

# Dr. Moira Hough

Research Scientist

Michigan Technological University College of Forest Resources and Environmental Science

[Google Scholar Profile: https://scholar.google.com/citations?user=GbFid9QAAAAJ&hl=en](https://scholar.google.com/citations?user=GbFid9QAAAAJ&hl=en)

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## Education

- PhD 2020**      **University of Arizona, Tucson AZ**  
Department of Ecology and Evolutionary Biology  
Global Change Minor  
*Advisors:* Scott Saleska & Virginia Rich  
Dissertation title: “Tracing the new C-cycle from plant inputs to microbial outputs across an arctic permafrost thaw gradient”
- MSc 2013**      **University of Arizona, Tucson AZ**  
School Natural Resources and the Environment  
Department of Watershed Management and Ecohydrology  
*Advisor:* Mitchell Pavao-Zuckerman  
Thesis title: “Tracing environmental change from plant traits to social-ecological systems on the San Pedro River”
- BA 2009**      **Carleton College, Northfield MN**  
*Magna Cum Laude*      *Major:* Biology, *Advisors:* Susan Singer, Robert Max Holmes  
Thesis title: “Plant-mediated effects of anthropogenic nitrogen deposition on carbon accumulation in peatlands.”  
*Minor:* Environment & Technology Studies, *Advisor:* Tsegaye Nega  
Thesis title: “Ecological Modeling in the Cannon River Watershed.”

## Awarded Grants & Fellowships

- |      |   |            |
|------|---|------------|
| 2018 | DOE Office of Science Graduate Student Research Fellowship  | \$12,500   |
| 2017 | <b>Environmental Molecular Sciences Laboratory (EMSL)/Joint Genome Institute (JGI) Facilities Integrating Collaborations for User Science (FICUS) initiative.</b><br>“Investigating the carbon cycling implications of changing microbial leaf litter decomposition across a permafrost thaw gradient.” EMSL Proposal ID: 503547. S Saleska (PI), Virginia Rich, Ellen Dorrepaal, Steve Blazewicz, Gene Tyson, Jeff Chanton, Malak Tfaily, <b>Moira Hough</b> |            |
|      | Lab services equivalent to ~\$300,000   |            |
| 2017 | University of Arizona Graduate & Professional Student Council Travel Grant  | \$ 750     |
| 2017 | University of Arizona Global Change Program Student Travel Grant  | \$ 800     |
| 2016 | National Science Foundation/Swedish Research Council –<br>Graduate Opportunities Worldwide Fellowship   | \$ 20,000  |
| 2014 | University of Arizona Graduate & Professional Student Council Travel Grant  | \$ 750     |
| 2014 | US Permafrost Association Student Travel Grant  | \$ 350     |
| 2013 | NSF-Graduate Research Fellowship  | \$ 132,000 |

## Awards & Honors

- |      |  |          |
|------|--|----------|
| 2020 | University of Arizona College of Science Galileo Circle Scholar  | \$1000   |
| 2019 | University of Arizona College of Science Galileo Circle Scholar  | \$1000   |
| 2017 | Outstanding Graduate Student Mentor Honorable Mention:<br>University of Arizona Undergraduate Biology Research Program |          |
| 2005 | National Merit Scholarship   | \$ 2,500 |

