SURVEY REPORT

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

FISH MANAGEMENT SURVEY AND RECOMMENDATIONS

FOR

EUFAULA LAKE

2023

SURVEY REPORT

State: Oklahoma

Project Title: Eufaula Lake Fish Management Survey Report

Period Covered: 2021-2023

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Date Prepared: January 25th, 2024

Eufaula Lake

ABSTRACT

Eufaula Lake was surveyed by fall trap nets (2021, 2023) and fall night electrofishing (2021) to monitor trends in fish populations. Largemouth Bass abundance increased significantly while Spotted Bass and Smallmouth Bass abundance decreased. Crappie abundance decreased, however abundance of Crappie 10 inches and greater was at the second highest level recorded. Trap net surveys, spring electrofishing surveys and fall night electrofishing surveys should continue to monitor trends in Crappie and Black Bass populations.

INTRODUCTION

Eufaula Lake impounds the Deep Fork River, North Canadian River, South Canadian River and Gaines Creek. The dam is located 12 miles east of the City of Eufaula in McIntosh County, Oklahoma. Eufaula Lake covers 102,500 surface acres and was constructed in 1964. It is operated by the United States Army Corps of Engineers (USACE) for the purposes of flood control, water supply, hydroelectric power and navigation. Lake Eufaula has a mean depth of 23 feet and a maximum depth of 87 feet, a shoreline development ratio of 13.4, and a water exchange rate of 1.8. Secchi disc visibility ranges from about 50 (in) in the central pool in August to about 12 (in) in the Gaines Creek arm; turbidity is mainly from suspended clay in less clear areas of the lake. Fish habitat consists primarily of flooded timber and rock in some areas of the lake. Water willow has become established in some areas of the lake in recent years. Approximately six miles of shoreline having little or no habitat was planted with water willow in 2003; however, additional plantings have not been conducted.

Reservoir-strain Smallmouth Bass were first stocked in 1992 and continued through 1998 with fish distributed in eight areas of the lake where there was suitable habitat. The fish were reared in a series of nursery ponds operated in conjunction with the now defunct Fishermen's Association of Oklahoma (FAO). Stocking were discontinued when natural reproduction was confirmed. Smallmouth Bass abundance have declined significantly in recent years, likely due to water elevation and condition during and after spring spawning.

Florida largemouth bass were first stocked in mid-2000's (Appendix 1), in areas having suitable habitat. Currently the goal is to stock Florida largemouth bass in Eufaula Lake on a biannual basis. This varies based on available fry from the hatchery section. Stockings are now focused in the Duchess Creek, Porum, Broken Cove and Longtown Cove areas.

The most recent Fish Health Survey was conducted in early 2019, no new pathogens of concern were found in the tested fish (Largemouth Bass, Gizzard Shad, White Crappie, Common Carp, Blue Catfish and White Bass). Largemouth Bass Virus (LMBV) was confirmed, however, it was expected to be found based on the results of previous testing. LMBV was first detected in Eufaula Lake in 2001. Then found in subsequent testing in 2002 and 2003. White Crappie were surveyed in 2011 with no pathogens of concern found. Paddlefish were surveyed in 2014 with no pathogens of concerns found (ODWC Fish Health Survey Report 2019).

The Arkansas River basin has been identified as a major pathway for the introduction of aquatic nuisance species. Due to its proximity to the McClellan Kerr Arkansas River Navigation System, Eufaula Lake is particularly vulnerable to the transport of invasive species by boaters. Zebra Mussels, salvinia, and water hyacinth have been confirmed in Eufaula Lake.

Fluctuating water levels and deteriorating fish habitat are major lake management problems. Most game fish populations have fluctuated in abundance over the years due mostly to year-class strengths being affected by success of reproduction and/or recruitment. Boom and bust cycles are not uncommon and can be attributed to periods of unfavorable water conditions. High and stable spring (April - May) water levels improve spawning success. A summer rise (June-Aug) of 1-2 ft. in water levels provides escape cover for newly spawned fish and improves their survival and recruitment. Water levels over an elevation of 586 ft. during these time periods should help to increase crappie and bass populations. Studies at Eufaula Lake have shown that high mortality occurs with greater water level fluctuations for young of year fish. Largemouth Bass had doubled in abundance following

implementation of a water level plan in 1985. However, their abundance declined considerably following 2000 due to poor recruitment, Largemouth Bass Virus disease and the cancellation of a lake level manipulation plan.

In 2007 congress passed legislations "Section 3133(b)(1) of the Water Resources Development Act of 2007" requiring the development of the "Lake Eufaula Advisory Committee" (LEAC) with a purpose of *"The Committee shall provide information and recommendations to the Secretary of Defense through the Secretary of the Army, the Assistant Secretary of the Army for Civil Works, and the U.S. Army Corps of Engineers ("the Corps"), regarding the operations of Lake Eufaula for the project purposes for Lake Eufaula. According to section 3133(a) of the 2007 WRDA, the Lake Eufaula project goal is to maximize the use of available storage in a balanced approach that incorporates advice from representatives from all the project purposes to ensure that the full value of the reservoir is realized by the United States. To achieve this goal, recreation is recognized as a project purpose at Lake Eufaula, pursuant to section 4 of the Flood Control Act of December 22, 1944 (58 Stat. 889)".* The committee was officially formed in 2015 and was administratively disbanded in 2018 after accomplishing its purpose.

