PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-221-M-2

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2016 Fisheries Management Survey Report

Mackenzie Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Mackenzie Reservoir were surveyed in 2016 using electrofishing and in 2017 using gill nets. Historical data are presented with the 2016-2017 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:** Mackenzie Reservoir was constructed in 1974 on Tule Creek, a tributary of the Prairie Dog Town Fork of the Red River. It is located 12 miles northwest of Silverton in Briscoe County, Texas. The reservoir is owned by the Mackenzie Municipal Water Authority and is used for water supply and recreational purposes. Mackenzie Reservoir is characterized as being a deep, clear, eutrophic reservoir that experiences strong thermal stratification during summer months. At conservation pool (3,100 feet above mean sea level; FMSL) the reservoir is a 900-acre impoundment. At the time of sampling, the reservoir had a mean elevation of 3027 FMSL and a surface area of approximately 295 acres. Habitat consisted primarily of natural featureless shoreline and rock bluff.

- **Management History:** Important sport fish include Largemouth Bass, Palmetto Bass, White Bass, White Crappie, and catfish. All species have been managed with statewide harvest regulations.

- **Fish Community**
  - **Prey species:** Gizzard Shad and Bluegill were present in the reservoir. Electrofishing catch rates for Gizzard Shad have increased greatly since 2012; however only 27% of the sampled Gizzard Shad were small enough to be available as prey to sport fish. The majority of Bluegill sampled were five inches in length or smaller and available to most predators.

  - **Catfishes:** While Blue Catfish are present in the reservoir, Channel Catfish remain the dominate catfish species. The majority of Channel Catfish collected during the gill net sample were between 12 and 20 inches.

  - **Temperate basses:** While White Bass are present in the reservoir, past creel surveys indicated that they received no angling effort. Gill net catch rates for Palmetto Bass have fluctuated over the past four years.

  - **Largemouth Bass:** Largemouth Bass abundance has declined since 2014, and the majority of fish sampled were below the legal length limit (14 inches).

  - **White Crappie:** White Crappie were present in the reservoir. A total of 58 Crappie were observed during the fall electrofishing and spring gill netting surveys.

- **Management Strategies:** Continue stocking Palmetto Bass at 5 fish/acre annually, as long as the reservoir remains above 200 surface acres. Continue management under current harvest regulations. The proposed sampling schedule includes baited hoop netting and electrofishing in 2018 and 2020 and gill netting in 2021. Access, habitat, and creel surveys will be conducted in 2020.

INTRODUCTION

This document is a summary of fisheries data collected from Mackenzie Reservoir in 2016-2017. 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 2016-2017 data for comparison.

Reservoir Description

Mackenzie Reservoir is a 900-acre impoundment constructed in 1974 on Tule Creek, a tributary of the Prairie Dog Town Fork of the Red River. It is located 12 miles northwest of Silverton in Briscoe County, Texas. The reservoir is owned by the Mackenzie Municipal Water Authority and is used for water supply and recreational purposes. The reservoir has a history of water level fluctuations and has never caught sufficient runoff to fill to capacity (Figure 1). Mackenzie Reservoir is characterized as a eutrophic reservoir with a mean Trophic State Index chl-a of 53.2 (Texas Commission on Environmental Quality 2011). The reservoir has also been known to experience strong thermal stratification during summer months. At the time of sampling, the habitat consisted primarily of natural featureless shoreline and rock bluff. Other descriptive characteristics for Mackenzie Reservoir are in Table 1.

Angler Access

Mackenzie Reservoir has two public boat ramps and one private boat ramp. At the time of sampling, reservoir levels only allowed for the use of the Mackenzie boat ramp located on the southeast side of the dam. Extension of the Marina boat ramp is not feasible due to reduced slope. Additional boat ramp characteristics are in Table 2. There is one courtesy fishing dock located near the Marina boat ramp. Shoreline access is limited to a beach area on the west end of the reservoir and to areas around the boat ramps. There are no handicapped specific facilities.

Management History

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

1. In an effort to maintain a Palmetto Bass fishery, it is recommended that stocking every year at 5-10 fish/acre, based upon actual surface area of the reservoir, be continued.
   Action: Palmetto Bass were stocked in 2013 and 2015. Production issues have resulted in a biennial stocking schedule rather than an annual stocking schedule.
2. In an effort to mitigate the effects of persistent drought conditions, it is recommended to conduct sonar mapping of the reservoir basin and investigate feasibility of habitat restoration project such as brush piles or PVC trees.
   Action: Partial sonar mapping was completed before the watershed experienced two large rain events resulting in an approximately 20 foot reservoir level rise and 80 acres of flooded timber and terrestrial vegetation. Areas have been identified that might benefit from artificial habitat, and meetings have been established with the controlling authority to discuss implementing a habitat restoration project.
3. To monitor the effects of persistent drought conditions on the fish populations conduct an additional electrofishing, trap net, and gill net surveys during the 2014-2015 sampling season.
   Action: Electrofishing and trap net surveys were conducted in 2014, and a gill net survey was conducted in 2015.

4. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir; contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers; educate the public about invasive species through the use of media and the internet; and make a

speaking point about invasive species when presenting to constituents and user groups.

Action: Presentations have been given to the Regional water planning group and various area civic groups and school groups. Interviews and news releases concerning invasive species have been done for area newspapers. Stories and posts have been added to the district Facebook page. Invasive Species literature has been sent to the controlling authority and placement of signage has been advised.

Harvest regulation history: Sport fishes in Mackenzie Reservoir have always been managed with statewide regulations (Table 3).

Stocking history: Mackenzie Reservoir was last stocked in 2013 and 2015 with Palmetto Bass. The complete stocking history is in Table 4.

Vegetation/habitat management history: There is no vegetation or habitat management history for this reservoir.

Water transfer: Mackenzie Reservoir is primarily used for municipal water supply and recreation. One permanent pumping station on the reservoir transfers water to the Mackenzie Municipal Water Authorities water treatment plant for municipal water supply. No interbasin 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 Mackenzie 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 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.

