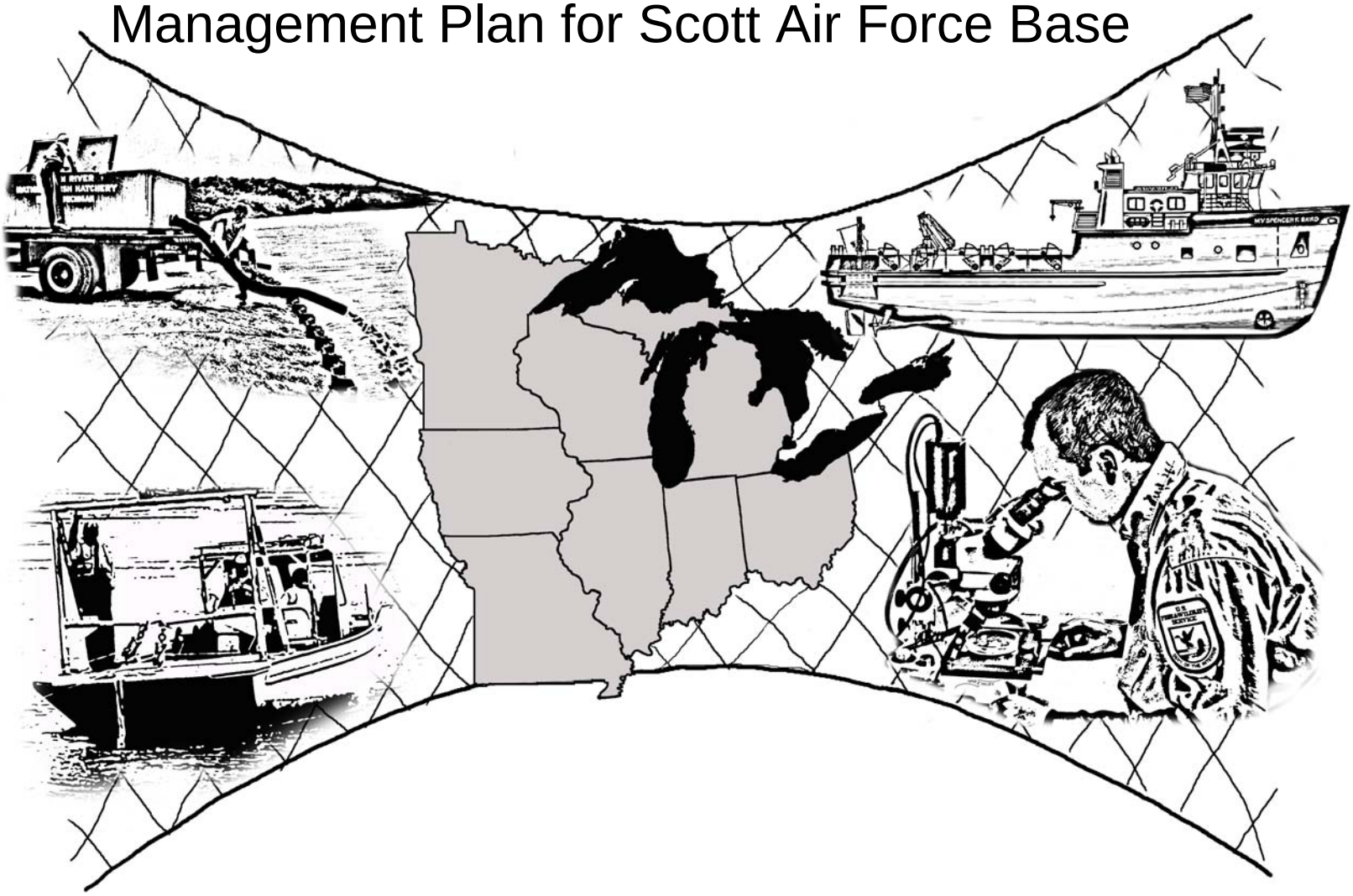
U.S. Fish & Wildlife Service

Region 3 Fisheries Management Plan

FMP-2006-2

2006 Addendum to the Fisheries Management Plan for Scott Air Force Base



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

The Carterville Fishery Resources Office (CFRO) provides fishery management assistance to Scott Air Force Base (AFB). Scott (AFB) contains two small impoundments (Scott Lake and Cardinal Lake) which are managed for recreational fishing. CFRO performs annual spring electrofishing surveys of the lakes and generates a report that includes summaries of the fisheries and management recommendations.

Scott Lake
Results

CFRO conducted the annual spring electrofishing survey of Scott Lake on May 9, 2006. A total of 0.83 hours of daytime D.C. electrofishing was used to survey the Scott Lake fish community. CFRO collected 155 total fish representing 5 species (Table 1). The overall catch-per-unit-effort (CPUE) was 186 fish/hour. This CPUE is much lower than the 2005 CPUE of 308 fish/hour. The decrease in overall CPUE may be attributed to dense aquatic vegetation growth (primrose and filamentous algae) during the 2006 survey, which made for difficult electrofishing conditions and probably decreased electrofishing efficiency. CFRO also measured a suite of water quality parameters (Table 2).

The electrofishing survey was conducted prior to the July 2006 fish kill at Scott Lake. This report only summarizes the status of the fishery prior to the fish kill. The spring 2007 electrofishing survey will provide insights into the effects of the fish kill on the fish community.

Largemouth Bass