Based on the recommendation of the LEAC, no lake level manipulation plan should be implemented, and no reallocation study should occur. However, in the interest of recreation with an added benefit to the fishery, the LEAC recommended changing release methods to hydropower only when the lake is between elevations of 585 and 587 during the months of May- September. The USACE partially agreed, stating "flood events are unpredictable and this will be implemented when circumstances allow. Safety of the public, flows, rainfall amounts, lower Arkansas River evacuation needs, must be considered during each flood before a decision is made to implement. When conditions allow, the Tulsa District will use this recommendation for release of flood waters. The estimated time this will occur is approximately 20%".

Fish attractor habitat sites have increased from 25 locations on the lake in 2005, to rough 200 listed sites in 2020. Many of the sites need to be refurbished and buoys inspected. Maintaining that volume of sites on a lake the size of Eufaula is nearly impossible with the limited manpower. It is recommended to reduce the number of sites containing cedar trees to no more than 100. It would then be feasible to maintain all brush piles at Eufaula Lake on a five year rotation. It is also recommended to increase the number and type of artificial structures, since they do not degrade over time.

A Creel survey of Eufaula Lake was conducted from 2010 to 2014. A total of 4,328 anglers were interviewed between March and June of 2010 to 2014 and indicated that the majority of anglers (58 %) targeted Crappie. The remaining pressure was split among Blue Catfish anglers (14 %), Largemouth Bass anglers (15 %), Channel Catfish anglers (6 %), White Bass anglers (4 %), Flathead Catfish anglers (1 %), Smallmouth Bass anglers (0.3 %), and any species (1 %). Overall approximately 78,069 fishermen visited Eufaula from March to June and spent a total of 394,325 hours on the water.

As of 2005 boating access development projects have been completed at nine locations, by 2020 an additional three were completed. As of 2020, the Crowder boat dock (2005), Deep Fork boat ramp (2006), and the South Point (Peters Point)(Nichols Point) boat ramp and asphalt parking lot (2016) are

the only projects still within their considered useful life (20 years) that receive annual inspections and required maintenance.

Eufaula Lake was surveyed by fall trap nets (2021, 2023) and fall night electrofishing (2021) to monitor trends in fish populations.

RESULTS

Largemouth Bass

Largemouth Bass (LMB) were surveyed in the fall of 2021 by means of night boat electrofishing. A total of 27, ten minute shoreline units fixed on areas of quality habitat were surveyed. Overall LMB abundance, catch per unit of effort (CPUE) increased significantly in 2021 (CPUE = 107.8) compared to 2020 (CPUE = 62.4) (Table 1). Relative abundance increased for all size classes during the 2021 survey except for memorable size fish where no change occurred. Abundance of Largemouth Bass less than eight inches in 2021 (CPUE = 29.8) increased significantly compared to 2020 (CPUE = 8.4). Body conditions decreased slightly for all size classes except for memorable size fish, but all remained in good condition. It is important to note that the results from the 2020 and 2021 fixed sites were from the fall night electrofishing sites used for Smallmouth Bass surveys. These areas focused strictly on rocky substrate in two arms of the lake (Central Pool and South Canadian).

Length frequency histograms (Figure 1) showed a slight increase in overall size structure, in 2021 compared to 2020. Abundance of fish greater than 16 inches increased from 5% to 6%. The abundance of fish less than eight inches also increased from 17% to 41%. Indicating excellent recruitment from the 2020 year class

Age data was collected on a subset of Largemouth Bass from the 2021 survey. Largemouth Bass growth was moderate but steady, taking approximately four years to reach the legal harvest length of 14 inches with a mean length of 15.9 inches by age four a slight decrease compared to the 2020 spring survey (Table 5). However, growth rates increased for ages six and up. Von Bertalanffy growth curve gives a visual representation of the predicted growth of Largemouth Bass for Eufaula Lake and estimates the mean maximum length at 22.3 inches (Table 2, Figure 2) based on the 2021 survey results, and increase of 2.6 inches compared to 2020. The 2021 age frequency (Figure 3) indicated strong 2021 (age 0), 2020 (age 1), and 2019 (age 2) year classes. The largest fish sampled from the 2021 survey measured 20.7 (in) in total length and 6.2 (lbs.) in weight.

