CHRONOLOGY

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Ryan Daniel, Biologist Manager, District II

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Ryan Daniel

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Ryan Daniel
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WATERBODY EVALUATION

STRATEGY STATEMENT

Recreational
Sportfish species are managed to provide a sustainable population while providing anglers the opportunity to catch or harvest numbers of fish adequate to maintain angler interest and efforts.

Commercial
Species comprising a commercial fishery exist in Lake Providence with commercial fishing permitted during a special winter season. Commercial species are not actively managed in Lake Providence, as their presence and abundance is generally a factor of habitat conditions in the lake. Harvest of commercial species is generally encouraged to enhance sportfish populations and provide value to an often under-utilized natural resource.

Species of Special Concern
No threatened or endangered fish species are found in this waterbody.

EXISTING HARVEST REGULATIONS

Recreational
Statewide regulations are in effect for all fish species. Regulations can be viewed at: http://www.wlf.louisiana.gov/regulations

Commercial
In March 1992, legislation was passed that prohibits the use of gill and trammel nets in Lake Providence except during a special recurring trammel and gill netting season to commence each year at sunrise on November 1 and close at sunset on the last day of February the following year. In 2014, this rule was modified to begin the season on October 1. The trammel and gill nets allowed during the special recurring season shall have a minimum mesh size of three and one-half inch bar and seven inch stretched. Nets may remain set overnight, but fish captured must be removed during daylight hours only. Commercial fishing regulations may be viewed at the link below: http://www.wlf.louisiana.gov/regulations

SPECIES EVALUATION

Recreational
Largemouth bass (*Micropterus salmoides*) are targeted for evaluation since they are a species indicative of the overall fish population due to their high position in the food chain and because they are highly sought after by anglers. Electrofishing is the best indicator of largemouth bass abundance and size distribution, with the exception of large fish. Sampling with gill nets determines the status of large bass and other large fish species.
**Largemouth Bass**

**Largemouth Bass Catch per Unit Effort (CPUE) and Length Frequency**

In the chart below (Figure 1), spring electrofishing results are used as an indicator of relative abundance over time with total CPUE (bass per hour) indicated for three size categories of largemouth bass from 1993 - 2017. The CPUE for each size class shows variability between samples, with both upward and downward trends apparent for different periods of time.

![Bar chart](image)

**Figure 1.** Mean catch-per-unit-effort (bass per hour) for stock-, quality-, and preferred-size largemouth bass collected in spring electrofishing samples on Lake Providence, LA from 1993 – 2017.

The CPUE for each inch group from the most recent electrofishing samples conducted in 2012, 2014 and 2017 are shown below in Figures 2, 3, and 4, respectively. It should be noted that spring samples were not taken in 2014 due to turbid conditions in the lake. The size classes appeared to be normally distributed in 2012 and 2017, though smaller sizes were noticeably absent in 2014 and the overall CPUE was also low. The 2014 sample could indicate poor spawning success and recruitment in the previous two years, possibly due to the excessive turbidity that persisted throughout the spring in 2013 and 2014. It should also be noted that larger bass (> 20 inches) are not efficiently sampled by electrofishing and may be under represented in these results.
Figure 2. Largemouth bass size distribution by length group (bass per hour) from fish collected during spring and fall 2012 electrofishing on Lake Providence, LA.

Figure 3. Largemouth bass size distribution by length group (bass per hour) from fish collected during fall 2014 electrofishing on Lake Providence, LA.
Largemouth Bass Relative Weight

Relative weights (Wr) for various size classes are shown in Figure 5. This measurement is obtained from fall samples only and is defined as 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 relative weights below 80 may indicate a problem of insufficient or unavailable forage, whereas relative weights closer to 100 indicate sufficient available forage. A description of the forage species and sampling methods is described below. Relative weights for each of the four size classes are greater than 95%, indicating that there is an adequate forage supply for the largemouth bass in Lake Providence. The 2014 sample was not included because of its low sample size, though all Wr values exceeded 90.
Figure 5. Mean relative weights (± SE) for largemouth bass collected from Lake Providence, LA from fall electrofishing samples in 2001, 2003, 2007, 2009, 2012 and 2017.

