

Kira Borden Ph.D.

Assistant Professor
School of the Environment
Trent University
1600 West Bank Drive
Peterborough, ON Canada, K9L 0G2
kiraborden@trentu.ca

Academic Appointments

- 2022 - Assistant Professor, School of the Environment, Trent University, Canada
- 2021-2022 NSERC-Banting Postdoctoral Fellow, School of Environmental Sciences, University of Guelph, Canada
- 2019-2021 NSERC Postdoctoral Research Fellow, Faculty of Land and Food Systems, University of British Columbia (UBC), Canada
Research Affiliate, Centre for Sustainable Food Systems, UBC, Canada
- 2018 Postdoctoral Research Fellow, Department of Physical and Environmental Sciences, University of Toronto Scarborough (UTSC), Canada
Research Affiliate, Centre for Critical Development Studies, UTSC

Education

- 2018 Ph.D. Geography, University of Toronto, Canada
Thesis: "Root ecology for sustainable agroecosystems: intraspecific variation in a pan-tropical tree crop"
Advisor: Professor Marney Isaac
Graduate Associate, Centre for Critical Development Studies, UTSC
- 2013 M.Sc. Forestry, University of Toronto, Canada
Thesis: "Tree roots in agroforestry: evaluating biomass and distribution with ground penetrating radar"
Advisors: Professors Sean Thomas and Marney Isaac
- 2008 B.Sc. (Honours) Environmental Science, Queen's University, Canada

Research Grants [funds in CAD]

I have secured >\$1.2 million in research funds as PI or co-PI.

Under review *Agroforest Network*. Agricultural Climate Solutions Living Lab [collaborator]
Under review *Gas flux instrumentation for novel investigations of the plant-soil-atmosphere*

- continuum in agroecosystems*. Canada Foundation for Innovation-John R. Evans Leaders Fund and Ontario Research Fund [PI; requested \$284,893] (2023)
- 2023-2028 *Harnessing plant-soil interactions in agroecosystems to improve nutrient cycling and mitigate climate change*. NSERC Discovery Grant [PI; \$192,500]
- 2023-2026 *On-farm monitoring of subsurface carbon sequestration in regenerative agriculture*. NSERC Alliance Missions Grant: Anthropogenetic greenhouse gas research [PI; \$752,473]
- 2023-2024 *Precision study of plant-soil interactions in agroecosystems with in-situ microdialysis sampling*. Trent University Internal Research Development Grant [PI; \$7,000]
- 2022-2025 *Cover crop mixtures: evaluating complementarity in root-soil interactions and effects on greenhouse gas emissions*. Ontario Agri-Food Innovation Alliance's Tier I Research Program – Ontario Ministry of Agriculture, Food and Rural Affairs [listed project team member (postdoc at time of project start), co-leading project; \$219,000]
- 2020-2021 *Opportunity assessment of agricultural greenhouse gas reductions and carbon sinks through multi-criteria analysis*. CleanBC – British Columbia Ministry of Agriculture, Food and Fisheries [co-PI; \$70,000]
- 2016 Centre for Global Change Science Graduate Student Research Grant. University of Toronto [co-PI; \$4,000]
- 2012 Centre for Global Change Science Graduate Student Research Grant. University of Toronto [PI; \$5,000]

Research Awards and Fellowships [funds in CAD]

- 2021-2023 Banting Postdoctoral Fellowship [\$140,000 + \$18,000 institutional research funds]
- 2019-2021 NSERC Postdoctoral Fellowship [\$90,000 + \$40,000 institutional research funds]
- 2019 Royal Society of Canada Alice Wilson Award nominee [nominated by NSERC]
- 2019 NSERC and L'Oréal-UNESCO For Women in Science Supplement nominee [nominated by NSERC]
- 2014-2017 NSERC Postgraduate Scholarship - Doctoral [\$63,000]
- 2015 Donald F. Putnam Graduate Scholarship [\$1,500]
- 2014 General Motors Women in Science and Mathematics Award [\$3,500]
- 2012-2013 Forest Soils Fellowship (Ontario Graduate Studies) [\$10,000]
- 2011-2012 Edward H. Buckley & Grace B. Buckley Graduate Scholarship [\$5,000]
- 2011 University of Toronto Faculty of Forestry Fellowship [\$8,000]

