

ELLIE BROADMAN

CURRICULUM VITAE

University of Arizona Laboratory of Tree-Ring Research

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RESEARCH INTERESTS & EXPERTISE

Past, present, and future climate and environmental change; hydroclimate; climate dynamics; atmospheric and oceanic circulation patterns and modes of variability; the Holocene; climate of Alaska and the North Pacific region; lake sediments; tree rings; tephrochronology; diatoms; oxygen isotopes; human-environment interactions

EMPLOYMENT

August 2021 -

Postdoctoral Research Associate

Laboratory of Tree-Ring Research

University of Arizona, Tucson, AZ

Supervisor: Valérie Trouet

2014 - 2016

Physical Science Technician GS-07 (2015-2016; federal employee)

Laboratory and Field Technician (2014-2015; as an independent contractor)

Quaternary Paleoenvironmental Research Laboratory

United States Geological Survey, Menlo Park, CA

Supervisor: Dave Wahl

EDUCATION

2021

Ph.D. in Earth Science and Environmental Sustainability, *with distinction*

Northern Arizona University, Flagstaff, AZ

Committee: Darrell Kaufman, Nick McKay, Scott Anderson, Andrew Henderson

Thesis: "Holocene hydroclimate in southern and arctic Alaska inferred from diatom oxygen isotopes and data-model comparisons"

2020

Graduate Certificate in Science Communication

Northern Arizona University, Flagstaff, AZ

2014

B.A. in Geography, *Summa cum laude*

University of California, Berkeley, CA

Advisor: Dave Wahl

Thesis: "Late Holocene environmental history of the Los Osos watershed, Morro Bay, CA"

PUBLICATIONS

In press, review, revision, or preparation

8. Xu, G., Meko, M., Klippel, L., **Broadman, E.**, Ludlow, F., Dorado-Liñan, I., Esper, J., Trouet, V., *et al.*, in preparation. 800 years of summer European-North Atlantic jet stream variability and its impact on climate extremes and human systems.
7. Wroblewski, E., **Broadman, E.**, Kaufman, D.S., in preparation. Multi-proxy evidence for climate and environmental change during the late glacial and Holocene at Kelly Lake, Kenai Peninsula.
6. Kaufman, D.S., **Broadman, E.**, in preparation. The global Holocene thermal maximum (review).
5. **Broadman, E.**, Reidy, L., Wahl, D., in revision for *Anthropocene*. Late Holocene human-environment interactions on California's central coast inferred from Morro Bay salt marsh sediments.
4. **Broadman, E.**, Kaufman, D.S., Fortin, D., Henderson, A.C.G., Anderson, R.S., McKay, N.P., Ford, M., Bogle, S., Leng, M.J., Muñoz, S.E., accepted at *Quaternary Research*. Reconstructing postglacial hydrologic and environmental change in the eastern Kenai Peninsula lowlands using proxy data and mass balance modeling.

Published in academic journals

3. **Broadman, E.**, Kaufman, D.S., Henderson, A.C.G., Malmierca-Vallet, I., Leng, M.J., Lacey, J.H., 2020. Coupled impacts of sea ice variability and North Pacific atmospheric circulation on Holocene hydroclimate in Arctic Alaska. *Proceedings of the National Academy of Sciences* 117(52), 33034-33042. doi:10.1073/pnas.2016544117
2. **Broadman, E.**, Kaufman, D.S., Henderson, A.C.G., Berg, E.E., Anderson, R.S., Leng, M.J., Stahnke, S.A., S.E. Muñoz. S.E., 2020. Multi-proxy evidence for millennial-scale changes in North Pacific hydroclimate from the Kenai Peninsula lowlands, south-central Alaska. *Quaternary Science Reviews* 241, 106420. doi:10.1016/j.quascirev.2020.106420
1. **Broadman, E.**, Thurston, L.L., Schiefer, E., McKay, N.P., Fortin, D., Geck, J., Loso, M.G., Nolan, M., Arcusa, S.H., Benson, C.W., Ellerbroek, R.A, Erb, M.P, Routson, C.C., Wiman, C., Wong, A.J., Kaufman, D.S., 2019. An Arctic watershed observatory at Lake Peters, Alaska: weather-glacier-river-lake system data for 2015-2018. *Earth System Science Data* 11(4). doi:10.5194/essd-11-1957-2019

