

# Fiona M Soper

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## PROFESSIONAL EXPERIENCE

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- 2020- Assistant Professor, Department of Biology and School of Environment, McGill University  
*Maternity leave Mar-Nov 2022*
- 2018-19 Postdoctoral Research Associate, Dept of Ecology and Evolutionary Biology, Cornell University
- 2016-18 Postdoctoral Research Associate, College of Forestry and Conservation, University of Montana
- 2009 Research Projects Officer, Plant Industry Division, Commonwealth Scientific and Industrial Research Organisation, Australia

## EDUCATION

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- Ph.D. Cornell University (Ecology and Evolutionary Biology), May 2016
- B.Sc. Hons University of Queensland, Australia (Botany), 2008

## PUBLICATIONS

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*H-index: 15 Total citations: 650*

\*Indicates supervised McGill undergraduate or graduate student co-author

*In review or revision*

*Published or accepted*

1. CC Cleveland, CRG Reis, SS Perakis, KA Dynarski, SA Batterman, TE Crews, M Gei, MJ Gundale, DNL Menge, MB Peoples, SC Reed, VG Salmon, **FM Soper**, BN Taylor, MG Turner, N Wurzbarger. Exploring the role of cryptic nitrogen fixers in terrestrial ecosystems: a frontier in nitrogen cycling research *Ecosystems* Accepted
2. L Toro, D Pereira Arias, D Peres-Aviles, G Vargas, **FM Soper** Gutknecht, J Powers (2022) Phosphorus limitation of early growth differs between nitrogen fixing and non-fixing dry tropical forest trees. *New Phytologist* Accepted
3. KA Dynarski, **FM Soper**, SC Reed, WR Wieder, CC Cleveland (2022) Patterns and controls of foliar nutrient stoichiometry and flexibility across United States forests *Ecology* Accepted
4. C Dallstream\*, M Weemstra, **FM Soper** (2022) Multiple nutrient uptake strategies may co-exist in tropical communities, contributing to soil phosphorus partitioning. *Oikos* In press
5. D Cusack, ...**FM Soper** et al. [39 authors, alphabetical order] (2021) Tradeoffs and synergies in tropical forest root traits for nutrient and water acquisition: field and modeling advances. *Frontiers in Forests and Global Change* 4:704469
6. D Falster, ...**FM Soper** et al. [105 authors] (2021) AusTraits: a curated plant trait database for the Australian flora. *Scientific Data* 8:254
7. BB Osborne, **FM Soper**, MK Nasto, D Bru, S Hwang, MB Machmuller, ML Morales, L Philippot, BW Sullivan, GP Asner, CC Cleveland, AR Townsend, S Porder. (2021) Litter inputs drive patterns of soil nitrogen heterogeneity in a diverse tropical forest. *Soil Biology and Biochemistry* 158:108247
8. RJ Cole, **FM Soper**, CM Litton, AE Knauf, K Sparks, KG Gerow, GP Giardina, JP Sparks (2021) Restoration benefits of soil nutrient manipulation and weeding in invaded dry and wet tropical ecosystems in Hawai'i. *Restoration Ecology* 29:e13390
9. K Covey, **FM Soper** et al. (2021) Carbon and Beyond: The biogeochemistry of climate in a rapidly changing Amazon. *Frontiers in Forests and Global Change* 4:1-11  
\*\*\* Featured in *National Geographic online, The Smithsonian Magazine, CNN, NPR, New Republic, Mongabay and others*

