

LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES



OFFICE OF FISHERIES
INLAND FISHERIES SECTION

PART VI -B

WATERBODY MANAGEMENT PLAN SERIES

TOLEDO BEND RESERVOIR

WATERBODY EVALUATION &
RECOMMENDATIONS

CHRONOLOGY

May 2010 - Prepared by

Ricky Yeldell, Biologist Manager, Toledo Bend Research Station

November 2013– Updated by

Ricky Yeldell, Biologist Manager, Toledo Bend Research Station

November 2015 – Updated by

Jason J. Brancamp, Biologist Manager, District 10

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WATERBODY EVALUATION

STRATEGY STATEMENT

Recreational

Largemouth bass (LMB) are managed to provide the opportunity to catch fish of greater than average size. Sunfish, catfish and crappie are managed to provide a sustainable population while providing anglers the opportunity to catch or harvest numbers of fish.

Commercial

Catfish, buffalo, freshwater drum and bowfin are managed to provide sustainable populations.

Species of Special Concern

Paddlefish, *Polyodon spathula*, are managed to provide the greatest opportunity to restore the population to a viable fishery.

The Sabine shiner, *Notropis sabinae*, is a species of interest and occurs throughout the reservoir.

Suckermouth minnows, *Phenacobius mirabilis*, occur in this waterbody and are listed as a species of conservation interest.

EXISTING REGULATIONS

Recreational

Current Texas regulations may be viewed at the Texas Parks & Wildlife website:
<http://www.tpwd.state.tx.us/publications/annual/fish/>.

Current Louisiana recreational fishing regulations may be viewed at the link below:
<http://www.wlf.louisiana.gov/fishing/regulations>

Scuba Diving Season

A special season for scuba diving (spear fishing) for largemouth bass, crappie, and *Lepomis* species resulted from the passage of Act No. 323 of 1984 and was initiated on July 3, 1985. This season was in effect only for Toledo Bend Reservoir south of Highway 6 on the Louisiana side of the reservoir. The season ran from sunrise on June 1st to sunset the last day of September. A special permit was required of participants and a monthly report had to be filed in order to keep the permit. Limits were 5 largemouth bass, 25 crappie, and 50 *Lepomis* spp. (bream). In addition to the special permit, participants could not have other types of fishing gear in the boat at the time and were required to have a valid recreational fishing license.

The special scuba diving season on Toledo Bend was amended by the LWFC in May 1989 (**Appendix I**) to only allow the take of crappie and *Lepomis* spp. (sunfish or bream). In January 2013, the LWFC abolished the special scuba diving season on Toledo Bend. Therefore the take of any freshwater gamefish with scuba diving equipment is not allowed.

Commercial Fishing Regulations

Texas commercial regulations may be viewed at the Texas Parks & Wildlife website:
<http://www.tpwd.state.tx.us/publications/annual/fish/>.

While current Louisiana commercial fishing regulations may be viewed at the link below:
<http://www.wlf.louisiana.gov/fishing/regulations>

SPECIES EVALUATION

Recreational Species

Recreational angler surveys-

Creel survey data obtained during the period June 1, 2009 to March 1, 2010 indicate that 73% of all angling efforts on the entire waterbody were directed toward black bass. Anglers fishing the Louisiana side of the reservoir and anglers fishing the Texas side of the reservoir directed 69.5% and 76.3%, respectively, of their angling efforts toward black bass. Anglers surveyed on the Louisiana side of the reservoir caught 0.73 black bass per hour of angling effort during the survey period.

Relative abundance and relative weight-

Spring electrofishing data from Toledo Bend Reservoir reveals relatively constant CPUE values for LMB over time. Relative abundances of both quality-size and preferred-size (≥ 15 in. total length) largemouth bass have been consistent in recent years, as indicated in Figure 1. The CPUE values for memorable size LMB for years 2008, 2009, 2010, 2011 and 2012 were 0.5, 0.3, 0.7, 0.3 and 1.0 respectively.

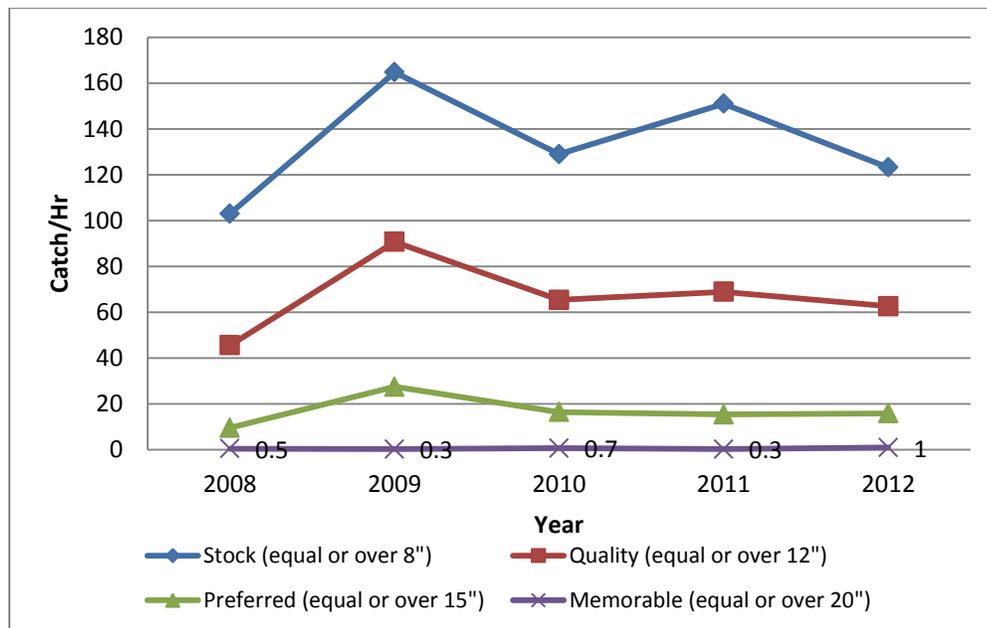


Figure 1. Spring electrofishing CPUE for LMB of stock-, quality-, preferred-, and memorable- size fish sampled in years 2008-2012.

Median relative weights for different size groups of LMB sampled from Toledo Bend Reservoir during the years 2009 – 2010 are stock size – 103.3, quality size – 102, preferred

size – 104.3, and memorable size – 97.7. Relative weight data for largemouth bass are depicted in Figure 2.



Figure 2. The relative weights of largemouth bass by stock-, quality- and preferred-size fish sampled at Toledo Bend Reservoir, Louisiana from fall electrofishing 2002 – 2010.

Relative weights for LMB collected in 2012 are lower than those found in 2011. However, the 2012 values are equivalent to the median values for years 2008 – 2012. The exception is the 2012 memorable size W_r which is 103.5. This value is well above the median memorable W_r for the period which was 95.7. Largemouth bass relative weight values are further described in Table 1.

Table 1. Largemouth bass relative weights for 2012 electrofishing samples compared to largemouth bass average relative weights for samples collected from 2008 – 2012.

LMB Size Group	2008-2012 Median W_r	2012 W_r	2012 W_r vs. 08-12 Median W_r
Stock	97.8	97.8	Equal
Quality	94.4	94.4	Equal
Preferred	96.4	96.4	Equal
Memorable	95.7	103.5	+8.2%

Seine sampling results from Toledo Bend, although quite variable from year to year, show a mean catch of 5.7 young-of-the-year (YOY) largemouth bass per seine haul during the period from 1990 -2010. Values for LMB caught per seine sample appear in Figure 3.

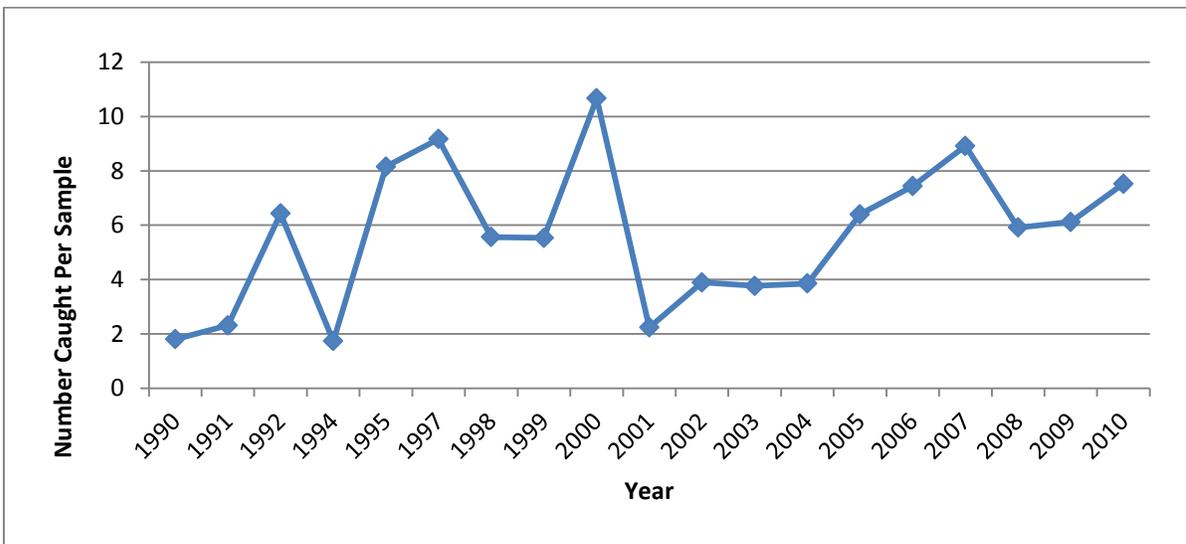


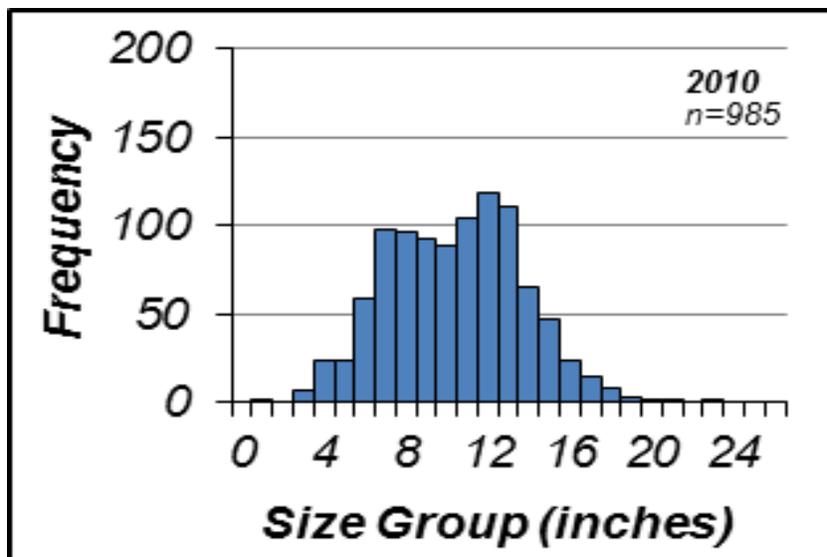
Figure 3. Catch per seine haul of YOY largemouth bass in Toledo Bend Reservoir, Louisiana from 1990-2010.

Age, growth and mortality-

LDWF recently concluded an intensive study of the Toledo Bend Reservoir LMB population. The project included data collection over a period from 2010 – 2012. Population dynamics including relative abundance, spawning success, growth, body condition, mortality, and longevity were measured. Toledo Bend anglers were also surveyed to determine their collective influence on the LMB population.

Electrofishing gear was used by fisheries biologists to collect LMB from Toledo Bend each spring. Length and weight measurements were recorded for each fish and ear bones (called otoliths) were removed from approximately 32% of the sampled fish for age and growth analyses. Annual growth rings on the otoliths provide an accurate measurement of fish age. Size and age for all of the sampled fish were combined to generate estimates of average rate and longevity. Angler surveys were conducted during the sample period to document fishing effort, angler catch rate and harvest rates.

Figure 4 illustrates that Toledo Bend supports a healthy bass population that includes some large individuals. Good representation of fish in the 7 to 14 inch range was observed for each year. It is important to note that spring sampling typically does not include fingerling size bass. However, the recurring presence of age-1 bass indicates successful reproduction (Figure 4).



