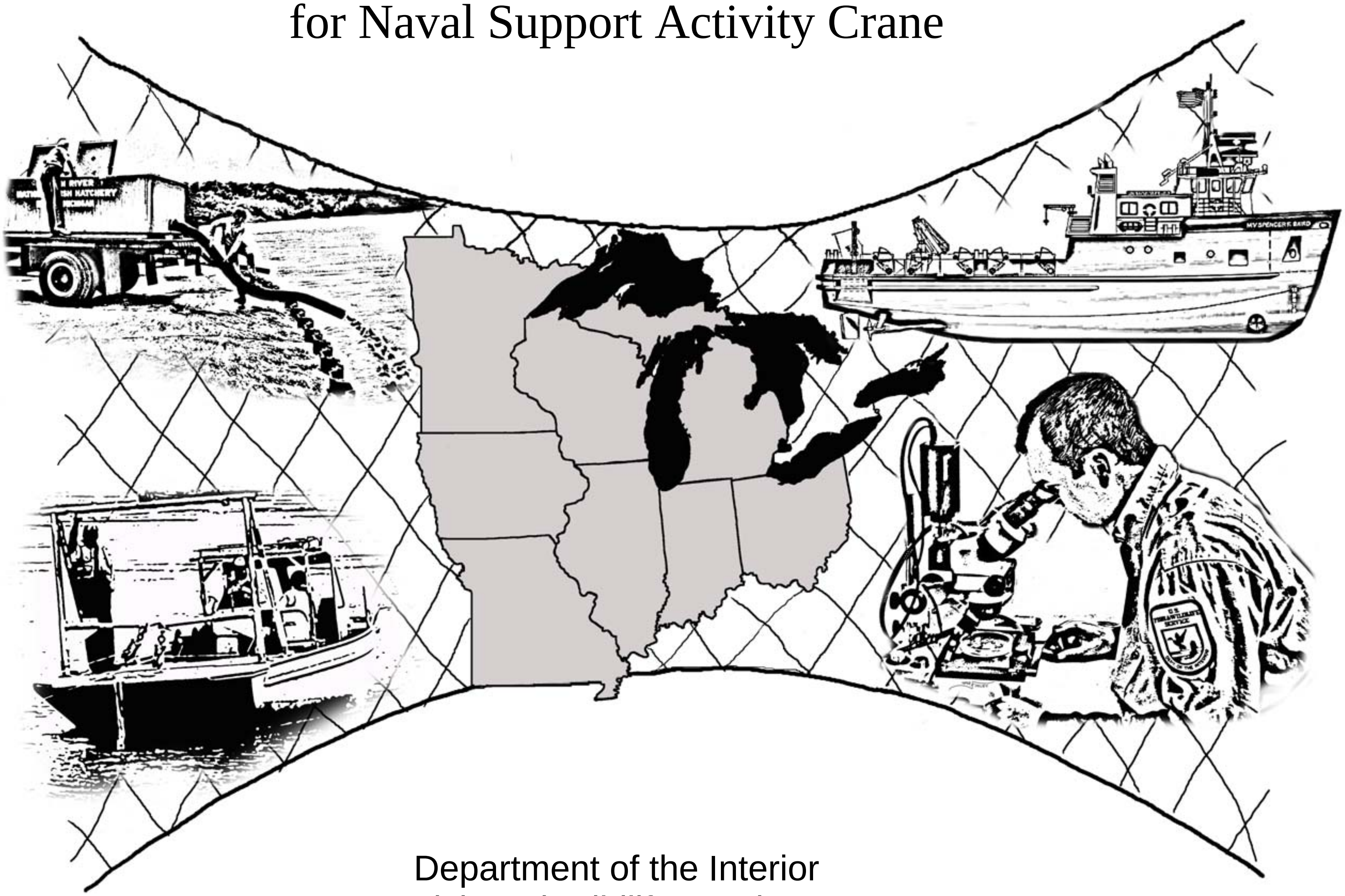
U.S. Fish & Wildlife Service

# Region 3 Fisheries Management Plan

FMP 2006-003

## 2006 Addendum to the Fisheries Management Plan for Naval Support Activity Crane




Department of the Interior
U.S. Fish and Wildlife Service
Great Lakes-Big Rivers Region
Carterville Fishery Resources Office
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September 2006

## Introduction

The Carterville Fishery Resources Office (CFRO) provides fishery management assistance to Naval Support Activity (NSA) Crane. CFRO performs an annual spring electrofishing survey on Lake Greenwood and one additional impoundment selected by NSA Crane. CFRO has suspended the fall walleye survey due to logistic and budgetary reasons. During the 2006 spring survey, CFRO set gill nets to target walleye.

