ASSESSING IMPACTS OF DEFORESTATION ON WATER QUALITY IN AGRICULTURAL LANDSCAPE IN INDIANA

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Indiana is primarily an agricultural state with about half of its land utilized for growing crops, mostly in the northern region. High concentrations of nitrogen, phosphorus, and pesticide residues due to agricultural runoff not only deteriorate the quality of surface and ground water within the state, but also contribute to pollutions as far as in the Gulf of Mexico. Forests in this intensive agricultural landscape, therefore, play a pivotal role in reducing runoff and purifying water, especially in areas with high hydrogeologic and aquifer sensitivity. Total forest cover in Indiana has slightly increased between 2008 to 2018, suggesting net afforestation. However, a closer examination reveals that the patterns of forest cover change have been spatially and temporally heterogenous, particularly between 2014 and 2018. While the largely forested southern region has witnessed a steady climb in the forest area, the northern region where agriculture is concentrated has experienced considerable forest loss owing to cropland expansion, predominantly of corn and soybean. The overarching goal of this proposed study is to assess the impact of forest cover change in Indiana's agricultural landscape from 2008 to 2018 on retention of nutrients from farm runoffs. Our study has two specific aims: 1. To pinpoint times, locations, and magnitudes of deforestation in the intensive agricultural landscape in Indiana from 2008 to 2018, using data from USDA's Cropland Data Layer (CDL); 2. To estimate deforestation impacts on water quality due to agricultural runoffs at the watershed level, with the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) model. The InVEST model uses, in addition to the land cover data, other geospatial datasets and user-defined nutrient export and filtration coefficients to estimate pixel-level nutrient export and retention magnitudes. They are then aggregated to 10-digit watershed boundaries, enclosed within Indiana.

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