

# 2012 Willowbrook Lake Fisheries Survey

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## Introduction

Willowbrook Lake is an approximately 4.5-acre freshwater lake in Willowbrook Park, in the northwest area of Staten Island, New York. It is fished recreationally and is a target destination of youth fishing clinics. Much of the shoreline has consisted of a grass lawn with a small number of trees, although the New York City Department of Parks and Recreation has added plantings over the past two years in an attempt to remedy an eroded shoreline. Part of the eastern shoreline borders a wooded forest.

DEC Fisheries staff has responded to several fish kills at Willowbrook Lake, the most recent in March 2010. Conditions contributing to the kills included unauthorized discharges from an adjacent facility and shoreline erosion, both of which likely degraded water quality.

DEC Fisheries performed an electrofishing survey of Willowbrook Lake on 29 September 2010 to check the status of the fish community (Cohen 2012). Findings of that survey included the following:

- Capture of 88 American eels indicated existence of a connection to coastal waters
- Largemouth bass (*Micropterus salmoides*) PSD of 21 was well below accepted range for balanced fish populations
- Panfish PSD of 5.2 was well below accepted range for balanced fish populations
- Scale aging indicated a fast growth rate for young-of-the-year fish

Low PSDs for both predators and prey were attributed to the fish kills; however, no additional fish kills have been reported to DEC since the 2010 survey and water quality issues that likely contributed to the kills may have been resolved due to the shoreline erosion control measures and cessation of discharges. An electrofishing survey was performed by DEC Fisheries on 12 September 2012 to determine if the structure of the fish populations had improved.

## Methods

The survey followed the Bureau of Fisheries Centrarchid Sampling Plan (Green, 1989). All fish were captured using a five meter Smith-Root 16H electrofishing boat with two umbrella arrays, each with six stainless steel dropper cables. Power was supplied by a Kohler 7,500 Watt generator and output varied around 6.0 Amps. Voltage was set to 500 rather than 170 Volts as in 2010; and pulse rate was set to 60 pulses per second, rather than the pulse rate of 120 of the previous survey. The crew consisted of one driver and two dippers each equipped with 0.635 cm mesh nets. Dippers attempted to collect all fish species except common carp (*Cyprinus carpio*) and American eels (*Anguilla rostrata*) which were not netted for logistical reasons but all observed individuals were recorded. All netted fish were transferred to live wells for transport to shore where data were collected.

The majority of the lake's shoreline was electrofished in 23 minutes. Shallow water prevented boat access to the northernmost area of the lake, therefore this area was not fished. A gamefish-only run was included in this survey, in contrast to the last, and was performed in 12 minutes. Water temperature was 25.5 C (78 F) and conductivity was 334  $\mu$ S/cm. All fish captured were returned to the water after recording length, weight and species, and removing scales for age estimation.

Catch per unit effort (CPUE) was determined for four size classes of largemouth bass and for all panfish which consisted of bluegills (*Lepomis macrochirus*) and pumpkinseeds (*Lepomis gibbosus*). Largemouth bass and panfish length distributions were determined by plotting fish length versus frequency for all fish captured.

Proportional Stock Density (PSD) and Relative Stock Density (RSD) indices were used to describe the size structure of the largemouth bass and panfish populations of Willowbrook Lake. PSD is expressed as the percentage of the fish stock that is of “quality” size or greater. Fish “**stock**” size is the size at or near which fish reach maturity. “**Quality**” size is larger than stock size and, in general, represents the size of fish anglers most like to catch. Both stock and quality sizes differ among different fish species. RSD is similar to PSD but usually compares a size larger than “quality”, to “stock” size. In this case RSD-**preferred** (RSDp) was calculated for largemouth bass to account for larger fish found during the survey. Largemouth bass stock, quality and preferred sizes are 200 mm (8 in), 300 mm (12 in) and 380 mm (15 in) respectively. Stock and quality for bluegills and pumpkinseeds are 80 mm (3 in) and 150 mm (6 in), respectively.

## Results

### *Fish Species Composition*

A total of 2,078 fish were collected in 35 minutes of electrofishing time. The fish species assemblage included largemouth bass, golden shiners (*Notemigonus crysoleucas*), bluegills, and pumpkinseeds (Figure 1). *Lepomis spp.* (n = 1608) were bluegills and pumpkinseeds that were too small to be identified to species and were, by far, the majority of fish collected. Bluegills (n = 215) were the next most collected species, followed by largemouth bass (n = 129), pumpkinseeds (n = 108) and golden shiners (n = 17). One brown bullhead (*Ameiurus nebulosus*) was also collected but was not included in Figure 1. Observed but not collected were common carp (n = 11) and American eels (n = 21).

