservoir is three feet below conservation pool, 2,451 surface acres are separated from the rest of the reservoir (Austin et al. 2006). Mean reservoir depth when at full pool is 16 feet and shoreline development index is 7.3. Conductivity in August 2017 was 4,266 µS/cm. Habitat at time of sampling consisted of natural shoreline and rocks. Water level has fluctuated >25 feet below conservation pool to above conservation pool since 2014 (Figure 1). Golden alga (*Prymnesium parvum*) caused fish kills have occurred almost annually since 2002, severely impacting the sport fishery. Recently, however, the severity of the kills has lessened and some species have been able to recover. A small golden alga fish kill occurred in late 2017 but lasted only a couple of days. Other descriptive characteristics for Kemp Reservoir are in Table 1.

Angler Access

Kemp Reservoir has seven public boat ramps, of which five offer access to the reservoir. One is located in a cove that has silted in to a point where boats cannot access the main lake from the ramp, and one ramp has been undercut by water and the concrete collapsed. Additional boat ramp characteristics are in Table 2. The Waggoner Ranch solely controls all access to the lake and charges a $15/per person entry fee. Adequate shoreline access is available at the public boat ramp areas and numerous other shoreline access points.

Management History

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

1. Golden alga blooms and resulting fish kill events have been routine since 2002 greatly affecting multiple sport fish species, therefore stockings would only occur if surplus fish were made available and there are indications for the potential of survival.

   Action: A small (1.4 fish/acre) Striped Bass stocking occurred in 2015 when surplus fish were available. The stocked fish survived and were being caught, so a Striped Bass stocking was requested and occurred in 2017.

2. The potential spread of zebra mussels and other invasive species exists. Informing the public and reservoir authorities of what to do to prevent the spread and what to do if they suddenly appear in the reservoir are prudent actions.

   Action: Spoke and gave material about invasive species to the gate keepers; requesting that they post invasive species information at their booths since all visitors must go through these points to access the reservoir. Partnered with City of Wichita Falls to hold a joint media announcement about zebra mussels being very near and what the public can do to help protect our local municipal water supply reservoirs.

Harvest regulation history: Sport fish species in Kemp Reservoir have always been managed using statewide regulations (Table 3).

Stocking history: Kemp has been stocked with Blue Catfish, Channel Catfish, Striped Bass, and Florida Largemouth Bass in attempts to rebuild population abundances since the 2002 golden alga fish kills. The complete stocking history is in Table 4.

Vegetation/habitat management history: Kemp Reservoir has no significant vegetation/habitat management history.

Water transfer: Kemp Reservoir, in the Red River basin, is used primarily for irrigation by the Wichita County Water Improvement District No. 2. However, beginning in 2009 the City of Wichita Falls began receiving 10% of their municipal water supply from Kemp. To use the naturally salty water, a large reverse osmosis water treatment plant was built. The briny, reject water from this plant is then pumped via pipeline directly into the Wichita River. Kemp water is also used for cooling water at a coal-fired power plant located near Oklaunion, Texas and operated by West Texas Utilities. The sale of this water provides an additional revenue source for the City of Wichita Falls.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Kemp 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) except the number of sampling sites were reduced from the recommended number for a reservoir of this size.

Electrofishing – Largemouth Bass, sunfishes, and Gizzard Shad were collected by 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.

Trap netting – Crappie were collected using trap nets (7 net nights at 7 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting – Channel Catfish and Striped Bass were collected by gill netting (7 net nights at 7 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Genetics – Genetic analysis of Largemouth Bass was conducted 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 since 2005 and by electrophoresis for previous years.

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (Wr)] 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 structural habitat survey was conducted in 2017. Vegetation surveys were conducted every four years beginning in 2001 to monitor presence/absence of aquatic vegetation. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Water level – Source for water level data was the United States Geological Survey (USGS 2018).

Results and Discussion

Habitat: A structural habitat survey and a vegetation survey were conducted in 2017 indicating that the littoral zone habitat consisted primarily of natural shoreline with some rocky shoreline (Table 6) and insignificant aquatic vegetation was present (Table 7). Flooded terrestrial plants made up a significant part of the available habitat accounting for over 1,000 acres (6.7%) of the reservoir acreage being categorized as such.

Prey species: Electrofishing catch rates of Gizzard Shad and Bluegill were 42.0/h and 4.0/h, respectively. Index of Vulnerability for Gizzard Shad was 90, indicating that most Gizzard Shad were available to existing predators. Total CPUE of Gizzard Shad was slightly higher than the previous 2013 survey (31.0/h) but significantly less than the 2009 survey which was the historical record high catch rate (674.0/h; Figure 2). Total CPUE of Bluegill has always been extremely low (0.0-29.0/h), 2017 was the second highest electrofishing catch rate sampled at this reservoir, but was still considered low at 4.0/h (Figure 3). High conductivity makes electrofishing extremely difficult at the reservoir and doesn't necessarily give a good indication of the true fish abundance.

Blue Catfish: No Blue Catfish were sampled in 2018, nor have they been since 2004.