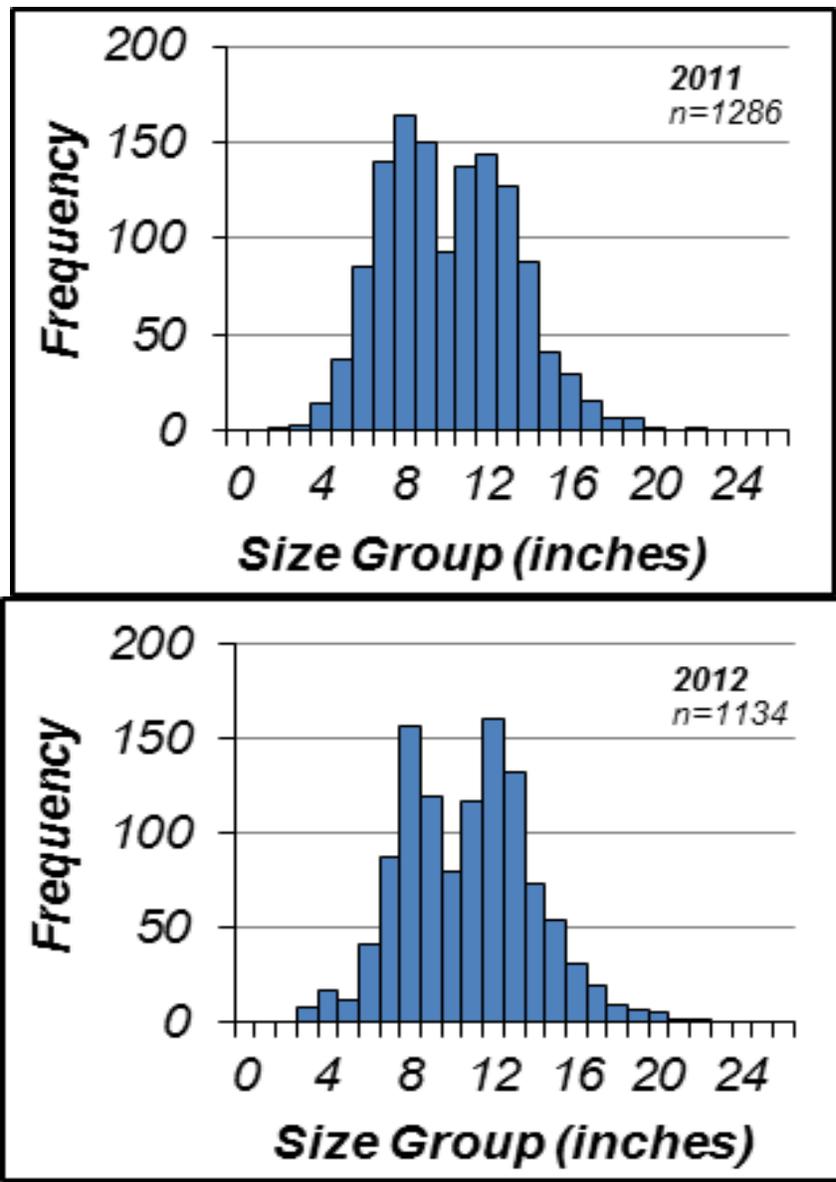


Figure 4. Annual length distributions of LMB collected from Toledo Bend Reservoir, LA during spring electrofishing surveys in 2010-2012.

Age structure of the complete electrofishing sample (2010-2012) is shown in Figure 5. The majority of the age 6+ fish were females. While bass up to 11 years old were found, only a small percentage of Toledo Bend LMB 6 years and older were included in the sample. Average length at age for Toledo Bend bass is provided in Table 1. A Toledo Bend LMB typically reaches 14" TL in three years. Growth of LMB is rapid through age 5, but then slows to only 1.2 inches or less per year (Figure 6).

Body condition for Toledo Bend bass can be described as robust. Good physical condition of bass generally is the product of an adequate food supply, readily available to predation. One of the more significant findings is the stable recruitment of age-1 LMB into the Toledo Bend population. Contributing factors include favorable water fluctuation, quality spawning substrate, and adequate cover for fingerlings.

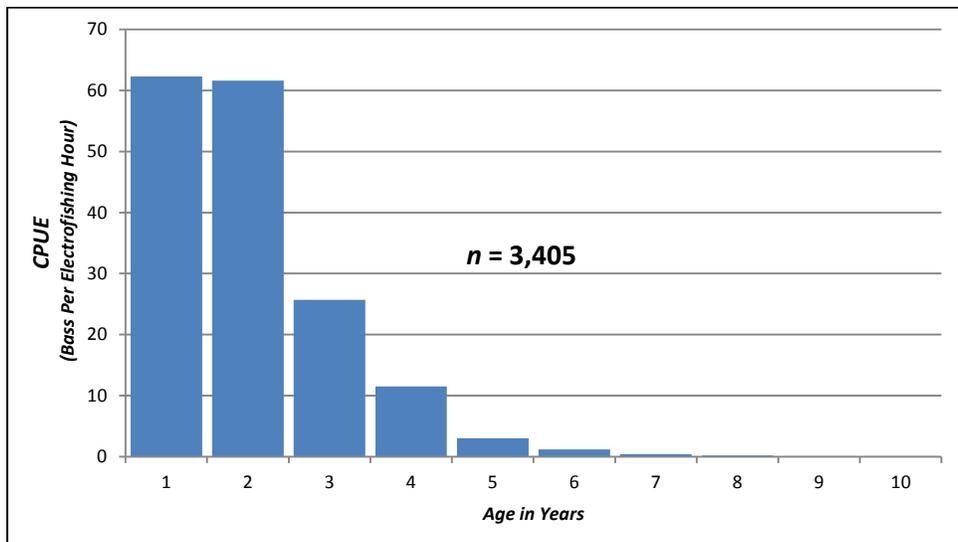


Figure 5. CPUE for LMB by age class for Toledo Bend Reservoir, LA, from spring electrofishing results, 2010 – 2012.

Table 2. Length at age for LMB from Toledo Bend Reservoir, LA, 2010 – 2012.

Age	Length in Inches
1.0	7.3
2.0	11.2
3.0	14.1
4.0	16.3
5.0	17.9
6.0	19.1
7.0	20.0
8.0	20.7
9.0	21.2
10.0	21.5

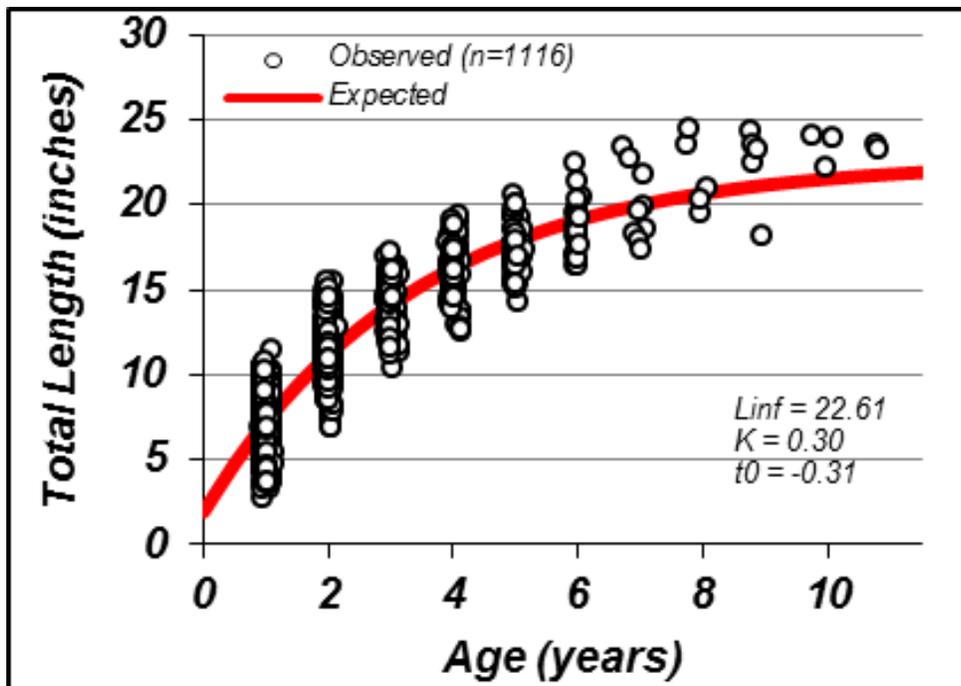


Figure 6. Total length at capture by age for Toledo Bend Reservoir LMB (2010-2012).

The rate at which fish die each year is referred to as mortality. Mortality consists of two parts: natural mortality (predation, disease) and fishing mortality (angler harvest and discard mortality). Results of the recent study indicate that the total mortality rate for Toledo Bend LMB is 65% per year. At that rate, if you start with 100 age-1 Toledo Bend LMB, only 1.5 fish will remain alive by age 5.

The results of this study suggest that the Toledo Bend LMB population has a total mortality that is more heavily influenced by fishing mortality than by natural mortality (41 and 24% per year, respectively). The fishing mortality rate for Toledo Bend LMB is 41% per year. This rate comes from two sources; 1) harvest and 2) post release mortality. Creel survey results suggest that Toledo Bend bass anglers harvest a much larger percentage of LMB than they release (61% of legal-size fish are kept).

STUDY SUMMARY

The Toledo Bend Reservoir LMB population has a high maximum age, moderate growth rate, high mortality rate, and a good annual recruitment of Age-1 fish. The Toledo Bend Reservoir LMB fishery has a 39% voluntary catch and release rate and an annual fishing mortality rate that is almost twice that of natural mortality. The Toledo Bend Reservoir LMB fishery is currently managed with a 14 inch minimum length limit (MLL) and an eight fish per day harvest limit. Given the dynamics of the Toledo Bend Reservoir LMB population and fishery, the existing 14 inch MLL size regulation appears beneficial. At current levels of fishing mortality, the existing 14 inch MLL on LMB produces a larger catch rate and higher frequency of catches greater than 15").

Largemouth Bass Genetics

Toledo Bend has been stocked with Florida-strain largemouth bass since 1984. Florida-strain largemouth bass are stocked into the reservoir to incorporate a genetic trait associated with larger maximum-sized adult fish. Genetic analysis of largemouth bass taken by electrofishing (Table 3) shows that, over time, the percentage of bass with Florida influence ($F - F_x$) has increased from 0.16 percent (1989-1990) to 43 percent (2003-2004). Analysis also indicates that largemouth bass with the genetic signature defined as pure Florida have increased from

0.16 percent (1989-1990) to 18 percent (2001-2002).

Table 3. Genetic analysis of largemouth bass taken by electrofishing from Toledo Bend Reservoir, Louisiana, 1988 – 2012.

Year	Number	Northern	Florida	Hybrid	Florida Influence
1988	Unknown	52%	11%	37%	48%
1989	89	98.9%	1.1%	0	1.1%
1990	Unknown	84%	2%	14%	16%
1992	Unknown	85%	3%	11%	14%
1994	Unknown	86.4%	7.2%	6.3%	13.5%
1999	148	68%	8%	24%	32%
2000	50	80%	2%	18%	20%
2001	104	65%	18%	20%	38%
2002	118	61%	16%	23%	39%
2003	170	57%	11%	32%	43%
2004	176	76%	9%	15%	24%
2005	170	67.3%	5.8%	26.9%	32.7%
2006	181	68.50%	4.97%	25.41%	30.38%
2007	171	64%	4%	32%	36%
2009	106	71%	3%	26%	29%
2010	383	71%	7%	22%	29%
2011	382	74.5%	4%	21.5%	25.5%
2012	364	67.3%	4.1%	28.6%	32.7%

On October 7, 2000, results of a survey conducted by Texas A & M University were published in *Characteristics, Participation Patterns, Attitudes, Management Preferences, Expenditures, and Economic Impacts of Toledo Bend Reservoir Anglers: Texas and Louisiana*. Mail surveys were sent to 1,045 Toledo Bend anglers who fished between October 1998 and September 1999 (Thailing & Ditton, 2000). The anglers were interviewed as part of the creel survey conducted by Texas Parks & Wildlife and the Louisiana Department of Wildlife & Fisheries. One angler per fishing party was randomly selected to receive the mail survey. Anglers were asked questions in reference to their satisfaction with fishing at Toledo Bend Reservoir. Opinions in reference to existing and proposed management regulations were solicited as was a description of their trip in progress, including species targeted and fishing-related expenditures.

Relevant data from this study are considered to represent public opinion regarding current fishing regulations at Toledo Bend Reservoir. Anglers were asked whether they supported or opposed current or proposed fishing regulations at Toledo Bend Reservoir. Responses to the questions concerning largemouth bass regulations appear in Table 4.

