

Effects of land use and vegetation density on nitrate concentration using remote sensing
and GIS

Christy Gullikson, Tyler Bax, Suresh Muthukrishnan, and Brannon Andersen
Earth and Environmental Sciences, Furman University, Greenville, SC 29613

High nitrate concentrations in streams have adverse effects on water quality and have been correlated with specific land use types within a watershed. The 1878 square kilometer Enoree River basin in Upstate South Carolina incorporates different land uses and variable nitrate concentrations. Brushy Creek, a more developed sub watershed, was studied using remote sensing and geographic information systems to assess the effect of spatial distribution of land use, and density of vegetation on nitrate concentrations. Thirty meter resolution Landsat ETM+ satellite imagery of the Enoree River basin, acquired in June of 2000, was used to develop land use data for the watershed. The same satellite imagery was used to calculate the normalized difference vegetation index. GIS was used to combine and analyze land use, vegetation index, and nitrate data collected from fifteen sample sites in the summer of 2000. Nitrate concentrations measured were found to be variable in sample sites that drained small areas (less than 10 square kilometers), but decreased as area increased from 10 to 40 square kilometers. Most nitrate concentrations followed expected trends, increasing as percent commercial and residential land use increased and decreasing as the NDVI increased. Outliers falling off these trends demonstrated that spatial distribution of land use and vegetative cover had a marked impact on nitrate concentrations in the stream.

Key words: land use, remote sensing, GIS, nitrate study, South Carolina