Gill netting – Channel Catfish, White Bass, and Palmetto Bass were collected by gill netting (8 net nights at 8 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Palmetto Bass PSD was calculated according to Dumont and Neely (2011). 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 and vegetation survey was conducted in 2016. 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 2017).

RESULTS AND DISCUSSION

Habitat: Littoral zone structural habitat consisted primarily of natural featureless shoreline (56%) and rock bluff (42%). Remaining shoreline consisted of rip rap (2%) (Table 6). There were approximately 113 acres of flooded terrestrial vegetation (97.4 acres) and standing timber (15.3 acres), but no aquatic vegetation was present in the reservoir.

Prey species: Electrofishing catch rates of Gizzard Shad and Bluegill were 421.0/h and 46.0/h, respectively. Index of vulnerability (IOV) for Gizzard Shad was poor, indicating only 27% of Gizzard Shad were available to existing predators; this was similar to IOV estimates from 2012 (IOV=14) and 2014 (IOV=29) (Figure 2). Total CPUE of Gizzard Shad was much higher in 2016 compared to the 2012 and 2014 surveys (Figure 2). While total CPUE of Bluegill in 2016 (46.0/h) was lower than 2014 (132.0/h), it was similar to 2012 (44.0/h) (Figure 3). Historically CPUE for Bluegill appears to fluctuate from year-to-year. Size structure of Bluegill is dominated by small individuals. OBS objectives were met for CPUE and IOV for Gizzard Shad, but the RSE≤25 was not met for CPUE. For Bluegill, RSE objectives were met, but the sample was 4 fish short of the CPUE objective.

Channel Catfish: Channel Catfish CPUE was 3.8/nn in 2017, a slight increase over the 2015 survey (2.4/nn) and slightly lower than 2013 (5.8/nn) (Figure 4). Larger Channel Catfish had a mean W_r near or greater than 100; however, smaller fish had a mean W_r near or below 90. Reproduction was indicated by the catch of smaller fish. Due to the high amount of effort required (approximately 30 random gill net stations) to meet OBS objectives for relative abundance (CPUE-S; RSE≤25 with 80% confidence) and size structure estimation (PSD; 50 fish minimum with 80% confidence), objectives were not met.

Palmetto Bass: Palmetto Bass CPUE was 0.5/nn in 2017, a decline from 1.8/nn in 2015 and similar to 0.4/nn in 2013 (Figure 5). Only four fish were sampled during the 2017 gill net survey. Low relative abundance is most likely attributed to the biennial stockings rather than annual stockings as mentioned above. Due to actual CPUE-S (0.5/nn) being much lower than the historical average CPUE-S (3.8/nn), it

was determined that the amount of effort required to achieve OBS objectives would have been in excess of 70 random stations. As a result, the OBS objectives for Palmetto Bass were not met.

Largemouth Bass: The electrofishing catch rate of Largemouth Bass was 56.0/h in 2016, similar to 2012 at 47.0/h, but much lower than 175.0/h in 2014 (Figure 6). Although the total CPUE declined from 2014 to 2016 the stock CPUE increased from 31.0/h to 50.0/h (Figure 6). Size structure of the population appears to be dominated by smaller individuals, and body condition was fair with most W_r's near 90. All OBS objectives were met for Largemouth Bass.

White Crappie: No legal size crappie were sampled during the last trap net survey (2012). Due to trap net catch rates of White Crappie being highly variable, trend data has only been able to determine presence/absence of the species. White Crappie observed during the electrofishing survey were documented and measured to the nearest inch class; eleven crappie between 5 and 10 inches were recorded. A total of 47 White Crappie were also observed during the spring gill net survey.

Fisheries management plan for Mackenzie Reservoir, Texas

Prepared – July 2017

ISSUE 1: Gill net catch rates for Palmetto Bass decreased substantially since 2009. Stocking of Palmetto Bass is required to sustain the population and maintain the fishery.

MANAGEMENT STRATEGY

1. Stock Palmetto bass annually at 5-10 fish/acre as long as the reservoir size remains greater than 200 surface acres.
2. Conduct a creel survey to determine angler preferences, directed effort, and total harvest of Palmetto Bass in the reservoir.

ISSUE 2: Although past rain events have increased the reservoir level and provided large amounts of aquatic habitat in the form of flooded terrestrial vegetation and standing timber, future drought conditions will continue to plague the reservoir with inadequate aquatic habitat for sport fishes.

MANAGEMENT STRATEGY

1. Continue to work with the reservoir controlling authority to locate additional funding sources for habitat restoration projects.

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. Continue to 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 for Mackenzie Reservoir

Sampling Years 2017-2021

Sport fish, forage fish, and other important fishes

Sport fishes in Mackenzie Reservoir have historically included Channel Catfish, Blue Catfish, Flathead Catfish, White Bass, Palmetto Bass, Largemouth Bass and White Crappie. The primary forage species are Gizzard Shad and Bluegill.

Negligible fisheries

Blue Catfish: Blue Catfish are typically collected in gill nets at a rate below 1.0/nn; past angler surveys indicated limited effort toward this species (Henegar 2005). General monitoring trend data (without precision or sampling size requirement) will be gathered for this species while sampling for Palmetto Bass as outlined below.

White Bass: Although, White Bass are typically collected in gill nets at a rate of 2.4/nn to 4.4/nn; past angler surveys indicated no directed effort towards this species. Gill net sampling effort needed to achieve sampling for relative abundance (CPUE-S; RSE25 with 80% confidence) could require approximately 15 random stations. General monitoring trend data (without precision or sampling size requirement) will be gathered for this species while sampling for Palmetto Bass as outlined below. Evaluations will also be made to determine the viability of promoting White Bass as a developing fishery.

