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Pond and Lake Management

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Aquatic Weed Control

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Fish Population Surveys

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Electrofishing Surveys

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Fish for Lake Stocking

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Pond and Lake Aeration Systems

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Waterfowl Habitat Management

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Stream Surveys

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Fish Elimination

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Water Quality Management

2012

FISH POPULATION SURVEY

NORTH ARROWHEAD LAKE

"Providing quality pond and lake management since 1987"

INTRODUCTION

On August 16, 2012, a fish population survey was conducted on North Arrowhead Lake by Aquatic Environment Consultants, Inc. The purpose of this survey was to collect data on the lake, identify problems with the lake and develop a management plan for the lake. Data relating to water quality and the fish population was collected.

MANAGEMENT GOAL

North Arrowhead Lake is a lake with an established fish population that had a significant water drawdown beginning in the fall of 2007 and continuing through most of 2008. The impact of this drawdown on the fish population is a concern. The fish population was surveyed in 2009. The goal of the survey was to continue monitoring the changes to the fish population since the drawdown.

FISH POPULATION MANAGEMENT

Freshwater lakes have fish populations that are composed of fish that fall into one of two categories. They are classified as either a predator or forage fish. The predator fish feed on the forage fish. In a "balanced" population, predator fish will prevent the forage fish from overpopulating. Also, there are about three to four pounds of forage fish for every pound of predator fish in a "balanced" population. In some fish populations, the predator fish are removed much faster than the forage fish and the population quickly shifts to one that is "out of balance". The opposite can also be true where there is an under harvest of the predator fish causing them to become stunted and slow growing. Certain predator species work better with certain forage species. Certain predator species work better with certain forage species. In general, a forage fish works well with a predator that shares the same habitat. The spawning period for the forage fish should be shortly after the spawning period for the predator. The reason for this delay is that the young of the year predators will have a supply of newly hatched forage fish that are small enough for the predators to eat. If the forage fish hatch before the predator, the forage fish are too large for the predator fish to eat when they hatch. A good example of this relationship is that of the largemouth bass and bluegill. Bluegills spawn after the largemouth bass, share the same habitat and provide good forage for the young of the year largemouth bass.

The first goal in the management of the fish population in any water body is to match the proper predator fish with the proper forage fish. Once this is accomplished, the object is to manage the forage fish population to produce large numbers of young fish on which the predators can feed. The predator fish must also be maintained in large enough numbers to prevent the forage fish from overpopulating. As the forage fish overpopulate, they stunt out, their reproduction decreases and the fish population of the entire water body deteriorates. The opposite can also be the case where the predator fish numbers are too high for the available forage base causing overcrowding of the predator fish resulting in stunted growth and poor weights.

FISH POPULATION SURVEY METHOD

Fish populations were sampled using an electrofishing boat equipped with a 4000 watt VVP electrofishing unit. The electrofishing boat was used to sample the lake for the various species of fish. Electrofishing took place along the shoreline and was used to sample around the structure found in the lake.

FISHES PRESENT

Common Name	Scientific Name
Largemouth Bass	*Micropterus salmoides*
Chain Pickerel	*Esox niger*
Bluegill	*Lepomis macrochirus*
Pumpkinseed	*Lepomis gibbosus*
Yellow Perch	*Perca flavescens*
Black Crappie	*Pomoxis nigromaculatus*
Golden Shiner	*Notemigonus crysoleucas*
Carp	*Cyprinus carpio*

Largemouth Bass

The largemouth bass is one of the main predators in the fish population. The majority of this fish's diet is composed of smaller forage fish in the lake. It feeds well on small sunfish, golden shiners and other shoreline forage fish. The largemouth thrives best in shallow, weedy lakes or in river backwaters. Largemouth bass prefer weedy habitats not only because their food supply is available in those areas, but also because aquatic plants and sunken debris furnish protection. The largemouth bass population in North Arrowhead Lake is composed of a variety of sizes. Largemouth bass were sampled in many inch classes up to 17 inches. Largemouth bass of all sizes were found in less than desirable numbers. Reproduction from 2012 was poor. The young bass sampled were healthy and growing at a good rate. They ranged in size from 3 to 4 inches.