Table 4. Angler support or opposition to current largemouth bass fishing regulations at Toledo Bend Reservoir, Louisiana, 2000.

Opinion of All Anglers to 14 inch minimum length limit for largemouth bass (%)					
	Strongly Support	Support	Neutral	Oppose	Strongly Oppose

All Anglers	43.8	36.4	9.5	6.4	3.9
Opinion of Anglers by State to 8-fish daily bag limit for black basses in any combination (%)					
	Strongly Support	Support	Neutral	Oppose	Strongly Oppose
Louisiana anglers	37.6	39.8	10.5	7.3	4.8
Texas anglers	30.7	36.8	13.2	10.4	8.9

With regard to the current largemouth bass length limit regulation, 80.2% of anglers either supported or strongly supported the current 14 inch minimum length limit while 10.3% either opposed or strongly opposed this regulation. The current 8-fish daily bag limit for black bass in any combination was supported or strongly supported by 77.4% of Louisiana anglers and 67.5% of Texas anglers.

Sunfish (Bluegill & Redear)

Creel survey data from 2009-2010 indicate that 8% of angler-hours on the Louisiana side of the reservoir are directed toward sunfish. Sunfish provide an excellent opportunity to introduce new anglers to sportfishing due to their generous abundance and their willingness to accept lures. Sunfish also make up a significant portion (43.7% in 2010) of available forage for predatory sport fish species. Creel survey data further shows that Louisiana anglers seeking sunfish caught 4.7 sunfish per hour of angling effort during the survey period.

Crappie

The 2009-2010 creel survey data show that crappie anglers contributed 18% of all angling effort hours on the Louisiana side of the reservoir. Louisiana crappie anglers caught 2.0 crappies per hour of angling effort during the survey period.

Relative abundance, length distribution and size structure indices-

Total gill net sampling catch-per-unit-of-effort (number of fish caught per 100' of net per net night) values for 2002-2012 are provided given in Figure 7. These values indicate a slightly increasing population over time. Both crappie species are known to exhibit cyclical population patterns and such fluctuations are depicted by the gillnetting data.

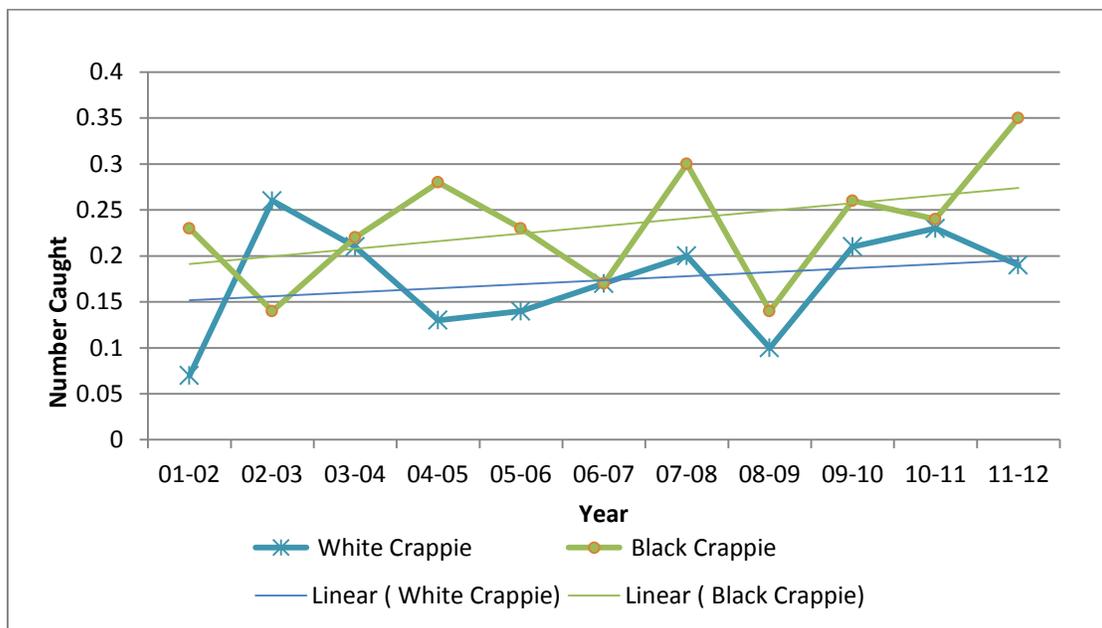


Figure 7. The CPUE (number caught)/100’/Net Night of white crappie and black crappie in Toledo Bend Reservoir, Louisiana by gillnet sampling 2002-2012.

Inch group compositions of crappie samples taken by lead net sampling also show variation from year to year. Over time, crappies collected by lead net sampling are clustered primarily within the seven inch – ten inch range with the most commonly captured group being eight inch. The catch per hour values for each size group is given in Figure 8.

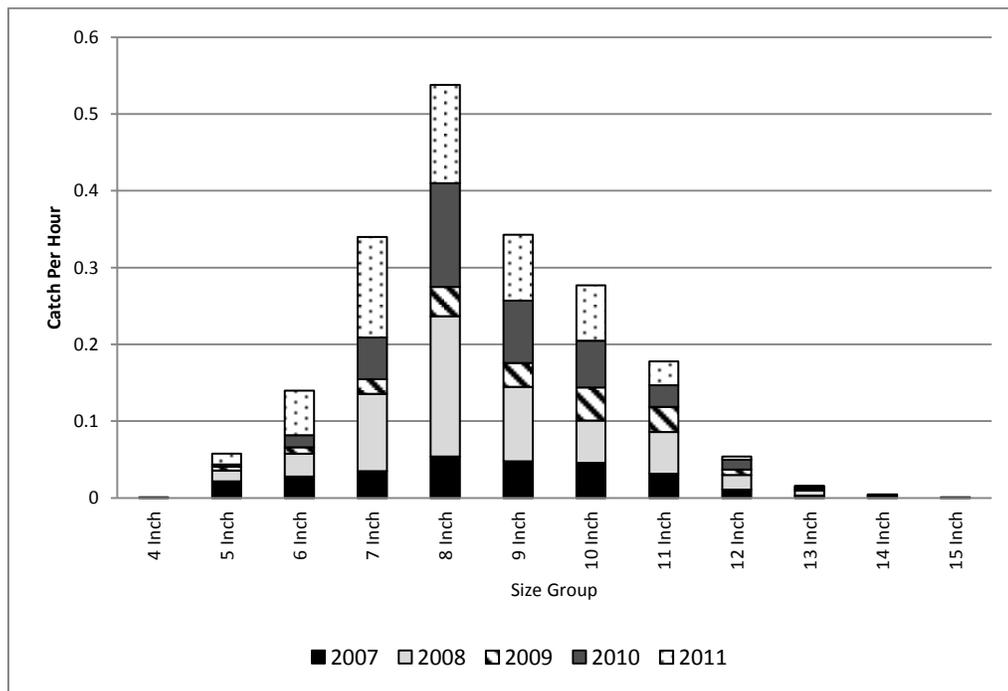


Figure 8. The CPUE by inch group for crappies collected by lead net sampling at Toledo Bend Reservoir, Louisiana in years 2007-2011.

Figure 9 depicts the catch per unit effort (CPUE) for crappies collected in lead net sampling. CPUE values are given for stock-size, quality-size, preferred-size and memorable-size groups. As previously stated, crappie populations are known to be cyclical. Changes in crappies

populations typically correspond to strong year classes produced when environmental conditions favor crappie recruitment. Gillnet and lead net sample data bear out this cyclical pattern.

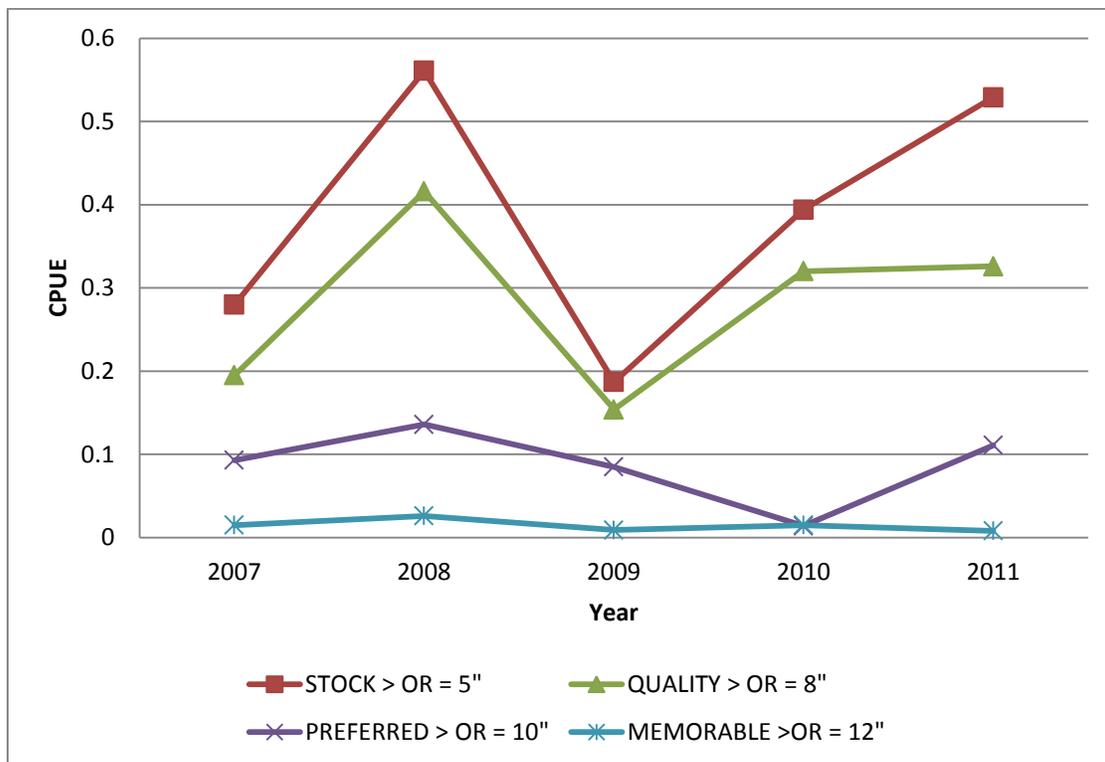


Figure 9. The catch per unit effort of selected crappie size groups caught in Toledo Bend Reservoir, Louisiana by lead net sampling 2007 – 2011.

Relative stock density (RSD) and proportional stock density (PSD) values for crappies are also derived from lead net sampling data. These stock density indices are illustrated in Figure 10.

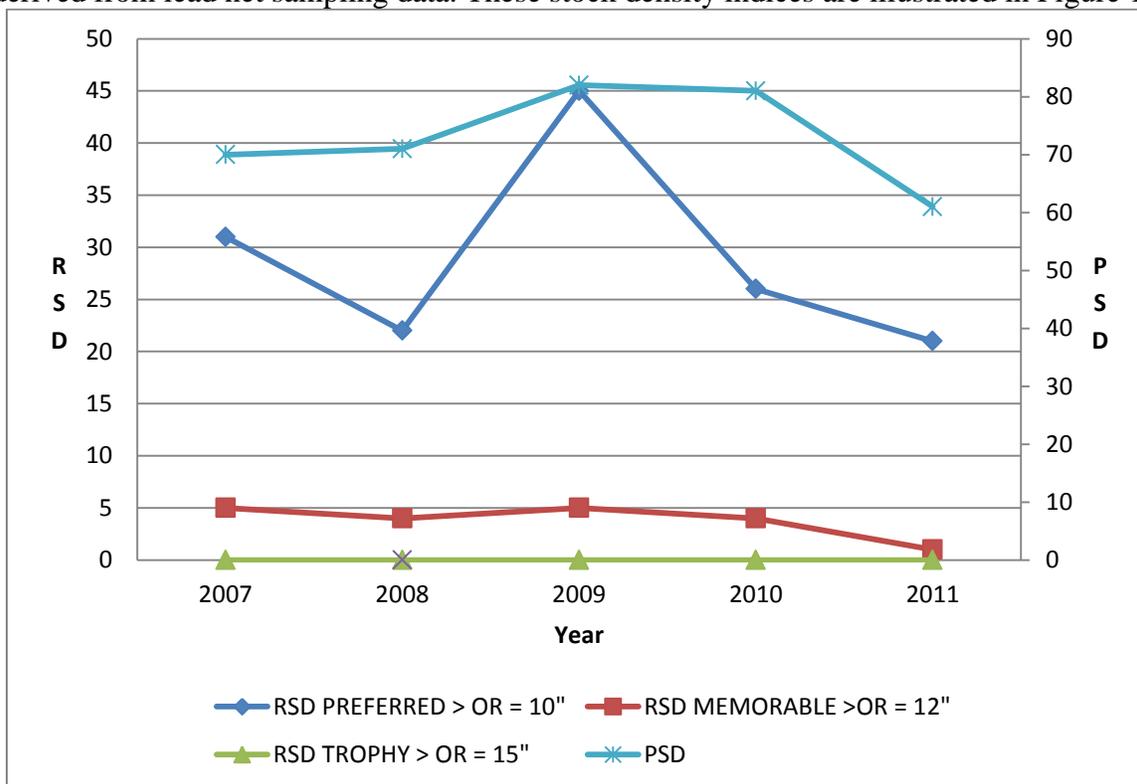


Figure 10. Structural stock density indices for crappies caught in Toledo Bend

Upon examination of the CPUE values from both gillnetting and lead netting, it appears that overall abundance of crappies increased during the period from 2009 to 2011. A corresponding decrease in PSD and RSD values for crappies during the same period may be a reflection of that population increase.

