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Pond
and Lake
Management

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Management

2021

FISH POPULATION SURVEY

NORTH ARROWHEAD LAKE

INTRODUCTION

On September 27, 2021, 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 fish population, identify problems with the lake and update a management plan for the lake. Data that related to water quality, fish habitat 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 continued through most of 2008. The impact of this drawdown on the fish population has been a concern. The fish population was surveyed in 2009, 2012, 2015, 2018 and most recently in 2021. 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". 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 this delay is important is that the young of the year predators will have a supply of newly hatched forage fish that are small enough for the newly hatched predators to eat. If the forage fish hatch before the predator, the forage is 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	<i>Micropterus salmoides</i>
Bluegill	<i>Lepomis macrochirus</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Yellow Perch	<i>Perca flavescens</i>
Black Crappie	<i>Pomoxis nigromaculatus</i>
Golden Shiner	<i>Notemigonus crysoleucas</i>
Rock Bass	<i>Ambloplites rupestris</i>
Brown Bullhead	<i>Ictalurus nebulosus</i>
Common Carp	<i>Cyprinus carpio</i>
Rainbow Trout	<i>Oncorhynchus mykiss</i>

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 about the same numbers that were observed in 2018. Reproduction from 2021 was very good and represents future year classes of catchable sized fish. The young bass sampled were healthy and growing at a good rate. They ranged in size from 3 to 6 inches.

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. 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 be healthy and reproduction is good. The population is also continuing to show signs of improvement.

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. 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 smaller in size than that of the bluegill. Pumpkinseeds are reproducing at an acceptable rate. Most of the larger pumpkinseeds sampled during the survey were 4-5 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. The number of yellow perch remains stable as it is similar to what was observed during 2018.

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. A good number of black crappie were sampled during the survey. Most of the adult crappies were sampled in the 9 to 13-inch ranges. They are reproducing well since numerous small black crappies were sampled in the 2 to 3-inch range.

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 young of the year shiners were sampled during the survey. These small shiners were mostly 3 to 4 inches in length. Golden shiners were sampled in numbers similar to what the survey showed in 2018.

Rockbass

Rockbass are members of the sunfish family. They were sampled during the survey in low numbers. Most of the rockbass ranged in size from 7 to 9 inches. The rockbass do not have a significant impact on the fish population, and therefore no recommendations will be made concerning them.

Brown Bullhead

Brown bullheads are a medium size slender-bodied catfish. Bullheads are an omnivorous feeder and will feed on anything from plant material to fish. Being a bottom feeder, however, a major portion of its diet is composed of insect larvae and mollusks. All bullheads sampled during the survey were 8 to 10 inches in size and only two were collected during the survey. The population appears healthy and not a real concern in the management of the lake.

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 sampled in the 2021 survey than were sampled in the 2018 survey. The reason for more carp in this year's survey is that a significant effort was made to target them during the survey. Thirty-one common carp were removed from North Arrowhead Lake during the survey. As a whole, the carp population has been reduced. The game fish population is showing direct improvements as a result of the lower density of carp in the lake.

Rainbow Trout

Four rainbow trout were collected during the survey. They are present in the lake as a result of stocking in the spring of 2021. They will spend most of the summer in the deeper, cooler water. Rainbow trout should be used as a put and take fish if there continues to be angling interest in this species.

FISH MANAGEMENT NORTH ARROWHEAD LAKE

Results of the 2021 fish population survey indicate that the quality of the sport fish population (largemouth bass, black crappie and bluegills) in North Arrowhead Lake is in balance with a desirable number of predator fish and a good forage base. The fishery has improved from what was observed six years ago. This improvement is largely the result of a reduction in the density of common carp.

One important observation from the 2021 survey is there was a noteworthy number of 4 to 6-inch bass observed. These bass are young of the year. There are a significant number of them in the lake and their growth rate is excellent when compared to standard growth rates for the region. Their likely survival will improve the balance of the fishery. The adult largemouth bass are average weight for their length indicating that there is plenty of forage available for them.

The carp population continues to be reduced from where it was six years ago. This reduction has resulted in improved water clarity and less turbidity. This improved water quality has resulted in improvements with the game fish population.

No stocking of additional fish is recommended at this time. Continued removal of the carp using electrofishing should take place during future surveys. As carp become harder to collect using electrofishing equipment, their removal can be suspended.

It is important that the fish population be studied on a regular basis as conditions are changing rapidly with improved water quality. A fish population survey should be conducted in 2024 to evaluate the changes in the population and update the management recommendations.

WATER QUALITY DATA

Total Alkalinity 14.0 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 20.5 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 7.0 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 your lake has similar water quality as other lakes in the region. While the water quality is less than desirable for fish production, the fishery in North Arrowhead Lake has done very well and is above average for the region. Nothing needs to be done to change the water quality as it is dictated by the geology in the region.

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 adjust the management recommendations.

