LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES

OFFICE OF FISHERIES
INLAND FISHERIES SECTION

PART VI -B

WATERBODY MANAGEMENT PLAN SERIES

KEPLER LAKE

WATERBODY EVALUATION & RECOMMENDATIONS

CHRONOLOGY

DOCUMENT SCHEDULED TO BE UPDATED THREE YEARS

March 2013 -- Prepared by:

Evan Thames, Biologist Manager, District 1
James Seales, Biologist III, District 1

January 2016—Prepared by:
Jeff Sibley, Biologist Manager, District 1

Remainder of this page intentionally left blank.

TABLE OF CONTENTS

WATERBODY EVALUATION

STRATEGY STATEMENT

Recreational

Sport fish species are managed by the Louisiana Department of Wildlife and Fisheries (LDWF) to provide sustainable populations while providing anglers the opportunity to catch or harvest numbers of fish adequate to maintain angler interest and efforts. Bass anglers are afforded the opportunity to occasionally catch preferred-size largemouth bass through the introduction of Florida largemouth bass.

Commercial

Commercial harvest is allowed; however, there is no indication of an active commercial fishery.

Species of Special Concern

No threatened or endangered fish species are found in this lake.

EXISTING HARVEST REGULATIONS

Recreational

Statewide regulations for all fish species, the recreational fishing regulations may be viewed at the link below:
http://www.wlf.louisiana.gov/fishing/regulations

Commercial

The commercial fishing regulations may be viewed at the link below:
http://www.wlf.louisiana.gov/fishing/regulations

Species of Special Concern

No threatened or endangered fish species are found in this waterbody.

SPECIES EVALUATION

Recreational

Largemouth bass (*Micropterus salmoides*) and crappie (*Pomoxis* spp.) are targeted through standardized sampling in Kepler Lake as species of interest due to their popularity with recreational anglers and their high positions in the food chain. In years past, bass and other fish species were sampled using rotenone to derive biomass estimates. Biomass (rotenone) sampling was used extensively in Kepler from 1961 until 1991. Biomass sampling is an excellent method for determining standing crop for all fish species, predator-prey ratios and relative sizes of various fish species. However, recent increases in lakeshore residents and changes in public attitudes have made the use of fish toxicants controversial. Consequently, biomass sampling has been discontinued, being replaced by electrofishing, netting and other non-lethal sampling methods. Of the sampling methods presently used, electrofishing is the best indicator of largemouth bass abundance and size distribution, with the exception of larger sized bass. Gill net sampling is used to determine the status of large bass and other large fish species. Shoreline seining and fall electrofishing are used to collect information related to reproduction.

Largemouth Bass

Standing crop estimates-

The black bass population in Kepler Lake consists primarily of largemouth bass. Spotted bass (*Micropterus punctulatus*) represent <1% of the black bass population in Kepler Lake, as only one individual has been collected during standardized sampling efforts. Figure 1 below indicates the standing crop of largemouth bass in pounds per acre from rotenone sampling from 1969 to 1991. The largemouth bass standing crop for 1969 of 19.82 pounds per acre was the highest recorded in 7 years of biomass sampling conducted from 1969 to 1991. There is a significant decline in the standing crop of largemouth bass over this time period on Kepler Lake. Generally, this decline in production is associated with aging impoundments that tend to lose fertility over many years, and may have been affecting the reproductive potential of the overall bass population.

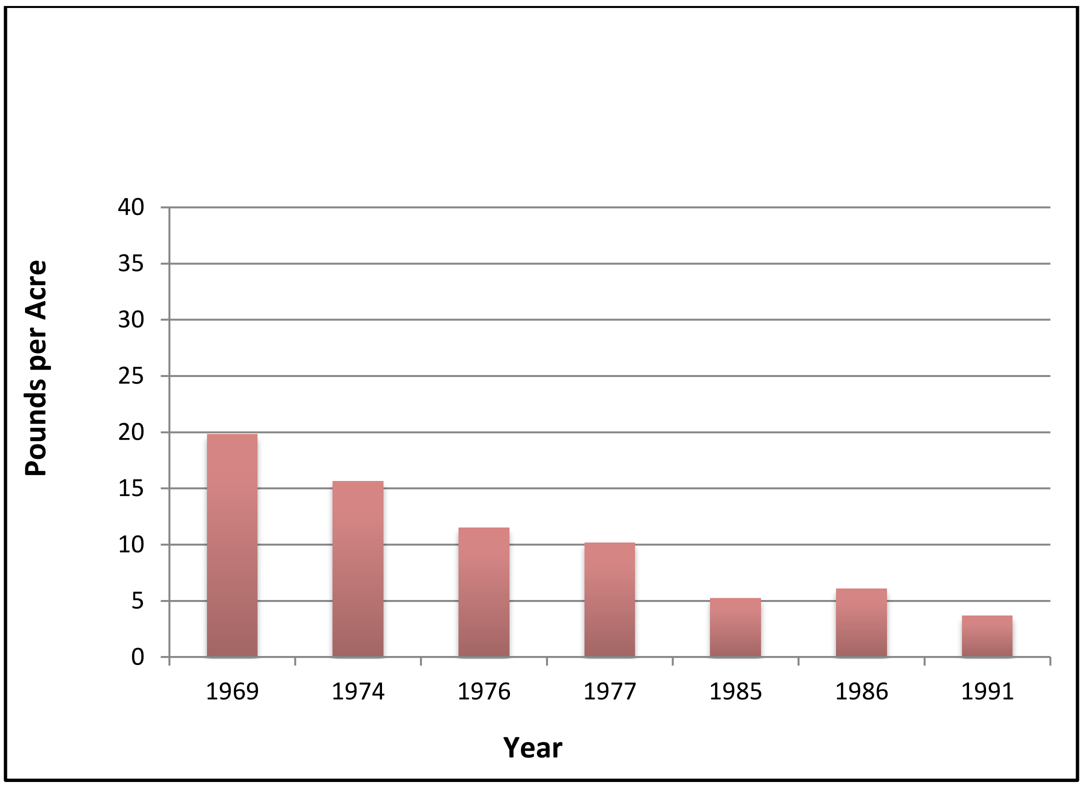

Figure 1. Average standing crop estimates (pounds per acre) for largemouth bass collected from biomass (rotenone) sampling in Kepler Lake, LA from 1969 to 1991.

Catch per unit effort, structural indices and size distribution-

Electrofishing has been the primary sampling technique utilized on Kepler Lake since 1991. Electrofishing is the best indicator of largemouth bass relative abundance and size distribution, with the exception of large fish (> 5 lbs.). Sampling with gill nets provides better assessment of large bass and other large-bodied fish species.