## **Publications**

- Ayala-Ortiz, C., **Hough, M.**, Eder E.K., Hoyt D.W., Chu R.K., Toyoda, J., Blazewicz, S.J., Crill, P.M. Varner, R., Saleska, S.R., Rich, V.J., Tfaily, M.M., 2025. Tracing priming effects in peat carbon dynamics using a stable isotope-assisted metabolomics approach. *Frontiers in Molecular Biosciences*. 12:1621357. DOI: <https://doi.org/10.3389/fmolb.2025.1621357>
- Cory, A. B., Wilson, R. M., Ogles, O. C., Crill, P. M., Li, Z., Chang, K.-Y., Bosman, S.H., Rich, V.I., Chanton, J.P., EMERGE Project Coordinators, **Hough, M.**, Dominguez, S., Irwin-Raab, N., Trubl, G., Jones, R.M., Anderson, D., Isogenie Field Team. 2025. On the relationship between methane production in anaerobic incubations of peat material and in situ methane emissions. *Journal of Geophysical Research: Biogeosciences*, 130, e2024JG008371. <https://doi.org/10.1029/2024JG008371>
- Abs, E., **Hough, M.**, 2024. Changing the culture of ecology from the ground up. *Elementa: Science of the Anthropocene* 12(1). DOI: <https://doi.org/10.1525/elementa.2023.00003>
- Hribljan, J., **Hough, M.**, Lilleskov E., Suarez, E., Heckman, K., Planas-Clarke, A.M., Chimner R. A. 2023. *Mitigation and Adaptation Strategies for Global Change*. Elevation and temperature are strong predictors of long-term carbon accumulation across tropical Andean mountain peatlands. <https://link.springer.com/article/10.1007/s11027-023-10089-y>
- Abs, E., **M. Hough**. 2023. *Elementa: Science of the Anthropocene*. The world of underground ecology in a changing environment. <https://doi.org/10.1525/elementa.2022.00139>
- Contributing Author to: UNEP (2022). Global Peatlands Assessment – The State of the World’s Peatlands: Evidence for action toward the conservation, restoration, and sustainable management of peatlands. Regional Assessment for North America. Global Peatlands Initiative. United Nations Environment Programme, Nairobi. [https://globalpeatlands.org/sites/default/files/2022-12/peatland\\_assessment.pdf](https://globalpeatlands.org/sites/default/files/2022-12/peatland_assessment.pdf)
- R. M. Wilson, **M.A. Hough**, B. A. Verbeke, S. B. Hodgkins, G. Tyson, M. B. Sullivan, E. Brodie, W. J. Riley, B. Woodcroft, C. McCalley, S. C. Dominguez, P. M. Crill, R. K. Varner, S. Frolking, W. T. Cooper, J. P. Chanton, S. D. Saleska, V. I. Rich, M. M. Tfaily. 2022. *Science of the Total Environment*. Plant organic matter inputs exert a strong control on soil organic matter decomposition in a thawing permafrost peatland. <https://doi.org/10.1016/j.scitotenv.2021.152757>
- Hough, M.**, S. McCabe, S.R. Vining, E. Pickering-Pedersen, K. Chang, G. Bohrer, The IsoGenie Coordinators, W. Riley, P. Crill, R. Varner, M. Tfaily, S. Saleska, V. Rich. 2021. *Global Change Biology*. Coupling plant litter quantity to a novel metric for litter quality explains C storage changes in a thawing permafrost peatland. <https://doi.org/10.1111/gcb.15970>
- Defrenne, C.E., E. Abs, A.L. Cordeiro, L. Dietterich, **M. Hough**, J.M. Jones, S.N. Kivlin, W. Chen, D. Cusack, A.L.C. Franco, A. Khasanova, D. Stover, A.L. Romero-Olivares, 2021. *New Phytologist*. The Ecology Underground Coalition: Building a collaborative future of belowground ecology and ecologists. <https://doi.org/10.1111/nph.17163>
- Bolduc B, Hodgkins SB, Varner RK, Crill PM, McCalley CK, Chanton JP, Tyson GW, Riley WJ, Palace M, Duhaime MB, **Hough MA**, IsoGenie Project Coordinators, IsoGenie Project Team, A2A Project Team, Saleska SR, Sullivan MB, Rich VI. 2020. The IsoGenie database: an interdisciplinary data management solution for ecosystems biology and environmental research. *PeerJ* 8:e9467 <https://doi.org/10.7717/peerj.9467>
- Hough, M.**, A. McClure, B. Buldoc, E. Dorrepaal, S. Saleska, V. Klepac-Ceraj, V. Rich, 2020. *Frontiers in Microbiology*. Biotic and environmental drivers of plant microbiomes across a permafrost thaw gradient. <https://doi.org/10.3389/fmicb.2020.00796>

**Hough, M.**, M. Pavao-Zuckerman, C.A. Scott, 2018. Connecting plant traits and social perceptions in riparian systems: ecosystem services as indicators of thresholds in social-ecohydrological systems. *Journal of Hydrology*. <https://doi.org/10.1016/j.jhydrol.2018.08.005>

Hodgkins, S.B., Richardson, C.J., Dommain, R., Wang, H., Glaser, P.H., Verbeke, B., Winkler, B.R., Cobb, A.R., Rich, V.I., Missilmani, M., Flanagan, N., Ho, M., Hoyt, A.M., Harvey, C.F., Vining, S.R., **Hough, M.A.**, Moore, T.R., Richard, P.J.H., Cruz, F.B.D. La, Toufaily, J., Hamdan, R., Cooper, W.T., Chanton, J.P., 2018. Tropical peatland carbon storage linked to global latitudinal trends in peat recalcitrance. *Nature Communications*. <https://doi.org/10.1038/s41467-018-06050-2>

#### Technical Reports

Kurzweil, J., **Hough, M.**, Chimner R. (2023). Restoration Feasibility Study for Little Green Valley, Arizona. Consulting Report to: United States Forest Service, Tonto National Forest, Arizona USA.