Largemouth Bass Genetics
Florida bass are typically stocked into suitable waterbodies to improve the overall size potential of the bass fishery. Annual stocking was initiated in 2000 and discontinued after 2007. There was one previous stocking in 1987. No genetic analysis was conducted before this period, but it was assumed that the population was comprised of only northern largemouth bass. No genetic samples have been collected since 1999, thus the success of these stockings (measured by the percent of the Florida genome found in the sample) is not known. However, the 1999 sample did reveal the presence of the Florida genome in the population (Figure 6). Thirteen percent of the fish in the sample (n= 63) contained Florida genes.

Figure 6. Genetic composition of Lake Providence, LA largemouth bass from a 1999 fall electrofishing sample (n=63).
**Largemouth Bass Age and Growth**

Length at age was determined for largemouth bass from fall electrofishing samples in 1999 and 2007. Lengths (mm) for ages 1+ to 4+ are shown in Figure 7. Lake Providence largemouth bass growth has mostly been greater than the estimated statewide average (age 1+ = 262mm, age 2+ = 335mm, age 3+ = 384mm, age 4+ = 424mm). Small sample sizes for age 3+ and 4+ fish reduce confidence in accuracy for these age classes. Based on the trend lines for each sample (Figure 7), there appears to be no difference in growth rates between the 1999 and 2007 samples.

![Figure 7. Actual mean length at age for largemouth bass at time of capture.](image)

Fish were collected in fall electrofishing samples from Lake Providence, LA in 1999 and 2007. Trend lines are linear regressions of the relationship between age and total length at capture. The dashed line is the 1999 sample, and the solid line is the 2007 sample. Coefficients of determination ($R^2$-values) indicate the strength of the relationship, where 0 is no relationship and 1.0 is a perfect linear relationship.

**Crappie**

Crappie (*Pomoxis* spp.) were first targeted for sampling in fall 2007 with the use of lead nets. Prior to this, crappie had been collected by electrofishing, gill nets, and biomass samples. Sampling with these gear types are not considered to be reliable estimators of the crappie population due to low sample size. Lead net samples were collected at six station locations in 2007 and at three stations in 2014 and 2017. Both species, white (*P. annularis*) and black (*P. nigromaculatus*) were collected. Black crappie comprised 94% of the sample ($n=47$) in 2007, 32% of the sample ($n=44$) in 2014, and only 8% ($n=226$) in 2017. This is especially noteworthy as this population shift may be evidence of a fisheries impact caused by the recent and more severe turbid conditions on Lake Providence, which have prompted a major study. White crappie are typically the dominant species of crappie in turbid environments. Catch per
hour of all crappies captured in 2007 and 2014 is shown in Figure 8. Catch per hour from the 2017 sample is shown in Figure 9. Overall crappie abundance was considered to be low in 2007 and 2014 as it typically has been for the past few decades, though the reason for this is not known. The sample in 2017, though, represents a well distributed and robust crappie fishery, likely the result of one or more strong year classes of fish in the previous three years.

Figure 8. Catch per unit of effort by length group for crappies collected in fall lead net samples taken on Lake Providence, LA for 2007 and 2014.

Figure 9. Catch per unit of effort by length group for crappies collected in fall lead net samples taken on Lake Providence, LA in 2017.
Sunfish—

