John Paul Landing Reservoir

2019 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in John Paul Landing Reservoir were surveyed in 2019 using electrofishing and in 2020 using electrofishing and tandem hoop netting. Historical data are not available for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

Reservoir Description: John Paul Landing Reservoir is currently a 176-acre impoundment located between the headwaters of Bear, Cypress, and Langham Creeks approximately 6.8 miles north of Katy, Texas. Water level has been within 2 feet of spillway elevation since the initial section filled in 2016. John Paul Landing Reservoir will eventually contain 450 surface acres once construction is complete. Habitat features consisted of standing timber, submerged timber piles, rock and concrete rip rap piles, a highly contoured bottom surface, native submerged and emergent aquatic plants, and alligator weed.

Management History: Important sport fish include Largemouth Bass, White Crappie, and Channel Catfish. Initial stockings of Bluegill occurred in 2016 and 2017. Florida Largemouth Bass and Channel Catfish have been stocked annually since 2016. All sport fish have been managed under statewide regulations since the lake opened to the public in April 2018. Recent efforts to minimize erosion issues along banks have included placing riprap along highly eroded areas.

Fish Community

- **Prey species:** Threadfin Shad were present in the reservoir. While electrofishing catch rate of Gizzard Shad was low, most were available as prey to larger sport fish. Electrofishing catch rates of Bluegill and Longear Sunfish were low, dominated by small individuals under 4-inches in length.
- **Catfishes:** Channel Catfish were abundant with legal-size fish available to anglers. Body condition of Channel Catfish was fair.
- **Largemouth Bass:** Largemouth Bass were present in the reservoir, but sampling efforts produced few small individuals.
- **White Crappie:** White Crappie were abundant with legal-size fish available to anglers. Most crappie reached legal size (10 inches) within three years.

Management Strategies: Inform the public about the negative impacts of aquatic invasive species. Conduct general monitoring surveys with electrofishing and hoop net surveys in 2023-2024. Access and full vegetation surveys will be conducted in 2023-2024. Vegetation surveys assessing invasive species will be conducted yearly.

Introduction

This document is a summary of fisheries data collected from John Paul Landing Reservoir in 2019-2020. 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 not available for comparison.

Reservoir Description

John Paul Landing Reservoir is currently a 176-acre impoundment that opened to the public in 2018. Construction began in 2012 as local developments needed fill dirt for their construction sites and has progressed in phases as new developments arise and contract with Harris County Precinct 3 (HCP3) for their fill-dirt needs. Construction will continue in phases until the waterbody reaches its full size of approximately 450-acres. John Paul Landing Reservoir is located approximately 6.8 miles north of Katy, Texas and is operated and controlled by Harris County Precinct 3. Primary water uses include storm water retention and recreation. Water depth increases quickly from shore and reaches 15-20 feet within casting distance of the shoreline. The reservoir has a maximum depth of 30 feet in various locations due to artificial creek channels. Habitat at time of sampling consisted of standing timber, submerged timber piles, rock and concrete rip rap piles, a highly contoured bottom surface, native submerged and emergent aquatic plants, and alligator weed. Native aquatic plants included bulrush, spike rush, pickerel weed, Illinois pondweed, smartweed, and multiple sedges. Alligator weed, a non-native, has been observed in the connecting drainage ditch on the north end of the reservoir and in patches along the northeastern shoreline, but does not seem to be spreading. Water level has been within 2 feet of spillway elevation since the initial section filled in 2016, except for a brief period of flooding after Hurricane Harvey in 2017 where debris and construction downstream prevented flood waters from draining properly. Other descriptive characteristics for John Paul Landing Reservoir are in Table 1.

Angler Access

John Paul Landing Reservoir currently has no boat ramps. Shoreline access is good around the full perimeter of the reservoir except for within existing construction areas. There are 3 covered fishing piers on a peninsula on the south bank, as well as multiple walking bridges over deeper channels between reservoir sections. A fourth pier is dedicated to a fish cleaning station with four cleaning tables and running water; however, fishing is not allowed from this pier.

Management History

Previous management strategies and actions: John Paul Landing Reservoir was opened to the public in 2018. No prior assessments have been conducted by TPWD.

Harvest regulation history: The reservoir is currently managed under statewide regulations (Table 2).

Stocking history: John Paul Landing Reservoir has been stocked annually with Florida Largemouth Bass and 9” Channel Catfish since 2016. A full stocking record can be found in Table 3.

Vegetation/habitat management history: As HCP3 digs each new section of reservoir, riprap piles, log piles, concrete culverts, and other hard structure are added to the bottom as near shore as possible. Artificial channels, dips, and humps are also created along the bottom of each new section prior to filling. Native vegetation was planted on one of the islands at John Paul Landing Reservoir in August 2017. Shortly thereafter, Hurricane Harvey flooded the reservoir and water levels remained high for months, negating previous planting efforts. Current native plants are thought to originate from upstream drainage canals or from planting efforts that were scattered during stormwater rises. The Magnolia West Anglers Club (Friends of Reservoirs Chapter for John Paul Landing Reservoir) installed several Mossback Artificial Fish Habitat structures around the fishing piers in April 2018.

Water transfer: John Paul Landing Reservoir is primarily used for recreation and flood control. 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 John Paul Landing Reservoir which was designed with the goal of collecting baseline data and describing fisheries present in the young reservoir. Primary components of the OBS plan are listed in Table 4. All survey sites were randomly selected, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Electrofishing – Largemouth Bass, crappies, sunfishes, and shads were collected by daytime electrofishing (1 hour at 12, 5-min stations) in both fall 2019 and spring 2020. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for crappie were determined using otoliths from 23 randomly selected fish (range 9.0 to 10.9 inches).

Tandem hoop nets – Channel Catfish were collected using 5 tandem hoop-net series at 5 stations. Nets were baited with soap and deployed for 2-night soak durations. CPUE for tandem hoop netting was recorded as the number of fish caught per tandem hoop net series (fish/series).

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 – A structural habitat survey was conducted in 2019. Habitat was assessed with the digital shapefile method (TPWD, Inland Fisheries Division, unpublished manual revised 2017).

Water level – No recorded water level data exists. Water level was determined by communications with Harris County Precinct 3 and TPWD staff observations.