Largemouth bass CPUE was 160 fish/hour in 2006 which was slightly lower than the 2005 CPUE of 194 fish/hour. The length frequency distribution demonstrates that the largemouth bass population is comprised of mostly 8-14 inch fish, with few large fish (Figure 1). In 2006, 38% of the largemouth bass were greater than 12-inches which was similar to 2005 (39% greater than 12-inches). The proportion of small bass (less than 8-inches) in the population fell sharply in 2006, from 33% in 2005 to 8% in 2006. This may indicate that recruitment of the 2005 largemouth bass year class was lower than the previous year.

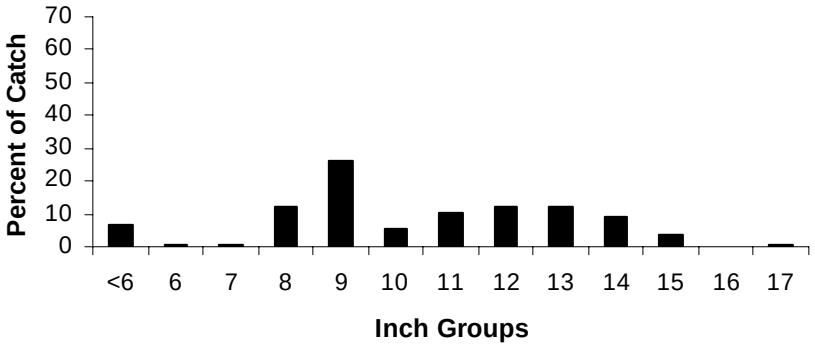

Figure 1. Length frequency distribution of largemouth bass collected at Scott Lake using D.C. electrofishing, May 9, 2006.

The relative weight (W_r) index is a tool for assessing the physical condition of fish in a given body of water. Relative weights are calculated by comparing the weights of a sampled fish population to standard weights for similar length fish of the same species. Generally, a standard weight between 90 and 110 is desirable and indicates that the fish population is in good health with ample forage available.

In 2006, mean W_r for largemouth bass decreased to 85. This value is below the desired range of 90 – 110. As largemouth bass grew in length, their W_r values declined (Figure 2). This decline in W_r values for larger bass has been a common occurrence at Scott Lake and indicates that forage is a limiting factor for large bass. At Scott Lake the forage base for adult bass consists of mainly small bluegill (less than 6-inches). During the years when small bluegill were plentiful at Scott Lake, the largemouth bass responded with improved relative weights. The number of small bluegill decreased sharply in the 2006 survey, which may explain the decline in largemouth bass W_r values. Low relative weights are typically a result of an over abundant predator population that lacks ample forage.