The current fishery management goals for Lake Greenwood include: maintain a quality bluegill fishery, make slight improvements to the largemouth bass population, and establish a walleye sport fishery. Prior to the 2001 fishing season, a 12-15 inch protected slot limit was implemented for largemouth bass. The goal of the slot limit was to reduce the abundance of small bass (<12-inches), which would increase bass growth rates, while protecting larger (12-15 inch) bass. Also, by reducing the largemouth bass abundance, predation on bluegill would decrease, leading to a more stable, quality bluegill fishery. From 1991-1996, a similar slot limit was in place at Lake Greenwood which led to improvements in bass growth rates and a reduction in abundances of small bass. Insufficient harvest of the small fish below the slot limit is a common reason that slot limits fail to have the desired effects. Since 2001, Lake Greenwood has been closed to the general public which has led to a decrease in fishing pressure. Bass fishing tournaments have been initiated and tournament anglers are encouraged to harvest small bass. The bass tournaments remove approximately 100 bass monthly during the fishing season.

## Methods

The annual fishery survey at Lake Greenwood, NSA Crane, Crane, Indiana, was conducted on 16 May 2006. A combination of nighttime D.C. electrofishing and overnight, bottom set gill nets were used. The electrofishing methods were consistent with the sampling procedures used since 2000. Two types of gill nets were used (150’x8’x2” monofilament gill net (N=1) and 100’x6’ multifilament experimental gill net (N=2) consisting of alternating panels of 1” and 2” mesh). The gill nets were set to target walleye. In past years, a fall nighttime electrofishing survey was used to sample the walleye population. It was hoped that spring gill netting would provide an adequate walleye sample, with lower operating costs than the fall electrofishing survey. All fish collected were measured (mm) and weighed (g). A sub-sample of the bluegill and largemouth bass populations were removed for age and growth analysis. Fish were aged using halved sagittae otoliths. Otoliths were submerged in glycerin, placed under a compound light microscope, and annuli were counted. Water quality data were also recorded (Table 1).

## Results

A total of 1.2 hours of electrofishing were used to sample the Lake Greenwood fish community. Electrofishing collected a total of 563 fish consisting of 16 different species. The overall catch-per-unit-effort was 481 fish/hour which is similar to the 2005 CPUE of 495 fish/hour. Longear sunfish were the most abundant fish (35.2% of the total catch), followed by bluegill (27.6%) and largemouth bass (19.0%). Nine walleye were collected with electrofishing. (Table 2).

Overall, the gill nets captured 14 total fish, with spotted sucker (N=9) the most common species. No walleye were captured with gill nets (Table 3).

*Largemouth bass*
Largemouth bass CPUE (91 fish/hour) fell slightly from last year (120 fish/hour). However the CPUE for largemouth bass greater than 12-inches (36 fish/hour) was similar to last year (38 fish/hour), while the CPUE for largemouth bass 8-12 inches (39 fish/hour) fell sharply from last year (65 fish/hour). The percentage of largemouth bass greater than 12-inches (38.9%) increased for the second consecutive year and is at the highest level since 1997. The percentage of largemouth bass 8-12 inches declined for the third consecutive year and is at the lowest level since 1999 (Figure 1). No bass 15-inches or greater were captured. The largemouth bass sample was dominated by 9-13 inch fish (Figure2).

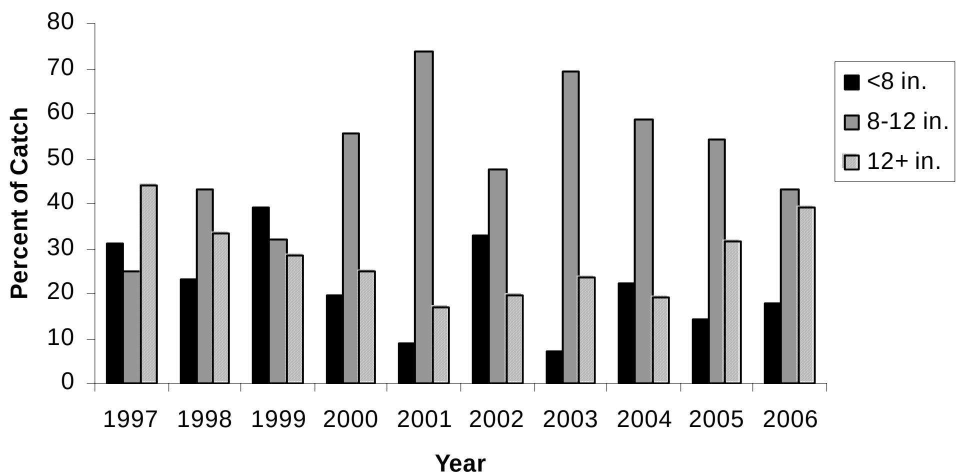


Figure 1. Length frequency distribution of largemouth bass collected at Lake Greenwood with D.C. electrofishing from 1997-2006.

