Land use / land cover and discharge in the Altamaha River 1992-2016, Georgia, USA

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Watershed land use / land cover (LULC) is a driver of the quality and quantity of discharge from rivers. Stream discharge may more likely to be affected by the land use / land cover in close proximity than more distant areas of the watershed. Additionally, different LULC classes may stream affect discharge equally across scales and thus scale may be more relevant when managing some LULC at greater distances from streams. Our objectives were to 1) determine if LULC changes in the greater Altamaha are associated with discharge metrics; 2) determine which LULC classes are most related to our focal discharge distribution; and 3) determine spatial scales at which LULC changes are most strongly associated with our focal discharge metrics. The Altamaha River Watershed encompasses five sub-watersheds (The Altamaha, Ocmulgee, Little Ocmulgee, Oconee, and Ohoopee) and covers 35,000 km^2 of Georgia. Stream discharge data were downloaded from the USGS Water Watch program (Altamaha river at Doctortown: station 02225000). Discharge data was selected for 3 year windows centered on the year of each NLCD LULC dataset. Three-year minimum, median, mean, first & third quantiles, and peak recorded discharge were selected as focal discharge metrics. Subsequently, correlations between each discharge metric and aggregate land use / land cover were calculated at each buffer scale. Forest land use was positively correlated with first quantile discharge at the 50 and 500 m stream buffers. Developed LULC near streams was negatively correlated with first quantile discharge at all spatial scales. Wetlands were negatively correlated with the 3rd quantile discharge at the 50 m steam buffer. In several sub-watersheds, agricultural and forest land use strongly correlated with the median and minimum recorded discharge at the 50 and 500 m stream buffers. Developed and wetland land use cover near streams was negatively correlated with minimum recorded discharge in most sub-watersheds. Discharge metrics appear to be most strongly associated with LULC in the immediate vicinity of the stream (50 m) and within larger buffers (500 m). Increased developed LULC may drive decreased discharge through increased surface runoff generating flashier hydrographs. Higher minimum recorded discharges associated with high forest cover and agricultural LULC could result from greater baseflow. These results are may be applicable to planning watershed management as well as targeting forest management and restoration plans.

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