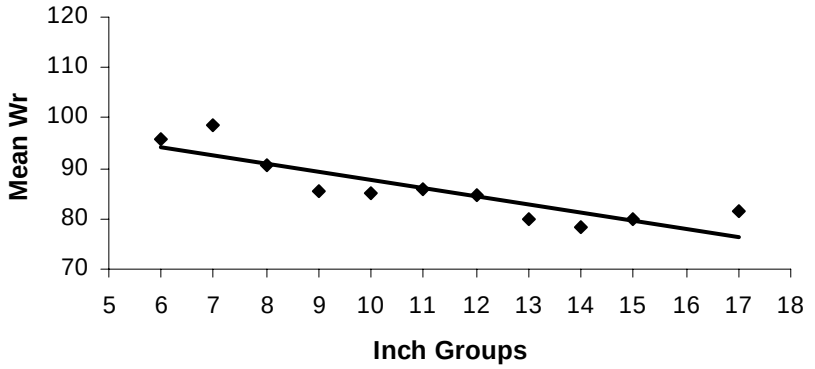

Figure 2. Mean relative weight (W_r) for largemouth bass collected at Scott Lake using D.C. electrofishing, May 9, 2006.

Bluegill

Bluegill CPUE declined sharply in 2006 at Scott Lake, from 76 fish/hour in 2005 to 16 fish/hour in 2006. The 2006 bluegill CPUE may be lower in part due to the heavy weed growth at the time of the survey, which may have decreased electrofishing efficiency, but this likely doesn't explain the large decrease we saw. Historically, the bluegill population at Scott Lake has been cyclical with a year of high bluegill CPUE followed by a year of low CPUE. Predation by largemouth bass is one factor that can affect bluegill recruitment (Santucci and Wahl 2003). Predation by the abundant largemouth bass may partially explain the cyclical bluegill population at Scott Lake.

In the 2006 survey we collected only one bluegill less than three inches, which indicates poor recruitment of the 2005 year class. Only 4 bluegill greater than 6-inches were collected. The majority of the bluegill sampled were between 3 and 6 inches (Figure3).

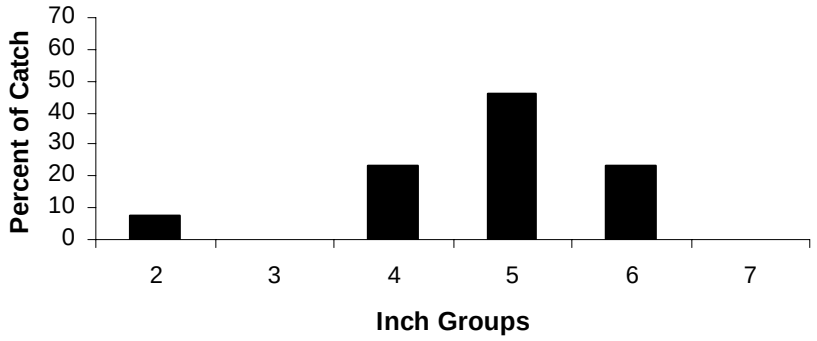

Figure 3. Length frequency distributions of bluegill collected at Scott Lake using D.C. electrofishing, May 9, 2006.

The mean W_r value (105) for bluegill was good (Table 1). Bluegill W_r values at Scott Lake are traditionally above 100. These high W_r values indicate there is ample forage to support the current bluegill population. These values also indicate that predation by largemouth bass and harvest by anglers is keeping the bluegill population under control.