Results and Discussion

Habitat: Structural shoreline habitat consisted primarily of natural shoreline (Table 5) with 3 fishing piers, 3 bridges with pilings, and a fish cleaning station pier. As HCP3 digs each new section of reservoir, riprap piles, log piles, concrete culverts, and other hard structure are added to the bottom as near shore as possible. Artificial channels, dips, and humps are also created along the bottom of each new section prior to filling. The Magnolia West Anglers Club (Friends of Reservoirs Chapter for John Paul Landing Reservoir) installed several Mossback Artificial Fish Habitat structures around the fishing piers in April 2018. Native vegetation covered <0.1% of the reservoir's surface area (Table 6). Native vegetation was planted on one of the islands at John Paul Landing Reservoir in August 2017. Shortly thereafter, Hurricane Harvey flooded the reservoir and water levels remained high for months, negating previous planting efforts. Current native plants are thought to originate from upstream drainage canals or from planting efforts that were scattered during stormwater rises. Non-native alligator weed is present in nearby drainage canals and has been observed in the reservoir in the past. High turbidity (5-10cm visibility) due to colloidal clay suspensions and ongoing constructions limits vegetation establishment in the reservoir.

Prey species: High turbidity and low conductivity (86-94 µS/cm) contributed to extremely low productivity of both fall and spring electrofishing surveys. Electrofishing catch rates of Bluegill, Longear Sunfish, and Gizzard Shad were 32.0/h, 13.0/h, and 9.0/h, respectively for fall 2019 (Figures 1, 3, and 5) and 12.0/h, 19.0/h, and 2.0/h, respectively for spring 2020 (Figures 2, 4, and 6). All sunfish collected were 4 inches

or smaller, indicating they are a good prey source for predators. Index of Vulnerability (IOV) for Gizzard Shad was excellent for the fall electrofishing sample, indicating that 100% of Gizzard Shad were available to existing predators, while IOV for the spring electrofishing survey indicated that 0% of Gizzard Shad were available to existing predators. Sample sizes were small for both surveys with 9 individuals collected in the fall and 2 in the spring.

Channel Catfish: The hoop net catch rate of Channel Catfish was 44.5/net series in 2020 (Figure 7). Few stock-sized individuals (≥ 11 inches) were also of quality size (≥ 16 inches), indicated by a PSD of 13. Body condition was sub-optimal with relative weights averaging around 80. Reproductive success was observed by collecting multiple individuals well under the 9-inch stocking size (Figures 8 and 9) during electrofishing surveys.

Largemouth Bass: The electrofishing catch rate of Largemouth Bass was 1.0/h in fall 2019 (Figure 10) and 2.0/h in spring 2020 (Figure 11). No legal-sized or stock-sized Largemouth Bass were captured during either the fall or spring electrofishing surveys, preventing age-and-growth analyses from being conducted. Individuals collected during surveys were also too small to calculate relative weights but were in extremely good condition. Low catch rates may indicate that Largemouth Bass have yet to fully establish in this young reservoir or that high turbidity, low conductivity, ample deep-water cover, and lack of adequate shoreline vegetation concentrated Largemouth Bass in deep water, lowering the efficacy of electrofishing.

White Crappie: The electrofishing catch rate of White Crappie was 64.0/h in 2019 (Figure 12) and 41.0/h in 2020 (Figure 13). The size distribution for fall and spring electrofishing were similar with PSDs of 81 and 73. Mean relative weight was close to 90 for most size classes in fall 2019, indicating adequate prey availability, but ranged from 75 to just over 90 in spring 2020. Growth of White Crappie at John Paul Landing Reservoir was slow. Average age at 10 inches was 3.11 years (N = 9; range = 1 – 4 years; Figure 14) during the fall survey and 2.86 years (N = 14; range = 2 – 3 years; Figure 15) in the spring.

Fisheries Management Plan for John Paul Landing Reservoir, Texas

Prepared – July 2020

ISSUE 1: Due to the young age of John Paul Landing Reservoir, consistent Katy Prairie winds, and continued construction activities, native vegetation isn't well established in the reservoir and is mostly found immediately along the shoreline.

MANAGEMENT STRATEGY

1. Work with HCP3 and the John Paul Landing Friends of Reservoirs group on efforts to establish native shoreline vegetation to both stabilize banks as well as provide shoreline habitat for young-of-year fish.

ISSUE 2: Florida Largemouth Bass were stocked yearly from 2016-2019, yet electrofishing surveys yielded only 3 young-of-year individuals. John Paul Landing Reservoir's high turbidity and low conductivity limit productivity of electrofishing surveys for all target species. Continued construction perpetuates turbidity issues and has released colloidal clay into the reservoir, minimizing shoreline vegetation that is crucial for young-of-year survival as well as making foraging difficult. In a small system such as John Paul Landing, top predators like Largemouth Bass are needed to help keep species such as crappie from overpopulating and stunting.

MANAGEMENT STRATEGIES

1. Discontinue Florida Largemouth Bass stocking until construction is complete and vegetation begins to establish. Address any remaining colloidal clay issues as able.
2. Survey Largemouth Bass population again in 2023 and resume stocking if shoreline vegetation has established.
3. Work with local anglers and HCP3 to collect volunteer angler catch data to gain additional information about target species that may not be captured with standard sampling techniques.

ISSUE 3: Electrofishing surveys indicate a promising White Crappie population at John Paul Landing Reservoir.

MANAGEMENT STRATEGY

1. Promote crappie fishery during conversations with anglers. Should volunteer angler data show abundant legal-sized fish in the next 4 years, then promotion through press releases and social media will be warranted.

ISSUE 4: 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 (2020–2024)

John Paul Landing Reservoir was opened to the public in 2018, is still under construction, and has only been sampled 2019-2020; therefore, baseline fisheries information is still being compiled. The proposed sampling schedule to meet the following OBS plan can be found in Table 7.

Negligible Fisheries

Reservoir maturation, construction completion, and future vegetation growth may significantly alter the sport fish community. Additional data collection using standard survey methods will be needed to determine negligible fisheries.

Sport fish, forage fish, and other important fishes

Sport fish in John Paul Landing Reservoir include Channel Catfish, White Crappie, and Largemouth Bass. Important forage species include Gizzard and Threadfin Shad, Bluegill, and Longear Sunfish.

Survey objectives, fisheries metrics, and sampling objectives

Channel Catfish: A second exploratory hoop net survey will be conducted to evaluate recruitment of the current population. Additional population-level data (relative abundance, size composition, relative weight) will be collected for specimens sampled. Baited tandem hoop netting will be conducted in the summer of 2023 at randomly selected sites. In order to make direct comparisons with the 2020 data, hoop nets will be set at 5 randomly selected sites in the summer of 2023 for a 2-night soak.

Largemouth Bass: A second exploratory electrofishing survey will be conducted to identify presence/absence and to aid in evaluating past stocking success. Additional population-level data (relative abundance, size composition, relative weight) will be calculated for specimens collected. Because there is currently no boat ramp at John Paul Landing Reservoir; boat access must be gained from the bank in a non-secured area. Due to limited boat access, daytime electrofishing will continue to be conducted with 12 randomly selected 5-minute stations in the fall of 2023. Should Harris County Precinct 3 construct a boat ramp, nighttime electrofishing will be considered.

