LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES

OFFICE OF FISHERIES
INLAND FISHERIES SECTION

WATERBODY MANAGEMENT PLAN PART B

CROSS LAKE

WATERBODY EVALUATION &
RECOMMENDATIONS 2023

CHRONOLOGY

DOCUMENT SCHEDULED TO BE UPDATED EVERY THREE YEARS

December 2013 – Prepared by:
James Seales, Biologist III, District 1
Jeff Sibley, Biologist Manager, District 1
Kevin Houston, Biologist III, District 1

January 2017 – Updated by:
Jeff Sibley, Biologist Manager, District 1

January 2020 – Updated by:
Jeff Sibley, Biologist Manager, District 1

January 2023 – Updated by:
Jeff Sibley, Biologist Manager, District 1

The remainder of this page left intentionally blank.

TABLE OF CONTENTS

WATERBODY EVALUATION

STRATEGY STATEMENT

Recreational

Sportfish species are managed to provide a sustainable population while providing anglers with the opportunity to catch or harvest numbers of fish adequate to maintain angler interest and effort. Bass anglers are afforded the opportunity to catch an occasional trophy fish through the introduction of Florida Largemouth Bass.

Commercial

Catfish are managed to provide a sustainable population while providing anglers and commercial fishers the opportunity to harvest numbers of fish. Commercial fishing is only allowed by contract with the City of Shreveport as per a city ordinance (see City Regulations below).

Species of Special Concern

No threatened or endangered fish species are found in this waterbody. Bald Eagles (*Haliaeetus leucocephalus*) are frequently seen around the lake during the winter.

EXISTING HARVEST REGULATIONS

Recreational

A 14"-17" protected slot limit with an 8 fish creel (no more than 4 fish over 17") was in effect from April 1, 1991 until April 20, 2014 for black bass. The slot limit was replaced with statewide regulations (10 fish creel with no minimum length limit). Statewide regulations have been in effect for all other game fish species since impoundment. The recreational fishing regulations may be viewed at the link below:
http://www.wlf.louisiana.gov/regulations

Commercial

The use of gill nets, trammels nets, hoop nets and fish seines was prohibited in Cross Lake in September 1986 by the Louisiana Wildlife and Fisheries Commission. Commercial fishing is allowed only by contract with the City of Shreveport per city ordinance (see City Regulations below for more details). The statewide commercial fishing regulations may be viewed at the link below:
http://www.wlf.louisiana.gov/regulations

City Regulations

Cross Lake is owned, operated and maintained by the City of Shreveport as a water supply reservoir for the city.

Act No. 31 of the 1910 Louisiana Legislature (Appendix I) transferred Cross Lake to the City of Shreveport as a water supply for the city and gave the city the authority to enact and enforce rules and regulations pertaining to Cross Lake.

In addition to the prohibition of gill nets, trammels nets, hoop nets and fish seines by the Louisiana Wildlife and Fisheries Commission, the City of Shreveport has ordinances regulating commercial fishing activities on the lake. Section 78-403 of the Code of Ordinances

prohibits the taking of fish, turtles or other wildlife from Cross Lake or by the use of nets of any kind, traps, wire baskets, yoyos, set lines, or trotlines. Section 78-404 allows commercial fishing on Cross Lake pursuant to a contract with the City of Shreveport, and allows such contract to provide for exemptions to Section 78-403.

The City of Shreveport passed a resolution on September 24, 2013 authorizing the Mayor to enter into an agreement with two interested parties to conduct turtle trapping operations on Cross Lake.

Boat permits are required and may be obtained from the Cross Lake Patrol Office. The Cross Lake Patrol is responsible for enforcing city ordinance pertaining to Cross Lake. Rules and regulations pertaining to Cross Lake can be viewed at:
https://shreveportla.gov/1928/Boating-Permit

Shreveport Police Department – Cross Lake Patrol
2900 Municipal Pier Rd.
Shreveport, LA 71119
318-673-7245

The Code of Ordinances concerning Cross Lake for the City of Shreveport may be viewed at the link below:

https://library.municode.com/la/shreveport/codes/code_of_ordinances?nodeId=PTIICOOR_CH78STSIOTPUPL_ARTVIIICRLA

SPECIES EVALUATION

Recreational

Cross Lake has been sampled with various types of gear over the years. Biomass (rotenone) sampling was one of the primary sampling methods utilized from 1967 through 1989 in an effort to estimate standing crop of all fish in the lake. Biomass sampling was discontinued in 1990. Electrofishing samples were initiated in 1988 to collect information specifically on Largemouth Bass (*Micropterus nigricans*) and crappie (*Pomoxis* spp.) populations. Largemouth Bass and crappie are targeted as species indicative of the overall health of fish populations due to their high position in the food chain. Forage samples are conducted in conjunction with fall electrofishing samples. Lead netting replaced electrofishing in 2010 as the primary sampling gear to evaluate the crappie population. Gill net sampling was initiated in 1978 to sample the hybrid Striped Bass population and commercial species of fish (e.g., catfish, Common Carp, and Freshwater Drum).

Largemouth Bass Biomass Estimates

Electrofishing is the best indicator of Largemouth Bass abundance and size distribution, with the exception of large fish (i.e.,> 5 lbs.). Sampling with gill nets provides a better assessment of large bass and other large-bodied fish species (e.g., Bowfin or Common Carp). Biomass (rotenone) sampling was the primary method used to sample the fisheries in Cross Lake until 1988. Figure 1 indicates the standing crop estimates of Largemouth Bass in pounds per acre, from 1967 through 1989. There was no significant change in the standing crop of Largemouth Bass on Cross Lake during the period sampled except for the 1986 sample, when nearly 25 pounds of Largemouth Bass per acre was the average for three one-acre rotenone samples. The yearly average standing crop for all other years sampled ranged from 1.7 to 7.6 pounds per

acre. These estimates are quite possibly low, as the typical sites selected on Cross Lake for rotenone sampling were not in ideal bass habitat. During the 1986 sampling, one site was selected in shallow, cypress tree-filled flat and yielded in excess of 70 pounds of bass. This lone sample accounts for the variance in the 1986 sampling as seen below, but may be more indicative of the standing crop of Largemouth Bass in suitable habitat on Cross Lake.

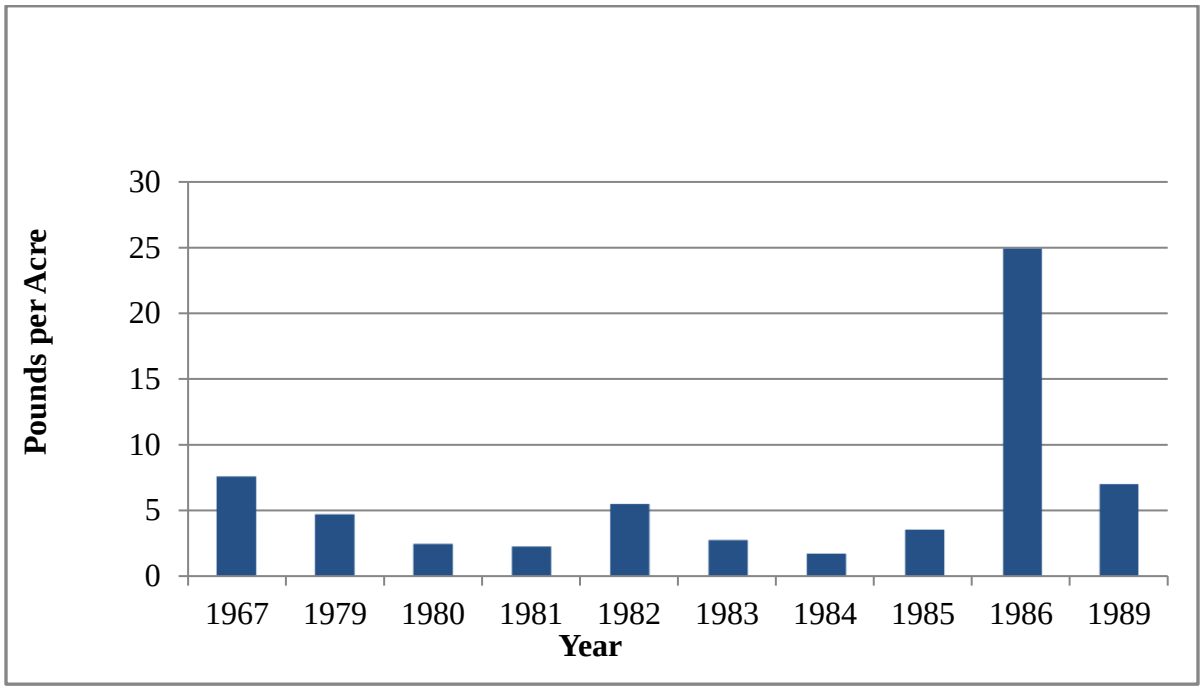

Figure 1. Annual estimates in pounds per acre of Largemouth Bass collected during biomass (rotenone) sampling in Cross Lake, LA from 1967 to 1989.

Largemouth Bass Catch per Unit Effort and Size Distribution

Electrofishing has been the primary sampling technique utilized on Cross Lake in recent years. Results from spring electrofishing samples for stock-size (i.e., total length ≥ 8 in.) Largemouth Bass from 1990 – 2022 are presented in Figure 2.

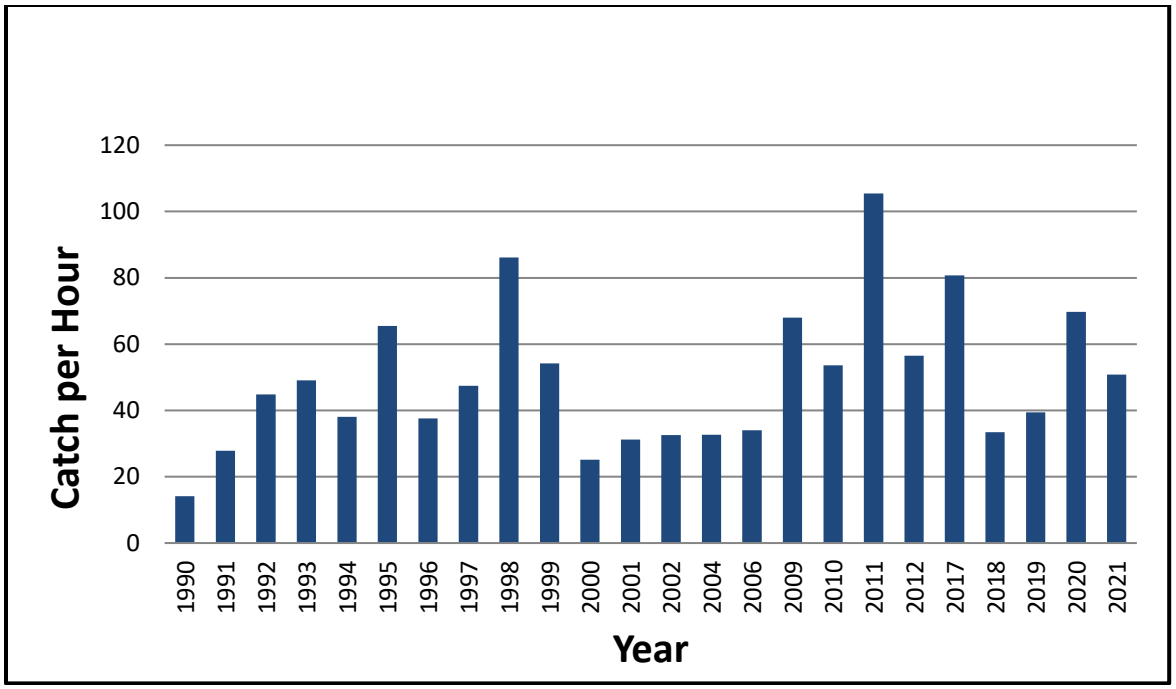

Figure 2. The catch-per-unit-of-effort (CPUE) for ≥ stock-size (8" and larger) Largemouth Bass from spring electrofishing results on Cross Lake, LA from 1990-2021.

The CPUE for stock-size Largemouth Bass from the fall electrofishing samples are shown in Figure 3. Results from both the spring and fall electrofishing samples for stock-size Largemouth Bass suggest a similar trend over the time period sampled.