Peer-reviewed publications

17. Gao Y, **Borden KA**, Brown SE, Wagner-Riddle C (accepted) Non-growing season soil nitrous oxide emissions as influenced by cover crops and fall tillage termination. Canadian Journal of Soil Science.
16. de la Riva E, **Borden KA**, Ostonen I, Saengwilai P, Prieto I. (2023) Editorial: root functional traits: from fine root to community-level variation. Frontiers in Plant Science 14: 1152174
15. Norgaard A, Lewis D, **Borden KA**, Krzic M, Carillo J, Smukler SM. (2023) Trade-offs in organic nutrient management strategies across mixed vegetable farms in southwest British

- Columbia. Frontiers in Sustainable Food Systems. 6: 706271
14. Mafa-Attoye, TG; **Borden, KA**; Alvarez, D; Thevathasan, NV; Isaac, ME; Dunfield, KE (2022) Roots alter soil microbial diversity and interkingdom interactions in diversified agricultural landscapes. Oikos. doi:10.1111/oik.08717
 13. Bargaz A, Elhaissofi W, Khourchi S, Benmrid B, **Borden KA**, Rchiad, Z (2021) Benefits of phosphate solubilizing bacteria on belowground crop performance and P-fertilizers profitability for improved crop eco-acquisition of P. Microbiological Research. 252: 126842
 12. **Borden KA**, Mafa-Attoye TG, Dunfield KE, Thevathasan NV, Gordon AM, Isaac ME (2021) Root functional trait and soil microbial coordination: implications for soil respiration in riparian agroecosystems. Frontiers in Plant Science. 12: 681113
 11. **Borden KA**, Anglaaere LCN, Owusu S, Martin AR, Buchanan SW, Addo-Danso SD, Isaac ME (2020) Effects of shade trees on cocoa root functional traits on a climatic gradient are moderated by soil texture. Agriculture, Ecosystems & Environment. 295: 106915
 10. Addo-Danso SD, Defrenne C, McCormack LM, Ostonen I, Addo-Danso A, Foli, EG, **Borden KA**, Isaac ME, Prescott CE (2020) Fine-root morphological trait variation in tropical forest ecosystems. Plant Ecology. 221: 1–13
 9. **Borden KA**, Thomas SC, Isaac ME (2020) Variation in fine root traits reveals nutrient-specific acquisition strategies in agroforestry systems. Plant and Soil. <https://doi.org/10.1007/s11104-019-04003-2>
 8. Isaac ME & **Borden KA** (2019) Nutrient acquisition strategies in agroforestry systems. Plant and Soil. [invited *Marschner Review*] 444: 1-19. <https://doi.org/10.1007/s11104-020-04670-6>
 7. Martin AR, Hayes FJ, **Borden KA**, Buchanan SW*, Gordon AM, Thevathasan NV, Isaac ME (2019) Integrating nitrogen fixing structures into above- and belowground functional trait spectra in soy (*Glycine max*). Plant and Soil. 440: 53-69
 6. **Borden KA** & Isaac ME (2019) Management strategies differentially affect root functional trait expression in cocoa agroforestry systems. Agronomy for Sustainable Development. 39: 21
 5. **Borden KA**, Anglaaere LCN, Adu-Bredu S, Isaac ME (2019) Root biomass variation of cocoa and implications for carbon stocks in agroforestry systems. Agroforestry Systems. 93: 369-381
 4. Isaac ME, Isakson R, Levkoe CZ, Dale B, Hargreaves SK, Méndez VE, Wittman H, Hammelman C, Langill JC, Martin AR, Nelson E, Ekers M, **Borden KA**, Gagliardi S, Buchanan S, Archibald S, Gálvez Ciani A (2018) Agroecology in Canada: Towards an integration of agroecological practice, movement and science. Sustainability.10: 3299
 3. **Borden KA**, Thomas SC, Isaac ME (2017) Interspecific variation of tree root architecture in a temperate agroforestry system characterized using ground penetrating radar. Plant and Soil. 410: 323-334
 2. **Borden KA**, Isaac ME, Thevathasan NV, Gordon AM, Thomas SC (2014) Estimating coarse root biomass with ground penetrating radar in a tree-based intercropping system. Agroforestry Systems. 88: 657-659
 1. Isaac ME, Anglaaere LCN, **Borden K**, Adu-Bredu S (2014) Intraspecific root plasticity in agroforestry systems across edaphic conditions. Agriculture, Ecosystems & Environment. 185: 16–23

