

# Memorandum

To: Bow Mar Owners, Inc.  
From: Don Conklin, Peter Carlson, GEI Consultants, Inc., Chadwick Ecological Division  
Date: August 7, 2007  
Re: **Status of the Fishery of Bow Mar Lake 2007**

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## Introduction

Fish sampling has been conducted in Bow Mar Lake periodically since 1992. The lake was last sampled in the fall of 2002. The data over this period are used to monitor the year-to-year changes in the fishery in order to assess the current status of the fishery and to identify any management options that may be appropriate for 2007 and 2008.

Bow Mar Lake covers approximately 100 acres, with a maximum depth near 16 feet. Much of the lake is shallow and is suitable for the growth of aquatic macrophytes (vegetation, weeds). In response to excessive growth of macrophytes in 2007, herbicides were applied to the lake approximately one month prior to sampling. In the past, grass carp, an herbivorous species, were stocked in 1991, 1997, and 2002 to help control macrophyte density. They have had variable success controlling macrophytes over the years. This report presents the results of sampling of Bow Mar Lake in early summer 2007, evaluates the 2007 status of the fishery, evaluates the relationship between the fishery and the extent of macrophytes in the lake, and makes recommendations for future management.

## Methods

An electrofishing survey was conducted on the evening of June 27, 2007. Sampling procedures were generally similar to those used from 1992 to 2002. Boat electrofishing was conducted with a variable voltage pulsator (VVP-15, Colfelt Electronics), a 4,000-watt generator, and two electrodes off the front of the boat. The seven electrofishing sites around the perimeter of the lake sampled in previous years were again sampled in 2007. These sites were chosen to include generally similar fish habitat conditions within each site. Electrofishing was conducted close to the shore in relatively shallow water, up to several feet deep. This method is not effective in deeper water. This zone of the lake is also the zone that is suitable for the growth of macrophytes. Each year, the density and extent of the macrophytes are visually estimated around the lake during electrofishing.

All fish were returned to the water alive after being weighed and measured. The health or condition of older, larger fish was evaluated using the relative weight index (Wr). With this index, the measured weight of a captured fish is compared to a length specific standard weight for that particular species, which is used to represent the species as a whole around the United States. Relative weight values usually fall between 70 and 130, with values between 95 and 105 being the optimal management target for most species. Relative weight values below this range indicate the fish are not as "healthy" or "plump" as expected, which may result from an unbalanced fish community, lack of food, or some environmental stress. Relative weight is not calculated for young fish less than 4-6 inches (100-150 mm) long, although this length varies with the individual species.

## Results

### 2007 Data

The status of the fishery of Bow Mar Lake in 2007 was healthy. The fishery in 2007 was very similar to that found since 1994, with abundant young fish of the forage species. A total of nine species and one hybrid were captured in Bow Mar Lake in 2007 (Table 1). Yellow perch and bluegill sunfish were the most common species collected in 2007, with 197 and 186 individuals collected respectfully. These two species made up over 87% of the total number of fish collected in 2007. Twenty-four largemouth bass were captured making it the most numerous predator species in 2007, as in past years. Common carp were also collected, with twelve individuals captured. Five other species and one hybrid were captured in low numbers. No walleyes were collected in 2007.

Bluegill sunfish was the only species that was in optimal condition in 2007 (Table 1). All other species were in less than optimal condition, with  $W_r$  values less than 95. Largemouth bass represent the main predators of the lake and had a  $W_r$  of 93.8, a value just under 95, the minimum value representative of good condition. The fair and poor condition of the other species indicates that these fish are not well fed, and they may be overpopulated. This may be the result from an unbalanced fish community or some environmental stress.

**Table 1: Species list, number collected, and general condition of the larger fish collected by electrofishing from Bow Mar Lake, 27 June 2007. NA = all fish of this species were smaller than the minimum size for calculating  $W_r$ .**

Species	Number Collected	Average $W_r$	Condition
Bluegill	186	100.5	Good
Yellow perch	197	NA	NA
Largemouth bass	24	93.8	Fair
Black crappie	7	77.7	Poor
Common carp	12	70.9	Poor
Green sunfish	3	NA	NA
Hybrid sunfish	1	NA	NA
Wiper	3	70.4	Poor
Northern pike	4	68.9	Poor
Channel catfish	2	88.0	Fair
<b>TOTAL</b>	<b>439</b>	<b>--</b>	<b>--</b>

In the past, sampling was conducted in fall, and most of the fish collected were young-of-the-year (YOY) fish spawned earlier that spring. In 2007, with sampling in the early summer, most of the fish collected were one year old. The species in the lake spawn in spring, and most of the 2007 YOY fish were too small to collect. However, we did collect a few YOY fish. The bluegills in the 40 mm and 50 mm size classes were probably YOY fish from the 2007 spawning season (Figure 1). The majority of the bluegills were larger than 60 mm and represent fish from the 2006 spawning season and a few older fish. For the yellow perch, the few fish collected in the 40 mm and 50 mm size classes were YOY fish from 2007 and the larger fish were from 2006 (Figure 2). The bass from 2007 were 40 mm long, the one year old fish from 2006 were 70 mm to 110 mm long, and the fish greater than 210 mm long were two or more years old (Figure 3). The data from 2007 and past years for all three of these species demonstrate consistent natural reproduction from year to year.