Chain Pickerel

Chain pickerel are usually found where larger species of pike are either rare or absent. Chain pickerel grow rather quickly and can reach 14 inches in 3 years. It takes about 6 years to attain a length of 20 inches and if one survives to the maximum of 10 years, should be 36 inches long and weigh approximately 9 pounds. Only a few chain pickerel were sampled during the survey. The ones sampled were larger adults. The 2012 chain pickerel reproduction was also poor.

Bluegill

The bluegill is a species of sunfish that prefers quiet, weedy waters where it can hide and feed. In the daytime, the smaller fish are close to shore in coves and under docks. The larger bluegills prefer the adjacent deeper waters in the daytime but move into shallow areas in the morning and evening to feed. Bluegills also work well in a predator-prey relationship with largemouth bass. Bass feed well on this fish and they supply a large amount of food for the young of the year bass. Bluegills spawn after the bass, which gives the young of the year bass a good supply of food for growth their first year. Bluegills tend to spawn more often during the summer than pumpkinseeds, resulting in a larger food supply for the young bass. The bluegill population appears to healthy and reproduction is good.

Pumpkinseed

The pumpkinseed is a species of sunfish that inhabits standing water with soft bottoms covered with sunken plant material. It prefers weed patches, docks and logs for cover, and is most often found in these locations. These sunfish are a species that work well in a predator-prey relationship with the largemouth bass. Bass feed well on these fish and they supply an abundance of food for the young of the year bass. Pumpkinseeds spawn after the bass, which gives the young of the year bass a good supply of food for growth that first year. The pumpkinseed population appears to be very healthy with a good growth rate. The pumpkinseed population is comparable in size to that of the bluegill. Pumpkinseeds are reproducing at a high rate. One to four inch pumpkinseeds were sampled in large numbers during the seine survey at all locations along the shoreline. Most of the larger pumpkinseeds sampled during the survey were 6-7 inches.

Yellow Perch

This is the most widely distributed member of the perch family. The perch is at home in small and large lakes alike, and though found in rivers it is considered primarily a lake fish. Lakes with cool, clean, water and ample amounts of sandy or rocky bottoms make better perch lakes. The yellow perch works well as a forage fish with chain pickerel and walleye. They do not work as well with largemouth bass since they prefer a slightly different habitat. Yellow perch in a variety of sizes were sampled during the survey. Many perch were sampled in the 4 to 5.

Black Crappie

The black crappie is a popular freshwater panfish found throughout the United States. The black crappie likes quiet waters and prefers more vegetated areas than the white crappie. The black crappie is strictly carnivorous, feeding on small fishes, aquatic insects, and crustaceans. Several large crappies were sample in the 9 to 10 inch range. Small black crappies sampled during the survey were 4 to 6 inch in length.

Golden Shiner

The golden shiner is a fish found in relatively clear, weedy lakes and quiet streams. Although schools may be found in open water, they are not often far from weed beds. Golden shiners are a good forage fish for largemouth bass and walleye. A large bass can eat an adult shiner easier than it can eat an adult sunfish. A desirable number of of young of the year shiners were sampled during the survey. These small shiners were mostly 1 to 3 inches in length. Larger golden shiners were sampled up to 9 inches in length.

Common Carp

The common carp is native to Asia but has been introduced to every part of the world. Numerous carp were sampled during the survey. More carp were found during this survey than in the 2001 and 2009 survey. A large amount of reproduction occurred during the drawdown. These carp are now full size adults. The carp are present in such large numbers that they are having a negative impact on the sport fish population.