The catch-per-unit-effort (CPUE) for two size groups of largemouth bass collected during spring electrofishing samples from 1991 – 2014 are depicted in Figure 2. The 8" – 12" total length (TL) group (stock-size) is indicative of recruitment in the largemouth bass population and the 12" TL and greater is the quality-sized fish favored by anglers. Although both values are relatively low, the trend lines indicate an increase in both size groups of largemouth bass over the time period 1991 – 2014 on Kepler Lake. Prior to 2006, nearly all electrofishing samples were conducted on the lower portion of the lake below the bridge and sample sizes were low. However, most recreational bass fishing occurs in the upper portion of the lake where vegetation and woody debris are more abundant. A re-evaluation of LDWF sampling locations in 2006 resulted in the inclusion of representative bass habitats from the upper part of the lake which probably contributed to the overall upward trend noted in CPUE over the 25 year monitoring period.

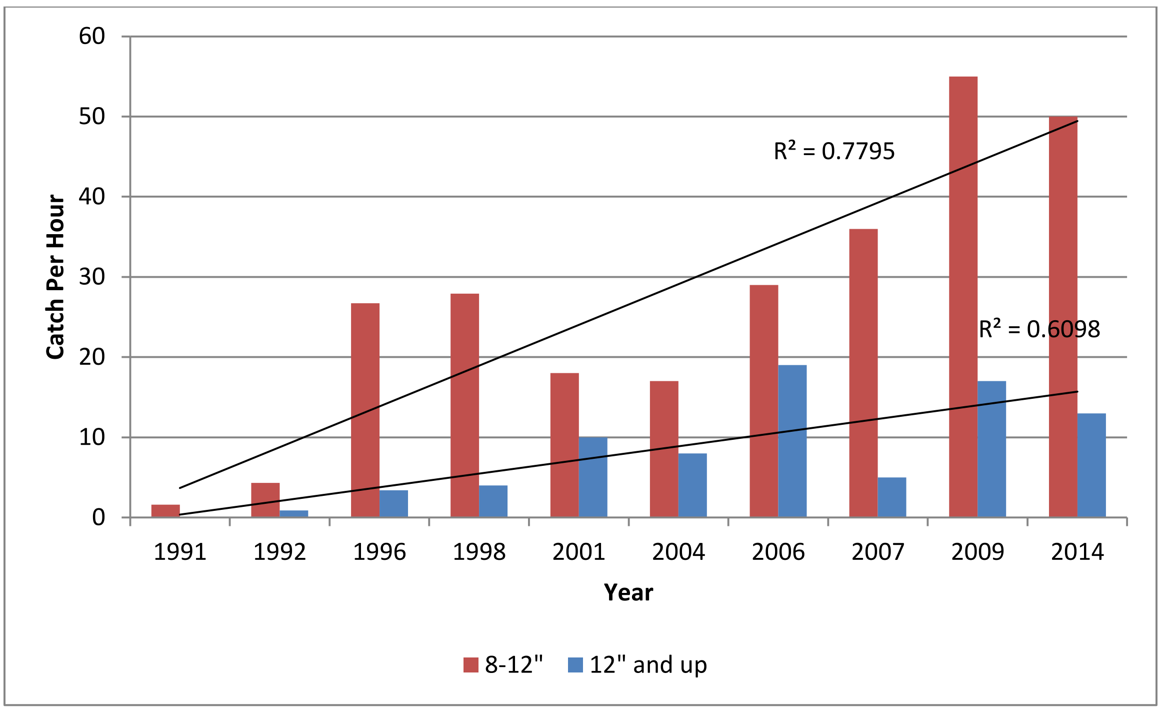

Figure 2. Spring electrofishing catch-per-unit-of-effort (CPUE) for two size groups, stock-size (8" – 12" TL) and quality-size or larger (≥12" TL), of largemouth bass in Kepler Lake, LA, from 1991 – 2014.

Proportional stock density (PSD) and relative stock density (RSD) are indices used to numerically describe size distribution (length) data. Proportional stock density compares the number of fish of quality-size (≥ 12 inches total length (TL) for largemouth bass) to the number of bass of stock-size (≥ 8 inches 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 or 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–$_P$ (> 15 inches TL), are shown in Figure 3. Ideal PSD and RSD-$_P$ values for largemouth bass range from 40-70 and 10-40, respectively. The values for both indices fell below the desired ranges for all years except 2006, and the average values for both indices are well below the ideal range.

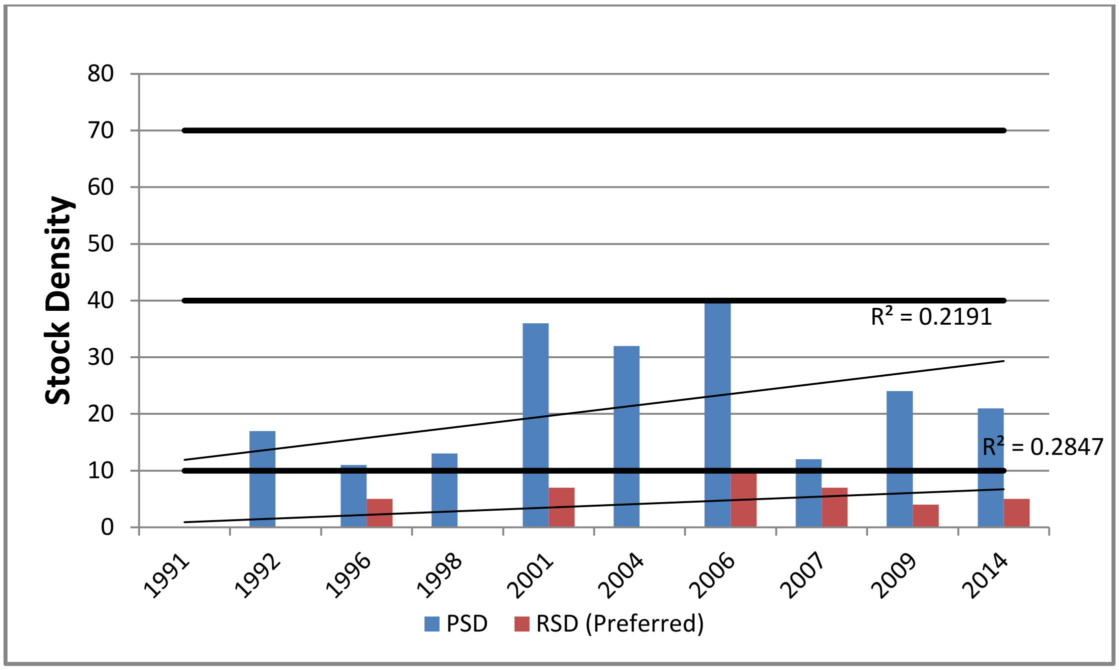

Figure 3. Largemouth bass size-structure indices on Kepler Lake, LA, from 1991 to 2014 for spring electrofishing samples.