Proportional stock density (PSD) is the proportion of fish of quality size present within a stock. The PSD value, expressed as percent, is calculated by dividing the number of quality size individuals in the sample by the number of stock size individuals. Stock and quality sizes are defined as 8.0 and 12.0-inches for largemouth bass and 3.0 and 6.0-inches for bluegill, respectively. The PSD of bluegill (prey) can be plotted as a function of PSD of largemouth bass (predator). When PSD values are plotted over time, trends in the fish community can be observed. The predator-prey community is considered "balanced" when PSD values fall within desired ranges. Desired ranges are established according to the management objective for a specific body of water. For Scott Lake the desired PSD for largemouth bass is 40-60%, and 20-40% for bluegill.

During the 2006 survey the PSD values were 41% for largemouth bass and 25% for bluegill. This year marks the first time in many years that both bluegill and largemouth bass PSD values have fallen within the desired range. This indicates that both the largemouth bass and bluegill populations have desirable ratios of quality sized fish. Historically PSD values at Scott Lake have fluctuated greatly from year to year. We should strive to maintain PSD values within the desired target range.

Discussion

Fish Management

Largemouth bass were abundant in the 2006 survey of Scott Lake. The largemouth bass population was comprised of mostly 8-14 inch bass, with 38% of the bass population greater than 12-inches, but only 5% of the bass were greater than 15-inches. Bass anglers would likely desire a greater percentage of large bass. Largemouth bass relative weights were once again below target levels, and as bass grew in length, their relative weights decreased. This trend indicates that forage, especially for large bass, is limited. A limited forage base results in slow growth and higher natural mortality rates. Under these conditions fish do not reach optimal size. The low relative weights coupled with the high CPUE for largemouth bass indicate that they are slightly overpopulated in Scott Lake.

Bluegill CPUE was very low (16 fish/hour). Historically the bluegill population at Scott Lake has been cyclical. The bluegill population will likely rebound, but we should strive for a stable and robust bluegill population. There may be a couple reasons for the fluctuations in the bluegill population; inconsistent weed control and high predation by largemouth bass.

An overabundance of aquatic vegetation can hinder predation by largemouth bass leading to high recruitment for bluegill. An extreme overabundance can lead to bluegill spawning failures and reduced numbers. Conversely, too little vegetation leaves young bluegill more vulnerable to predation and causes low recruitment (Hayse and Wissing 1996). Consistent vegetation control can lead to a more stable bluegill population. Aquatic vegetation that covers approximately 20% of the total surface area of a lake is considered ideal for most small lakes and ponds.

Inconsistent bluegill recruitment in some lakes has been linked to an overabundant population of small largemouth bass. The high CPUE for largemouth bass and low CPUE for bluegill, combined with the low W_r values for largemouth bass indicate that largemouth bass have become overly abundant at Scott Lake. By reducing the number of small bass at Scott Lake we may be able to improve largemouth bass W_r values, growth rates, and maximum size, while creating a more stable and robust bluegill population.

It is important to keep in mind that the fish kill during July 2006 may have altered the balance of the fish community. All recommendations are dependent upon the results of the 2007 electrofishing survey, which will indicate the extent of the fish kill. If these current trends continue into 2007, we recommend allowing anglers to harvest some largemouth bass. This harvest should be conducted under a protected slot-length limit

regulation. This type of regulated harvest allows anglers to keep some small bass for a meal, while protecting the adult bass which are necessary to maintain a self sustainable fishery. The protected slot-length limit also allows anglers the opportunity to harvest a trophy bass. Several studies have demonstrated that slot limits can be effective (Eder 1984; Perry and Janowsky 1995; Novinger 1990; Gabelhouse 1987).