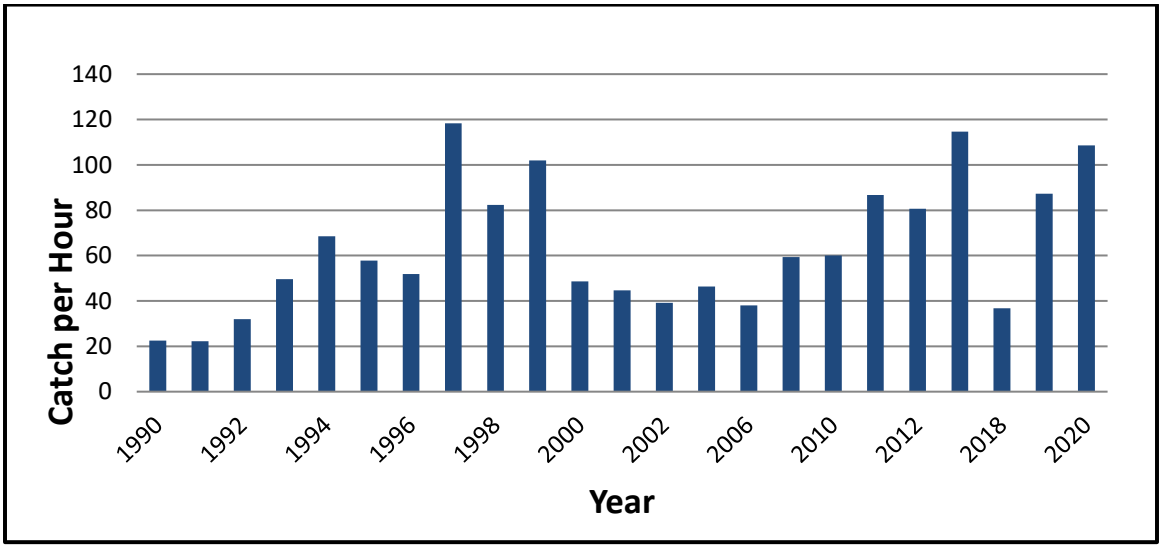

Figure 3. The catch-per-unit-of-effort (CPUE) for ≥stock-size (8" and larger) Largemouth Bass collected from fall electrofishing results on Cross Lake, LA from 1990-2020.

Proportional stock density (PSD) and relative stock density (RSD) are indices used to numerically describe length-distribution data. Proportional stock density compares the number of fish of quality-size (greater than 12 inches for Largemouth Bass) to the number of bass of stock-size [greater than 8 inches in total length (TL)]. The PSD is expressed as a percentage. A fish population with a high PSD consists mainly of larger individuals, whereas a population with a low PSD consists mainly of smaller fish. Relative stock density compares the number of fish of a given size range to the number of bass of stock size. A common

calculation used in fisheries management is for RSD-Preferred (RSD-P). This value compares the number of Largemouth Bass > 15 inches TL to the number of stock-size Largemouth Bass in the population. This is also commonly called RSD-15 values. Values for PSD and RSD – Preferred (> 15 inches in TL) from the spring electrofishing samples are shown in Figure 4. Ideal PSD and RSD-P values for Largemouth Bass range from 40-70 and 10-40, respectively. Spring electrofishing samples from recent years indicate that the Cross Lake Largemouth Bass population is above or near the upper end of the preferred range for both statistics, thus showing that Cross Lake maintains an abundance of bass greater than 15 inches (Figure 4 and 5).

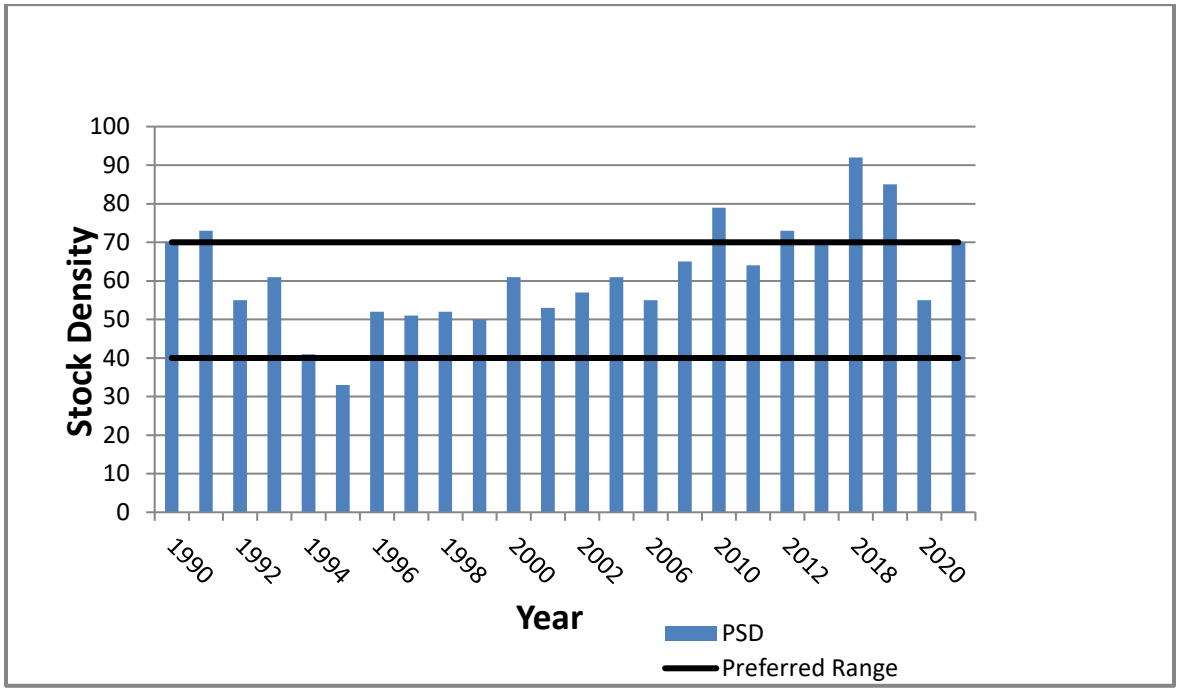

Figure 4. Proportional stock density values for Largemouth Bass on Cross Lake, LA, from 1990 to 2021 for spring electrofishing results.

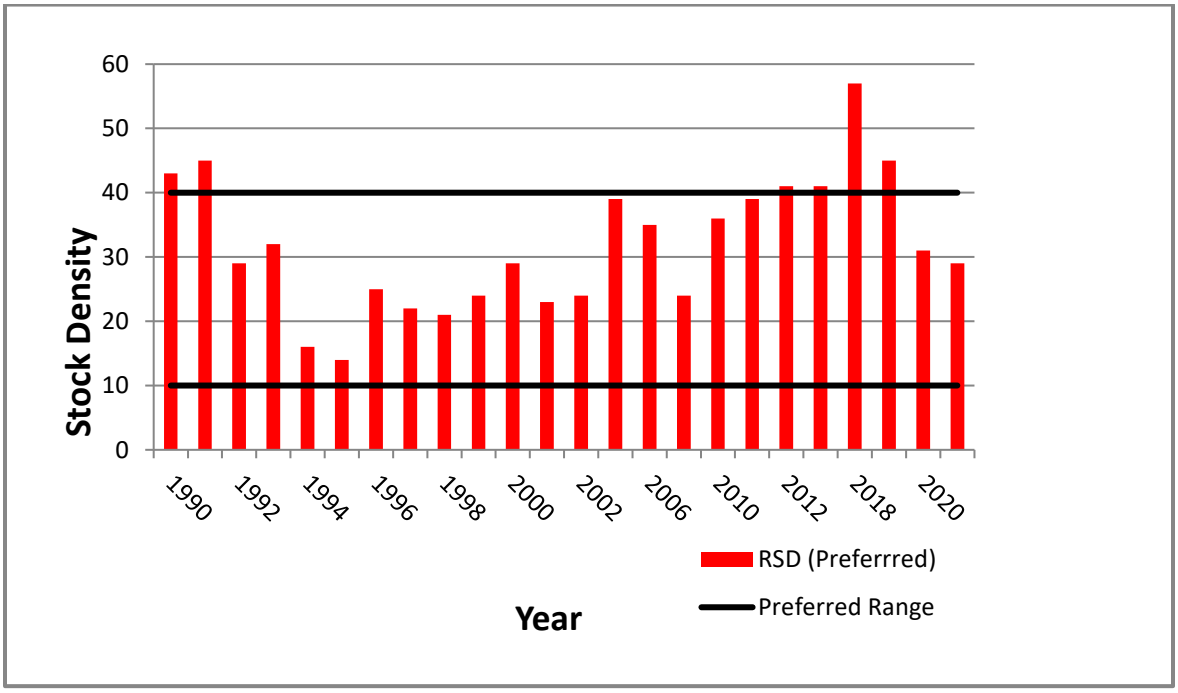

Figure 5. Relative stock density (preferred) values for Largemouth Bass on Cross Lake, LA, from 1990 to 2021 for spring electrofishing results.

Largemouth Bass size-structure indices for fish collected during the fall electrofishing samples indicate results similar to those found in the spring samples with variation from year to year. No significant change was observed in the proportion of preferred-size fish during this time period. The graph shows a slight decline in the proportion of quality-size fish over the entire period, but essentially no change within the last fifteen years. This information is shown in Figures 6 and 7 below.

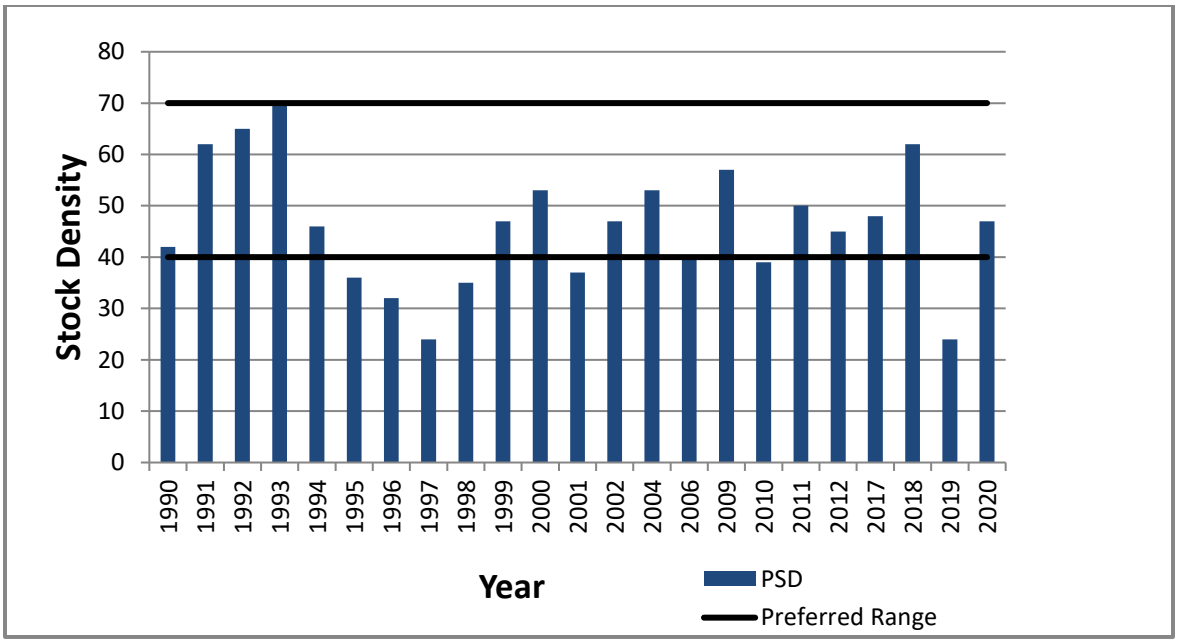

Figure 6. Proportional stock density values for Largemouth Bass collected on Cross Lake, LA during fall electrofishing from1990 to 2020.

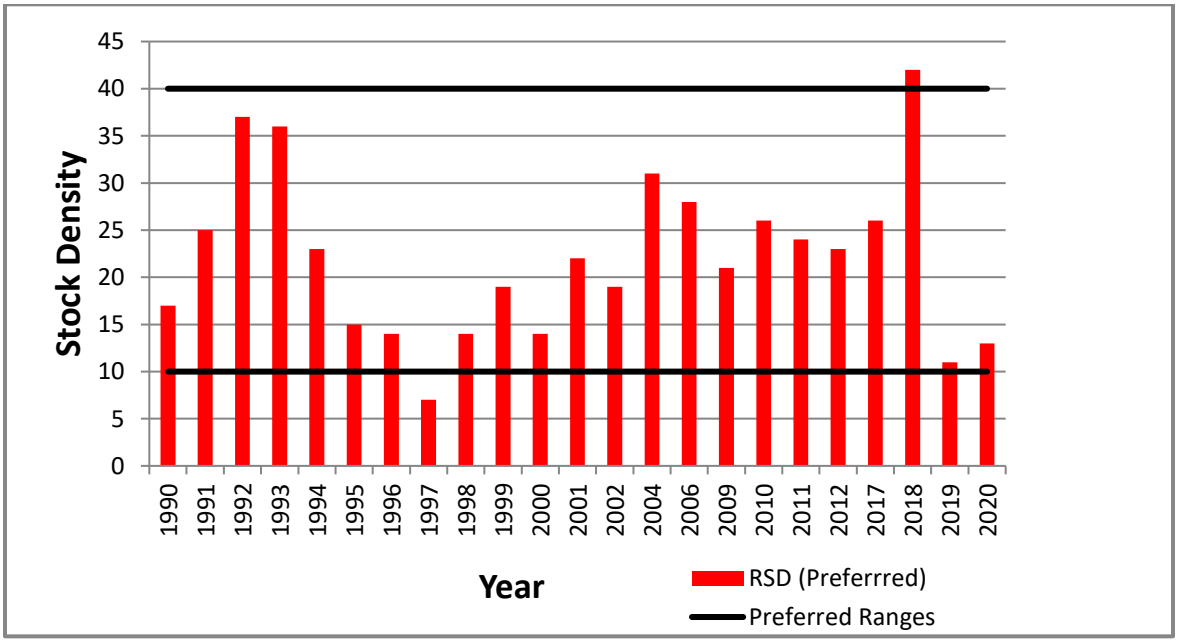

Figure 7. Relative stock density (preferred) values for Largemouth Bass collected on Cross Lake, LA during fall electrofishing from1990 to 2020.