**Hough, M.**, Marjolein K. (2007). Pilot study of the market pressures of crayfish in the commune of Miarinavaratra. Internal Report: WWF Madagascar.

#### In Preparation

**Hough, M.**, Jaramillo, R., Chimbolema, S., Suarez, E., Chimner R., Lilleskov R. *In revision at Ecological Applications*. Impacts of grazing on greenhouse gas emissions from high elevation Andean peatlands.

**Hough, M.**, S. Blazewicz, L. Solden, E. Dorrepaal, E. Eloë-Fadrosh, B. Koch, The IsoGenie Coordinators, P. Crill, M. Tfaily, S. Saleska, V. Rich. *Submission planned December 2025*. Litter deposition drives divergent priming effects for aerobic and anaerobic decomposition in a thawing permafrost peatland.

**Hough, M.**, E. Swails, K. Hergoualc'h, L. Bourgeau-Chavez, R. Bhomia, R. Chimner, E. Lilleskov, R. Kolka. *In prep*. "What do we need to know to create effective science-based peatland policy?"

#### Research and Professional Experience

2023-Present **Research Scientist:** College of Forest Resources & Environment, Michigan Technological University.

2021-2023 **Postdoctoral Scholar:** College of Forest Resources & Environment, Michigan Technological University. Supervisors: Rod Chimner, Erik Lilleskov

2020-2021 **Postdoctoral Research Associate:** Environmental Sciences/Ecology & Evolutionary Biology, University of Arizona. Supervisor: Malak Tfaily

2017-2020 **Graduate Research Assistant:** Saleska Lab  
Department of Ecology & Evolutionary Biology, University of Arizona

2018 **Graduate Research Fellow:** Department of Energy, Joint Genome Institute. Supervisor: Emiley Eloë-Fadrosh

2016 **Graduate Research Fellow:** Climate Impacts Research Centre, Umeå University

2013-2016 **Graduate Research Fellow:** National Science Foundation Graduate Research Fellowship at the University of Arizona

2011-2013 **Graduate Research Assistant,** Biosphere 2: Tucson AZ  
NSF Coupled Natural and Human Systems Project: "Strengthening Resilience of Arid Region Riparian Corridors"

2010 **Field Assistant,** University of Alaska, Fairbanks: Craig, AK  
Studied impacts of logging on habitat use and fawn mortality using capture and radio tracking of fawns and adult female Sitka Black-Tailed Deer.

2009-2010 **Environmental Scientist,** TRC Environmental: Lowell, MA  
Wetland delineation, protected habitat surveys, project permitting, and environmental compliance assessments.

- 2009 **Student Researcher**, The Polaris Project: Cherskiy, Russia.  
Impacts of climate change on carbon and nutrient cycling in the Kolyma River watershed. Public outreach on climate change.
- 2008 **Student Researcher**, La Selva Biological Station, Costa Rica  
Studied scent attraction in Euglossine bees and response to disturbance in Nasutitermes termites.
- 2008 **Student Researcher (REU)**, McKnight Lab: University of Colorado, Boulder.  
Alpine lake biogeochemistry. Stream biogeochemistry and invertebrate community structure.
- 2007 **Intern**, WWF: Fandriana, Madagascar  
Assessed anthropogenic pressures on crayfish populations. Community outreach.
- 2006 **Farm Hand**, Stone Barns Center for Food & Ag: Pocantico Hills, NY  
Managed and maintained enclosures for free-range livestock.