Channel Catfish: The 2018 gill netting survey had a catch rate of 1.1/nn (Figure 4) which is the second highest catch rate for the reservoir and almost triple the historical average. Channel Catfish had not been sampled with gill nets since 2004. Body condition was good being near 100 as indexed by Wr.

Temperate Basses: No White Bass were sampled in 2018, nor have they been since 2006.The 2018 gill net survey resulted in the highest Striped Bass catch rate since 2002 when the first golden alga caused fish kill occurred. Stocking of this species stopped after 2005 because of annual golden alga fish kills. Surplus fry were stocked in 2009 but no survival was documented. A stocking of surplus fingerlings occurred in 2015 and survival was good, with many anglers reporting catching them and being documented in our gill net survey. Since there was recruitment to legal-length and anglers were utilizing them, stocking resumed in 2017 with a reduced number (5 per acre) being requested.

Largemouth Bass: The electrofishing CPUE of Largemouth Bass was 15.0/h in 2017 (Figure 6), an improvement over 2013, when only one bass was sampled. Body condition as measured by Wr was good with values close to 95 for all inch groups. Genetic analysis determined that 11 of the 15 bass captured were pure northern strain Largemouth Bass (Table 8). The other four bass were intergrades. Past genetic sampling has documented Florida strain Largemouth Bass influence in the reservoir. This indicates one of two things have likely occurred in the reservoir. Northern Largemouth Bass have been illegally introduced into the reservoir by unknown entities or they entered the reservoir in large enough numbers from upstream impoundments and had successfully spawned with outstanding recruitment during the 2015 flood. While a catch rate of 15.0/h is considered very low, it must be remembered that conductivity is quite high and influences the electrofishing survey results. Anglers report catching high numbers of quality bass with little effort. Indicating a robust, healthy population exists in the reservoir.

White Crappie: A 2017 trap netting survey resulted in a catch rate of 4.6/nn (Figure 7), comparable to pre-2002 surveys. White Crappie have always been found in the reservoir, but not in this abundance and not throughout the reservoir. During the golden alga kills, they were only found near the river. Body condition as measured by Wr was considered good with values close to 100.

Fisheries Management Plan for Kemp Reservoir, Texas

Prepared – July 2018

ISSUE 1: The Waggoner Ranch has been acquired by new ownership. District Reservoirs Diversion and Kemp are both located within the Waggoner Ranch. In 2017, public access to Diversion Reservoir was terminated by the new ranch ownership leading to concerns about future Kemp access. Lake Kemp access is still available for payment of an access fee.

MANAGEMENT STRATEGY

1. Monitor any changes in access policy for Lake Kemp by the Waggoner Ranch.

ISSUE 2: Since January 2002, golden alga fish kill events have severely impacted the reservoir. These events have acted to greatly displace fish and cause population losses. Since 2015, some sport fish species have rebounded from the algal caused fish kills while other populations have not rebounded at all.

MANAGEMENT STRATEGIES

1. Because of the threat of golden alga fish kills and that some species populations have rebounded, only stocking of Striped Bass should be considered at this time. Striped Bass will be requested at a reduced rate every other year. Stocking rate of requests will account for golden alga, access, and effective surface acreage issues.
2. Monitor the reservoir for golden alga fish kills and gather angling information from local anglers. In the past, this technique has provided adequate information for monitoring the reservoir and its fish populations.

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 authorities to post 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.
4. 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

From 2002 (when the first golden alga caused fish kill occurred) through 2015, there has not been a species that could be called important. Since the reservoir elevation attained full pool in 2015 following the drought of record, many species have recovered but because of the entrance fees that are charged to access the reservoir, angling effort is low. Striped Bass and Largemouth Bass are the only species that could be considered important at the time of this report.

Low-density fisheries

After the 2002 golden alga caused fish kill and subsequent kills, all fish populations were considered low density. This has changed recently for Channel Catfish and White Crappie populations. They are no longer considered low density but there is little fishing pressure for these species, in part because of the entrance fees charged to access the reservoir

Survey objectives, fisheries metrics, and sampling objectives

A golden alga fish kill event of short duration occurred during the winter of 2017 indicating that fish kill events are still likely at this reservoir, despite the rebound of fish populations since 2015. With little fishing pressure, this reservoir does not need additional survey work. Historically, electrofishing catch rates of Largemouth Bass, Bluegill, and Gizzard Shad have not been representative because of the reservoir's high conductivity leading to sampling inefficiency. Anecdotal information and rod and reel angling may provide as good an indication of the population. Therefore, we recommend using angler information and angling to monitor the status of the Largemouth Bass population.

The siltation at this reservoir has been such that at least 1/3 of the total acreage is regularly dry or inaccessible. Further, in 2006 it was estimated that when the reservoir is three feet below conservation pool, surface-acreage would be 10,710 (Austin et al. 2006). Therefore, while it is listed as 15,104 acres, it deserves sampling effort as if it is between 5,000 to 10,000 acres in size. Gill netting for Striped Bass will occur in 2022 using 7 random sites monitoring for presence/absence since golden alga can always decimate this population. The proposed sampling schedule is available in Table 9.

