

Dr. Katherine R. Hayes
krhayes.com | katherine.hayes@ucdenver.edu
ORCID: 0000-0002-6612-9398

RESEARCH APPOINTMENTS

NSF Postdoctoral Fellow **2023 - Present**
Future Forests Lab, Cary Institute of Ecosystems Studies

EDUCATION

PhD in Integrative and Systems Biology

University of Colorado, Denver

Advised by Dr. Brian Buma

Thesis title: “Short-interval reburning changes forest composition, carbon, and fire behavior of boreal forests”

Master of Science in Geography

University of Oregon

Advised by Dr. Dan Gavin

Thesis title: “Fire history and soil carbon in old growth coast redwood forests across the late Holocene”

Bachelor of Science in Environmental Studies, Spanish, and Geography (Honors)

University of Wisconsin, Madison

Advised by Dr. Jack Williams

Minor in European Studies

Thesis title: “A continuous charcoal record of Bonnett Lake, Ohio since the Last Glacial Maximum”

PEER REVIEWED PUBLICATIONS

8. Carter T., **Hayes K.**, Buma B. Putting more fuel on the fire... or maybe not? A synthesis of spruce beetle and fire interactions in North American Subalpine Forests. (2022). *Landscape Ecology*. <https://doi.org/10.1007/s10980-022-01481-1>
7. **Hayes K.**, Carter T., Cook P., Twaddell E., Buma B. Supporting Graduate Field Leadership through Community-Sourced Advice, Action, and Policy. (2022). *Ecosphere*. <https://doi.org/10.1002/ecs2.4247>
6. Buma, B., **Hayes, K.**, Weiss, S., Lucash, M. Short interval fires increasing in the Alaskan boreal forest as fire self-regulation decays across forest types. (2022). *Scientific Reports*, 12, 4901. <https://doi.org/10.1038/s41598-022-08912-8>
5. Muthukrishnan, R., **Hayes, K.**, Bartowitz, K., Cattau, M., Harvey, B., Lin, Y., Lunch, C. (2022). Harnessing NEON to evaluate ecological tipping points: opportunities, challenges, and approaches. *Ecosphere*, 13(3), p.e03989. <http://doi.org/10.1002/ecs2.3989>
4. Nagy C., Balch J, Bissell E, Cattau, M., Glenn, N., Halpern B., ... **Hayes K.**, ... O’Riordan, C. (2021). Harnessing the NEON data revolution to advance open environmental science with a diverse and data-capable community. *Ecosphere*, 12(12), p.e03833. <https://doi.org/10.1002/ecs2.3833>
3. **Hayes, K.**, Buma, B. (2021). Effects of short-interval disturbances continue to accumulate, overwhelming variability in local resilience. *Ecosphere*, 12(3), e03379. <https://doi.org/10.1002/ecs2.3379>
2. Jensen, A. M., Fastovich, D., Watson, B. I., Gill, J. L., Jackson, S. T., Russell, J. M., Bevington, J., **Hayes, K.**, & Williams, J. W. (2021). More than one way to kill a spruce forest: The role of fire and climate in the late-glacial termination of spruce woodlands across the southern Great Lakes. *Journal of Ecology*, 109(1), 459-477. <https://doi.org/10.1111/1365-2745.13517>
1. Buma, B., Weiss, S., **Hayes, K.**, & Lucash, M. (2020). Wildland fire reburning trends across the US West suggest only short-term negative feedback and differing climatic effects. *Environmental Research Letters*, 15(3), 034026. <https://doi.org/10.1088/1748-9326/ab6c70>

OTHER PUBLICATIONS

- Kulakowski D., Buma B., Guz J., **Hayes K.** (2019). “The ecology of forest disturbances”. Reference Module in *Earth Systems and Environmental Science*. <https://doi.org/10.1016/B978-0-12-409548-9.11878-0>

PUBLICATIONS IN REVIEW (available on request)

- Weiss S, Marshall A, **Hayes K**, Nicolsky D, Buma B, Lucash M. Future transitions from a conifer to a deciduous-dominated landscape are accelerated by greater wildfire activity and climate change in interior Alaska. *Landscape Ecology*. **[In Review]**
- **Hayes K.** Acid-digestion recovers more pyrogenic carbon and reduces variability compared to traditional manual counting, particularly where pyrogenic carbon is scarce. *Geoderma*. **[In Revision]**