### **Teaching**

- 2024 **Lead trainer:** Etude des tourbières du Kongo Central en République Central Démocratique du Congo, training in field techniques for peatland mapping ground-truthing and total carbon storage assessment (in french)
- 2023 **Primary Instructor:** Wetlands Ecology lecture and lab based course for upper division undergraduate/graduate students, receiving an average course evaluation score of 4.4 out of 5.
- 2017 **Graduate Teaching Assistant:** primary instructor for Introductory Biology Laboratory, Department of Ecology & Evolutionary Biology, University of Arizona
- 2013-2019 **Sky School Teaching Fellow:** Instructor at K-12 outdoor science program
- 2012 **Catalina Foothills High School Mentor** for students developing environmental inquiry projects
- 2010-2011 **Seasonal Naturalist**, Long Lake Conservation Center: Palisade, MN.  
Teacher for groups of students grades 5-7 in ecology and environmental science
- 2009 **Teaching Assistant:** Ecosystems Ecology, Carleton College.
- 2005-2009 **Kids for Conservation Instructor:** teaching principles of conservation to elementary school classes

### **Mentoring**

- Students mentored:** Yamini Sree Manchala (MSc student at MTU 2025), Samantha McCabe (OSU MSc student with Virginia Rich 2017-2019), Rose Vining (UA BSc student with Virginia Rich 2014-2017), Amelia McClure (Wellesley College BA student with Vanja Klepac-Ceraj 2014)
- 2009 **Student Departmental Advisor:** Carleton College.
- 2007 **Canoe Trip Leader:** Carleton College four-day freshman orientation trips in Boundary Waters Wilderness Area.

### **Service & Outreach**

- Journal Peer Review:** PNAS, Soil Biology & Biochemistry, Functional Ecology, JGR: Biogeosciences, Plant & Soil, Ecological Applications
- 2023 **Electronic Proposal Review**, NSF Division of Environmental Biology
- 2022-2023 **Guest Editor**, Elementa: Science of the Anthropocene, Special Feature: The World of Underground Ecology in a Changing Environment

- 2021 **Community, Anti-Racism, and Equity Committee**, Department of Ecology & Evolutionary Biology
- 2021 **Footprints Running Camp**: Speaker and mentor for participants in a running camp aimed at fostering environmental understanding and activism
- 2019 **Outreach**: Public outreach discussion of climate change at March for Science AZ science speakeasy
- 2018 **Outreach**: Public presentation on Arctic C-cycling for March for Science AZ science trivia night
- 2017 **Outreach**: Panel member for Arctic climate change discussion after “Between Earth and Sky” film showing
- 2012, 2014 **Travel Grant Review**: University of Arizona Graduate & Professional Student Council
- 2012-2013 **Natural Resources Graduate Student Organization Co-chair**: Graduate student-faculty liaison and representative
- 2013 **Southern Arizona Regional Science and Engineering Fair Judge**
- 2011 **Biosphere 2**: developed interpretive materials for public outreach exhibit
- 2004 **SCA Trail Crew**: Guadalupe Mountains National Park, Texas

### Languages

**English**, Native

**French**, Conversational (CEFR B1/B2)

**Spanish**, Basic (CEFR A2)

### Invited Talks

**Hough, M.**, C. Bourgeois, L. Bourgeau-Chavez, E. Lilleskov, “Développement d’une carte stratifiée des tourbières en République Démocratique du Congo” (Invited talk – in French) *Meeting of the Parties of the Congo Basin Forest Partnership site event : Peatlands for life in the Congo Basin*, Kinshasa, DRC, June 2024

**Hough, M.** 2024, “Potential and limitations of peatlands as natural climate solutions” (Invited talk) *SMU Energy, Environment, and Natural Resources Colloquium*, Dallas, TX, May 2024

### Presentations

**Hough, M.**, R. Jaramillo, S. Chimbolema, E. Suarez, R. Chimner, E. Lilleskov, “Impactos del pastoreo en las emisiones de gases de efecto invernadero de las turberas andinas de gran altitud” (Presentation - in Spanish) *Congreso Latinoamericano de Ecología y Conservación de Ecosistemas Altoandinos*, Quito Ecuador, July 2024.

**Hough, M.**, E. Swails, K. Hergoualc’h, L. Bourgeau-Chavez, R. Bhomia, R. Chimner, E. Lilleskov, R. Kolka. 2024, “What do we need to know to create effective science-based peatland policy?” (Presentation) *International Union of Forest Research Organizations XXVI World Congress*, Stockholm, Sweden, June 2024.

