# WHEELER RESERVOIR MANAGEMENT REPORT

## 2008

**Prepared By**

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## Introduction

The reservoir management objective for Wheeler Reservoir is to collect baseline biological data that is important to the sport fishery. From the data, length-at-age frequencies, growth, relative abundance and relative weight are obtained. This information is used to formulate management recommendations.

In 1998 local anglers expressed a concern for the Wheeler Reservoir bass fishery.. The anglers concern dealt with a decline in the quantity and quality of largemouth bass in the reservoir. Anglers were seeing a decline in the total weights in tournaments and fewer fish over five pounds. The 1998 B.A.I.T. report also documented this decline in the ten-fold increase in the number of hours it took for tournament anglers to catch a bass five pounds or larger. The reservoir was sampled in 1998 to document any changes from the last sample period in 1994. The reservoir has been sampled regularly since 1999 to document any changes that have occurred over the last few years.

## Methods

Wheeler Reservoir was sampled in 2008 according to the guidelines of the Reservoir Management Program Manual (1999). Electrofishing was conducted from April 10-16, 2008. Electrofishing gear consisted of a 5.5 meter aluminum boat with bow mounted electrodes. A 5,000 watt generator and a Smith-Root Mark IV-A electrofisher were used to provide 300-1,000 volts of pulsed direct current.

Spring electrofishing consisted of ten thirty-minute sample sites, seven within major embayments and three on the main river. Largemouth bass was the target species. Lengths and weights were taken from all bass and otoliths were extracted from 10 bass per 25mm group greater than 150mm TL.

Otoliths were aged at the District One laboratory. The Alabama Division Wildlife and Freshwater Fisheries computer program developed by Slipke (2004) was used to assign ages to unaged fish and summarize length and age specific data. Simulation modeling was conducted using Fisheries Analysis Simulation Tools (FAST) developed by Slipke and Maceina (2006).

**Results and Discussion**

Largemouth bass had a total catch-per-unit-effort (CPE) of 62.4 fish/hour of electrofishing, with the CPE for stock-memorable size fish at 48.6 fish-per-hour (Table 2). This CPE is slightly higher than the overall lake average of 44.9 fish/hour for stock-memorable size categories. The Proportional Stock Density (PSD) value was 60%, higher than the overall lake average value of 54% for Wheeler Reservoir.

Length frequency indices vary between sample years (Table 2). The variation observed between years can be attributed to the abundance and scarcity of year classes as they grow through subsequent RSD categories. The RSD distribution observed in 2008 is indicative of a high to moderate density bass population (Gablehouse 1984). Values for the RSD S-Q and RSD P-M categories were below statewide averages and lake averages, whereas the value for the RSD Q-P category was well above statewide and lake averages.

The growth for largemouth bass showed high variability between year classes. Age 2 and Age 3 individuals exhibited rapid growth with fish obtaining mean total length of 312.8 mm TL by Age 2. Both Age 2 and Age 3 mean total lengths were greater than statewide means and also were above the statewide $90^{th}$ percentiles. By contrast Age 4 and Age 5 mean total lengths were below statewide averages (Table 3).

The age structure was well distributed with ten year classes represented. The 2007 and 2006 year classes, Age 1 and Age 2 respectively, dominated the sample, representing 81% of the largemouth bass sampled (Table 3). Estimated weighted and un-

weighted annual survival rates from catch curves were 73% (r2=0.569) in 2008. This survival rate should be viewed with caution since the $r^2$ value does not meet the requirements outlined in the Reservoir Program Manual (1999).

The 2007 B.A.I.T. (Abernethy 2008) report ranked Wheeler ninth out of 22 reservoirs. Anglers averaged 3.34 bass/day, with an average weight of 5.93 lbs/day. Average weight of fish caught was 1.78 lbs. Anglers had an 85% success rate while fishing on Wheeler.