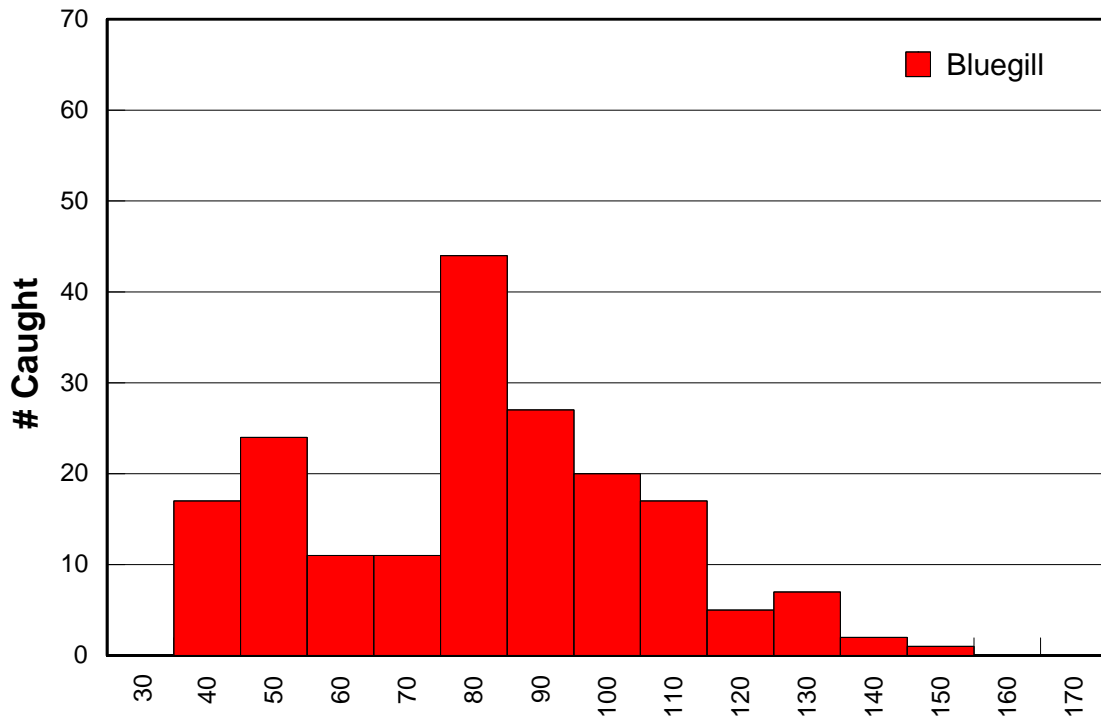


Figure 1: Length frequency of bluegill sunfish from Bow Mar Lake, June 2007.

