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Analysis of stream network changes: A case study in Watonwan river watershed, Minnesota

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The Watonwan river watershed is located in south-central Minnesota, USA, with a total surface area of 561,620 acres. Due to highly erodible soils, land use changes, and higher flows attributed to climate and landscape changes in the Watonwan River system, there was a dramatic increase in the erosion level in the stream network of the watershed since European settlement in the late 1800s (MPCA, 2016), which has caused various other environmental issues. This study aims to map stream network changes and analyze associated environmental impacts in the Watonwan River Watershed from 1855 to present. Historical plat maps, multi-resolution contemporary DEMs, multi-temporal historical aerial images are used, along with field surveys. Scale effects are investigated using 1-m, 3-m, 8.5-m, and 30-m DEMs. Historical surface water features digitized from the plat map will be compared to contemporary natural stream networks extracted from a hydrologically enforced LiDAR-based DEM. Stream orders are calculated. Major land use and land cover changes near the stream network are assessed. Environmental impacts of the stream network changes along the main stem are assessed using derived hydrological characteristics and other relevant data sets such as soil, precipitation, and conservation management data. The results aid in our understanding of near-channel sediment sources at the watershed scale and assist mitigation or preventative policy in the future.

Biography

Fei Yuan has her expertise in environmental monitoring and resource mapping using remote sensing and geographic information systems. She has extensive experience in land use and land cover mapping, landscape change detection and modeling, natural resource management, and environmental impact assessment. Her current research emphasizes quantitative methods and applications for high-resolution land and water resource mapping, long-term environmental change analysis, and site-specific crop management.

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