10. **FM Soper**, BN Taylor, JB Winbourne, MY Wong, KA Dynarski, CRG Reis, MB Peoples, CC Cleveland, S Reed, DNL Menge, SS Perakis (2021) A roadmap for sampling and scaling biological nitrogen fixation in terrestrial ecosystems. *Methods in Ecology and Evolution* 12:1122-1137
11. G McNicol, Z Yu, ZC Berry, N Emery, **FM Soper**, W Yang (2021) Tracing plant-environment interactions from plant to planetary scales using stable isotopes: a mini-review. *Emerging Topics in Plant Science* 5:301-316
12. **FM Soper**, C Simon\*, SV Jaus (2021) Measuring terrestrial nitrogen fixation by the Acetylene Reduction Assay: Is three really the magic ratio? *Biogeochemistry* 152:345-351
13. BB Osborne, MK Nasto, **FM Soper**, GP Asner, CS Balzotti, CC Cleveland, PG Taylor, AR Townsend, S Porder (2020) Leaf litter inputs reinforce islands of nitrogen fertility in a lowland tropical forest. *Biogeochemistry* 147:293-206
14. AE Eller, **FM Soper**, JP Sparks (2020) The influence of elevated CO<sub>2</sub> on phenology of Arabidopsis thaliana (Brassicaceae) is altered by common air pollutants (NO<sub>2</sub> and O<sub>3</sub>) and soil nitrogen. *Journal of the Torrey Botanical Society* 147:156-166
15. **FM Soper**, RA MacKenzie, S Sharma, TG Cole, CM Litton, JP Sparks (2019) Non-native mangroves support carbon storage, sediment carbon burial and accretion of coastal ecosystems. *Global Change Biology* 25:4315-4326  
\*\*\* Gene E. Likens Outstanding Publication Award, Ecological Society of America
16. AH Halbritter, H de Boeck... **FM Soper** et al. [90 authors] (2019) The handbook for standardized field and laboratory measurements in terrestrial climate change experiments and observational studies. *Methods in Ecology and Evolution* 11:22-37
17. **FM Soper** (2019) Three's a crowd: Triple-isotope analysis traces alternate plant nitrogen nutrition pathways. *New Phytologist* 223:1687-1689
18. B Sullivan, RL Nifong, MK Nasto, S Alvarez Clare, C Dencker, **FM Soper**, KT Shoemaker, FY Ishida, J Zaragoza-Castells, EA Davidson, CC Cleveland (2019) Biogeochemical recuperation of lowland tropical forest during succession. *Ecology* 100:e02641
19. PG Taylor, C Cleveland, **FM Soper**, W Wieder, SZ Dobrowski, CE Doughty, AR Townsend (2019) Greater stem growth, woody allocation and above ground biomass in Paleotropical versus Neotropical forests. *Ecology* 100:e02589
20. **FM Soper**, B Sullivan, B Osborne, A Shaw, C Cleveland (2019) Leaf cutter ants engineer large N<sub>2</sub>O hot spots in tropical forests. *Proceedings of the Royal Society B* 286:1-7  
\*\*\* Featured in New Scientist and Science magazine
21. **FM Soper**, S Chamberlain, S Gregor, J Crumsey, L Derry, JP Sparks (2018) Biological cycling of mineral nutrients in a temperate forested shale catchment. *JGR Biogeosciences* 123:3204-3215
22. **FM Soper**, M Nasto, BB Osborne, CC Cleveland (2018) Nitrogen fixation and foliar nitrogen do not predict phosphorus acquisition in tropical trees. *Journal of Ecology* 107:118-126
23. **FM Soper**, B Sullivan, M Nasto, BB Osborne, D Bru, C Balzotti, P Taylor, G Asner, A Townsend, L Philippot, S Porder, CC Cleveland (2018) Remotely sensed canopy nitrogen influences N<sub>2</sub>O emissions in a lowland tropical rainforest. *Ecology* 99:2080-2089
24. SM Freund, **FM Soper**, SR Poulson, PC Selmants, BW Sullivan (2018) Actinorhizal species influence plant and soil nitrogen in semiarid shrub-dominated ecosystems in the western Great Basin. *Journal of Arid Environments* 157:48-56
25. **FM Soper**, PG Taylor, W Wieder, S Weintraub, C Cleveland, S Porder, A Townsend (2017) Low rates of gaseous nitrogen loss point to conservative nitrogen cycling in a lowland tropical forest watershed. *Ecosystems* 21:901-912
26. **FM Soper**, JP Sparks (2017) Estimating ecosystem nitrogen addition by a leguminous tree: a mass balance approach using a woody encroachment chronosequence. *Ecosystems* 20:1164-1178
27. **FM Soper**, CK McCalley, K Sparks, JP Sparks (2016) Soil carbon dioxide emissions from the Mojave Desert: isotopic evidence for a carbonate source. *Geophysical Research Letters* 44:245-251
28. **FM Soper**, PM Groffman, JP Sparks (2016) Denitrification in a subtropical, semi-arid savanna: field measurements and intact soil core incubations. *Biogeochemistry* 128:257-266

29. **FM Soper**, TW Boutton, PM Groffman, JP Sparks (2016) Nitrogen trace gas fluxes from a semi-arid subtropical savanna under woody legume encroachment. *Global Biogeochemical Cycles* 30:614-628
30. **FM Soper**, AE Richards, I Siddique, MPM Aidar, GD Cook, LB Hutley, N Robinson, S Schmidt (2015) Natural abundance ( $\delta^{15}\text{N}$ ) indicates shifts in nitrogen relations of woody taxa along a savanna-woodland continental rainfall gradient. *Oecologia* 178:297-308
31. **FM Soper** TW Boutton, JP Sparks (2015) Investigating patterns of symbiotic nitrogen fixation during vegetation change from grassland to woodland using fine scale  $\delta^{15}\text{N}$  measurements. *Plant, Cell & Environment* 38:89-100
32. **FM Soper**, C Paungfoo-Lonhienne, R Brackin, D Rentsch, S Schmidt, N Robinson (2011) *Arabidopsis* and *Lobelia anceps* access small peptides as a nitrogen source for growth. *Functional Plant Biology* 38:788-796
33. N Robinson, R Brackin, K Vinall, **FM Soper** et al (2011) Nitrate paradigm does not hold up for sugarcane. *PLoS ONE* 6(4):e19045.