Walleye: Walleye stockings were discontinued after 1985. There is a small remnant population of Walleye that reproduce naturally and maintain a small population. Walleye are typically collected in gill nets at a rate of 0.2/nn; past angler surveys indicate no directed effort towards this species. General monitoring trend data (without precision or sampling size requirement) will be gathered for this species while electrofishing for Largemouth Bass and gill netting for Palmetto Bass as outlined below.

Survey objectives, fisheries metrics, and sampling objectives

Channel Catfish: According to the 2004 creel survey, Channel Catfish were the most sought species in the reservoir, with 35.1% of angler effort (Henegar 2005). Trend data on relative abundance and size structure of Channel Catfish has been collected biennially since 1999. Continuation of trend data will allow for general monitoring of large-scale changes in relative abundance and size structure. Gill net sampling effort needed to achieve sampling objectives for relative abundance (CPUE-S; RSE≤25 with 80% confidence) is 35 random stations. Effort for size structure estimation (PSD; 50 fish minimum with 80% confidence) is 30 random gill net stations. In 2021, Channel Catfish data will be collected using previous effort (8 random gill net stations). In order to reach the above desired precision for relative abundance and size structure, Channel Catfish catch rates using baited hoop nets will be evaluated during summer 2018 and 2020 using 6 sites. Due to the reservoir experiencing an extreme thermocline, sites will be selected with a stratified random design limiting site location to water depths between 5 and 20 feet.

Palmetto Bass: Palmetto Bass receive 12.8% of the angler effort (Henegar 2005). Trend data on relative abundance of Palmetto Bass has been collected biennially since 1999. Continuation of trend data will allow for general monitoring of any large-scale changes in relative abundance. Catch rates have been variable, ranging from a low of 0.4/nn (2005, 2013) to 14.6/nn (1999); however, catch rates have typically been greater than 3.8/nn. Utilizing catch rate data from the past 3 gill net surveys, achieving a relative abundance precision with an RSE≤25 for CPUE-S with 80% confidence would require 75 random gill net stations. Effort for size structure estimation (PSD; 50 fish minimum with 80% confidence) would also require 75 random stations. Due to the excessive effort required to meet relative abundance and size structure estimation objectives, Palmetto Bass data will be collected using the sampling strategy for Channel Catfish (8 random gill net stations).

Largemouth Bass: Largemouth Bass were the second most sought species in the reservoir, with 22.2% of the angler effort (Henegar 2005). Trend data on relative abundance and size structure of Largemouth Bass has been collected biennially since 2000 with fall nighttime electrofishing. Continuation of biennial fall nighttime electrofishing will allow for general monitoring of any large-scale changes in the Largemouth Bass population that may spur further investigation. Analysis of past sampling indicates that it would require a minimum of 10 electrofishing sites to achieve a CPUE-S RSE≤25. Effort for size structure estimation (PSD; 50 fish minimum with 80% confidence) would require a minimum of 14 random electrofishing stations. Twelve randomly selected 5-min electrofishing sites will be sampled in 2018 and 2020. If objectives are not met, sampling will continue at random sites until 50 stock-size fish are collected for PSD indices and an RSE≤25 for CPUE-S is achieved or until a maximum of 18 sites are sampled.

White Crappie: White Crappie receive approximately 3% of direct angler effort at Mackenzie Reservoir (Henegar 2005). Due to trap net catch rates of White Crappie being highly variable, trend data has only been able to determine presence/absence of the species. General monitoring on a quadrennial basis will allow for the evaluation of presence/absence of White Crappie. To determine presence/absence we will document any White Crappie observed in the electrofishing survey and the gill net survey. If no White Crappie are detected in the electrofishing survey, additional effort will include 5 biologist selected trap net stations. Stations will be selected based upon historic catch rates from previous surveys. Data from the 2021 gill net survey will also be evaluated to determine if objectives for relative abundance (CPUE-S; RSE≤25 with 80% confidence) and size structure (PSD; 50 fish minimum with 80% confidence) can be achieved.

Forage Fish: Bluegill and Gizzard Shad are the primary forage species at Mackenzie Reservoir. Trend data has been collected biennially since 2000. Continuation of sampling, as per Largemouth Bass above, will allow for general monitoring of large-scale changes in relative abundance and size structure. No additional effort will be extended beyond what is used for Largemouth Bass sampling.

Creel Survey: The last creel survey was conducted in 2004 (Henegar 2005). Anecdotal evidence suggests that angler preferences in the reservoir may have shifted due to extreme drought conditions resulting in a record low water level, loss of habitat, and changed fish populations. A spring quarter creel survey will be conducted between April 1, 2020 and June 30, 2020 to evaluate angler preferences, directed angler effort, and total harvest.

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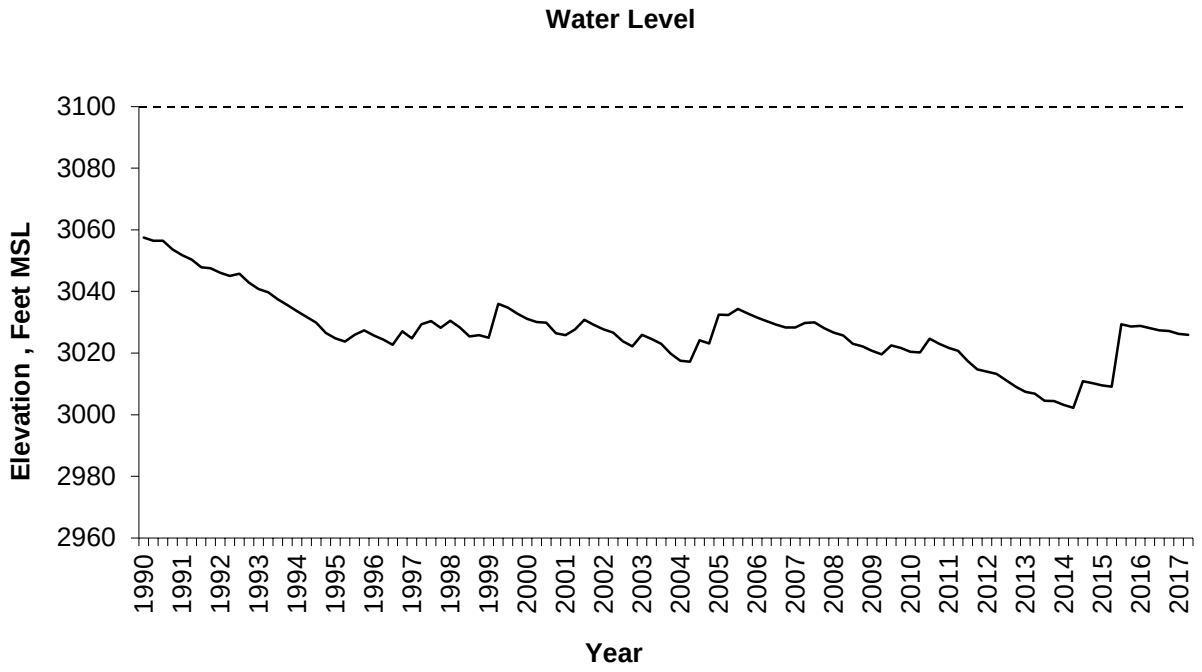