Sunfish (*Lepomis* spp.) provide a very popular fishery for anglers at Lake Providence, as there is an abundance of medium and large size fish. Sunfish (bream) are members of the family Centrarchidae, as are black bass and crappie. Bluegill (*L. macrochirus*) and longear sunfish (*L. megalotis*) are the most abundant sunfish species in Lake Providence and comprised 81% and 17%, respectively, of the sunfish captured during 2007 lead net sampling. This ratio was nearly identical in the 2014 lead net sample and also the 2017 community assemblage electrofishing sample (Figure 9). Size distribution of bluegill from the 2017 community assemblage electrofishing sample is shown in Figure 10. Inch groups up to 7 inches were well represented. Redear sunfish (*L. microlophus*) are also present in Lake Providence, but far less common. Mean catch per hour for all sunfish in lead nets was calculated to be 0.83 in 2014 and 0.241 in 2017. Other sunfish species identified from previous samples include green sunfish (*L. cyanellus*), orangespotted sunfish (*L. humilis*), warmouth (*L. gulosus*) and various sunfish hybrids. Sunfish biomass (in pounds per acre) has been estimated by rotenone sampling from the 1950’s thru 1994. Biomass samples taken from 1980 – 1994 (*n* = 9) produced a mean estimate of 80.7 lbs. sunfish/acre (Figure 11).

![Figure 9. Percent relative abundance (by number) of the three most common species of sunfish captured during fall community assemblage electrofishing sampling on Lake Providence, LA in 2017. Total *n* = 732.](image-url)
Figure 10. Catch per unit of effort (CPUE=fish per hour) by length group for bluegill captured during fall community assemblage electrofishing samples on Lake Providence, LA in 2017. Total $n=580$.

Figure 11. Biomass estimates (pounds per acre) of sunfish, shad, and shiners from Lake Providence, LA for 1980 - 1994.
Channel Catfish-
Channel catfish (*Ictalurus punctatus*) are a significant fisheries resource of Lake Providence and have been a source of angler interest and concern. They have had a reputation of being abundant in the lake with average size being smaller than expected or desired by anglers. A special project was initiated in May 2004 in response to the most recent angler concern of a possibly stunted population. A total of 101 channel catfish were captured in wire traps and by angling to gather biological data on the population. Lengths and weights were recorded and fish were aged by counting annuli on thin sections of the pectoral spines. Figure 12 shows the size distribution in length groups of catfish collected in this sample. The mean total length (TL) of channel catfish in this sample was 12.5 inches. Assigning ages to pectoral fin sections proved to be difficult, with estimates varying from one to three years of age for many fish. Nearly all of the fish sampled were three to five years old, with the oldest being seven. There was a high variability in age among similar sized fish. For example, 11-inch TL catfish varied in age from two to six years. The mean age of a 12.5-inch TL catfish was 4.0 years. For comparison, age estimates for channel catfish from D’Arbonne Lake, Union Parish, showed that 12.5-inch TL fish were estimated to be 2.5 years old. Also, the mean lengths at age for all ages were less at Lake Providence than D’Arbonne Lake, which is considered a less fertile upland reservoir. It appears that the population in Lake Providence may be stunted, possibly due to overcrowding, though the mean length of catfish from this study was higher than was determined from sampling conducted by LDWF in 1985 (9.6 in.) and 1994 (9.9 in.). A similar number of channel catfish were captured in lead nets in 2014 (*n* = 27) and 2017 (*n* = 21). The length distribution of these samples is shown below in Figure 13. The 2017 sample was comprised of slightly larger fish than the 2014 sample.

![Figure 12. Length distribution in inches of channel catfish collected May – June, 2004 on Lake Providence, LA from various sampling gears (*n* = 101).](image-url)
Figure 13. Length distribution by inch group of channel catfish collected in the 2014 ($n = 27$) and 2017 ($n = 21$) lead net samples on Lake Providence, LA.

Forage
Sunfish, yellow bass ($\text{Morone mississippiensis}$), brook silversides ($\text{Labidesthes sicculus}$), gizzard shad ($\text{Dorosoma cepedianum}$), threadfin shad ($\text{D. petenense}$), and cyprinid minnows (shiners) have been identified as the primary forage species in Lake Providence. In addition to measurement of forage availability indirectly from largemouth bass relative weight (described above), forage abundance has also been estimated from biomass (rotenone) sampling. Figure 11 (above) shows pounds per acre of shad, sunfish, and shiners obtained during the last nine biomass samples. The mean weight in pounds for shad and shiners respectively, are 145.8 lb./acre and 1.2 lb./acre. Figure 14 below shows the CPUE (catch per hour) of the common forage species collected from the 2017 community assemblage electrofishing samples.
Figure 14. Total CPUE (fish per hour) of common forage species in Lake Providence, LA from community assemblage electrofishing samples in fall 2017.

