

The Impacts of Land Use Land Cover Change on Water Quality in the Big Sioux River: 2006-2015

Abstract

The conversion of grassland into cropland in the Western Corn Belt Plains Ecoregion during the early twenty-first century has led to an increased amount of nitrate runoff from agricultural land (particularly from the corn cropland) to river. The river transports the nitrates downstream leading to an increased nitrogen proportion from the headwaters to the lower Big Sioux River. High nitrate concentrations (10ppm) in the water has negative impacts on human health and the ecosystem. My research focuses on determining the extent to which the nitrogen compounds are present in the Big Sioux River especially brought by the nitrogen leaching from the corn cropland. The research investigates the spatial and temporal pattern/trend of nitrate runoff from agriculture land to the Big Sioux River. My research used ArcSWAT model in ArcGIS to calibrate and validate the nitrate data from 2000 to 2015. The SWAT model calibrated the water flow and water quality parameters from the years 2000 to 2015 and validated the simulations covering the period from the year 2015 to 2016 for monthly/weekly conditions. As the result, I was able to characterize the land use land cover change in the study area from the 2000 to 2016, determine the rates of land change, and assess the correlation between an increase in converted croplands and increased nitrogen levels in the Big Sioux River.

Keywords: Big Sioux River basin, water quality, Soil and Water Assessment Tool (SWAT), land use/land cover