Other peer-reviewed publications

Broadman, E., Tyree, M. 2018. *Neidium hitchcockii*. In "Diatoms of North America."
<https://diatoms.org/species/neidium-hitchcockii>

Popular science writing

Broadman, E., 2021. Explainer: What are aerosols? *Science News for Students*.
<https://www.sciencenewsforstudents.org/article/explainer-what-are-aerosols>

Broadman, E., 2021. Can wildfires cool the climate? *Science News for Students*.
<https://www.sciencenewsforstudents.org/article/wildfires-australia-siberia-california-cool-climate-aerosols>

RESEARCH EXPERIENCE

Field locations: Kenai Peninsula, Arctic National Wildlife Refuge, Idaho, California, Arizona, Colorado, Utah

Field skills: Lake sediment coring (Percussion/Livingstone), water sampling and chemistry, bathymetric profiling, stream gauging, ablation stakes, lake sediment traps, suspended sediment sampling, land surveying, soil trenching and profile characterization, diatom/plankton sampling, increment coring (trees), stratigraphic descriptions, vegetation/arboreal surveying

Laboratory skills: volcanic ash (tephra) sampling and characterization, diatom identification, sedimentary diatom purification, diatom oxygen isotope analysis, sedimentary biogenic silica analysis (molybdate blue reduction and spectroscopy), sedimentary charcoal analysis, sedimentary pollen analysis, sedimentary radiocarbon and macrofossil analysis, grain size analysis, initial sediment core description and analyses (magnetic susceptibility, loss on ignition, scanning X-Ray fluorescence), sedimentary carbonate isotope analysis

Analytical skills: environmental data organization and curation, age-depth modeling, hydrologic and isotope mass balance modeling, storm back-trajectory analysis, time series analysis

Software: *Proficient:* R, ArcGIS, Adobe Creative Suite, Microsoft Office; *Beginner:* Python

SCHOLARSHIPS & HONORS

- *Sustainability Leadership Award* (NAU), \$500, 2021
- *Finalist: Presidential Management Fellowship Program* (USA OPM), 2021
- *Graduate Teaching Assistant Award* (NAU), \$1000, 2019
- *Christopher G. Freeman Scholarship* (NAU), \$2500, 2017
- *Albert and Leslie Farrington Foundation Fund Scholarship* (NAU), \$800, 2017
- *Phi Beta Kappa* (UC Berkeley), 2014

RESEARCH GRANTS & FELLOWSHIPS

- NERC/NIGFSC Award IP-1910-0619, £24,780, 2019-2020; named PhD student. PI: A.C.G. Henderson. "Holocene climate evolution in Arctic Alaska and its link to Aleutian Low variability"
- Bedwell Earth Physics Award, \$500, 2019; \$1150, 2018
- Pioneer Natural Resources Award, \$1000, 2019
- Henry Hooper Graduate Award, \$1000, 2019; \$1000, 2018; \$2000, 2017
- Kerry Kelts Student Research Award, \$1250, 2018
- Phycological Society of America Hannah T. Croasdale Fellowship, \$2000, 2018
- Muehlberger Family Award, \$500, 2017
- LacCore Visiting Student Travel Grant, \$1000, 2017
- Geological Society of America Graduate Student Research Grant, \$1116, 2017
- James J. Parsons Scholarship for Field Research in Geography, \$2000, 2013