Crappies: An exploratory trap net survey will be conducted to identify presence/absence and to aid in evaluating success of the current population. Additional population-level data (relative abundance, size composition, relative weight) will be collected for specimens sampled. A minimum of 5 randomly selected trap net sites will be sampled to collect crappies.

Prey Species: Sampling with electrofishing per Largemouth Bass and crappies will be sufficient to identify presence/absence of forage fishes. Additional population level data (relative abundance, size composition) will be recorded on specimens collected.

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.

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.

Tables and Figures

Table 1. Characteristics of John Paul Landing Reservoir, Texas.

Characteristic	Description
Year constructed	2018 opened to public - construction ongoing
Controlling authority	Harris County Precinct 3
County	Harris
Reservoir type	Flood Detention Basin
Conservation Elevation	150 feet above mean sea level (MSL)
Conductivity	86-94 µS/cm

Table 2. Harvest regulations for John Paul Landing 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, Largemouth	5	14-inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 3. Stocking history of John Paul Landing Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling.

Species	Year	Number	Size
Bluegill	2016	12,013	FGL
	2017	41,993	FGL
	Total	54,006	
Channel Catfish	2016	1,079	AFGL
	2017	10,001	AFGL
	2018	10,150	AFGL
	2019	10,052	AFGL
	Total	31,282	
Florida Largemouth Bass	2016	3,102	FGL
	2017	43,950	FGL
	2018	40,508	FGL
	2019	40,562	FGL
	2020	40,855	FGL
	Total	168,977	

Table 4. Objective-based sampling plan components for John Paul Landing Reservoir, Texas 2019–2020.Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Presence/Absence		N > 0
Bluegill	Presence/Absence		N > 0
Gizzard Shad	Presence/Absence		N > 0
	Prey availability	IOV	
Crappie	Presence/Absence		N > 0
Tandem hoop netting			
Channel Catfish	Presence/Absence		N > 0

Table 5. Survey of structural habitat types, John Paul Landing Reservoir, Texas, 2019. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Natural shoreline	4.64 miles	97.5
Piers and docks/open water	0.14 miles	2.9
Standing timber	0.59 acres	<0.1

Table 6. Survey of aquatic vegetation, John Paul Landing Reservoir, Texas, 2019. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2012
Native floating-leaved	0.11 (<0.1)
Native emergent	1.27 (<0.1)
Non-native	
Alligator weed (Tier III)*	Trace (<0.1)

*Tier III is Watch Status

Gizzard Shad

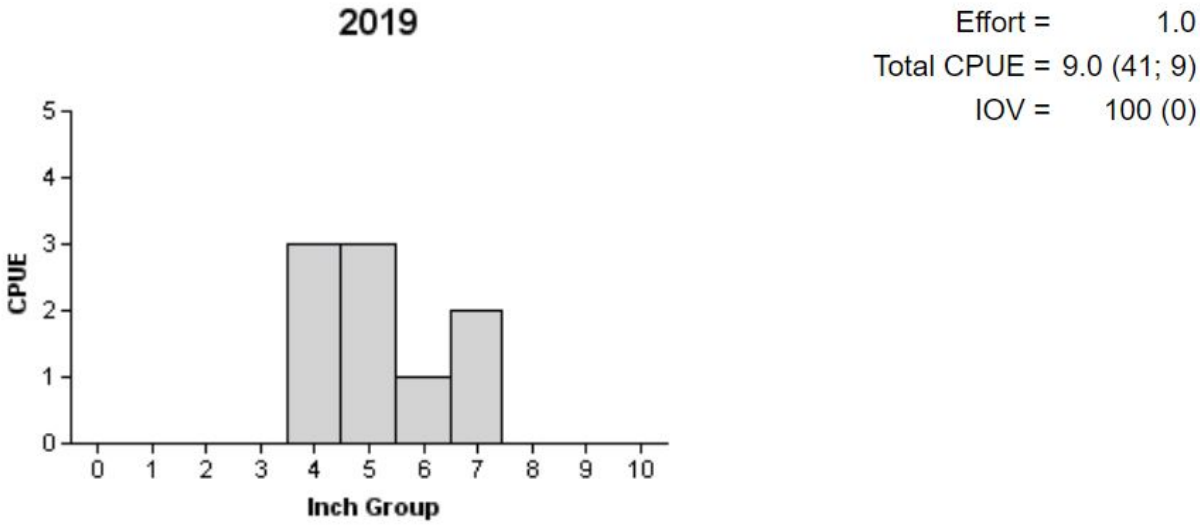


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing survey, John Paul Landing Reservoir, Texas, 2019.

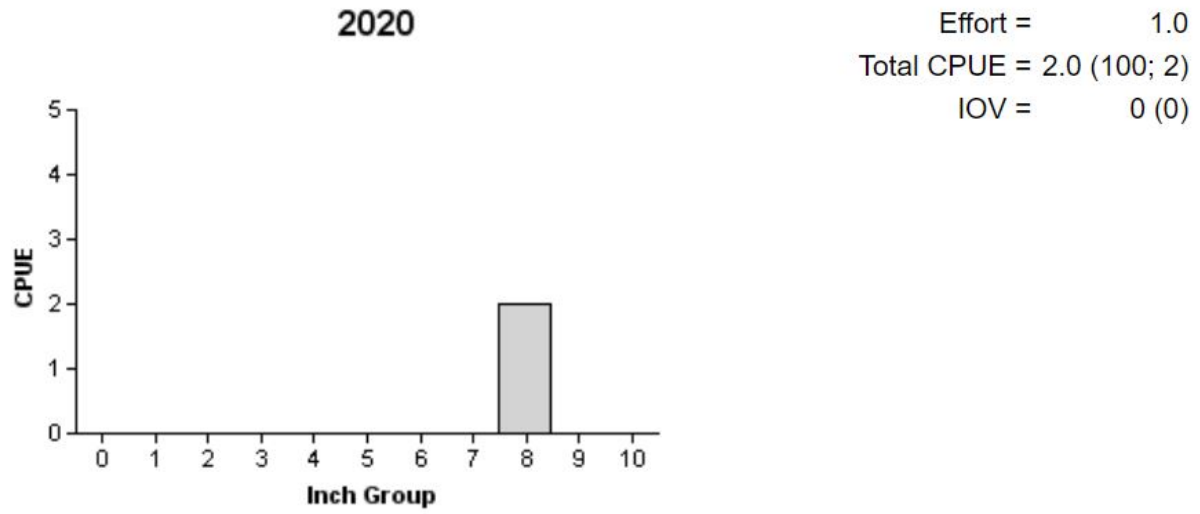


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for spring electrofishing survey, John Paul Landing Reservoir, Texas, 2020.

