Aquatic Environmental
SERVICES, INC.

August 17, 2001

Providence Lake HOA
C/O Larry Dilbeck
13530 Providence Lake Dr.
Alpharetta, GA 30004

Dear Mr. Dilbeck:

Aquatic Environmental Services, Inc. conducted an electrofishing survey and water quality analysis on Providence Lake on July 19, 2001. The fish analysis was performed using an electroshock boat that stuns most fish species but has very low mortality. The fish analysis and water quality analysis determines the current status of the fisheries.

The data collected was analyzed and provides insight into the proper future management of the pond to achieve your fishing goals. The data generates a report describing current conditions of the fishery. Based on the current fish populations, management recommendations are made to help improve the fishery.

Methods

Electrofishing is the most scientifically advanced method of analyzing fish populations in freshwater lakes and ponds in the southeastern United States. A 4-stroke engine emitting little if any pollutants into the water powered the boat. The electroshock boat has its limitations, in that the effective shocking range is a 10-foot area around the front of the boat to a depth of 6 feet. It is biased toward elongated species such as largemouth bass due to higher conductivity. It also shocks large fish better than small fish, and is not as efficient shocking catfish species.

All habitat types found in the lake were sampled including open water, shallow points, wood structure, shallow coves and deeper dropoffs. By sampling all habitats all species should be collected excluding catfish. The water visibility and water temperature was sufficient for the capture of fish.

Table 1. Water quality analysis performed at 10:00 a.m. on July 19, 2001.

Parameter	Result
Conditions	82^{o} Sunny
Water Temperature	84
pH	7.4
Dissolved Oxygen	12.8 mg/l
Visibility	56”
Hardness	12 mg/l
Alkalinity	10 mg/l

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Results

Water Quality Results

The results fall within an expected range. The descriptions for each parameter are described below. The pH and dissolved oxygen readings for both ponds were normal for this part of the day. The hardness and alkalinity levels were also sufficient since a fertilization program is not suggested. The high visibility contributes to the weed problems by allowing sunlight to penetrate to the bottom in the shallow areas.

The fecal coliform is the best analysis to determine the potential for health-related problems that may occur when coming in contact with the lake water. The fecal coliform analysis does not test for all potential pathogens, but rather serves as an indicator test. It tests for the presence of E.coli. Elevated levels could be attributed to many sources. Some of the more common are leaking sewer lines or septic systems or excessive waterfowl use.

The GA EPD sets a standard of 200 colonies/100mls for recreational use lakes meaning lakes used for swimming and/or fishing. The standard is based on a monthly average above this level for a minimum of four samples. With a direct sewage leak you would see readings from 1,000 to 100,000 colonies/100 ml. The results of the fecal coliform analysis were below the EPD safe level since it was 4.

Water Quality Parameter Descriptions

Temperature

The temperature affects many other parameters making it critical to determine and report. It is also a major factor in the reproduction strategies of many fish species. When measured as a depth profile it indicates the possibility of year around trout habitat.

Fecal Coliform

Fecal coliform analysis determines the concentration of the bacteria *Escherichia coli*, which is specific to the guts of birds and mammals. The bacteria itself resides in the gut of humans, and is not harmful unless in high numbers. It serves as an indicator of possible sewage contamination because it persists longer than most other harmful pathogens associated with sewage, and it does not prosper or reproduce outside its host animal. Fecal coliform can originate from human or animal sources, and is usually higher after rains. Levels are not of concern unless above 200 colonies per 100 ml of lake water. High levels indicate a sewage leak, animal waste in the watershed, or excessively high numbers of waterfowl utilizing the lake.

Visibility

Visibility is measured with the use of a secchi disc. The white/black disc 20-cm in diameter is lowered vertically through the water until it can no longer be seen. Suspended particles reduce this visibility level. Therefore, in the absence of turbidity from silt or mud the secchi disc serves as an international standard to indicate phytoplankton abundance. The desired range to maximize fish production is between 18 and 24 inches.

pH
The pH measures the concentration of the hydrogen ions present in the water, and is usually thought of as the measurement of acidic or alkaline conditions. A pH of 7 is neutral with lower values being acidic and higher values being alkaline. Most organisms in a lake prosper when the pH is maintained between 6.5 and 9. The pH cycles daily due to a complex interaction of alkalinity, hardness, carbon dioxide, and photosynthesis and respiration. The lake is more acidic in the mornings, and varies with depth. When pH levels are out of the desired range for long periods, detrimental affects may occur.

Dissolved Oxygen
Dissolved oxygen (DO) is a measure of the amount of oxygen available to aquatic organisms, and is reported as mg/l or percent saturation. Percent saturation is a representation of how much oxygen is dissolved in the water relative to the amount of oxygen that can be held at a specific temperature. Colder water can hold more oxygen than warm water. Dissolved oxygen fluctuates daily with it being at its lowest levels in the early morning hours. DO does not pose a problem for most fish until levels fall below 3 mg/l. A dissolved oxygen profile shows how stratification affects DO levels as depth changes.

Hardness
Hardness is a measure of the quantity of divalent ions in water. Generally in Georgia, calcium and magnesium carbonate account for the majority of the hardness. Hardness levels affect the toxicity of some algaecides, limit phytoplankton formation, and play a role in fish growth. Levels below 20 mg/l should be increased with the addition of 2-4 tons per acre of agricultural lime.