Currently Scott Lake has a catch and release regulation for largemouth bass. This regulation was effective at maintaining a decent largemouth bass population, but changes in the fish community suggest that some harvest of bass may be beneficial. By harvesting some small bass, growth rates and the relative weights of the remaining bass will likely improve. The removal of some small bass will also reduce predation on bluegill, which will likely create a more stable bluegill population. *Based on the 2006 data and pending the results of the 2007 survey, CFRO recommends allowing anglers to keep two largemouth bass under 13-inches and one largemouth bass over 18-inches. All largemouth bass between 13 and 18 inches must be released immediately.*

Even though there was a large fish kill during the summer of 2006, we do not recommend stocking any largemouth bass or bluegill at this time. Largemouth bass and bluegill populations in small ponds usually rebound quickly from fish kills. The fish that remained after the fish kill should have good survival rates and will repopulate the pond. In fact, fishing conditions may actually improve since the remaining fish will have more resources available and will likely grow faster and be in better condition. If desired channel catfish could be stocked at approximately 500 pounds of 1-1.5 pound fish without adversely affecting existing fish populations.

Vegetation Control

We believe that the July 2006 fish kill was caused by extremely warm water temperatures and decay of dead aquatic vegetation, which, when combined, led to critically low dissolved oxygen levels. The best way to prevent these types of fish kills is to treat aquatic vegetation early in the spring. By treating the vegetation earlier, we can prevent the dense weed growth which plagued the lake during 2006. Unfortunately, filamentous algae, which is very common at Scott Lake, often requires periodic treatment throughout the summer. The Illinois Department of Natural Resources recommends that most aquatic herbicide application be completed before July first. The application should be done under sunny conditions when the water temperature is above 60°F (Illinois Department of Natural Resources). Using aquatic herbicides should be avoided when water temperatures are very warm (~85°F). If treatment is absolutely necessary during times of elevated water temperature, CFRO recommends that only small portions of the lake be treated, with a 1 to 2 week interval between treatments. Some aquatic vegetation (~20% of the total surface area) is beneficial and should be allowed to persist. More detailed vegetation control recommendations can be found in the Fisheries Management Plan for Scott Air Force Base (USFWS 2006).

Table 1. Fish collected from Scott Lake during 0.83 hours of daytime D.C. electrofishing on the afternoon of 9 May 2006.

Species (size range)	Number	Percent Composition*	CPUE (fish/hour)	Mean Relative Weight (Wr)**
Largemouth bass	133	85.8%	160	85
(0.0 - 7.9)	11	(8.3%)	13	97
(8.0 - 11.9)	72	(54.1%)	87	87
(12.0+)	50	(37.6%)	60	81
(15.0+)	6	(4.5%)	7	80
Bluegill	13	8.4%	16	105
(0.0 - 2.9)	1	(7.6%)	1	NA
(3.0 - 5.9)	9	(69.2%)	11	106
(6.0+)	3	(23.1%)	4	102
(8.0+)	0	(0.0 %)	0	NA
Channel catfish	2	1.3%	2	
Hybrid Sunfish	1	0.6%	1	
Redear sunfish	4	2.6%	5	
Warmouth	2	1.3%	2	
Totals	155	100.0%	186	

*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 2. Water Quality parameters measured at Scott Lake on the afternoon of 9 May 2006.

Parameter	Result
Water Temperature	20.8° C
Conductivity	241 uS/cm
Dissolved Oxygen	6.2 mg/L
Secchi Transparency	153 cm
pH	7.46

Cardinal Lake
Results

The Carterville Fishery Resources Office (CFRO) conducted the annual spring electrofishing survey of Cardinal Lake on May 9, 2006. A total of 0.37 hours of daytime D.C. electrofishing was used to survey the Scott Lake fish community. CFRO collected 44 total fish representing 3 species (Table 3). For the second consecutive year, the overall CPUE increased substantially (119 fish/hour in 2006). Carterville FRO also measured a suite of water quality parameters (Table 4).

Largemouth Bass
Largemouth bass CPUE was 79 fish/hour in 2006 which is slightly higher than the 2005 CPUE of 62 fish/hour. Similar to previous years, the Cardinal Lake largemouth bass population was dominated by fish less than 12-inches (Figure 4). Only 10% of the largemouth bass population was greater than 12-inches.