Hribljan, J.A., **M. Hough**, E.A. Lilleskov, E. Suarez, K. Heckman, A.M. Planas-Clarke, R.A. Chimner. 2022. “Elevation, temperature, and long-term carbon accumulation across Andean peatlands” (Presentation) *In Proceedings of the Association for Tropical Biology and Conservation Annual Meeting 2022*, Cartagena, Colombia, July 2022.

**Hough, M.**, E. Abs, A. Romero Olivares. “Finding what matters in microbial response to environmental change” (Presentation) *In Proceedings of the Ecological Society of America Conference 2021*, Virtual Meeting, August 2021.

**Hough, M.**, S. McCabe, R. Vining, E. Pickering -Pedersen, R. Wilson, R. Lawrence, K. Chang, G. Bohrer, The IsoGenie Coordinators, W. Riley, P. Crill, R. Varner, S. Blazewicz, E. Dorrepaal, M.

Tfaily, S. Saleska, V. Rich. “Implications of changing plant growth and bioavailability for C storage in a thawing permafrost peatland” (Presentation) *In Mer Bleue and Beyond Virtual Symposium 2021*, Virtual Meeting, May 2021.

**Hough, M.,** S. Blazewicz, L.M. Solden, M. Tfaily, E. Dorrepaal, P. Crill, V. Rich, S. Saleska. “**Impacts of fresh litter inputs on microbial C degradation and CH<sub>4</sub> fluxes across an Arctic permafrost thaw gradient**” (Presentation) *In Proceedings of the Ecological Society of America Conference 2020*, Virtual Meeting, August 2020.

**Hough, M.,** M. Tfaily, S. Blazewicz, E. Dorrepaal, P. Crill, V. Rich, S. Saleska. “Impacts of fresh litter inputs on microbially mediated C fluxes across an Arctic permafrost thaw gradient” (Presentation) *In Proceedings of the Ecological Society of America Conference 2019*, Louisville, KY, 13 August 2019.

**Hough, M.,** M. Tfaily, S. Blazewicz, E. Dorrepaal, P. Crill, V. Rich, S. Saleska. “Identifying the role of plant-microbial interactions in driving Arctic carbon cycle changes using a <sup>13</sup>C isotope tracer” (Poster) *In Proceedings of the American Geophysical Union Fall Meeting 2017*, New Orleans, LA, 12 December 2017.

**Hough, M.,** E. Dorrepaal, P. Crill, V. Rich, S. Saleska. “Measuring impacts of plant community transition on peatland C cycling,” (Presentation) *Climate Impacts Research Centre Autumn Symposium 2016*, Abisko, Sweden, 26 October, 2016.

**Hough, M.,** A. J. Garnello, D. Finnell, M. Palace, V. Rich, S. Saleska. “Can Plant Community Turnover Mitigate Permafrost Thaw Feedbacks to the Climate System?” (Poster) *In Proceedings of the American Geophysical Union Fall Meeting 2014*, San Francisco, CA, 17 December 2014.

**Hough, M.,** D. Chan, C.A. Scott, B. Enquist, M. Pavao-Zuckerman. “Application of trait-based mechanisms to resilience of ecosystem service provision in an arid riparian corridor.” (Presentation) *Ecological Society of America Conference*, Minneapolis, MN, 6 August, 2013.

**Hough, M.,** J. Stromberg, C.A. Scott, B. Enquist, M. Pavao Zuckerman. “Functional traits as predictors of resilience for riparian ecosystem processes and services,” (Poster) *Ecosystem Services Partnership Conference*, Portland, OR, 31 July – 4 August, 2012.

**Hough, M.,** D. Chan, C.A. Scott, M. Pavao Zuckerman. “Ecosystem Services as Tools to Assess Social-Ecological Resilience in Arid Riparian Corridors,” (Poster) *Adaptation Futures Conference* Tucson, AZ, 29-30 May, 2012.

**Hough, M.,** K.E. Frey, W. Sobczak, A. Bunn, E.B. Bulygina, S. Chandra, S. Davydov, R.M. Holmes, J. Schade, V. Spektor, & S. Zimov. “Potential impacts of permafrost degradation on carbon storage of peat soils in the Kolyma River basin, East Siberia.” (Poster). *State of the Arctic Conference*, Miami FL, 2010.

**Hough, M.** Impacts of DOM on aquatic macroinvertebrate communities (Presentation). *Research Experience for Undergraduates Symposium*, University of Colorado, Boulder Mountain Research Station. August 2008.