GRANTS

- | | | |
|------|---|--------------------------|
| 2022 | NSF Collaborative Proposal. Buma B, Higuera C, Hoffman C, Chapman M, Hayes K.
<i>The Past, Present and Future of Boreal Fire Feedbacks</i> | \$276,934 of 1.4 million |
| | NSF Postdoctoral Research Fellowship. Hayes K, Hansen W, Johnstone J.
<i>Investigating fire-biotic disturbance interactions and their sensitivity to climate in the North American boreal biome</i> | \$321,333 |
| 2021 | UC Denver Integrative and Systems Biology Merit Grant | \$15,000 |
| | Colorado STEM Graduate Grant | \$1,250 |
| 2019 | Joint Fire Science Program Graduate Research Innovation Award. Hayes K, Buma B.
<i>Evaluating Flammability across Reburns in Interior Alaska.</i> | \$25,000 |

ORAL PRESENTATIONS

2023

- **Hayes K**, Hansen W. “A systematic review of emerging biotic disturbances in Interior Alaska”, International Association of Landscape Ecology: North America. Riverside, CA. March 2023.
- Buma B, **Hayes K**, Ziegler J, Hoffman C. “*Changing fuels and fuel structures in boreal forests alter and can increase fire spread through wind, spread, and other mechanisms*”, American Meteorological Society. Denver, CO. January 2023. **[Invited]**

2022

- **Hayes K**, Hoffman C, Ziegler J, Lucash M, Buma B. “*Continued short-interval reburning changes carbon storage and future fire behavior of boreal forests regardless of forest resilience*”, American Geophysical Union. Chicago, IL. December 2022.
- **Hayes K**, Hoffman C, Ziegler J, Buma B. “*Evaluating flammability of reburns across Interior Alaska*”, Alaska Fire Science Consortium. Webinar. November 2022. **[Invited]**
- **Hayes K**, Carter T, Cook P, Twaddell E, Buma B. “*How do we practice, develop and support graduate field leadership skills?*”, Pal(a)eo Early Career Seminar Series. Remote Seminar. September 2022. **[Invited]**
- **Hayes K**, Lucash M, Hoffman C, Ziegler J, Buma B. “*Short-interval reburning changes fuel structure, carbon storage and fire behavior of boreal forests*”, Ecological Society of America. Montreal, CA. August 2022.
- **Hayes K**, Carter T, Cook P, Twaddell E, Buma B. “*Strategies for managing and leading fieldwork successfully as a graduate student*”, Ecological Society of America: Inspire Session. Montreal, CA. August 2022.

- **Hayes K**, Lucash M, Buma B. “*Repeat short-interval fires put carbon storage in Interior Alaska at risk*”, International Association of Landscape Ecology: North America. Remote. April 2022. [Presentation Award]
- **Hayes K**, Gavin D. “*Establishing baseline patterns of fire in old-growth coast redwood forests using soil carbon and charcoal*”, Northwest Science Association. Remote. March 2022.
- **Hayes K**, Carter T, Cook P, Twaddell E, Buma B. “*Graduate Field Leadership: Challenges, Successes and Strategies*”, Front Range Student Ecology Symposium. Fort Collins, CO. Feb. 2022.

2021

- **Hayes K**, Buma B. “*Repeat short-interval fires drive changes in biomass and soil carbon in Interior Alaska, regardless of local site conditions or resilience*”, American Geophysical Union. New Orleans, LA. December 2021.
- Buma B, **Hayes K**, Weiss S, Lucash M. “*Short-interval fires increasing in the boreal forest over multi-decadal time periods, especially in drier coniferous forest landscapes*”, American Geophysical Union. New Orleans, LA. December 2021.
- **Hayes K**, Buma B. “*Continued short-interval reburning drives changes in fuel-scapes across boreal forest landscapes*”, Great Plains Rocky Mountains Applied Geography. Remote. October 2021.
- **Hayes K**, Buma B. “*Biomass and soil carbon in reburned stands burnt in short-intervals in Interior Alaska*”, International Boreal Forest Research Association. Remote. August 2021. [Presentation Award]
- **Hayes K**, Buma B. “*Repeat short-interval fires drive changes in biomass and soil carbon in Interior Alaska*”, International Association of Landscape Ecology: North America. Remote. April 2021.
- **Hayes K**, Buma B. “*The effects of multiple short-interval fires on community and functional trait-based regeneration in boreal Alaska*”, American Association of Geographers. Remote. April 2021.
- **Hayes K**, Buma B. “*Repeat short-interval fires drive changes in forest structure, composition and carbon in Interior Alaska*”, Front Range Student Ecology Symposium. Remote. March 2021. [Presentation Award]