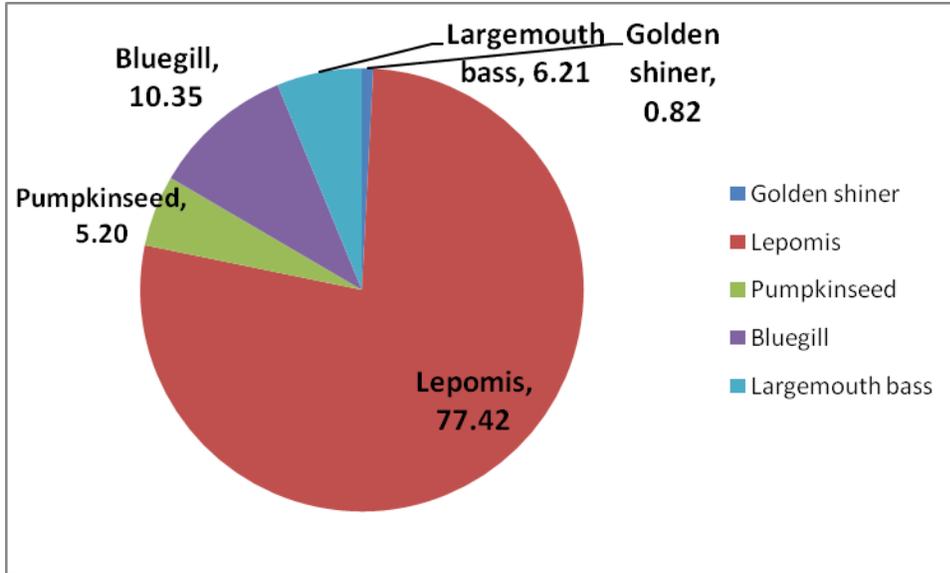


Figure 1: Proportions of fish species collected from Willowbrook Lake, NY, 2012

#### Catch per unit effort

Overall CPUE for all fish (gamefish run included) was 5,421/hr. Overall CPUE for largemouth bass was 221/hr (Table 1). Slightly more than half of these bass were young of the year (YOY) with a CPUE of 117/hr and an average length of 5.9 inches. CPUE of largemouth bass between YOY (5.9 inches) and ten inches in length was 38/hr and CPUE for bass greater than 12 inches in length was 32/hr.

Table 1. Willowbrook Lake 9/12/12 Electrofishing Survey Summary Information. Time fished with gamefish run = 0.58h; time fished without gamefish (GF) run = 0.38h							
Species	Total Catch	Total CPUE	Avg Length (in) (min,max)	Avg Weight (lb) (min,max)	CPUE YOY	CPUE YOY<#<10"	CPUE >12"
Largemouth bass (GF run)	129	221.14	8.6 (5.1, 16.7)	0.44 (0.1, 2.5)	117	38	32
Lrgmouth bass (all fish run)	102	266.09	8.3 (5.1, 16.7)	0.39* (0.1, 2.5)	157	37	57
Lepomis	1931	5037	4.6** (2.5, 6.9)	0.08*** (0.02, 0.3)	-	-	-

\*does not include largemouth bass less than 3.94 inches in length

\*\* does not include Lepomis less than 2.4 inches as these were counted as "bulk fish" within the range of 0.8 – 2.4 inches making a estimate of average length not possible

\*\*\*does not include Lepomis less than 3.15 inches in length

### Size Distribution

Largemouth bass length frequency distribution suggests four different size and age classes (Figure 2). Length of the largest largemouth bass from this survey was almost 17 inches, three inches greater than the longest of the 2010 survey (Cohen 2012). Maximum largemouth bass weight was 2.5 pounds whereas that of the previous survey was 1.3 pounds. Average length of the smallest size class of bass was 5.9 inches, close to 2 inches less than that for YOY bass of the 2010 survey (7.7 inches). Aging fish scales confirmed that these were YOY fish. The average length of one-year-old fish was 8.8 inches.