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.

Austin, B., J. Furnans, D. Thomas, R. Burns, T. Connell, and H. Weyant. 2006. Volumetric survey of Lake Kemp. Texas Water Development Board, Austin.

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.

Lang, T., and R. Mauk. 2014. Statewide freshwater fisheries monitoring and management program survey report for Kemp Reservoir, 2015. Texas Parks and Wildlife Department, Federal Aid Report F-221-M-4, Austin.

United States Geological Society (USGS). 2018. National water information system: Web interface. Available: http://waterdata.usgs.gov/tx/nwis (July 2018).

Tables and Figures

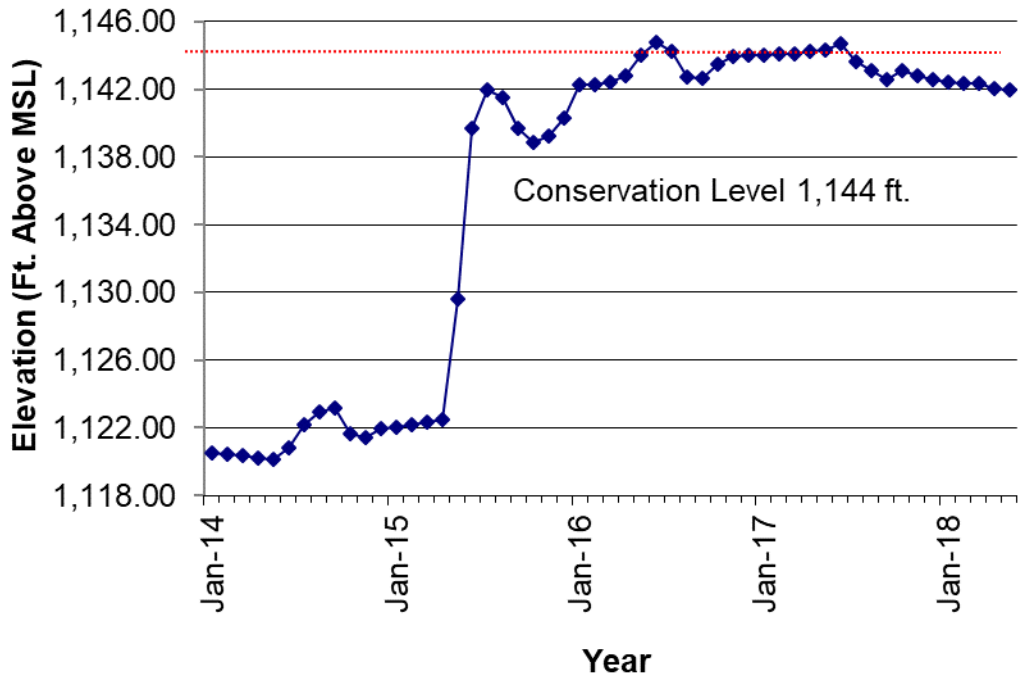

Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Kemp Reservoir, Texas.

Table 1. Characteristics of Kemp Reservoir, Texas.

Characteristic	Description
Year constructed	1923
Controlling authority	City of Wichita Falls and Wichita County WID No. 2
County	Baylor
Reservoir type	Mainstem
Shoreline Development Index	7.3
Conductivity	4,266 µS/cm

Table 2. Boat ramp characteristics for Kemp Reservoir, Texas, August, 2017. Reservoir elevation at time of survey was 1,142.7 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Moonshine Bay	33.74800 -99.15552	Y	30	1,121	Good
Wilbarger Bass Club	33.76905 -99.15483	Y	25	1,133	Good
McKinney Point	33.78635 -99.15715	Y	5	1,139	Good
Herring Point	33.77708 -99.16928	Y	5	1,134	Good
Alman Point	33.77030 -99.18453	Y	5	1,136	Unusable, concrete has fallen apart
Bates Bay	33.73270 -99.23047	Y	25	NA	No access to reservoir, bay too silted in
Weddle Point	33.74807 -99.20830	Y	10	1,136	Not in very good shape

Table 3. Harvest regulations for Kemp 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, White	25	10-inch minimum
Bass, Striped	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 Kemp Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults; FRY = fry; UNK = unknown.

Year	Number	Size
	Threadfin Shad	
1999	725	ADL
	Blue Catfish	
1989	165,496	FGL
1990	168,011	FGL
1991	143,977	FGL
2002	112,857	FGL
Species Total	590,341	
	Channel Catfish	
1967	17,500	AFGL
1969	6,000	AFGL
1970	12,000	AFGL
1971	300	UNK
1972	210,000	AFGL
2005	297,239	FGL
2009	97,512	FGL
Species Total	640,551	
	Striped Bass	
1979	81,961	UNK
1981	211,961	UNK
1983	164,859	UNK
1987	28,000	FGL
1988	167,386	FRY
1989	130,355	FGL
1992	20,800	FGL
1993	126,674	FGL
1994	83,543	FGL
1994	4,000,000	FRY
1995	82,796	FGL
1995	3,000,000	FRY
1997	33,323	FGL
1998	728	AFGL
1998	82,700	FGL
1999	98,087	FGL
2004	37,796	FGL
2005	149,771	FGL
2009	186,119	FRY
2015	21,818	FGL
2017	89,900	FGL
Species Total	8,974,086	

