August 6, 2004

RE: Providence Lake Fishery and Water Quality Survey

Aquatic Environmental Services, Inc. conducted an electrofishing survey Providence Lake on July 30, 2004. We performed the fish analysis using an electroshock boat that stuns most fish species, but has a very low mortality. Additionally, a water quality analysis was performed.

The data collected from this study was analyzed and used to describe the current conditions of the fishery. Management recommendations are based on the current fish population in the pond and are made to improve the fishery by providing insight into the proper management of the pond to achieve your personal fishing goals.

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. This boat effectively shocks a range of up to 10 feet in front of the boat and to a depth of 8 feet. It is biased toward elongated species such as largemouth bass due to higher conductivity. It also shocks larger fish better than small fish, and is not as efficient shocking catfish species.

We sampled all habitat types found in the lake, including open water, shallow points, wood structure, shallow covers, and deeper drop-offs. By sampling all habitats, all species present can be collected. Water conditions, such as visibility and temperature, were sufficient for the capture of fish.

Table 1. Electrofishing Results

Species	Size	Quantity
Bluegill	2-3 inch	1
Bluegill	3-4 inch	0
Bluegill	4-5 inch	0
Bluegill	5-7 inch	1
Bluegill	7-9 inch	3
Shellcracker	4-6 inch	2
Shellcracker	6-9 inch	8
Shellcracker	>9 inch	1
Redbreast	7-9 inch	1
Bass	4-8 inch	9
Bass	8-10 inch	13
Bass	10-12 inch	8
Bass	12-14 inch	3
Bass	>14 inches	1
Average Relative Weight		85%

The lack of intermediate ranges of bluegill and shellcracker and the high percentage of bass 8-14 inches indicates a "bass heavy" environment. Although not captured we know the lake also has a population of crappie. Please see **Management Recommendations** for suggestions regarding fishery improvements.

As shown in Table 1., an additional pond assessment we conduct is a relative weight index (RW) on adult bass. This is a comparison of the standard weight of a bass at a given length to the actual weight of the collected bass at the same length. It determines the "plumpness" of the specimens. Values over 90% indicate a healthy bass population and adequate forage base. Relative weights below this level indicate limited "ideal" food sources for bass.

While your pond does contain bluegill, the absence of intermediate bluegill indicates that your larger bass do not have the "ideal" food source. Bass feed efficiently on bream 1/3 their length. When this ideal food source is unavailable the bass are forced to forage on a larger number of smaller fish. This causes the bass to expend more energy and weight gain is sacrificed. In this case, a good harvest plan will result in a better balance between the bass population and the ideal food supply. The RW average for your pond is calculated to be 85% with the biggest bass measuring 22 inches. Goals should be set for an average RW of 100% when managing for quality bass fishing.

Water Quality Results

Table 2. Water quality analysis performed on July 14, 2004.

Parameter	Results
Conditions	Cloudy; 92° F
Water Temperature	90° F
pH	7.5
Dissolved Oxygen	7.42 mg/L as $CaCO_3$
Visibility	46 inches
Hardness	10.3 mg/L Total as $CaCO_3$
Alkalinity	5
Fecal Coliform	< 5 (EPD safe limit is 200)

Water Quality Parameter Descriptions

Fecal Coliform

Fecal coliform is the measure of 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.

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.

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 will also vary according to depth. When pH levels are out of the desired range for long periods, detrimental affects may occur.

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.

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 15 mg/l should be increased with the addition of 2-3 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. By maintaining the desired pH levels nutrients are more available to phytoplankton resulting in a lake that has an increased carrying capacity.

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.

Results

The results fall within a normal range for a community pond. The visibility measured 46 inches, which is significantly higher than the preferred 18-24 inches for maximum fish production. A fertilization program could resolve this problem, but Providence Lake is also used for recreational activities other than fishing and water clarity is more desirable for a community pond. The alkalinity is low but again is not a concern unless maximizing fish production. The oxygen and pH levels were adequate and normal.