Age, growth and mortality-

Crappie species are annually surveyed for age and growth information. Black crappie and white crappie length at age for the period 2009 – 2011 is shown in Figure 11. Since regulations for both species are the same, the data sets were combined to generate age, growth, and mortality results.

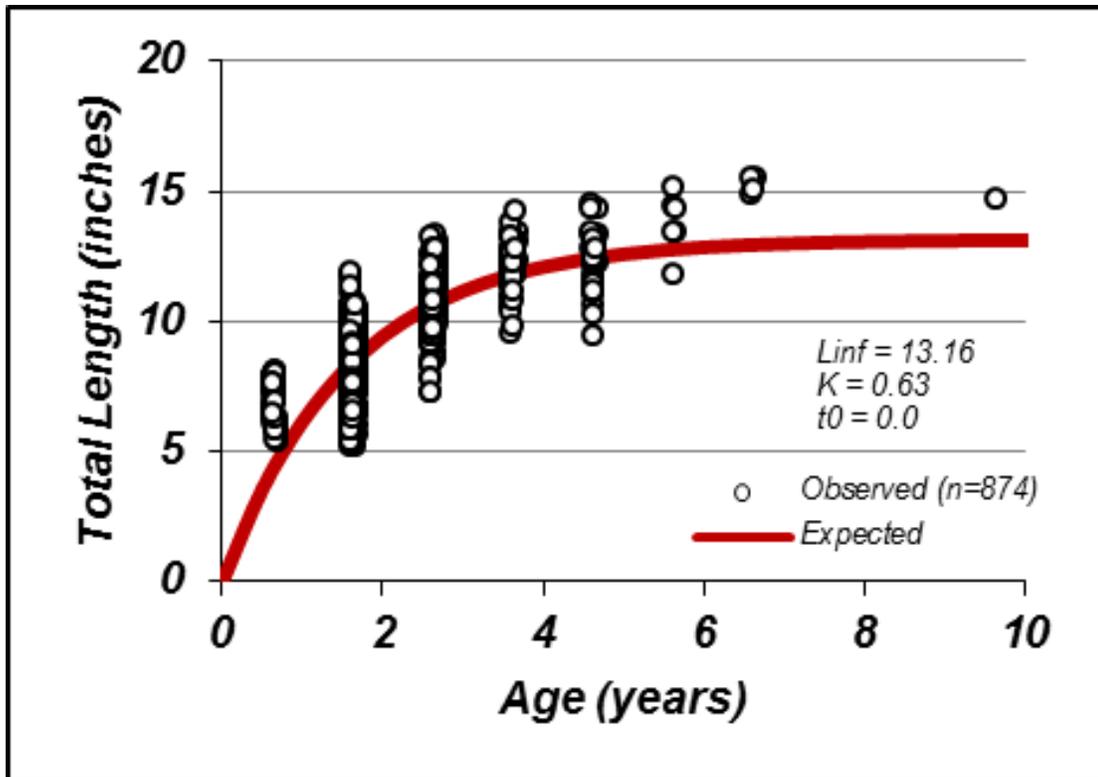


Figure 11. Observed and predicted total length at age of Toledo Bend Reservoir crappie (2009-2011). Von Bertalanffy parameter estimates and sample sizes (n) are presented in each graphic.

Age analyses revealed that the Toledo Bend crappie population is primarily comprised of age 1 and age 2 fish (Figure 12). These crappies are subject to relatively moderate annual mortality rates (Figure 13). Additionally, coefficients of variation (CV) describing the magnitude of variation in mean annual age-1 crappie catches in lead nets indicate a very stable recruitment of crappies into the population (CV = 11.5%).

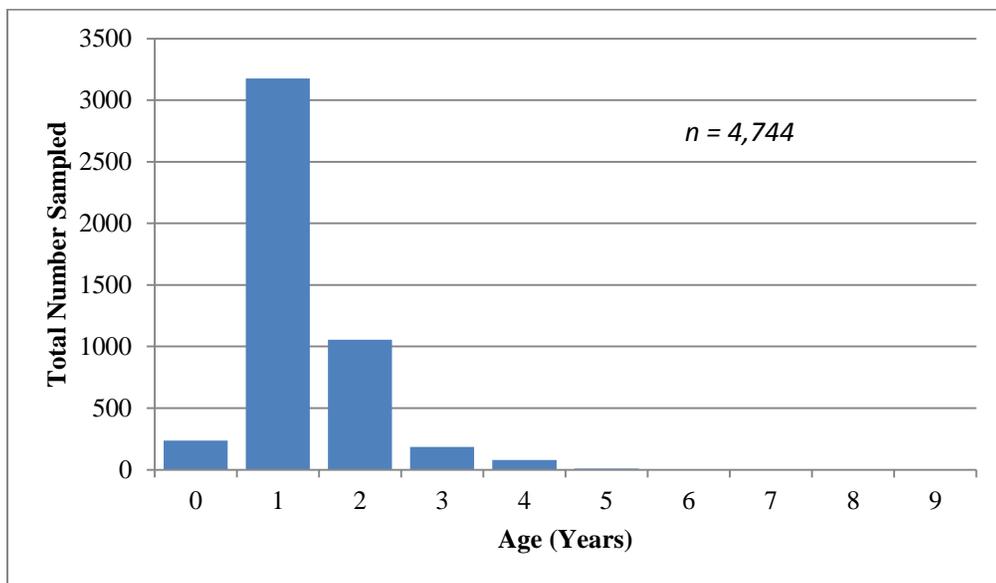


Figure 12. The age frequency of crappies (black and white combined) collected with lead nets from Toledo Bend Reservoir, Louisiana 2009 – 2011.

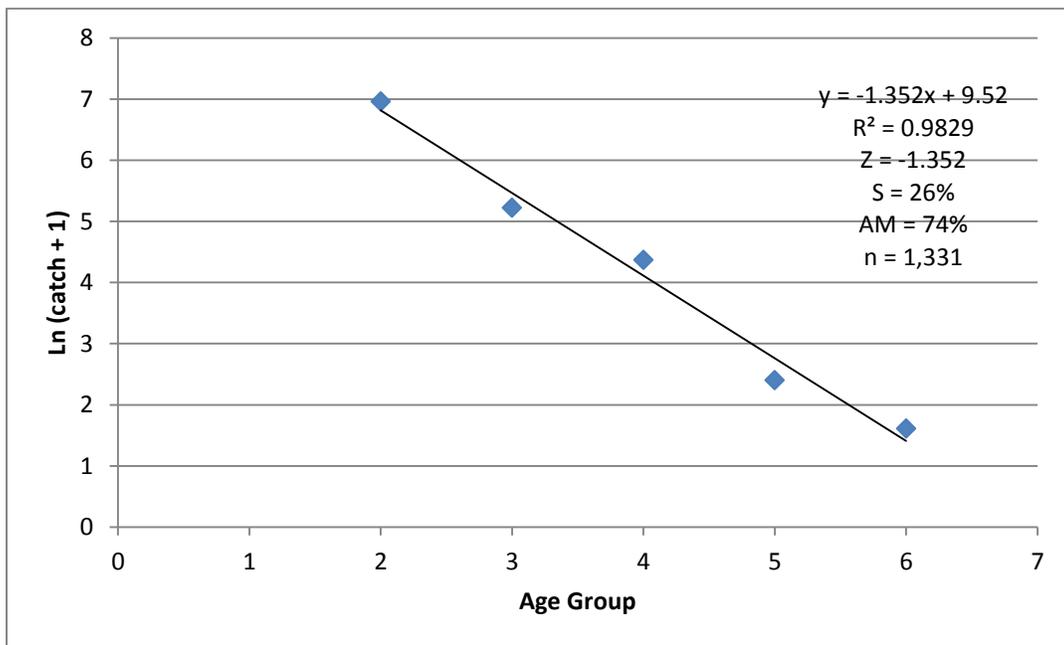


Figure 13. Annual mortality and corresponding survival rate of crappie (black and white) from Toledo Bend Reservoir, LA, derived from lead net samples collected in 2009 - 2011.

In Figure 13, the un-aged fish in samples were assigned ages from an annual age-length-key. The catch curve equation and coefficient of determination (R^2) are presented in graphic. Z = slope of descending catch curve; S = survival rate; AM = annual mortality (which includes mortality due to fishing and natural causes); N = sample size.

Catfish

Catfish are traditionally known as a commercial species in Louisiana. However, a recreational

catfish fishery does exist statewide. For that reason, catfish are discussed in both the recreational and commercial sections of this document. Creel data for the Louisiana side of the reservoir show that during the 2009-2010 survey period recreational anglers who targeted catfish caught 1.96 catfish per hour of effort. Catfish angler effort comprised 3.28% of all angling effort on the reservoir.

Recreational catfish regulations have undergone several changes at Toledo Bend in recent years. Current regulations allow for 50 fish daily in aggregate of channel catfish and blue catfish with no more than five fish over twenty inches in total length. Recreational regulations for flathead catfish are ten fish daily with an eighteen inch minimum length limit.

Recent research by LDWF indicates that the current catfish regulations are more restrictive than biologically necessary, especially with regard to blue catfish. LDWF is currently in negotiation with TPWD regarding catfish regulations for Toledo Bend Reservoir. LDWF routinely samples Toledo Bend with gillnetting gear to assess catfish among other species. Gillnetting data for all three species of catfish from a fifteen year period are shown in Figure 14.

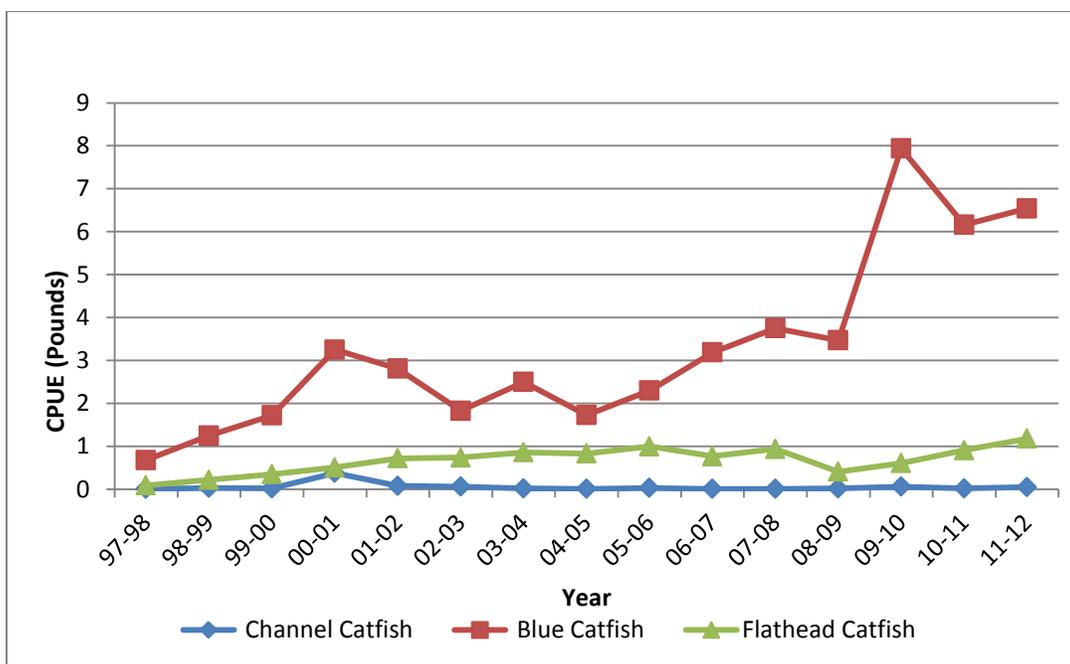


Figure 14. Catch per unit effort (pounds per net night/100 net) of catfish by species collected in Toledo Bend Reservoir, Louisiana by gillnet sampling 1997 – 2012.