Year	Number	Size
	Largemouth Bass	
1967	7,500	UNK
1970	100,000	UNK
1971	35,000	UNK
Species Total	427,000	
	Florida Largemouth Bass	
1977	174,200	FRY
1990	415,356	FRY
1999	414,186	FGL
2005	194,404	FGL
Species Total	1,198,146	
	Red Drum	
1954	58	UNK
1955	16	UNK
1956	1,304	UNK
1957	4	UNK
1981	204,837	UNK
Species Total	206,219	

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

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Exploratory	Presence/absence	Practical effort
Bluegill	Exploratory	Presence/absence	Practical effort
Gizzard Shad	Exploratory	Presence/absence	Practical effort
Trap netting			
Crappie	Exploratory	Presence/absence	Practical effort
Gill netting			
Blue Catfish	Exploratory	Presence/absence	Practical effort
Channel Catfish	Exploratory	Presence/absence	Practical effort
White Bass	Exploratory	Presence/absence	Practical effort
Striped Bass	Exploratory	Presence/absence	Practical effort

Table 6. Survey of structural habitat types, Kemp Reservoir, Texas, 2017. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Natural	130.3 miles	82.2
Rocky	28.3 miles	17.8
Flooded terrestrial	1,005.6 acres	6.7

Table 7. Survey of aquatic vegetation, Kemp Reservoir, Texas, 2001, 2005, 2009, 2013, and 2017. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2001	2005	2009	2013	2017
Native submersed		505.0 (3.6)	52.3 (<0.1)		1.0 (<0.1)
Native floating-leaved					
Native emergent		0.1 (<0.1)			

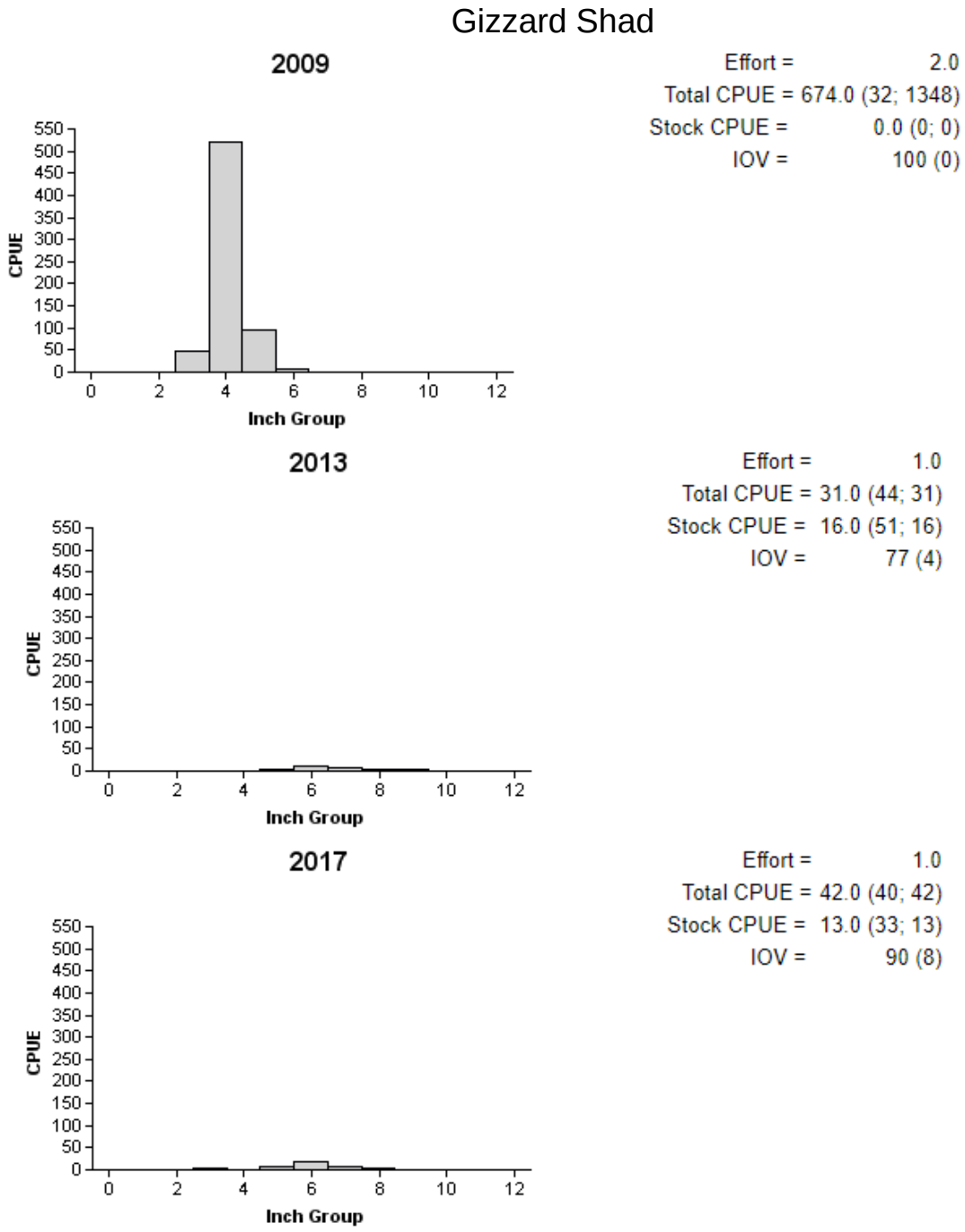

Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Kemp Reservoir, Texas, 2009, 2013, and 2017.