Figure 1. Quarterly water level elevations in feet above mean sea level (FMSL) recorded for Mackenzie Reservoir, Texas. Conservation pool elevation is 3,100 feet above mean sea level.

Table 1. Characteristics of Mackenzie Reservoir, Texas.

Characteristic	Description
Year constructed	1974
Controlling authority	Mackenzie Municipal Water Authority
County	Briscoe
Reservoir type	Mainstem
Shoreline Development Index (SDI)	3.96
Conductivity	682 µmhos/cm

Table 2. Boat ramp characteristics for Mackenzie Reservoir, Texas, August, 2016. Reservoir elevation at time of survey was 3027 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Mackenzie	34.54498 -101.44220	Y	20	UNK	Useable, currently no access issues.
Marina	34.54467 -101.54083	Y	10	3035	Out of water. Extension is not feasible
Coronado Shores	34.55237 -101.44977	N	unknown	3055	Out of Water.

Table 3. Harvest regulations for Mackenzie Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18–inch minimum
Bass, White	25	10–inch minimum
Bass, Palmetto	5	18-inch minimum
Bass: Smallmouth and Largemouth	5 (in any combination)	14-inch minimum
Crappie: White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum
Walleye	5	No more than 2 under 16 inches

Table 4. Stocking history of Mackenzie Reservoir, Texas. Fry = fry; FGL = fingerling; ADL = adults.

Species	Year	Number	Size
Rainbow Trout	1975	10,000	ADL
Brown Trout	1975	5,000	ADL
Blue Catfish	1980	3,000	FGL
	1982	44,998	FGL
	Total	47,998	
Channel Catfish	1973	4,000	FGL
	1974	50,000	FGL
	1986	40,000	FGL
	Total	94,000	
Flathead Catfish	1975	5,000	FGL
Palmetto Bass	1979	5,000	FGL
	1981	10,951	FGL
	1994	13,507	FGL
	1995	13,500	FGL
	1997	9,202	FGL
	1998	9,025	FGL
	1999	13,511	FGL
	2003	9,020	FGL
	2005	9,214	FGL
	2007	9,333	FGL
	2009	10,160	FGL
	2011	2,039	FGL
	2013	2,696	FGL
	2015	2,200	FGL
	Total	119,358	
Florida Largemouth Bass	1982	20,680	FGL
	1988	35,400	FGL
	1993	90,194	FGL
	1994	44,944	FGL
	Total	191,218	
Smallmouth Bass	1976	10,600	FGL
	1977	39,800	FGL
	1978	50,000	FGL
	Total	100,400	
Walleye	1976	350,000	FRY
	1977	180,000	FRY
	1978	350,000	FRY
	1983	1,122,00	FRY
	1984	720,000	FRY
	1985	630,000	FRY
	Total	3,352,000	

Table 5. Objective-based sampling plan components for Mackenzie Reservoir, Texas 2016 – 2017.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE - Stock	RSE – Stock ≤ 25
	Size Structure	PSD, length frequency	N ≥ 50 Stock
Bluegill [a]	Abundance	CPUE - Total	RSE ≤ 25
	Size Structure	PSD, length frequency	N ≥ 50
Gizzard Shad [a]	Abundance	CPUE - Total	RSE ≤ 25
	Size Structure	Length frequency	N ≥ 50
	Prey availability	IOV	N ≥ 50
Gill netting			
Channel Catfish	Abundance	CPUE – Stock	RSE – Stock ≤ 25
	Size Structure	PSD, length frequency	N ≥ 50 Stock
Palmetto Bass	Abundance	CPUE – Stock	RSE – Stock ≤ 25
	Size Structure	PSD, length frequency	N ≥ 50 Stock

[a] No additional effort will be expended to achieve an RSE≤25 for CPUE of Bluegill and Gizzard Shad if not reached from designated Largemouth Bass sampling effort. Instead, Largemouth Bass body condition can provide information on forage abundance, vulnerability, or both relative to predator density.

Table 6. Survey of structural habitat types, Mackenzie Reservoir, Texas, 2016. Shoreline habitat type units are in miles.