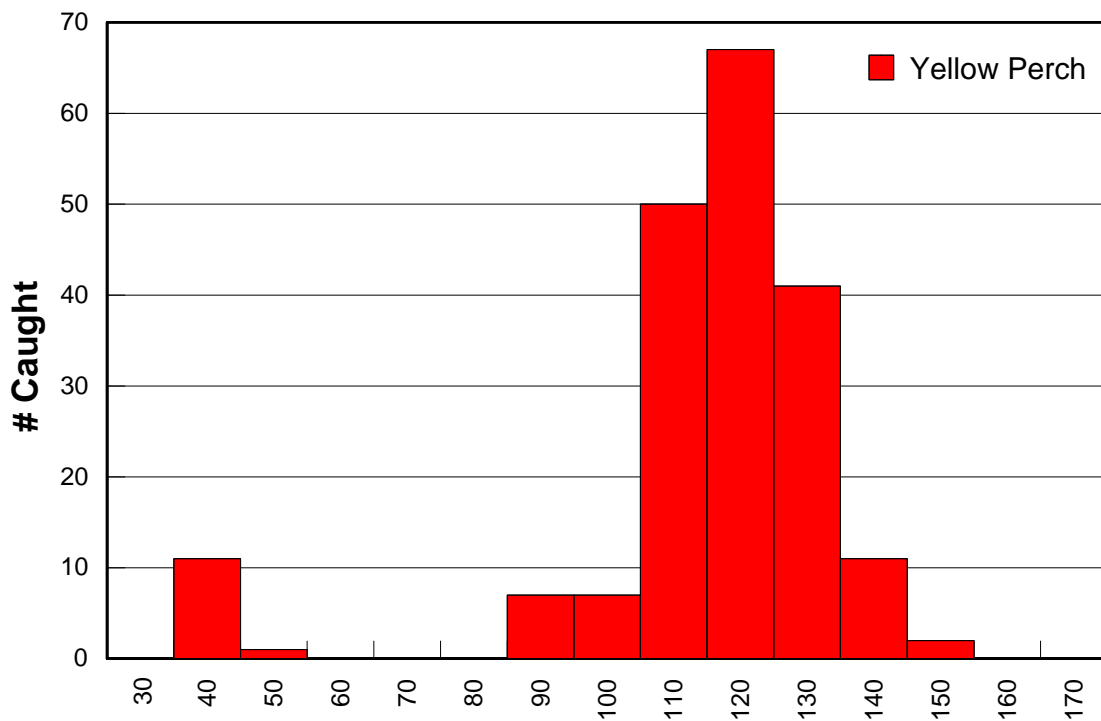


Figure 2: Length frequency of yellow perch from Bow Mar Lake, June 2007.

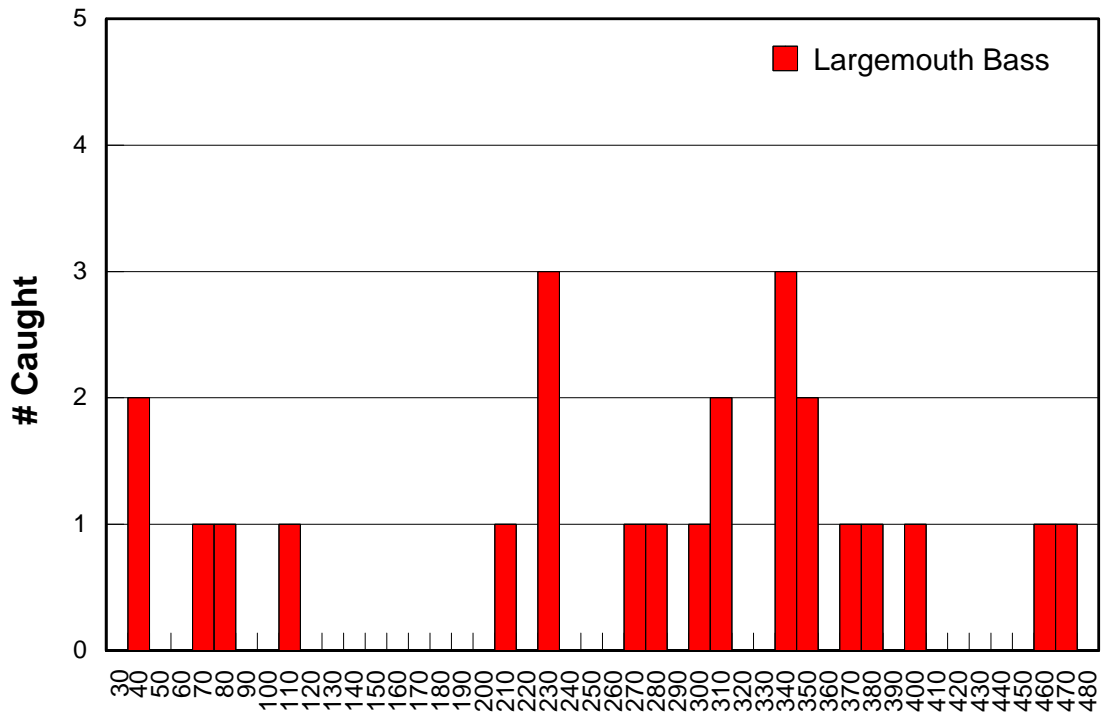


Figure 3: Length frequency of largemouth bass from Bow Mar Lake, June 2007.

### Past Data

Based on our observations, the extent of coverage of Bow Mar Lake with aquatic macrophytes has varied considerably since 1992. The macrophytes were very dense in 1992. Grass carp were originally stocked in 1991 and with periodic stocking have controlled macrophyte density to some extent. Approximately one month prior to the 2007 fish sampling, herbicides were applied to the lake to treat the macrophytes. At the time of sampling, macrophytes were nearly nonexistent in Bow Mar Lake. Apparently, the herbicide treatment resulted in nearly a complete kill of the macrophytes.

In the past, the beds of macrophytes have been the dominate habitat feature of the lake for both game and forage fish. The macrophytes and cattails provide the major cover features for fish in the lake, along with the dock area, the walleye spawning reef, and a few downed trees along the southwest shore. In addition, the loss of macrophytes reduces biomass and changes species composition of the invertebrate community, therefore directly reducing the quality and quantity of the food supply of fish foraging on these invertebrates, especially the young fish. In past years when macrophytes were sparse, the lake bottom had some flat, shallow areas less than 10 feet deep with a ring of cattails along the edge, especially on the west half of the lake and on the northeast corner. In 2007, the extent of macrophytes was much less than in all previous years. Although the removal of macrophytes may not be beneficial from a fishery standpoint, their absence apparently is more aesthetically acceptable and improves the appearance of the lake.