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. Elevated levels could be attributed to many sources (see general descriptions).

The GA EPD sets a standard of 200 cfu/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 was a low level indicating the water is safe should anyone go swimming or come in contact with the water while fishing in the lakes.

Goals
The lake is in a community where most lake owners desire good quality fishing for bass, bream, and additional species. These goals can be accomplished by adhering to the following recommendations made with these very goals in mind.

Management Recommendations
In addition to your individual goals, it is the goal in most lakes to have a balanced relationship between the predator (bass) and the prey (bluegill) populations. When these populations are balanced the prey are reproducing at high enough numbers to serve as forage for the predator, and the predator has a population large enough to limit the number of prey. As a result, the pond produces catchable size bass and bluegill. In order to achieve all of these goals as listed above, I recommend the following:

1. **Harvesting –** Currently the lake is slightly "bass heavy". It has more bass than you have fish species that serve as their food source. We removed several stunted bass that measured 8-12 inches during the survey and harvesting an additional 400 bass this year measuring less than 12 inches will improve the population by better balancing the prey to predator ratio. It also promotes a less competitive environment amongst the bass themselves by allowing for more food per bass. These factors lend themselves to greater bass productivity with increased weights, disease reduction, and better reproduction. Because your bluegill population is currently low, I advise you to restrict the harvesting of these. Although not captured, via electrofishing, any crappie caught when fishing should be removed to help prevent over populating.

2. **Stocking -** Since lacking bluegill in the 3-5 inch range, I recommend stocking 2000 intermediate bluegill (4-6 inches in length). We can provide you with these for a charge of $1300 including delivery. By stocking more of the bluegill the lake will produce better quality bass. Additional fish species recommended for the purpose of producing quality bass are threadfin shad. The shad occupy an additional niche in the food chain and this provides additional forage for bass. Shad are sold by the load for $1,000. A load consist of 3500-5000 adult shad and should be stocked in the spring. An additional species mentioned in the past is the stocking of channel catfish. To discuss stocking of these please call for prices, sizes and availability.

3. **Supplemental Feeding –** Feeding the bluegill floating fish food creates healthier bluegill that reproduce at higher rates therefore increasing the bluegill population. More importantly, feeding bluegill increases their weight, which consequently increases the weight of the bass. This is one of the easiest and most efficient methods for improving the pond. Having a feeder in the pond provides a great food source on a continuous basis. The feeders also concentrate bluegill for easier fishing. For questions on feeders, food and pricing, please call us.

4. **Fertilizing –** Fertilizing a pond increases its productivity. An unfertilized pond produces 100-150 lbs. per acre while a fertilized pond produces 300-350 lbs. per acre thereby tripling your ponds productivity. When done properly, the visibility is decreased to a depth of 18-24 inches. This lower visibility helps deter weed growth by blocking sunlight reaching lake bottom. Fertilizer promotes phytoplankton. This is a food source for an organism known as zooplankton. Zooplankton is a favorite food source for aquatic insects eaten by bluegill, which are in turn a food source for the bass. I recommend using a water-soluble fertilizer. This fertilizer is a 12-52-4 mixture high in phosphorus, a limited nutrient in southeastern ponds. Applications should continue through the summer until October to maintain the 18-24 inch visibility. We can provide this service if fishing becomes greater importance on the lake.

5. **Pond Habitat –** The overall conditions of the lake were good, but can be improved by the addition of more cover. Cover will attract bluegill and allow bass more opportunity for ambush points when foraging, as well as concentrate fish for successful fishing. The weeds and algae and specifically bladderwort of the past have not presented a problem this year. This indicates grass carp populations are currently at adequate levels.

Conclusion

The fishing in your pond should continue to improve when implementing the above recommendations. Harvesting, stocking, supplemental feeding, fertilizing, and habitat improvement will produce the results that you desire. Please feel free to call with any questions or to place an order.

Sincerely,
Aquatic Environmental

Russell Nix
Aquatic Ecologist