Habitat type	Estimate	% of total
Natural	5.3 miles	56
Rock Bluff	4.0 miles	42
Rocky	0.2 miles	2

Gizzard Shad

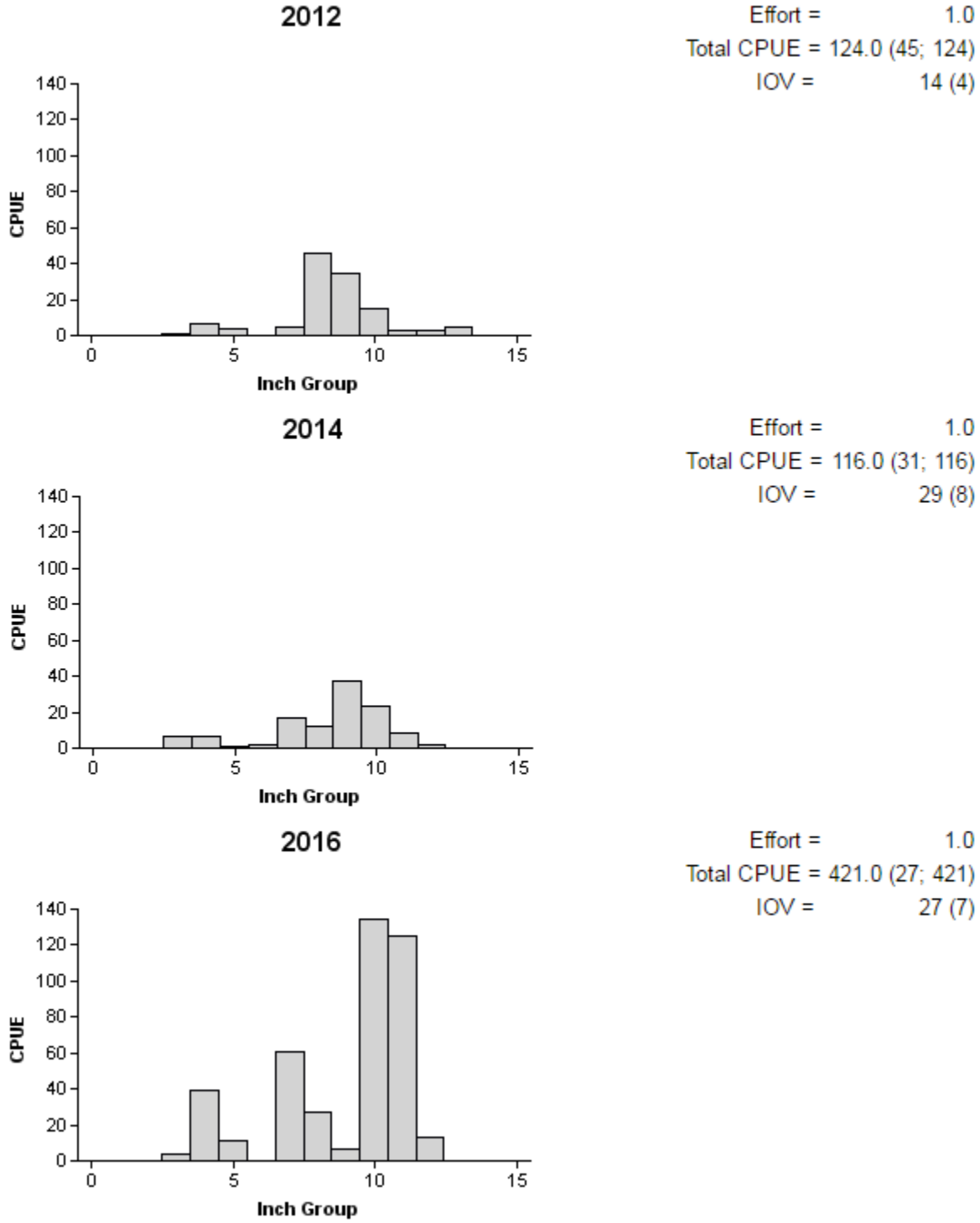


Figure 2. Number of Gizzard Shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Mackenzie Reservoir, Texas, 2012, 2014, and 2016.