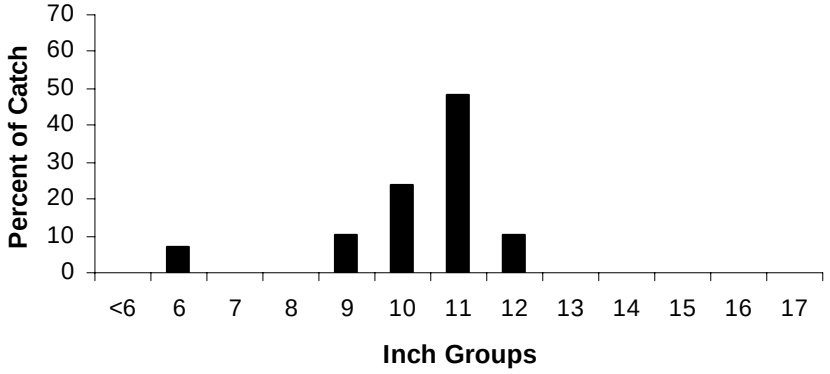

Figure 4. Length frequency distribution of largemouth bass collected at Cardinal Lake using D.C. electrofishing, May 9, 2006.

The largemouth bass mean relative weight (87) was slightly below the desired range. As largemouth bass grew in length, their relative weights decreased (Figure 5). This trend is typical of a lake that lacks sufficient forage for adult bass.

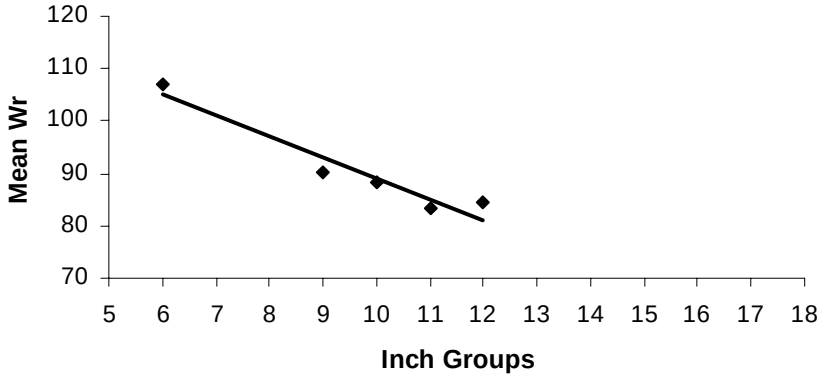

Figure 5. Mean relative weight (W_r) for largemouth bass collected at Cardinal Lake Using D.C. electrofishing, May 9, 2006.

Bluegill

Bluegill CPUE increased from 9 fish/hour in 2005 to 35 fish/hour in 2006. The Cardinal Lake bluegill population was composed of mostly 3-6 inch fish (Figure 6). Only one bluegill less than 3-inches was collected which indicates poor recruitment of the 2005 bluegill year class. Only two bluegill over 6-inches were collected.

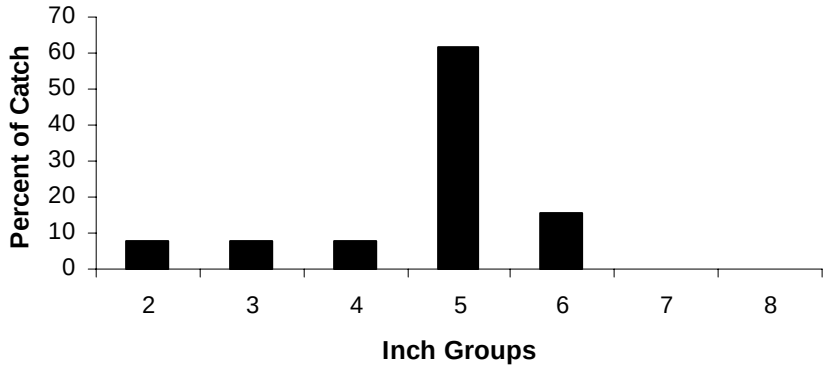

Figure 6. Length frequency distribution of bluegill collected at Cardinal Lake using D.C. electrofishing, May 9, 2006.