Florida largemouth bass (FLMB) are stocked periodically in Eufaula Lake in an effort to introduce FLMB genetics into the bass population, the most recent stocking occurred in 2021 (Appendix 1). FLMB will grow quicker and larger than native Northern Largemouth Bass, given enough forage and the right conditions within the system. Largemouth Bass genetics and age data were sampled in 2023 to determine the extent to which the FLMB genetics integrated into the population. Data is still in processing. Given the sheer size of Eufaula Lake and the unlikely event for FLMB to add genetics to the

entire population, Florida largemouth bass stocking efforts are focused on areas identified as quality bass habitat (Duchess Creek, Porum, Brooken Cove and Longtown cove).

Table 1. Total number (No.), catch per unit of effort (CPUE), and relative weights (Wr) by size groups of Largemouth Bass collected by **fall night electrofishing** from Eufaula Lake. Sample sites were **fixed** on areas of quality habitat. Acceptable Wr values are ≥90.

		Total CPUE	Substock 0-7.8 in	Stock 7.9 in		Quality 11.8 in		Preferred 15 in		Memorable 20.1 in		Trophy 24.8 in	
Year	No.	CPUE	CPUE	CPUE	Wr	CPUE	Wr	CPUE	Wr	CPUE	Wr	CPUE	Wr
2020	281	62.4	8.4	26.0	99	20.9	97	6.9	99	0.2	103	.	.
2021	485	107.8	29.8	42.2	93	24.0	95	11.6	97	0.2	119	.	.

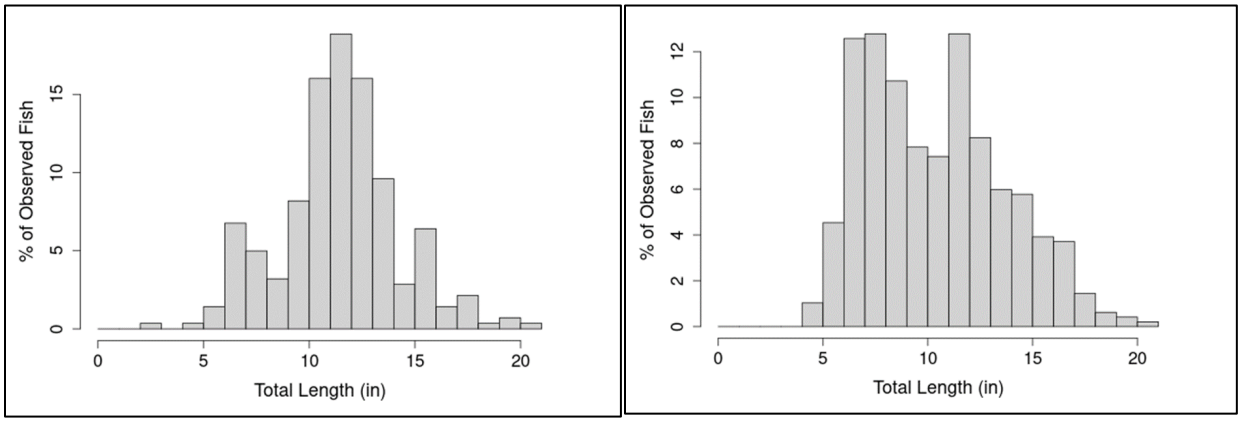

Figure 1. Largemouth Bass Length Frequencies for Eufaula Lake 2020 (left) and 2021 (right). Fall Night Fixed Sites.

Table 2. Mean Total Length at age (inches) and L infinity (estimated mean maximum length for Largemouth Bass from Eufaula Lake.

Year	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	L inf.
2019 Spring Health Survey	6.9	10.5	13.3	17.6	15.5	16.2	18.3	.	.	.	.	.	18.6
2019 Fall Tournament	.	15.2	16.6	17.3	17.8	18.8	18.2	19.7	.	.	20.6	.	19.9
2020 Spring Electro	7.6	11.2	14.2	15.6	17.0	18.3	19.3	18.7	19.2	.	.	.	19.7
2021 Fall Electro	7.0	9.8	12.7	15.9	.	19.4	.	19.7	.	.	.	.	22.3

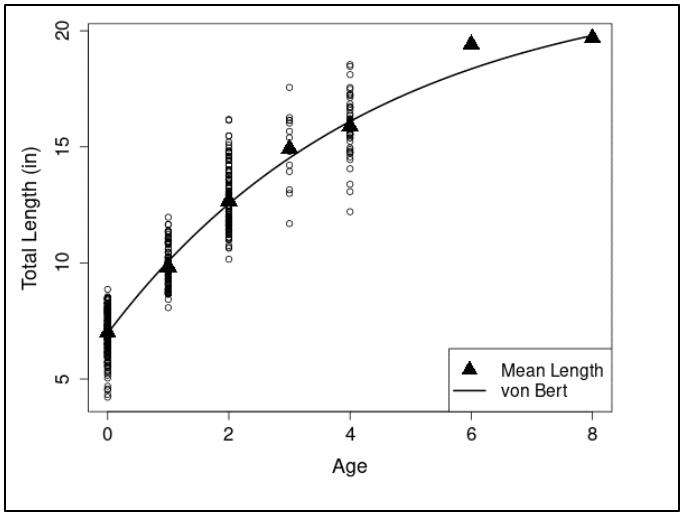

Figure 2. 2021 Largemouth Bass Mean Length at Age: Von Bert Estimated Growth Curve. The Von Bert Growth Curve indicates the estimated growth rate of Largemouth Bass.