2020

- **Hayes K**, Buma B. “*Interacting Effects of Herbivory and Short-Interval Reburns on Successional trajectories in Boreal Interior Alaska*”, International Association of Landscape Ecology: North America. Remote. May 2020.
- Buma B, **Hayes K**. “*Evaluating flammability of reburns in the boreal forests of Interior Alaska*”. Alaska Fire Science Consortium. Webinar. April 2020. [Invited]

2019

- Buma B, **Hayes K**, Weiss S, Lucash M. “*Overlapping and interacting fires, a double whammy: Short-interval burns are becoming more frequent across the US West, but pace suggests negative feedbacks and spatial patterning*”, American Geophysical Union. San Francisco, CA. December 2019.
- **Hayes K**, Buma B. “*Continued short-interval fires overwhelm serotinous resilience regardless of topographic variation*”, Association for Fire Ecology. Tucson, AZ. November 2019.
- Buma B, **Hayes K**, Weiss S, Lucash M. “*Rates of short-interval fires increasing across the US West*”, Association for Fire Ecology. Tucson, AZ. November 2019.
- **Hayes K**. “*Repeat short-interval fires in boreal cause continued ecosystem change*”, UC Denver Integrative Biology Graduate Student Seminar Series. Denver, CO. October 2019.
- **Hayes K**. “*Using NEON data to identify ecological tipping points across spatial/temporal scales*”, NEON Science Summit. Boulder, CO. October 2019.
- **Hayes K**, Buma B. “*Landscape Context mediates the effect of shortening fire intervals in boreal systems*”, International Association of Landscape Ecology: North America. Fort Collins, CO. April 2019.
- Buma B, Lucash M, **Hayes K**, Weiss S. “*The Predictable, and not so Predictable, Spatial distribution of Short Interval Fires across the US West*”, International Association of Landscape Ecology: North America. Fort Collins, CO. April 2019.

- **Hayes K**, Buma B. “*Landscape Context mediates the effect of shortening fire intervals in boreal systems*”, UC Denver Integrative Biology Graduate Student Seminar Series. Denver, CO. April 2019.

2017

- **Hayes K**, Gavin D. “*Reconstructing Paleofire in Old Growth Coast Redwood Forests in Northern California Using Pyrogenic Charcoal and Soil Carbon*”. Association of Pacific Coast Geographers. Chico, California. October 2017. [**Presentation Award**]
- **Hayes K**, Gavin D. “*Reconstructing a fire history in the Coast Redwood (*Sequoia Sempervirens*) forests of Northern California*”. Ecological Society of America. Portland, OR. August 2017.
- **Hayes K**. “*Marine Fog, Climate Change and Coast Redwood Forests: Implications for management and research*”. University of Oregon Graduate Research Forum. Eugene, OR. April 2017.
- **Hayes K**, Gavin D. “*Marine Fog, Climate Change and Coast Redwood Forests: Past, Present and Future*”. UO Climate Change Research Symposium, Eugene, OR. April 2017.

2016

- **Hayes K**, Williams J. “*Fire History of Bonnett Lake, Ohio since the Last Glacial Maximum*”. Midwest Undergraduate Geography Symposium, Minneapolis, MN. April 2016.
- **Hayes K**, Williams J. “*Compiling a continuous charcoal record of Bonnett Lake, Ohio since the Last Glacial Maximum*”. University of Wisconsin Undergraduate Symposium, Madison, WI. April 2016.