Simulation modeling was conducted using the average estimated conditional natural mortality (CM) of 0.27 (range = 0.22 – 0.32, n = 7). Three minimum length limits (MLL) were used in the simulations, 400 mm MLL, 380 mm MLL and 300 mm MLL. We can assume that the 300 mm MLL would reflect current conditions since no size limit is in effect and most anglers view 300 mm TL bass as the minimum acceptable for harvest. We predicted that yield would be similar for all three MLL through an exploitation rate of 66% (Figure 4). Maceina et al (2003) estimated a maximum exploitation rate of 20% on Wheeler by tag returns from anglers. At the current exploitation levels observed, a size restriction would not increase yield above the current levels.

We also predicted that the percent of a cohort recruiting to 508 mm TL would be small under all MLL examined, but would be slightly higher under the larger length limits at the current exploitation and annual survival rates (Figure 5). Establishing size restrictions have the potential to increase the number of memorable size fish to the population but the increase would be minor.

## Conclusions

The largemouth bass population has shown various changes over the years. These changes are predominantly influenced by the variable recruitment that is observed on the Tennessee River mainstream impoundments. The slow growth rates of largemouth bass greater than age 3 may be associated with LMB Virus similar to that observed by Maceina et al (2003). We are beginning to observe positive changes in the growth rates and numbers of large bass, both in electrofishing and the anglers creel, albeit not at the levels that were observed in the early 1990's. In 1994 Maceina found Wheeler largemouth bass to be some of the fastest growing in the state.

The simulation modeling conducted with the current population parameters indicates that we could see slight increases in the numbers and size of largemouth bass with a restrictive size limit, albeit minimal. These increases would come with the cost of restricting anglers with what they can harvest or weigh in during a tournament. At the current rate of exploitation any positive benefit would be minimal.

## Literature Cited


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TABLE 1. Wheeler Reservoir morphometric, physical and chemical characteristics.

| | | |
|---|---|---|
| Surface area | 67,070 | acres |
| Drainage area | 29,590 | sq. mi. |
| Full pool elevation | 556 | feet-msl |
| Mean annual fluxuation | 6 | feet |
| Shoreline distance | 1,027 | miles |
| Shoreline development index | 24.8 | |
| Mean depth | 15.7 | feet |
| Maximum depth | 57 | feet |
| Outlet depth | 52 | feet |
| Total dissolved solids | 92.6 | mg/l |
| Morphoedaphic index | 5.9 | TDS/mean depth(ft) (Ryder 1965) |
| Growing season | 214 | frost free days (Jenkins 1967) |
| Date of impoundment | 1936 | |

Table 2. Relative stock density, catch per effort, relative weight and proportional stock density of largemouth bass from Wheeler Reservoir.