Gill net sampling conducted on Cross Lake provides insight into fish that are not effectively sampled with standardized electrofishing techniques. Those include larger size Largemouth Bass, hybrid Striped Bass and crappie. Figure 8 indicates the number per net night and size distribution of Largemouth Bass captured in standardized sampling gill nets from 2003 – 2020. Largemouth Bass were not prevalent during these gill net samples and the results are not indicative of the overall population, as the gill nets were fished in open water areas of the lake and do not represent good bass habitat.

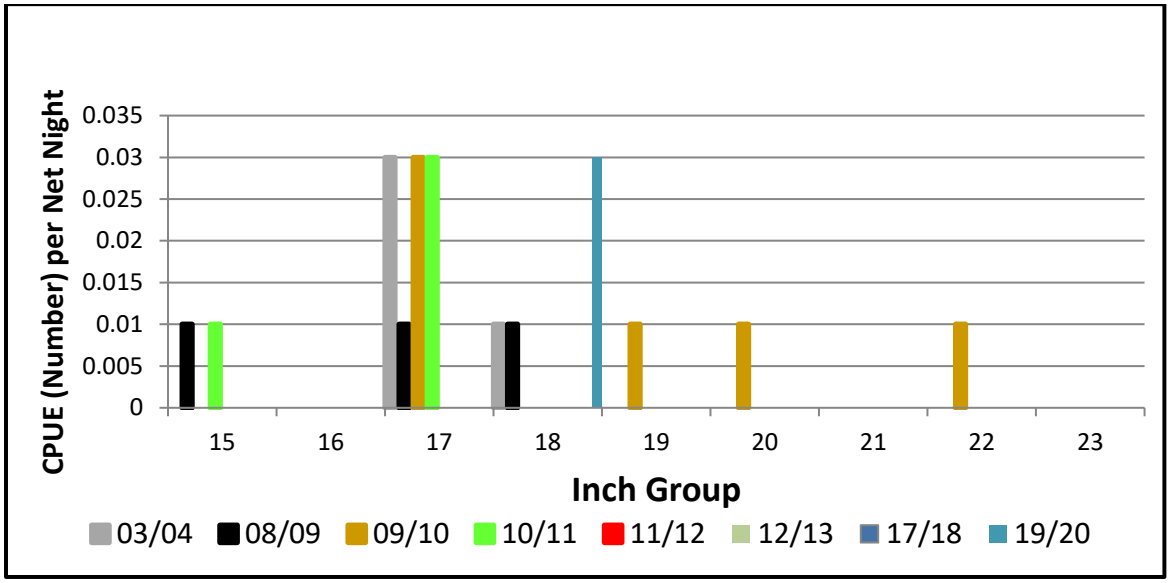

Figure 8. The CPUE (number) per net night (100' net) of Largemouth Bass collected on Cross Lake, LA, from standardized gill net results from 2003 - 2020.

Floating gill nets were fished in early March 2011 and mid-February 2012 in order to sample the larger size bass which did not show up in standard gill nets fished in the open water areas of the lake. These nets consisted of standard monofilament gill nets with the lead line and tie downs removed. The nets were fished in the littoral zone of the lake close to cover in order to target larger size classes of Largemouth Bass for inclusion in the population assessment study. The nets were fished two nights during 2011. Each night the following net sizes were fished: 200 yards of 3" bar mesh, 300 yards of 3.5" bar mesh, and 100 yards of 4" bar mesh. The floating nets were fished one night during 2012. During this sample, 200 yards of 3" bar mesh, 400 yards of 3.5" bar mesh, and 200 yards of 4" bar mesh nets were fished. The CPUE of Largemouth Bass was substantially increased versus the catch of standard gill net sampling. The results are presented in Figure 9.

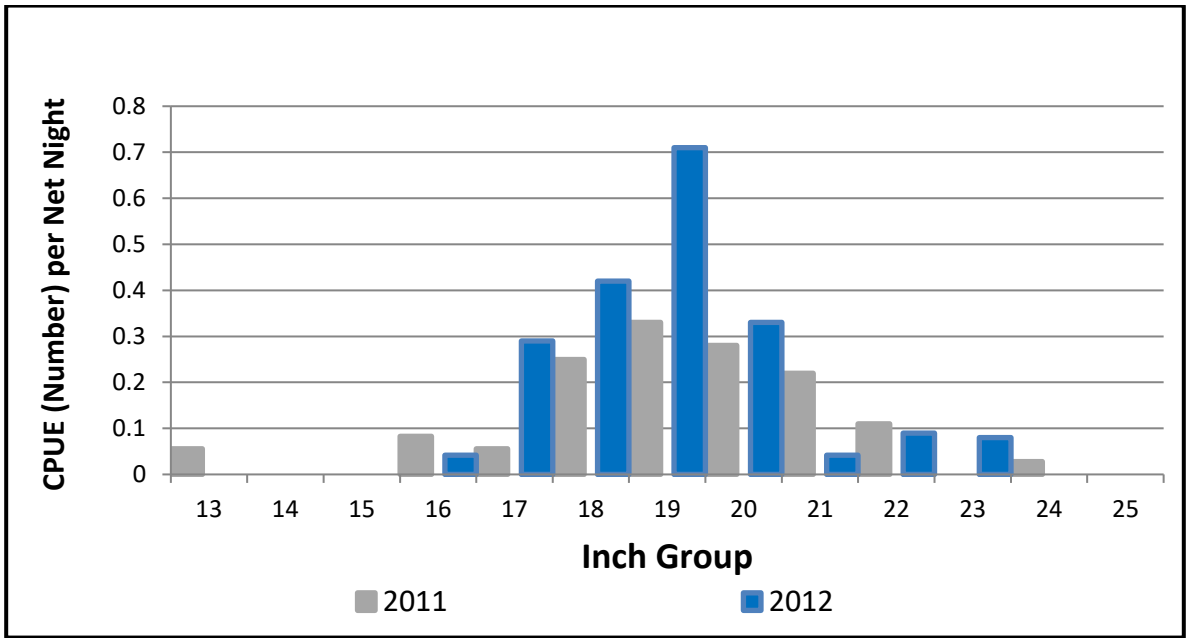

Figure 9. The CPUE (number) per net night (100' net) of Largemouth Bass collected utilizing floating gill nets on Cross Lake, LA in 2011 and 2012.

Largemouth Bass Age, Growth, and Mortality

An assessment study to describe the Cross Lake Largemouth Bass population was completed in 2013. The project included data collection over a three year period from 2010 – 2012. Population dynamics including relative abundance, spawning success, growth, body condition, mortality, and longevity were analyzed. Cross Lake anglers were also surveyed to collect insight regarding their collective influence on the Largemouth Bass population.

Electrofishing gear was used to collect Largemouth Bass from Cross Lake each spring. Length and weight measurements were recorded for each fish. Sagittal otoliths (ear bones) were removed from approximately 47% of the sampled fish for age and growth determination. Annual growth rings on the otoliths provide an accurate measurement of fish age. Size and age for all of the sample fish were combined to generate estimates of average growth rate and longevity. Angler surveys were conducted during the sample period to document fishing effort, angler catch rate and harvest rates.

As Figure 10 illustrates, Cross Lake supports a healthy bass population with some individuals reaching 22 inches. Largemouth Bass ranging from 10 to 18 inches were well represented in the 2nd and 3rd years of the project. It is important to note that spring sampling typically does

not include fingerling size bass. However, the recurring presence of small (age-1) bass indicates consistently successful reproduction.

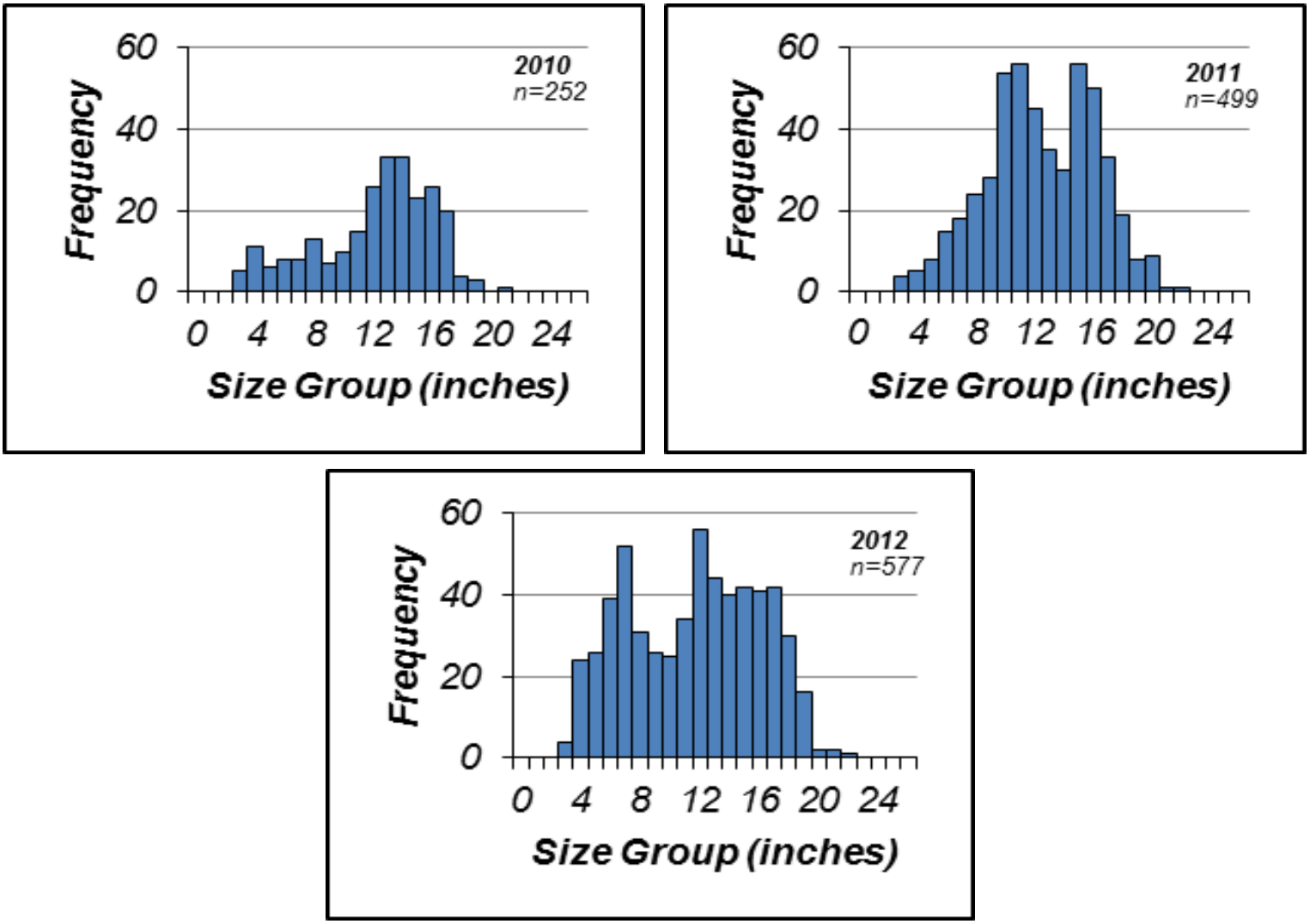

Figure 10. Annual length distributions of Largemouth Bass collected from Cross Lake, LA during spring electrofishing surveys in 2010 – 2012. Sample sizes (*n*) are shown on each yearly graph.

Age structure of the complete electrofishing sample (2010-2012) is shown in Figure 11. Forty percent of the total sample were comprised of age-1 and age-2 bass. The majority of the age 8+ fish were females. While bass up to age-12 were found, only a small percentage of Cross Lake Largemouth Bass were age-6 and older.

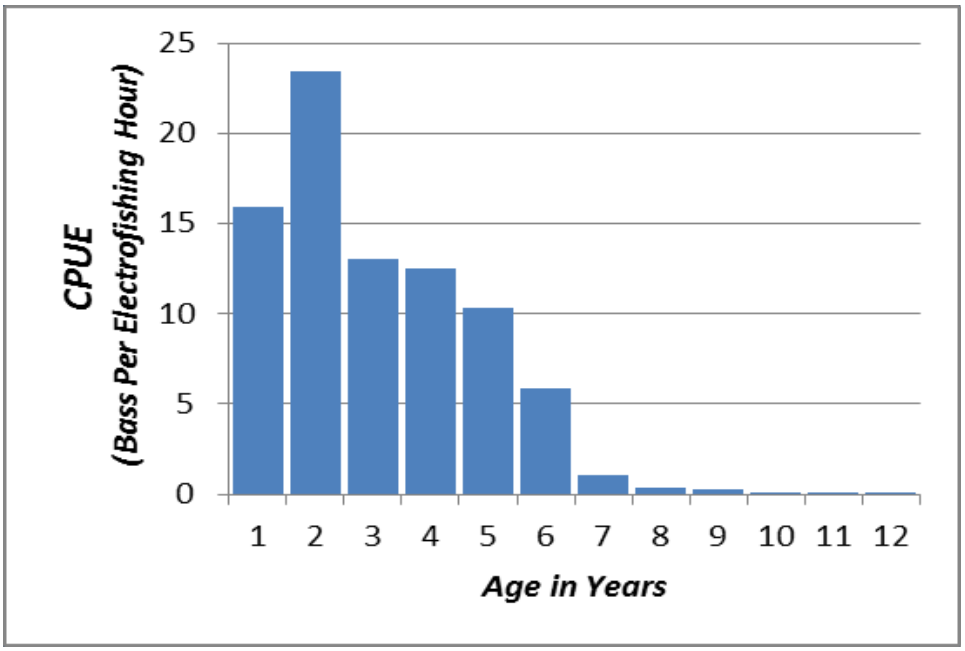

Figure 11. The catch per unit effort (CPUE) for Largemouth Bass by age class for Cross Lake, LA, from spring electrofishing results, 2010 – 2012. *n* = 1328.