Mean W_r values for bluegill (110) were within the desired target range. This indicates that Cardinal Lake has ample forage available for the bluegill population, and the lake could likely support more bluegill. Mean W_r values for bluegill at Cardinal Lake are typically above 100 which is to be expected given the low population densities.

The PSD values for largemouth bass (11) and bluegill (17) both fell outside the desired range. This indicates that the size structure for both species is sub-optimal and the fishery could benefit by having a greater proportion of quality sized largemouth bass and bluegill.

Discussion

The Cardinal Lake largemouth bass population is dominated by fish less than 12-inches. Currently, sportfishing for largemouth bass at Cardinal Lake is poor. The largemouth bass size structure in 2006 is consistent with the last several years. The largemouth bass at Cardinal Lake lack an adequate forage base, as indicated by the low relative weights. The forage base for adult bass consists of mainly small bluegill, but unfortunately bluegill are not plentiful within the lake. The establishment of a stable bluegill population would likely result in more large bass. In small lakes such as Cardinal Lake, bluegill are the most common and manageable forage fish. Gizzard shad are not recommended for stocking in small lakes, due to potential negative impacts, and threadfin shad are unlikely to survive in small lakes. Some minnow species (fathead minnows and golden shiners) can be stocked in small lakes and do provide a greater forage base for largemouth bass, but minnows rarely become established in small lakes, so frequent stocking is required.

The largemouth bass size structure will likely remain poor until the bluegill population becomes well established.

The 2002 and 2003 efforts to establish a strong bluegill population through stockings and habitat improvement (brush piles) were not as successful as hoped. The 2006 bluegill CPUE has improved slightly over the past two years. These improvements may be due to increased weed growth, which provided refuge for small bluegill.

In 2005, CFRO presented three possible management options for Cardinal Lake (USFWS 2005). Given the current funding levels, results of past management strategies and the desires of anglers at Scott AFB, CFRO recommends the put-and-take catfish management strategy. This option would provide for immediate sport fishing which is also easy to manage. The drawback to stocking channel catfish is the need for periodic restocking, since channel catfish rarely reproduce or recruit successfully in small lakes. Catfish can be stocked at approximately 50 (1-2 pound) catfish per acre. See Fisheries Management Plan for Scott Air Force Base (USFWS 2006).

Table 3. Fish collected from Cardinal Lake, during 0.37 hours of D.C. electrofishing on the afternoon of 9 May 2006.

Species (size range)	Number	Percent Composition*	CPUE (fish/hour)	Mean Relative Weight (Wr)**
Largemouth bass	29	65.9%	79	87
(0.0 - 7.9)	2	(6.9%)	5	107
(8.0 - 11.9)	24	(82.8 %)	65	86
(12.0+)	3	(10.3%)	8	84
(15.0+)	0	(0.0%)	0	0
Bluegill	13	29.5%	35	110
(0.0 - 2.9)	1	(7.7%)	3	NA
(3.0 - 5.9)	10	(76.9%)	27	109
(6.0+)	2	(15.4%)	5	111
(8.0+)	0	(0.0%)	0	0
Grass Carp	2	4.5%	5	
Totals	44	100.0%	119	

Table 4. Water Quality parameters measured at Cardinal Lake on the afternoon of 9 May 2006.

Parameter	Result
Water Temperature	21.4°C
Conductivity	244 uS/cm
Dissolved Oxygen	13.2 mg/L
Secchi Transparency	248 cm
pH	9.48

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