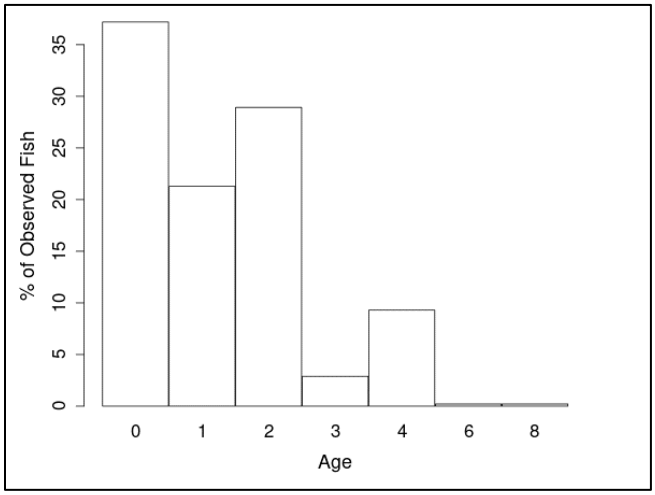

Figure 3. 2021 Largemouth Bass Age Frequency.

<u>Spotted Bass</u>

Spotted Bass were surveyed in the fall of 2021 by means of night boat electrofishing. A total of 27 ten minute shoreline units fixed on areas of quality habitat were surveyed. Overall Spotted Bass abundance decreased from 2020 (CPUE= 88.9) to 2021 (CPUE=51.8) (Table 3). Relative abundance for all size classes decreased in 2021 with the largest decrease occurring in substock size fish (CPUE = 4.2) compared to 2020 (CPUE = 22.2). It is important to note that the results from the 2020 and 2021 fixed sites were from the fall night electrofishing sites used for Smallmouth Bass surveys. These areas focused strictly on rocky substrate in two arms of the lake (Central Pool and South Canadian).

The 2021 length frequency histogram (Figure 4) is similar to the 2020 survey but shows a decrease in number of Spotted Bass less than seven inches in total length. Body conditions had decreased in all size

classes but remained at acceptable levels except for stock size fish (Wr=88) (Table 3). The largest fish sampled from the 2021 survey measured 15.9 (in) in total length and 1.9 (lbs.) in weight.

Age data was collected on a subset of Spotted Bass from the 2021 survey. Spotted Bass grew to a mean length of 9.1 inches by age one, and a mean length of 11.5 inches by age two (Table 4). The Von Bertalanffy growth curve (Figure 5) gives a visual representation of the predicted growth of Spotted Bass for Eufaula Lake and estimates the mean maximum length at 17.2 inches. Greater than 50% of the fish sampled were aged to be one (Figure 6), indicating a strong 2020 year class.

While Spotted Bass abundance has decreased, growth rates remain good. Spotted bass typically grow slower and obtain smaller sizes than Largemouth Bass but they compete for the same food source. For management reasons, a low abundance of Spotted Bass is preferred. Spotted Bass have no minimum length limit.

Table 3. Total number (No.), catch per unit of effort (CPUE), and relative weights (Wr) by size groups of Spotted Bass collected by **fall night electrofishing** from Eufaula Lake. Sample sites were **fixed** on areas of quality habitat. Acceptable Wr values are ≥90.

		Total CPUE	Substock 0-7 in	Stock 7.1 in		Quality 11 in		Preferred 13.8 in		Memorable 16.9 in		Trophy 20.1 in	
Year	No.	CPUE	CPUE	CPUE	Wr	CPUE	Wr	CPUE	Wr	CPUE	Wr	CPUE	Wr
2020	400	88.9	22.2	48.9	101	12.7	95	5.1	99	.	.	.	.
2021	223	51.8	4.2	32.2	88	12.0	92	3.3	97	.	.	.	.