Bluegill

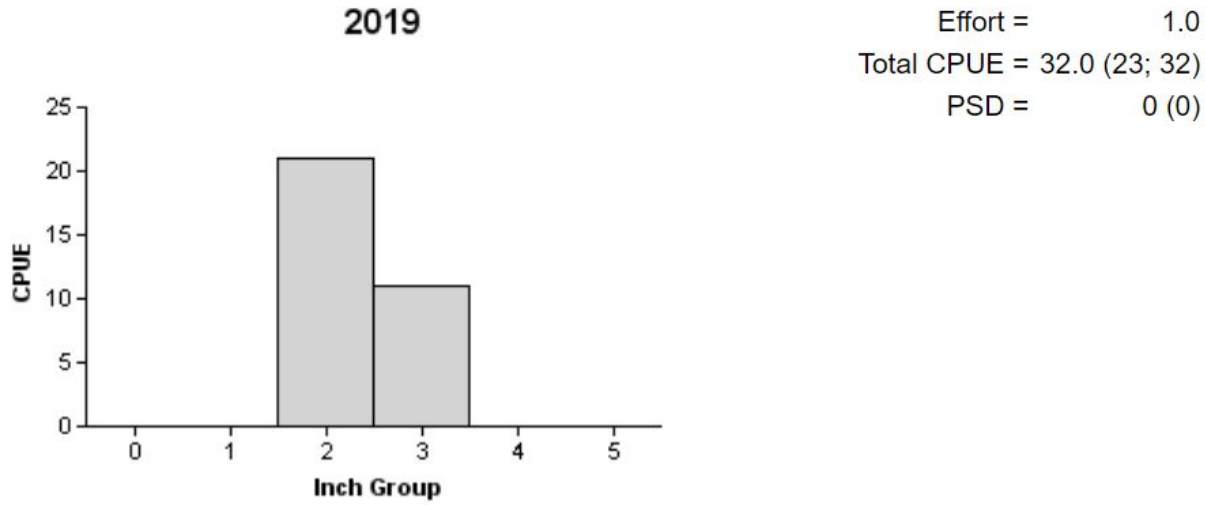


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, John Paul Landing Reservoir, Texas, 2019.

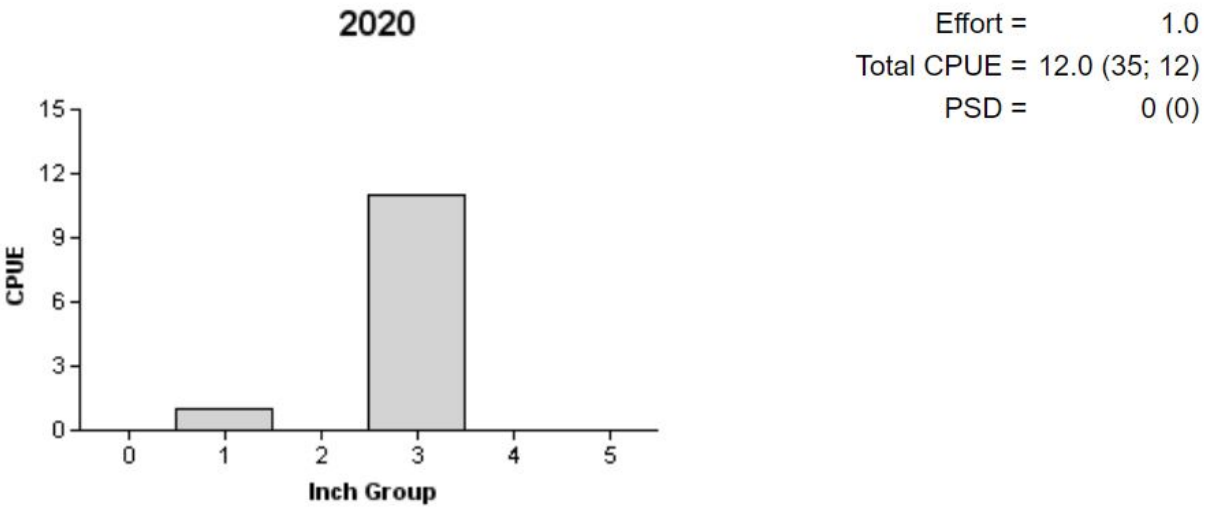


Figure 4. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing survey, John Paul Landing Reservoir, Texas, 2020.

Longear Sunfish

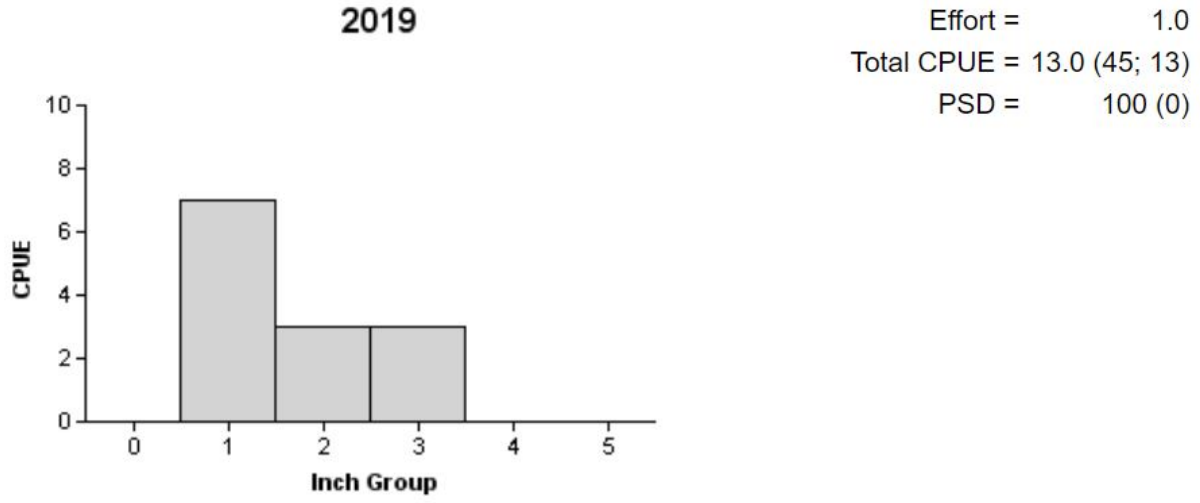


Figure 5. Number of Longear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, John Paul Landing Reservoir, Texas, 2019.