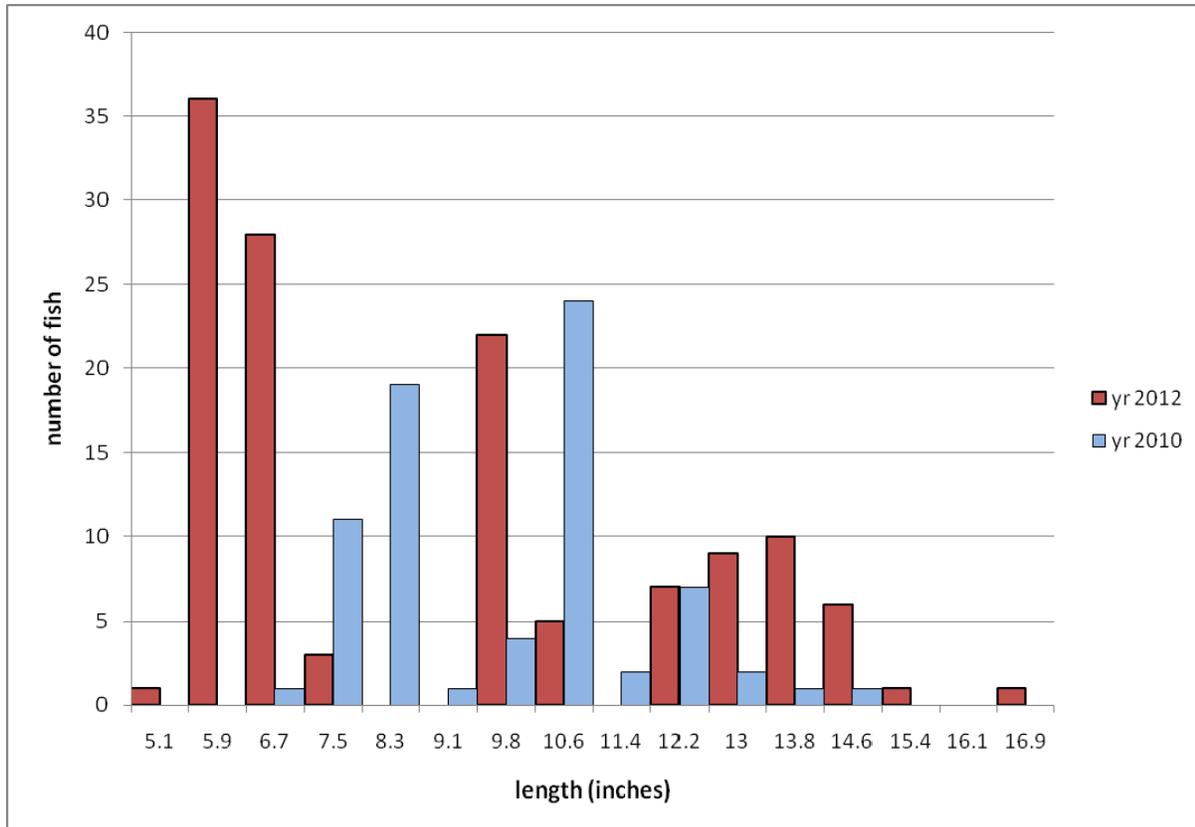


Figure 2: Largemouth bass length frequency distributions for 2010 and 2012 surveys

Panfish length ranged from 0.8 to approximately 7 inches (Figure 3). Most (n = 1,608) were less than 2.5 inches and the second largest size group of panfish was 3.9 – 4.7 inches. Maximum panfish length (6.9 inches) was slightly greater than the maximum panfish length from the 2010 survey (6.6 inches).