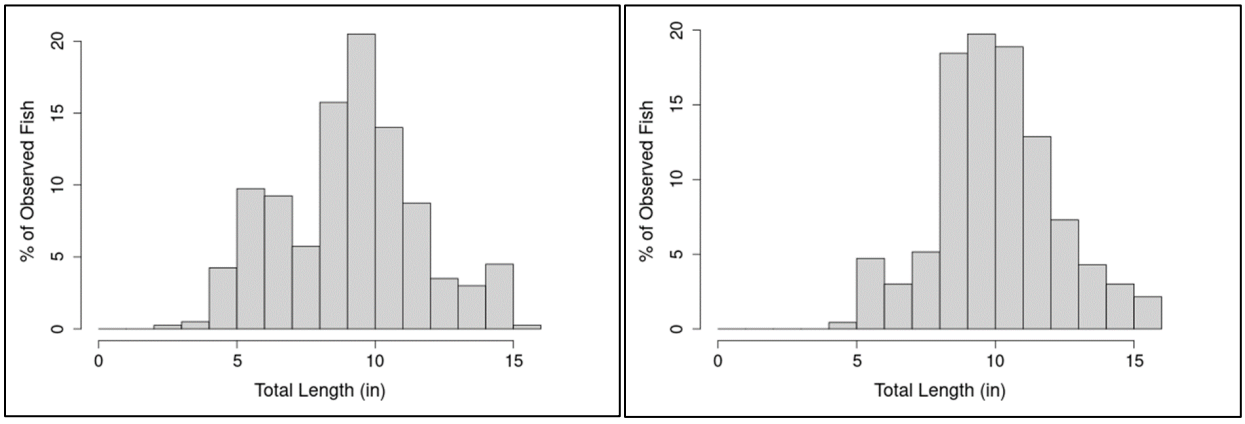

Figure 4. Spotted Bass Length Frequencies for Eufaula Lake 2020 (left) and 2021 (right).

Table 4. Mean Total Length at age (inches) and L infinity (estimated mean maximum length) for Spotted Bass from Eufaula Lake.

Year	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	L inf.
2020	5.9	11.7	13.2	13.1	16.9	15.2	.	.	.	14.1
2021	9.1	11.5	.	14.3	14.8	.	.	.	.	17.2

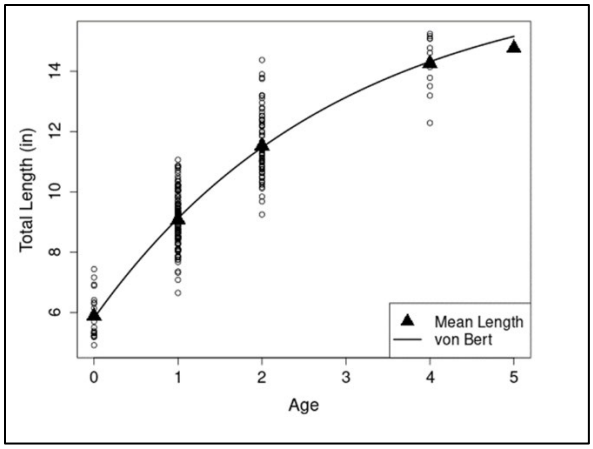

Figure 5. 2021 Spotted Bass Mean Length at Age: Von Bert Estimated Growth Curve. The Von Bert Growth Curve indicates the estimated growth rate of Spotted Bass.

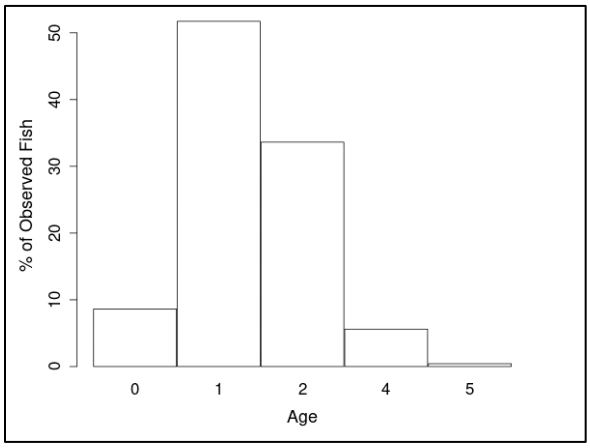

Figure 6. 2021 Spotted Bass Age Frequency.

Smallmouth Bass

Fall nighttime electrofishing surveys for Smallmouth Bass were conducted in 2021. Sample sites were fixed from year to year on areas with rocky substrate. Overall Smallmouth Bass abundance decreased from 2020 (CPUE = 0.9) to 2021 (CPUE = 0.7) (Table 5). Only three fish were collected during the 2021 survey. Relative abundance increased for stock size fish (CPUE = 0.2) but decreased for both quality and preferred size fish. Body conditions were considered poor for all size classes. The largest fish surveyed was from 2007 and measured 16.3 (in) in total length and weighed 2.2 (lbs.) in weight. Sample size is considered too small to make any reliable conclusions about population dynamics.

Table 5. Total number (No.), catch per unit of effort (CPUE), and relative weights (Wr) by size groups of Smallmouth Bass collected by **fall night electrofishing** from Eufaula Lake. Sample sites were **fixed** on areas of quality habitat. Acceptable Wr values are ≥90.

		Total CPUE	Substock 0-7 in	Stock 7.1 in		Quality 11 in		Preferred 13.8 in		Memorable 16.9 in		Trophy 20.1 in	
Year	No.	CPUE	CPUE	CPUE	Wr	CPUE	Wr	CPUE	Wr	CPUE	Wr	CPUE	Wr
2007	69	15.33	1.6	11.8	84	1.6	85	0.2	74	0.2	92	.	
2020	4	0.9	.	.	.	0.4	89	0.4	94	.	.	.	.
2021	3	0.7	.	0.4	85	.	.	0.2	87	.	.	.	.