RECOMMENDATIONS TO FOLLOW

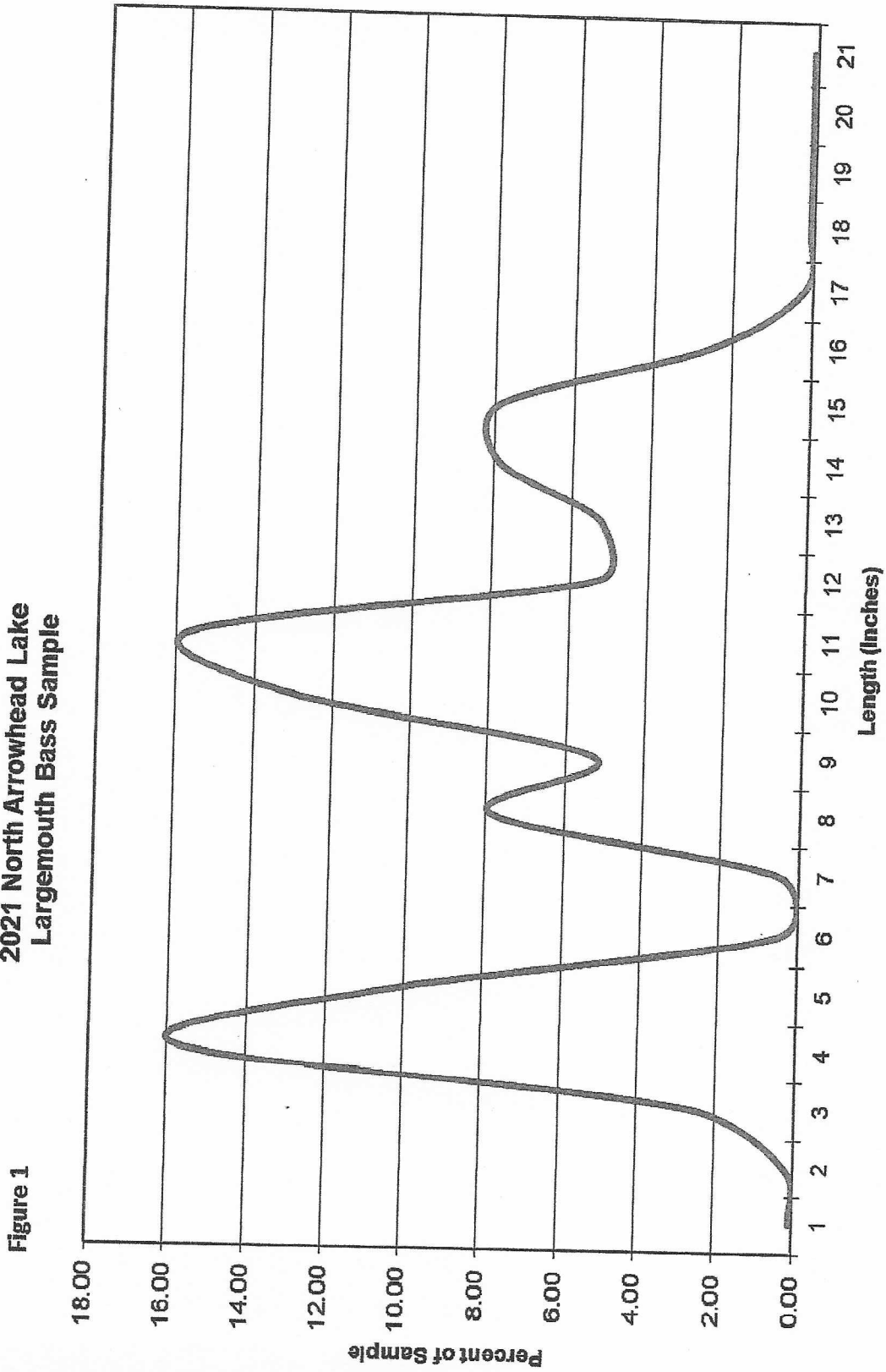
- Continue the removal of common carp with electrofishing during future surveys.
- No harvest of largemouth bass from the lake.
- No stocking of additional native game fish species
- Trout can continue to be stocked for the purposes of "put and take" fishing
- Survey the fish population in September 2024.

TABLE 1

Survey Data on North Arrowhead Lake taken 9-27-21

SPECIES	NUMBER SAMPLED	LARGEST FISH	MOST COMMON SIZE
Largemouth Bass	39	16.5"	4"-6" & 11"-12"
Bluegill	82	9"	5"-6"
Pumpkinseed	15	6"	4"-5"
Yellow Perch	61	12"	5"-7"
Black Crappie	17	13"	8"-9"
Golden Shiner	28	7"	3"-4"
Rockbass	2	8"	n/a
Brown Bullhead	2	10"	n/a
Common Carp	31	30"	4 to 7 lbs
Rainbow Trout	4	16"	15"-16"

2021 North Arrowhead Lake
Largemouth Bass Sample



2021 North Arrowhead Lake Largemouth Bass Length / Weight Ratio

Figure 2