SELECT POSTER PRESENTATIONS [Undergraduate mentees underlined]

2022

- **Hayes K**, Hoffman C, Lucash M, Buma B. “*Short-interval reburning changes fuel structure, carbon storage and fire behavior of boreal forests*”, Forest Disturbance and Ecosystem Dynamics Symposium. Berchtesgaden National Park, Germany. September 2022. [**Poster Award**]

2021

- **Hayes K**, Hoffman C, Ziegler J, Buma B. “*Continued short-interval reburning changes fuel structures of Boreal forests*”, Int. Fire Ecology and Management Congress. Remote. December 2021.
- **Hayes K**, Buma B. “*Recovery of aboveground biomass and soil carbon after multiple short-interval disturbances in boreal Interior Alaska*”, North American Carbon Program Open Science Meeting. Remote. March 2021.

2019

- **Hayes K**, Buma B. “*Effects of Spatial Heterogeneity on successional trajectories following repeat disturbances in Boreal Interior Alaska*”, American Geophysical Union. San Francisco, CA. Dec 2019.
- Weiss S, **Hayes K**, Lucash M. “*Modeling Post-fire Successional trajectories under Climate Change in Black Spruce forests in Interior Alaska*”, American Geophysical Union. San Francisco, CA. Dec 2019.
- Olson K, Buma B, **Hayes K**. “*Fine-scale Observations of Permafrost after Repeat Fires in Interior Alaska*”, American Geophysical Union. San Francisco, CA. December 2019.
- Kodicherla V, Shabaga J, Vogel J, Buma B, **Hayes K**. “*Soil Respiration in very high frequency Boreal Wildfires as a function of Species*”, AGU. San Francisco, CA. December 2019.
- **Hayes K**, Buma B. “*The Implications of increasing fire frequency in boreal forests in Interior Alaska*”, University of Colorado Denver Research and Creative Activities Symposium. Denver, CO. April 2019.

2018

- **Hayes K**, Buma B. “*The Future of the Boreal Forest*”, University of Colorado Denver Applied Spatial Statistics Poster Presentation. Denver, CO. December 2018.

- Jensen A, Rubbelke C, **Hayes K**, Bevington J, Fastovich D, Watson B, Jackson S, Russel J, Williams J. “*The role of fire in the late-glacial decline of spruce forests across the midwestern US*”, American Geophysical Union. December 2018.
- **Hayes K**, Gavin D. “*Fire and Carbon Cycling in Old Growth Coast Redwood*”. University of Oregon Graduate Research Forum. Eugene, OR. May 2018.

2017

- **Hayes K**, Hendricks L, Gavin D. “*Forests with naturally infrequent fire: their resilience and susceptibility to impacts by people & climate change*”. Joint Campus Conference. Eugene, OR. May 2017.
- **Hayes K**, Gavin D. “*Marine fog and Climate change in Coast redwood (Sequoia sempervirens) forests: Implications for management & research*”. American Association of Geography. Boston, MA. April 2017.

OTHER TALKS

- “*The theory, premise and problems with botanical sexism*”. Nerd Nite. Denver, CO. November 2022.
- “*Bears, burning and Battlestar Galactica: climate change in Alaska and why it matters*”. Nerd Nite. Denver, CO. October 2021.
- “*Climate change: how the Arctic is changing and why it matters*”. First Unitarian Society Sunday Forum. Milwaukee, WI. November 2019.

HONORS & AWARDS

2022

UC Denver Dept. of Biology Doctoral Teaching Award. **\$2,500.**
U.S. Carbon Program Leadership Award. **\$1,000.**
UC Denver Department of Integrative Biology Travel Award. **\$500.**
UC Denver College of Liberal Arts and Sciences Travel Award. **\$500.**
International Association of Landscape Ecology Presentation Award. **\$300.**
UC Denver Dept. of Biology Graduate Excellence in Research Award. **\$250.**

2021

UC Denver Department of Integrative Biology Travel Award. **\$600.**
International Boreal Forest Research Association Presentation Award. **\$400.**
Front Range Student Ecology Symposium Presentation Award. **\$150.**
Ecological Society of America Graduate Policy Award

2020

Polanki Graduate Achievement Award. **\$1,200.**
Association of Fire Ecology TREE Graduate Travel Award. **\$265.**
UC Denver Department of Integrative Biology Travel Award. **\$300.**

2019

Association of Fire Ecology TREE Graduate Travel Award. **\$330.**
UC Denver Department of Integrative Biology Travel Award. **\$500.**
UC Denver College of Liberal Arts and Sciences Travel Award. **\$500.**
UC Denver Graduate School Travel Award. **\$500.**

