

Dr. Katherine R. Hayes
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RESEARCH APPOINTMENTS

Postdoctoral Scientist Forest Futures Lab, Cary Institute of Ecosystems Studies	2025 - Present
National Science Foundation Postdoctoral Fellow	2023 - 2025

EDUCATION

Ph.D. in Integrative and Systems Biology University of Colorado, Denver	<i>Advised by Dr. Brian Buma</i>
M.S. in Geography University of Oregon	<i>Advised by Dr. Dan Gavin</i>
B.S. in Environmental Studies, Spanish, and Geography, with honors University of Wisconsin, Madison	<i>Advised by Dr. Jack Williams</i>

PEER-REVIEWED PUBLICATIONS

12. Barrio, I, Vuorinen K, Barbero Palacios L, Defourneaux M, Petit Bon M,... **Hayes K**, ... Kamena S. Emerging priorities in terrestrial herbivory research in the Arctic. (2025). *Arctic Science*. **[In Press]**
11. Carter T, Stears A, Fornwalt P, Atkins D, Dwire K, Fleri J, **Hayes K**, Mount H, Twaddell E, Wessel S, Buma B, Laughlin D. Fine-root traits coordinate with aboveground strategies but are poor predictors of understory plant species response to widespread spruce mortality. (2025). *Plant and soil*. **[In Press]**
10. **Hayes K**, Hoffman C, Linn R, Ziegler J, Buma B. Fuel constraints, not fire weather conditions, limit fire behavior in reburned boreal forests. (2024). *Agricultural and Forest Meteorology*.
<https://doi.org/10.1016/j.agrformet.2024.110216>
9. 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. (2023). *Landscape Ecology*. <https://doi.org/10.1007/s10980-023-01733-8>
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*.
<https://doi.org/10.1038/s41598-022-08912-8>
5. Muthukrishnan R, **Hayes K**, Bartowitz K, Cattau M, Harvey B, Lin Y, Lunch C. Harnessing NEON to evaluate ecological tipping points: opportunities, challenges, and approaches. (2022). *Ecosphere*.
<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. Harnessing the NEON data revolution to advance open environmental science with a diverse and data-capable community. (2021). *Ecosphere*. <https://doi.org/10.1002/ecs2.3833>
3. **Hayes K**, Buma B. Effects of short-interval disturbances continue to accumulate, overwhelming variability in local resilience. (2021). *Ecosphere*. <https://doi.org/10.1002/ecs2.3379>
2. Jensen A, Fastovich D, Watson B, Gill J, Jackson S, Russell J, Bevington J, **Hayes K**, Williams J. 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. (2021). *Journal of Ecology*. <https://doi.org/10.1111/1365-2745.13517>
1. Buma B, Weiss S, **Hayes K**, Lucash M. Wildland fire reburning trends across the US West suggest only short-term negative feedback and differing climatic effects. (2020). *Environmental Research Letters*. <https://doi.org/10.1088/1748-9326/ab6c70>

OTHER PUBLICATIONS

- Reichenborn M, Rottler C, Aragón L, Bishop T, **Hayes K**, Kottler E, Talal M, Sommers P. Advice from the field: practical skills, challenges, and how to support early career ecologists. (2023). *Bulletin of the Ecological Society of America*. <https://doi.org/10.1002/bes2.2127>
- Kulakowski D, Buma B, Guz J, **Hayes K**. The ecology of forest disturbances. (2019). 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)

- **Hayes K**, Lucash M, Olson K, Buma B. Repeat short-interval fires put carbon storage at risk in Interior Alaska via cumulative combustion of soil carbon. *Global Change Biology*. [In Revision]
- Carter, T*, **Hayes K*** [Joint co-authors], Buma B. Boreal forest understory plant communities transform after one fire but demonstrate resilience to continued reburning. *American Journal of Botany*. [In Revision]

