

Final Report on Characterization of Hydrologic Input into Lake Greenwood

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Project Objectives and Methods

Introduction and Objectives

The goal of this research was to characterize the loadings of key contaminants into Lake Greenwood from the two major basins in the watershed: Reedy River and Saluda River.

To accomplish this goal, the following objectives were accomplished:

1. Sampling sites were chosen at the bottom of each basin as close to the entry to Lake Greenwood as possible.
2. Sampling instrumentation was established at these sites to collect discrete samples before, during, and after storm events.
3. Sample approximately 25 storm events between 11/03 and 6/05.
4. Measure total suspended solids, total dissolved nitrogen, dissolved organic carbon, chloride, nitrite, orthophosphate, bromide, nitrate, sulfate, total phosphate, total potassium, total calcium, total magnesium, total zinc, total copper, total manganese, total iron, total sulfur, total sodium, total boron, and total aluminum for each sample.
5. Using measured flow rates and water quality measurements, calculate loadings for each variable.
6. Calculate daily loadings for each constituent.

Results and Discussion

Sampling stations were established at the base of each watershed (Fig 1). Stations were solar powered and equipped with ISCO samplers, flow meters and phone or satellite communication to signal when the samplers were flow-activated (Fig 2). Samples were collected from over 25 storm events from December, 2003 through June, 2005. All

water quality analyses were conducted using standard methods. For detailed methods please contact sklaine@clemson.edu. Flow data were obtained from nearby U.S. Geological Survey gauging stations.

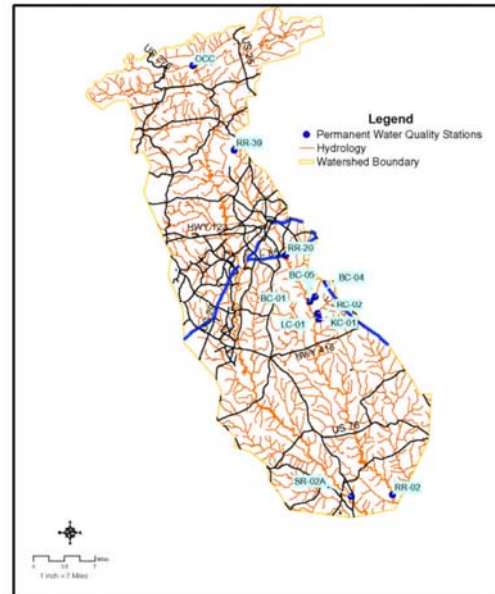


Figure 1. Saluda-Reedy watershed showing permanent water quality stations operated by Clemson University researchers. SR-02A and RR-02, located at the bottom of the Saluda and Reedy River basins are the sites for this research.

In general, constituent concentrations, with the exception of Total suspended Solids (TSS) were greater on the Reedy River (Fig. 2). The higher concentrations may reflect the contribution of point source discharges on the Reedy River while the higher concentrations of TSS probably reflect non-point source discharges on the Saluda River.



Figure 2. Sampling shed showing ISCO sampler, solar panel and wireless communication device.

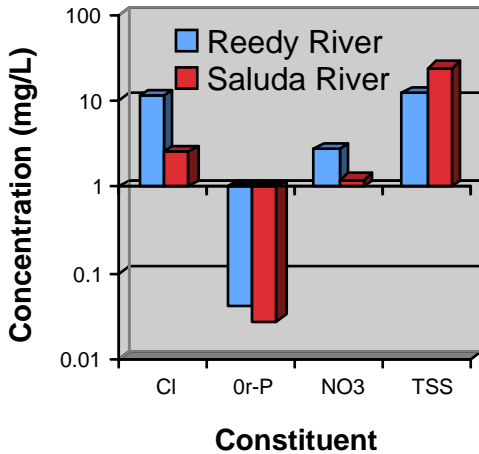


Figure 2. Average daily concentrations of chloride (Cl), orthophosphate (Or-P), nitrate-nitrogen (NO3), and total suspended solids (TSS) for the Reedy and Saluda River basins. These data are for Jan – June, 2004.

The average daily flow in the Saluda River was approximately 3 times greater than in the Reedy River during this time period. Hence, the constituent load contribution from each basin was different than the constituent concentration contribution

(Fig.3). When loads were computed it became clear that the loading of many constituents into Lake Greenwood were approximately equal for both basins.

