

TWO M.SC. GRADUATE STUDENT POSITIONS
Department of Biology, University of British Columbia - Okanagan

Project title: Understanding the impact of irrigation on soil C storage, and associated greenhouse gas emissions, at a regional scale

Supervisor: Dr. Melanie Jones

Background: Combustion of fossil fuels and changes in land use have contributed to a massive rise in atmospheric CO₂ concentrations. Efficient, strategically managed irrigation has been proposed as a possible tool for mitigating rising CO₂ levels. However, there is an urgent need to develop a more integrated understanding of the impact of irrigation on soil organic and inorganic C dynamics across soil types and crops.

The Okanagan Valley in British Columbia, Canada has a semi-arid climate; irrigation is required to sustain the diverse crops (e.g., grapes, apples, cherries, forage) grown in the region. We are using the Okanagan Valley as a 'natural laboratory' to understand how irrigation practices can affect soil C storage under different cropping systems and on different soil types.

Description of two available MSc positions:

We are seeking two enthusiastic MSc students to join our inter-disciplinary research team. Both students will assist in the collection and analysis of soil samples from non-cultivated sites and from irrigated fields, orchards and vineyards located along length of the Okanagan Valley. These students will also learn how to measure soil CO₂ and N₂O emissions at key points through the annual irrigation cycle, and will receive training in cutting-edge techniques for assessing soil properties and processes.

The first student will examine the contribution of organic C to soil C storage and CO₂ emissions. This student will learn water-stable aggregate separation techniques to assess the stability of soil C pools, and will employ novel ¹³C analyses to partition soil surface CO₂ efflux into that released by respiring roots and rhizosphere biota, and that released by the decay of older soil organic carbon.

The second MSc student will focus on the inorganic soil C pool, and how it relates to total soil C storage and CO₂ emissions. This student will conduct a series of laboratory experiments to better understand how soil properties (e.g., soil texture, moisture, pH and carbon content) can influence the release of CO₂ from irrigation water-derived bicarbonates and soil inorganic C. This student will also employ novel ¹³C analyses to partition soil surface CO₂ efflux into that released from organic and inorganic sources.

A bit of light background reading:

Fentabil et al. 2016a. Effect of micro-irrigation type, N-source and mulching on nitrous oxide emissions in a semi-arid climate: An assessment across two years in a Merlot grape vineyard. *Agric. Water Manage.* 171: 49-62.

Fentabil et al. 2016b. Effect of drip irrigation frequency, nitrogen rate and mulching on nitrous oxide emissions in a semi-arid climate: An assessment across two years in an apple orchard. *Agric. Ecosys. Environ.* 235: 242-252.

Hannam et al. 2016a. Irrigation practices, nutrient applications, and mulches affect soil nutrient dynamics in a young Merlot (*Vitis vinifera* L.) vineyard. *Can. J. Soil Sci.* 96: 23-36.

Hannam et al. 2016b. Bicarbonates in irrigation water contribute to carbonate formation and CO₂ production in orchard soils under drip irrigation. *Geoderma* 266: 120-126.

Qualifications: A background in Soil Science, Biology or Environmental Studies and a keen interest in agriculture, environmental health and ecosystem services are required. Applicants must also possess a valid driver's license.

Annual stipend: An annual stipend of \$20,000 will be provided. Scholarships are also available.

Other important information: The biology graduate program at the University of British Columbia's Okanagan campus in Kelowna, BC, offers tier-one degrees in a collegial, close-knit setting. Our dynamic faculty and students are engaged in a variety of research projects in the field of biological sciences, many in collaboration with partners in government, non-profit agencies or industry. Our research-based MSc degree provides students with theoretical, practical and analytical expertise, as well as experience in the application of scientific results to real-world problems. Graduates of the MSc program are prepared for positions in government, management, industry, education, consulting or for further graduate studies.

For more information about graduate studies in the Department of Biology at UBC-Okanagan, please visit <http://biol.ok.ubc.ca/graduate/biology.html>.

To apply for one of these positions: Please send your transcripts (unofficial versions are acceptable), CV and the names of two references to Drs. Melanie Jones (melanie.jones@ubc.ca) and Kirsten Hannam (kirsten.hannam@ubc.ca), and let us know which position interests you most.