Figure 4 illustrates the CPUE and size distribution of largemouth bass for the spring 2014 electrofishing results, along with relative weight (Wr) values. Bass ranged from 4 inches to 15 inches TL, with the 9-11 inch TL groups the most abundant. The sample size for stock-size or larger fish (>8 inches TL) was more representative than samples collected in previous years. The Wr results suggest that a negative relationship may exist between Wr and increased bass length. Although sample size is quite low, Wr's for quality- and preferred-size bass indicate that forage for these size groups may be limited (see forage section).

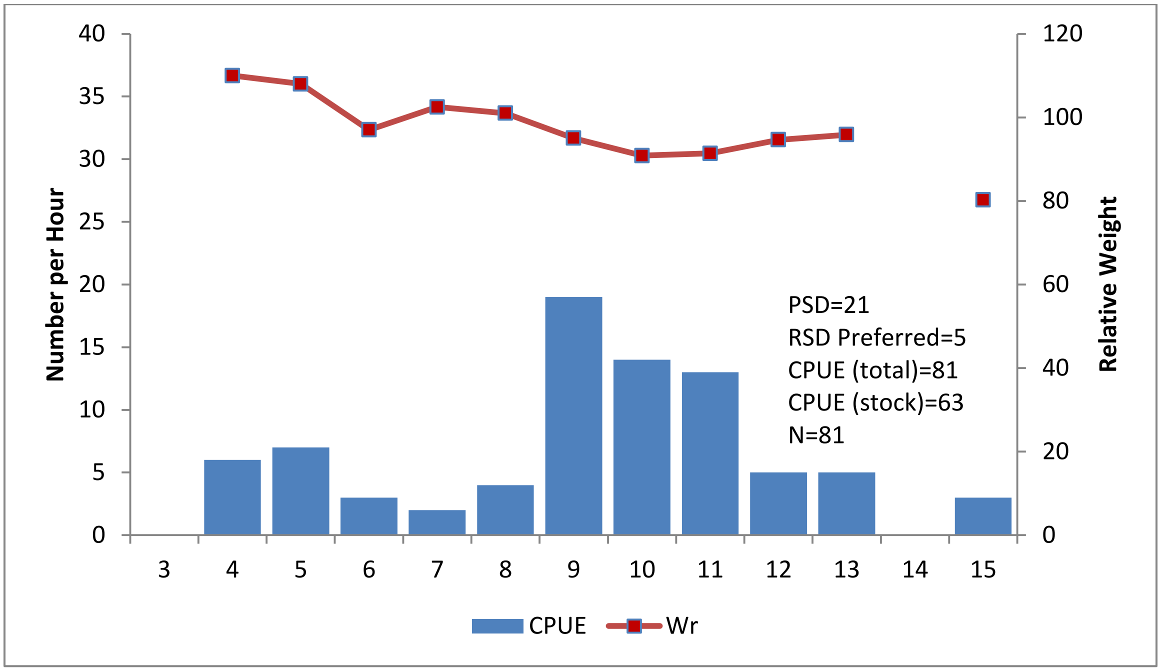

Figure 4. The CPUE, size distribution and relative weights for largemouth bass from Kepler Lake, LA for spring 2014 electrofishing samples.

Forage

Bluegill (*Lepomis macrochirus*), redear (*L. microlophus*) and longear sunfish (*L. megalotis*) are abundant in Kepler Lake and provide the primary forage base for the largemouth bass population. Brook silversides (*Labidesthes sicculus*), topminnows (*Fundulus* spp.) and Western mosquito fish (*Gambusia affinis)* are also important components of the forage base in Kepler Lake. Efforts to introduce threadfin shad (*Dorosoma petenense*) have not been successful even after several stockings. Benthic invertebrates that live on the bottom substrate such as insect larvae, worms and crawfish are also utilized by predatory fish species. Figure 5 below gives a summary of fingerling-size fish (≤ 5" TL) which are available as forage collected during rotenone sampling from 1969 to 1991 on Kepler Lake.

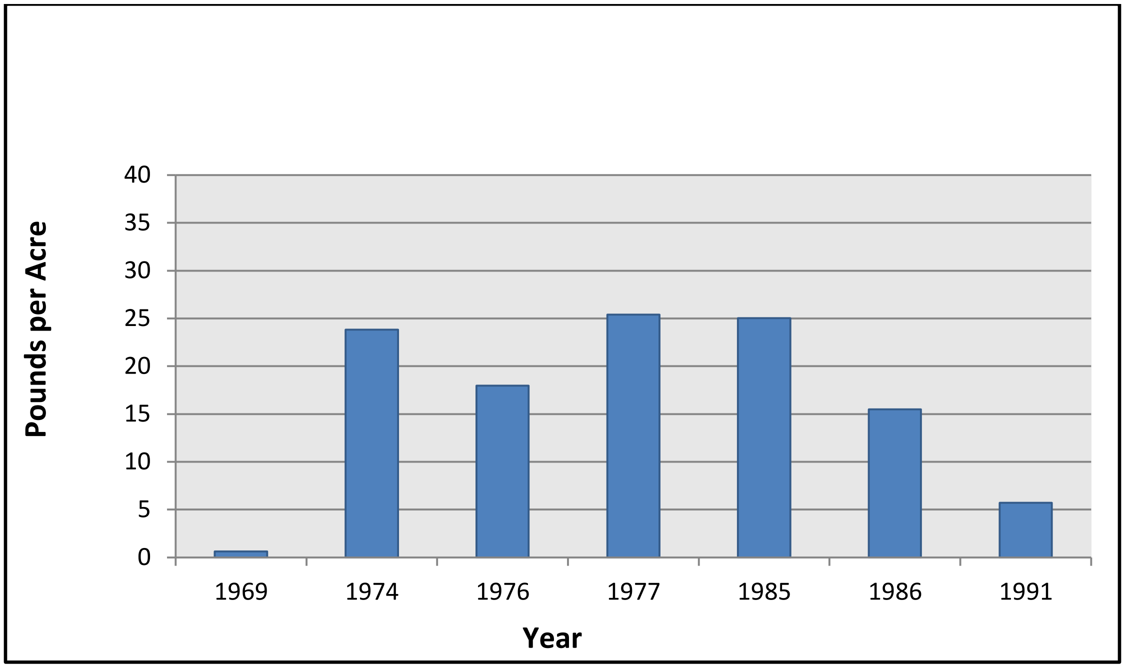

Figure 5. Pounds per acre of fingerling-size fish which are available as forage collected during biomass (rotenone) sampling on Kepler Lake, LA from 1969 to 1991.

