

Aquatic Environmental

RE: WATER QUALITY ANALYSIS RESULTS

July 29, 2008

Dear Lakeowners:

Aquatic Environmental Services, Inc. conducted a water quality analysis including fecal coliform on **July 29, 2008 at 7:55 AM at Providence lake**. The data collected from this study was analyzed and used to describe the current conditions of the water quality and uses. Based on these results, recommendations are made to correct water quality issues.

METHODS

We conducted the water quality analysis using oxygen meter equipment (YSI model 55) for dissolved oxygen (DO) and temperature determinations. Hardness and alkalinity were determined by using a portable Hatch® digital titrator. We used a secchi disk to determine visibility. A portable meter (ExStick 11) was used to determine pH and conductivity.

Fecal coliform was determined by collecting a water sample in the effluent area. Samples were stored in sterilized plastic bottles at 10 °C and released to a private lab (Environmental Management Services, Inc) for analysis less than 6 hours after collection.

I- WATER QUALITY EVALUATION

The results fall within a normal range for a community lake (Table 1). The visibility measured >**36** inches, which is above the preferred 18-24 inches for maximum fish production. However, this is the level desired for the aesthetic appeal of a community lake. The alkalinity was low but this is not a concern unless maximizing fish production. The oxygen and pH levels were adequate and normal for production and aquatic life. Aquatic weeds were not present in the lake. Additional information about these water quality parameters is provided as an annex at the end of this report.

III- CONCLUSIONS

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In general water quality is adequate for production of fish. Also water quality indicates the lake is safe for recreational activities. If you have any question or need more information about issues discussed in this report, please feel free to contact us.

Table 1. Water quality analysis results.

Parameter	Results	Desired range
Air Temperature (°F)	75	-
Water Temperature (°F)	85	-
pH	6.72	6.5-9
Dissolved oxygen (mg/L)	7.3	5-10
Visibility (inches)	>36	18-24
Conductivity (µS/cm)	51.8	>50
Alkalinity (mg/L as CaCO ₃)	7	>20
Fecal (colonies/100 ml of water sample)	10	<200

II- FECAL COLIFORM ANALYSIS

The water sample collected on **July 29, 2008 at 7:55 AM** contained **10 colonies/100ml**. This is below the maximum limit set by EPD and the Georgia Department of Natural Resources Rules and Regulations for Water Quality Control (Chapter 391-3-6, revised May 22, 1997). According with these regulations recreational waters should not exceed 200 colonies/100 mL (Table 2). Therefore, at this time the watershed and lake is safe should humans come in contact with the water.

Fecal coliform is the measurement of the concentration of the bacteria *Escherichia coli*, which is specific to the guts of birds and mammals. They are not dangerous by themselves (pathogenic), but their presence in high number can be an

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indicator of the existence of potentially harmful microorganisms. Pathogens are relatively scarce in water, making them difficult and time-consuming to monitor directly. Instead, fecal coliform levels are monitored, because of the correlation between fecal coliform counts and the probability of contracting a disease from the water.

For instance, if fecal coliform counts are high (over 200 colonies/100 ml of water sample) in the lake, there is a greater chance that pathogenic organisms are also present. A person swimming in such waters has a greater chance of getting sick from swallowing disease-causing organisms, or from pathogens entering the body through cuts in the skin, the nose, mouth, or the ears. Diseases and illness such as typhoid fever, hepatitis, gastroenteritis, dysentery, and ear infections can be contracted in waters with high fecal coliform counts.

Some of the more common sources of fecal coliforms are leaking sewer lines or failed septic systems, animal waste in the watershed or excessive waterfowl use. Traditionally the fecal coliform test 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 coliforms were once thought only to be persistent for 24-48 hrs after leaving their host warm-blooded animal or birds. But, in warm, moist climates, such as here in Georgia, these micro-organisms may bind with the sediments, nutrients and other bacteria of the soil and remain there dormant for several months until say a ground disturbance or rain event transport this contaminated sediments to streams and lakes. For example, if sampled after a rain event, fecal coliforms can reach elevated levels (i.e., 500 to 10,000 colonies/ml). For this reason, erosion and sedimentation activities are also an important factor along with possible sources of pathogens and bacteria to monitor within your respective watershed basin upstream of your lake.

Table2. Fecal coliform (FC) standards for different sources of water.

Water use	Coliform standards (colonies/100 ml)
Drinking water	1 TC*
Total body contact (swimming)	200 FC
Partial body contact (boating)	1000 FC

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Treated sewage effluent

Not to exceed 200 FC

* Total coliform (TC) includes bacteria from cold-blooded animals and various soil organisms.

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Sincerely,
Aquatic Environmental Services

Mike Rosa
Lake Management Supervisor

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Water Quality Parameters Description:

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 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.

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 lakes prosper when the pH is between 6.5 and 9. The pH cycles daily due to complex interactions of alkalinity, hardness, carbon dioxide, and photosynthesis and respiration. The lake is more acidic in the mornings, and will 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.

Conductivity

Conductivity is a measure of the ability of water to pass an electrical current and is important to determine the effectiveness of electrofishing. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge).

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 reported as mg/l CaCO₃. Alkalinity determines the buffering capacity of a lake. A good buffering capacity will absorb introductions of acids and bases minimizing pH swings. By maintaining desired pH levels nutrients are available to phytoplankton resulting in a lake with increased carrying capacity.

Visibility

Visibility is measured with the use of a secchi disk. 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.

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