| | Largemouth bass | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of | SUBSTOCK | | | RSD S-Q | | | | RSD Q-P | | | | RSD P-M | | | | RSD M-T | | | | TOTAL | | |
| Year | Gear | Samples | NO. | CPE | PCT.[1] | NO. | CPE | PCT | Wr | NO. | CPE | PCT | Wr | NO. | CPE | PCT | Wr | NO. | CPE | PCT | Wr | NO. | CPE | PSD |
| 1989 | Electro. | 6 | 42 | 14.8 | 39 | 34 | 12.0 | 33 | 95 | 57 | 20.1 | 57 | 94 | 14 | 4.9 | 14 | 98 | 2 | 0.7 | 2 | 96 | 149 | 53.2 | 67 |
| 1991 | Electro. | 10 | 46 | 10.2 | 37 | 63 | 14.0 | 50 | 95 | 38 | 8.4 | 30 | 103 | 21 | 4.6 | 17 | 104 | 3 | 0.6 | 2 | 100 | 171 | 38.0 | 50 |
| 1994 | Electro. | 10 | 179 | 36.2 | 80 | 103 | 20.8 | 46 | 93 | 61 | 12.3 | 27 | 96 | 49 | 9.9 | 22 | 96 | 11 | 2.2 | 5 | 98 | 403 | 81.7 | 54 |
| 1998 | Electro. | 10 | 122 | 24.4 | 45 | 118 | 23.6 | 43 | 89 | 112 | 22.4 | 41 | 91 | 42 | 8.4 | 15 | 90 | 1 | 0.2 | 0 | 81 | 395 | 79.0 | 57 |
| 1999 | Electro. | 10 | 116 | 23.2 | 53 | 109 | 21.8 | 50 | 99 | 87 | 17.4 | 40 | 105 | 20 | 4.0 | 9 | 99 | 1 | 0.2 | 0 | 113 | 333 | 66.6 | 50 |
| 1999f | Electro | 5.5 | 35 | 12.8 | 35 | 48 | 17.5 | 48 | 89 | 36 | 13.1 | 36 | 88 | 16 | 5.8 | 16 | 90 | 1 | 0.3 | 1 | 96 | 136 | 50.3 | 52 |
| 2000 | Electro. | 10 | 112 | 22.4 | 29 | 214 | 42.8 | 55 | 92 | 147 | 29.4 | 38 | 93 | 27 | 5.4 | 7 | 93 | 1 | 0.2 | 0 | 90 | 501 | 100.2 | 45 |
| 2003 | Electro. | 10 | 218 | 43.6 | 89 | 118 | 23.6 | 48 | 94 | 88 | 17.6 | 36 | 101 | 37 | 7.4 | 15 | 101 | 3 | 0.6 | 1 | 109 | 464 | 92.8 | 52 |
| 2006 | Electro. | 10 | 8 | 1.6 | 6 | 65 | 13.0 | 46 | 97 | 40 | 8.0 | 29 | 95 | 34 | 6.8 | 24 | 95 | 1 | 0.2 | 1 | 89 | 148 | 29.6 | 54 |
| 2008 | Electro. | 10 | 69 | 13.8 | 28 | 97 | 19.4 | 40 | 94 | 113 | 22.6 | 47 | 99 | 33 | 6.6 | 14 | 98 | 0 | 0 | 0 | 0 | 312 | 62.4 | 60 |
| | Lake Average | | 95 | 20.3 | 44 | 97 | 20.9 | 46 | 94 | 78 | 17.1 | 38 | 97 | 29 | 6.4 | 15 | 96 | 2 | 0.5 | 1 | 97 | | 65.4 | 54 |

TABLE 3. Age composition and mean length of largemouth bass from Wheeler Reservoir, spring 2008.

| Age | Year Class | Number | Percent | CPE | Mean TL | SE |
|---|---|---|---|---|---|---|
| 1 | 2007 | 121 | 38.8 | 24.2 | 189.1 | 3.5 |
| 2 | 2006 | 132 | 42.3 | 26.4 | 312.8 | 2.6 |
| 3 | 2005 | 5 | 1.6 | 1.0 | 378.4 | 7.8 |
| 4 | 2004 | 30 | 9.6 | 6.0 | 382.9 | 7.1 |
| 5 | 2003 | 10 | 3.2 | 2.0 | 387.9 | 16.2 |
| 6 | 2002 | 9 | 2.9 | 1.8 | 394.7 | 13.5 |
| 7 | 2001 | 1 | 0.3 | 0.2 | 456.0 | |
| 8 | 2000 | 2 | 0.6 | 0.4 | 466.0 | 2.0 |
| 9 | 1999 | 1 | 0.3 | 0.2 | 489.0 | |
| 10 | 1998 | 0 | 0.0 | 0.0 | | |
| 11 | 1997 | 1 | 0.3 | 0.2 | 500.0 | |
| Total | | 312 | 100.0 | 62.4 | | |