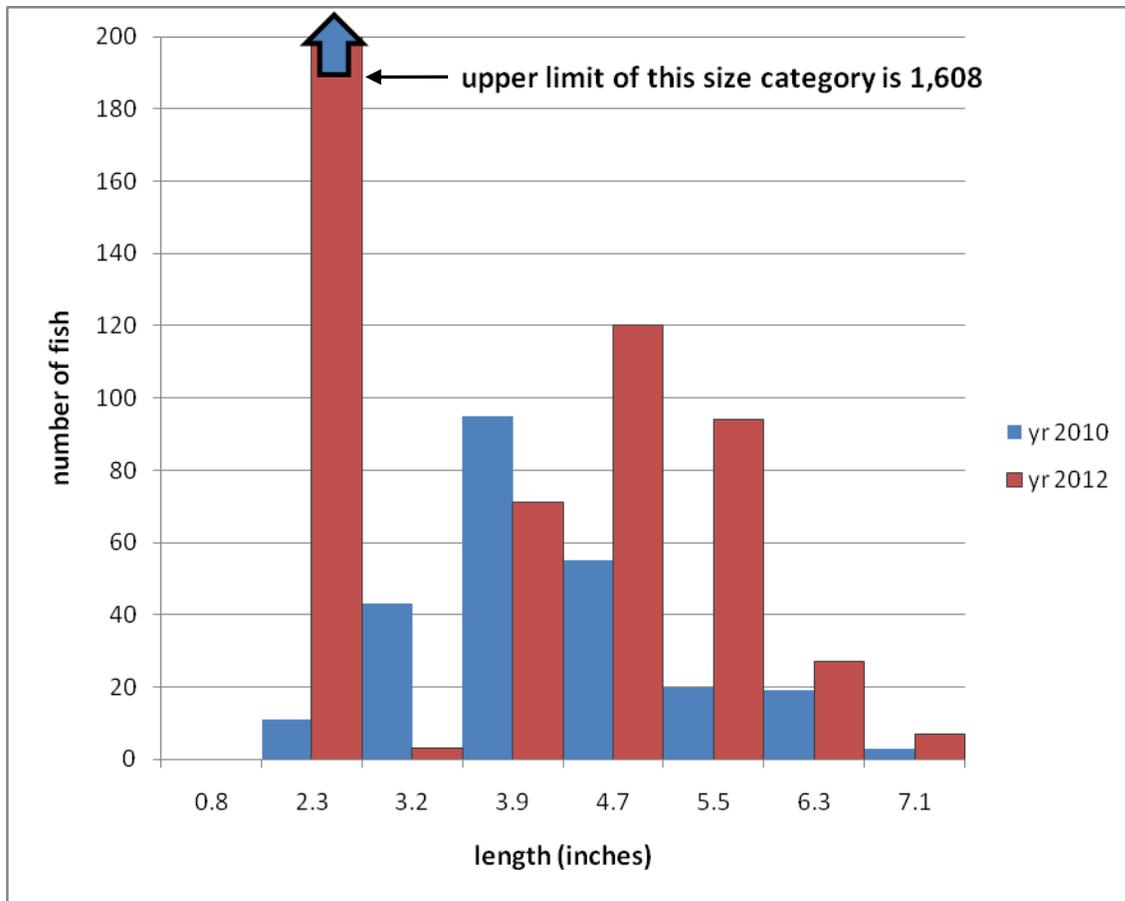


Figure 3: Panfish length frequency distribution

Generally accepted PSD index ranges for balanced fish populations are 40 – 70 for largemouth bass and 20 – 60 for bluegill sunfish (Anderson, 1980). The bass PSD determined from this survey was 52, meaning 52% of the mature bass captured were 300 mm or greater in length. This is within the acceptable range for balanced fish populations and a significant change from the PSD of 21 calculated from 2010 Willowbrook Lake survey data (Cohen 2012). The RSDp of 1.6 was low for bass populations but is still an improvement from 2010 as none of the bass captured in that survey reached the “preferred” length of 380 mm. Panfish PSD for this survey was 53, within the acceptable range for balanced fish populations. This is significantly greater than the PSD of 5.2 from the 2010 survey.

### Discussion

Largemouth bass and panfish CPUEs were greater in 2012 than they were in 2010. The 2012 largemouth bass CPUE was over three times that of the 2010 survey, and the 2012 panfish CPUE was over five times that of the 2010 survey. One potential reason for the increased panfish catch rate is a concerted effort by staff to count and measure the smallest fish, which were not captured and measured in 2010. Another possibility is the difference in electrofishing boat settings: pulses per second were less in 2012 and voltage was set higher, but Amps were approximately the same between the two

surveys. Improvements in water quality, as suggested by lack of fish kills, likely contributed to increased fish abundance, and thus may have resulted in higher catch rates.

Collection of larger-sized bass resulted in an increased PSD, from 21, which is indicative of a more balanced fish community. However, even though the RSDp was improved from 2010, it was still low, an indication that larger adults are still relatively rare in this lake. Panfish length range was similar between the two surveys but panfish PSD was significantly greater than in 2010, and well within the range established for balanced fish populations.

Largemouth bass length range was greater than in 2010, ranging from 5.1 to 16.7 inches, whereas those from the 2010 survey ranged from 6.3 to 14 inches in length. The former is a broader size range and is more similar to largemouth bass size ranges found in other New York City lakes and ponds. The lack of fish kills over the last 2 years seems to have improved survival of largemouth bass, including YOY and older fish in the population, which may have been particularly vulnerable during fish kill events.

Aging of largemouth bass scales indicated YOY fish decreased in length from an average of 7.7 inches in 2010 to an average of 5.9 inches. The growth rate in 2010 was considered unusually high and the 2012 growth rate was closer to what is typical for many New York waters. The lower largemouth bass growth rate could be the result of the increased population density, which would increase intraspecific competition for food (Rose et al, 2001).

Willowbrook Lake appears to have adjusted towards a more ecologically balanced condition over the past two years. The increases in catch rate and improvements in size structure observed in this survey are likely related to the absence of fish kills since 2010. This low incidence of fish kills is likely related to NYC Parks Department's shoreline erosion control work and the cessation of unauthorized discharges from an adjacent facility. However, because little is known about angler use of this lake, there is still some uncertainty about these relationships. Continued periodic surveys and additional angler use information are necessary to more reliably understand and manage Willowbrook Lake.

### **Recommendations**

Conduct a creel survey. This was recommended in the last Willowbrook Lake report but is not yet planned. It was of interest to determine if anglers will observe improved bass fishing as is suggested by survey data.

Continue to manage under NYC catch and release fishing regulations.

Conduct electrofishing surveys every two years to monitor trends in ecological condition of fish populations and continue to track numbers of American eels observed to detect any declining trend.

### **Literature Cited**

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