PhD Position on Modelling Water Quality and Climate Services of Wetlands at the Continental Scale

One fully funded 4-year PhD position available at the University of Waterloo on **Mapping Wetland Restoration Scenarios** at continental scales.

Wetland restoration is a key strategy to sequester soil organic carbon and improve downstream water quality via nutrient retention; however, wetlands can also be potential sources of greenhouse gases (GHGs), namely methane (CH_4) and nitrous oxide (N_2O). Furthermore, wetland restoration on cropland might not be an economically viable strategy, thereby limiting widespread adoption of restoration. For wetland restoration to be successful it is necessary to explicitly consider the potential benefits and tradeoffs, and focus restoration in locations where synergies can be maximized.

The project involves using remotely sensed wetland information with empirical and process-models of varying levels of complexity to quantify GHG emission and water purification services of wetlands in two major agricultural regions in Canada (Great lakes and the Prairies), with potential of expanding to the North America scale. The project will build on our research in the US (Cheng et al. 2020, *Nature*), where our team found that targeted wetland restoration in high nutrient input areas can lead to 40 times more nitrogen removal than non-targeted restoration. Adding the GHG component to this framework is a fundamental aspect of the project.

The student will be co-supervised by Dr. Tonya DelSontro (Earth and Environmental Sciences), an expert on GHG emissions from aquatic systems, and Dr. Nandita Basu (Civil and Environmental Engineering & Earth and Environmental Sciences) with expertise in water quality modeling. The project is a part of a large pan-Canadian Project called *Solutionscapes: Designing Climate and Water Smart Agricultural Solutions in Complex Working Landscapes* that aims to develop pan-Canadian, spatially explicit solution portfolios for agricultural landscapes that will move Canada towards a net-zero GHG future, while also prioritizing water quality and other ecosystem services. Though the project will focus on Canada, the methodologies developed would be transferable to other countries and regions. The project involves a collaboration between multiple universities (University of Waterloo, University of Guelph, University of British Columbia, McGill University, University of Saskatchewan, Pennsylvania State University), and a range of partners across Canada (Environment and Climate Change Canada, Agriculture and Agri Food Canada, Ontario Ministry of Agriculture Food and Rural Affairs, Ducks Unlimited Canada, Conservation Ontario, Toronto and Region Conservation Authority, Grand River Conservation Authority, Alternative Land Use Services, Canadian Biogas Association, Canadian Water Network).

Applicants are expected to hold a masters degree in related science or engineering fields (undergraduate degree would be considered for exceptional candidates). Previous experience in geospatial tools (e.g., GIS, Python) and coding platforms (Matlab, R) would be beneficial, though not required. We embrace equity, diversity and inclusion and seek lab members who can contribute to a welcoming, engaging environment for students and researchers of all genders, races, abilities, and backgrounds.

Application Procedure: For further information and to apply, send a CV, transcripts, and a page describing your interests and background to Laura Klein (l3klein@uwaterloo.ca, cc nandita.basu@uwaterloo.ca; tonya.delsontro@uwaterloo.ca) by December 15, 2022. Position will remain open until filled.