Crappie

Crappie were surveyed in 2021, and 2023 by fall trap nets. The 2021 survey had a total of 30 net nights. The 2023 survey had a total of 142 net nights. Randomly selected sites of all habitat types were sampled. Relative Abundance during the 2021 (CPUE = 28.8) survey increased slightly compared to 2020 (CPUE = 27.4), then decreased in 2023 (CPUE = 17.1) (Table 6). All size classes had decreased during the 2023 survey except for memorable size (11.8-15 in) where a slight increase was observed in 2023 (CPUE = 0.5) compared to 2021(CPUE = 0.3). While total relative abundance decreased, abundance of Crappie 10 inches and larger varied since 1981 but appears to be on an increasing trend, with 2023 (CPUE = 4.1) the second highest recorded (Figure 7). Body conditions for all size classes had increased in 2023 compared to 2021, except for preferred size fish where a slight decrease occurred. Body conditions for all size classes during both surveys, were well above the acceptable value (Wr≥90) (Table 6). Both 2021 and 2023 length frequency histogram indicated nearly 20% of the fish surveyed were ten inches or larger an increase compared to the 7% in 2020 (Figure 8). Of the 2,275 Crappie sampled 81 were Black Crappie. Crappie data were combined and reported as total Crappie for all surveys.

When comparing catch rates between arms. An increase was observed in both Deep Fork and North Canadian arms, while South Canadian, Central Pool and Gaines Creek arms all saw a decrease in total abundance (Table7). Gaines Creek arm consistently has the highest catch rates between arms. It showed a decrease from 2021 (CPUE = 51.7) to 2023 (CPUE = 27.4). It's worth noting, with only six net nights sampled, variability between sites during the 2021 survey was high, at 40 %. The increased number of net nights in 2023, reduced variability to 18 %, giving higher confidence with the abundance estimates. While the 2021 Gaines Creek abundance was estimated at (CPUE 51.7) it had a wide estimated range for the upper and lower confidence levels, (U 95% CPUE = 90.8, L 95% CPUE = 10.8). 2023 Gaines Creek (U 95% CPUE = 36.4, L 95% CPUE = 17.2) estimated abundance (CPUE = 27.4) was well within the confidence values present in 2021.

Age data was collected on a subset of Crappie from both 2021 and 2023 surveys. Growth was considered good for all ages and years surveyed. Mean length at ages varied slightly from 2021 to 2023. Crappie grew to a mean length of 9.8 inches by age two and 11.7 inches by age three (Table 8). The 2023 age frequency histogram (Figure 9) indicated strong and consistent year classes for 2021 (age 2),

2022 (age 1), and 2023 (age 0). The largest fish sampled was from the 2023 survey and measured 14.3 (in) in total length and 1.7 (lbs.) in weight.

Crappie at Eufaula Lake are considered to be a fast growing, healthy population. While abundance has decreased the number of fish greater than ten inches is trending higher and was the second highest levels since 1981. Variability was greatly reduced and higher confidence in relative abundance estimates were achieved with the increased sampling efforts in 2023. Eufaula Lake is known to cycle through boom and bust years based on environmental conditions, in particular, water levels during and after spawning season. No changes to creel or length limits are recommended at this time.

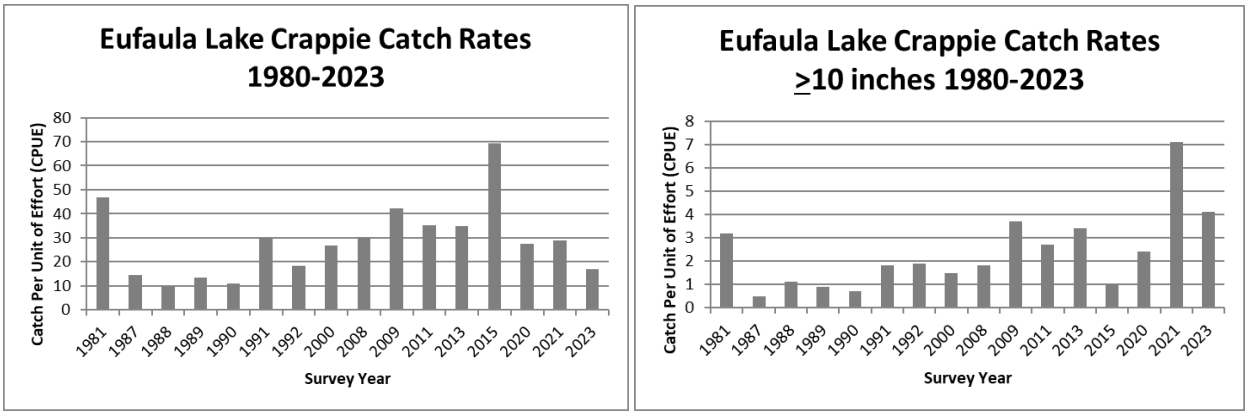

Figure 7. Total Crappie catch rates (left) and greater than or equal to 10 inches (right) from fall trap net surveys 1981-2023.