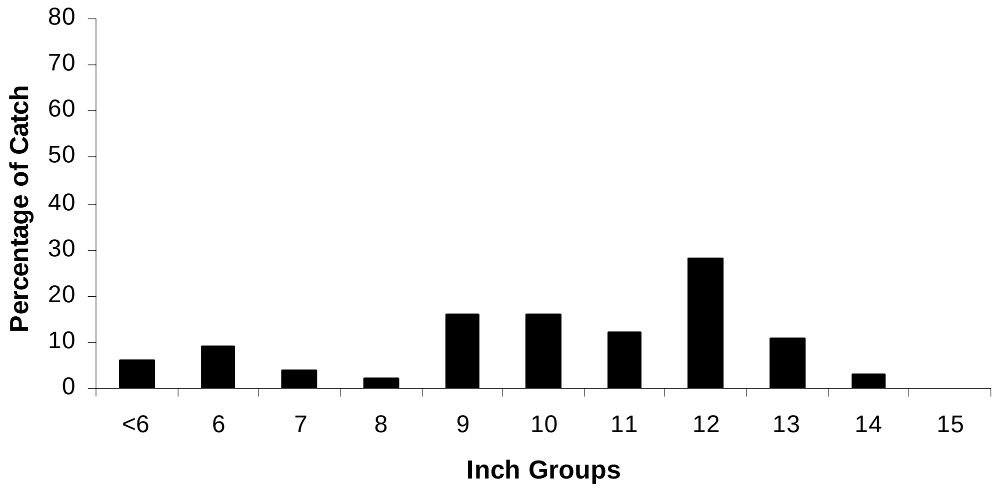


Figure 2. Length frequency distribution of largemouth bass collected at Lake Greenwood with D.C. electrofishing on 16 May 2006.

Mean relative weight ($W_r$) for largemouth bass declined for the second consecutive year. The 2006 $W_r$ value of 80 is considerably below the desired range (90-110) (Table 2). As largemouth bass grew in length the $W_r$ values decreased (Figure3).

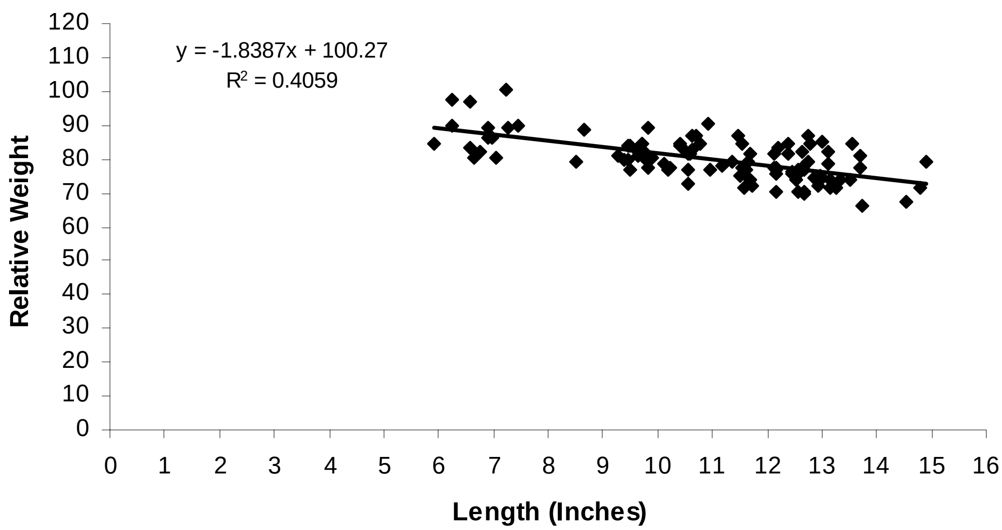


Figure 3. Relative weights for largemouth bass collected at Lake Greenwood with D.C. electrofishing on 16 May 2006.

Age and growth analysis was performed on 69 largemouth bass (128-370 mm). Growth rates appear to be similar to recent years (Table 4). Bass reached approximately10-inches at Year-2. There was little growth after fish reach 12-13 inches at Year-4 (Figure 4). Growth rates are similar to 2003, but slightly below 1996 rates (Figure5).