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Bluegill

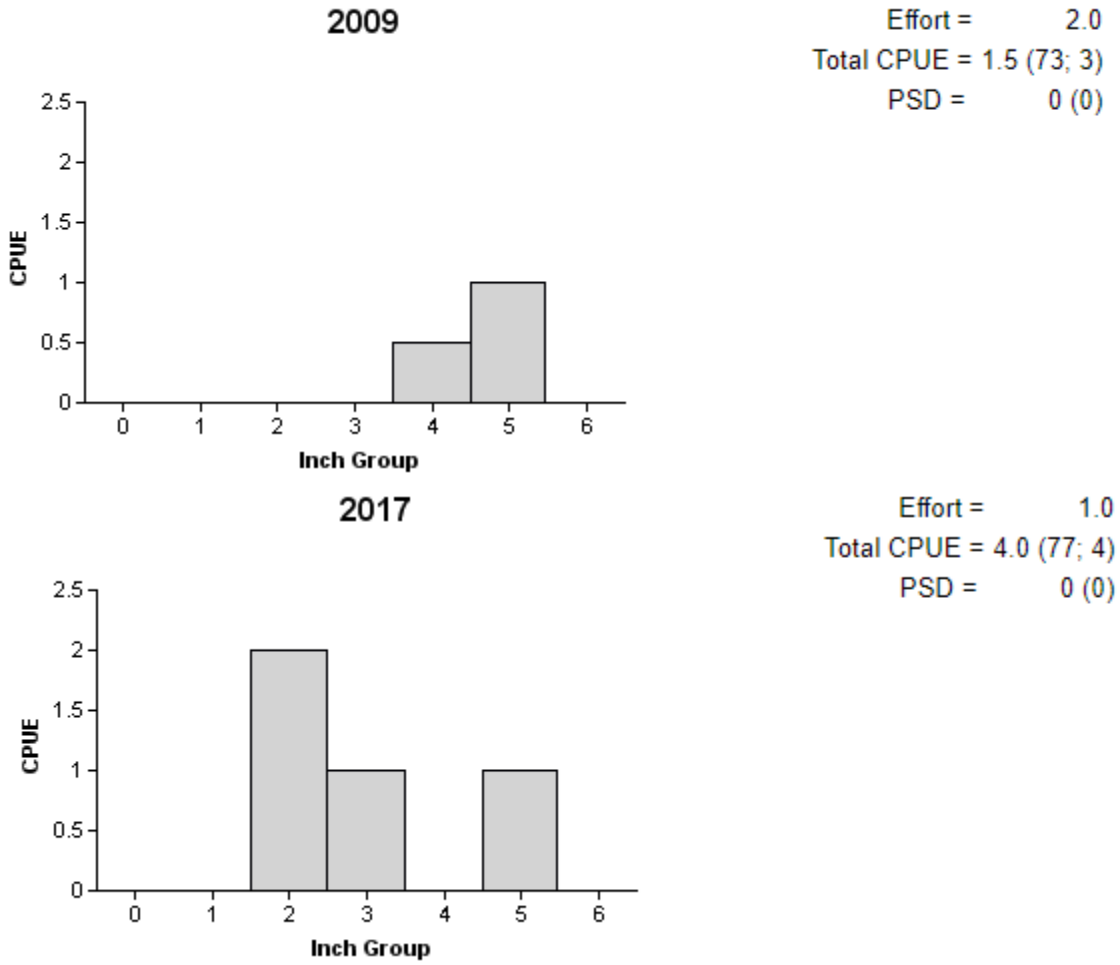


Figure 3. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Kemp Reservoir, Texas, 2009, 2013 and 2017. No Bluegill were captured in 2013.