Technical reports

The following three publicly available reports inform concrete pathways to meeting emission reduction targets in the province of British Columbia's 'Roadmap to 2030':

Norgaard A*, Li C, Friesen H*, **Borden K**, Smukler S (2021) BC agriculture GHG emission profile analysis. Prepared for British Columbia (BC) Ministry of Agriculture, Food and Fisheries. 75p.

Norgaard A*, Li C, Hamilton M*, Smukler S, **Borden K** (2021) Multi-criteria framework for GHG emissions and co-benefits. Prepared for BC Ministry of Agriculture, Food and Fisheries. 152p.

Hanuszak P, Li C, Norgaard A, **Borden K**, Smukler S (2021) Agroecosystem models for GHG emissions and co-benefits. Prepared for BC Ministry of Agriculture, Food and Fisheries. 59p.

Supervision

Graduate faculty member: Environmental & Life Sciences program, Trent University

PhD

2022- Liyanage, D.K. PhD. University of Guelph, School of Environmental Sciences [co-advisor with Claudia Wagner-Riddle]

Graduate student committee member

2023- Muldoon, D. PhD supervisory committee member. Trent

2023 Doung, M. PhD conversion exam committee member. Trent

Undergraduate

2023 VanSlyke, V. Community Based Research project. Trent

2020-2021 Friesen, H. BSc thesis. UBC [co-supervisor with Sean Smukler, UBC]

- Best poster: Pacific Regional Society of Soil Science Annual Meeting (2021)
- NSERC-Undergraduate Student Research Award - \$4000 (2020)
- Art Bomke Undergraduate Student Research Award - \$3000 (2020)

2020 Wang, M. Socio-ecological methods (ENVR 448A; full-term research project). UBC [supervisor]

2019 Mayes, J. AGRI310 Internship in Agriculture or Environment, McGill University [co-supervisor with Sean Smukler, UBC]

- NSERC-Undergraduate Student Research Award

Research Associates

2019-2020 Norgaard, A. UBC [research project mentor of MSc thesis then formal co-supervisor for CleanBC project, listed in 'grants', with Sean Smukler, UBC]

- Hugo E. Meilicke Fellowship - \$5000 (2020)

Teaching

Course instructor

2023- Nutrient Cycling in Ecosystems (SAFS 4270). School of the Environment. Trent University

2015-2017 Biophysical Interactions in Managed Environments (EES 1128). Graduate course. Department of Physical & Environmental Sciences. UTSC (three offerings)

Guest lecturer

2021 “Climate change adaptation and mitigation in diversified agroecosystems”. (Graduate-level course in applied ecology) UTSC. Nov. 3
 2020 “Adapting food systems to a changing climate”. UBC. Jan. 31 (1st year course in agriculture and forestry science)
 2019 “Sustainability indicators”. UBC. Nov. 13 (2nd year course in agroecology)
 2019 “Pest management”. UBC. Oct. 21 (2nd year course in agroecology)
 2019 “Organic nutrient amendments”. UBC. Sep. 30 (3rd year course in ecohydrology)
 2014 “Near-surface imaging for forestry technicians”. Forestry Research Institute of Ghana, Kumasi