Bluegill

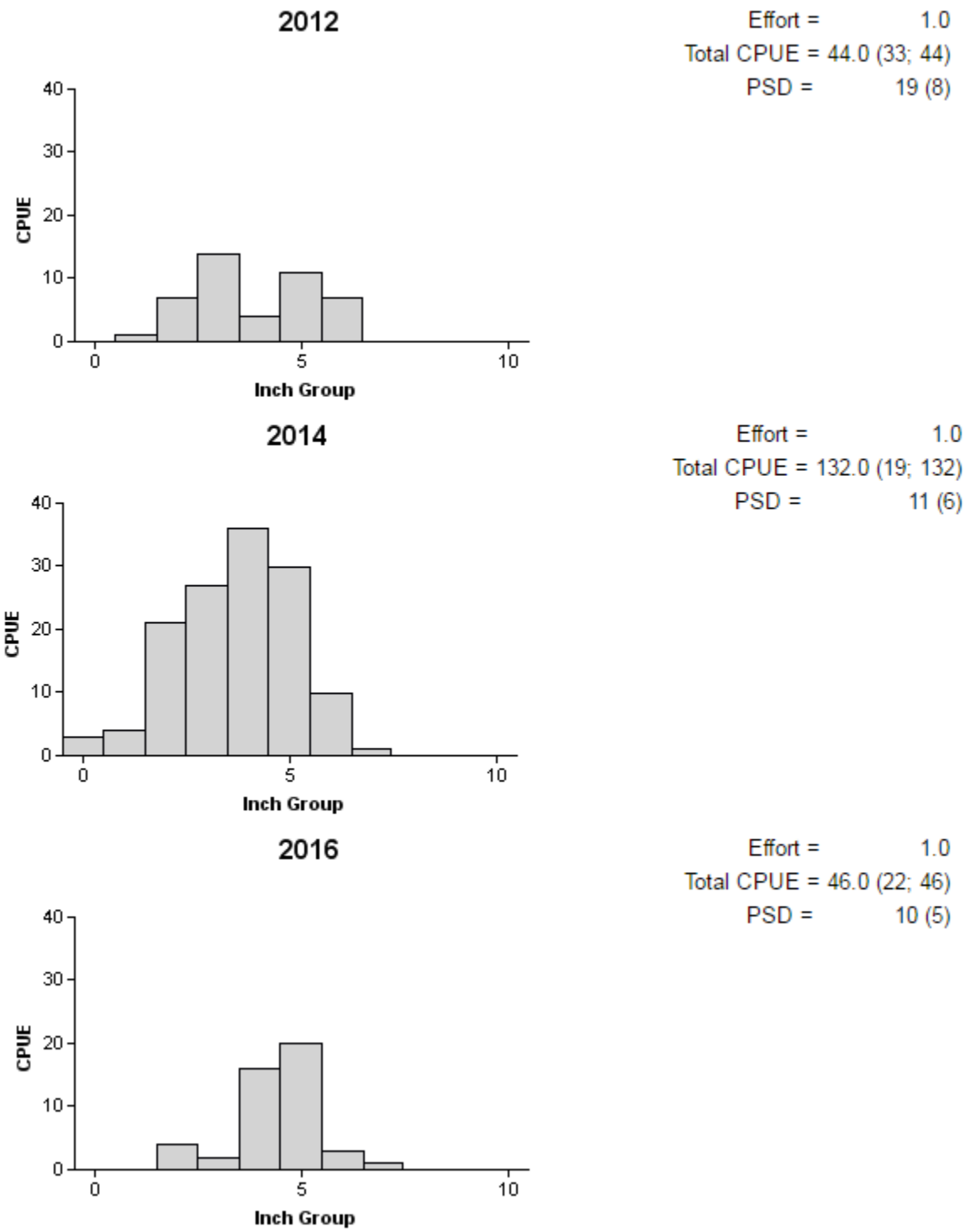


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mackenzie Reservoir, Texas, 2012, 2014, and 2016.

Channel Catfish

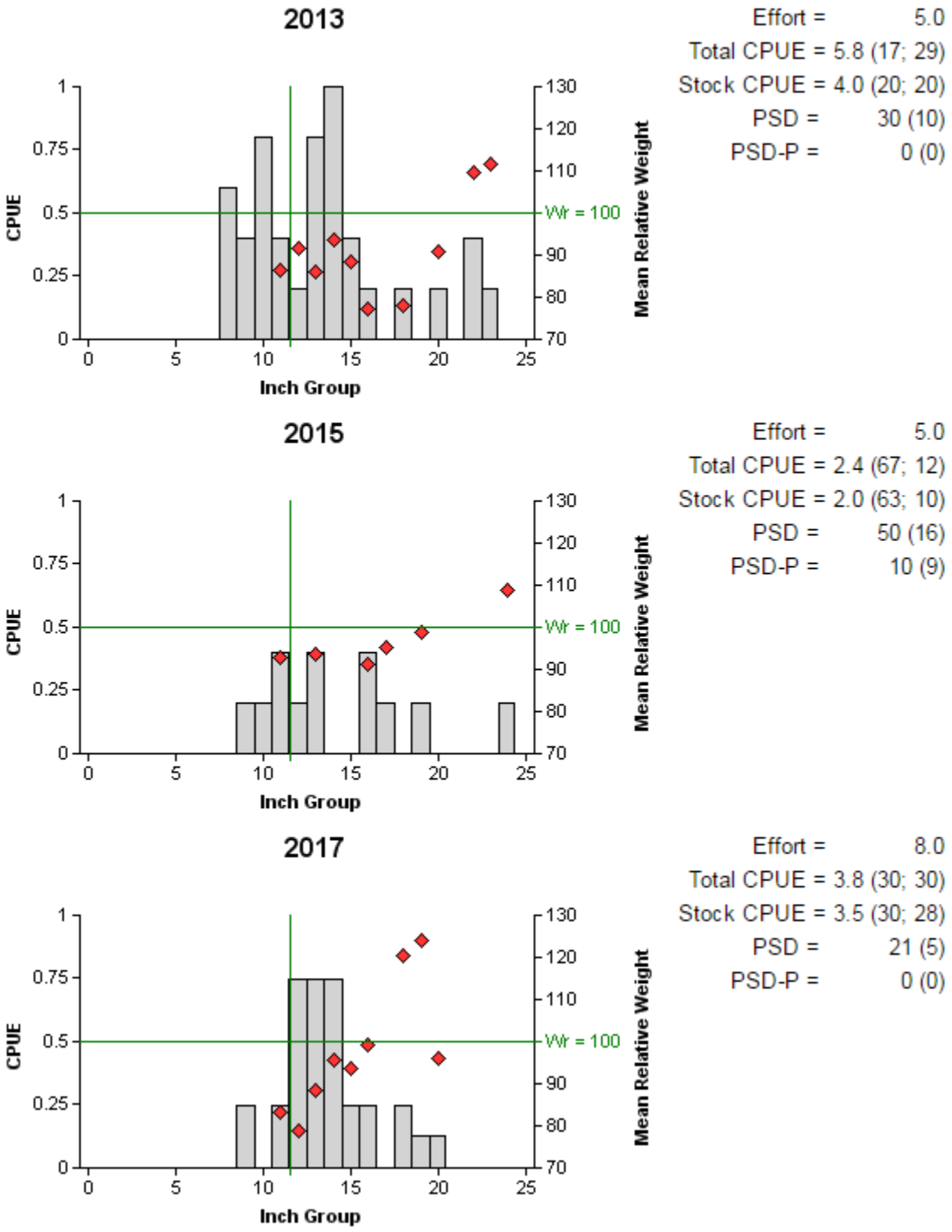


Figure 4. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Mackenzie Reservoir, Texas, 2013, 2015, and 2017. Vertical line represents minimum length limit of 12 inches, and horizontal line represents relative weight of 100.