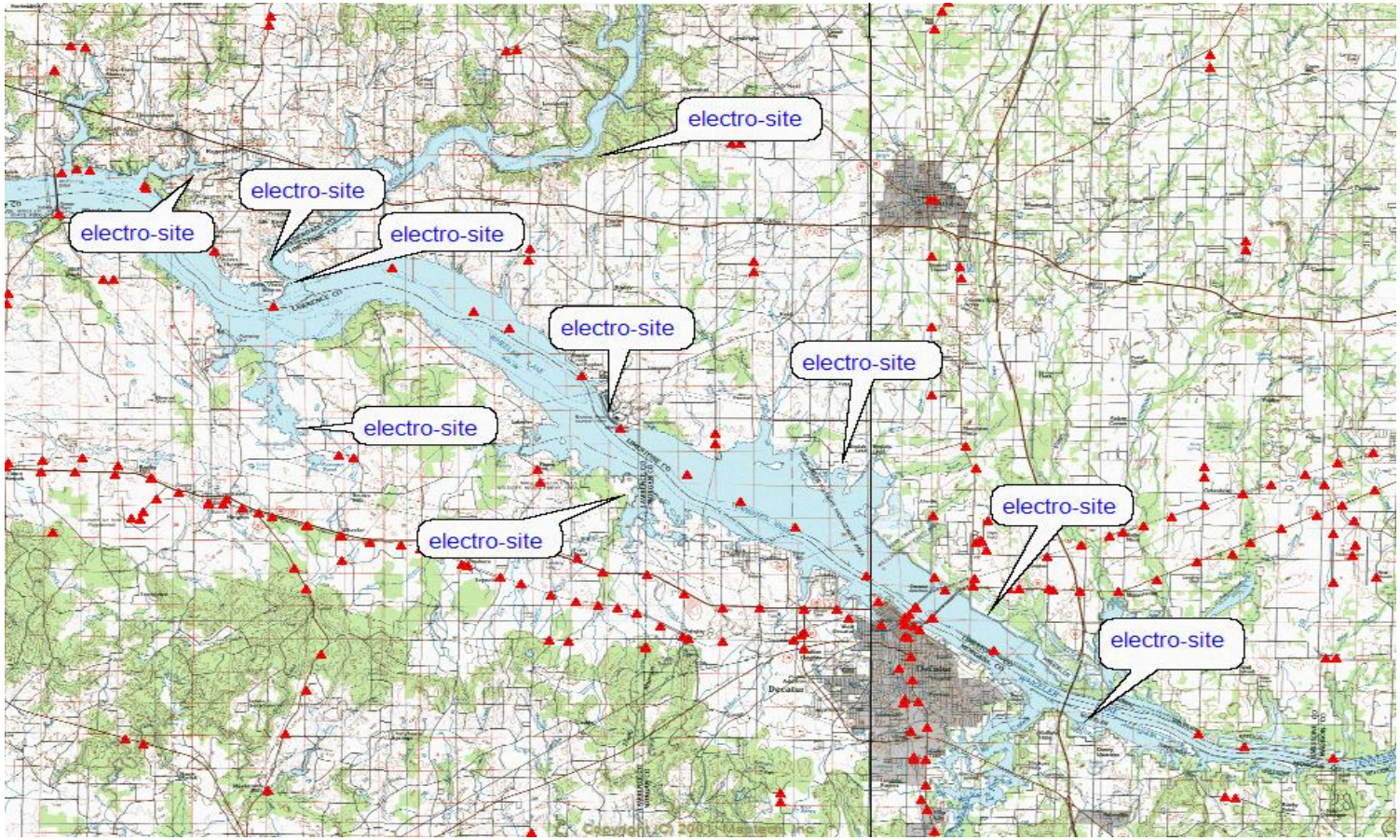


Figure 1. Electrofishing sites on Wheeler Reservoir, spring 2008.