Commercial
Several commercial species have been documented in Lake Providence. Six of the most abundant commercial species collected from gill net samples are listed in Table 1 along with their respective CPUE’s for 2001, 2006, and 2010. Bigmouth buffalo (*Ictiobus cyprinellus*), black buffalo (*I. niger*), and smallmouth buffalo (*I. bubalus*) are common in the lake. Channel catfish are the most common commercial species of catfish; though other species are present. Table 2 reports the pounds per acre of these six species from the last three biomass (rotenone) samples.

Table 1. Catch per unit effort in number of fish captured per 100 feet of gill net per net night for selected commercial species on Lake Providence, LA for 2001, 2006, and 2010.

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<thead>
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<th>2001</th>
<th>2006</th>
<th>2010</th>
<th>Mean</th>
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<tr>
<td>Buffalo (all species)</td>
<td>1.02</td>
<td>.17</td>
<td>.03</td>
<td>.41</td>
</tr>
<tr>
<td>Bowfin (<em>Amia calva</em>)</td>
<td>.01</td>
<td>0</td>
<td>0</td>
<td>.01</td>
</tr>
<tr>
<td>Common carp (<em>Cyprinus carpio</em>)</td>
<td>.04</td>
<td>.02</td>
<td>.53</td>
<td>.20</td>
</tr>
<tr>
<td>Channel catfish</td>
<td>.13</td>
<td>.13</td>
<td>.33</td>
<td>.20</td>
</tr>
<tr>
<td>Spotted gar (<em>Lepisosteus oculatus</em>)</td>
<td>.01</td>
<td>.01</td>
<td>.03</td>
<td>.02</td>
</tr>
<tr>
<td>Freshwater drum (<em>Aplodinotus grunniens</em>)</td>
<td>.03</td>
<td>.04</td>
<td>.03</td>
<td>.03</td>
</tr>
</tbody>
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Table 2. Estimates of pounds per acre of selected commercial species captured in biomass samples from Lake Providence, LA for 1987, 1990, and 1994.

<table>
<thead>
<tr>
<th>Species</th>
<th>1987</th>
<th>1990</th>
<th>1994</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffalo (all species)</td>
<td>2.43</td>
<td>5.62</td>
<td>0</td>
<td>4.0</td>
</tr>
<tr>
<td>Bowfin</td>
<td>0</td>
<td>.7</td>
<td>6.8</td>
<td>2.5</td>
</tr>
<tr>
<td>Common carp</td>
<td>10.2</td>
<td>17.1</td>
<td>12.2</td>
<td>13.2</td>
</tr>
<tr>
<td>Channel catfish</td>
<td>37.8</td>
<td>50.3</td>
<td>28.3</td>
<td>38.8</td>
</tr>
<tr>
<td>Spotted gar</td>
<td>0</td>
<td>.5</td>
<td>7.4</td>
<td>2.6</td>
</tr>
<tr>
<td>Freshwater drum</td>
<td>194.1</td>
<td>117.2</td>
<td>24.8</td>
<td>112.0</td>
</tr>
</tbody>
</table>

The gill net sample conducted in 2013 resulted in the capture of numerous smallmouth buffalo, though very few other commercial species were captured. Total CPUE for smallmouth buffalo was 1.03 (n = 74). Figure 15 shows their length distribution. The length distribution for smallmouth buffalo captured during the 2018 gill net sample is shown in Figure 16. Total CPUE was 0.26 (n = 19). Buffalo were the most common commercial species captured in 2018.