PRESENTATIONS

Invited Public Seminars and Webinars

- *Understanding the mechanisms, impact and management of disturbances in boreal forests*. University of Alaska Fairbanks, Dept. of Natural Resources and Environment. Fairbanks, AK. Seminar. February 2025.
- *How herbivores interact with fire to shape Alaskan forests: challenges and opportunities in understanding disturbance interactions under climate change*. Cary Institute of Ecosystem Studies. Millbrook, NY. [Seminar](#). November 2023.
- *Frequent fires change forest composition and carbon of Alaskan boreal forests*. Natural Resources Institute Finland. Seminar. Helsinki, Finland. April 2023.
- *Evaluating flammability of reburns across Interior Alaska*. Alaska Fire Science Consortium. [Webinar](#). November 2022.
- *How do we practice, develop and support graduate field leadership skills?* Pal(a)eo Early Career Seminar Series. [Webinar](#). September 2022.
- *Evaluating flammability of reburns in the boreal forests of Interior Alaska*. Alaska Fire Science Consortium. [Webinar](#). April 2020.

Oral presentations (presenting author only)

2024

- Hayes K, Hansen W, Johnstone J. *Modeling fire-herbivore interactions in Interior Alaska*. Bonanza Creek LTER Science Symposium. Fairbanks, AK. June 2024.

2023

- Hayes K, Hansen W, Johnstone J, Honkaniemi J, Albrich K. *How do Interactions between Fire and Biotic Disturbances influence Forest Carbon and Communities in Interior Alaska?*. American Geophysical Union. San Francisco, CA. December 2023.
- Hayes K, Ziegler J, Hoffman C, Buma B. *Simulated fire spread in reburned boreal deciduous forests limited by wind speed and fuel connectivity, not fuel availability*. Ecological Society of America. Portland, OR. August 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.
- Hayes K, Buma B, 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, 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.
- 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.

2019

- Hayes K, Buma B. *Continued short-interval fires overwhelm serotinous resilience regardless of topographic variation*. 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 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.

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, CA. 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.

Conference Posters

- Hayes K, Honkaniemi J, Albrich K, Johnstone J, Hansen W. *Herbivore impacts on postfire boreal forest trajectories may not scale to impact landscape carbon balance*. American Geophysical Union, Washington DC. December 2024.
- Hayes K, Hansen W, Honkaniemi J, Albrich K, Johnstone J. *Down the rabbit hole: Modeling the impacts of moose and hare herbivory on postfire carbon and community trajectories in Interior Alaska*. Ecological Society of America, Long Beach, CA. August 2024.
- 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]**
- 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.
- 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.
- 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*. American Geophysical Union. 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 & Creative Activities Symposium. Denver, CO. April 2019.
- Hayes K, Gavin D. *Fire and carbon cycling in old growth Coast redwood*. University of Oregon Graduate Research Forum. Eugene, OR. May 2018.
- 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.

FUNDING

\$2.26 million

2024	Joint Fire Science Program Collaborative Proposal <i>Informing effective strategies for managing carbon with increasing fire in boreal forests of Interior Alaska</i> Hansen W, <u>Hayes K [co-PI]</u> , Hall J, Rogers B	\$499,463
2022	NSF Collaborative Proposal <i>The Past, Present and Future of Boreal Fire Feedbacks</i> Buma B, Higuera C, Hoffman C, Chapman M, <u>Hayes K [PhD co-author]</u> NSF Postdoctoral Research Fellowship <i>Investigating fire-biotic disturbance interactions and their sensitivity to climate in the North American boreal biome</i> <u>Hayes K [PI]</u> , Hansen W, Johnstone J	\$276,934 of \$1.4m \$321,333
2021	UC Denver Integrative and Systems Biology Merit Grant Colorado STEM Graduate Grant	\$15,000 \$1,250
2019	Joint Fire Science Program Graduate Research Innovation Award <i>Evaluating Flammability across Reburns in Interior Alaska</i> <u>Hayes K</u> , Buma B [PhD co-author]	\$25,000
<i>Submitted / In review</i>		
	Dept. of Defense Strategic Environmental Research and Development Program <i>Boreal Burning Baselines: Historical variability and fire-related thresholds to ecosystem transformation</i> Higuera P, Chipman M, Nanavati W, Hoffman C, <u>Hayes K [co-PI]</u>	