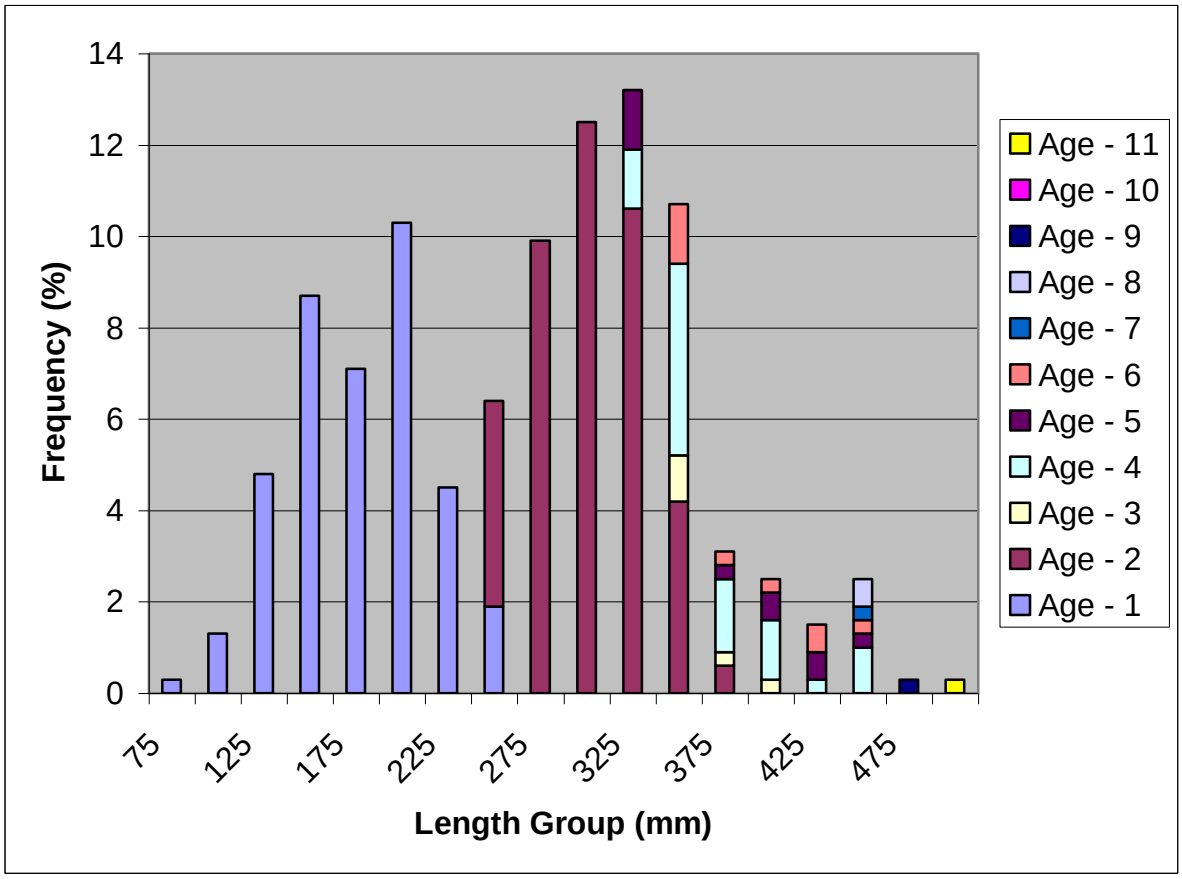


Figure 2. Length at age frequency of largemouth bass (n=312) from Wheeler Reservoir, spring 2008.

