1-1-2010

Fecal Indicator Bacteria Concentrations in Furman Lake and its Feeder Streams

Philip Hearn

T.J. Melton

Emily Tripp

Victoria Grimm-Oropesa

Fecal Indicator Bacteria Concentrations in Furman Lake and its Feeder Streams

Philip Hearn, TJ Melton, Emily Tripp, and Victoria Grimm-Oropesa

SUMMARY

One of the primary objectives of the Lake Restoration Project is to improve the water quality of the lake by reducing the amount of fecal bacteria. The Environmental Protection Agency (EPA) and South Carolina Department of Health and Environmental Control (SCDHEC) set limits for fecal coliform, E. coli, and Enterococcus concentrations in recreational waters at 126 cells/100mL (EPA), fecal coliform at 200 cells/mL (Sc DHEC), and Enteroococcus at 33 cells/100mL (EPA). In previous years, students enjoyed activities such as boating, swimming, and fishing in Furman Lake. Nowadays, these practices are prohibited due to elevated concentrations of total coliform, Escherichia coli, and Enterococcus sp.

There are two tributary streams feeding Furman Lake (Fig. 1) . We analyzed water chemistry and fecal indicator bacteria concentrations from the tributary passing under Poinsett Highway and through North Village Apartments. The other tributary passes through a forested area. Previous research has demonstrated that urbanization leads to increased concentrations of fecal indicator bacteria; therefore, we sampled five sites along the North Village Stream. We sampled upstream and downstream of both Poinsett Highway and North Village Apartments in order to assess the source of the elevated bacterial concentrations.

We found significantly elevated total coliform concentrations downstream of North Village (FU0G, FU01) as compared to levels upstream of Poinsett Highway (Fig. 2). There were no significant differences in E. coli or Enterococcus sp. concentrations among the five sites, however, and levels of these E. coli and Enterococcus were below EPA thresholds (Fig. 3,4). Additionally, water temperatures were higher downstream of North Village which may be due to increased impervious surface runoff. There is a significant correlation between dissolved oxygen and E. coli concentration ($r=0.631$ $p=0.0018$,). Total coliform and temperature were positively correlated ($r=0.7533$ $p=0.0012$).

Further research could assess the stream quality by means of fecal indicator bacterial concentrations in both tributary streams feeding Furman Lake. More sampling would improve the statistical strength and enable us to understand trends in water chemistry and bacterial concentrations over time. Two streams feed into the Furman Lake Stream, and another potential study involves testing the water quality of these headwaters.

Figure 1. Map of collection sites of second order streams feeding Furman Lake in Greenville, SC. FU0G, FU01, FU00, FUDP, and FUUP were sampled three times on April 7, 2010 for chemical and bacterial data. Conductivity, pH, dissolved oxygen, temperature, and fecal indicator bacteria concentration were quantified at each of five sites. Previous fecal indicator bacteria quantification has been recorded from FU01, FU04, and FU05 between July 2006 and November 2009. Black lines represent streams and dots represent sample collection sites.

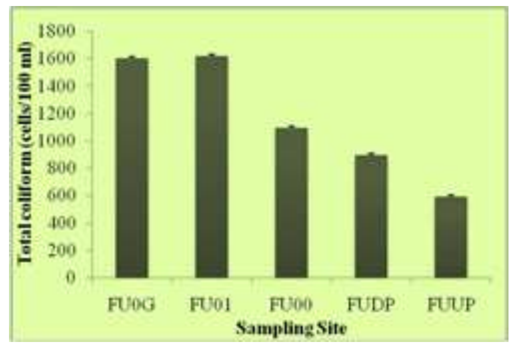

Figure 2. Mean total coliform concentrations in a second order stream feeding Furman Lake in Greenville, SC. FU0G, FU01, FU00, FUDP, and FUUP were sampled three times on April 7, 2010. Total coliform concentrations were statistically different among the five collection site according to ANOVA (p=0.0298).

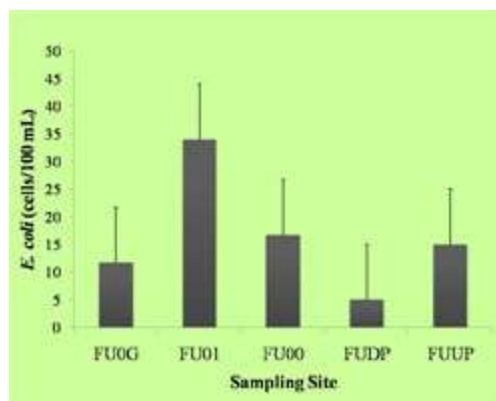

Figure 3. *E. coli* concentrations in a second order stream feeding Furman Lake in Greenville, SC. FU0G, FU01, FU00, FUDP, and FUUP were sampled three times on April 7, 2010. *E. coli* concentrations were not significantly different among the five collection site according to Kruskal-Wallis analysis (p=0.0705).

Figure 4. *Enterococcus* sp. concentrations in a second order stream feeding Furman Lake in Greenville, SC. FU0G, FU01, FU00, FUDP, and FUUP were sampled three times on April 7, 2010. *Enterococcus* concentrations were not significantly different among the five collection site according to Kruskal-Wallis analysis (p=0.3820).