PhD position in terrestrial laser scanning for understanding tree allometric variation and boreal forest carbon storage

Project Background: Canada's western boreal forest region represents a globally significant carbon pool. However, increases in aridity in recent decades have caused region-wide losses of forest carbon as moisture stress has both reduced productivity (slowed tree growth) and increased mortality. These changes pose a significant threat as warming temperatures and greater aridity together exacerbate the risk of fire, predispose trees to attack by insect pests, reduce supplies of merchantable timber, and trigger damaging climate change feedbacks when carbon stocks are released to the atmosphere. The goal of this project is to better understand the climate sensitivity of the western boreal through an extensive survey of ground plots and by utilizing unmanned aerial vehicle imagery, and terrestrial laser scanning to (1) evaluate how the effects of climatic water availability on the growth and survival of individual trees vary among species, with local competition, and with site hydrology; and (2) examine how climatic water availability and local competition influence partitioning of growth within crowns and in turn allometric models for aboveground biomass. Results from the project will provide an assessment of the climate risks to boreal forests in western Canada, including potential for decreased productivity, more extensive dieback, and changes in standing volume and carbon storage. We will translate these results into actionable information that will help the forest industry adapt to increasing levels of moisture stress.

PhD project description: We are seeking a PhD student to our team that includes Dr. Mark Vanderwall and a PhD student at the University of Regina, Mike Michaelian (Canadian Forest Service), Dr. Charles Nock (University of Alberta) and forest scientists with the governments of Alberta and Saskatchewan. The focus of the second PhD students research at U of A would be on developing more accurate estimates of aboveground biomass and productivity in stands that have experienced varying levels of moisture stress, to facilitate clearer assessments of changes in carbon stocks over time. This would include learning methods of 3D tree and forest level information utilizing terrestrial laser scanning (Leica RTC360), working to scan field plots and collect validation data, and fitting 3D models using software (quantitative structure models) to predict tree volumes and in turn biomass.

Candidate profile: We are seeking a candidate with a MSc degree and ideally experience collecting data on tree and forest structure. Strong candidates with a BSc searching to do a MSc may also be considered. Experience working with 3D methods of data acquisition (TLS, UAV) would be an asset. A strong quantitative skill set and experience in R and or other software is desired. Evidence of motivation and an ability to communicate science in publications or conference presentations would also be an asset.

Qualifications: Ability to work independently in the field with a field assistant, willingness to travel and work in remote locations of the boreal forest.

Please contact Dr. Charles Nock, nock at ualberta.ca, for more details. The position will remain open until filled.