Figure 15. Length distribution by inch group of smallmouth buffalo captured in gill nets during 2013 in Lake Providence, LA. Catch per unit effort is defined as the number of fish captured per 100 feet of gill net per net night.
Figure 16. Length distribution by inch group of smallmouth buffalo captured in gill nets during 2018 in Lake Providence, LA. Catch per unit effort is defined as the number of fish captured per 100 feet of gill net per net night.

**Total Standing Crop**

Total fisheries standing crops have been estimated from numerous biomass samples in the past (Figure 17). Estimates have generally ranged from 200 to 600 total pounds per acre, with a mean of 400 lbs./ac. With the exception of 1984, there is an increasing trend in total fish biomass from 1980 – 1990.

Figure 17. Standing crop estimates in pounds per acre of all fish species from Lake Providence, LA biomass (rotenone) sampling, from 1980 – 1994.
Invasive Species
Grass carp (Ctenopharyngodon idella) have been present in Lake Providence since the mid 1990’s. Silver carp (Hypophthalmichthys molitrix) were first reported to be present in 2011. The presence of silver carp was confirmed in February 2012, when 11 adult fish were captured in a LDWF gill net sample. These fish are believed to have entered the lake during a high water period in spring 2011, when they could have crossed the weir at Tensas Bayou. This is most likely how the grass carp were introduced into the lake in the 1990’s. Neither species has been captured by any gear methods since 2012.

HABITAT EVALUATION

Aquatic Vegetation
Aquatic vegetation has not been abundant or problematic in Lake Providence in recent years. Reduced water clarity from planktonic turbidity limits sunlight to submerged vegetation; however, in the 1990’s there was a moderate infestation of southern naiad (Najas guadalupensis) on the shallow flats on the southern end of the lake. Naiad is no longer present in any significant amount. Coontail (Ceratophyllum demersum) is present in some shallow areas, but is not abundant. There is a minimal amount of emergent and floating vegetation in the lake. Alligator weed (Alternanthera philoxeroides) and water hyacinth (Eichhornia crassipes) are the most common emergent and floating species in Lake Providence. Sea walls and wind action have prevented them from becoming abundant or problematic. They are mostly found in the bayous and ditches connected to the main lake. Currently, there is less than two acres of all combined types of vegetation in the lake.

There is a Louisiana Department of Agriculture and Forestry 2,4-D waiver period in East Carroll Parish from March 15 – Sept. 15. Glyphosate (0.75 gal/acre) should be used instead of 2,4-D during this period. Appropriate surfactants will be used in conjunction with all foliar herbicide applications.

Substrate
The substrate of Lake Providence is typical of the soils of the Mississippi alluvial valley. Silt loams and Sharkey clays are the most common soil types of the area. Though once a scoured channel of the Mississippi River, the lake bottom is now mostly covered with silt and fine clays from erosion of the surrounding soils.

Available complex cover
The most prominent forms of complex cover in Lake Providence are live bald cypress (Taxodium distichum) trees and residential piers. Cypress trees are abundant around much of the shoreline and in the shallow areas on each end of the lake. The roots and “knees” of these trees provide significant cover utilized by many species of fish. Residential piers have been constructed around much of the lake, with many extending into depths of at least 10 feet. Fish utilize the pier pilings and also the shade provided by them. Very little complex cover is found in the deeper portions of the lake.
Artificial Structure
No artificial structure has been placed in Lake Providence by LDWF.

