The UNIVERSITY CONSORTIUM

Dr. Kari Dunfield

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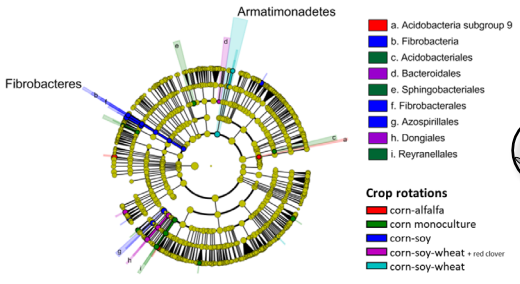
Dr. Kari Dunfield received her BSc in Cellular Molecular Microbial Ecology at the University of Calgary, and earned her MSc in Plant Science and PhD in Soil Science at the University of Saskatchewan. Since joining the University of Guelph in 2004, she has been performing innovative research in environmental microbiology. Dr. Dunfield uses molecular techniques to study the impacts of human activities on soil microbial communities, and the resulting effect on soil function and health.

Changes in soil microbial community composition were associated with **riparian buffer** types and agricultural soils.

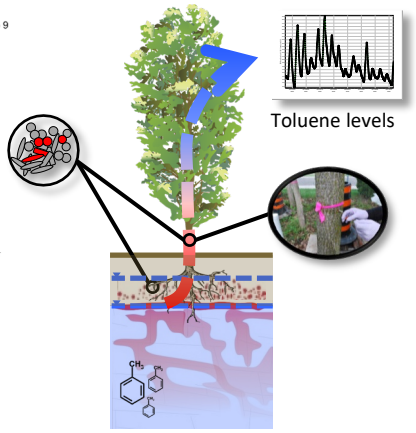
Her work is often multi-disciplinary and in collaboration with various scientists and university partners (Lincoln University, NZ, Algoma University, Univ of Manitoba, Dalhousie University). Dr. Dunfield's current research focuses on the anthropogenic impacts on soil ecosystems. Her first research focus examines the impact of agricultural practices (tillage and growing crops for biofuels) on soil microbial communities and soil health and soil ecosystem services, such as greenhouse gas emissions and nutrient cycling. The second focus involves the survival and transport of key microbes in soils, water, and associated with plants. Dr. Dunfield is looking at the presence and activity of toluene-degrading bacteria in a toluene contaminated shallow-fractured bedrock site under phytoremediation.

Soil microorganisms are responsible for many important soil functions such as biogeochemical cycling, contaminant remediation and plant growth. According to Dr. Dunfield, soil micro-organisms can impact soil ecosystem health and environmental sustainability.



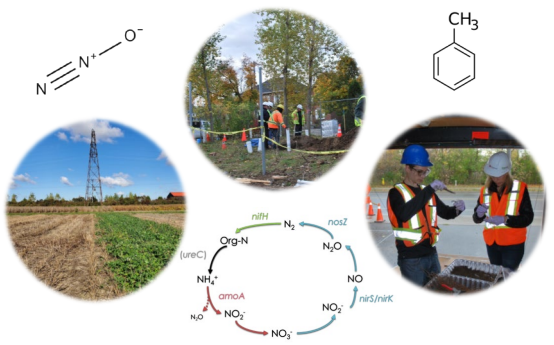
Crop rotation modified bacterial community composition in soils under no tillage

We utilize a variety of advanced, culture-independent molecular techniques, looking at DNA and RNA, to investigate soil microbial communities



Plants growing in contaminated soils selected for **microorganisms** able to degrade toluene.

Soil Ecosystem Services



The goal in my lab is to improve our understanding of soil ecosystem services in order to promote the development of sustainable farming and bioremediation practices that protect the environment.

Selected Papers

Gaiero, J., Bent, E., Boitt, G., Condron, LM, Dunfield, KE. 2020. Effect of long-term plant biomass management on phosphatase-producing bacterial populations in soils under temperate grassland. Applied Soil Ecology. 151, 103583.

Mafa-Attoye, T., Baskerville, M., Ofosu, E., Oelbermann, M, Thevathasan, N., Dunfield, KE 2020. Riparian land-use systems impact soil microbial communities and nitrous oxide emissions in an agro-ecosystem. Science of The Total Environment, 138148.

Tosi, M. Brown, S. Ferrari Machado, P., Wagner-Riddle, C., Dunfield, K. 2020. Response of N-cycling soil microbial communities to nitrification and urease inhibitors: short-term dynamics and relationship with field-scale N2O emissions. Soil Biology & Biochemistry. 142, 107703.

BenIsrael, M., Wanner, P, Fernandes, F., Burken, J., Aravena, R., Parker, B., Haack, E., Tsao, D and Dunfield, KE. 2020. Quantification of toluene phytoextraction rates and microbial biodegradation functional profiles at a fractured bedrock phytoremediation site. *Science of the Total Environment*, 707, 135890.

Wanner, P., Aravena, R., Fernandes, J., Ben-Israel., M., Haack, E., Tsao, D., Dunfield, K. Parker, B., 2019 Assessing toluene biodegradation under temporally varying redox conditions in a fractured bedrock aquifer using stable isotope methods. *Water Research*, 165: 114896. 114986.

Day., N., Dunfield, K., Johnstone, J., Mack, M., Turetsky, M., Walker, X., White, A., Baltzer, J. 2019. Wildfire severity reduces richness and alters composition of soil fungal communities in boreal forests of western Canada. *Global Change Biology*. 25 (7), 2310-2324.

Ben-Israel., M., Wanner, P., Aravena, R., Parker, B., Haack, E., Tsao, D., Dunfield, K. 2019. Toluene biodegradation in the vadose zone of a poplar phytoremediation system identified using metagenomics and toluene-specific stable carbon isotope analysis. *International journal of phytoremediation* 21: 60-69.

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Allen, A., Borchardt, M., Kieke, B., Dunfield, K., & Parker, B. (2017). "Virus occurrence in private and public wells in a fractured dolostone aquifer in Canada," *Hydrogeology Journal*. Hydrogeology Journal 25 (4), 1117-1136

Thompson, K., Bent, E., Abalos, D., Wagner-Riddle, C., & Dunfield, K. (2016). Soil microbial communities as regulators of *in situ* N_2O fluxes in annual and perennial cropping systems. *Soil Biology & Biochemistry, 103*, 262-273.

Arnaud, E., Best, A., Parker, B. L., Aravena, R., & Dunfield, K. (2015). Transport of *E. coli* through a Thick Vadose Zone. *JEQ*, *44*(5), 1424. http://doi.org/10.2134/jeq2015.02.0067

Best, A., Arnaud, E., Parker, B., Aravena, R., & Dunfield, K. (2015). Effects of Glacial Sediment Type and Land Use on Nitrate Patterns in Groundwater. *Groundwater Monitoring & Remediation*, *35*(1), 68–81. http://doi.org/10.1111/gwmr.12100

McCall, C. A., Jordan, K. S., Habash, M. B., & Dunfield, K. E. (2015). Monitoring Bacteroides spp. markers, nutrients, metals and Escherichia coli in soil and leachate after land application of three types of municipal biosolids *Water Research*, *70*, 255–65.
Full list of papers available on Google Scholar: Kari E Dunfield

Thompson, K., Bent, E., Abalos, D., Wagner-Riddle, C., & Dunfield, K. (2016). Soil microbial communities as regulators of *in situ* N_2O fluxes in annual and perennial cropping systems. *Soil Biology & Biochemistry, 103*, 262-273.

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