Investigating the Impacts of Streamflow Disturbances on Water Quality using a Data-driven Framework

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Project Abstract: Floods and droughts are projected to increase over the next few decades due to climate change. These streamflow disturbances can worsen water quality by increasing salt, nutrient, and contaminant concentrations, which will have direct consequences for human and ecosystem health. There is a pressing need to understand and predict how water quality in streams and rivers will respond to new flow- disturbance regimes. This study will determine how future changes in streamflow-disturbance events, ranging from floods to low-flow conditions, will change water quality over time. The study will use a data-driven framework consisting of data integration and analytical modules, which will be applied to the Colorado, Columbia, and Delaware River corridors.

Here we present preliminary analysis of water temperature and conductivity in the Delaware River corridor. We also describe the application of surrogate models to optimize machine-learning algorithms for prediction of daily groundwater levels in aquifers that are hydraulically connected to the Delaware River. The models use daily historical observations of temperature, precipitation, river discharge, and groundwater levels as inputs. Finally, we present tools that can be used to reproducibly synthesize diverse data for machine learning.

The outcome of this work will yield new predictions of watershed water quality characteristics, in response to extreme perturbations. The same framework will also serve as a hub to enable the generation and analysis of integrated interagency watershed datasets in real-time that are transferable to many stakeholders.