Table 4 compares the most recent gillnetting CPUE (Pounds) for the major catfish species found in the reservoir to the mean CPUE (Pounds) values for the last ten sampling periods.

Table 4. Gillnetting CPUE for three catfish species collected at Toledo Bend Reservoir, Louisiana from 2002 – 2012.

Species	Mean CPUE 2002-2012	CPUE 2011-2012	2011-2012 CPUE VS Mean CPUE 2002-2012
Channel Catfish	0.029	0.05	+72%
Blue Catfish	3.941	6.54	+66%
Flathead Catfish	0.825	1.18	+43%

Forage

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 considered forage fish. Fall electrofishing forage samples from 2001 through 2010 show that the reservoir yields an average of 68.5 pounds of forage per hour. Figure 15 depicts the percentage of total forage poundage for each of the major forage species collected during fall electrofishing forage sampling in year 2010.

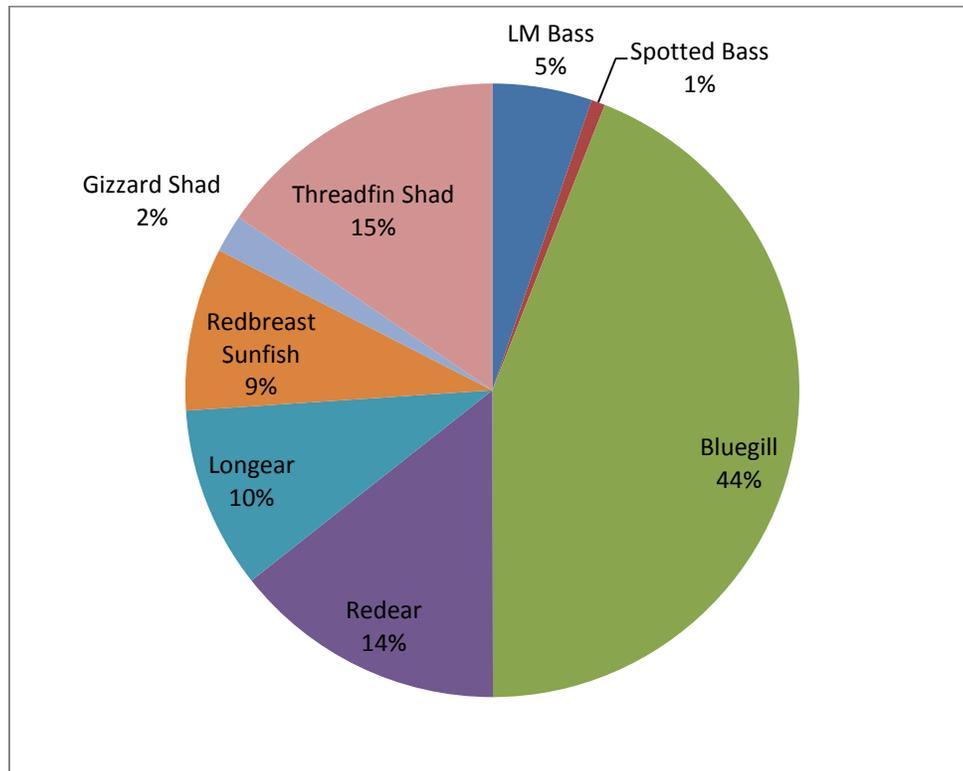


Figure 15. Percentage by pounds of forage species collected by electrofishing on Toledo Bend Reservoir, Louisiana, in year 2010.

Commercial Species

Data gathered by LDWF during standardized gillnet sampling is presented in the following graphs. Standardized sampling involves the use of 100 yards each of 2.5 inch, 3 inch, 3.5 inch and 4 inch monofilament gill nets at each sampling station.

Carp

While common carp (*Cyprinus carpio*) are not subject to species specific management, they are monitored as they occur in standardized sampling efforts directed toward other species. Figure 16 depicts total CPUE of common carp collected during gillnet sampling at Toledo Bend Reservoir.

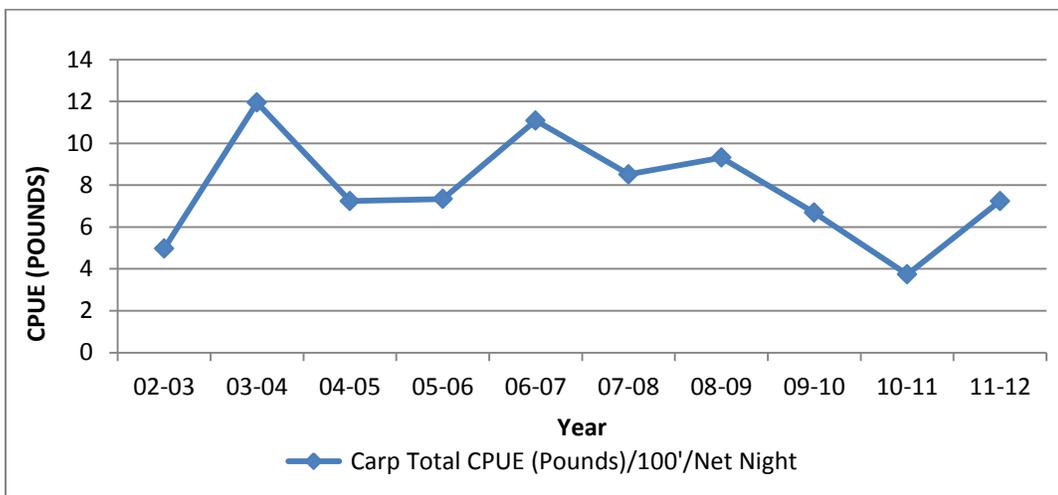


Figure 16. Total catch per unit effort (pounds per net night) of common carp taken by gillnet sampling in Toledo Bend Reservoir, Louisiana from 2002 - 2012.

Catfish

All catfish species are managed to provide a sustainable population. Although the three major catfish species (channel catfish, *Ictalurus punctatus*, blue catfish, *Ictalurus furcatus*, and flathead catfish, *Pylodictis olivaris*) exhibit some fluctuations in population numbers annually, these fishes are certainly being sustained within the waterbody. Data from standardized gillnet sampling relative to these species is presented in Figures 17 -19.

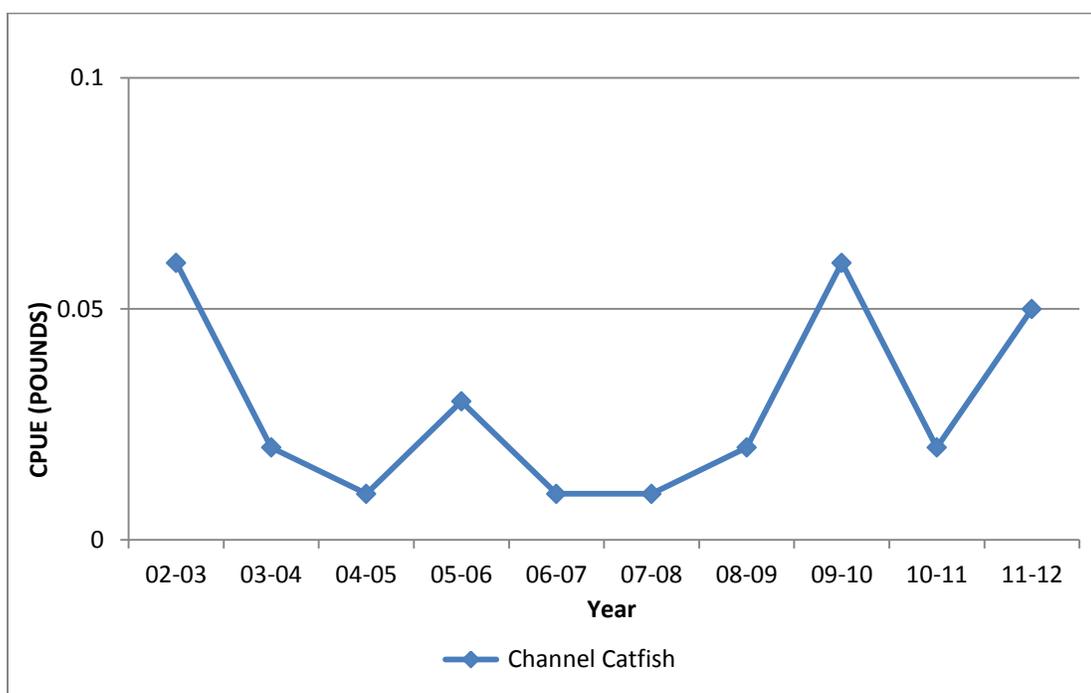


Figure 17. Total CPUE (pounds per net night/per 100 ft. net) of channel catfish taken by gillnet sampling in Toledo Bend Reservoir, Louisiana from 2002 - 2012.

While the CPUE value for channel catfish collected by gill net sampling remains small, the species' frequency remains fairly consistent during gillnet sampling at this reservoir. It is understood that large specimens of channel catfish are not common at Toledo Bend

Reservoir. The low CPUE for gillnet sampling is likely due to gear bias against smaller specimens.

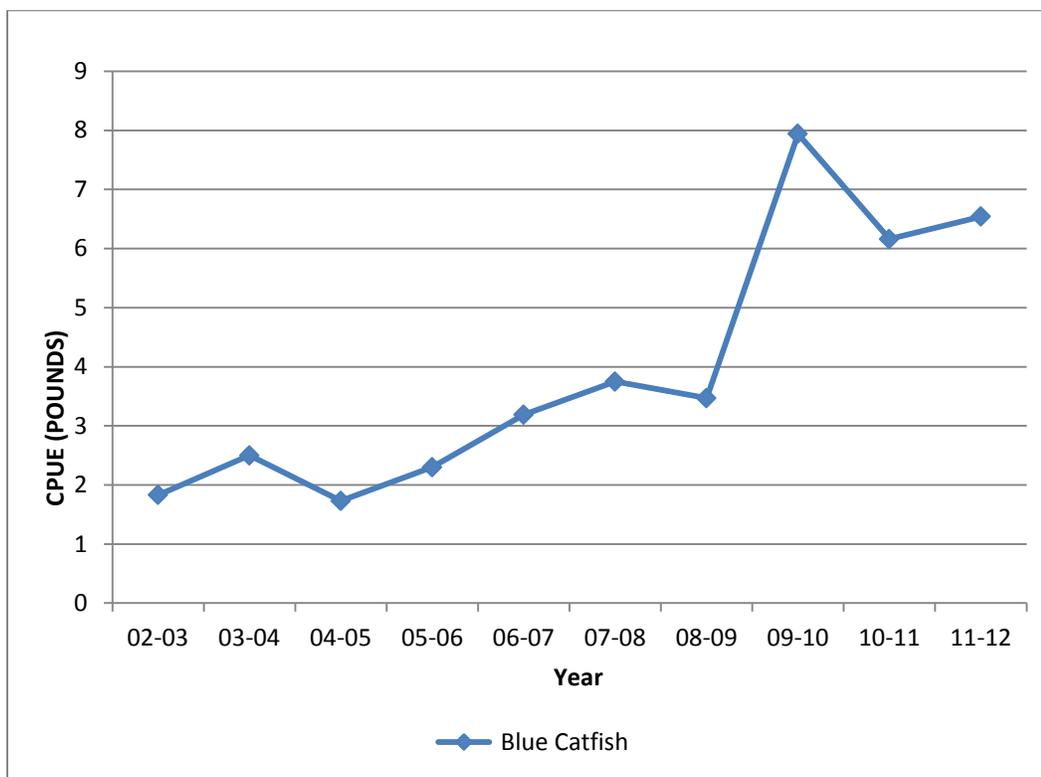


Figure 18. Total CPUE (pounds per net night/100 ft. net) of blue catfish taken by gillnet sampling in Toledo Bend Reservoir, Louisiana from 2002 - 2012.

Gillnetting CPUE indicates that blue catfish are increasing in abundance at Toledo Bend Reservoir. Blue catfish are the most commonly collected catfish species in LDWF samples.