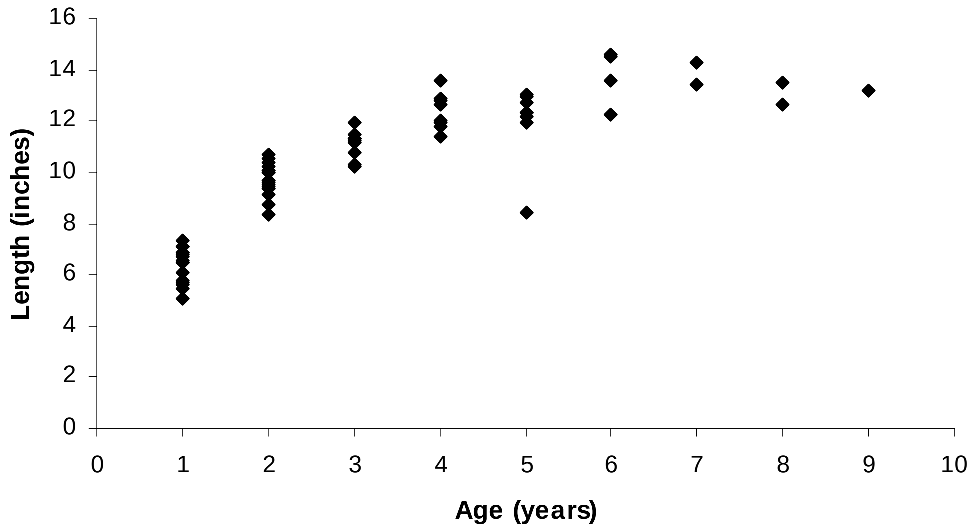


Figure 4. Length at age for largemouth bass collected at Lake Greenwood with D.C. electrofishing on 16 May 2006.

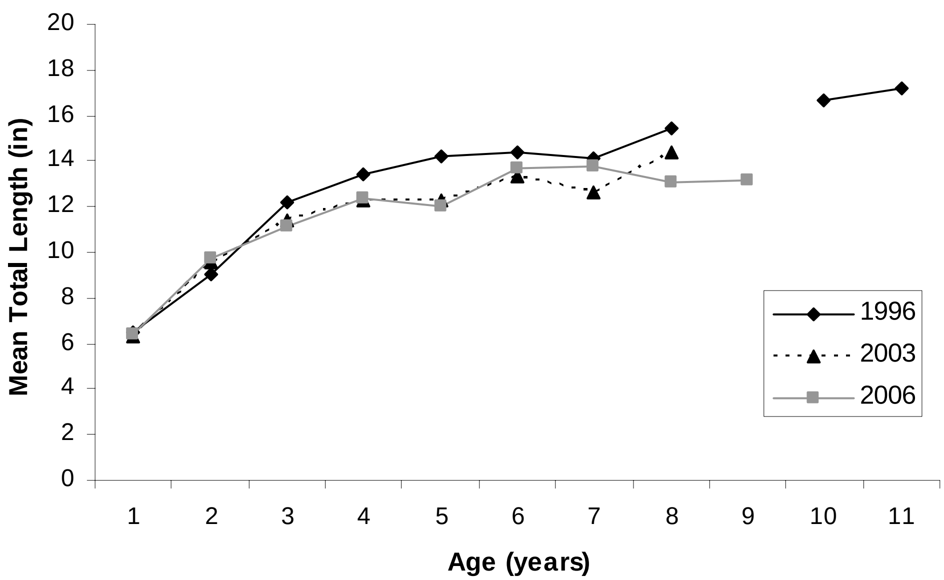


Figure 5. Mean length at age for largemouth bass collected at Lake Greenwood with D.C. electrofishing 1996, 2003, and 2006.

*Bluegill*

Bluegill CPUE increased from 95 fish/hour in 2005 to 126 fish/hour in 2006. This was due mainly to the large increase in abundance of small (less than 3-inches) bluegill. The CPUE for small bluegill increased from 44 fish/hour in 2005 to 92 fish/hour in 2006. Bluegill less than 3-inches composed 73% of the population, while fish greater than 6-inches composed 20% (Table 2). The percentage of bluegill less than 3-inches has increased for four consecutive years (Figure 6). The 2006 bluegill sample was composed mostly of fish less than 3-inches and fish greater than 6-inches (Figure7).

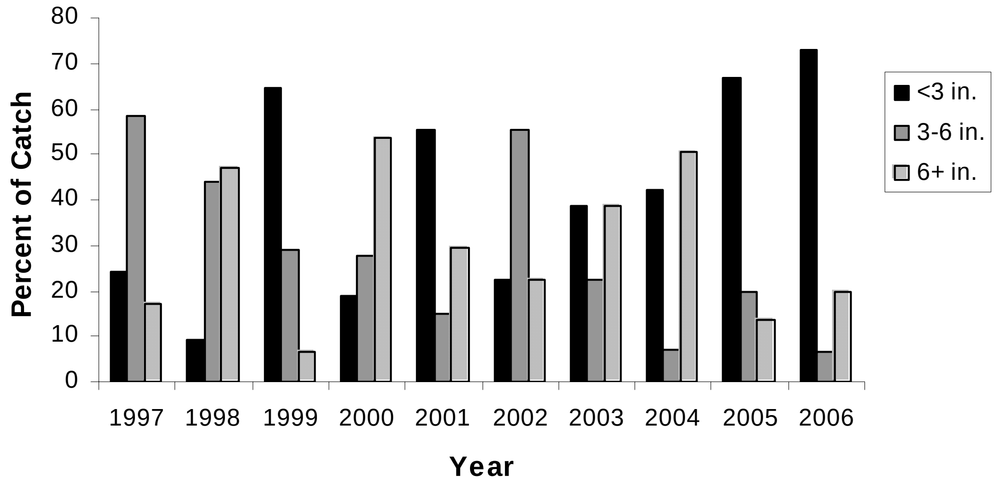


Figure 6. Length frequency distribution of bluegill collected at Lake Greenwood with D.C. electrofishing from 1997-2006.