Bluegill, yellow perch, and largemouth bass were the most common fish collected in 2007 and in most past years. The consistently high numbers of small forage fish over the years provide plenty of food for the larger, predatory species, such as bass, pike, and wiper. The fishery of Bow Mar Lake has been consistent from year to year with respect to species composition and relative abundance. Bluegill and yellow perch have been consistently the most common species each year. Black crappies have also been relatively common in most past years, but were less abundant in 2007. The crappie may have moved to deeper water in 2007 because of the lack of macrophytes. Largemouth bass are consistently the most common predator species in the lake. All other species are collected in very low numbers

each year. This indicates that the fishery of Bow Mar Lake is stable and could remain in a similar condition indefinitely, unless there is a significant change in stocking, water quality, or habitat conditions.

The core of the fishery is the bluegill-crappie-bass component of the fishery. In 2007, as in past sampling events, it appears to be healthy. The abundant bluegills, yellow perch, and black crappie should provide sufficient forage for predators into the future.

In the past, we cautioned that control of macrophytes may result in lower numbers of young fish in the Lake. However this has not happened yet, based on the abundant one year old and YOY fish collected in 2007, when macrophytes were nearly absent within the lake. Abundant young fish still provide ample forage for predators in the lake. However, the macrophytes were removed just a few weeks prior to sampling. The fishery had not yet had time to adjust to the new habitat conditions. Without cover for the young fish, the larger fish will have an easier time finding food. This would be a benefit in the short-term, but in the long term, the larger fish may deplete the forage base of younger fish.

The low number of channel catfish and the absence of walleye collected 2007 is most likely related to the deep water preference of these species. These species have a higher probability of avoiding electrofishing which was concentrated in the shallow shoreline areas of the lake, areas likely avoided by the adult channel catfish and walleye.

In 2007, four northern pike in poor condition were collected, and except for a few large individuals, the northern pike in the lake over the past few years have typically been in poor condition. Physical factors (such as high water temperatures) or diseases may be responsible for the poor condition of the pike. Northern pike are apparently vulnerable to numerous diseases and parasites. In addition, it appears that pike have not been able to take advantage of the abundant forage fish in the lake, as have the largemouth bass. Based on the poor condition of the pike over the last few years, it appears that Bow Mar Lake is not suitable for supporting many northern pike. This species should not be a target of management of the fishery, except that it may be beneficial to harvest pike to reduce their numbers. This situation may remedy itself, as the survival of the less healthy pike may decline, leaving fewer, healthier pike in the near future.

The relative weight of bass has been consistently fair to good over the years, despite large numbers of young bass which can, in some circumstances, result in stunting and numerous small fish. Large, healthy bass up to several pounds have been collected each year in Bow Mar Lake indicating the success of this predatory species.

## **Management Recommendations**

Because nearly all aquatic macrophytes in 2007 were removed using herbicide, the immediate continued stocking of grass carp is not recommended. In the future, the stocking of grass carp may be utilized as macrophytes return to historically high densities.

An important factor in justifying the cost of stocking more fish is the satisfaction of anglers. If the current status of the fishery is acceptable to fishermen, then stocking is not necessary. If angling success is considered less than adequate, or anglers seek to catch larger or different species of fish than the lake could probably support, additional stocking of larger individuals of the predator species recommended.

The abundance of YOY forage fish over the past few years indicates that there is an ample forage base to support more predator fish. The lack of cover for prey species should increase predation efficiency in the short-term, therefore directly benefiting the larger predator species such as largemouth bass, channel catfish, and wiper for this year until the macrophytes return. Abundant largemouth bass including YOY indicate this species can successfully increasing their numbers to take advantage of this situation. Walleye, channel catfish, and wipers large enough to take advantage of the abundant and currently easily accessible prey species could be stocked in the lake in 2007 or 2008. The increased predation will also result in improved condition of surviving small forage fish, especially when coupled with the current reduction of invertebrates, the food base of these fish. Based on the abundance of

YOY observed in all sampling events, there appear to be enough adult forage fish large enough to survive the increase in predation and reproduce in spring to maintain the current stock of forage fish. It is expected that by next spring macrophytes will have returned to higher densities, once again providing cover to forage fish.

Smaller fish should not be stocked in 2007 or in 2008 until the macrophytes return. Small fish would have nowhere to hide without the macrophytes and would be easy prey for the abundant fish already in the lake. Although small walleye or bass might be available for stocking, their survival would be very low and would not justify their cost.