

Katherine R. Hayes

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EDUCATION

PhD in Integrative and Systems Biology

University of Colorado, Denver

2018 - Present

Advised by Dr. Brian Buma

Master of Science in Geography

University of Oregon

2018

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

2016

Advised by Dr. Jack Williams

Minor in European Studies

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

PUBLICATIONS

7. 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>
6. 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>
5. 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>
4. **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>
3. 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>
2. 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>
1. 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

- 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. *Landscape Ecology*. [In Revision]
- **Hayes K.**, Carter T., Cook P., Twaddell E., Buma B. Supporting Graduate Field Leadership through Community-Sourced Advice, Action, and Policy. *Ecosphere*. [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]

RESEARCH APPOINTMENTS

Graduate Researcher

2018 - Present

Buma Lab, Department of Integrative and Systems Biology, University of Colorado Denver

- Guiding undergraduate researchers in field data collection, laboratory analysis & data organization.

Graduate Field Assistant 2019

Buma Lab, Landslide Task Force, Sitka Sound Science Center

- Conducted vegetation and soil surveys as part of a team of landslide-researchers in Sitka, Alaska.

Research Lead Technician 2018

Buma Lab, Department of Natural Resources, University of Alaska Fairbanks/Southeast

- Coordinated field sampling efforts with a team of researchers from multiple institutions.
- Trained undergraduate interns in field sampling methods and laboratory procedures.

Graduate Researcher 2016 – 2018

Environmental Change Research Group, Department of Geography, University of Oregon

- Recruited and trained undergraduate research assistants.
- Coordinated the establishment of several new laboratory procedures.

Undergraduate Researcher 2015 – 2016

Williams Paleocology Lab, Department of Geography, University of Wisconsin

- Collaborated with research teams on field work and laboratory analysis.

GRANTS

- UC Denver College of Liberal Arts and Sciences Travel Grant. 2022, **\$500**.
- UC Denver Department of Integrative Biology Travel Grant. 2021, **\$600**.
- Association of Fire Ecology TREE Graduate Travel Grant. 2020, **\$265**.
- UC Denver Integrative and Systems Biology Merit Scholarship, 2021, **\$15,000**.
- Colorado STEM Graduate Grant. 2021, **\$1,250**.
- UC Denver Department of Integrative Biology Travel Grant. 2020, **\$300**.
- **Hayes K, Buma B.** *Joint Fire Science Program Graduate Research Innovation Award.* Evaluating Flammability across Reburns in Interior Alaska. 2019, **\$25,000**.
- Association of Fire Ecology TREE Graduate Travel Grant. 2019, **\$330**.
- UC Denver Department of Integrative Biology Travel Grant. 2019, **\$500**.
- UC Denver College of Liberal Arts and Sciences Travel Grant. 2019, **\$500**.
- UC Denver Graduate School Travel Grant. 2019, **\$500**.
- Association of Pacific Coast Geographer's Travel Grant. 2017, **\$200**.

ORAL PRESENTATIONS

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, Hoffman C, Ziegler J, Buma B.** “*Repeat reburning drives changes in fuel structure and fire behavior in black spruce forests*”. Alaska Fire Science Consortium. Webinar. May 2022. **[Invited]**
- **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.
- **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**]
- **Hayes K**, Buma B. “*The role of spatial heterogeneity in mediating the effect of shortening fire intervals in boreal systems*”, American Association of Geographers. Denver, CO. April 2020. [Cancelled due to COVID-19].

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

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.

PUBLIC TALKS

- **Hayes K**, “*Bears, burning and Battlestar Galactica: Climate Change in Alaska and Why it Matters*”. Nerd Nite. Denver, CO. October 2021.
- **Hayes K**. “*Climate Change: How the Arctic is Changing and Why it Matters*”. First Unitarian Society Sunday Forum. Milwaukee, WI. November 2019.

HONORS & AWARDS

International Boreal Forest Research Association, Presentation Award	Fall 2021
Front Range Student Ecology Symposium, Presentation Award	Spring 2021
Ecological Society of America Graduate Policy Award	Spring 2021
Polanki Graduate Achievement Award	Spring 2020
University of Colorado Graduate Research Fellowship	Fall 2018
Nominated for University of Oregon Dean’s Award	Spring 2018
Robert J. Leonard Memorial Award	Spring 2018
Christopherson Geosystems Award for Excellence in Applied Geography/Earth Systems Science	Fall 2017
UO Graduate Research Forum Oral Session Award	Spring 2017
University of Oregon Graduate Teaching Fellowship	2016 – 2018
Polanki College Achievement Award	Spring 2014
Polish National Alliance Scholarship	2013 – 2015
UW-Madison Initiative Award	2014 – 2015

TEACHING AND MENTORING EXPERIENCE

Instructor of Record

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

Teaching Assistant

2020 - 2021 General Biology, University of Colorado Denver (1 semester)
 2019 - 2020 Biostatistics, University of Colorado Denver (1 semester)
 2016 - 2018 The Professional Geography, 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 *The Professional Geography*, University of Oregon
 2017 “Biogeographic theory”, *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 Research Experience for Undergraduates Mentor (2 students)

Students mentored in lab: 4
 Students mentored in field: 6

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 paleotempestology*”, 2016.

SERVICE AND ENGAGEMENT

Service positions

- 2018 – Present Journal Reviewer. *Plant and Soil, Global Change Biology, Ecosphere*
- 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

- 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.
 Participant. *Regional analysis of landscape and forest change towards practical landscape management*. International Association of Landscape Ecology, North America. Remote.
- 2021 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 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.