Average length at age for Cross Lake bass is provided in Table 1. Growth is rapid through age-5, but then slows to only an inch or less per year.

Table 1. Length at age for Largemouth Bass from Cross Lake, LA, 2010 – 2012.

Age	Length in Inches
1.0	6.8
2.0	10.9
3.0	13.9
4.0	16.0
5.0	17.4
6.0	18.5
7.0	19.3
8.0	19.8
9.0	20.2
10.0	20.5
11.0	20.7
12.0	20.8

Body condition for Cross Lake bass can be described as very robust. Good physical condition of bass generally is the product of an adequate food supply that is readily available to predation. Figure 12 shows the observed and predicted weight and total length from the 2010 – 2012 spring electrofishing samples.

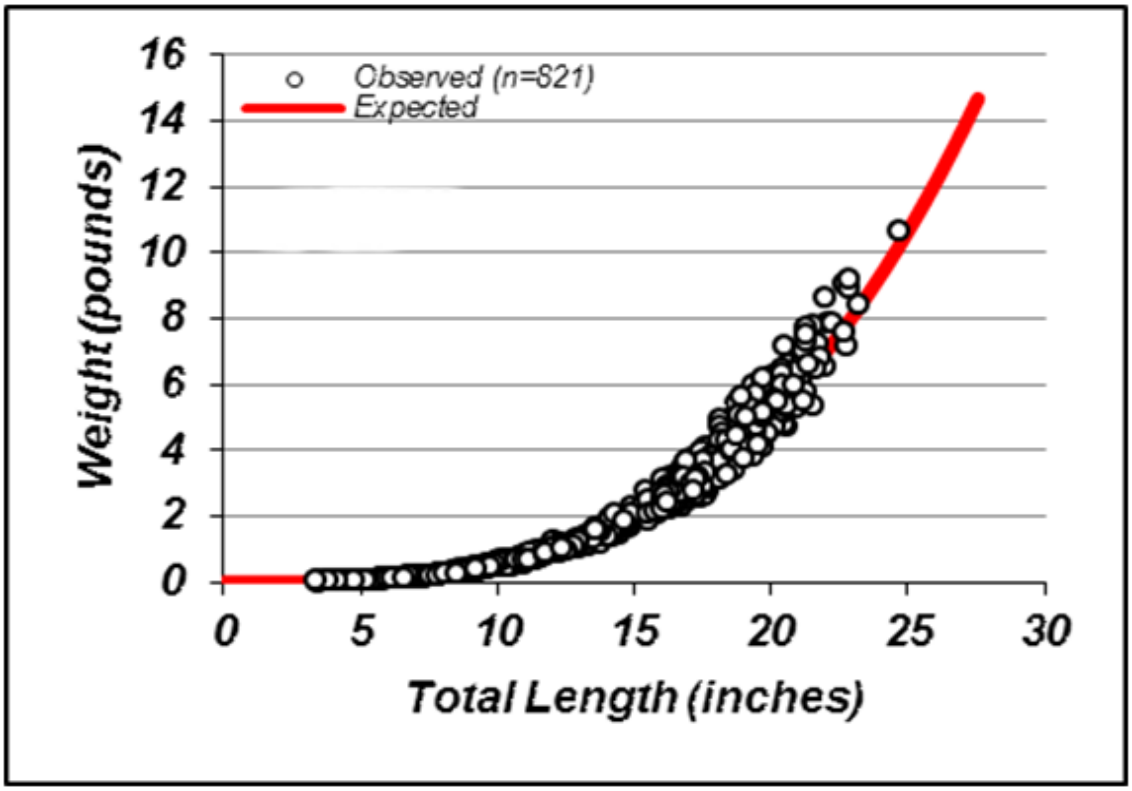

Figure 12. Observed and predicted weight at total length of Cross Lake, LA, Largemouth Bass collected from spring electrofishing results 2010 – 2012.

One of the more significant findings of the project was the stable recruitment of age-1 Largemouth Bass into the Cross Lake population. Contributing factors likely include favorable water fluctuation, abundant forage, quality spawning substrate, and adequate protective cover for fingerlings.

The rate at which fish die each year is referred to as mortality. Mortality consists of two parts: natural mortality (predation, disease, senescence) and fishing mortality (angler harvest and discard mortality). Results of the study indicate that the total mortality rate for Cross Lake bass is comparable to other recently sampled Louisiana lakes at 48% per year. The following example is provided to illustrate the effect. At 48% mortality, if you start with 100 age-1 Cross Lake bass, only 6 will remain alive by age 5.

Length distribution, age structure, growth rate, and mortality rate were found to be at levels that provide a stable bass population in Cross Lake. The results of this study suggest that the Cross Lake bass population has a total mortality that is similarly influenced by natural and fishing related mortalities (26 and 23%, respectively estimated). The fishing mortality rate for Cross Lake bass was estimated at 23% per year. This rate comes from two sources; 1) harvest and 2) post release mortality. Creel survey results indicate that almost half (47%) of the anglers utilizing Cross Lake describe themselves as bass anglers. The results also suggest that these same bass anglers voluntarily release a much larger percentage of Largemouth Bass than they harvest (92% of legal size fish are released). Bass anglers caught an average of 0.995 bass/trip with an estimated 8,075 bass angling trips annually. This creel information would suggest that even the 23% angling mortality estimate from statistical analysis may be quite liberal.

Angler harvest is critical for a protective slot limit regulation to be effective. The results of this project indicated that Cross Lake Largemouth Bass harvest was lacking due to anglers' tendency to voluntarily release fish of legal harvest size. If Cross Lake anglers remain hesitant to harvest bass, the effectiveness of any size regulation as a management tool will be severely limited.

Based upon the study results, a Notice of Intent (NOI) was passed by the Louisiana Wildlife and Fisheries Commission on January 9, 2014 to remove the 14" - 17" protective slot limit on Cross Lake and replace it with the statewide creel limit of 10 fish per day for black bass. The regulation change became effective April 20, 2014.

The same study design was repeated starting in 2019 and concluding in 2021 to determine if any changes had occurred in the bass stock of Cross Lake after the regulation change. Upon completion of the follow-up study, very little appears to have changed with the removal of the protective slot limit. Catch and release remains the dominant trend with bass anglers even though the entire bass population is now available for harvest. Growth rates of Largemouth Bass have increased somewhat within the reservoir, but that can likely be attributed to continued stocking of Florida Bass and a higher genetic influence in the population. More bass anglers were interviewed during the follow-up creel, but no opinion questions were asked to determine what influence the slot limit may have had on the anglers choosing a fishing destination. Table 2 below compares the results from the two stock assessment studies.

Table 2. Comparison of Stock Assessment Results between 2010-2012 Study and 2019-2021 Study, Cross Lake, LA.

Statistic	2010-2012	2019-2021
Total # Fish (N)	1,328	1,520
Maximum Age	12	11
Time to reach 12-Inches TL (Years)	2.27	2.02
Time to reach 15-Inches TL (Years)	3.48	3.1
PSD-P	42.1	37.2
Relative Weight 12+ Inch Bass	105.6	104.8
Relative Weight 15+ Inch Bass	105.7	107.7
Estimated Annual Mortality Rate (%)	49	42
Estimated Natural Mortality Rate (%)	32	30
Estimated Fishing Mortality Rate (%)	17	12
# of Bass Anglers Interviewed	398	776
Catch per Angler Hour	0.28	0.24
Retention Rate of Legal Size Bass (%)	10.83	6.8
Retention Rate of all size bass caught (%)	6.56	6.8
Average Percentage of Florida Influence (%)	22.82	43.65

Largemouth Bass Genetics

Florida Largemouth Bass stockings on Cross Lake were initiated in 1982 in an effort to offer anglers an increased chance to catch a fish of greater than average size. To date, 3,266,210 Florida bass fingerlings have been stocked in Cross Lake. Genetic analysis of the Largemouth Bass population in Cross Lake was conducted every three years from 1992 – 2004. Testing was conducted annually from 2010 – 2012 in conjunction with the Largemouth Bass study on

Cross Lake, and again in conjunction with the follow-up study (2019-2021). Samples collected in 2022 were part of a statewide project comparing the genetic composition of fish collected from LDWF electrofishing versus fish caught by tournament anglers. The results are listed in Table 3. The overall Florida genome increased from 3% to 45% during the study period; however, the percentage of pure Florida Bass remained low ranging from 0% to 13%. The latest genetic testing, conducted in 2022, indicated 18% Florida bass genetic introgression, but only 2% are pure Florida bass.

It is important to note that prior to 2021, liver allozymes were analyzed using electrophoresis to determine the genotype of Largemouth Bass samples. Beginning with some samples in 2021 (including the Cross Lake samples), LDWF began using microsatellites to determine genotype and gain additional information from genetic samples.

Table 3. – Largemouth Bass genetic analysis from Cross Lake, LA, 1992 - 2022. From 1992-2020, allozymes were analyzed, and from 2021-2022 microsatellites were analyzed.

Year	Number	Northern %	Florida %	Hybrid %	Total % Florida
1992	33	97%	3%	0%	
1995	44	93%	0%	7%	
1998	60	81%	2%	17%	
2001	50	76%	4%	20%	
2004	70	86%	1%	13%	
2010	145	82%	3%	15%	
2011	281	79%	4%	17%	
2012	307	73%	3%	24%	
2018	31	55%	13%	32%	
2019	214	58%	9%	33%	
2020	196	55%	12%	33%	
*2021	60	68%	2%	30%	13%
*2022	30 Electrofishing	43%	0%	57%	17%
*2022	30 Tournament Caught	53%	3%	44%	20%

***** Denotes change in sampling technique to more precise microsatellites

Forage

Forage availability is measured directly through fall forage electrofishing results, and indirectly through measurement of Largemouth Bass body condition or relative weight (Wr). Relative weight is the ratio of a fish's weight to the weight of a ''standard'' fish of the same length. The Wr index is calculated by dividing the weight of a fish by the standard weight for its length, and multiplying the quotient by 100. Largemouth Bass Wr below 80 indicate a potential problem with forage availability.

Figure 13 illustrates the relative weight (Wr) for stock-size and larger bass collected during fall electrofishing samples from 1990 – 2020. Relative weights were above 90, indicating that sufficient forage was available for these size groups of Largemouth Bass during this period.

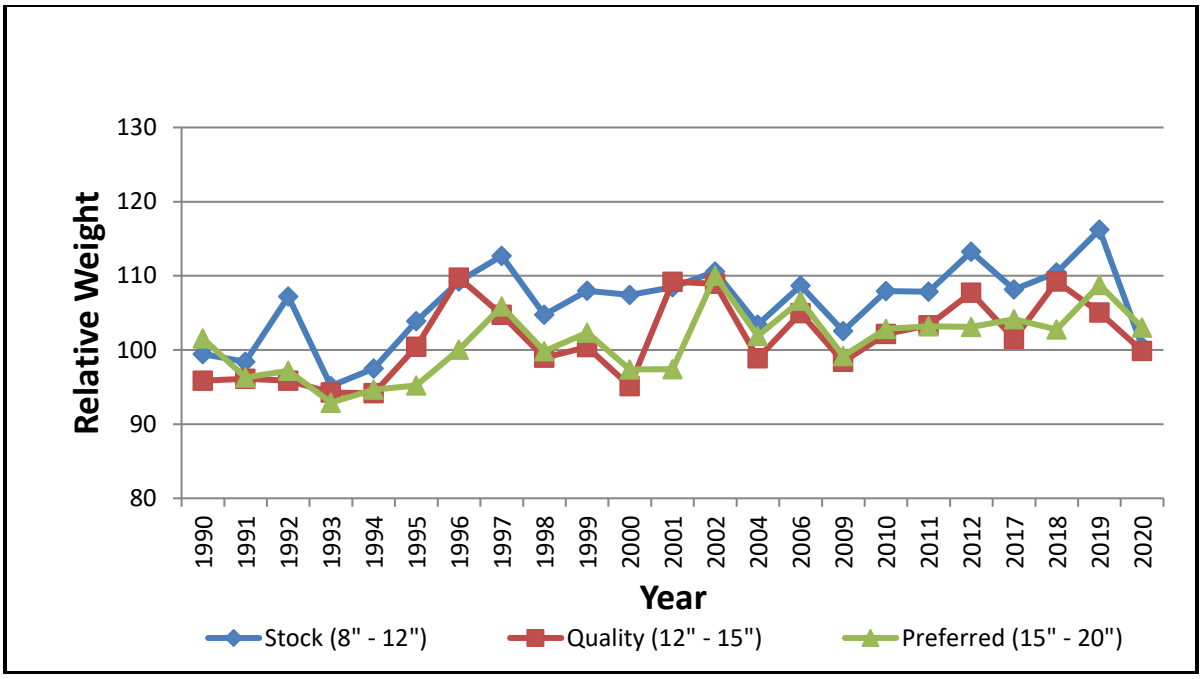

Figure 13. The relative weights of Largemouth Bass by size group collected during fall electrofishing from Cross Lake, LA from 1990 to 2020.