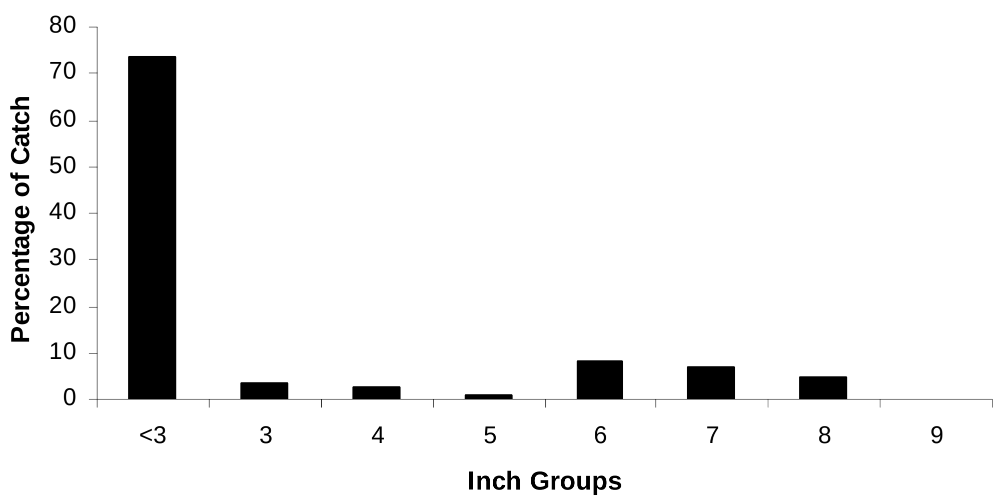


Figure 7. Length frequency distribution of bluegill collected at Lake Greenwood with D.C. electrofishing on 16 May 2006.

Mean relative weight for bluegill (100) was within the desired ranged, a slight improvement from the 2005 $W_r$ value (93). Bluegill $W_r$ values remained consistent for all size classes (Figure 8).

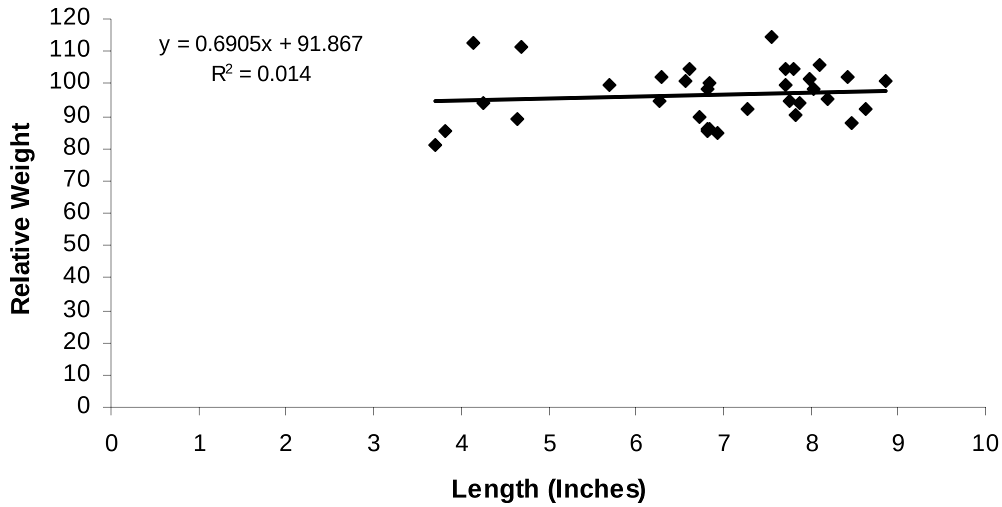


Figure 8. Relative weights for bluegill collected at Lake Greenwood with D.C. electrofishing on 16 May 2006.

Age and growth analysis was performed on 38 bluegill (67-221 mm). Bluegill growth rates were consistent with previous years (Table 5). By Year-4, most bluegill had reached lengths of 7 to 8 inches (Figure 9). No bluegill older than 6-years or greater than 9-inches were collected in the sample.