Alkalinity
Alkalinity is defined as the quantity of base present in water. The most common bases include carbonates, bicarbonates, hydroxides, and phosphates. Total alkalinity is closely related to hardness with both being reported as mg/l $CaCO_{3.}$ Alkalinity basically determines the buffering capacity of a lake. A good buffering capacity will absorb introductions of acids and bases with less change in pH levels. Good alkalinity reduces the magnitude of daily pH swings making available more phosphorus for phytoplankton formation resulting in a lake that has an increased carrying capacity.

Electrofishing Results
The pond has a limited number of intermediate size bluegill *Lepomis macrochirus*. The following bluegill were captured: 2 1-2”, 0 2-3”, 5 3-4”, 0 4-5”, 4 5-6” and 2 > 6”. This low occurrence of intermediate size bluegill indicates a bass heavy environment.

Electroshock resulted in 20 largemouth bass *Micropterus salmoides.* There were 5 less than 10-inches, 12 between 10 and 12-inches and 3 greater than 12-inches captured. The largest bass 16-inches weighing 2-lbs was tagged with a blue tag. Also captured were warmouth *Lepomis gulosus*, and redbreast sunfish *Lepomis auritus.*

Redear sunfish (shellcracker) *Lepomis microlophus* were also collected and are good since in most case they get a little larger than bluegill. The redear is a beneficial species that compliments the bluegill. A lake is normally stocked 20% redear and 80% bluegill due to the lower reproduction level of shellcracker. The bluegill will provide more prey for bass, but the shellcracker feeds on mollusks and do quite well in most lakes.

The fish that needs to be removed is the white crappie *Pomoxis annularis.* It is a controversial species that according to the GA Department of Natural Resources is not recommended for stocking in most private ponds. Crappie compete with both bass and bluegill for food. They are discouraged due to competition and for potential "takeover". The crappie reproduce sooner than most bass meaning the largemouth bass fingerlings born the same year can not control the numbers the way they can bluegill born throughout the summer. What may result is a lake with many small crappie and reduced bass growth rates. It is strongly recommended to remove all caught crappie.

An additional pond assessment is a relative weight index (RW) conducted on adult bass. A relative weight index is a comparison of a standard weight of a bass at a given length compared to the actual weight of the collected bass at the same length. It determines the "plumpness" of individuals, and values over 90% indicate that the bass are fairly healthy with an adequate forage base.

When relative weights are below this level the food source is limited for bass. In this case a good harvest plan will result in the bass left in the pond having more food in which to grow. Goals should be set for an average RW of 100% when managing for quality bass fishing.

The RW average was 86% indicating the fish are healthy but could be improved by harvesting a few of the smaller 10 to 13-inch bass. What is happening is the bass simply have a limited "ideal" food supply. The lake has the presence of few intermediate 3 to 6-inch bluegill the larger bass need for forage. Bass feed efficiently on bream 1/3 their length, but much more energy is used while capturing several small two-inch fish to equal a four-inch fish. What energy the bass has left goes into reproduction. What is sacrificed is weight gain.

Management Recommendations

It is the goal in most lakes to have a balanced condition. This does not mean a true equilibrium, but a satisfactory relationship between the predator (bass) and prey (bluegill) populations. When balanced, the prey are reproducing at high numbers providing forage for the predator, and the predator has the proper numbers to limit the number of prey. As a result, the pond produces catchable size bass and bluegill. General lake management advice and explanations are found in the articles *Pond Management 101* and *Do It Yourself Hawg Pond*.

Harvest
Since most folks on the lake would give up catching as many small bass for a better chance of catching some larger ones, I suggest removing 250 largemouth bass between 10 and 13-inches. The most important way to help the balance of the pond is through the aggressive removal of all crappie caught. I am including a guide to help identify the difference in bream species and crappie.

Stocking
If desired channel catfish can be stocked to provide a good fish for kids to catch. They are $1.00 each for a 10 to 12 inch size or $.75 for 7 to 9-inches, and you may stock up to 100-channel catfish/acre without negatively impacting the balance of the pond.

Weeds/Algae
The upper end of the pond has a large infestation of a weed called bladderwort that is difficult to treat with herbicides. We have performed 3 applications of a granular herbicide at a cost of over $400 to help this problem. The best way to combat this problem is with the maintenance of grass carp populations. This is difficult due to the spillway design allowing escape. We have designed a barrier that should allow most debris to pass through but keep in the grass carp during all but extreme rainstorms. Hopefully by next spring the barrier will be installed and we can stock an additional 60 10-12 inch grass carp.

Supplemental Feeding
Feeding the bluegill floating fish food creates healthier bluegill that reproduce at higher rates thus increasing the carrying capacity. This means even more bass food and more catchable bream for fun and to eat. This is one of the easiest methods to increase the capacity of the pond because it jumps ahead two levels in the food chain.

Interested lakeowners can place fish feeders on their docks that will provide a great food source on a continuous basis. The feeders also concentrate bluegill for easier fishing especially for kids. I carry two lines of feeders with many different options so those interested call for details. This is also critical if you plan on stocking channel catfish.

Conclusion
I hope this helps explain the why and how of your lake management plan. The pond is in good shape, and can improve for fishing by increasing the carrying capacity with feeding, and removing any crappie since they can “takeover” the pond and ruin fishing. Feel free to call with any questions.

Sincerely,
Aquatic Environmental

Greg Grimes
President

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