Forage fish are those that are available for use as food by predatory fishes. In general, all individuals up to six inches in length are forage fish, particularly when discussing forage for Largemouth Bass. Forage samples are collected in conjunction with fall standardized electrofishing samples. Standard procedures for collecting these samples were changed in 2012 in an attempt to get a more representative sample of the entire lake. Prior to this time, samples were only collected at one location each year. Shorter duration samples are now collected at four separate locations each fall. Forage sampling conducted by electrofishing in the fall of 2020 resulted in a mean catch of 84.07 pounds per hour of forage fishes, with sunfish species representing the majority of the available pounds of forage and threadfin shad far outnumbering all other species. Figure 14 shows the mean number per hour of forage fish species collected for Cross Lake in 2020.

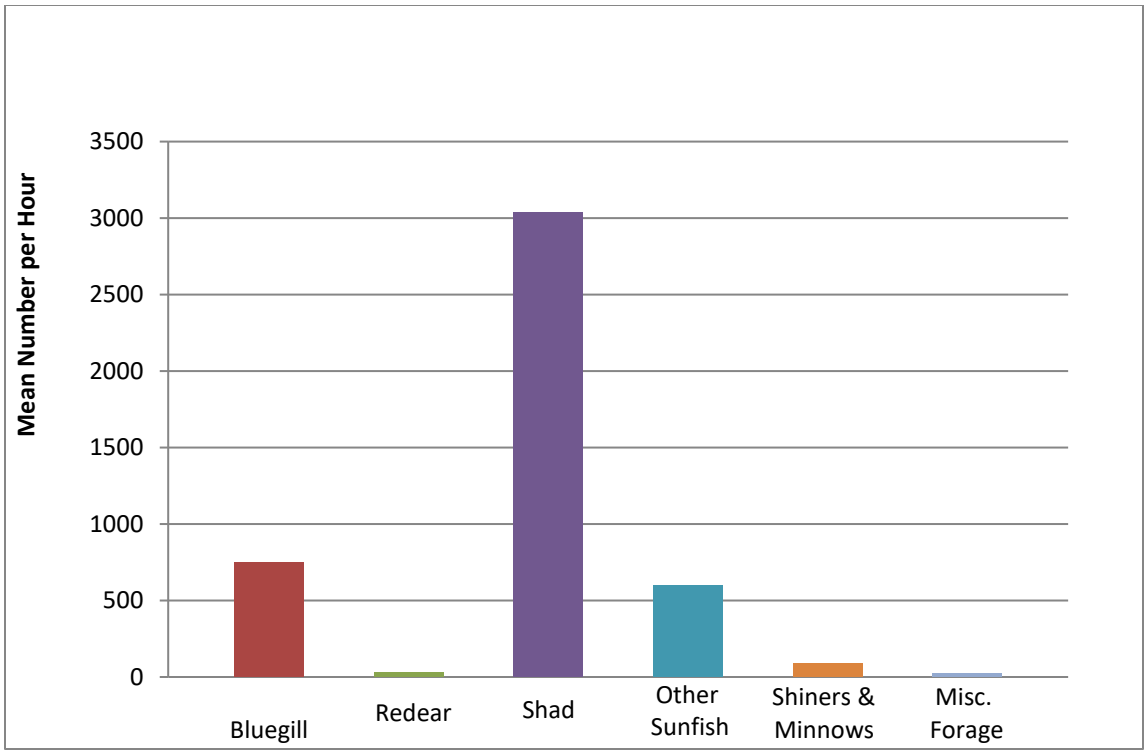

Figure 14. The CPUE in number per hour of fishes ≤ 5 inches TL captured in fall forage samples from Cross Lake, LA, in 2020.

Crappie

Crappie collected during biomass (rotenone) sampling conducted from 1967 to 1989 consisted of both Black Crappie (*Pomoxis nigromaculatus*) and White Crappie (*Pomoxis annularis*). White Crappies were found to be more abundant. The sampling revealed variations in abundance through the period sampled. The crappie population averaged a relatively low 3.6 pounds per acre per year (Figure 15).

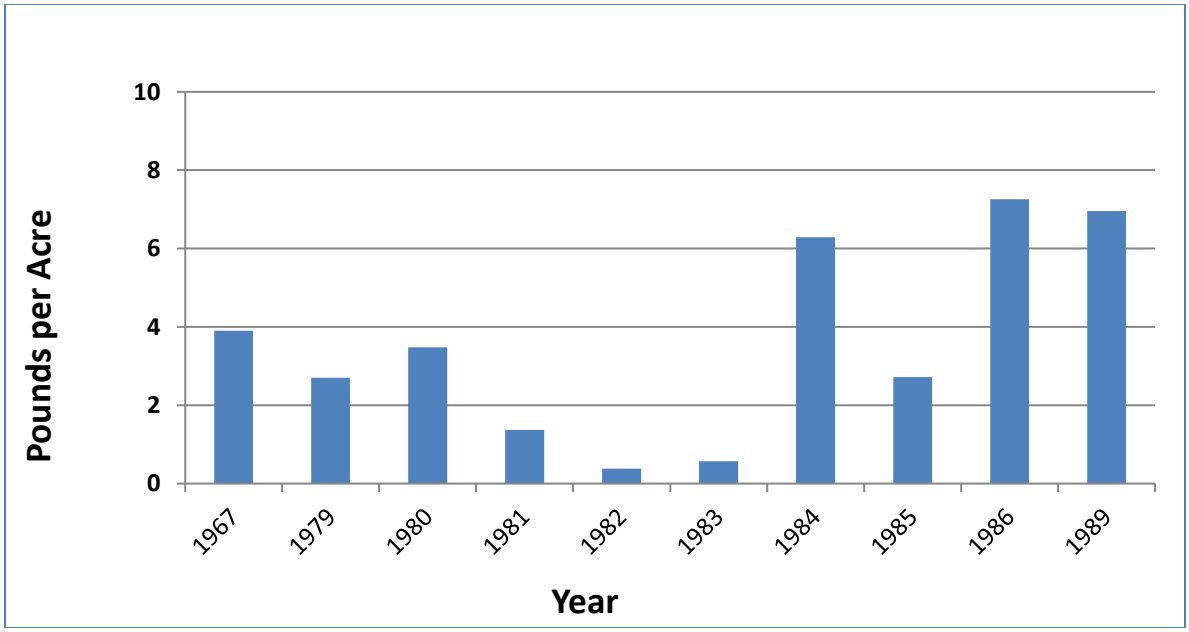

Figure 15. The CPUE in pounds per acre of crappie collected from Cross Lake, LA, during biomass (rotenone) sampling from 1967 to 1989.

Few crappie were collected during spring electrofishing samples from 1990 – 2010 as depicted in Figure 16. Since 2011, catches of crappie during spring electrofishing has increased. This increase is primarily associated with a shift in focus and timing of sampling events. Most spring sampling has been focused very early in the spring to maximize the chances of catching larger size bass for stock assessment studies. Subsequently, this coincides with the peak spawn for crappie on Cross Lake. Most crappie collected are actively bedding and are males.

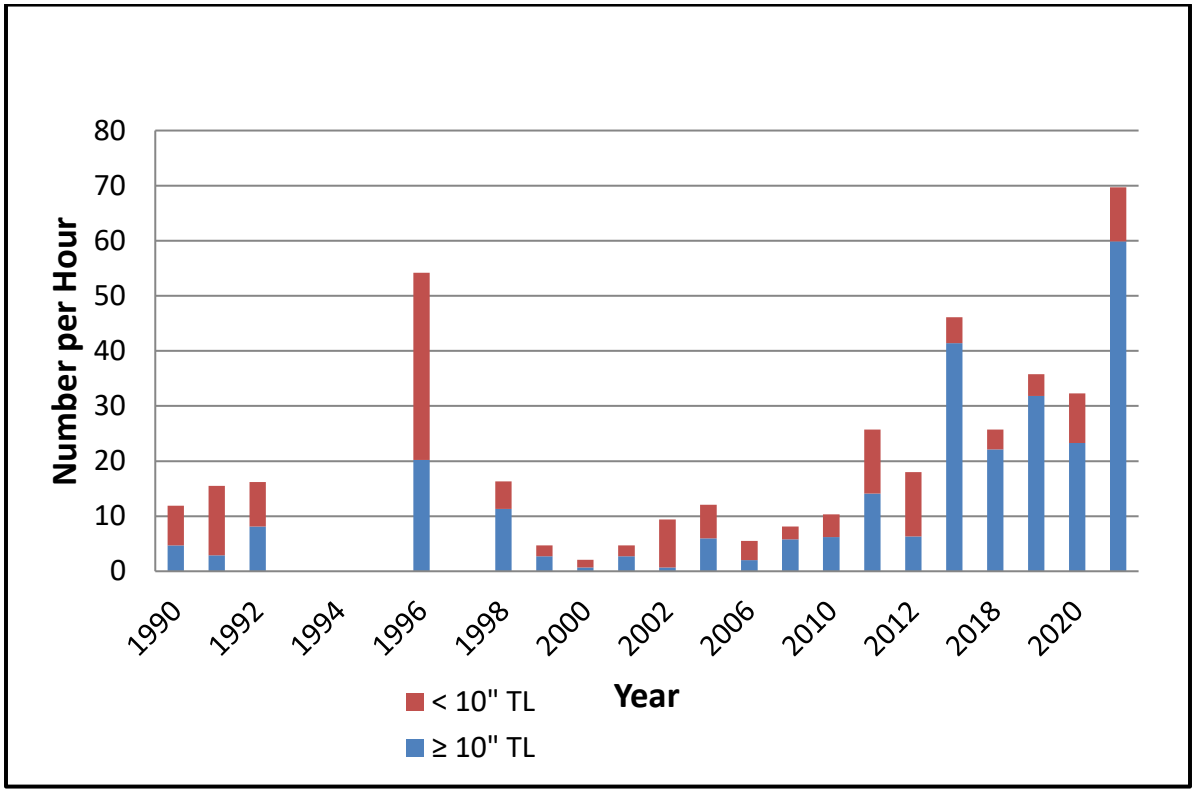

Figure 16. The CPUE of crappie from Cross Lake, LA captured during springtime electrofishing samples from 1990 to 2021. TL = total length.

Results from gill net sampling are indicated in Figure 17. Although overall numbers of crappie collected in gill nets are relatively low, sampling reveals that larger size crappies are present in Cross Lake.

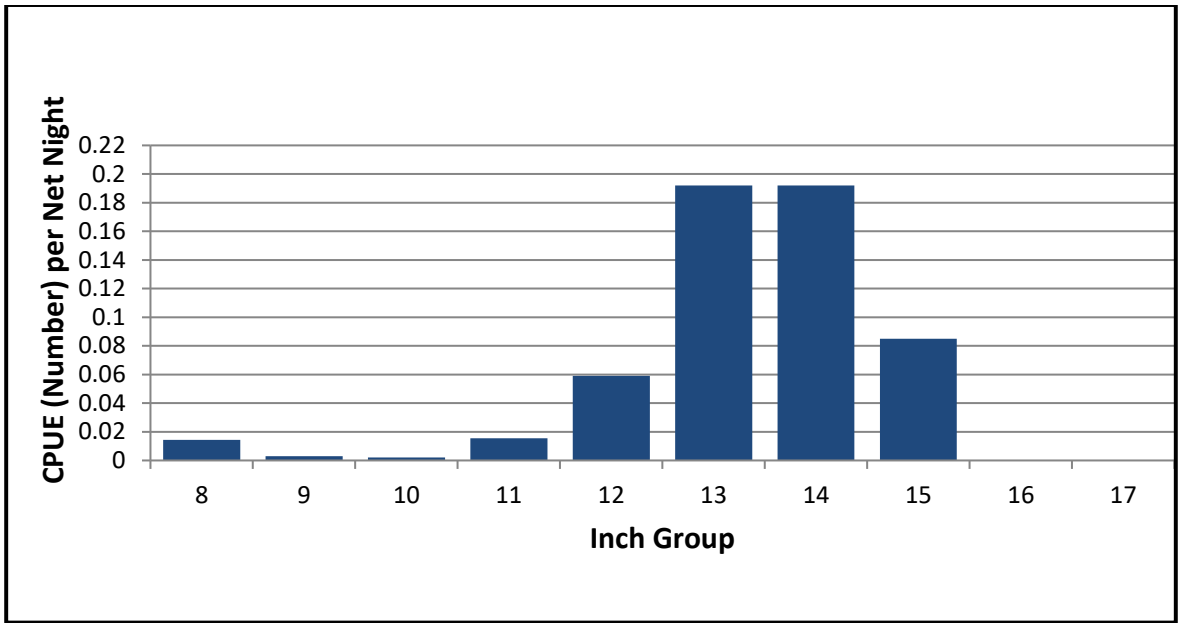

Figure 17. The Mean CPUE (number) per net night (per 100' net) of crappie collected during standardized gill net sampling on Cross Lake, LA from 1989 - 2020.