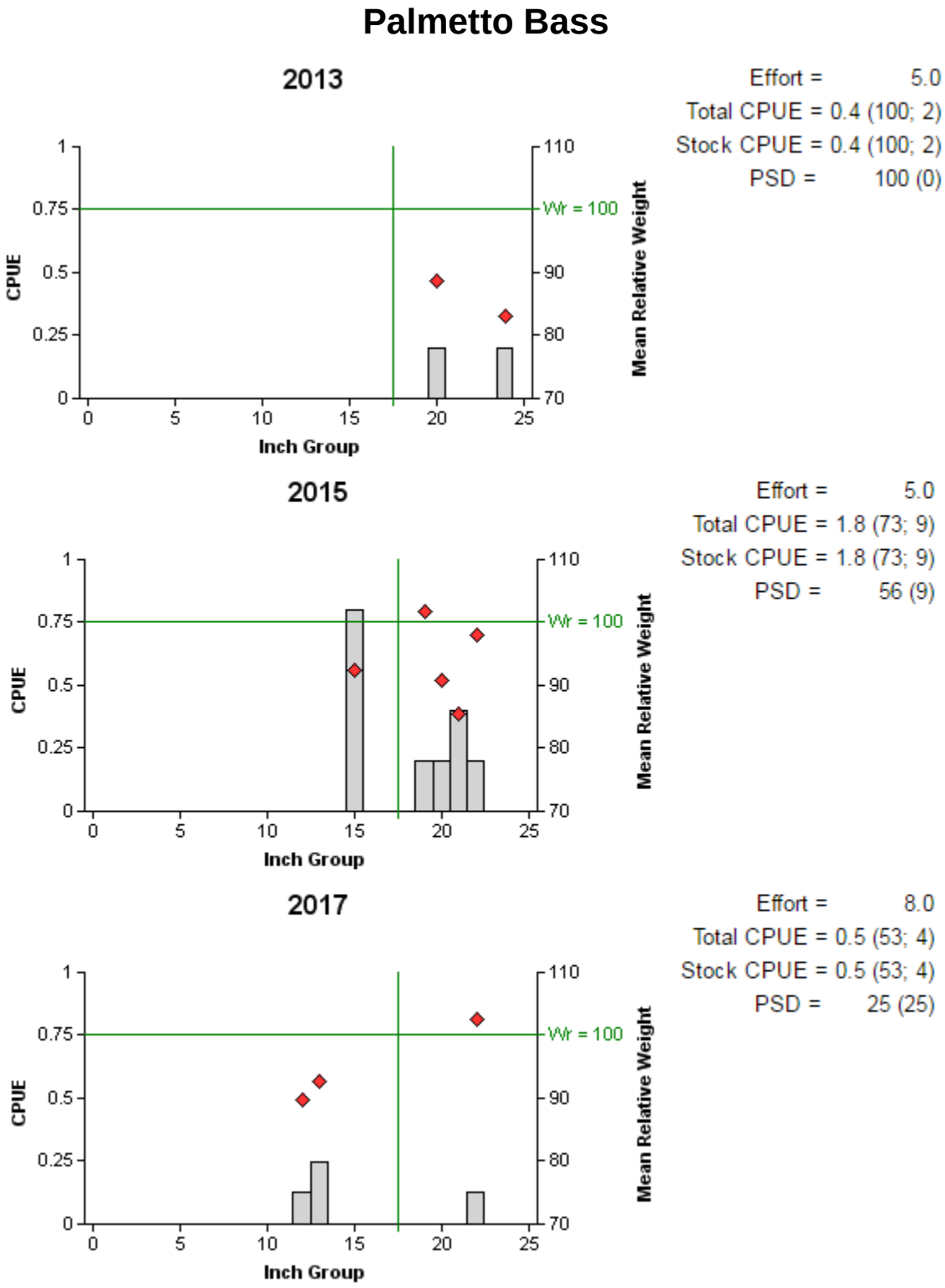


Figure 5. Number of Palmetto Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill netting surveys, Mackenzie Reservoir, Texas, 2013, 2015, and 2017. Vertical line represents minimum length limit of 18 inches, and horizontal line represents relative weight of 100.