Table 6. Total number (No.), catch per unit of effort (CPUE), and relative weights (Wr) by size groups of **Crappie** collected by fall trap netting from Eufaula Lake. Acceptable Wr values are ≥90.

		Total CPUE	Substock 0-5 in	Stock 5.1 in		Quality 7.9 in		Preferred 9.8 in		Memorable 11.8 in		Trophy 15	
Year	No.	CPUE	CPUE	CPUE	Wr	CPUE	Wr	CPUE	Wr	CPUE	Wr	CPUE	Wr
2008	688	30.4	15.4	7.9	97	5.4	100	1.4	105	0.4	99	.	.
2009	1053	42.1	22.9	9.7	98	7.7	105	3.4	105	0.3	109	.	.
2011	878	35.1	13.6	15.9	91	2.9	100	1.9	106	0.8	103	.	.
2013	867	34.7	26.6	2.5	100	4.5	99	3.1	100	0.3	95	.	.
2015	1579	69.4	53.0	9.8	90	3.0	91	0.9	99	0.1	100	.	.
2020	679	27.4	7.9	8.6	96	8.6	102	2.0	97	0.4	97	.	.
2021	815	28.8	7.8	3.8	95	10.1	100	6.8	103	0.3	98	.	.
2023	2275	17.1	4.5	2.5	96	6.0	101	3.6	102	0.5	100		

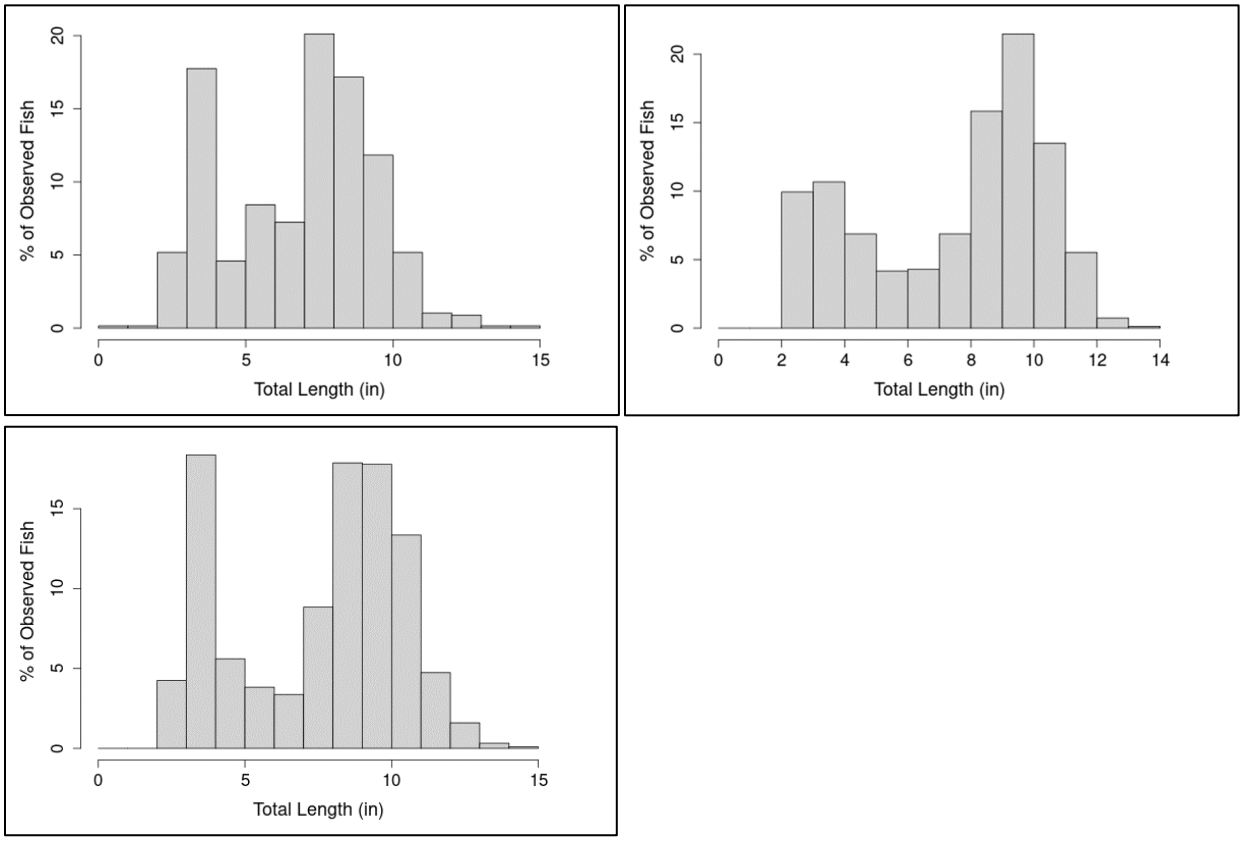

Figure 8. Crappie, Trap Net Length Frequency Histogram 2020 (top left), 2021 (top right), and 2023 (bottom).