ADVISING & MENTORING

Undergraduates

- Alexandria Thwaites (2021-present; Women in Science & Engineering; University of Arizona)
- Rajesh Kumar (2021-present; Geoscience Education & Mentorship Support program)
- La'Zairia Weatherspoon (2020; Louis Stokes Alliance for Minority Participation; NAU)
- Aibhlin Ryan (2019-2020; Laboratory assistant; Northern Arizona University)
- Sean Stahnke (2019-2020; Capstone research project; Northern Arizona University)
- Matthew Ford (2019; Capstone research project; Northern Arizona University)
- Emmy Wroblewski (2018-2019; Undergraduate thesis; Mount Holyoke College)
- Mackenzie Sanchez (2018; Laboratory assistant; Northern Arizona University)
- Kathryn Geyer (2017; Laboratory assistant; Northern Arizona University)

TEACHING

Northern Arizona University

Teaching Assistant & Lab Instructor

- Environmental Challenges and Solutions (ENV 101L)
- Essential Ecology (ENV 326L)
- Physical and Chemical Processes in the Atmosphere and Hydrosphere (ENV 360L)
- Energy, Resources, & Policy (ENV 385W)
- Geologic Disasters (GLG 112L)

Guest Lecturer

- Environmental Challenges and Solutions (ENV 101L)
- Physical and Chemical Processes in the Atmosphere and Hydrosphere (ENV 360)

Laboratory Curriculum Development

- Physical and Chemical Processes in the Atmosphere and Hydrosphere (ENV 360)
- Energy, Resources, & Policy (ENV 385W)

University of California, Berkeley

Grader & Editor

- Cartographic Representation (GEOG 183)

Peer Teaching Assistant

- Advanced Cartographic Methods: GIS for Cartographers (GEOG 187)

CONFERENCE PRESENTATIONS

European Geophysical Union General Assembly (upcoming in April 2022):

- Coupled impacts of sea ice variability and North Pacific atmospheric circulation on Holocene hydroclimate in Arctic Alaska. **Broadman, E.**, Kaufman, D.S., Henderson, A.C.G, Malmierca-Vallet, I., Leng, M.J., Lacey, J.H.

- 800 years of summer European-North Atlantic jet stream variability and its impact on climate extremes and human systems. Xu, G., **Broadman, E.**, Meko, M., Klippel, L., Ludlow, F., Dorado-Liñan, I., Esper, J., Trouet, V.

American Geophysical Union (AGU) Fall Meeting 2021

- *Reconstructing postglacial hydrologic and environmental change in the eastern Kenai Peninsula lowlands using proxy data and mass balance modeling. **Broadman, E.**, Kaufman, D.S., Fortin, D., Henderson, A.C.G., Anderson, R.S., McKay, N.P., Ford, M., Bogle, S., Leng, M.J., Muñoz, S.E.
- Challenges and Opportunities from a Semester of Anti-Racist Geoscience Curriculum: Lessons from the School of Earth & Sustainability URGE Pod at Northern Arizona University. **Broadman, E.**, Arcusa, S.H., Baransky, E., Klein, Z., Lynch, E.M., Marshall, L., Riche, A.T., Riggs, N., Schottenfels, E., Wiman, C.
- Holocene volcanism trends from south-central Alaska tephra records: exploring linkages to climate. Bolton, M., **Broadman, E.**, Jensen, B.J.L., Kaufman, D.S., Reyes, A. V.

*Served as in-person session chair due to conveners' absence at this hybrid conference.

AGU Fall Meeting 2020

- Coupled impacts of sea ice variability and North Pacific atmospheric circulation on Holocene hydroclimate in Arctic Alaska. **Broadman, E.**, Kaufman, D.S., Henderson, A.C.G., Malmierca-Vallet, I., Leng, M.J., Lacey, J.H.

International Quaternary Assembly (INQUA) 2019

- Holocene hydroclimatic change in south-central Alaska inferred from $\delta^{18}\text{O}_{\text{diatom}}$ and diatom flora at Sunken Island Lake. **Broadman, E.**, Kaufman, D.S., Henderson, A.C.G., Anderson, R.S., Berg, E., Leng, M.J.

Pacific Climate Workshop (PACLIM) 2019

- Holocene hydroclimatic change in south-central Alaska inferred from $\delta^{18}\text{O}_{\text{diatom}}$ at Sunken Island Lake. **Broadman, E.**, Kaufman, D.S., Henderson, A.C.G., Anderson, R.S., Berg, E., Leng, M.J.