In recent years, biomass (rotenone) sampling has been discontinued. Forage availability is now determined by shoreline seining, electrofishing and indirectly by the measurement of largemouth bass 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 index is calculated by dividing the weight of a fish by the standard weight for its length, and multiplying the quotient by 100. Relative weights for largemouth bass typically measure between 80 and 100 for all size groups, indicating adequate forage is available to a bass population. Largemouth bass Wr values below 80 indicate a shortage of available forage. Relative weights obtained from fish collected during the fall of the year are more indicative of the available forage in a lake, while Wr's obtained from fish collected in the spring may have inflated Wr's due to egg bearing fish. The chart in Figure 4 above gives Wr values for Kepler Lake largemouth bass of all size groups captured in the spring 2014 electrofishing samples.

Shoreline seine sampling conducted during the summer months on Kepler Lake provides insight into the primary components of the forage base. Sunfish are the primary component of the forage base (Figure 6). Brook silversides, topminnows and mosquitofish are also available as forage. Similar results were observed through earlier biomass sampling.

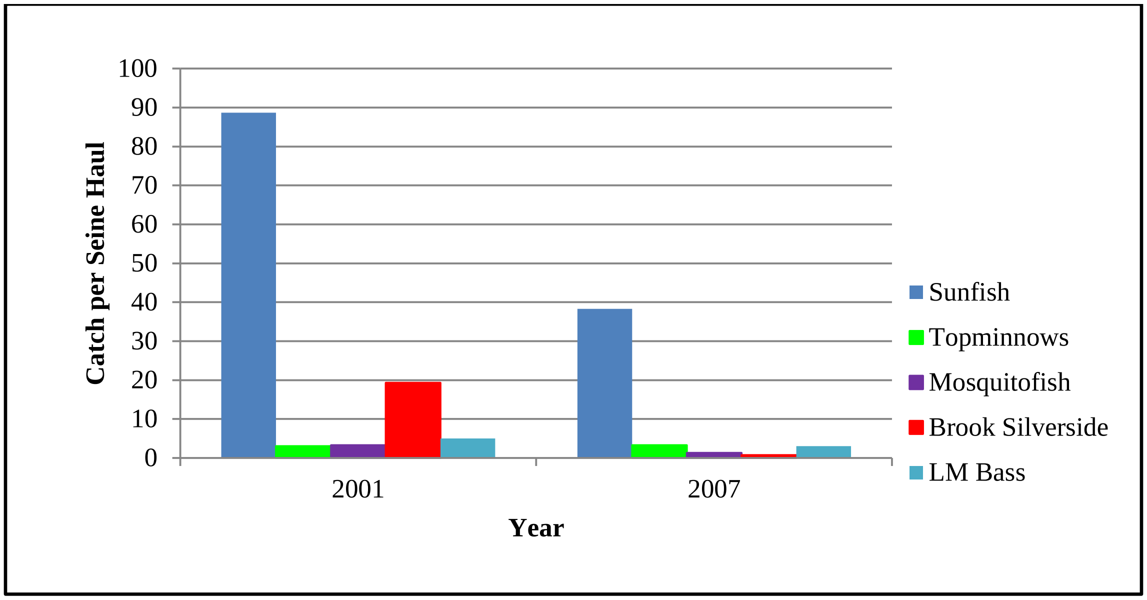

Figure 6. Forage fish composition from haul seine sampling on Kepler Lake, LA for 2001 and 2007.

A forage sample was conducted by electrofishing during the fall of 2009 and analysis of that data is presented in Figure 7. The results indicate that sunfish (all *Lepomis* spp.) are the primary forage base found in Kepler Lake, but brook silversides are numerous as well. Forage sampling yielded an estimated 17.97 pounds of forage per hour, which is considerably lower than some other lakes in the area (Caney Creek Reservoir 30.79 pounds/hour and Black Bayou Bossier 59.95 pounds per hour). Forage fish results combined with Wr results indicate forage is likely lacking, especially for larger size bass. Threadfin shad stockings of the past have been regarded as unsuccessful; however, gizzard shad were identified in the samples taken in the fall of 2015. Additional forage sampling will be conducted to evaluate the shad population.

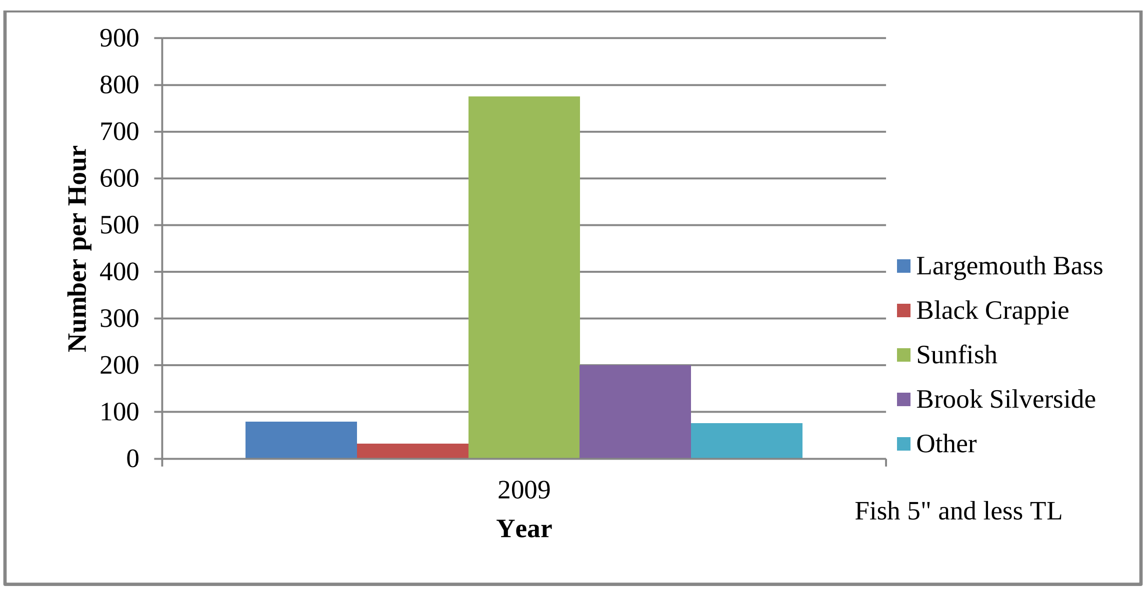

Figure 7. Catch per unit effort for forage fish groups from Kepler Lake, LA, for fall electrofishing samples taken in 2009.