Channel Catfish

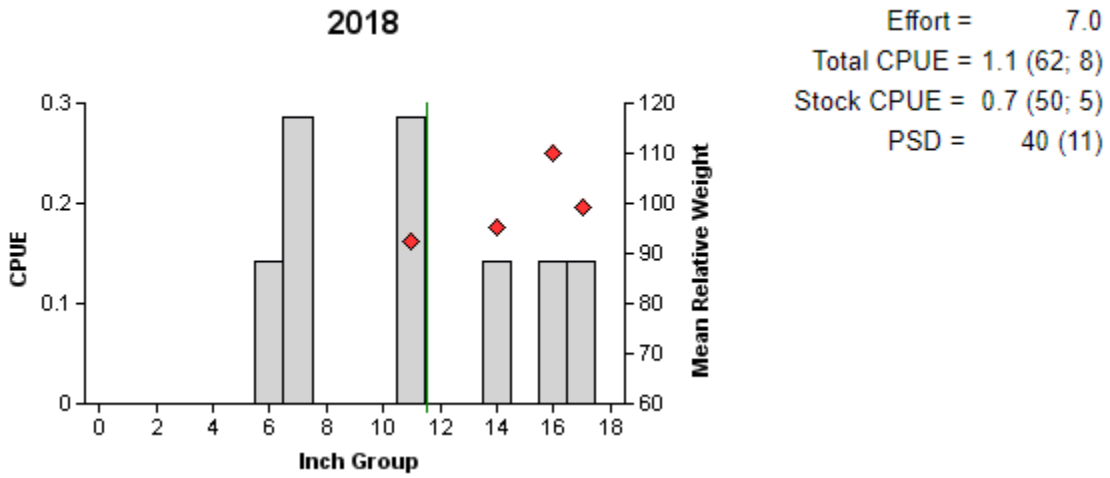


Figure 4. Number of Channel Catfish caught per hour (CPUE, bars) mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for winter gill net survey, Kemp Reservoir, Texas, 2018. No Channel Catfish were caught in 2006, 2009, or 2010 surveys. Vertical line indicates minimum length limit at time of sampling.

Striped Bass

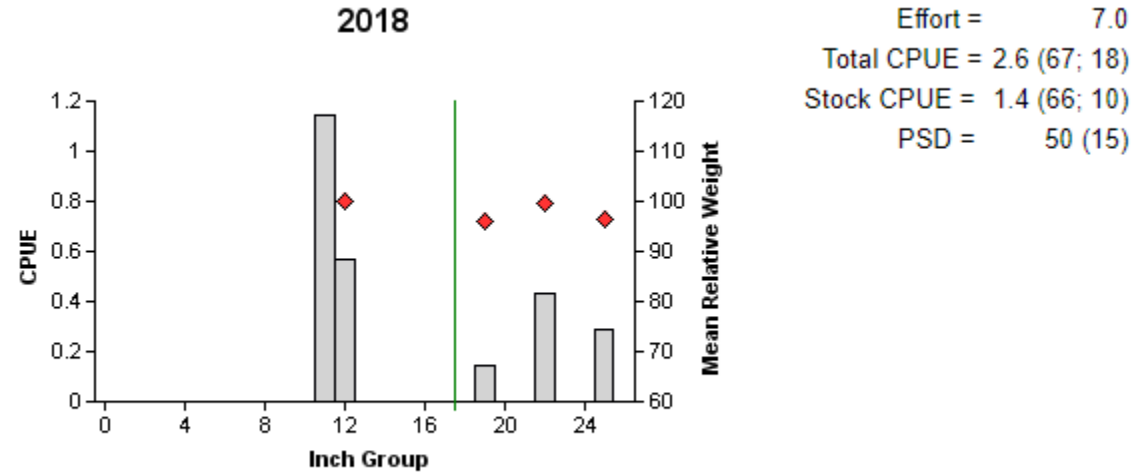


Figure 5. Number of Striped Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for winter gill net survey, Kemp Reservoir, Texas, 2018. Prior to this sample, no Striped Bass had been collected since 2006. Vertical line indicates minimum length limit at time of sampling.