Lead net sampling has become the primary sampling tool used by LDWF to assess crappie populations. Lead net sampling was conducted on Cross Lake from 2010-2012, and the data were used to complete a population assessment study of the species. Lead nets were also used to sample crappie in 2017 and 2019.

Inch group compositions of crappie taken by lead net sampling show some variation from year to year. The majority of the crappie collected from Cross Lake with lead nets ranged from 5 to 9 inches, with the 5 inch group being the most common size. The mean catch per hour values for each size group is given in Figure 18.

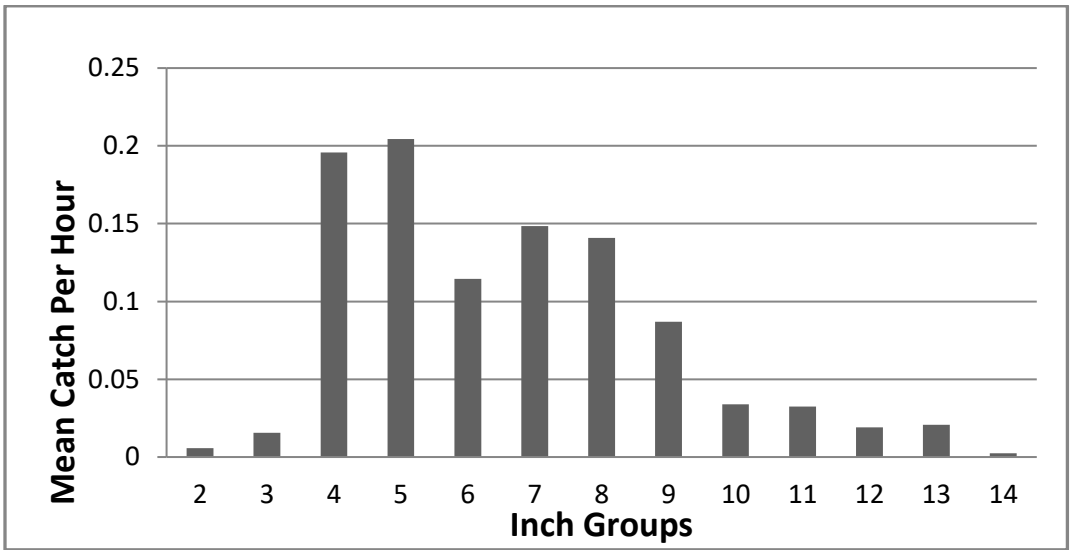

Figure 18. The Mean CPUE by inch group for crappies collected at Cross Lake, LA by lead net sampling during 2010 – 2019.

Figure 19 depicts the relative abundance for crappies by catch per hour of selected size groups collected in lead nets. It appears that a strong year class of fish moved from stock-size, to

quality-size, and preferred-size from 2010-2012. The 2019 samples indicate another strong year class recruited to the gear.

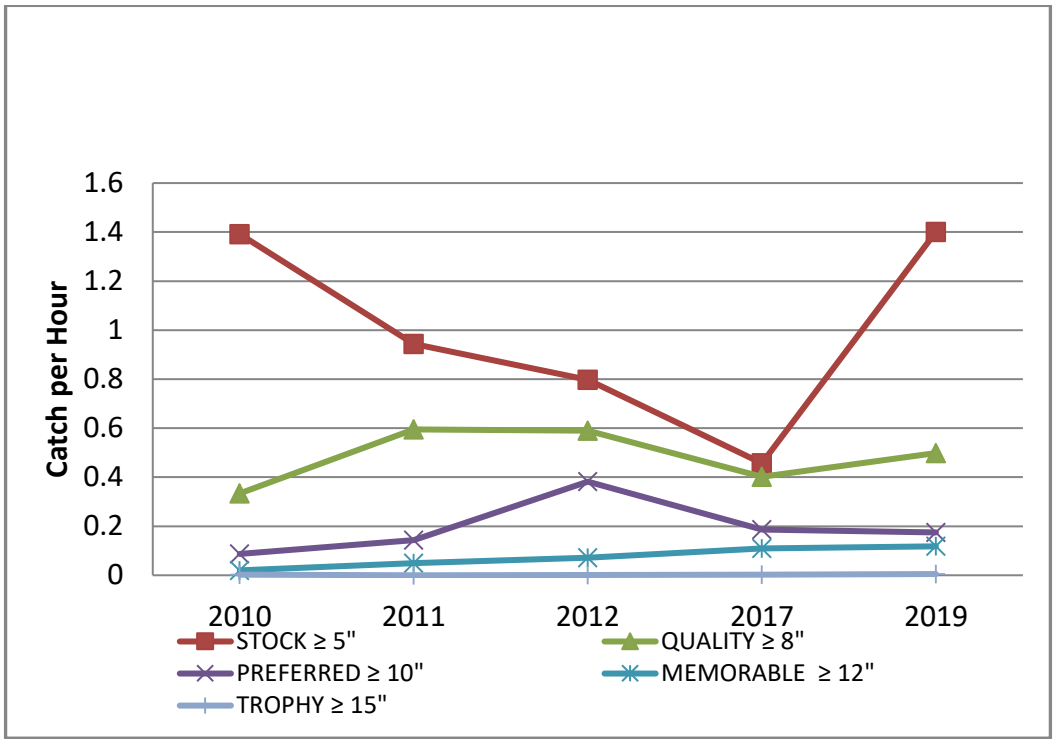

Figure 19. The CPUE (number per hour) of selected crappie size groups for Cross Lake, LA, by caught in lead net samples from 2010 – 2019.

Relative stock density (RSD) and proportional stock density (PSD) values for crappies are also derived from lead net sampling results. These stock density indices are illustrated in Figure 20. The indices reveal an increase in the proportion of fish 8 inches and longer collected in lead net samples over the period 2010 – 2017. A very robust young-of-the-year cohort in 2019 led to a reduction in the values of the indices.

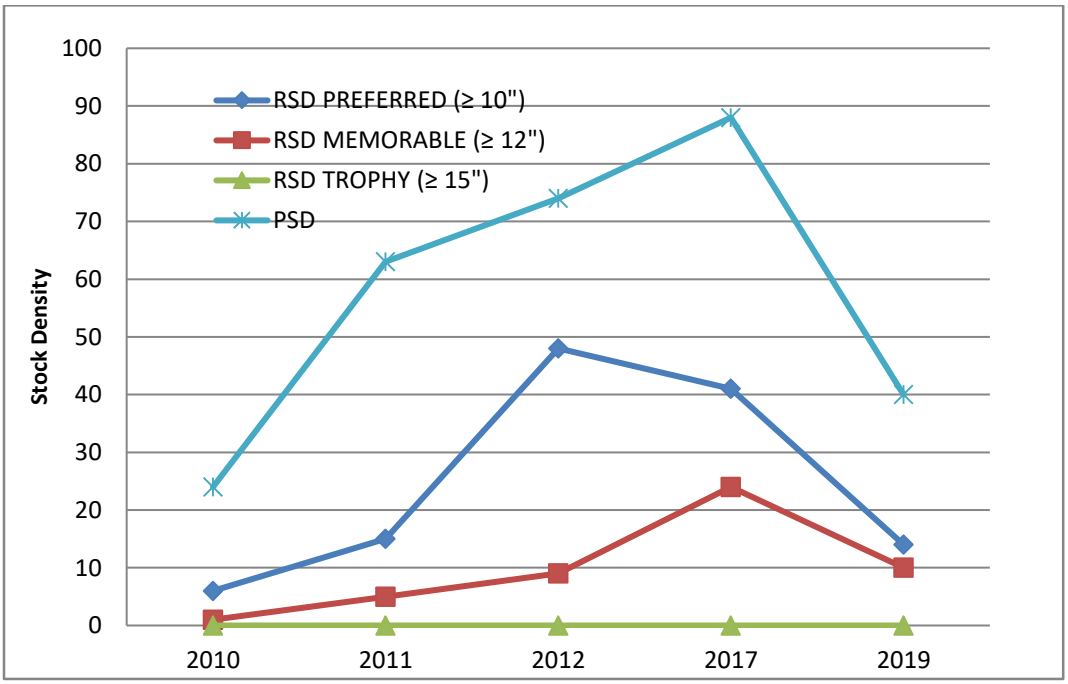

Figure 20. The proportional stock density (PSD) and relative stock density (RSD) for crappies caught in Cross Lake, LA, by lead net sampling 2010 – 2019.

Crappie Population Assessment Study

An assessment study to describe the Cross Lake crappie population was completed in 2014. The project included data collection over a three year period from 2010 – 2012. Population dynamics including relative abundance, spawning success, growth, body condition, mortality, and longevity were analyzed. Cross Lake anglers were also surveyed to collect insight regarding their collective influence on the crappie population.

Lead nets were used to collect crappie from Cross Lake each fall. Length and weight measurements were recorded for each fish. Sagittal otoliths (ear bones) were removed from approximately 26% of the sampled fish for age and growth determination. Annual growth rings on the otoliths provide an accurate measurement of fish age. Size and age for all of the sample fish were combined to generate estimates of average growth rate and longevity. Angler surveys were conducted during the sample period to document fishing effort, angler catch rate and harvest rates.

The Cross Lake crappie population is about equally composed of White Crappie (42.5%) and Black Crappie (57.5%). Cross Lake crappie can be generally categorized as having moderately fast growth rates, desirable proportional stock densities (PSD-Q=53, PSD-P=24), adequate relative weights (98.32%), relatively low recruitment variability and high total mortality rates (75%) compared to other waterbodies in Louisiana (Figure 21).

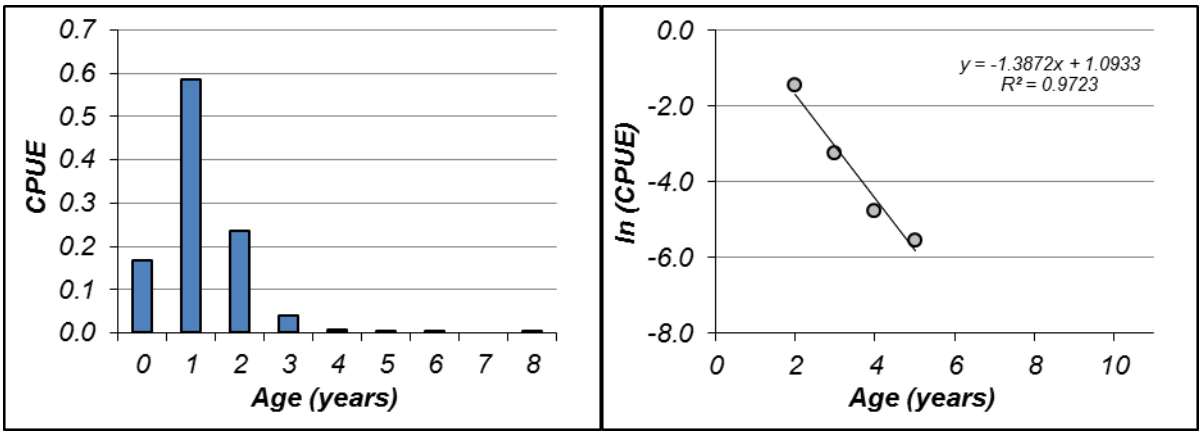

Figure 21: Observed mean catch rates by age of the Cross Lake crappie fall lead net samples (2010-2012; left graphic). The right graphic depicts observed (circles) and predicted (line) mean log_e CPUE by age. The catch curve equation and coefficient of determination (R^2) are also presented in the graphic. Catch per unit effort (CPUE) is defined as lead net catch per hour.

Although Cross Lake crappies grow quickly, very few crappie survive past age-3. Of the 1,808 crappie collected during the study, only 24 fish (1.3%) were collected in the Age 4-8 range. Based upon the study, on average crappie will reach quality-size (8-inches) in 1.45 years, preferred-size (10-inches) in 2.09 years, and memorable-size (12-inches) in 3.06 years. Based upon mortality rates, few fish will survive long enough to reach memorable sizes. Based upon creel data collected in 2010, it appears anglers are having little impact on the population (Figures 22 and 23).