Growth Rates

Due to the limited forage base in Kepler Lake, predator fish like bass and crappie do not grow as fast or reach desired size ranges as in other lakes. Figure 8 illustrates the difference between the growth rates of largemouth bass from Kepler Lake compared to the Louisiana statewide growth rate for all lakes combined (2009-2015). LDWF employs the von Bertallanffy Growth Equation for predicting growth rates for fish populations, a method widely used in fisheries science. Largemouth bass in Kepler Lake grow at about the same rate as in other Louisiana waters for the first year since forage is available for smaller size groups of fish. However as bass grow larger, suitable forage becomes more of a limiting factor and growth rates slow and fall well below the Louisiana average.

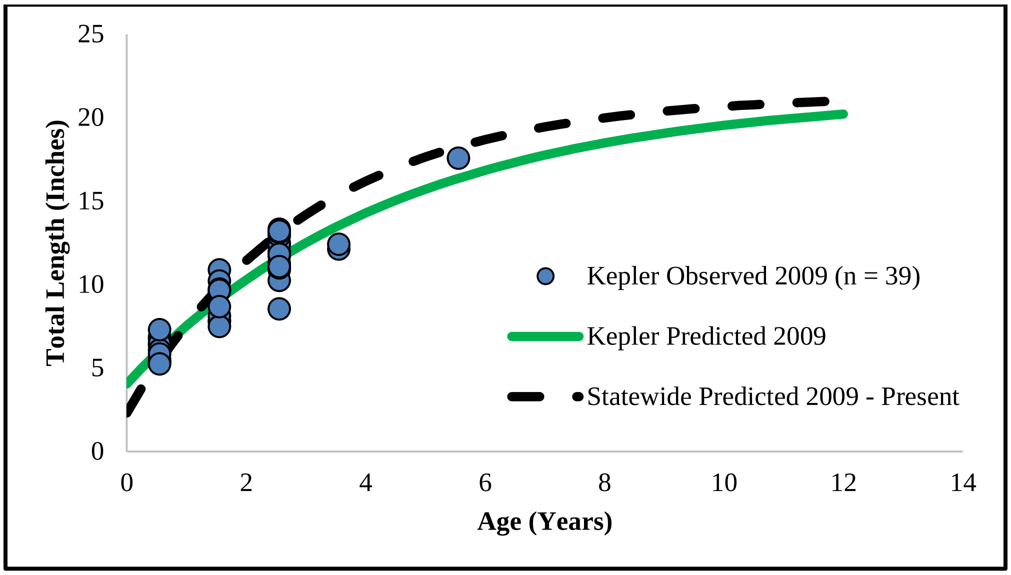

Figure 8. Observed and predicted length-at-age of largemouth bass collected from Kepler Lake, LA, in 2009 (N = 39) as compared to statewide Louisiana growth rates for 2009-2015 (von Bertallanffy; t_0 =- 0.9425, $L_{inf=}$ 543.7, and k=0.2225).

Genetics-

Florida largemouth bass have been stocked into Kepler Lake in an attempt to increase the genetic potential for production of large bass. Florida bass have been stocked in Kepler nine times. The initial introductions were made in 1998. Stocking rates have been low (10 per acre) and the size of the fingerlings were small (< one inch). Genetic analysis was conducted in 2004 and 2009 with a return of 0% Florida and 0% hybrid in 2004 and 0% Florida and 8% hybrid in 2009 (Table 1). Greater success has been seen in lakes stocked at higher rates over more consecutive years and with larger fingerlings. Future genetic sampling is needed to evaluate the success of more recent stockings. Table 1 shows the percent ratios of northern (or native), Florida, and hybrid largemouth bass in the Kepler Lake population sample.

Table 1. – Largemouth bass genetic analysis from Kepler Lake, LA for 2004 and 2009.

Year	Number (n)	Northern %	Florida %	Hybrid %
2004	56	100	0	0

2009	39	92	0	8

Crappie

Crappies are very popular with recreational anglers in Kepler Lake. The population consists primarily of black crappie which is better adapted to reservoir habitat. Considerable interest has been expressed in improving crappie fishing in the lake. Crappie populations and angler satisfaction have varied considerably over the years indicating both the cyclic nature of the species and the difficulty in obtaining reliable population data with standard sampling techniques. Crappie populations were sampled in Kepler using biomass (rotenone) techniques from 1961-1991. Figure 9 shows crappie standing crop estimates in pounds per acre for 1961-1991. Crappie standing crop was highest in 1969, 1976 and 1977 following drawdown events.

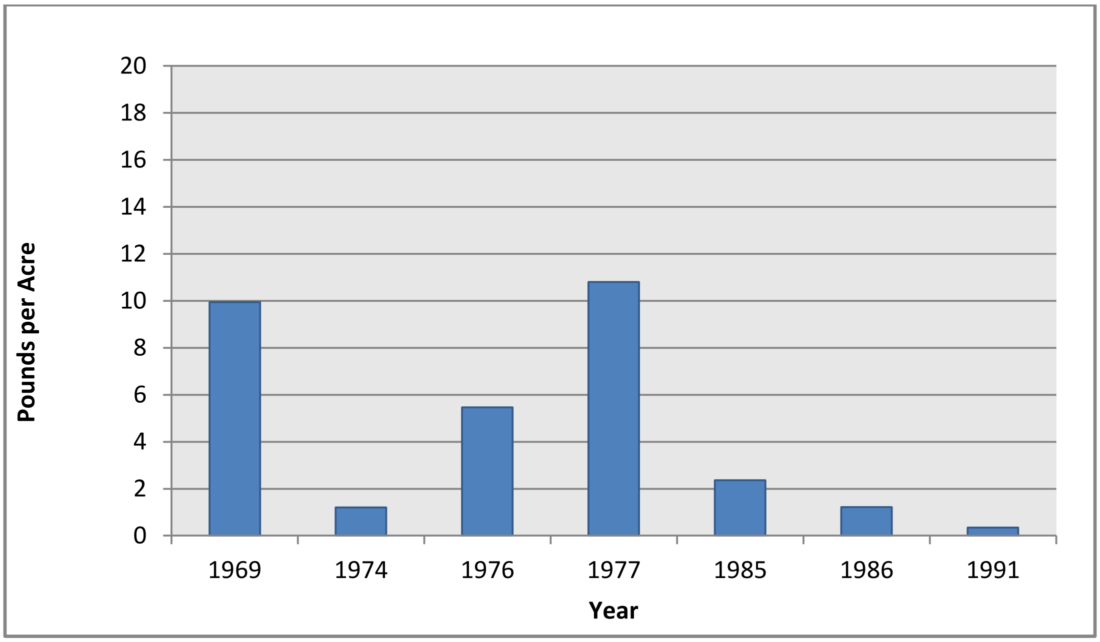

Figure 9. Standing crop estimates in pounds per acre of black crappie from Kepler Lake, LA biomass sampling conducted from 1969 – 1991.

