

Humans have modified the nitrogen cycle tremendously, particularly increasing the flux from terrestrial to aquatic environment. One focus of the River Basin Research Initiative at Furman University is the relationship between urbanization and nitrogen concentrations of streams in the South Carolina piedmont. Brushy Creek watershed, with 60% urban land cover, is the most urbanized watershed in the area. Unlike studies of previous watersheds, urbanization was concentrated in the headwaters of Brushy Creek, and no point source or agriculture inputs exist. The objective of the study was to characterize trends in nitrate concentrations and the biogeochemical processes controlling them.

In the summers of 2004 and 2005, water samples were collected from 31 localities for a total of 156 samples. Samples were analyzed for pH, dissolved oxygen, conductivity, major cations and anions, dissolved organic carbon, total dissolved nitrogen and alkalinity. In contrast to previous urban watershed studies, small headwater streams had the highest concentrations of total dissolved nitrogen. Unlike forested watersheds, which typically contain significant dissolved organic nitrogen, dissolved nitrogen in Brushy Creek was mostly nitrate. Nitrate concentrations at the headwaters ranged from between 9 and 16 mg/L and exponentially decreased to approximately 3 mg/L in the main channel.

With commercial urban land cover, the primary source of nitrogen in headwaters likely is acid deposition. Unlike forested watersheds, denitrification is not a significant sink of nitrogen, perhaps allowing nitrogen to accumulate. Stream incision could also lead to enhanced nitrification. Ponds in the urban landscape proved to be a significant sink of nitrogen.