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Landscape Characteristics and Their Relationship to Water Quality in the Headwaters of a Northeast Ohio Watershed

Abstract: Water quality in the headwaters of the Sugar Creek watershed, a primarily agricultural watershed in northeast Ohio, was related to landscape characteristics to determine their influence on water quality in the watershed. Water quality data (NO_3^--N, NH_4^+-N, PO_4^--P concentrations, and Total Solids) were collected over three years at twenty sample locations. Remote sensing, geographic information systems, and redundancy analyses were used to relate water quality at each sample location to characteristics of the up-stream contributing area, including land use/land cover, soil drainage, and stream network and road densities. Temporal variation in water quality data was considered through separate year-round, growing season (May 1-October 15), and dormant season (October 16-April 30) analyses. Nitrate-nitrogen concentrations were positively-related to increased stream density and percent cover of pasture and forage crops (primarily legume species), and negatively-related to row crops and poorly-drained soils. Ammonium-nitrogen and soluble reactive phosphorus concentrations were positively-related to percent cover of woodlots and developed areas (anthropogenic structures), and negatively-related to well-drained soils and increasing contributing area. Mean concentrations of total solids were positively-related to row crops and poorly-drained soils, and negatively-related to forage crops. These trends indicate landscape characteristics (both natural and anthropogenic) influence water quality within the headwaters of the Sugar Creek watershed.   Water quality improvement and restoration plans for the watershed are in development and trends revealed from this research will be used to target specific landscape characteristics for restoration within the Sugar Creek watershed.

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