Service

Review activity

Grant reviewer

2022 Invited reviewer. Organic Science Cluster 4

Journal editorial activity

Associate Editor: *Ecological Solutions and Evidence*

Special Topic Editor: *Frontiers in Plant Science*

Ad hoc reviewer

<i>Agriculture</i>	<i>Field Crops Research</i>
<i>Agriculture, Ecosystems & Environment</i>	<i>Forests</i>
<i>Agroforestry Systems</i>	<i>Frontiers in Plant Science</i>
<i>Agronomy</i>	<i>Functional Ecology</i>
<i>Agronomy for Sustainable Development</i>	<i>Geoderma</i>
<i>Plant Methods</i>	<i>Journal of Applied Ecology</i>
<i>Arboriculture & Urban Forestry</i>	<i>Oikos</i>
<i>Basic and Applied Ecology</i>	<i>Plant and Soil</i>
<i>Biological Invasions</i>	<i>PlosOne</i>
<i>Diversity</i>	<i>Resources</i>
<i>Ecology</i>	<i>Science of the Total Environment</i>
<i>Ecology and Society</i>	<i>Scientific Data</i>
	<i>Sustainability</i>
	<i>Water</i>

Event Administration

2022 Oral presentation judge. Canadian Society of Soil Science Annual Meeting.
 2018 Organizer. Agroecology: the science, practice, and social movements across farming landscapes. *Canadian Association of Geographers Ontario division annual meeting*. University of Toronto. Oct 20
 2017 Moderator. Soil ecology in tropical systems. *Association of Tropical Biology and Conservation annual meeting*. Merida, Mexico. Jul 10

Service to the University

- 2020 Invited judge. Graduate Student Symposium. UBC. Mar 16 [cancelled due to covid-19]
- 2018 Invited panelist. Panel with the Premier of Ontario to discuss graduate student education and research opportunities. UTSC. Feb 13
- 2018 Invited judge. Scinapse Undergraduate Science Case Competition. UTSC
- 2015 Member of Graduate Chair search committee. Department of Geography & Planning, University of Toronto
- 2014-2016 Invited departmental panelist. Multiple sessions: “Thinking about going to grad school?”; “Comprehensive exams”; “Grants and fellowships”; “Preparing for fieldwork”. Department of Geography & Planning and the Centre for Critical Development Studies, University of Toronto

Service to the Public and Extension

- 2022 Podcast interviewee. Climate change adaptation of organic vegetable farming in BC. OrganicBC.
- 2020 Recorded webinar. Too much or too little water: Climate resilient farming
- 2020 Presenter and workshop facilitator. ACARN Irrigation and Soil Management Symposium. Creston, British Columbia
- 2020 Presenter and workshop facilitator. British Columbia Certified Organic Conference. Richmond, British Columbia
- 2020 Presenter. Horticultural Growers’ Short Course. Pacific Agricultural Show. Abbotsford, British Columbia
- 2019 UBC Farm tour speaker: “Nutrient cycling”. UBC. Oct. 8
- 2019 Research farm open house tour speaker. UBC Farm
- 2017 Invited documentary panelist. Public screening of *Race to Extinction*. University of Toronto
- 2015 Science outreach article: Borden KA & Isaac ME. Uncovering tree roots: how radar technology can help scientists better understand belowground ecology. *The Journal of Student Science and Technology - Science from the Source*. 8: 64-68
- 2013 Interviewee on extension video series. Which trees are best for intercropping systems? In *Trees Can Help Save the World*. Agriculture and Agri-Food Canada (www.youtube.com/watch?v=ZqqVXOImc0I)

Invited talks

- 2022 “Organic vegetable nutrient management” and “Overwinter soil cover for small-scale growers”. Part of the Soil Management Workshop Series. OrganicBC. Online. March 1 and 8.
- 2021 “To dig or not to dig: methodological innovations in root-soil investigations”. Pacific Regional Society of Soil Science Annual Meeting. Online. March 6, 2021
- 2021 Invited faculty talk. “Adaptation and mitigation: Dual objectives for addressing climate change in diversified agroecosystems”. Centre for Sustainable Food Systems. Online. May 11. <https://ubcfarm.ubc.ca/csfs-associate-seminars-dr-kira-borden/>
- 2020 “Belowground plant-soil interactions in diversified agroecosystems”. Plant & Soil