From 1989 to 2010, crappies were sampled using spring and fall electrofishing methods. Electrofishing has not proven a reliable technique for sampling the crappie population in Kepler Lake due to very low catch rates. Crappie catch by electrofishing in Kepler Lake was as follows - eight black crappie collected in the spring 1992, one black crappie in spring 2006, one black crappie in spring 2009 and six black crappie in the fall of 2009. Sampling inconsistency is likely responsible for the variation seen in the results rather than an actual population change. Anecdotal information from anglers and preliminary lead net data indicates that while the crappie population is not highly abundant, crappie are more common than the electrofishing results reveal.

Sampling crappies with lead net gear has recently been used with success in other Louisiana lakes. Preliminary sampling was conducted on Kepler Lake in fall 2010 with success and this technique will be used to sample crappies in the future. Figure 10 shows the CPUE of black crappie, bluegill and redear from the 2010 lead net results. Lead net sampling may also provide insight into sunfish populations.

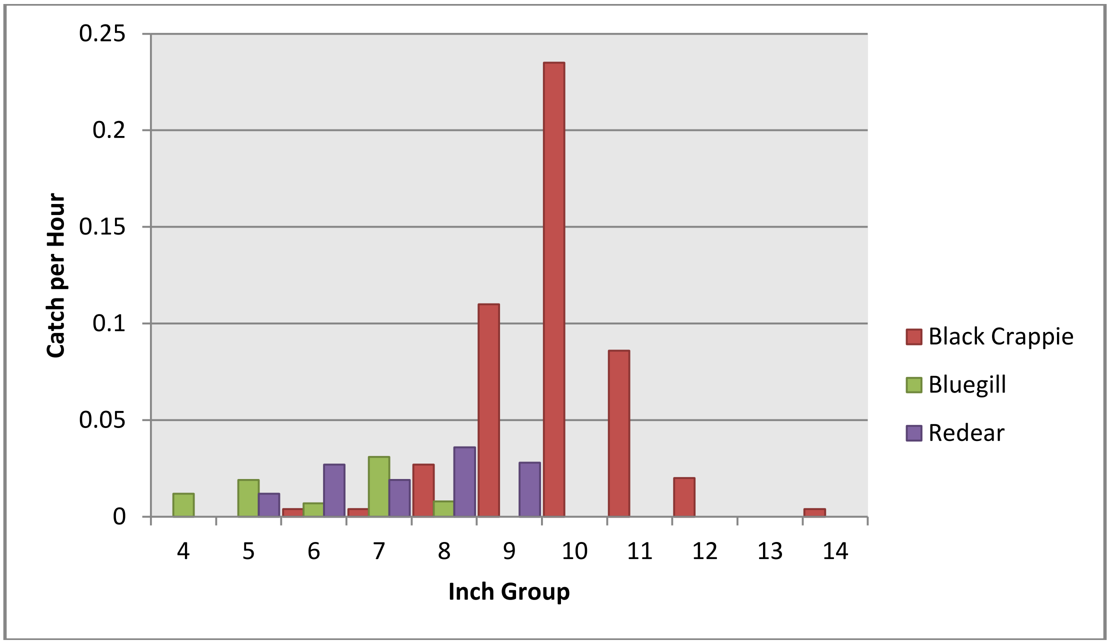

Figure 10. The mean CPUE for black crappie, bluegill, and redear captured in lead nets from Kepler Lake, LA, for 2010.

Age and Growth

Similar to largemouth bass, forage for crappie in Kepler Lake appears to be limited. Figure 11 indicates that the crappie in Kepler grow slower than crappie in other Louisiana waterbodies, especially after Age-1.

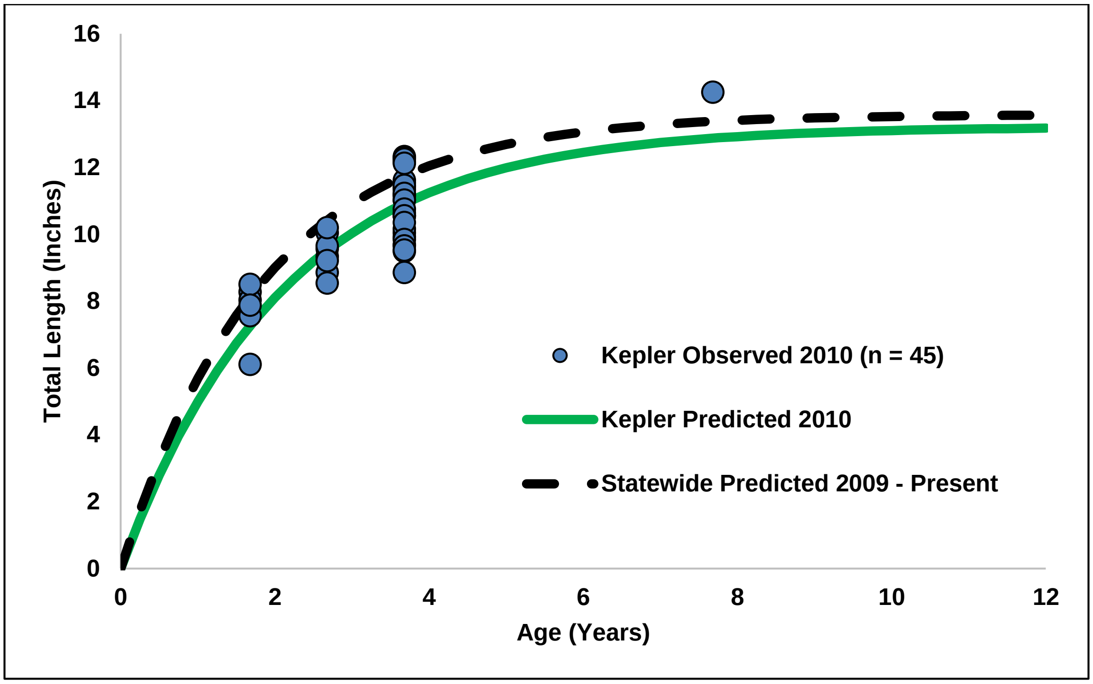

Figure 11. Observed and predicted length-at-age of black crappie collected from Kepler Lake, LA in 2010 (N=45), as compared to statewide Louisiana rates for 2009-2015 (von Bertallanffy; t_0 =- 0, $L_{inf=}$ 335.7, and k=0.475).

Commercial

Only a limited commercial fishery exists on Kepler Lake.