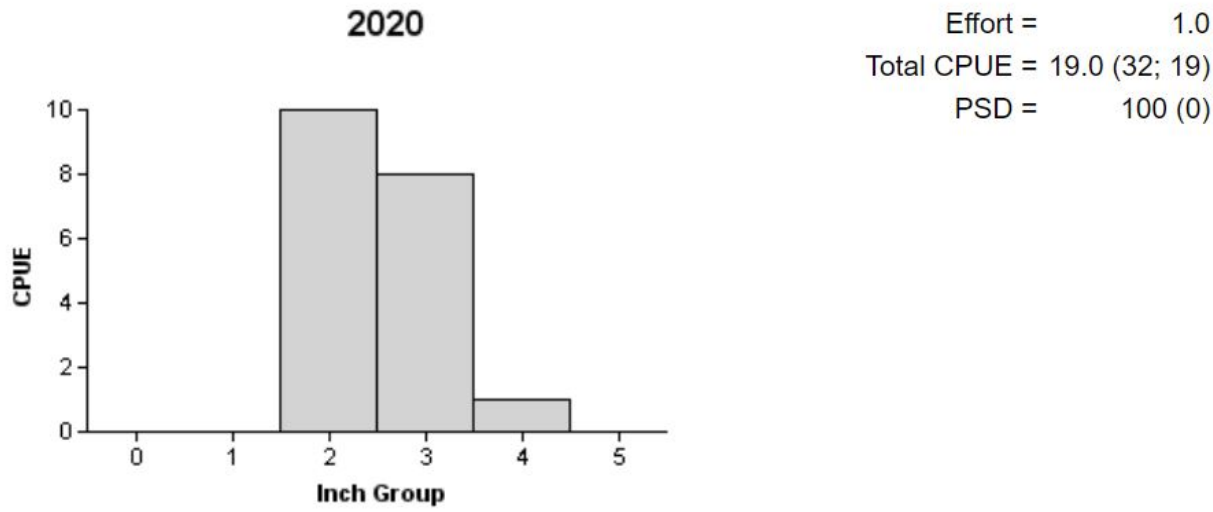
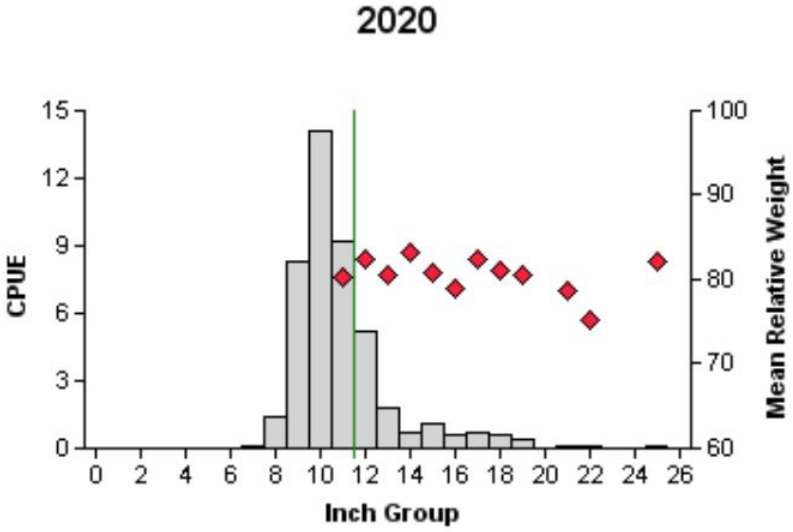


Figure 6. Number of Longear Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing survey, John Paul Landing Reservoir, Texas, 2020.

Channel Catfish



Effort = 10.0
Total CPUE = 44.5 (43; 445)
Stock CPUE = 20.6 (40; 206)
PSD = 13 (10)

Figure 7. Number of Channel Catfish caught per series (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring hoop net survey, John Paul Landing Reservoir, Texas, 2020.

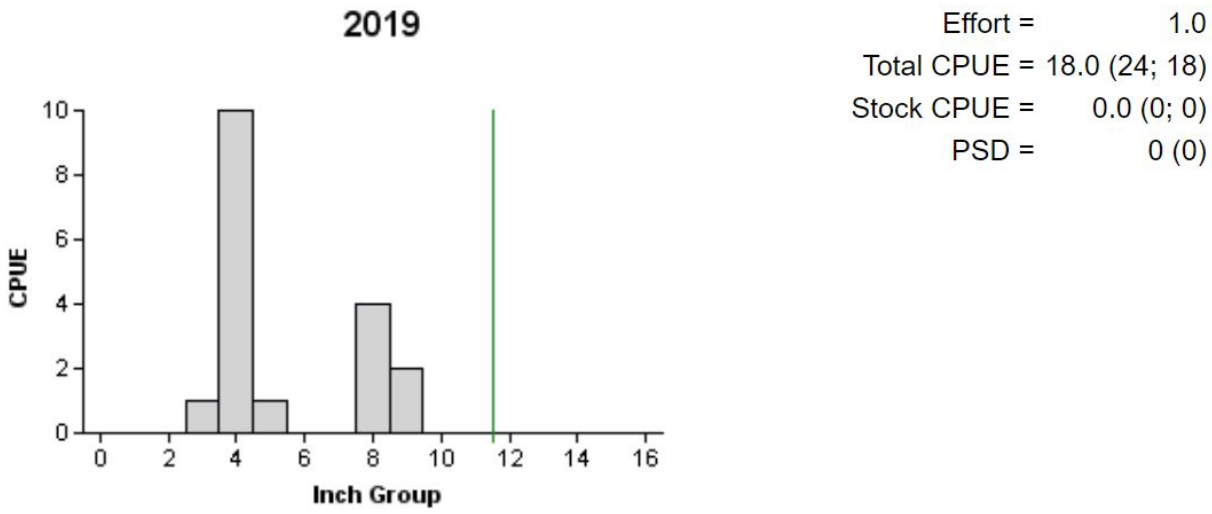


Figure 8. Number of Channel Catfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, John Paul Landing Reservoir, Texas, 2019. Vertical line indicates minimum length limit.

