Using GIS Models to Identify Relative Nitrogen Attenuation by Riparian Buffers in the Coastal Plain of North Carolina

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Riparian areas have demonstrated the ability to attenuate nutrients and provide water quality services at the field scale, but services of riparian buffers for downstream users should be assessed at watershed scales. GIS-based riparian models have been developed to connect riparian buffers to agriculture at the watershed scale but the influence of sub-surface flows and variations in agricultural practices were not considered. In the Coastal Plain of North Carolina, flow paths often include significant sub-surface flows which can influence riparian buffer effectiveness. Artificial drainage can also reduce nitrogen attenuation by effectively bypassing existing buffers. Spatial variation in nutrient loads influence the relative degree of water quality service provided by riparian buffers. Here we present the development of a simple GIS-based watershed riparian model that connects various agricultural nitrogen sources with natural buffers via surface and sub-surface flows. The model broadly assesses the relative nitrogen attenuation for the Coastal Plain of North Carolina. To better account for sub-surface flows in the model, we include GIS-derived data layers of local landform and baseflow. In addition, we use existing stream networks, digital elevation models, soils, and landcover data to estimate the influence of artificial drainage layer on relative nitrogen attenuation. When combined in the GIS riparian model, these additional data layers produce maps that highlight the relative nitrogen attenuation by riparian buffers in the Coastal Plain of North Carolina. Such maps can then be used to inform conservation and restoration plans. Although this work was reviewed by EPA and approved for publication, it may not necessarily reflect official Agency policy.