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SWAT Model of Phosphorus Loading to Lake Allatoona

The watershed of Lake Allatoona in North Georgia includes the Etowah River and eleven smaller rivers. Lake Allatoona is classified as in transition to eutrophic and the state has placed a cap on annual phosphorus (P) loads to the lake. Our objective was to develop a watershed-scale model of P transport to Lake Allatoona using the Soil Water Assessment Tool (SWAT). We calibrated SWAT using data from a USGS gauge station on the Etowah River with daily flow and approximately monthly samples of sediment and P concentrations from 1992-1996. We also used monthly samples of flow, sediment concentration, and P concentration collected on each of the major tributaries in a Clean Lakes Study conducted from 1992-1996. Land use data was from 1992. The dominant land use was forest ranging from 79.9 to 95.2% of the area among watersheds. Next was pasture land use (1.5-11.2%), and then low density residential land use (0-10.9%). Pasture land use consisted, for the most part, of combined poultry and beef cattle operations. The mean annual load of total P predicted by SWAT was 175,217 kg/yr, which was about 77% of the limit. Point sources accounted for 10.4% of the total P loading to the lake, pasture land use accounted for 76.3%, urban land use accounted for 7.1%, and forest land use accounted for 3.5%. Pasture had the highest annual export per hectare for sediment and total P (2.24 Mg/ha/yr and 2.62 kg/ha/yr, respectively). Urban land use was intermediate and forest land use had the lowest annual export per hectare. Urban land use has increased in the Lake Allatoona basin since the period we modeled. If this represents a conversion of forest to urban land use, one can expect that the annual load of sediment and P has increased to Lake Allatoona.

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