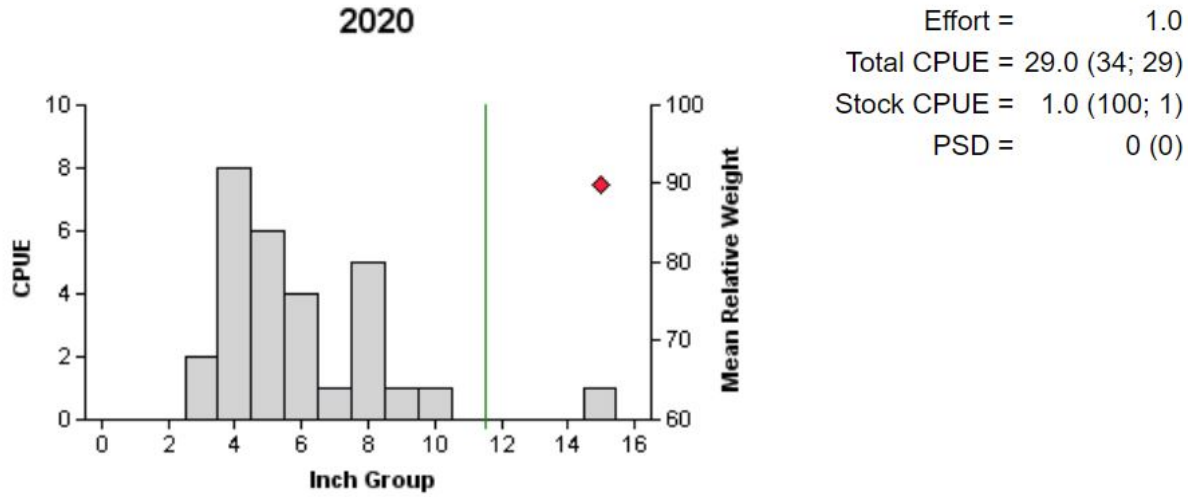


Figure 9. Number of Channel Catfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing survey, John Paul Landing Reservoir, Texas, 2020. Vertical line indicates minimum length limit.

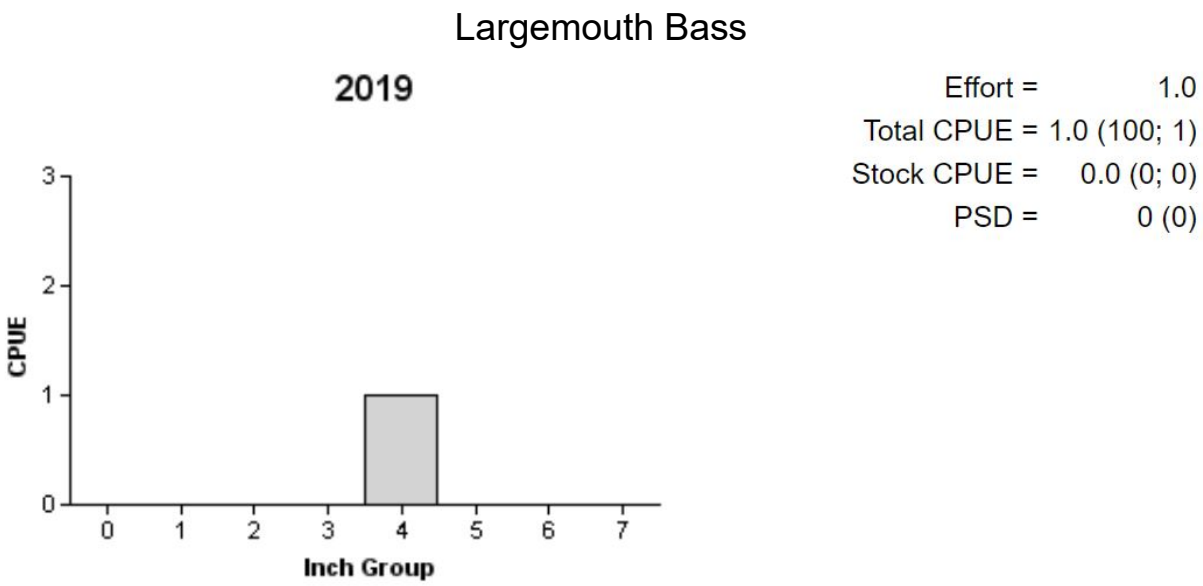


Figure 10. Number of Largemouth Bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, John Paul Landing Reservoir, Texas, 2019.

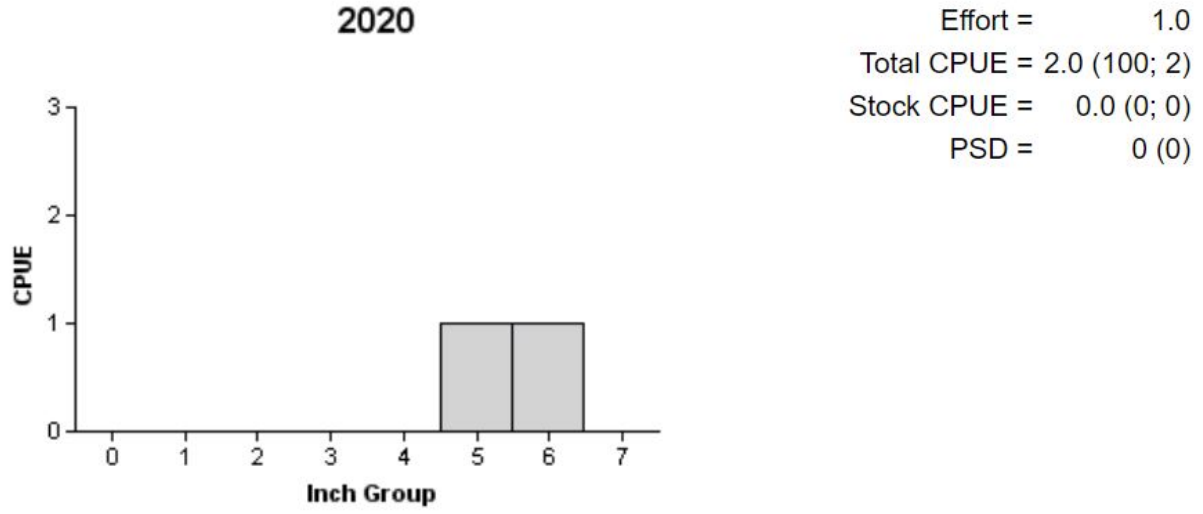


Figure 11. Number of Largemouth Bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing survey, John Paul Landing Reservoir, Texas, 2020.