Sciences Seminar. Faculty of Land and Food Systems. UBC. Jan 10

Media coverage

- 2022 Vowles, A. U of Guelph Cover Cropping Studies Aim to Help Farmers Prevent Greenhouse Gas Emissions. University of Guelph News/Media release
- 2022 Geldart, E., Graves, M.E., Boudreau, N., Wallace, J., and Hammermeister, A.M. (Editors). 2022. Organic Science Canada. Volume 4. Organic Federation of Canada, Montreal, QC and Dalhousie University, Truro, NS. 40 pp. www.dal.ca/oacc/oscIII. Economics vs the Environment: Trade-offs in Nutrient Management for Organic Vegetables.
- 2021 Vowles, A. Prestigious Banting Award. University of Guelph News.
- 2020 Pacific Regional Society for Soil Science. Interview with a Soil Scientist. Aug. 5 (www.countrylifeinbc.com/pacific-ag-show-keeps-up-with-changing-times/)
- 2020 Schmidt. Pacific Ag Show keeps up with changing times. Country Life BC. Jan 1
- 2019 Lipton G. Trees: A pairing for coffee, chocolate and wine. Favorite foods need agroforestry to survive. Landscape news series on agroforestry. June 13 (blog.worldagroforestry.org/index.php/2019/06/13/trees-a-pairing-for-coffee-chocolate-and-wine/)

Conference presentations

*supervised student presentation

- accepted* *Liyanage DK. Canadian Society of Soil Science Annual Meeting. Truro, Nova Scotia [talk] (Jun 2023)
- 2022 Ecological Society of America and Canadian Society of Ecology and Evolution Joint Annual Meeting. Montreal, Canada [talk]
- 2022 World Congress on Agroforestry, Quebec City, Canada [talk]
- 2022 Canadian Society of Soil Science Annual Meeting, Edmonton, Canada [talk] (<https://www.youtube.com/watch?v=iUz3eDhcHbE&list=PLIZuEw10F8iLk0rmXXQK0URMvJjE-NA7T&index=2>)
- 2019 Rhizosphere 5. Saskatoon, Canada [talk]
- 2019 World Congress on Agroforestry. Montpellier, France [talk] (agroforestry2019.cirad.fr/FichiersComplementaires/webconf/4_32_BORDEN%20Kir/index.html)
- 2019 Agriculture and Agri-Food Canada (AAFC) Agricultural Greenhouse Gases Program symposium, University of Guelph, Canada [talk]
- 2018 Canadian Association of Geographers Ontario Division Annual Meeting. University of Toronto, Canada [talk]
- 2017 Annual Meeting of the Association of Tropical Biology and Conservation. Merida, Mexico [talk]
- 2015 100th Annual Meeting of the Ecological Society of America. Baltimore, Maryland [talk]
- 2014 World Congress on Agroforestry. New Delhi, India [talk]
- 2013 13th North American Agroforestry Conference. University of Prince Edward Island, Canada [talk]

- 2013 AAFC Agricultural Greenhouse Gases Program symposium, Bishop's University, Canada [talk]
- 2012 Canadian Association of Geographers Ontario Division Annual Meeting. UTSC, Canada [talk]
- 2012 Soil Science Society of America Annual Meeting. Cincinnati, Ohio [poster]
- 2012 International Symposium of Root Research. Dundee, Scotland [poster]
- 2011 Society of American Foresters National Convention. Honolulu, Hawaii [poster]

Memberships, working groups and research network member

- 2019-present Canadian Society of Soil Science member
- 2020-present Diversified Agroecosystems Research Cluster. UBC
- 2019-present British Columbia Agricultural Climate Adaptation Research Network (ACARN)
- 2017 Agroecology Research Network, Canada. UTSC
- 2012 Thematic workshop: Facilitative processes in the acquisition of nutrients in multi-species plant communities. Montpellier, France