FISH MANAGEMENT NORTH ARROWHEAD LAKE

Results of the 2012 fish population survey indicate that the quality of the sport fish population (largemouth bass and bluegills) in North Arrowhead Lake is being significantly impacted by the large numbers of common carp. Largemouth bass are the main sport fish in the lake and their numbers have been negatively impacted. Largemouth bass reproduction and recruitment to the adult population is less than desirable. The carp are causing lake sediments to become suspended in the water column. These sediments also impact the reproduction on the forage fish populations. The sport fish population will not be able to recover as long as carp occupy a large percentage of the biomass and carrying capacity of the lake. The one positive aspect is that carp reproduction is poor for the same reasons as the forage fish population.

As long as carp numbers remain high, North Arrowhead Lake will have a poor sport fishery. Therefore carp numbers need to be significantly reduced. The difficult part of this recommendation is deciding how to accomplish the removal of carp. Ultimately the best method would be to poison the entire fish population and restock with a desired ratio of species. The difficult aspect of such a recommendation is that it is expensive and the public perception can be difficult to manage.

Since the reproduction of carp is poor, removing the larger carp is what is necessary to improve the fishery. As adults are removed their numbers will be reduced accordingly. One possible option that would help is the use of large gill nets. Gill nets are vertical panels of netting normally set in a straight line. Fish are usually caught after they swim into the net and pass only part way through the mesh. When it struggles to free itself, the twine slips behind the gill cover and prevents escape. Most desirable fish species would pass through the nets and the larger carp would be caught. The best time for gill netting to take place would be in the spring of the year when carp are actively moving during their spawning period. If a group of dedicated volunteers could undertake the gill netting, it could be conducted fairly affordably.

It is recommended that you evaluate the different options for carp removal. Aquatic Environment Consultants could work with the association in working out the details of these various options.

WATER QUALITY DATA

Total Alkalinity 19.0 mg/liter North Arrowhead Lake

Total alkalinity refers to the total concentration of bases in water expressed as milligrams per liter of equivalent calcium carbonate. Waters with total alkalinity of less than 20 mg/liter usually have little available carbon dioxide to permit growth of plankton which is the main source of food for bluegills and other forage fish in your lake. Since the alkalinity in your lake is less than 20 mg/liter, the growth of plankton will be limited. This limited growth of plankton will cause the pounds per acre of fish to be less than that of lakes with higher total alkalinity.

Total Hardness 34.0 mg/liter North Arrowhead Lake

The calcium concentration in water is normally expressed as calcium hardness in terms of equivalent calcium carbonate. Desirable levels for total hardness for fish production usually fall in the range of 20 to 300 milligrams per liter. Hardness is not as important as alkalinity but should be about the same numeric value. The hardness of the water in North Arrowhead Lake is greater than 20 mg/liter and in the same range as total alkalinity.

pH 7.3 North Arrowhead Lake

The desirable range for fish production is pH 6.5 to 9.0. Any pH value found in the range pH 4.0 to 6.5 is in the slow growth range. Very little if any reproduction will occur if the pH is in the range of pH 4.0 to 5.0. The acid death point for fish is around pH 4.0 or less. The pH in a lake will vary during the day based on weather conditions. Usually a lake's pH will be higher on a sunny day in the afternoon than it is in the morning. This variation is a result of the photosynthetic processes of phytoplankton and other plants that are present in the lake. The pH of your water falls within the desired range, and should continue to be checked on an annual basis.

WATER QUALITY MANAGEMENT

The water quality parameters that were tested during the survey indicate that there is good water quality for fish production and other recreational activities. The greatest concern that you should have at this time is preventing nutrients from entering the lake. The faster nutrients enter a lake, the faster it will age, resulting in more management problems. Management of nutrients entering North Arrowhead Lake should be one of your greatest concerns for the long-term management of the lake.

CONCLUSION

North Arrowhead Lake is a valuable resource that with proper management can produce exceptional recreational opportunities for years to come. Management guidelines for the fish population should be followed if improvements are going to be made. The fish population should be studied on a regular basis to evaluate the results and make adjustments to the management recommendations.