TEACHING AND MENTORING EXPERIENCE

Instructor of Record

- Principles of Ecology, University of Colorado Denver (Summer 2021)

Teaching Assistant

- General Biology: Organisms to Ecosystems, University of Colorado Denver (2 semesters, Spring/Fall 2022)
- Biostatistics, University of Colorado Denver (Fall 2019)
- The Professional Geographer, University of Oregon (Spring 2018)
- Quantitative Data Analysis, University of Oregon (Winter 2017)
- Climatology, University of Oregon (Spring 2017)

- [Global Environmental Change](#), University of Oregon (*Winter 2016*)
- [Biogeography](#), University of Oregon (*2 semesters, Fall 2016 & 2017*)

Guest Lecturer

- **Introduction to Fire Ecology**, [Disturbance Ecology](#), UC-Denver (*2020*)
- **Introduction to Landscape Ecology**, [Principles of Ecology](#), UC-Denver (*2019*)

Student Supervision

[Field and lab assistants \(12\)](#)

[NSF Research Experience for Undergraduates \(2\)](#)

2019 – 2020 Vishnusai Kodicherla - Tree impacts on soil respiration
 Kristin Kraus – Relationship between reburn frequency & active layer depth
Outcomes: Two presentations, one publication in revision

[Student committees \(1\)](#)

2021 – 2022 Elizabeth Kuhn (B.S., University of Colorado Denver)
Community-scale indoor vertical hydroponic farms as a solution to food insecurity in urban settings

Curriculum Development

- Contributed data and feedback to updates of the *Wildfire Explorer (WFX) environment*, a teacher focused wildfire spread simulator build by the Concord Consortium (*2023 – 2024*)
- Co-developed *The Professional Geographer*, a professional development course in the Department of Geography at the University of Oregon (*2017 – 2018*)
- Contributed data and participated in educational [videos](#) of middle and high school lesson plan on boreal carbon cycling. Produced by ScienceLive Educational Modules (*2019*)

Pedagogy Training

- [AGU Postdoctoral Research Fellow](#). AGU Leadership Academy and Network for Diversity and Inclusion in the Geosciences (LANDInG) (*2023 – 2025*)
- [Pedagogy](#). Course at UC Denver, Department of Biology (*2019 – 2020*)
- [Graduate Teaching Training](#). University of Oregon (*2016*)

AWARDS

2023

Ecological Society of America Paleoecology Travel Award. **\$300.**

2022

UC Denver Dept. of Biology Doctoral Teaching Award. **\$2,500.**

U.S. Carbon Program Leadership Award. **\$1,000.**

International Association of Landscape Ecology Presentation Award. **\$300.**

UC Denver Dept. of Biology Graduate Excellence in Research Award. **\$250.**

2021

International Boreal Forest Research Association Presentation Award. **\$400.**

Front Range Student Ecology Symposium Presentation Award. **\$150.**

Ecological Society of America Graduate Student Policy Award

2020

Polanki Graduate Achievement Award. **\$1,200.**

2019 - 2022

UC Denver Department of Integrative Biology Travel Award(s). **\$1,900.**

UC Denver College of Liberal Arts and Sciences Travel Award(s). **\$1,000.**

UC Denver Graduate School Travel Award(s). **\$500.**

Association of Fire Ecology Graduate Travel Award(s). **\$595.**

2018

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

2017

Christopherson 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.**

SERVICE AND ENGAGEMENT

Stakeholder Engagement

- Alaska Interagency Fuels Workshop. Hosted by Alaska Fire Science Consortium and Alaska Wildland Fire Coordinating Group. (March 2025)
- Alaska National Wildlife Refuges Carbon Workshop. Hosted by US Fish & Wildlife and Northern Latitudes Partnerships. (March 2024)
- Alaska Wildfire Roundtable. Hosted by Alaska Venture Fund and Environmental Defense Fund. (October 2023)
- Alaska Fall/Spring Interagency Fire Operations Meeting(s). Hosted by Alaska Fire Science Consortium and Alaska Wildland Fire Coordinating Group. (2019 – Present)
- Bonanza Creek Community Symposium(s). Hosted by Bonanza Creek Long Term Ecological Research Program (LTER) (2019 – Present)