Table 7. Crappie catch per unit of effort (CPUE) totals and ≥10 inches, stratified by arm. Collected by fall trap netting from Eufaula Lake.

	All Arms		**North Canadian**		**South Canadian**		**Central Pool**		**Deep Fork**		**Gaines Creek**	
Year	**Total**	**≥10**	**Total**	**≥10**	**Total**	**≥10**	**Total**	**≥10**	**Total**	**≥10**	**Total**	**≥10**
2020	27.4	2.4	31.0	2.9	16.7	1.4	7.5	1.5	24.5	2.4	58.0	3.8
2021	28.8	7.1	14.3	5.8	25.3	9.4	43.6	10.2	15.9	2.5	51.7	9.0
2023	17.1	4.1	15.9	4.7	11.3	2.3	12.8	5.2	18.0	4.1	27.4	4.3

Table 8. Mean Total Length at age (inches) for Crappie from Eufaula Lake.

Year	Age 1	Age 2	Age 3	Age 4	Age 5
2008	7.5	9.9	11.6	.	.
2009	7.4	10.1	11.8	13.6	.
2011	6.1	9.2	11.3	12.1	.
2015	6.5	8.7	12.3	.	.
2020	7.3	9.6	11.7	.	12.4
2021	7.2	9.5	11.2	12.	.
2023	8.3	9.8	11.7	11.9	12.3

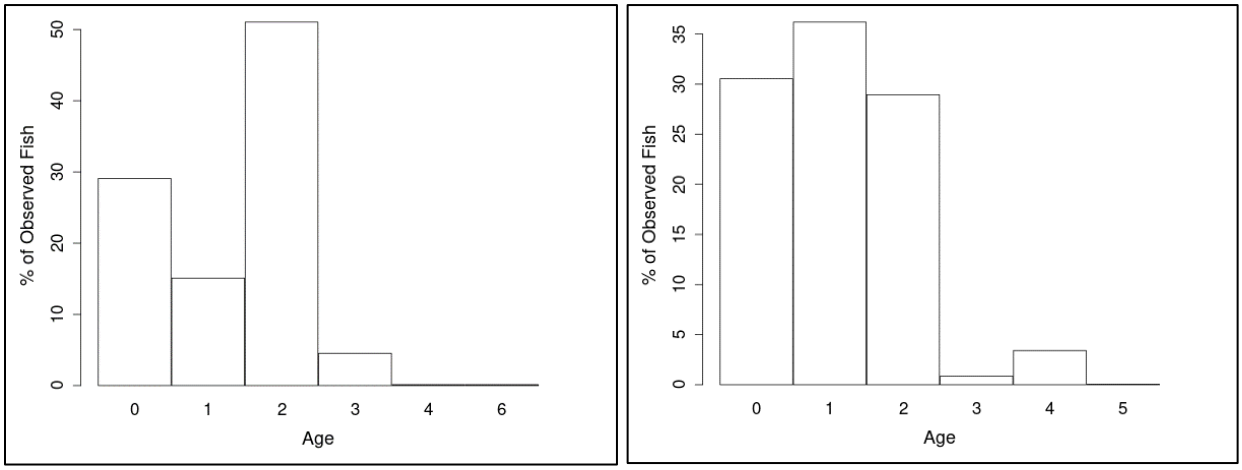

Figure 9. 2021 (left) and 2023 (right) Crappie Age Length Frequency.

Appendix 1. Species, number and size of fish stocked in Eufaula Lake since 2000.

Date	Species	Number	Size (inches)
2001	Threadfin Shad	3,000	2.5
2002	Threadfin Shad	215,040	1.25
2004	Florida Largemouth Bass	147,825	1.5
2005	Florida Largemouth Bass	100,071	1.5
2007	Paddlefish	1,028	20
2009	Paddlefish	41,056	18
2010	Paddlefish	17,041	11-18
	Threadfin Shad	13,600	3
2011	Paddlefish	9,206	12-24
2012	Paddlefish	47,648	11-17
2013	Paddlefish	38,252	11-24
	Florida Largemouth Bass	111,815	1.5
2014	Florida Largemouth Bass	105,200	1.5
	Florida Largemouth Bass	367	10
2016	Paddlefish	33,146	10-12
	Florida Largemouth Bass	100,044	1.5
2017	Florida Largemouth Bass	114,492	1.5
	Alligator Gar	2,472	2-13
2018	Alligator Gar	37,440	1-24
2019	Florida Largemouth Bass	120,558	1.5
	Alligator Gar	69,061	1-9
2020	Alligator Gar	10,024	2
2021	Florida Largemouth Bass	120,086	1.5
2023	Alligator Gar	12,000	1-2