### SELECTED RESEARCH GRANTS

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As Principal Investigator unless indicated. Pre-2020 values in \$USD

2022	FQRNT Research Support for New Academics McGill Bieler School of Environment Spark Research Award McGill Bieler School of Environment Ignite Research Award (Co-PI)
2020	Canadian Foundation for Innovation John Evans Leadership Fund Award
2020-2025	NSERC Discovery Grant and Launch Supplement
2018-2023	National Science Foundation Research Co-Ordination Network Grant (Co-PI) <i>"INCYTE: Investigating Nutrient Cycling in Terrestrial Ecosystems: Integrating Observations, Experiments and Models"</i>
2010-2014	Graduate student research grants (15 total) from Sigma Xi, Cornell University Cross-Scale Biogeochemistry and Climate Program, Andrew W. Mellon Foundation, Southwestern Association of Naturalists, Cornell University Graduate School, Cornell University Department of Ecology and Evolutionary Biology
2013	National Science Foundation Doctoral Dissertation Improvement Grant

### FELLOWSHIPS AND AWARDS

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2020	Gene E. Likens Outstanding Publication Award, Ecological Society of America
2018	Plant, Cell & Environment Postdoctoral Award (Best Oral Presentation), Ecological Society of America Annual Meeting
2016	Erskine Stewart Young Alumna of the Year, Stuartholme School, Australia
2015	Whittaker Award (Best Oral Presentation), Cornell University Department of Ecology and Evolutionary Biology
2014	Cornell University Betty Miller Francis '47 Graduate Fellowship
2013	Billings Award (Best Oral Presentation), Ecological Society of America Annual Meeting
2011	American Australian Association Education Fellowship
2010	Cornell University Graduate Fellowship
2008	D.A. Herbert Prize in Botany, University of Queensland

### WORKING GROUPS

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National Science Foundation Research Coordination Network '*Investigating Nutrient Cycling in Terrestrial Ecosystems: Integrating Observations, Experiments and Models*' 2019-present

United States Geological Survey John Wesley Powell Center '*Novel multi-scale synthesis of nitrogen fixation rates and drivers across the terrestrial biosphere*' 2019-present

Tropiroot research network, 2020-present

## TEACHING EXPERIENCE

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### Instructor, McGill University

- BIOL205 Functional Biology of Plants and Animals (2021, 2022)
- ENVR202 Evolving Earth (2021, 2022)
- ENVR401 Environmental Research (2020, 2021)
- BIOL601 Graduate Professional Development Seminar (2021)
- ENVR485 Readings in Environment (2021)
- BIOL413 Directed Reading in Biology (2020)

### Guest Lecturer

- Forest Ecosystem Analysis, Skidmore College (2019)
- Principles of Biogeochemistry, Cornell University (2014)

### Teaching Assistant, Cornell University

- Ecology and Environment (2015)
- Principles of Biogeochemistry (2014)
- Deserts, Snakes and Mentorship in the Field (2014)
- Introduction to Comparative Physiology (2011-2012)

## PRESENTATIONS

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### Invited

- 2021 Insights into nitrogen cycling in diverse biomes *Columbia University, New York*
  - Isotopic insights into nitrogen cycling in diverse biomes *Dept of Geography, McGill University, Montreal*
- 2020 Isotopic insights to nitrogen cycling in diverse tropical biomes *Geotop Research Center, Montreal*
- 2019 Novel applications of  $\delta^{15}\text{N}$  for measuring symbiotic nitrogen fixation *University of Michigan, Ann Arbor*
- 2017 Linking pattern and process: Nitrogen dynamics in a lowland tropical rainforest *University of Montana*