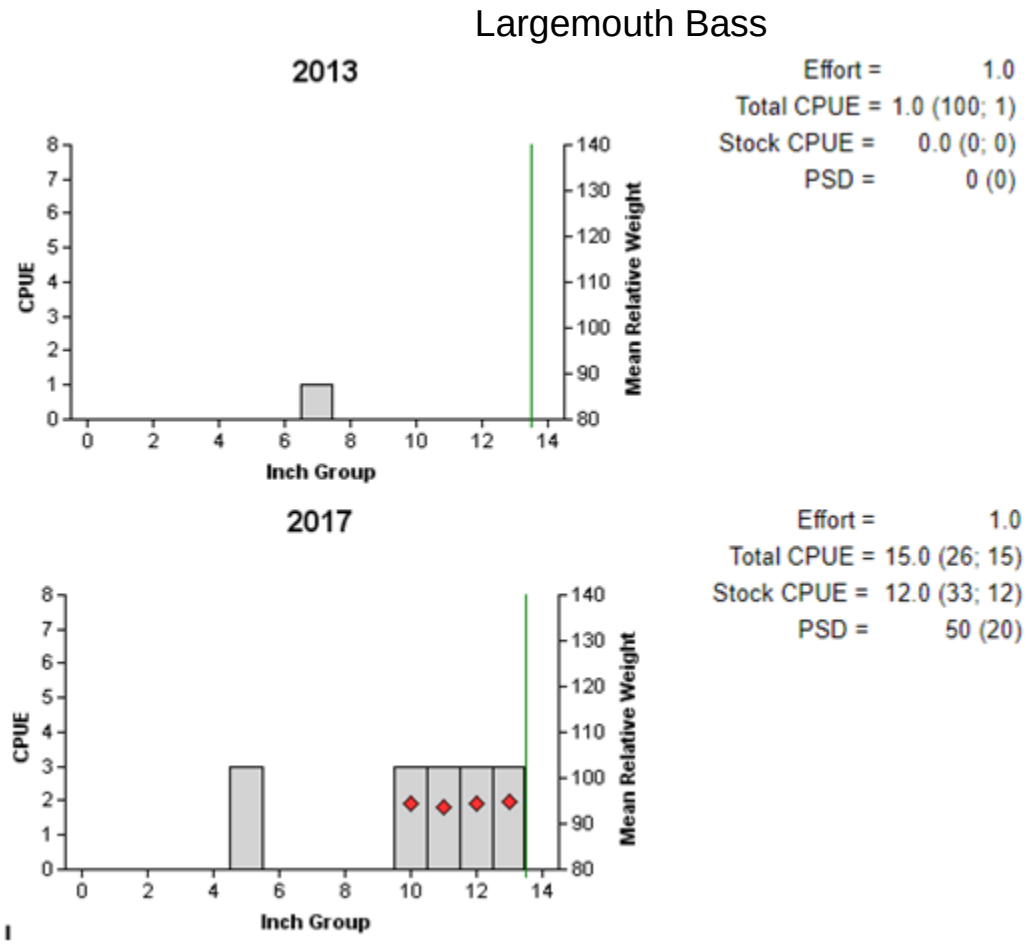


Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Kemp Reservoir, Texas, 2009, 2013 and 2017. No Largemouth Bass were collected in 2009. Vertical line indicates minimum length limit at time of sampling.

Table 8. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Kemp Reservoir, Texas, 1998, 2001, 2005, and 2017. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
1998	21	0	5	16	14.3	0.0
2001	23	0	11	12	18.5	0.0
2005	41	31	9	1	87.7	76.0
2017	15	0	4	11	4.0	0.0