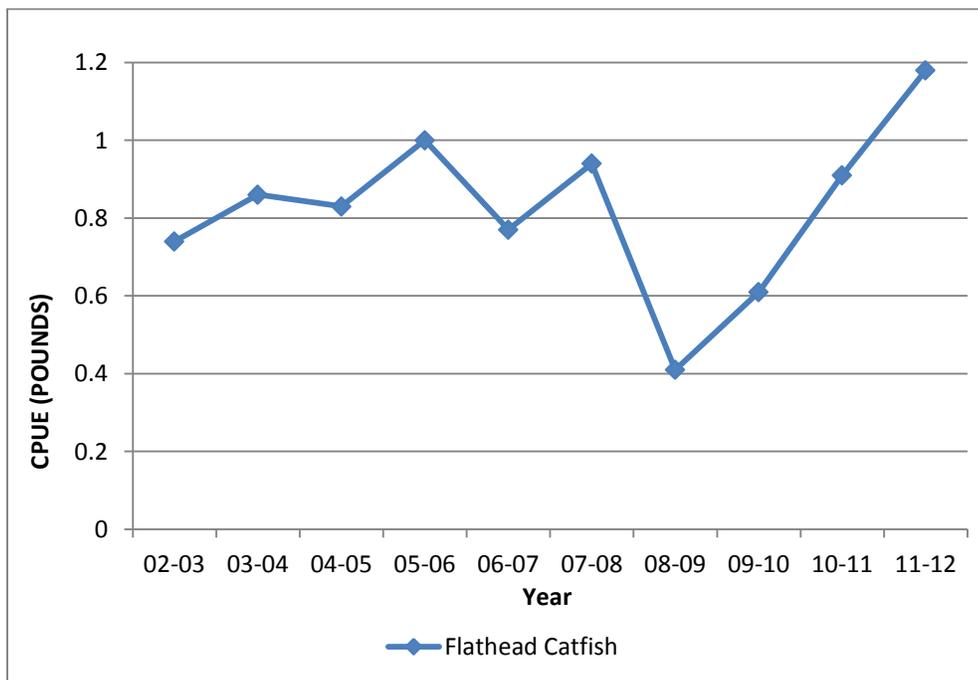


Figure 19. Total CPUE (pounds per net night/100 ft. net) of flathead catfish taken by gillnet sampling in Toledo Bend Reservoir, Louisiana from 2002 - 2012.

Flathead catfish are indicated to be increasing in abundance in recent years.

Freshwater Drum

Freshwater drum, *Aplodinotus grunniens*, has sustained a population in the reservoir for many years. Related data derived from gillnet sampling at Toledo Bend Reservoir is presented in Figure 20.

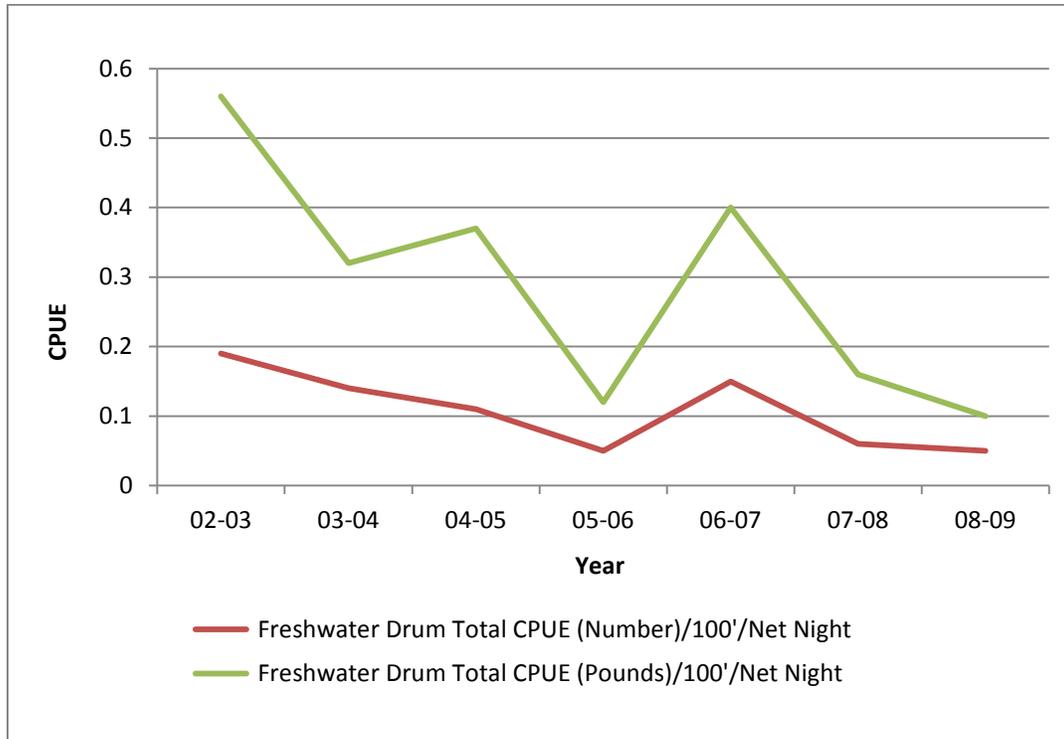


Figure 20. Total CPUE (number per net night and pounds per net night) of freshwater drum taken by gillnet sampling in Toledo Bend Reservoir, Louisiana from 2002 - 2012.

Gillnetting data for freshwater drum indicate a population that is well sustained within the reservoir. Peaks in the pounds per net night data likely represent the presence of older fish with higher individual weights.

Smallmouth Buffalo

The reservoir's smallmouth buffalo, *Ictiobus bubalus*, population has remained relatively stable over time. Some fluctuations are noted in the poundage values for this species. The majority of these fluctuations can be attributed to periods when age classes reach maximum size and exert great influence upon sampling values. Smallmouth buffalo data is provided in Figure 21.

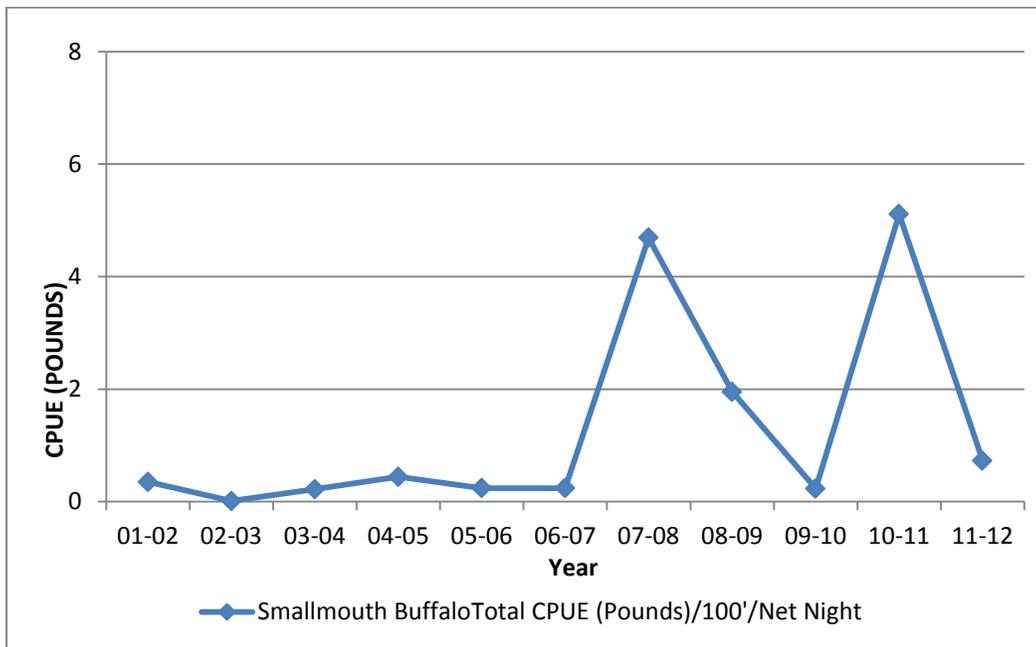


Figure 21. Total CPUE of smallmouth buffalo taken by gillnet sampling in Toledo Bend Reservoir, Louisiana from 2002 - 2012.

Bowfin

Bowfin, *Amia calva*, is not a major commercial species in Toledo Bend Reservoir. Bowfin is occasionally collected during standardized sampling but do not appear in significant numbers. However, bowfins do sustain themselves in this waterbody and no problems exist related to them. Gillnet sampling data for bowfin appears in Figure 22.

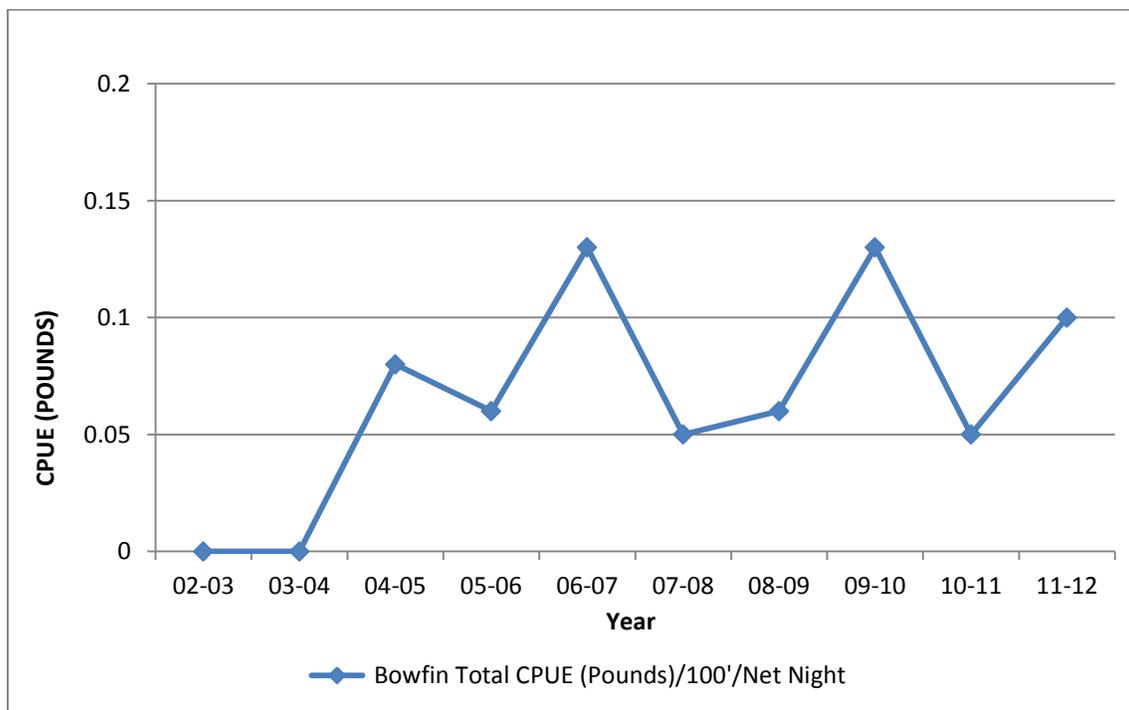


Figure 22. Total CPUE of bowfin taken by gillnet sampling in Toledo Bend Reservoir, Louisiana from 2002 - 2012.

Garfish

Longnose gar, *Lepisosteus osseus*, constitute the majority of garfish poundage collected during standardized gillnet sampling in Toledo Bend Reservoir. Spotted gar, *Lepisosteus oculatus*, occur frequently but do not attain the size and weight of longnose gar or alligator gar, *Atractosteus spatula*. All three species remain at relatively constant abundance from year to year. Gillnetting data for these species is depicted in Figure 23.