### Contributed

- 2020 Interactive global change impacts on Amazon biogeochemical cycles *American Geophysical Union Annual Meeting*
  - Interactive global change impacts on Amazon biogeochemical cycles *Ecological Society of America Annual Meeting*
- 2018 Tree-driven cycling of mineral nutrients in a temperate forested shale catchment *American Geophysical Union Fall Meeting, Washington, DC*
  - Nitrogen status does not predict phosphorus acquisition strategies in tropical trees *Ecological Society of America Annual Meeting, New Orleans, LA* \*Plant, Cell & Environment Postdoctoral Award
- 2017 Canopy foliar nitrogen heterogeneity influences denitrification rates in a tropical lowland forest *Ecological Society of America Annual Meeting, Portland, OR*
- 2016 Woody encroachment impacts on ecosystem nitrogen cycling: fixation, storage and gas loss *American Geophysical Union Fall Meeting, San Francisco, CA*
- 2015 Abiotic drivers, not woody legume encroachment, predict nitrogen trace gas flux from a semi-arid subtropical savanna *Ecological Society of America Annual Meeting, Baltimore, MD*
- 2014 Soil nitrogen gas fluxes during woody legume encroachment: Does encroachment increase gaseous losses? *American Geophysical Union Fall Meeting, San Francisco, CA*

Coupling graduate mentorship with undergraduate research in a field context *Ecological Society of America Annual Meeting, Sacramento, CA*

- 2013 Seasonal and individual variation in leguminous tree nitrogen fixation in a natural ecosystem *Ecological Society of America Annual Meeting, Minneapolis, MN* \*Billings Award
- 2012 Temporal variation in nitrogen fixation during woody encroachment of *Prosopis glandulosa* into grasslands of the Rio Grande Plains *Ecological Society of America Annual Meeting, Portland, OR*
- 2011 The support of plant growth by small peptides in two functionally different plant species *Ecological Society of America Annual Meeting, Austin, TX*

## SELECTED PROFESSIONAL SERVICE

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### Peer review

*Associate Editor*, Biogeochemistry (2021-)

*Reviewer*, Austral Ecology, Biogeosciences, Canadian Journal of Forest Research, Ecology, Ecology Letters, Ecosphere, Ecosystems, Forests, Functional Ecology, Geoderma, Geoderma Regional, Geophysical Research Letters, Global Change Biology, Insects, ISME Journal, JGR Biogeosciences, Journal of Arid Environments, Journal of Ecology, Methods in Ecology and Evolution, Nature Ecology and Evolution, New Phytologist, Oecologia, Plant and Soil, Pedobiologica, Pedosphere, Plant Ecology, PLoS ONE, Soil Biology and Biochemistry

### Institutional Service

McGill Biology Vice-Graduate Program Director (2021-)

McGill Climate Change Cluster Steering Committee (2021-)

McGill Biology Graduate Training Committee (2021-)

McGill Bieler School of Environment Experiential Learning Committee (2021-)

McGill Biology Graduate Experience Task Force (2020-)

### Leadership

Steering Committee, INCyTE Research Co-ordination Network (2019-present)

*Student President*, Sigma Xi: The Scientific Research Society (Cornell chapter), 2014-2015

*President*, Cornell Biogeochemistry, Environmental Science and Sustainability GSA, 2012-2013

### Mentorship

*Mentorship Program Coordinator*, Ecological Society of America Early Career Ecologist Section 2016-2018

### Outreach

*Guest*, Living Planet radio show (2021) and Knowledge Archives Podcast (2020)

*Interviews*: National Geographic, New Scientist, Science News, Monga Bay, Le Devior (2019-present)

*Co-presenter* 'Science Communication for Advocacy' Ecological Society of America Meeting, 2018

*Presenter*, 'What can you do with a career in Science?' Stuartholme School, 2016

### Grant/Prize/Fellowship Review

NASA Earth Science (invited panel member), 2021

National Science Foundation Division of Environmental Biology (ad hoc reviewer), 2020

Early Career Ecologist Outstanding Paper Award Selection Committee, 2018-2019

Science Ambassador Scholarship Advisory Board, 2017-2018

Ecological Society of America Billings and New Phytologist Student Presentation Awards, 2017, 2018

American Australian Association Education Fellowship, 2016

### Conference Sessions

*Co-organiser*, American Geophysical Union Annual Meeting 2019, 2021

## STUDENTS SUPERVISED

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PhD Caroline Dallstream (2020- )

Ana Vitorino (Co-supervised with Prof. Brian Leung, 202- )

MS Mia Marcellus (2020- ) *NSERC Canada Graduate Scholarship*

Undergrad Research Assistants

Camille Simon (2020), Emily Brown (2021), Natalie Swartz (2021-), Lola Milder (2022)

#### PROFESSIONAL AFFILIATIONS

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Ecological Society of America    American Geophysical Union    Canadian Society for Ecology and Evolution