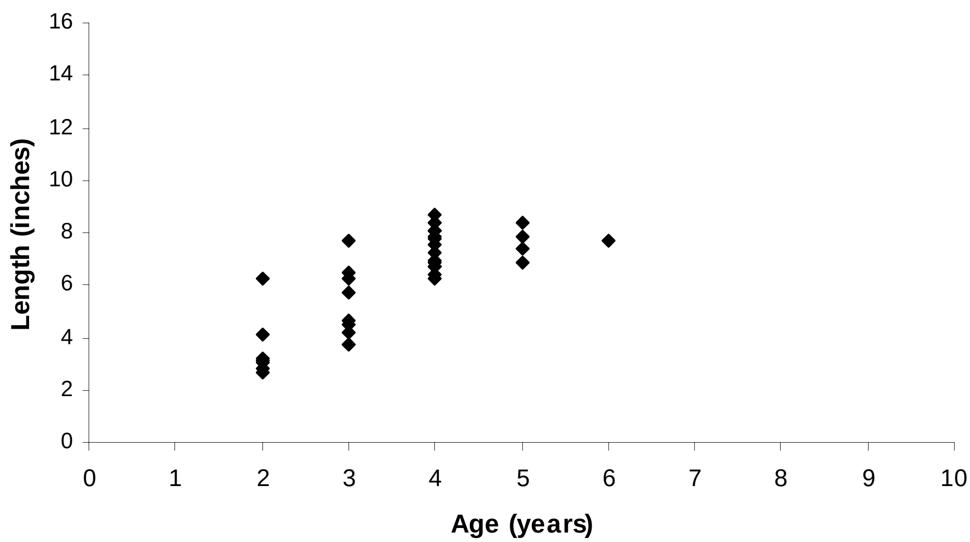


Figure 9. Length at age for bluegill collected at Lake Greenwood with D.C. electrofishing on 16 May 2006.

Proportional stock density (PSD) for both bluegill and largemouth bass were above the target range for the first time in recent years. During 2005, PSD values were within the target range (Figure 10).

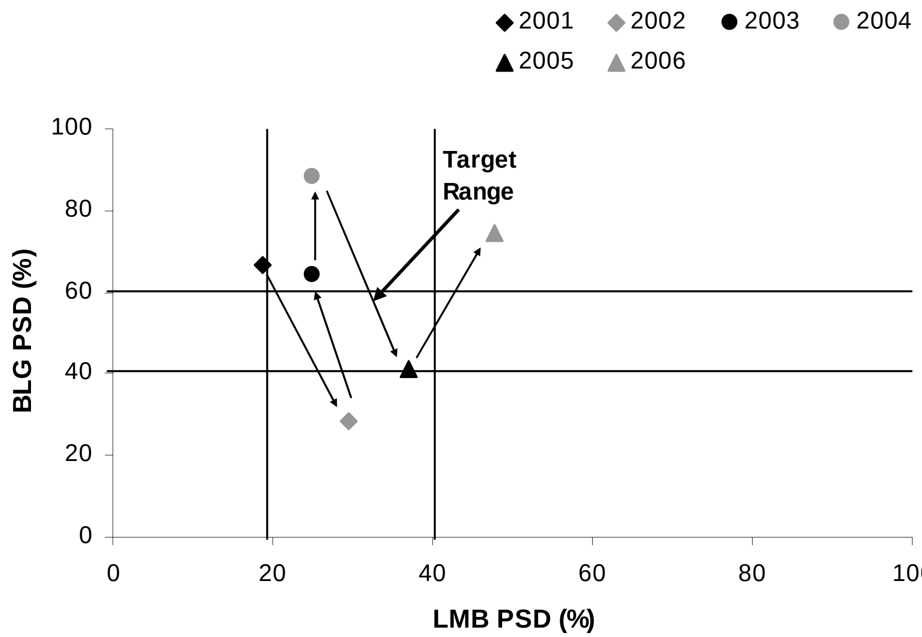


Figure 10. Proportional stock densities for bluegill and largemouth bass collected at Lake Greenwood with D.C. electrofishing, 2001-2006.

*Walleye*

The gill net sets did not capture any walleye. However, we did collect some walleye (N=9) with electrofishing. The majority of walleye in the sample were less than 10-inches. Relative weights for walleye were consistent with recent years' data. As walleye grew in length their relative weights decreased (Table 2).

## Discussion

Abundances of 8-12 inch largemouth bass have decreased. Both the CPUE and percent composition for 8-12 inch bass have fallen, while the percentage of bass greater than 12-inches has increased. Harvest of small bass below the slot limit may be responsible for this shift in the largemouth bass population structure. Unfortunately, neither the condition nor the growth rates for largemouth bass have improved. Although, CFRO did not capture any large bass during the 2006 electrofishing survey, recent bass fishing tournaments at Lake Greenwood have produced a few fish over 15-inches. In general, the Lake Greenwood largemouth bass population is composed of mainly 9-13 inch, slow growing fish in poor condition. Mean relative weights for largemouth were below the desired range and decreased as fish grew in length; this indicates that forage is limited for the current largemouth bass population. Largemouth bass are stunting at about 13-inches.