Water Quality
A problem with high turbidity, or very muddy water, has become increasingly more common in Lake Providence. The turbid conditions typically occur during late winter and may persist through early summer depending on the amount and intensity of local rainfall. The problem has been documented since the 1980’s, as numerous samples taken by the Louisiana Department of Environmental Quality (LDEQ) since 1988 have exceeded EPA standards for both turbidity and total dissolved solids (TDS). When turbid conditions occur, recreational use of the lake becomes minimal. There has also been fisheries data collected by LDWF that may portray evidence of impacts to the fish populations caused by turbid conditions, especially since these conditions are most common during the spawning season of most species of fish in Lake Providence. Extreme turbidity during spring months in 2013 and 2014 prompted local authorities and concerned citizens to form the Lake Providence Watershed Council (created by S.C.R. 115 of the 2015 Louisiana legislative session) to address this and other problems associated with the lake. Though a comprehensive study has not yet been completed, causes for the turbidity and associated high levels of TDS are suspected to be from improper agricultural drainage and insufficient water control devices. Actions have already been taken to reduce the sediment runoff into the lake, mostly by voluntary implementation of cover crops during the non-growing season and vegetated buffer strips to filter the runoff in the immediate watershed. There has also been recent EPA approval for LDEQ to conduct a 2-year water quality study on Lake Providence to identify potential pollution sources and better understand the environmental impacts to the lake. The study was initiated in May 2017.

CONDITION IMBALANCE / PROBLEM

Lake Providence Restoration Project
Improper drainage within the Lake Providence watershed and the lack of an efficient water control structure capable of dewatering the lake at a rate greater than one inch per day are the most important obstacles to the management of Lake Providence. The extreme turbidity that has been documented on numerous occasions is a direct result of these conditions. The Lake Providence Watershed Council was created by legislation in 2015, and currently meets on a regular basis to “identify, review, and evaluate management strategies to facilitate the goal of improving the aquatic habitat of Lake Providence; to provide recommendations for the optimal management and protection of the resources within the Lake Providence watershed” - Managing Lake Providence Watershed Resources: an interim report to the Louisiana legislature, April 2016. This document was produced by the Louisiana Department of Natural Resources and can be viewed at the following link:


Specific issues to be addressed include, but are not limited to: identification and prevention of sediment inflows, repair or replacement of current water control structures, investigation of sediment deposits within the lake, improvements to outflow drainage from the lake, and projects to enhance the fisheries and water quality.
The recent infestation of Asian carp and the pathway of introduction that currently exists could potentially have a negative impact on the fishery.

CORRECTIVE ACTION NEEDED

The Lake Providence Watershed Council is currently seeking solutions to the issues that plague Lake Providence. Numerous problems have been identified, as well as the appropriate means to solve them. Funding is currently being sought to initiate studies and projects necessary to achieve the goals of the Council, and efforts are to continue indefinitely. Priority issues will be investigating drainage into and out of the lake, and re-design of the water control structures.

To prevent additional introductions of Asian carp or other undesirable fish species into Lake Providence, the current weirs and water control structures should be redesigned. The weirs should be designed in a way to prevent fish passage into the lake during routine high water periods if possible. To achieve effective drawdowns for lake and fisheries management, the control structure should be designed to release a sufficient amount of water such that the lake level will fall at least one inch in a 24-hour period.

RECOMMENDATIONS

1. Continue to fulfill the role of LDWF to the Lake Providence Watershed Council, which includes involvement with fisheries management, habitat restoration, and assistance with coordinating related projects. Special investigations into the fisheries should be made when questions or problems arise. The Council should be kept updated on all fisheries activities and sampling results.

2. Monitor impacts of invasive species, particularly Asian carp, by both standardized and investigative sampling. General abundance of Asian carp should be monitored by CPUE from gill net sampling and relative weights of bigmouth buffalo and gizzard shad should also be evaluated.

3. Aquatic Vegetation - LDWF will respond to aquatic vegetation complaints from the Lake Providence Commission and shoreline residents. If herbicide treatment is deemed necessary, the nuisance vegetation will be treated in accordance with LDWF Aquatic Herbicide Application Procedure. Water hyacinth will be treated with 2,4-D (0.5 gal./acre), except during the LDAF waiver period. During the waiver period, glyphosate (0.75 gal./acre) will be applied. Alligator weed and other emergent species will be treated with imazamox at 0.5 gal/acre. Appropriate surfactants will be used in conjunction with all foliar herbicide applications.