Species of Special Concern

No threatened or endangered species are known to occur in Kepler Lake.

HABITAT EVALUATION

Aquatic Vegetation

Kepler Lake has extensive areas of shallow water that are susceptible to aquatic vegetation infestations. Emergent and submergent aquatic vegetation has been problematic in the lake since impoundment. This can create issues for shoreline property owners due in part to large expanses of shallow water found near the inhabited shoreline. It is suspected that aquatic growth increased over time as the lake aged and the eutrophication process accelerated. Additionally, high water clarity compounds the problem of submerged aquatics, allowing the vegetation to grow at greater depths.

An overabundance of aquatic vegetation is typical in this shallow water. Emergent species such as fragrant water lily (*Nymphaea odorata*), American Lotus (*Nelumbo lutea)*, alligator weed (*Alternanthera philoxeroides*), water shield (*Brasenia schreberi*) and water primrose (*Ludwigia octovalvis*) are typically present in severe to moderate infestations in this reservoir. Bladderwort (*Utricularia* spp.), fanwort (*Cabomba caroliniana*), variable leaf milfoil (*Myriophyllum heterophyllum*), Brazilian elodea (*Egeria densa*), naiad (*Najas* spp.), coontail (*Ceratophyllum demersum*) and muskgrass (*Chara* spp.) are the most troublesome submerged aquatic vegetation (SAV) species in Kepler Lake and are often present in moderate to severe amounts out to depths of 6 to 8 feet.

The reservoir has a long history of frequent fall drawdowns which have not proven to be successful in providing long term control of nuisance aquatic vegetation. Generally, 15% - 30% coverage of submersed aquatic vegetation is considered desirable for fisheries production. Vegetation coverage at these levels has proven unacceptable to the Kepler Creek Recreation and Water Conservation District Commission (KCRWCDC) and user groups of the lake. Frequent requests for drawdowns in the past are evidence to that end. With coverage levels in the 15% to 30% range for submerged aquatic vegetation, overall recreational use is reduced and access is impeded for a majority of the shoreline property owners.

As an alternative control method to frequent drawdowns, 2,000 triploid grass carp were stocked in 2009 (2 fish per acre). The first stocking was moderately effective, but a supplemental stocking was needed. An additional 1,500 carp were stocked in late 2013.

Giant salvinia (*Salvinia molesta*) was observed and documented on Kepler Lake in March, 2009. LDWF Inland Fisheries Biologists found tertiary stage giant salvinia on the lower end of the reservoir. Control efforts have been ongoing by LDWF spray crews using foliar applications of glyphosate and diquat. Salvinia has been controlled through these frequent foliar herbicide applications, while wind and wave action combined with the relatively infertile water have helped contribute to the overall low levels of salvinia on the lake.

Following the most recent drawdown in 2014, SAV has been slower to return than in years past. A vegetation survey conducted in August 2015 showed a 40 % overall reduction in aquatic vegetation with the greatest impact on SAV. Perhaps the combination of drawdown and grass carp may prove more effective at providing control for SAV on Kepler Lake than past attempts using only one method.

A vegetation survey was performed on August 18, 2015. Vegetation coverage was greatly reduced following the 2014 drawdown. Vegetation was only problematic in the extreme upper end of the lake. Submersed aquatic vegetation was present out to the 7 ft. contour, but coverage was sparse in most areas and not problematic. Approximately 364 acres of emergent vegetation was identified during the survey. The following species were present: fragrant water lily (*Nymphaea odorata*), creeping water primrose (*Ludwigia repens*), alligator weed (*Alternanthera philoxeroides*), pondweed (*Potamogeton* spp.), southern watergrass (*Luziola fluitans*), baby-tears (*Micranthemum umbrosum*) and American lotus (*Nelumbo lutea*). Approximately 480 acres (25%) of the lake had a light coverage of SAV including the following species: widgeon grass (*Ruppia maritima*), bladderwort (*Utricularia* spp.), muskgrass (*Chara* spp.), naiad (*Najas* spp.), fanwort (*Cabomba caroliniana*), and variable-leaf milfoil (*Myriophyllum heterophyllum*).

Recent aquatic plant control measures have primarily been foliar herbicide applications for giant salvinia. Limited applications have been made along the inhabited shoreline to control nuisance emergent vegetation, but these plants have mainly been treated in conjunction with salvinia treatments. Salvinia is treated using 0.75 gal/acre of glyphosate / 0.25 gal/acre of diquat/ 0.25 gal/acre Aquaking surfactant/ and 12 oz./acre of Air Cover surfactant from April

1 through October 31. A mixture of diquat at 0.75 gal/acre and non-ionic surfactant (0.25 gal/acre) is used the remainder of the year.

Substrate

The substrate of Kepler Lake is composed of relatively infertile sandy and light clay soils. Organic content is generally high in the upper end of the lake due to the long term overabundance of aquatic vegetation. Suitable fish spawning substrate is available along the shoreline in the lower end of the lake.

Complex Cover

Complex cover in Kepler Lake consists primarily of stumps and aquatic vegetation. The majority of the lake contains submerged stumps which provide some cover for fish, but are a major navigation hazard as the creek channel is poorly marked. Many local anglers add artificial cover in order to attract fish to a particular location.

CONDITION IMBALANCE / PROBLEM

Excessive aquatic vegetation has been a chronic problem in Kepler Lake since impoundment. The clear infertile water is almost universally associated with increased SAV coverage. The problem of excessive aquatic vegetation has become even more acute with the introduction of non-native invasive species, including *Egeria*, milfoil, and giant salvinia. Currently, SAV covers more than 50% of the upper end (above the bridge) of the lake, while emergent species plague the shallow shorelines and giant salvinia is scattered throughout.

Under-water obstructions make navigation on Kepler Lake difficult. Several small-scale attempts have been made by the Parish or lake commission to mark the existing creek channel and boat row to aid navigation. These markings were too few and have not withstood time. For boaters not extremely familiar with the lake, one must idle the entire lake except the small area adjacent to the dam.

CORRECTIVE ACTION NEEDED

In consideration of the shoreline owners and in the best interest of fisheries production, a more realistic and balanced approach should be to provide SAV in a range of 5% to 10% coverage instead of the customary 15-30% thought to be best for fisheries production. Emergent vegetation has historically been, and continues to be, a problem near the inhabited and developed shoreline areas of the lake. However, strategic foliar herbicide applications at key access points along the shoreline can be effective at providing property owners boating access to their homes and camps.

Control techniques for aquatic vegetation are generally categorized into three broad groups; chemical, physical, and biological. Because of the tremendous expense associated with chemical treatments to SAV, LDWF herbicide applications are primarily limited to floating and emergent species (i.e., water lily, alligator weed, and salvinia), which in the case of Kepler Lake is confined primarily to the shorelines and shallow upper end. Some control of emergent species is needed where they impede boating access to developed shorelines and boat launches.