Twelve inch largemouth bass are abundant in Lake Greenwood. These fish are protected from harvest under the current 12-15 inch protected slot limit. Harvest of the abundant 12-inch largemouth bass would likely reduce abundances and improve largemouth bass condition and growth rates. Also, anglers are more likely to harvest 12 inch largemouth bass than they would smaller bass, thereby increasing overall harvest of bass. After discussions with Crane Natural Resources Managers, we propose amending the current slot-limit to allow for harvest of 12-inch largemouth bass. The new slot limit should protect 13-15 inch fish, while allowing for harvest of fish less than 13-inches and fish greater than 15-inches.

Bluegill condition and growth rates continue to remain strong and are consistent with past surveys. The abundance of small bluegill (less than 3-inches) has increased in recent years. This indicates improved recruitment for bluegill. The reduction in the abundance of largemouth bass may partially explain the improved bluegill recruitment. The strong numbers of bluegill greater than 6-inches should provide quality angling opportunities.

Gill net sets were not effective in capturing walleye. Of the 9 walleye captured with electrofishing 7 were less than 10-inches, indicating good survivorship of the 2005 stocked fish. Anecdotal data provided by fisherman indicate that larger walleye are more abundant than the electrofishing survey suggests. All available data indicate that the current stocking densities of walleye have not had a negative impact on the bluegill or largemouth bass populations. The walleye stockings have provided Lake Greenwood anglers another sport fish option. In future fishery surveys, the gill net effort could be increased to capture additional walleye.

Four large channel catfish were captured in the 2006 survey. During 6 June 2006, 4,000 6-10 inch channel catfish were stocked in Lake Greenwood. These recently stocked fish will add to the fishery in coming years.

Table1. Water quality conditions measured at Lake Greenwood, 16 May 2006.

| Parameter | Measurement |
|---|---|
| Water temperature | 17.8°C |
| pH | 7.2 |
| Conductivity | 101µS |
| Dissolved Oxygen | 9 mg/L |
| Secchi | 210 cm |

Table 2. Fish collected from Lake Greenwood, during 1.2 hours of nighttime D.C. electrofishing, 16 May 2006.

| Species (size range) | Number | Percent Composition* | CPUE (fish/hour) | Mean Relative Weight (Wr)** |
|---|---|---|---|---|
| Largemouth bass | 107 | 19.0% | 91 | 80.15 |
| (0.0 - 7.9) | 19 | (17.8%) | 16 | 88 |
| (8.0 - 11.9) | 46 | (42.6%) | 39 | 81 |
| (12.0+) | 42 | (38.9%) | 36 | 77 |
| (15.0+) | 0 | (0.0% | 0 | NA |
| | | | | |
| Bluegill sunfish | 148 | 27.6% | 126 | 100 |
| (0.0 - 2.9) | 108 | (73.0%) | 92 | NA |
| (3.0 - 5.9) | 10 | (6.8%) | 9 | 108 |
| (6.0+) | 29 | (19.7%) | 25 | 97 |
| (8.0+) | 7 | (4.8%) | 6 | 97 |
| | | | | |
| Walleye | 9 | 1.6% | 8 | 89 |
| (0.0 - 9.9) | 7 | (77.8%) | 6 | 91 |
| (10.0 - 13.9 | 2 | (22.2%) | 2 | 81 |
| (14+) | 0 | (0.0%) | 0 | NA |
| | | | | |
| Black crappie | 3 | 0.5% | 3 | |
| Bluntnose minnow | 8 | 1.4% | 7 | |
| Channel catfish | 3 | 0.5% | 3 | |
| Common carp | 1 | 0.2% | 1 | |
| Golden shiner | 3 | 0.5% | 3 | |
| Green sunfish | 1 | 0.2% | 1 | |
| Longear sunfish | 198 | 35.2% | 169 | |
| Redear sunfish | 13 | 2.3% | 11 | |
| Spotfin shiner | 13 | 2.3% | 11 | |
| Spotted sucker | 12 | 2.1% | 10 | |
| Warmouth | 42 | 7.5% | 36 | |
| Yellow bullhead | 1 | 0.2% | 1 | |
| Yellow perch | 1 | 0.2% | 1 | |
| Totals | 563 | 100.0% | 481 | |

*Numbers in parenthesis indicate percent composition for the total of that species.
Other values indicate percent composition of the total number of fish in the sample.