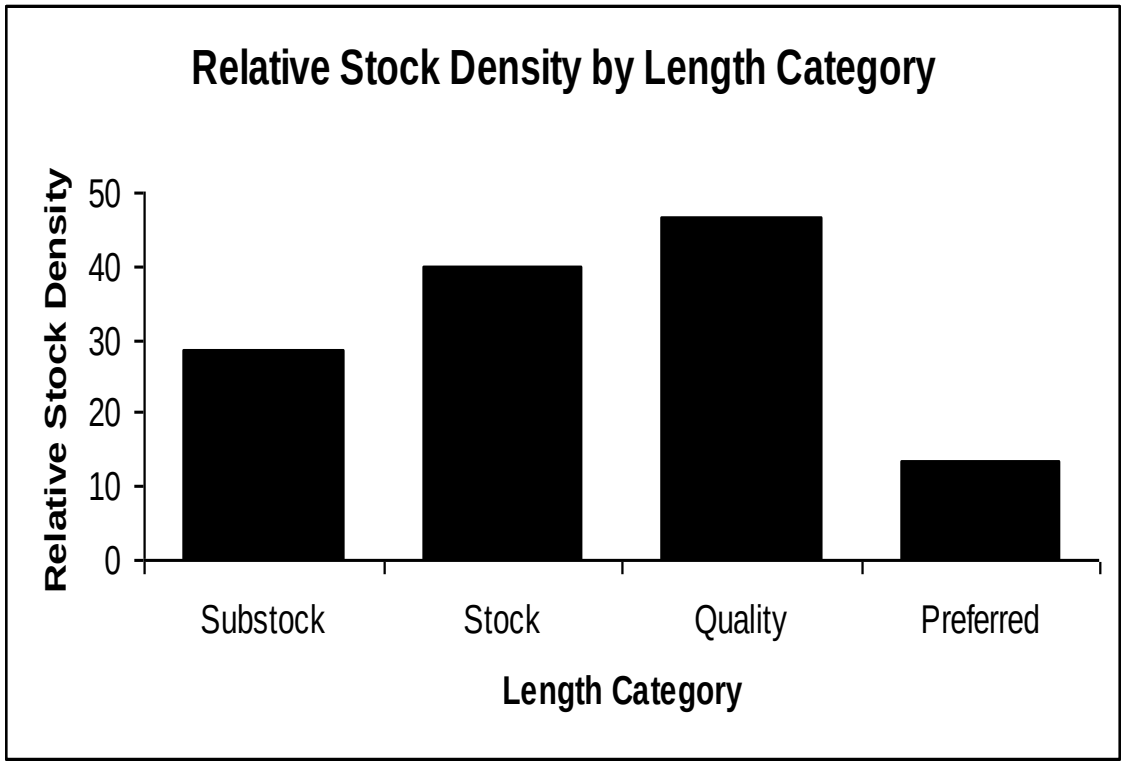


Figure 3. Relative Stock Density (RSD) of largemouth bass from Wheeler Reservoir, spring 2008.