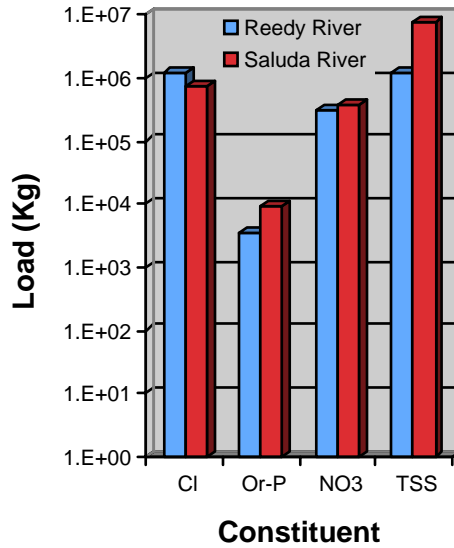


Figure 3. Total load for Chloride, Orthophosphate, Nitrate-nitrogen, and Total Suspended Solids for the Reedy and Saluda River basins during the first 6 months of 2004.

The obvious inconsistency is TSS. The Saluda River Basin contributed almost 8 times more TSS during the first 6 months of 2004. This could be due to the fact that land use in the Saluda River basin is more agricultural. In addition, there are many new land developments beginning in the Saluda River basin. Poor development practices coupled with inadequate best management practices to control soil erosion undoubtedly contribute to this TSS load.

Another factor to consider is that the Saluda River basin drains twice the land area compared to the Reedy River basin. The fact that the loads of dissolved constituents (ions, nutrients, etc.) were approximately

equal between the two basins suggests that the Reedy River basin contributes approximately twice the load per unit land area. Undoubtedly, this is due to the large number and volume of point source discharges in the Reedy River basin.

Similar results were seen in the second half of 2004 (Figs 4 & 5). Land development continued to increase in the Saluda River basin leading to 9 times more TSS loading into Lake Greenwood from the Saluda Basin as compared to the Reedy River basin.

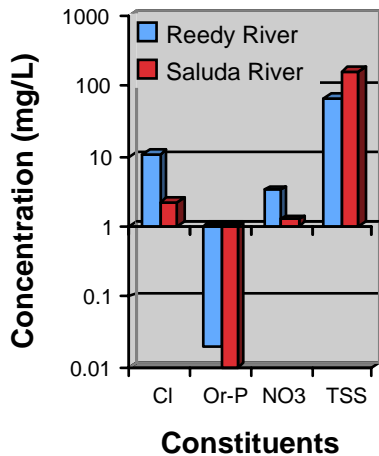


Figure 5. Average daily concentrations of chloride (Cl), orthophosphate (Or-P), nitrate-nitrogen (NO3), and total suspended solids (TSS) for the Reedy and Saluda River basins. These data are for July – December, 2004.

For the last 6 months of 2004, the flow in the Saluda River was 6 times greater than the flow in the Reedy River. Hence, while concentrations of dissolved constituents were similar during the two time periods, loads increased slightly in the second half of 2004. TSS concentrations, however, increased nearly six-fold in the last half of 2004 compared to the first 6 months. This coupled with the increased flow resulted in

increased TSS loading approximately an order of magnitude in the last 6 months of 2004 for both basins.

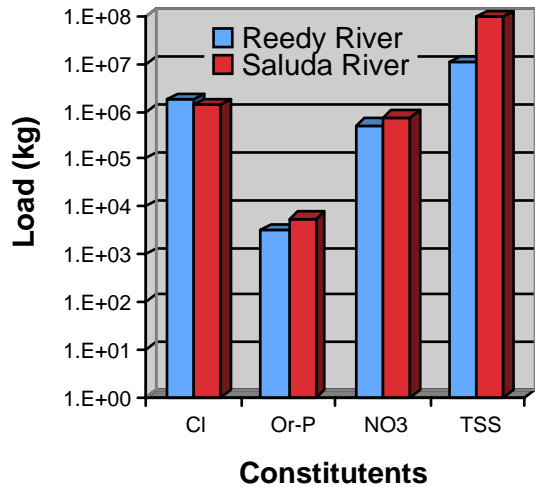


Figure 6. Total load for Chloride, Orthophosphate, Nitrate-nitrogen, and Total Suspended Solids for the Reedy and Saluda River basins during the last 6 months of 2004.

Conclusions

1. With the exception of TSS, constituent loadings into Lake Greenwood were approximately equal between the Reedy and Saluda River basins.
2. TSS loading was significantly higher in the Saluda River Basin.