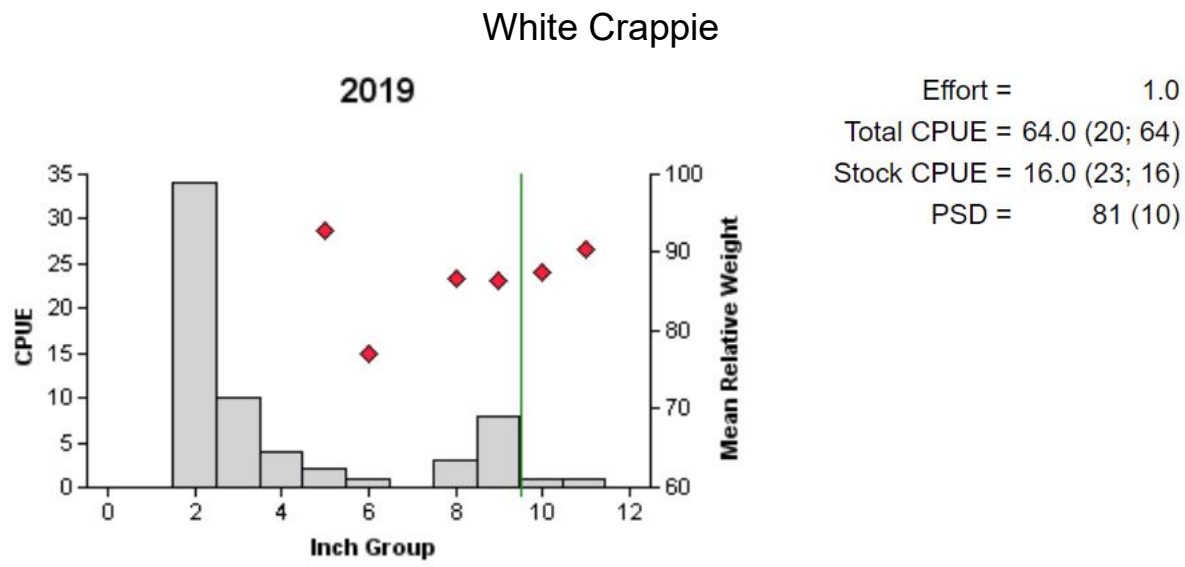


Figure 12. Number of White Crappie caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, John Paul Landing Reservoir, Texas, 2019. Vertical line indicates minimum length limit.

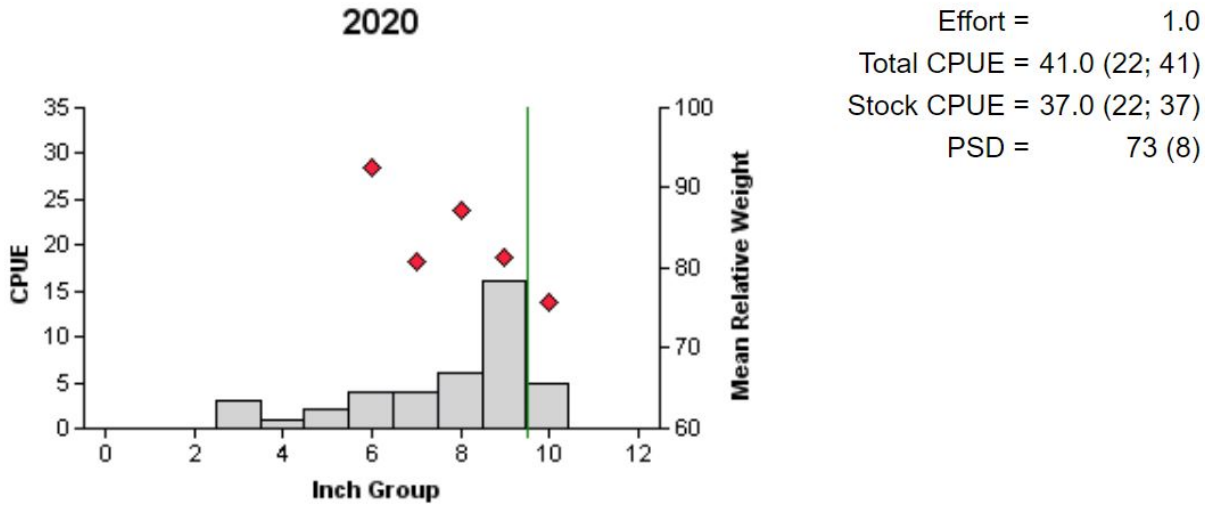


Figure 13. Number of White Crappie caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing survey, John Paul Landing Reservoir, Texas, 2020. Vertical line indicates minimum length limit.

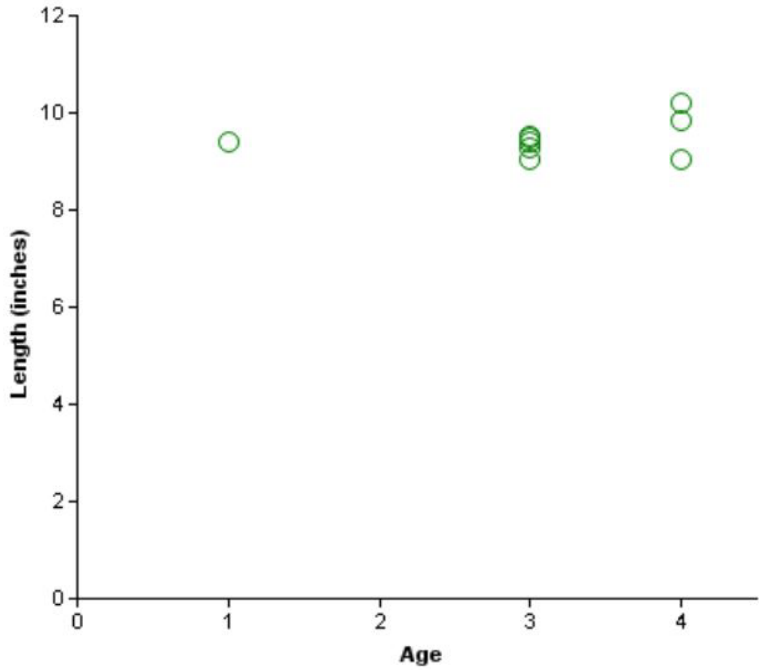


Figure 14. Length at age for White Crappie collected from electrofishing at John Paul Landing Reservoir, Texas, November 2019.

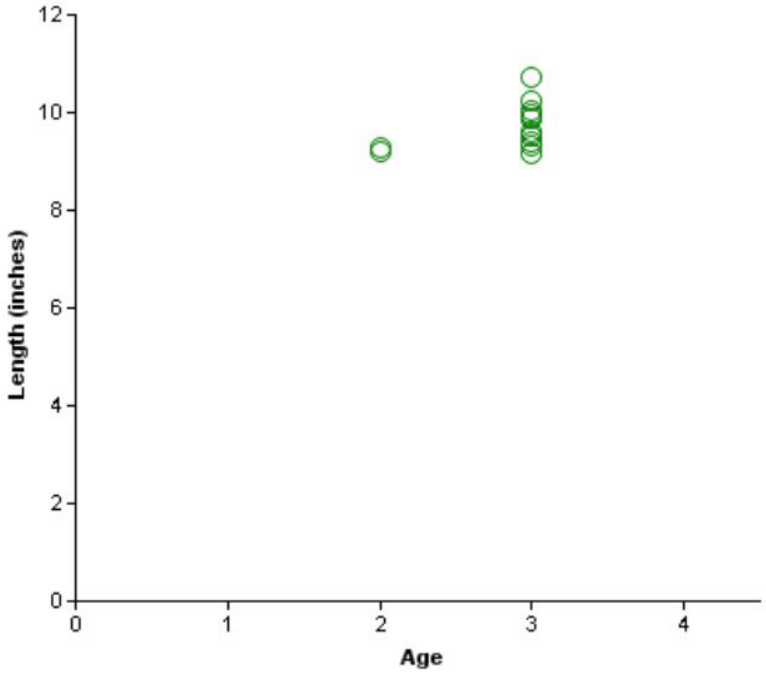


Figure 15. Length at age for White Crappie collected from electrofishing at John Paul Landing Reservoir, Texas, April 2020.