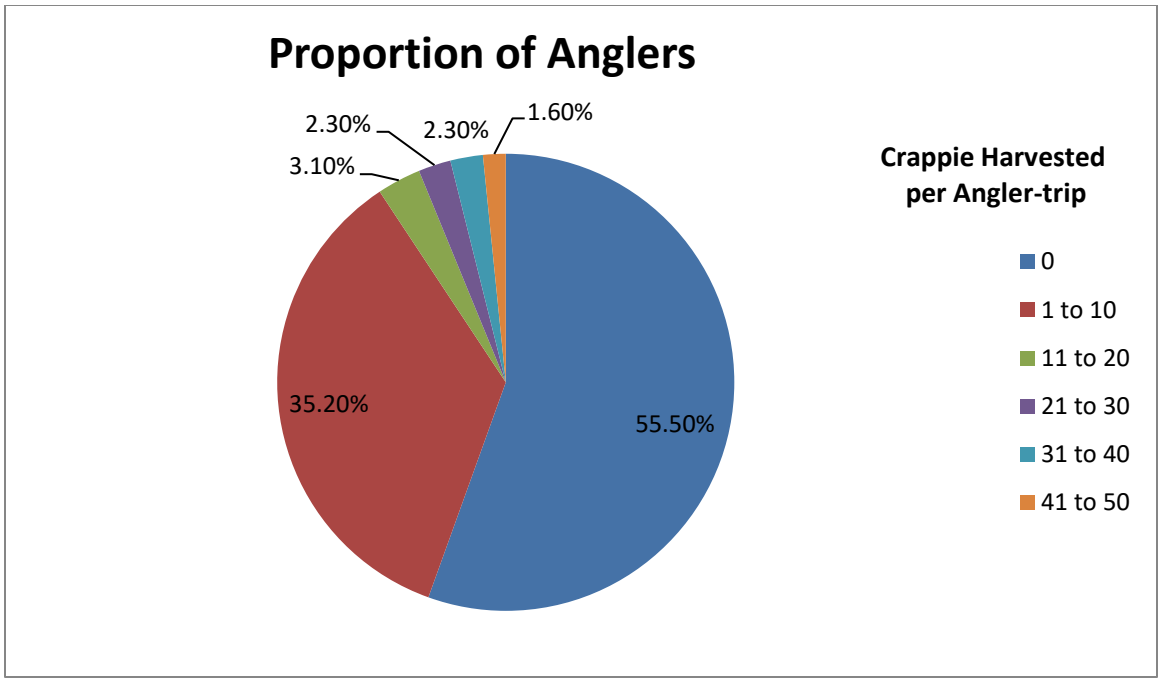

Figure 22: Frequencies of numbers of crappie harvested per angler-trip for Cross Lake crappie anglers derived from the creel survey conducted in 2010.

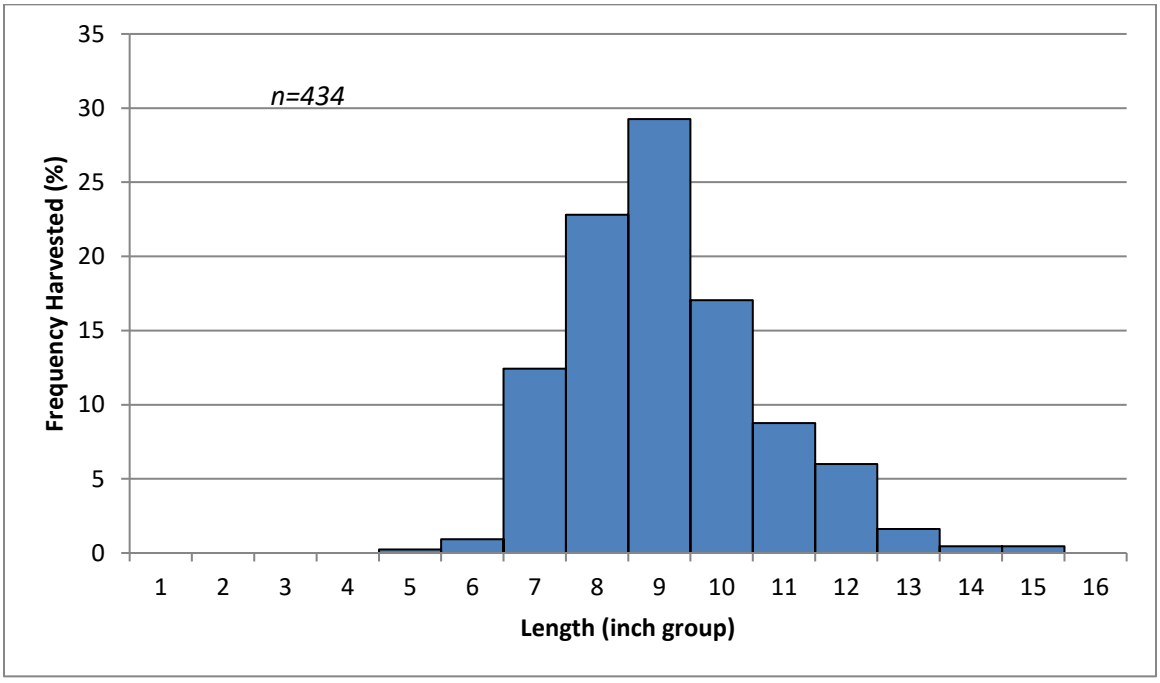

Figure 23: Frequencies of crappie harvested by inch group for Cross Lake crappie anglers derived from the creel survey conducted in 2010.

The majority of trips resulted in no crappie harvested or fewer than ten fish harvested (combined 90.7%) per angler. Of the fish harvested, two-thirds of the fish were less than 10-inches. This size distribution is similar to what was observed during lead net samples, and it appears anglers have a self-imposed minimum length of approximately 7-8 inches before crappie are considered "big enough to keep." Cross Lake crappie anglers averaged harvesting 3.57 crappies per trip, which is minimal removal given the growth rate and reproductive capacity of crappie in the lake.

Using this information, several simulated length regulations were modeled, and results predicted based upon the natural parameters of the Cross Lake crappie population and the Cross Lake crappie angler trends. The results indicate that under the current fishing pressure, any size regulation, such as a 10-inch or 12-inch minimum length limit, could possibly lead to a few more fish (3-4 crappie) being caught per trip. However, anglers would be forced to release 60-90% of their daily catch and the total yield in pounds of crappie harvested would not increase.

Hybrid Striped Bass

Hybrid Striped Bass have been stocked in Cross Lake for a number of years as an additional sport fish and to provide a biological control measure for the excess gizzard shad population. These fish are not readily sampled with other gear types but comprise a significant portion of the recreational fish collected during gill net sampling as indicated in the graph in Figure 24. The variation in Figure 24 may be explained by the inconsistent stockings of hybrid striped bass into the reservoir. No hybrid striped bass have been stocked into the reservoir since 2013, and catch rates have declined as expected.

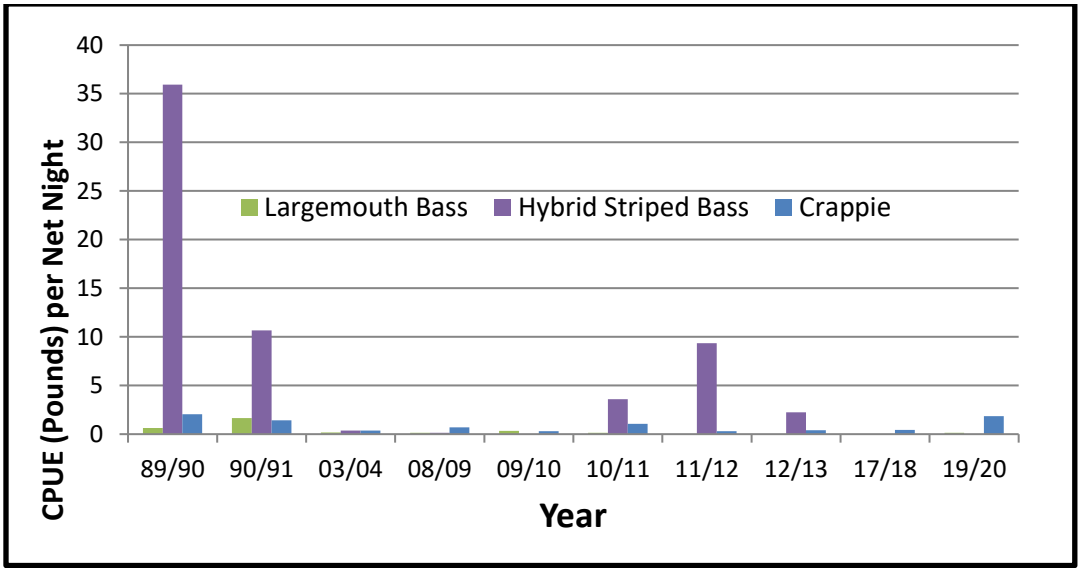

Figure 24. The catch per unit effort (CPUE) in pounds per net night (100' net) of Largemouth Bass, hybrid striped bass, and crappie in Cross Lake, LA, from standardized gill net results for 1989 – 2020.

Cross Lake supports robust populations of shad. Hybrid striped bass have been inconsistently stocked into the lake, but have survived in good numbers. The hybrid Striped Bass should afford anglers a larger-size sport fish, which is well adapted to the open water areas of Cross Lake (Figure 25). Despite there being ample numbers of hybrids to pursue, relatively few anglers target the species on Cross Lake. From the 2010 creel survey, an estimated 0.77% of anglers pursued hybrid striped bass and 0% for the 2019-

2020 creel. The effort in 2010 was from a small group of anglers temporarily stationed at nearby Barksdale Air Force Base. It is unknown why the species has not been popular with Cross Lake anglers. Hybrid Striped Bass fishing is quite popular on nearby Lake Claiborne. Due to the lack of interest and cost-savings, it was determined to cease stocking hybrid striped bass in Cross Lake.

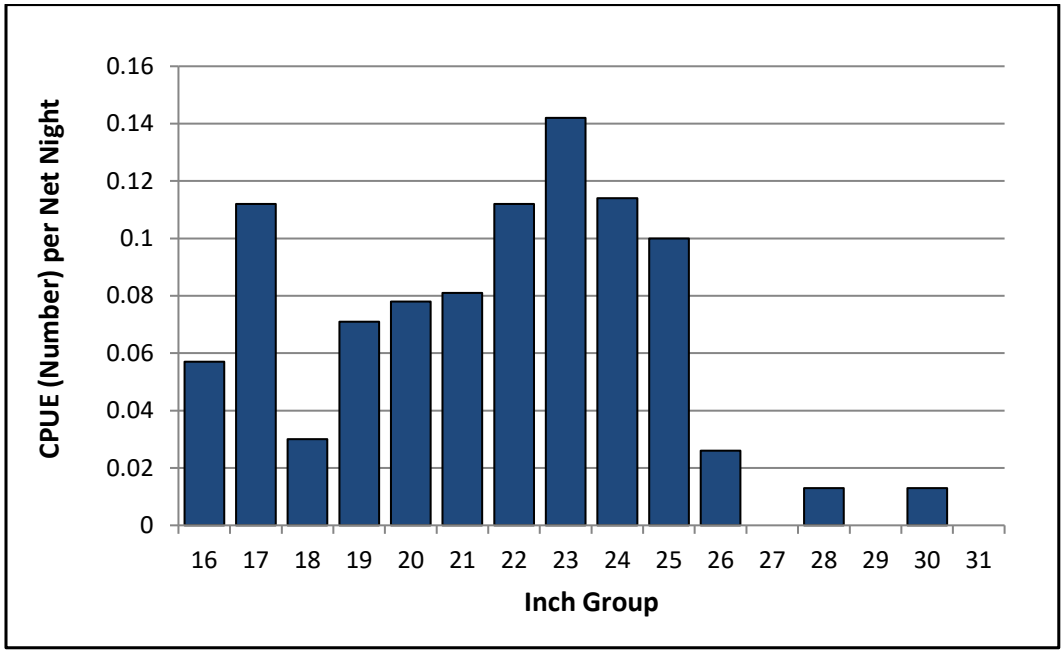

Figure 25. The mean CPUE (number of fish) per net night (100' net) per size group for hybrid striped bass collected during standardized gill net sampling on Cross Lake, LA from 1989 - 2020. N = 351.

Commercial

Cross Lake supports an abundant catfish population, readily available to recreational fishermen. Recreational fishing for catfish accounted for 17.1% of the total angling effort during the 2010 creel survey and 17.33% during the 2019-202 creel survey. Commercial fishing is only allowable by contract with the City of Shreveport as per a city ordinance. The use of gill nets, trammels nets, hoop nets and fish seines was prohibited in Cross Lake in September 1986 by the Louisiana Wildlife and Fisheries Commission.

Biomass sampling

Historical biomass sampling on Cross Lake indicates that Channel Catfish (*Ictalurus punctatus*), and Freshwater Drum (*Aplodinotus grunniens*) were present in significant numbers in the lake. (Figure 26).