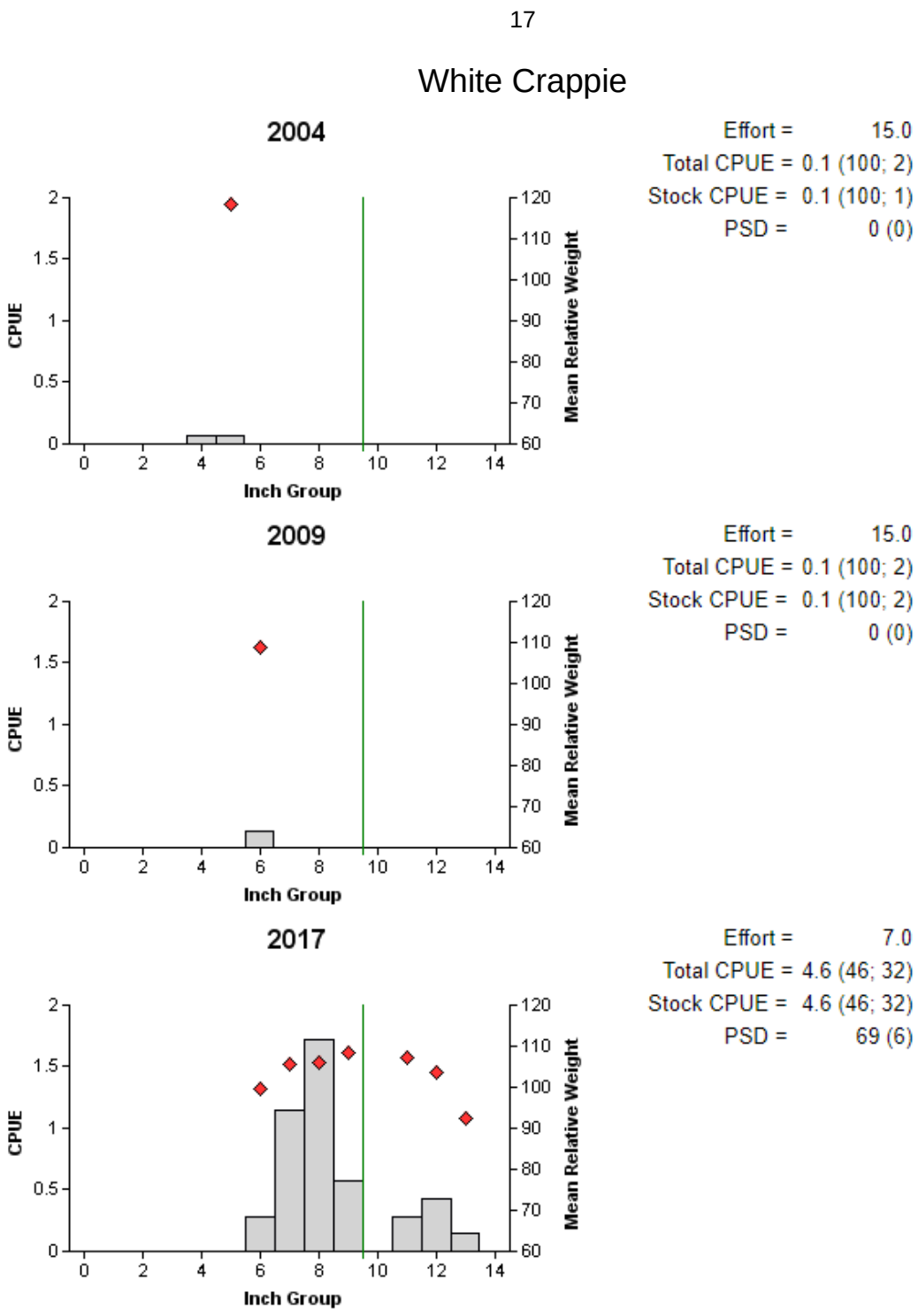


Figure 5. Number of White Crappie caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Kemp Reservoir, Texas, 2004, 2009 and 2017. Vertical line indicates minimum length limit at time of sampling.

Proposed Sampling Schedule

Table 9. Proposed sampling schedule for Kemp 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.

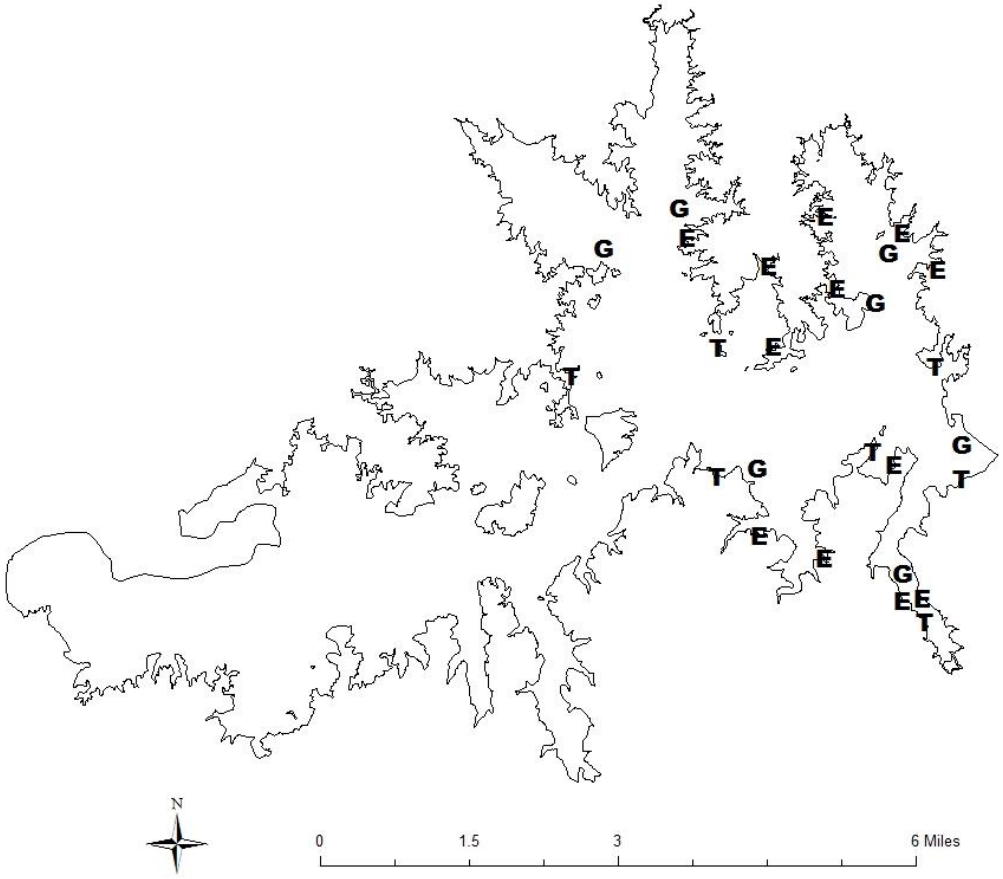
	Survey year			
	2018-2019	2019-2020	2020-2021	2021-2022
Angler Access				S
Structural Habitat				S
Vegetation				S
Gill netting				S
Report				S

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

Number (N) and catch rate (CPUE) (RSE in parentheses) of all species collected from all gear types from Kemp Reservoir, Texas, 2017-2018. Sampling effort was 7 net nights for gill netting, 7 net nights for trap netting, and 1 hour for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					42	42.0 (40)
Channel Catfish	8	1.1 (62)	31	4.4 (76)		
Striped Bass	18	2.6 (67)				
Green Sunfish			5	0.7 (50)	5	5.0 (46)
Bluegill			26	3.7 (33)	4	4.0 (77)
Longear Sunfish			3	0.4 (69)	1	1.0 (100)
Largemouth Bass	5	0.7 (100)	2	0.3 (65)	15	15.0 (26)
White Crappie	4	0.6 (75)	32	4.6 (46)		

APPENDIX B – Map of sampling locations



Location of electrofishing (E), trap netting (T), and gill netting (G) sites, in Kemp Reservoir, Texas, 2017 and 2018.

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