**Relative weight = Actual weight/Standard Weight

Table 3. Fish collected from Lake Greenwood using overnight, bottom set gill nets, 16 May 2006.

| Species (size range) | Number | Percent Composition* | CPUE (fish/net set) |
|---|---|---|---|
| channel catfish | 1 | 7.1 | 0.3 |
| spotted sucker | 9 | 64.3 | 3.0 |
| warmouth | 1 | 7.1 | 0.3 |
| white bass | 1 | 7.1 | 0.3 |
| white sucker | 1 | 7.1 | 0.3 |
| yellow perch | 1 | 7.1 | 0.3 |

Table 4. Mean length at age for largemouth bass collected from Lake Greenwood, 1990-2006.

| | Mean Length (inches) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Age Class | 1990 | 1993 | 1995 | 1996 | 1999 | 2000 | 2003 | 2006 |
| 1 | 5.1 | 4.9 | 5.1 | 6.5 | 6.9 | 6.3 | 6.3 | 6.4 |
| 2 | 7.7 | 9.3 | 10.5 | 9 | 10 | 9.5 | 9.6 | 9.7 |
| 3 | 9.6 | 11.1 | 12.6 | 12.2 | 11.5 | 11.1 | 11.4 | 11.1 |
| 4 | 11.4 | 12 | 13.4 | 13.4 | 12.3 | 11.7 | 12.3 | 12.4 |
| 5 | 13.8 | 13.8 | 13.3 | 14.2 | 12.9 | 12.1 | 12.3 | 12 |
| 6 | 13.6 | 13.6 | 13.6 | 14.4 | 13.1 | 13.3 | 13.3 | 13.7 |
| 7 | 17.7 | | 14.7 | 14.1 | 13.4 | 13.2 | 12.6 | 13.8 |
| 8 | 11.7 | 13 | 15 | 15.4 | | 14.9 | 14.4 | 13.1 |
| 9 | | | | | 13.7 | | | 13.2 |
| 10 | | | | 16.7 | | | | |
| 11 | | | | 17.2 | | | | |
| 12 | | | | | | 14.5 | | |

Table 5. Mean length at age for bluegill collected from Lake Greenwood, 1990-2006.

| | Mean Length (inches) | | | | | |
|---|---|---|---|---|---|---|
| Age class | 1990 | 1996 | 1999 | 2000 | 2003 | 2006 |
| 1 | 3.2 | | 3.1 | | 2.2 | |
| 2 | 4.8 | 4.4 | 3.9 | 3.8 | 3.1 | 3.6 |
| 3 | 5.6 | 5.6 | 5.1 | 4.8 | 5.8 | 5.2 |
| 4 | 7.2 | 7.9 | 7.5 | 7.8 | 7.7 | 7.5 |
| 5 | 7.8 | 7.9 | 7.8 | 8.3 | 8.3 | 7.6 |
| 6 | 8.0 | 8.0 | 8.1 | 8.6 | | 7.7 |
| 7 | 8.1 | | 8.7 | 8.6 | | |
| 8 | 8.3 | | | 9.1 | 8.3 | |
| 9 | | | | | | |
| 10 | 8.0 | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |
| 13 | 8.2 | | | 9.4 | | |

**Pond 3105**

Pond 3105 was sampled on 16 May 2005 using 0.09 hours of daytime D.C. electrofishing. All fish were measured (mm) and weighed (g). Water quality data were recorded (Table 6). Only largemouth bass were captured in the survey. Approximately 55% of the largemouth bass were less than 8 inches, and 45% were 8-11 inches. No largemouth bass greater than 12 inches were collected. Mean relative weights were low (72). As largemouth bass grew in length, relative weights declined (Table 7). The pond does not appear to have any forage fish (i.e. sunfish, minnows). The lack of quality forage is probably to blame for the small, poor conditioned bass. The pond could be improved by stocking non-vulnerable sized sunfish or removing the existing fish and restocking the lake with bass and bluegill. Currently the pond lacks refuge cover for small sunfish. Adding cover in the form of brush piles could help to establish a self-sustainable bluegill population.

Table 6. Water quality conditions measured at pond 3105 (NSA Crane), 16 May 2006.

| Parameter | Measurement |
|---|---|
| Water temperature | 15.6°C |
| pH | 6.96 |
| Conductivity | 65µS |
| Dissolved Oxygen | 7.7 mg/L |
| Secchi | 100 cm |

Table 7. Fish collected from pond 3105 (NSA Crane) with daytime D.C. electrofishing, 16 May 2006.

| Species (size range) | Number | Percent Composition | CPUE (fish/hour) | Mean Relative Weight (Wr) |
|---|---|---|---|---|
| Largemouth bass | 29 | 100.0% | 324 | 72 |
| (0.0 - 7.9) | 16 | 55.2% | 179 | 81 |
| (8.0 - 11.9) | 13 | 44.8% | 145 | 60 |
| (12.0+) | 0 | 0.0% | 0 | NA |
| (15.0+) | 0 | 0.0% | 0 | NA |