

# **Impacts of Land Use and Land Cover Change on Water Quality in the Big Sioux River: 2006-2016**

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## **Abstract**

The increased demands on ethanol and rises in the price of corn led to increment of corn acreage in South Dakota. Other driving forces such as crop insurance subsidies and disaster payments encouraged farmers to (1) convert pasture, fallow and grassland to corn acreage, and (2) shift from other crops such as wheat to corn. The increment on corn acreage and adjustments in crop rotation between corn and soybeans resulted in use of increased amount of industrial fertilizers. The excess nitrate runoff from agricultural land—that the crops could not completely consume, leach into the Big Sioux River. The river transports the nitrates downstream leading to an increased nitrogen from the headwaters to the lower basin. Nitrate increases in the river may be associated with increased areas and intensities of agriculture in the watershed. High concentrations (10 ppm) are associated with human health issues and are regulated by the United States Environmental Protection Agency (EPA). This 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 corn cropland. The research uses the National Agricultural Statistic Service (NASS) Cropland Data Layer (CDL) to characterize and determine the rates of land use land cover (LULC) change, uses Soil and Water Assessment Tool (SWAT) model in ArcGIS to calibrate and validate nitrogen data from East Dakota Water Development District (EDWDD) and analyze the temporal and spatial trend of nitrogen levels, and determine whether there is a correlation between LULC change and changes in nitrogen levels in the Big Sioux River.

**Keywords:** Big Sioux River basin, water quality, Soil and Water Assessment Tool (SWAT), land use/land cover, East Dakota Water Development District (EDWDD)