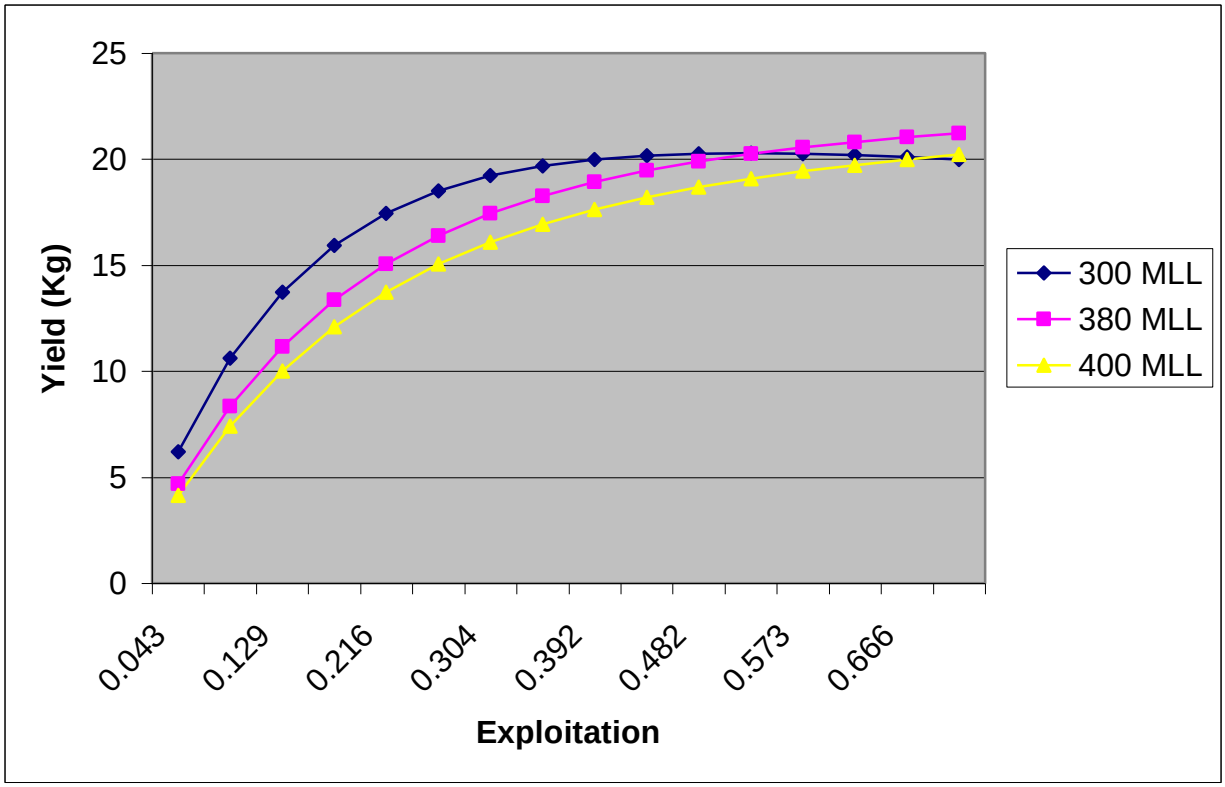


Figure 4. Total yield of largemouth bass modeled under minimum length limits of 300mm TL, 380mm TL and 400mm TL. Conditional natural mortality = 27% .

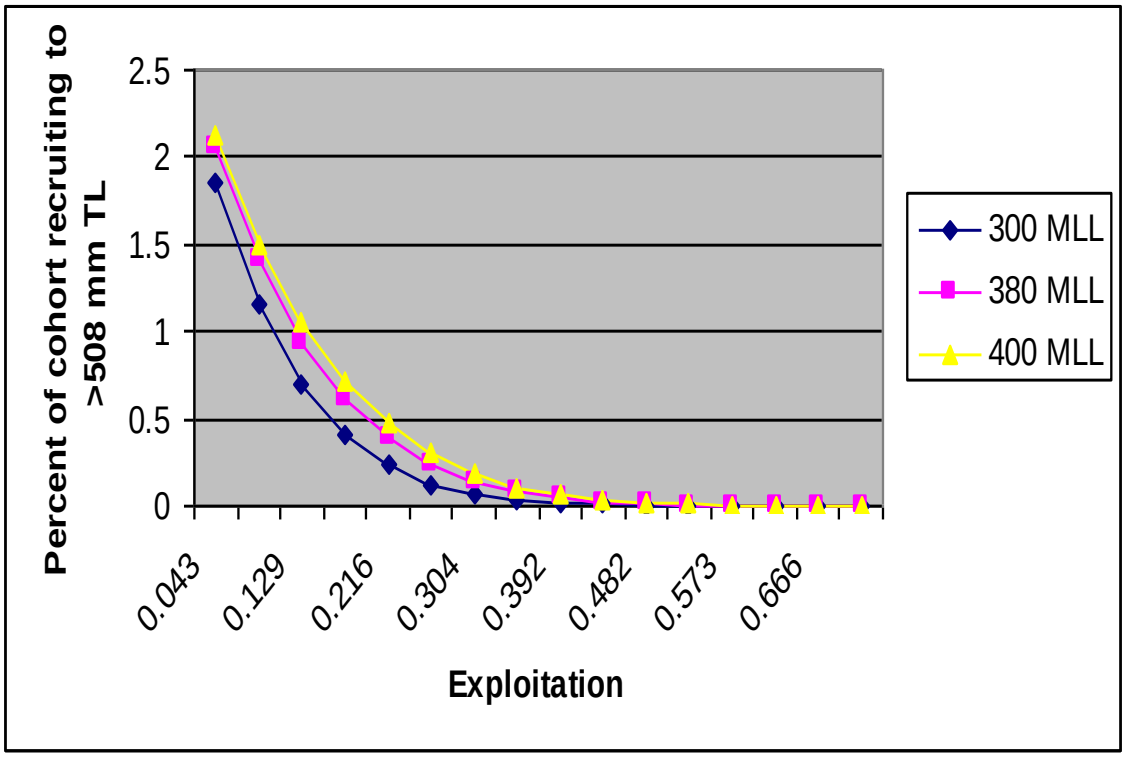


Figure 5. Percent of the largemouth bass cohort recruiting to ≥508 mm TL modeled under minimum length limits of 300mm TL, 380mm TL and 400mm TL. Conditional natural mortality = 27%.