Biological control of aquatic plants typically includes the introduction of herbaceous species such as triploid grass carp (TGC) and salvinia weevils. Since 2009, 3,500 triploid grass carp have been stocked into Kepler Lake to control SAV. Prior to the 2014 drawdown, no significant reduction of SAV had been noted in the lake. Initial observations made in the summer of 2015 may indicate that the grass carp are beginning to impact SAV when combined with the drawdown. The vegetation situation will be closely monitored in the future to determine if additional stockings will be required. The proper stocking application of TGC has produced the desired results in many other waterbodies. Currently giant salvinia is kept in check through herbicide treatments and there is no need for weevil introduction at this time.

Physical controls include actions to contain and even harvest vegetation, but the most common involves water level fluctuation. Past corrective actions have included both summer and fall drawdowns during the life of the reservoir (Table 3 in MP-A) for vegetation control. Results have been sporadic and have only provided short-term relief. The frequent drawdowns of the past (pre-1986) led to considerable loss in recreational opportunities to the public, and should be discouraged for the sole purpose of vegetation control.

Since 1986, drawdowns have become less frequent on Kepler Lake averaging a drawdown approximately every 4.3 years, which is similar to other lakes in the area. Although single drawdowns have not yielded long-term control of submerged aquatic vegetation on Kepler Lake, the use of drawdowns should not be abandoned as a control tool. Perhaps the integrated approach of drawdowns combined with grass carp can be used to maintain a more desirable level of SAV. An approach using regularly scheduled drawdowns or even a series of successive drawdowns combined with biological control may provide better results. A similar scenario on nearby Ivan Lake has proven successful at controlling SAV in recent years. Ivan Lake is in a watershed similar to Kepler Lake and was historically plagued by clear water and abundant SAV. Future monitoring of the vegetation on the lake will be used to determine the best approach for combining drawdowns and grass carp.

During the 2014 drawdown of Kepler Lake, LDWF personnel used GPS equipment to identify the creek channel and the previously cleared boat lanes that exist below the bridge (Figure 12). This information was used to help design a plan for marking the navigation channels using United States Coast Guard approved markers and materials. The proposed project would include the main creek channel as well as a man-made channel that runs along the northern side of the lake and two small lanes that connect the two. However, the KCRWCDC currently lacks sufficient funding to clear, adequately mark, and maintain boat lanes on the lake.

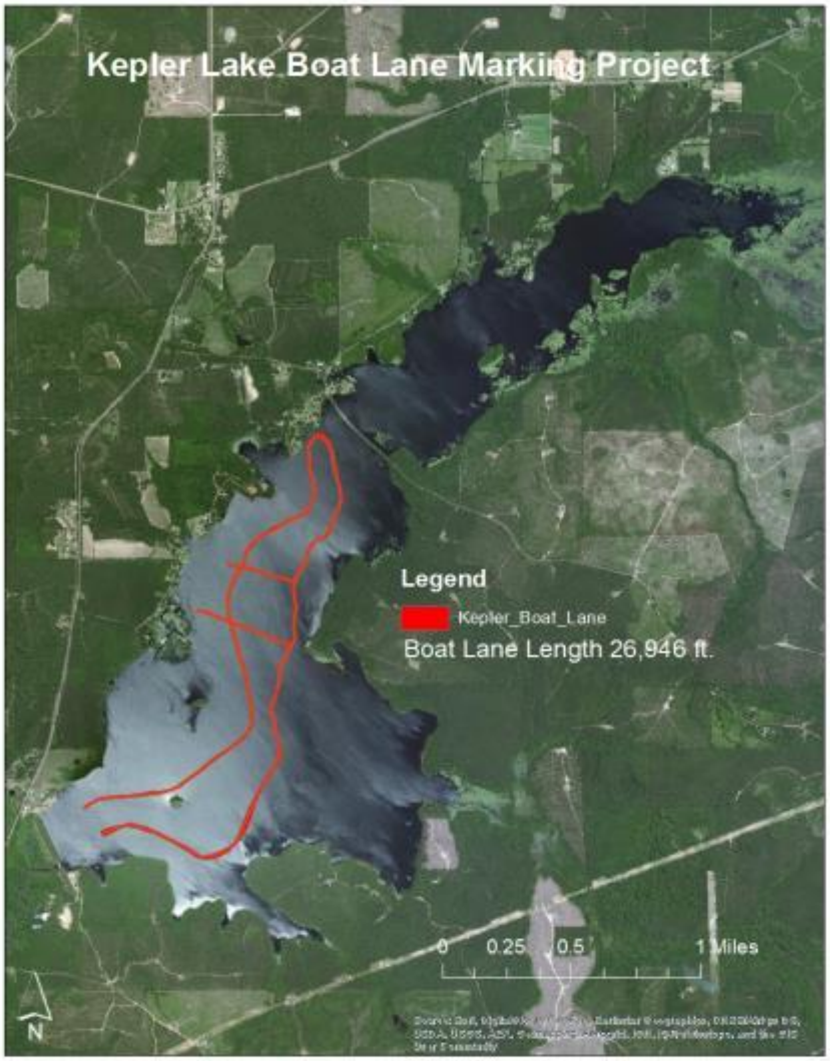

Figure 12. Map illustrating proposed navigation channel/boat lane marking areas on Kepler Lake.

RECOMMENDATIONS

1) Conduct strategic foliar herbicide applications to giant salvinia as needed. Diquat will be used from November 1 through March 31 at a rate of 0.75 gallons per acre mixed with a total of 1 qt. per acre of non-ionic surfactant. Outside of that time frame, giant salvinia will be controlled with a mixture of glyphosate (0.75 gal/acre) and diquat (0.25 gal/acre) with Aqua King Plus (0.25 gal/acre) and Air Cover (12 oz. /acre) surfactants. Alligator weed will be controlled with Imazapyr (0.5 gal/acre) in undeveloped areas and with Clearcast (0.5 gal/acre) near houses and developed shorelines if necessary.

2) Aquatic vegetation assessments will be conducted annually to assess the need for additional triploid grass carp stockings and/or future drawdown prescriptions.

3) Stock Florida largemouth bass fingerlings as per the official LDWF Stocking Policy. Florida largemouth bass should be stocked as available.

4) Continue standardized fisheries sampling on Kepler Lake to monitor fish populations.

5) Cooperate with KCRWCDC to implement a navigational channel/boat lane marking project. The largest limitation to the project will be securing adequate funding.

6) Stock 50,000 threadfin shad in the winter of 2016.