Collaborative Work

- Member. **Fire, Consumer, and Modeling Working Groups**. Bonanza Creek LTER (2023 – Present)
- Member. **Aspen Wildfire Pathogen Working Group**. Institute of Arctic Biology, University of Alaska Fairbanks (2023 – Present)
- Visiting Scientist. **Natural Resources Institute Finland (LUKE)**. (Spring 2023)

Service Activities

- Postdoc Representative. **Strategic Planning Committee**, Cary Institute of Ecosystem Studies (2023)
- **Postdoctoral Hiring Committee**, Bonanza Creek LTER (2022 – 2023)
- Graduate Representative. **Office of the Dean Graduate Advisory Group**, University of Colorado Denver (2020 – 2021)
- Student Representative. **International Association of Landscape Ecology North America** (2019 – 2021) **[Elected]**
- Graduate Representative. **Department of Biology Graduate Advisory Committee**, University of Colorado Denver (2019 – 2020)
- Department Representative. **Graduate Teaching Fellows Federation**, University of Oregon. (2016 – 2018)

Special sessions and Workshops

- Session Organizer - *Resilient natural systems in the paleo-record*. AGU, Washington DC (2025)
- Participant - *LTER Science Council*. Fairbanks, AK (2024)
- Participant - *NEON-NCAR Community Workshop*. Boulder, CO (2023)

- Panelist - *Advice from the Field: Practical Skills, Coping with Accessibility Challenges, and What Else You Need to Know*. ESA, Montreal, CA (2022)
- Session Organizer - *Exploring the context and implications of departures from historic fire frequency across ecosystems*. IALE-NA, Remote (2021)
- Session Organizer - *Water in the Pacific Midwest: Past and Future*. Graduate Student Research Forum, University of Oregon (2017) [**Organized Session Award**]

Volunteering

- Judge, *Hudson Data Jam Competition*, Cary Institute of Ecosystem Studies (2023)
- Judge, *Outstanding Student Presentation Award*, AGU Biogeosciences (2023)
- Visiting Guest Scientist, *Meet a Scientist Night*, Sitka Sound Science Center (2019)
- Abstract Reviewer, *Undergraduate Research Forum*, University of Oregon (2018)
- Moderator, *Oregon State Geography Bee*, National Geographic Society (2018)

Policy and Engagement Training

- Communicating with Journalists and the Media. COMPASS Training (2024)
- Strategic Science Communication. COMPASS Training (2024)
- Graduate Student Policy Award. Ecological Society of America (2021)
- Colorado Science Policy Summit. University of Colorado (2019)

Open Science and Quantitative Training

- Reproducible Practices for Arctic Research. NSF Arctic Data Center Workshop (2023)
- Foundations of Open Science Skills. CyVerse Workshop (2020)
- Using Google Earth Engine for Landscape Ecology. IALE North America Workshop (2020)
- Assimilating Long-Term Data into Ecosystems Models. PAIEON Workshop (2016)

Field Training

- Pest and Pathogen Workshop. Bonanza Creek LTER (2024)
- Wilderness First Aid License. (2022)
- Field Safety Training. National Science Foundation Polar Office (2018)

Journal and Grant Reviews

- *Nature, Plant and Soil, Global Change Biology, Ecosphere, OneEarth, Arctic, Antarctic, and Alpine Research, Ecosystems, Combustion Science and Technology, Forest Ecology and Management, Geoscientific Model Development, American Journal of Botany, International Journal of Wildland Fire, Conservation Biology, Nature*
- NSF Collaborative Proposal Reviewer, Arctic Natural Sciences Program (2022 – 2023)

Media

- **Hayes, K.** 2025. [A love letter to the Milwaukee Public Museum](#). Shepherd Express (February 27, 2025).