

**Dr. Katherine R. Hayes**  
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## RESEARCH APPOINTMENTS

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

## EDUCATION

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**Ph.D. in Integrative and Systems Biology**  
University of Colorado, Denver Advised by Dr. Brian Buma

**M.S. in Geography**  
University of Oregon Advised by Dr. Dan Gavin

**B.S. in Environmental Studies, Spanish, and Geography, with honors**  
University of Wisconsin, Madison Advised by Dr. Jack Williams

## PEER-REVIEWED PUBLICATIONS

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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

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- 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)**

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- **Hayes K**, Hoffman C, Linn R, Ziegler J, Buma B. Fuel constraints not fire weather conditions limit fire behavior in reburned boreal forests. *Agricultural and Forest Meteorology*. **[In Revision]**
- **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]**

#### **GRANTS**

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2023	<b>Joint Fire Science Program Collaborative Proposal</b> <i>Informing effective strategies for managing carbon with increasing fire in boreal forests of Interior Alaska</i> Hansen W, Hayes K [ <b>co-PI</b> ], Hall J, Rogers B	In Review
2022	<b>NSF Collaborative Proposal</b> <i>The Past, Present and Future of Boreal Fire Feedbacks</i> Buma B, Higuera C, Hoffman C, Chapman M, Hayes K [ <b>PhD co-author</b> ]	\$276,934 of 1.4 million
	<b>NSF Postdoctoral Research Fellowship</b> <i>Investigating fire-biotic disturbance interactions and their sensitivity to climate in the North American boreal biome</i> Hayes K [ <b>PI</b> ], Hansen W, Johnstone J	\$321,333
2021	UC Denver Integrative and Systems Biology Merit Grant	\$15,000
	Colorado STEM Graduate Grant	\$1,250
2019	<b>Joint Fire Science Program Graduate Research Innovation Award</b> <i>Evaluating Flammability across Reburns in Interior Alaska</i> Hayes K, Buma B [ <b>PhD co-author</b> ]	\$25,000

#### **RESEARCH PRESENTATIONS**

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##### *Invited Public Seminars and Webinars*

- *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.

*Conference Talks*

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, 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.

**Conference Posters [Undergraduate mentees underlined]**

- 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, California. 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.

## TEACHING AND MENTORING EXPERIENCE

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### *Instructor of Record*

- Principles of Ecology, University of Colorado Denver (2021 – 2022)

### *Teaching Assistant*

- Gen. Biology: Organisms to Ecosystems, University of Colorado Denver (2 semesters, 2020 -2022)
- Biostatistics, University of Colorado Denver (2020 – 2021)
- The Professional Geographer, University of Oregon (2017 – 2018)
- Biogeography, University of Oregon (2 semesters, 2016 - 2018)
- Quantitative Data Analysis, University of Oregon (2 semesters, 2016 - 2018)
- Climatology, University of Oregon (2016 – 2017)

### *Guest Lecturer*

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

### *Mentoring Experience*

2019 – 2020 NSF Research Experience for Undergraduates Mentor (2 students)

Student committees:

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

Thesis Title: *Community-scale indoor vertical hydroponic farms as a solution to food insecurity in urban settings*

### *Curriculum Development*

- 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 / high school lesson plan on boreal carbon cycling. Produced by ScienceLive Educational Modules (2019)

## HONORS & AWARDS

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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 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.**

## SERVICE AND ENGAGEMENT

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### *Stakeholder Engagement*

- 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 Meetings. Hosted by Alaska Fire Science Consortium and Alaska Wildland Fire Coordinating Group. (2019 – Present)
- Bonanza Creek Community Symposium. 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 Research (2023 – Present)
- Visiting Scientist. *Natural Resources Institute Finland (LUKE)*. (Spring 2023)

### *DEI Training and Initiatives*

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

### *Service positions*

- Working Group member. *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 Executive Committee* (2019 – 2021) **[Elected]**
- Student Representative. *Conference planning committee*. International Association of Landscape Ecology North America (2019 – 2021)
- Graduate Representative. *Department of Biology Graduate Advisory Committee*, University of Colorado Denver (2019 – 2020)
- Graduate Department Representative. *Graduate Teaching Fellows Federation*, University of Oregon. (2016 – 2019)

*Special sessions and Workshops*

- 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*. Ecological Society of America. Montreal, CA (2022)
- Session Organizer: *Exploring the context and implications of departures from historic fire frequency across ecosystems*. International Association of Landscape Ecology, North America (2021)
- Session Organizer: *Water in the Pacific Midwest: Past and Future*. Graduate Student Research Forum, University of Oregon (2017) [**Organized Session Award**]

*Other training*

- Reproducible Practices for Arctic Research. NSF Arctic Data Center Workshop (2023)
- Wilderness First Aid License (2022)
- Pedagogy. Course at UC Denver, Department of Biology (2019 - 2020)
- Foundations of Open Science Skills. CyVerse Workshop (2020)
- Using Google Earth Engine for Landscape Ecology. IALE North America Workshop (2020)
- Field Safety Training. National Science Foundation Polar Office (2018)
- Graduate Teaching Training. University of Oregon (2016).
- Assimilating Long-Term Data into Ecosystems Models. PAIEON Workshop (2016)

*Journal and Grant Reviews*

- 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
- NSF Collaborative Proposal Reviewer, Arctic Natural Sciences Program (2022 – 2023)