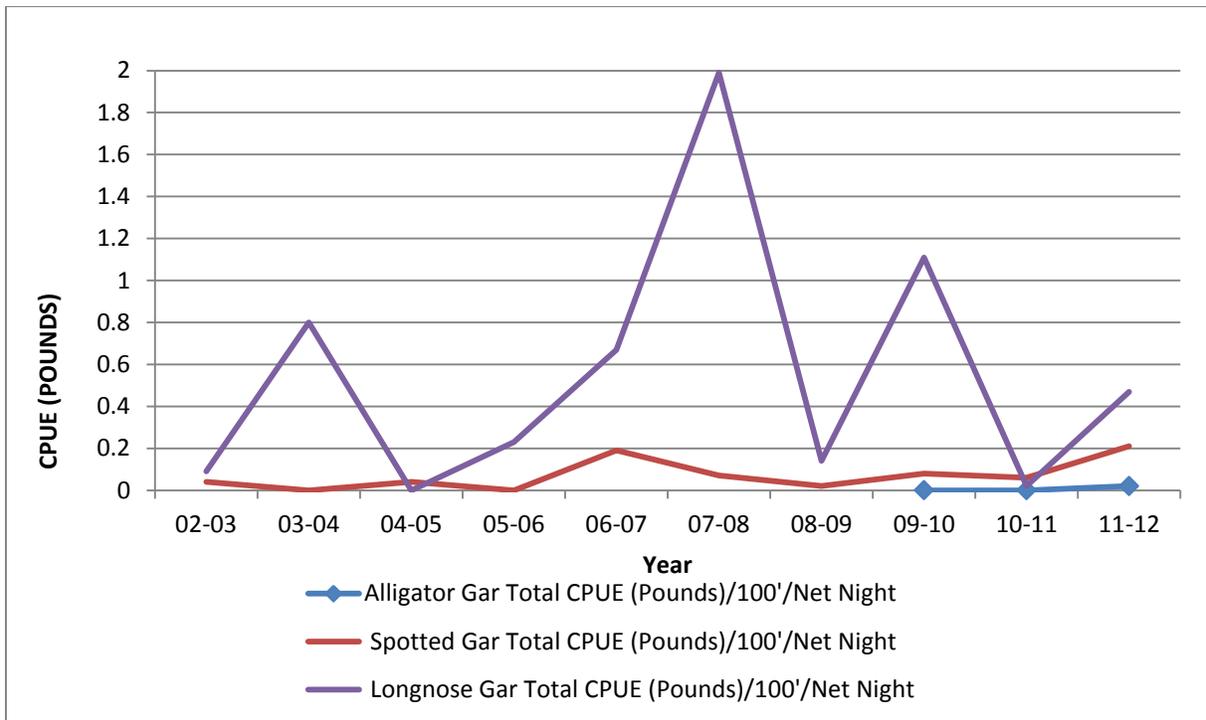


Figure 23. Total CPUE (pounds per net night) of garfish taken by gillnet sampling in Toledo Bend Reservoir, Louisiana from 2002 - 2012.

Species of Special Concern

Paddlefish, *Polyodon spathula* occur in Toledo Bend and are listed as a species of concern. They are rarely seen by Toledo Bend anglers. In 2003-2004 gill net sampling, 2 specimens were captured. In 2004-2005 gill net sampling, 3 specimens were captured. Of these 5 fish, the largest was collected near Fisherman's Wharf and weighed 43 lbs. The remaining four specimens were captured in gill nets north of San Patricio Bay. One paddlefish was collected in 2007-2008 gill net sampling. Five specimens were collected in 2010 – 2011 samples and two specimens were collected in the 2011 – 2012 samples. Gillnetting data for paddlefish appears in Figure 24.

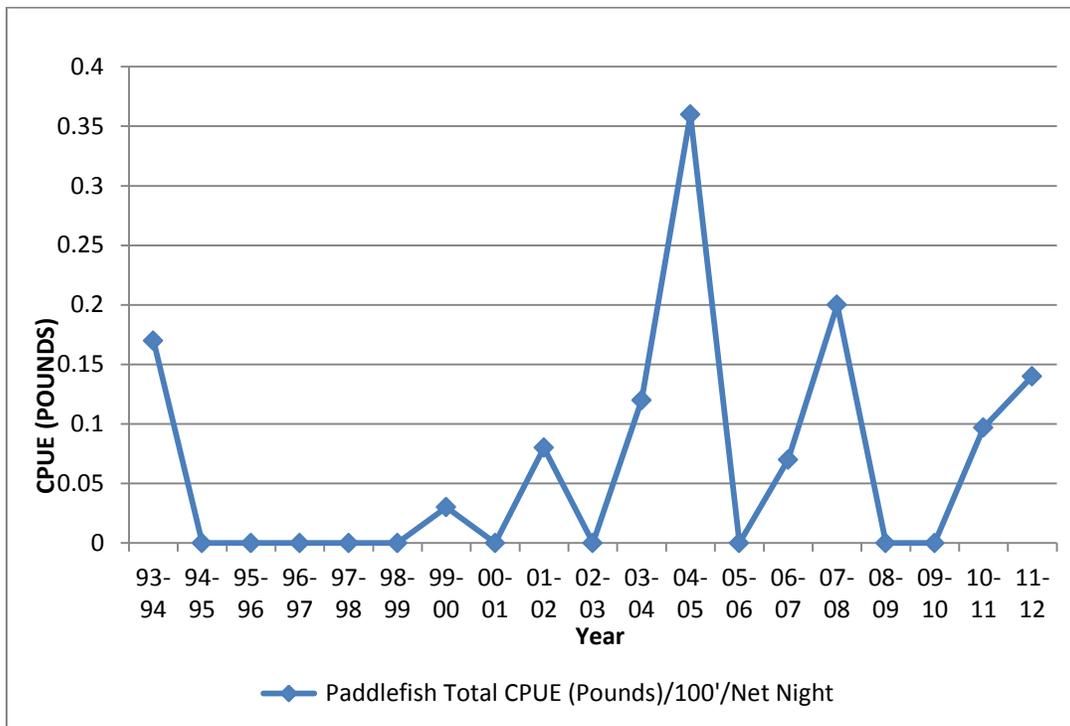


Figure 24. Total CPUE (pounds per net night) of paddlefish in Toledo Bend Reservoir, Louisiana by gillnet sampling from 1993 – 2012.

The Sabine shiner *Notropis sabinae* is a species of interest and occurs throughout the reservoir. Sabine shiners are occasionally collected during shoreline seine sampling. Collection years and (number collected) are as follows; 2003 (6), 2004 (6), 2005 (1), 2006 (2), 2007 (3), 2008 (2).

Five suckermouth minnows *Phenacobius mirabilis* were captured in the 2002 seine haul sample at Bass Haven Resort just above the dam. This is also a species of interest and has not been recorded since 2002.

Grass carp *Ctenopharyngodon idella* have been collected in gill net samples as well as reported by anglers and bow fishermen. One grass carp was collected during gill net sampling in 2002-2003, one in 2006-2007 and one in 2008-2009.

HABITAT EVALUATION

Aquatic Vegetation

Hydrilla (*Hydrilla verticillata*) is a significant submerged aquatic plant in Toledo Bend Reservoir. In recent years it has been the dominant submerged aquatic plant in the reservoir. Hydrilla is both beneficial as fish habitat and problematic to fishing and navigation. Coverage of hydrilla significantly decreased in 2001 and 2002 likely due to lower lake levels necessitated by dam repairs in 2001.

Aquatic vegetation coverage is typically estimated in spring and fall seasons each year. Additionally, more detailed surveys are periodically used to more accurately describe the vegetative coverage at that particular time.

In October of 2003 and 2004, the lake was surveyed by LDWF aquatic vegetation personnel for the presence of aquatic vegetation, mainly submerged, and spatial coverage of the major species. Table 5 below shows the acreages for the major species found during these surveys

along with recent estimates for year 2013.

In March 2005, an aerial survey of Toledo Bend was conducted to estimate the coverage of giant salvinia (*Salvinia molesta*). A total of 2,150 acres of salvinia was estimated to be on the lake at the time of the flight. It is also noted in this report that this plant can spread very rapidly and can double in size in 7 to 10 days.

A second aerial survey was conducted on November 2, 2006. At that time 250 acres of giant salvinia were noted on the Louisiana side of the reservoir.

Table 5. Total plant coverage in Toledo Bend Reservoir, Louisiana during annual plant surveys, 2003 – 2015.

YEAR	HYDRILLA	COON-TAIL	PONDWEED	AMERICAN LOTUS	GIANT SALVINIA
2003	1,600 acres	20 acres	60 acres	Not surveyed	0
2004	1,900 acres	30 acres	90 acres	Not surveyed	240 acres
2005	Not surveyed	Not surveyed	Not surveyed	Not surveyed	2,150 acres
2006	Not surveyed	Not surveyed	Not surveyed	Not surveyed	250 acres
2011	Not surveyed	Not surveyed	Not surveyed	Not surveyed	25 acres
2012 (Fall Estimates)	7,500 acres	1,000	1,200 acres	Not surveyed	1,200 acres
2013 Survey conducted 09-05-13	6,288 acres	Not surveyed	167 acres	896 acres	1,209 acres
2015 January estimates)	5,650 acres	Not surveyed	Not surveyed	Not surveyed	700

The giant salvinia weevil (*Cyrtobagous salviniae*) is being used as a biological control for giant salvinia at Toledo Bend Reservoir. The weevils have shown an ability to reduce the amount of giant salvinia in areas where they have been released. To date, 65 weevil releases have been made.

Durable Natural Structure

Much of the durable natural structure such as standing trees has decayed during the forty years since impoundment of Toledo Bend Reservoir.

Substrate

Information from the Natural Resources Conservation Service shows that soils in the Sabine River watershed range from a sandy type at higher elevations to a silt type at moderate elevations to a clay type at lower elevations. Soil pH found at higher elevations ranges from 4.5 to 5.3. Soil pH at slightly lower elevations is found to be 4.2. The soil pH of the lowest elevations is 4.6. All of these soil types are classified as low in fertility.

Artificial Structure

LDWF has been involved in an artificial reef program since 2003 on Toledo Bend Reservoir. The goal of this program is to increase angler success by providing underwater structure that attracts forage fish and provides food and cover for game fish. These reefs are made of various materials. Additionally, sand and gravel is being placed in locations that will attract spawning gamefish. Currently, thirty-one artificial reefs and one sand and gravel bed have been placed in the reservoir. Additional artificial reefs are planned.

CONDITION IMBALANCE / PROBLEM

Federal Energy Regulatory Commission (FERC) Project Relicensing

The Toledo Bend Project, of which Toledo Bend Reservoir is a part, is licensed by the Federal Energy Regulatory Commission as Project No. 2305. The original license for the project was issued on October 14, 1963. The license is for a fifty year period with an expiration date of September 30, 2013.

On August 29, 2014, the Sabine River Authority received notice from the FERC that its license had been renewed for an additional fifty years. This relicensing has an expiration date of July 31, 2064.

Invasive Aquatic Vegetation

Hydrilla, (*Hydrilla verticillata*), is a significant submerged aquatic plant in Toledo Bend Reservoir. LDWF's September 5, 2013 vegetation survey recorded 6,288 acres of hydrilla on the Louisiana side of the reservoir. November 2015 acreage estimate for hydrilla coverage was 1,400 acres. Abnormally high water levels during the summer of 2015 have greatly reduced the total amount of hydrilla in the reservoir. Hydrilla is both beneficial as fish habitat and problematic to fishing and navigation. Hydroelectric power generation has typically resulted in routine water level fluctuations which have limited the coverage of hydrilla and other submerged aquatic vegetation. The effect of such water level fluctuation is most obvious along the reservoir shoreline, being largely devoid of submerged aquatic vegetation. Hydrilla occasionally requires control in public use areas such as boat ramps, boathouses and swimming areas. Many Toledo Bend bass anglers welcome hydrilla as a complex structure plant which is utilized as cover by largemouth bass. These anglers voice concern when they note a reduction of hydrilla coverage.

Giant Salvinia (*Salvinia molesta*) causes navigational problems in some areas of the reservoir. Localized accumulations of the plant occasionally reach levels harmful to fisheries productivity. Although giant salvinia has been present in the reservoir since 1998, it remains problematic only in areas sheltered from wave action or water currents. Typical areal coverage of giant salvinia ranges from 2%-3% on the Louisiana side of the reservoir. Drought conditions during 2012 drastically reduced the areal coverage of the plant. The coverage of giant salvinia in September of 2013 was 1,209 acres. The November 2015 estimate for giant salvinia coverage was 1,090 acres.

November 2015 acreage estimates were conducted for other nuisance aquatic vegetation species including water hyacinth (*Eichhornia crassipes*), alligator weed (*Alternanthera philoxeroides*), and common salvinia (*Salvinia minima*). Water hyacinth coverage is estimated to be 40 acres, alligator weed coverage is estimated to be 200 acres and common salvinia coverage is estimated to be 20 acres.

Reduced Durable Structure

Forty-five years of impoundment have led to a reduction of complex woody structure through

the decay of submerged timber. While sufficient structure remains to sustain fisheries populations, angler success has been reduced due to the loss of this woody structure.

Recreational Catfish Regulations

Current regulations restrict harvest of blue and channel catfish to no more than 5 fish daily over 20 inches in total length. Passive gear anglers have expressed that this regulation is too restrictive for their needs.