Proposed Sampling Schedule

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

	Survey year			
	2020-2021	2021-2022	2022-2023	2023-2024
Angler Access				S
Structural Habitat				S
Vegetation – Complete				S
Vegetation – Exotic	A	A	A	
Electrofishing (Daytime)				S
Baited tandem hoop netting			S	
Trap netting				S
Report				S

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

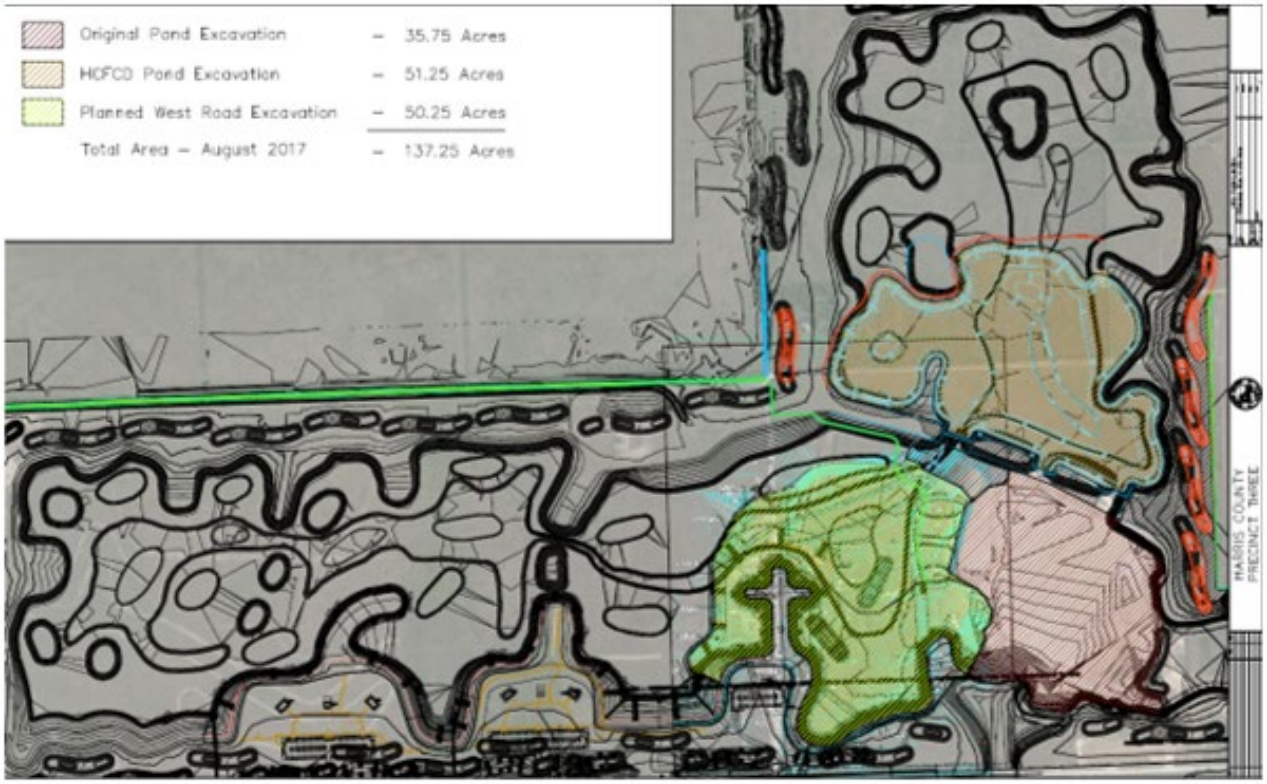
Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from John Paul Landing Reservoir, Texas, 2019-2020. Sampling effort was 5 net series for hoop netting and 1 hour for electrofishing.

Species	Hoop Netting		Fall Electrofishing		Spring Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Spotted Gar			3	3.00 (72)		
Gizzard Shad			9	9.00 (41)	2	2.00 (100)
Threadfin Shad			23	23.00 (28)	2	2.00 (67)
Common Carp	3	0.30 (71)	7	7.00 (33)	5	5.00 (46)
Red Shiner					1	1.00 (100)
Bullhead Minnow			59	59.00 (23)	7	7.00 (58)
Yellow Bullhead	24	2.40 (46)				
Channel Catfish	445	44.50 (43)	18	18.00 (24)	29	29.00 (34)
Green Sunfish					7	7.00 (33)
Warmouth			6	6.00 (46)		
Bluegill	13	1.30 (47)	32	32.00 (23)	12	12.00 (35)
Longear Sunfish	1	0.10 (100)	13	13.00 (45)	19	19.00 (32)
Redear Sunfish	11	1.10 (66)				
Largemouth Bass			1	1.00 (100)	2	2.00 (100)
White Crappie			64	64.00 (20)	41	41.00 (22)
Black Crappie					1	1.00 (100)
Freshwater Drum			41	41.00 (34)	1	1.00 (100)
Hybrid Tilapia			2	2.00 (67)		

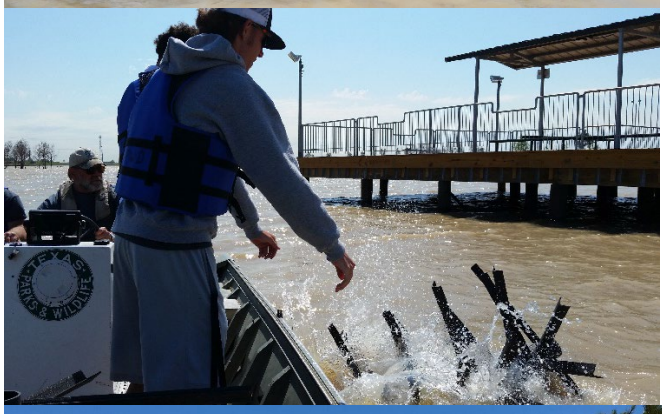
APPENDIX B – Map of sampling locations

Location of sampling sites, John Paul Landing Reservoir, Texas, 2019-2020. Fall electrofishing, spring electrofishing, and hoop net sites are indicated by F, S, and H, respectively. One spring electrofishing site was located in the newest addition to the reservoir, which is not visible on satellite imagery, so it has not been added to the GIS shapefile yet. Water level was near full pool at time of sampling.

APPENDIX C – Engineering schematic of total (future) reservoir area



APPENDIX D – Examples of habitat types and amenities

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