2018

Robert J. Leonard Memorial Award. **\$1,200.**

2017

Christopherson Geosystems Award for Excellence in Applied Geography/Earth Systems Science. **\$300.**
UO Graduate Research Forum Oral Session Award. **\$75.**
Association of Pacific Coast Geographer’s Travel Award. **\$200.**

TEACHING AND MENTORING EXPERIENCE

Instructor of Record

2022 Principles of Ecology, University of Colorado Denver (1 semester)

Teaching Assistant

2020 - 2022 Gen. Biology: Organisms to Ecosystems, University of Colorado Denver (2 semesters)
 Biostatistics, University of Colorado Denver (1 semester)
 2016 - 2018 The Professional Geographer, University of Oregon (1 semester)
 Biogeography, University of Oregon (2 semesters)
 Quantitative Data Analysis, University of Oregon (2 semesters)
 Climatology, University of Oregon (1 semester)

Guest Lecturer

2020 "Introduction to Fire Ecology.", *Disturbance Ecology*, UC-Denver
 2019 "Introduction to Landscape Ecology." *Principles of Ecology*, UC-Denver
 2018 "Graduate School in Geography." *The Professional Geographer*, University of Oregon
 2017 "Theory of Island Biogeography", *Biogeography*, University of Oregon

Seminar Coordinator

2019 Applied Ecology Seminar, University of Colorado Denver
 2018 Graduate Seminar Coordinator, University of Oregon

Mentoring Experience

2019 – 2020 NSF Research Experience for Undergraduates Mentor (2 students)
 Students mentored in lab: 6
 Students mentored in field: 8

Student committees:

CU Denver: Elizabeth Kuhn (B.S., 2022)

MAJOR GRANTS SUBMITTED, NOT FUNDED

- National Geographic Society Early Career Grant, "*Searching for ice: mapping and modeling permafrost in Interior Alaska*", 2019.
- NSF Graduate Research Fellowship, "*Reconstructing hurricanes and fire in Cuba using paleotemperature*", 2016.

SERVICE AND ENGAGEMENT

Service positions

Journal Reviewer: *Plant and Soil; Global Change Biology; Ecosphere; OneEarth; Arctic, Antarctic, and Alpine Research; Ecosystems; Combustion Science and Technology*

2023 – Present AGU Leadership Academy and Network for Diversity and Inclusion in the Geosciences (LANDIn) Postdoctoral Research Fellow.

2020 - 2021 Graduate Student Representative: Office of the Dean Graduate Advisory Group. Provided a student perspective and advocated for student issues to the office of the Dean.

2019 - 2021 Student Representative & Executive Committee Member: International Association of Landscape Ecology North America. Elected. Prepared student-specific events and

content for annual meetings (both virtual and in-person), provided a student perspective on the executive committee.

- 2019 – 2020 Graduate Student Representative: Department of Biology Graduate Advisory Committee, University of Colorado Denver.
- 2016 – 2019 Graduate Department Representative: Graduate Teaching Fellows Federation, University of Oregon.

Special sessions, workshops, and training

- 2023 Invited speaker. *Wildfire Research: Advances, Challenges and Opportunities*, American Meteorological Society. Denver, CO.
- 2022 Wilderness First Aid License
Panelist. *Advice from the Field: Practical Skills, Coping with Accessibility Challenges, and What Else You Need to Know*. Ecological Society of America. Montreal, CA.
Session Participant. *Regional analysis of landscape and forest change towards practical landscape management*. International Association of Landscape Ecology, North America. Remote.
- 2021 Session Organizer: *Exploring the context and implications of departures from historic fire frequency across ecosystems*. International Association of Landscape Ecology, North America. Remote.
- 2020 Participant. *Foundations of Open Science Skills* (FOSS) course, CyVerse. Remote.
Participant. *Introduction to Using Google Earth Engine for Landscape Ecology*. IALE North America Workshop.
- 2019 Participant. *NEON Science Summit*. Boulder, CO.
- 2018 Field Safety Training. National Science Foundation Polar Office. Fairbanks, AK.
- 2017 Session Organizer: *Water in the Pacific Midwest: Past and Future*. Graduate Student Research Forum, University of Oregon. [Organized Session Award]
- 2016 Participant. *PaleON: Assimilating Long-Term Data into Ecosystems Models* workshop. University of Notre Dame Research Station.