RECOMMENDATIONS TO FOLLOW

- Develop a program for removal of large numbers of carp.
- No harvest largemouth bass or Chain Pickerel from the lake.
- No stocking of additional fish other than trout until a carp removal program is established.
- If desired, trout can be stocked for the purposes of "put and take" fishing
- Survey the fish population in September 2015.

TABLE 1
Survey Data on North Arrowhead Lake taken 8-16-12

SPECIES	NUMBER SAMPLED	LARGEST FISH	MOST COMMON SIZE
Largemouth Bass	33	17"	10"-11"
Chain Pickerel	4	18"	15"-18"
Bluegill	52	9"	5"-6"
Pumpkinseed	21	7"	4"-5"
Yellow Perch	65	11"	4"-5"
Black Crappie	18	10"	9"-10"
Golden Shiner	54	9"	1"-3"
Common Carp	138	21"	18"-20"

Ave. Mon Gill Net 1-2K lbs/yr

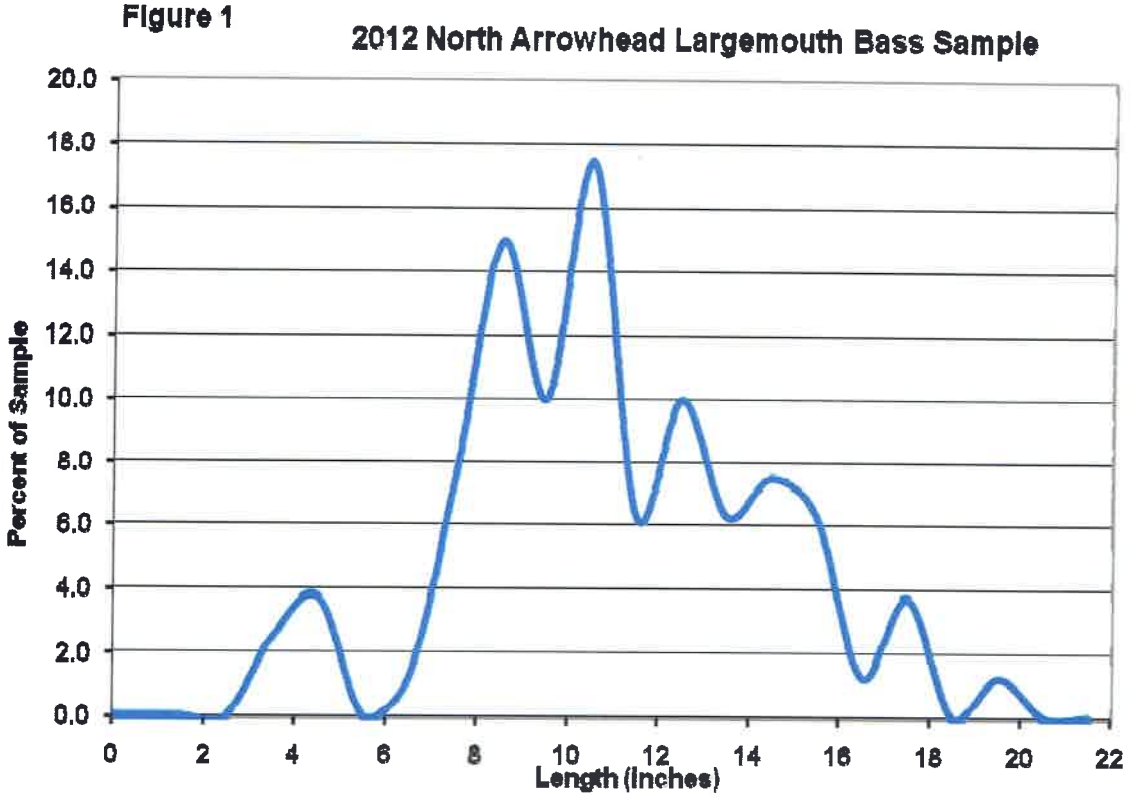
76 Nets 100 lbs/Net

200 ft Net, 3 to 4 ft Mesh

Floating Fish Pellets

Cast Nets, 11 ft

Figure 1


2012 North Arrowhead Largemouth Bass Sample
Percent of Sample
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
2
4
6
8
10
12
14
16
18
20
22
Length (Inches)

