Seminar: Dr. Nandita Basu

Presenter:
Dr. Nandita Basu ,University of Waterloo
Time of Event:
Tuesday, March 26, 2019 - 11:00

Location:
National Socio-Environmental Synthesis Center (SESYNC)
1 Park Place, Suite 300
Annapolis, MD 21401

A Race against Time: Nutrient Legacies and Time Lags Provide New Insight into Improving Water Quality in Human-Impacted Landscapes

Seminar presented by Nandita Basu ,University of Waterloo**.**

Global flows of reactive nitrogen (N) and phosphorus (P) have increased significantly over the last century in response to land-use change, agricultural intensification and elevated levels of atmospheric N deposition. Despite widespread implementation of a range of conservation measures to mitigate the impacts of intensive agriculture, N and P concentrations in surface waters are in many cases remaining steady or continuing to increase. Such lack of response has been attributed to legacy stores in subsurface reservoirs that contribute to time lags between conservation measures implemented on the landscape and water quality benefits realized in receiving water bodies. It has remained unclear, however, what the magnitudes of such stores might be, and how they are partitioned between various landscape elements (shallow soil and deeper groundwater reservoirs, reservoir and stream sediments). We have developed a unique modelling framework called the ELEMeNT (Exploration of Long Term Nutrient Trajectories)– which pairs a simulation of soil nutrient dynamics with a travel time-based approach – to reconstruct historic nutrient yields at the outlets of these watersheds and to model future nutrient loading under a range of scenarios. The uniqueness of the model is that in addition to time lags it can also provide information on magnitudes of legacy accumulation in various landscape elements. Our results, using a 200 year N input trajectory for the Mississippi River Basin (MRB) and the Susquehanna watershed, show significant N loading above baseline levels before the widespread use of commercial N fertilizers, largely due to 19th-century conversion of natural forest and grassland areas to row-crop agriculture. Our modeling of future scenarios indicates that even if agricultural N use were to become 100% efficient, it would take on the order of decades to meet policy goals for improving water quality.

About the speaker: Nandita Basu is an Associate Professor of Ecohydrology and Water Sustainability in the Departments of Civil and Environmental Engineering and Earth and Environmental Sciences at the University of Waterloo. In her research, she focuses on a broad range of issues related to water in human-impacted environments. From problems of nutrient pollution in intensively farmed regions to drought in water-stressed areas of India, Nandita uses tools from environmental science, engineering and the social sciences to improve our ability to sustainably manage water resources. Nandita's current research focuses on the legacies of nutrients that accumulate in anthropogenic landscapes, and lead to time lags between implementation of watershed conservation measures and stream water quality improvement. Her team is developing statistical and deterministic models that can quantify these time lags and help to identify adaptive management strategies to minimize watershed response times.

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