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# The Effect of Bioretention Areas on the Heavy Ion Concentration, pH, and Water Quality of the Furman University Lake

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**Summary**

The water quality of Furman University Lake has been declining in recent years. One source of the sediment and pollution that enters the lake is runoff from storm drains, parking lots, and other impermeable surfaces. The Lake Restoration Task Force installed three rain gardens, or bioretention areas, around the lake in an effort to increase in the water quality of the lake by addressing this issue of rainwater runoff. These rain garden areas include various plant species such as lichens, mosses, and sedums that are low growing and are tolerant to extreme conditions such as drought and flood. Along with hardy plant species that aid filtration, rain gardens were also equipped with and sandy soil that allowed percolation of the water in the hopes that water would be filtered easily.

Previous studies have shown that rain gardens have profound effects on water quality. Reductions in heavy metal ions, acidity, and other pollutants, as well as neutralization of pH have been observed, indicating that bioretention areas can drastically improve the water flowing into aquatic ecosystems which improves aquatic community ecosystems. This study examined if water enter and leaving the rain gardens during storm events had different concentrations of ions, suggesting that the rain garens were filtering the water effectively.

Immediately following a thunderstorm, two 500 mL samples from each of the three bioretention areas surrounding the Furman University Lake were taken on March 29, 2010. The first sample was taken from standing water at the top of each of the rain gardens and a second sample was taken from standing water at the bottom of each bioretention area to measure the difference in water quality and chemical content between the top and bottom of the bioretention area after water had filtered through the gardens. The pH levels, dissolved oxygen levels, and conductivity levels for the top and bottom of the bioretention area were measured using a dissolved oxygen meter and a pH meter. Following filtration, each sample was tested for levels of dissolved oxygen, turbidity, pH, and conductivity. Specific ions analyzed included Fe2+, Cl-, NO2-, NO32-, F- , NH4+, H2PO4-, SO42- ,H2NO2-, NO2-, Na+, K+, Mg2+, and Ca2+. Data were analyzed using pair-wise t-tests.

There were no statistically significant differences in the characteristics of the water entering and leaving the rain gardens, but several trends in the data do suggest some filtration of water occurred. In all three bioretention areas around Furman Lake, a lower concentration of H2PO4- was found at the bottom of the rain garden compared to the top. At site FURG 3, the level of H2PO4- actually fell from 0.08mg/L at the top to below detectable levels at the bottom. A similar trend was observed at sites FURG 1 and 3 where NO2- levels dropped from positive values at the top of the bioretention site to below detectable levels at the bottom. All three sites also exhibited a drop in NO32- concentration from the top to the bottom of the bioretention area. These trends in the data are suggestive that levels of some potentially damaging compounds are being filtered by the bioretention sites, thus, providing a benefit for Furman Lake.