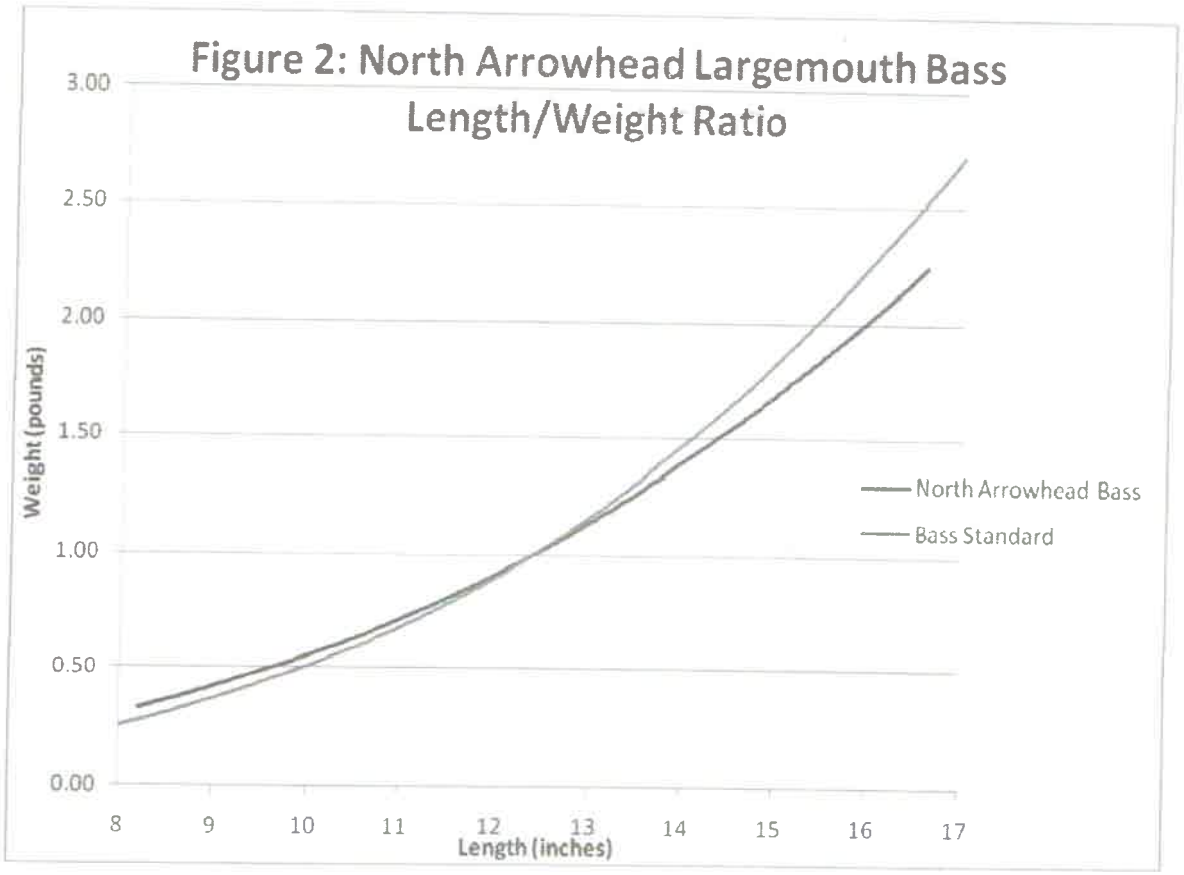


Figure 2: North Arrowhead Largemouth Bass Length/Weight Ratio
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Weight (pounds)
8
9
10
11
12
13
14
15
16
17
Length (inches)
North Arrowhead Bass
Bass Standard