CORRECTIVE ACTION NEEDED

1. LDWF participated in the 5-year FERC relicensing process (2008 – 2013) as a stakeholder. This process included providing input on future operations of the project relative to population stability of fisheries resources. LDWF will continue to provide input relative to future reservoir operations as they relate to fisheries management.
2. Beginning in July 2016 the Sabine River Authorities will begin releasing increased ambient surface water flows from tainter gates 6 and 7 in lieu of the original cold water releases thru the sluice gates to maintain constant river discharge (**Appendix III**).
3. Bi-annual monitoring of aquatic plant species to identify problems related to these plants. Appropriate use of herbicides, water level manipulation and biological agents to control vegetation as needed.
4. Placement of artificial reef structures and publication of reef locations for anglers.

RECOMMENDATIONS

1. Continue providing input to involved agencies throughout FERC relicensing and implementation process.
2. Continue an integrated management approach for Toledo Bend Reservoir to control overabundant vegetation. Herbicide applications for aquatic plants will be submitted according to the standard operating procedures for the application of herbicides as adopted by the LDWF Inland Fisheries Section. LDWF personnel will continue to perform annual surveys to monitor aquatic vegetation and will update recommendations as necessary.
 - a. Giant Salvinia
Continue foliar herbicide applications for control of giant salvinia. Giant salvinia will be treated with a mix of glyphosate (0.75 gal/acre) and diquat (0.25 gal/acre) with Aqua King Plus (0.25 gal/acre) and Thoroughbred surfactants (8 oz. /acre) from April 1 to October 31. Outside of that time period, diquat at a rate of 0.75 gallons per acre will be used with 0.25 gallons per acre of a non-ionic surfactant.
 - b. Water Hyacinth
Water hyacinth will be treated with foliar applications of 2,4-D (0.5 gal./acre) and Red River 90 (1 pint/acre).
 - c. Hydrilla
Chemical treatments for hydrilla will be limited to critical areas such as boat ramps and for shoreline angler access. Chemical treatments will be made with 4.0 ppm of Aquathol Super-K. Chemical treatments are not recommended for large-scale or long-term control of

submerged aquatic vegetation. The cost for such control is prohibitive and the control of hydrilla is short-lived.

Historically, drawdown measures have been unnecessary at Toledo Bend Reservoir due to the water level fluctuations resulting from hydroelectric power generation and drawdowns needed to perform repairs on the reservoir dam. However, the possibility of future drawdowns for vegetation control does exist. Physical control of hydrilla and other submerged aquatic vegetation (SAV) can be accomplished by means of lake drawdowns. Drawdown measures will be considered when coverage of SAV exceeds 40% (72,600 acres) of total waterbody surface area.

Triploid grass carp are a potentially effective option for biological control of hydrilla. Triploid grass carp are not recommended for Toledo Bend Reservoir at this time. Complex cover is directly related to sportfish productivity and angler success. Woody material in Toledo Bend Reservoir is limited and complex cover is primarily comprised of submerged aquatic vegetation. Excessive removal of submerged aquatic vegetation is not a desirable management goal for Toledo Bend Reservoir. Efforts to introduce triploid grass carp to manage submerged aquatic vegetation to a desired level of coverage have been largely unsuccessful. Recommendations for the introduction of triploid grass carp into Toledo Bend Reservoir will be reserved until alternative control options have been exhausted and until all stakeholder groups are aware of the potential benefits and risks.

d. American Lotus

American lotus will be treated as necessary to allow for boater access with foliar applications of 2,4-D (0.5 gal./acre) and Red River 90 (1 pint/acre).

3. Continue deployment of artificial reef structures.

LITERATURE CITED

Thailing, Carol E. & Ditton, Robert B. 2000. Characteristics, Participation Patterns, Attitudes, Management Preferences, and Economic Impacts of Toledo Bend Reservoir Anglers: Texas and Louisiana. Department of Wildlife & Fisheries. Texas A&M University.

Texas Parks & Wildlife Department. 2009. 2009-2010 Texas Commercial Fishing Guide. Texas Parks & Wildlife Department. Publication.

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Appendix I

113. Scuba Diving Game Fish Season

Pursuant to the authority granted under R.S. 56:320(E), the Louisiana Wildlife and Fisheries Commission hereby continues the special scuba game fish season at Toledo Bend Reservoir, but **deletes** black bass from the list of game fish eligible to be taken.

The rules regulating the special scuba game fish season as amended and re-enacted by the commission are as follows:

- (1) The special season shall be limited to Toledo Bend Reservoir, and only in that part of the lake located south of Highway 6 (Pendleton Bridge) on the Louisiana side.
- (2) The special season shall be for four months beginning at sunrise on the first day of June and ending at sunset on the last day of September each year.
- (3) The taking of game fish species shall be permitted during daylight hours only from sunrise to sunset.
- (4) Each diver harvesting game fish is required to have a special permit issued by the secretary of the Louisiana Department of Wildlife and Fisheries, and the permit must be available for inspection upon request.
- (5) In addition to the special permit the permit holder must have a valid Louisiana sportfishing license.
- (6) Crappie and bream shall be the only game fish species allowed to be taken.
- (7) The daily creel limit shall be 25 crappie and 50 bream; the possession limit shall be the same as the daily creel limit.
- (8) The scuba diver must be submerged in the water and use only standard underwater spearing equipment.
- (9) No permitted diver shall have in his possession (vessel or on his person) any other fishing gear.
- (10) Each permit holder shall submit to the Louisiana Department of Wildlife and Fisheries a monthly report of game fish taken, and other information requested on the forms supplied by the department; the report deadline for a specific month shall be on the fifteenth of the following month. All reports should be sent to Bennie Fontenot, Louisiana Department of Wildlife and Fisheries, Box 98000, Baton Rouge, LA 70898-9000. Each permit holder must submit the monthly report whether they fish or not.
- (11) A legal diving flag shall be conspicuously displayed while diving operations are taking place.
- (12) Permits will expire at the end of each season and shall be renewed on an annual basis.
- (13) Failure of the permittee to adhere to any of the above stipulations shall result in the revocation of the permit by the secretary of the department.
- (14) The secretary of the department shall be authorized to recall permits and/or to close the special season if deemed necessary.

AUTHORITY NOTE: Promulgated in accordance with R.S. 56:320(E).

HISTORICAL NOTE: Promulgated by the Department of Wildlife and Fisheries, Wildlife and Fisheries Commission, LR 11:706 (July 1985), amended LR 15:393 (May 1989).

Taking of other gamefish is prohibited as stated in current Louisiana Recreational Fishing Regulations:

Skin divers fishing for sport in freshwater, when submerged in the water and using standard spearing equipment, or any person using a bow and arrow, or any person using or possessing nets or traps, including recreational hoop nets, recreational slat traps, recreational pipes, recreational buckets, recreational drums, recreational tires, recreational cans, recreational

wire nets and recreational crawfish traps may not take or possess any largemouth bass (*Micropterus salmoides*), spotted bass (*M. punctulatus*), black or white crappie (*Pomoxis nigromaculatus*, *P. annularis*), white bass (*Morone chrysops*), yellow bass (*M. mississippiensis*), striped bass (*M. saxatilis*), hybrid striped bass (striped bass-white bass cross), or any species of bream.

Appendix II

OPERATING GUIDE RULE CURVE

OPERATING GUIDE RULE CURVE HYDROELECTRIC POWER PLANT, TOLEDO BEND DAM

Effective date:
May 25, 2007

MONTH	Reservoir Stage Ft. MSL	PLANT OPERATION
October thru December	Below 168 Above 168	No power generated. Operate plant up to full capacity. *
January	Below 168.5 Above 168.5	No power generated. Operate plant up to full capacity. *
February	Below 169 Above 169	No power generated. Operate plant up to full capacity. *
March	Below 169.5 Above 169.5	No power generated. Operate plant up to full capacity. *
April 1-15	Below 170 Above 170	No power generated. Operate plant up to full capacity. *
April 15-30	Below 171 Above 171	No power generated. Operate plant up to full capacity. *
May	Any stage Above 168 ** Above 172	Use Volume necessary to meet Prime Power Schedule (see Note 2.) Operate plant up to full capacity. *
June	Any stage Above 168 ** Above 172	Use Volume necessary to meet Prime Power Schedule (see Note 2.) Operate plant up to full capacity. *
July	Any stage Above 168 ** Above 172	Use Volume necessary to meet Prime Power Schedule (see Note 2.) Operate plant up to full capacity. *
August	Any stage Above 168 ** Above 172	Use Volume necessary to meet Prime Power Schedule (see Note 2.) Operate plant up to full capacity. *
September	Any stage Above 168 **	Use Volume necessary to meet Prime Power Schedule (see Note 2.)

Notes:

1. Maximum turbine discharge, capacity 30 M Ac. Ft. per day.
2. In accordance with Section 5.05 of the Consolidated Power Sales Agreement, no more than 30,000,000 kWh of prime power shall be scheduled during any one month of the Peaking Period, except with prior written consent of the Authorities.
3. Releases for downstream flows shall be in accordance with Section 5.10 of the Consolidated Power Sales Agreement.
4. When pool stage is at or above 172.5 and inflow is greater than power plant capacity, operate spillway in accordance with "Guide on Spillway Gate Operation."
5. Authorities will notify companies as to flow conditions in the Sabine River as required in Section 5.07 of the Consolidated Power Sales Agreement.
6. Control stages set forth above are to be maintained only to the extent possible when making releases through the power plant. Spillway gates are to be opened only when stages specified in the "Guide on Spillway Gate Operation" are reached.
7. During prime power season when stage of lake is near upper limit maintain close watch on inflow and make releases for secondary power generation to avoid spillway releases if possible.

* Releases to be determined based on best judgment considering upstream conditions, stages at Ruliff and inflows below dam.

** No generation below the 168' MSL except in the event of any of the following:

- (1) the FERC, or successor agency orders or requires a reduction in the water level of the Reservoir for purposes of inspecting or repairing the dam,
- (2) an insufficient supply of electric power to the Companies' firm or non-interruptible power users will result,
- (3) non-use of the waters of the Reservoir for the generation of hydroelectric power will result in the failure to satisfy minimum downstream flow requirements necessary to meet water sales from the diversion canals of the Authorities,
- (4) non-use of the waters of the Reservoir for the generation of hydroelectric power will result in the failure to deter saltwater encroachment into Sabine River Estuaries, or
- (5) the Authorities fail to make all credits owed to the Companies or fail to make full reimbursements as required in Section 3.02A and 3.07 of the Consolidated Power Sales Agreement within the time identified in the Amendment.

Appendix III

SPILLWAY CONTINUOUS FLOW RELEASE PLAN

On August 29, 2014 the Federal Energy Regulatory Commission (FERC) granted the Sabine River Authorities of Louisiana and Texas a new 50 year operating license to operate the Toledo Bend Hydroelectric Project (FERC Project No. 2305).

2.0 – LICENSE ARTICLE 402 AND 403 REQUIREMENTS

The Commission, under Article 403 of the License, required the Authorities, within 18-months of License issuance, to file with the Commission for approval a flow release plan for releasing and monitoring compliance with the continuous flow releases required at the project spillway pursuant to Article 402. Article 402 of the License states:

Article 402. Continuous Releases from the Spillway. From the issuance date of the license through the later of: (1) the end of the second year of the license term; or (2) 10 days following the Commission’s approval of the flow release plan required by Article 403, the licensees must release continuous minimum flows at the project spillway of 144 cubic feet per second (cfs). Such releases must be measured by a gage that meets or exceeds the U.S. Geological Survey standards used for gage 08025360, Sabine River at the Toledo Bend reservoir tailrace. The licensees are not required to provide releases at the spillway greater than 144 cfs, but may do so at their discretion.

Upon the later of: (1) the commencement of the third year of the license term; or (2) the Commission approved schedule required by Article 403, the licensees must release continuous minimum flows at the project’s spillway from a reservoir outlet structure with an elevation invert no lower than 145 feet above sea level (msl) according to the flow release schedule in the table below. All flow releases in this table are targeted, continuous values. Releases will occur thru tainter gates 6 and 7 or in the future a mini-hydro electric generator if deemed feasible by the Authorities and approved by FERC.

Continuous Flow Releases at Spillway (cfs)

Reservoir Elevation (msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
At > 162	150	150	300	300	300	300	200	200	200	200	200	150
162 – 156	150	150	225	225	225	225	150	150	150	150	150	150
At < 156	150	150	150	150	150	150	150	150	150	150	150	150