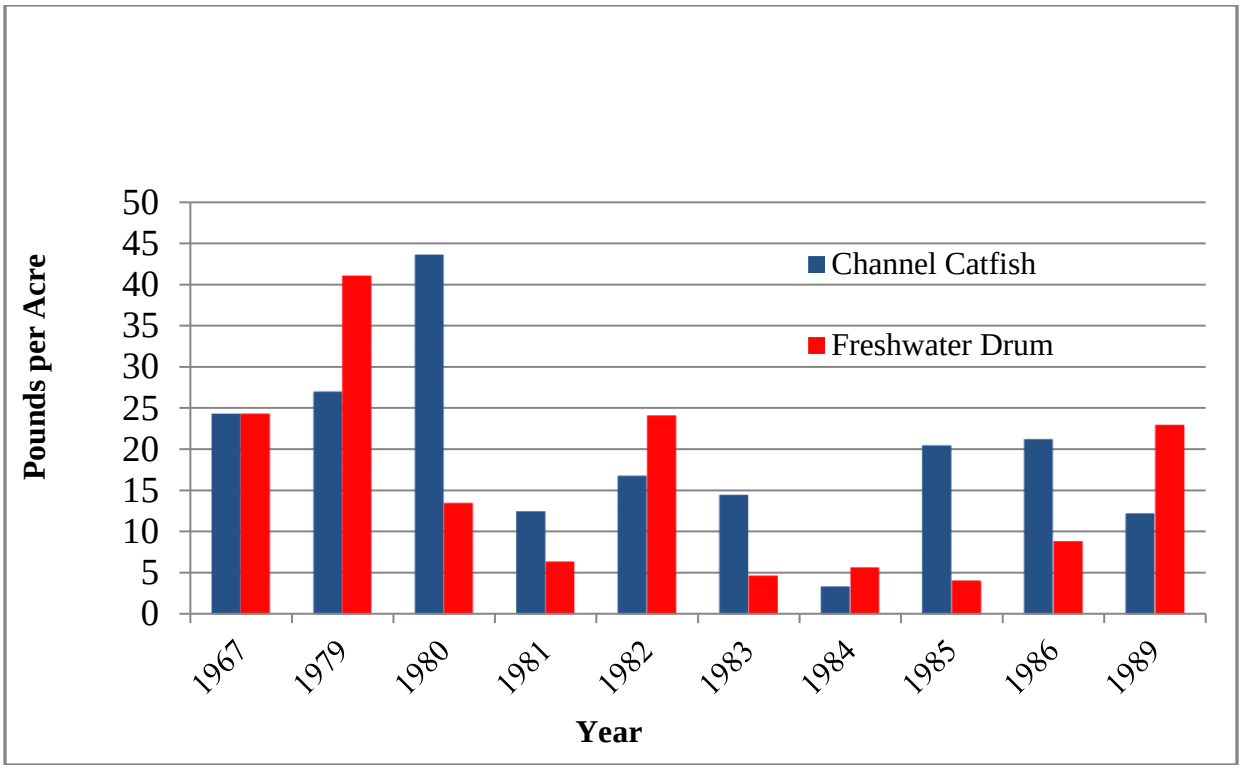

Figure 26. The CPUE in pounds per acre of commercial fish collected during standardized biomass (rotenone) sampling in Cross Lake, LA, from 1967 to 1989.

Gill nets

Standardized sampling with gill nets was conducted on the lake from 1989 – 2020. The primary commercial species collected were catfish as indicated in Figure 27.

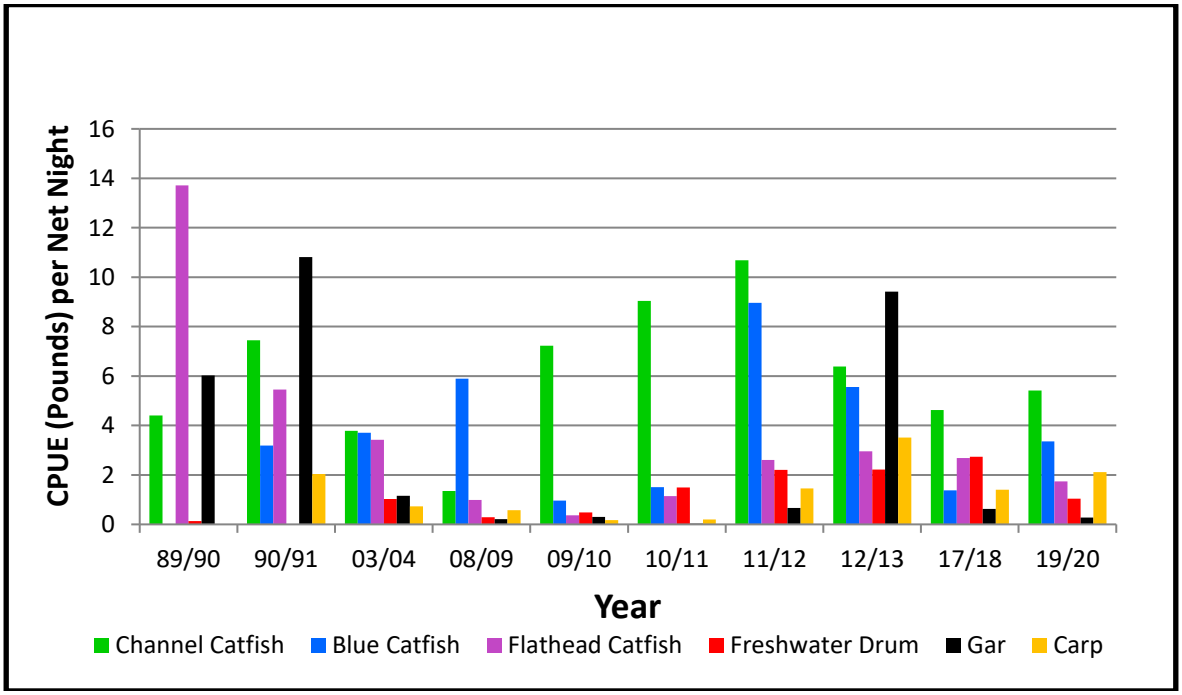

Figure 27. The CPUE in pounds per net night (100' net) per year of commercial fish in Cross Lake, LA, during standardized gill net sampling from 1989 – 2020.

HABITAT EVALUATION

Aquatic Vegetation

Nuisance aquatic vegetation has been present in Cross Lake for many years. Although Cross Lake is a relatively shallow reservoir, only the west end and the upper reaches of the coves possess cypress trees. Much of the lake is open and subject to abundant wave action. This wave action helps to reduce both floating and rooted submersed aquatic vegetation in the main body of the reservoir. Additionally, proactive management by city officials has been instrumental in protecting the water supply for the City of Shreveport. In most cases, vegetation problems have been managed through herbicide applications by city employees/contractors so that recreational boating and fishing access have not been seriously impacted.

Control efforts by city officials for hydrilla (*Hydrilla verticillata*) on Cross Lake have been ongoing since 1998. Those efforts include a combination of herbicide applications and biological control utilizing triploid Grass Carp. To date, hydrilla has been kept at manageable levels. No hydrilla has been identified during vegetation surveys since the spring of 2016. Only a few plants were identified in early 2016 (prior to the spring flood event) by City of Shreveport personnel. Escapement of Grass Carp is limited by the fencing material applied to the log rack at the spillway. However, relatively few Grass Carp have been collected during fisheries sampling. Other factors that may be helping to reduce hydrilla levels include detrital/organic accumulations on the lake bottom and reduced sunlight penetration from heavy algal blooms in the summer. The water supply is not imminently threatened, and recreational activities have not been seriously impacted by hydrilla.

Giant salvinia (*Salvinia molesta*) was first documented in Cross Lake in 2006. City officials have requested assistance from LDWF on several occasions to control the plant. Since 2009, LDWF spray crews have treated a total of 4,061.25 acres of giant salvinia in addition to the control efforts by the city. The cypress forests on the west end of the lake continue to harbor plants and offer good habitat for floating aquatic vegetation. In general, a predictable pattern has emerged for salvinia on Cross Lake. Plants are harbored in the shallow, forested west end, and limit access to these areas as the growing season progresses. With fall and winter rains, much of the mats are flushed into the open water portions of the lake, where wind and wave action deposit most of the plants onto the shore. Salvinia has yet to cause extended, negative impacts to the main lake area. LDWF performed a vegetation assessment on the lake in August of 2022, and estimated that giant salvinia was impacting about 150 acres of the lake. Two significant freeze events in January of 2021 greatly reduced salvinia throughout the Northwest Louisiana region. Salvinia coverage remained low on most area lakes all through 2021 and the first part of 2022. The reduction allowed spray crews to stay ahead of the plants and gain better control than in most recent years.

Substrate

The substrate of Cross Lake is composed of poorly drained soils in the valleys of Cross Bayou and Paw Paw Bayou. Cross Lake is typical of many impounded natural cypress swamps in that eutrophication has been accelerated by the altered hydrological regime. Aquatic vegetation and leaf litter from the dense forest canopy on the upper end of the lake contribute to a buildup of organic matter on the lake bed. This organic muck degrades fisheries habitat. In a natural cypress swamp, periods of low water in the late summer and early fall facilitate decomposition of organic matter through aerobic decomposition. Without the natural water fluctuation, leaf litter and dead aquatic vegetation are subject to the much slower anaerobic

decomposition. The slow anaerobic decomposition process of leaf litter in Cross Lake is responsible for accretion of organic material and an associated decline in habitat conditions and fish productivity in the heavily forested areas of the lake. Drawdowns have been used successfully on other lakes to slow the eutrophication process, but drawdowns are not used as a management strategy for Cross Lake since it serves as the water supply for the City of Shreveport.

Water Level

Presently, Cross Lake water levels are maintained close to pool stage by pumping water from nearby 12-mile Bayou into the lake during the summer, and by operating flood control Tainter gates in the spring. Cross Lake is often below pool stage during the spring when most lakes are consistently over pool. It is unknown what the impacts of these low-water events have had, but they often occur during prime spawning times for popular species such as Largemouth Bass and crappie. Rapidly removing water ahead of a possible rain event may be having a negative impact on spawning sunfish building their nests. Currently, there are no biological considerations cited in the City of Shreveport's operational plan regarding the tainter gates. Flood control and water retention for municipal uses are the main goals for the city.

Prior to the pump project going on-line in 1957, water levels in the lake would drop during the summer. The drop in water level coincided with increased municipal water use, increased evaporation rates, and decreased precipitation. These water fluctuations mimicked a small mid-summer drawdown on the reservoir and more closely resembled the natural water fluctuations present in a swamp habitat. These events helped reduce the organic accretion in the lake. As the population of Shreveport increased, there was concern over allowing the lake to drop so low each year and the pump was installed. Water levels are now maintained near pool unless there is a mechanical failure. The project was altered again in 1994 when the J. Bennett Johnston Waterway was completed on the Red River which raised and stabilized water levels at the pumping site in 12 Mile Bayou. Since 1995, pumping has increased to approximately 200 days per year on average. This increase in pumping has brought in nutrient-rich river water which likely helps the lake maintain its beneficial phytoplankton bloom year round.

With increased pumping, the lake level has been kept more consistent in recent years, and on average remains approximately 0.7 feet higher than in years past during the late summer and early fall. However, periods of low water are beneficial for drying and aerobic decomposition of bottom sediments. Additionally, the water being pumped in from 12 Mile Bayou is nutrient rich. The eutrophication and organic accretion rates may be accelerating on the lake due to more frequent utilization of the 12-Mile pump.

Complex Cover

Complex cover in Cross Lake consists primarily of cypress forests on the upper end of the lake and in the back of the coves. The majority of the shoreline of the lake is lined with scattered cypress trees, piers and boathouses. Submerged aquatic vegetation in Cross Lake is mostly on the upper end of the lake and in the coves. Cross Lake is estimated to have 4,946 acres of littoral habitat for black bass. This area includes water out to the 8 foot contour.

CONDITION IMBALANCE / PROBLEM

The most significant problem on Cross Lake is the presence of invasive aquatic vegetation, including giant salvinia and hydrilla. These plants pose a formidable threat to the aquatic habitat and recreational activities. The plants also are a serious potential hindrance to the pumping of water for the City of Shreveport.

The eutrophication process in Cross Lake is detrimental to fisheries habitats, storage volume and water quality for the reservoir which serves as the water supply for the City of Shreveport. The inability to utilize drawdowns to slow this process due to concerns over water storage volume leaves reservoir managers no practical solution to the problem.

CORRECTIVE ACTION NEEDED

Control invasive aquatic vegetation.

RECOMMENDATIONS

1. Provide technical advice and assistance to officials with the City of Shreveport for vegetation control efforts on Cross Lake when requested. LDWF has a standing offer to provide herbicide applications for giant salvinia on Cross Lake if requested by city officials. Giant salvinia will be controlled with a mix of glyphosate (0.75 gal/acre) and either diquat (0.25 gal/acre) or flumioxazin (0.015 gal/acre) with Turbulence (0.25 gal/acre) surfactant from April 1 to October 31. Outside of that time frame, diquat at a rate of 0.75 gallons per acre will be used in addition to 1 qt of 90:10 nonionic surfactant. City of Shreveport employees are working cooperatively with LSU Ag Center to stock and monitor salvinia weevil populations on the lake. Assistance will be provided with weevils as requested.

2. Continue to stock Florida Bass fingerlings at the rate of 20 fish per acre of bass habitat to keep the Florida gene established in the population and allow anglers an opportunity to catch an occasional memorable or trophy-size bass.

3. Continue LDWF standardized electrofishing sampling on a biennial basis.

4. Conduct tagging project to estimate crappie exploitation rate on Cross Lake in 2024.