Largemouth Bass

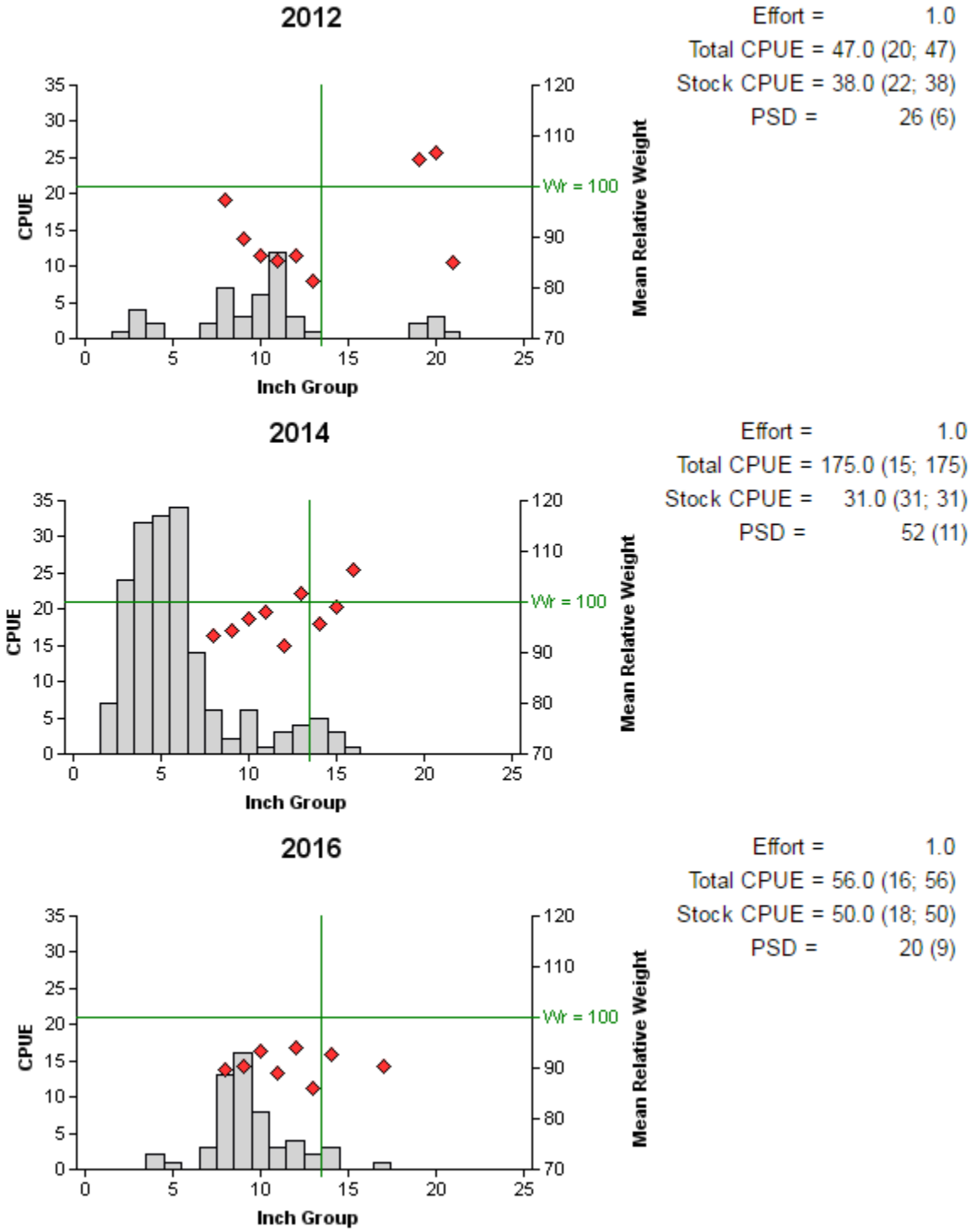


Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mackenzie Reservoir, Texas, 2012, 2014, and 2016. Vertical line represents minimum length limit of 14 inches, and horizontal line represents relative weight of 100.

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

Survey year	Electrofish Fall (Spring)	Gill net	Hoop net	Habitat		Access	Creel Survey	Report
				Structural	Vegetation			
2017-2018								
2018-2019	A		A					
2019-2020							S[a]	
2020-2021	S	S	A	S	S	S		S

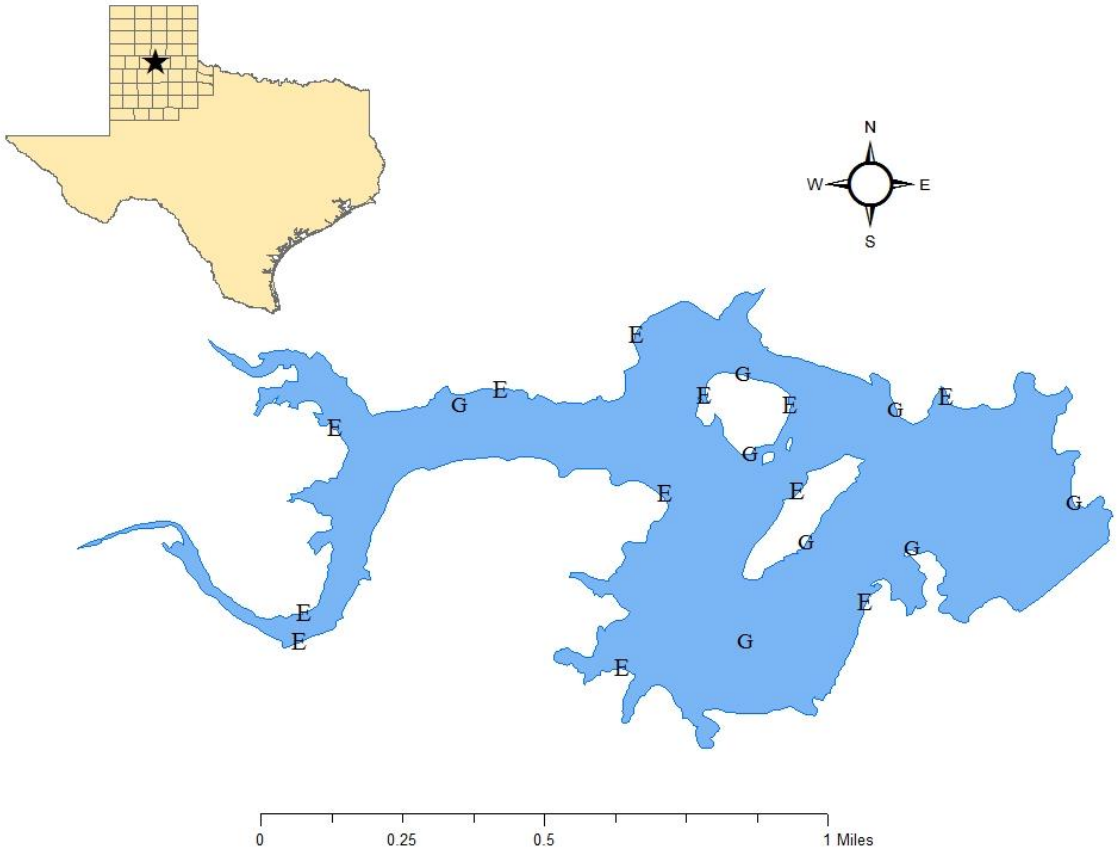
[a] Creel Survey will be conducted from April 1, 2020 to June 30, 2020

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Mackenzie Reservoir, Texas, 2016-2017. Sampling effort was 8 net nights for gill netting and 1 hour for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad	82	10.3	421	421.0
Common Carp	11	1.4	2	2.0
Blue Catfish	2	0.3		
Channel Catfish	30	3.8	2	2.0
Flathead Catfish	2	0.3		
White Bass	34	4.3	7	7.0
Palmetto Bass	4	0.5		
Green Sunfish	2	0.3	32	32.0
Warmouth	3	0.4		
Bluegill	24	3.0	46	46.0
Longear Sunfish			60	60.0
Redear Sunfish			4	4.0
Largemouth Bass	32	4.0	56	56.0
White Crappie	47	5.9	11	11.0

APPENDIX B



Location of sampling sites, Mackenzie Reservoir, Texas, 2016-2017. Gill net and electrofishing stations are indicated by G and E, respectively. Water level at time of sampling was 3027 feet MSL.