AGU Fall Meeting 2018

- Holocene hydroclimatic change in south-central Alaska inferred from $\delta^{18}\text{O}_{\text{diatom}}$ at Sunken Island Lake. **Broadman, E.**, Kaufman, D.S., Henderson, A.C.G., Anderson, R.S., Berg, E., Leng, M.J.

American Association of Geographers (AAG) Annual Meeting 2016

- Late Holocene Environmental History of the Los Osos Watershed, Morro Bay, CA. **Broadman, E.**, Reidy, L., and Wahl, D. 2016.

Geological Society of America (GSA) Annual Meeting 2015

- How old are the SP and Strawberry volcanic vents and flows in the San Francisco volcanic field, Arizona? New evidence from soils, OSL dated loess and ^3He exposure dating. Rittenour, T., Karlov, R., **Broadman, E.**, Lapo, K., Houts, A.N., Landis, H., Anderson, K.C., Licciardi, J., Riggs, N., Ort, M.H.

AGU Fall Meeting 2014

- Late Holocene Environmental History of the Los Osos Watershed, Morro Bay, CA. Annual meeting of the American Geophysical Union, San Francisco, CA. **Broadman, E.**, Reidy, L., Wahl, D.

AGU Fall Meeting 2013

- Prehistoric Agriculture and Soil Fertility on Lava Flows in Northern Arizona, USA: Results from the San Francisco Volcanic Field REU. **Broadman, E.**, Anderson, K.C.

GSA Annual Meeting 2013

- A Soil Chronosequence from Loess Deposits on Late Pleistocene Lava Flows, Northern Arizona, USA: Results from the San Francisco Volcanic Field REU. **Broadman, E.**, Anderson, K.C.

SERVICE

Professional Service and Leadership at Northern Arizona University

- *Unlearning Racism in Geoscience (URGE)* (NAU SES Pod Leader), Spring 2021
- *Climate Action Plan: Steering Committee*, Spring 2021
- *Director of Climate Action, Graduate Student Government*, Fall 2020–Spring 2021
- *Climate Action Plan: Justice and Resilience Working Group*, Fall 2020
- *Graduate Student Mentor for the Louie Stokes Alliance for Minority Participation Program*, Summer 2020–Fall 2020
- *School of Earth & Sustainability Diversity and Inclusion Committee*, Spring 2020 (member) and Fall 2020–Spring 2021 (co-chair)
- *School of Earth & Sustainability Graduate Faculty Meeting Representative*, Spring 2020–Spring 2021
- *Intergovernmental Panel on Climate Change AR6 WG1*, Volunteer Expert Reviewer, Spring 2020
- *NAU Academic Integrity Hearing Board*, Fall 2019–Spring 2021
- *School of Earth & Sustainability Academic Strategic Plan Committee*, Fall 2019–Spring 2020
- *School of Earth & Sustainability Seminar Series Coordinator*, Spring 2018–Spring 2019
- *Agassiz Undergraduate Scientific Writing Contest Judge*, Fall 2018–Spring 2019

Other Professional Service and Training

- *Participant in PaleoHack workshop for Python tools in paleoclimate data analysis*, Fall 2021
- *Mentor for the Women in Science & Engineering (WISE) program*, University of Arizona, Fall 2021
- *Mentor for the Geoscience Education & Mentorship Support (GEMS) program*, Fall 2021
- *Member of the Arizona DEI in STEM Working Group*, SciTech Institute, Spring 2020 – present
- *Inclusive Teaching: Supporting All Students in the College Classroom*, September 2020, ColumbiaX
- *Bystander Intervention Training*, September 2020, Hollaback!
- *Paleo to Policy Workshop*, February 2019, UC Davis Bodega Bay Marine Lab
- *Reviewer for Progress in Earth and Planetary Science, Quaternary Science Reviews*
- *Certifications in Wilderness First Aid and Arctic Field Training*
- *Affiliations with the American Geophysical Union and the Geological Society of America*

Science Communication and Public Outreach

- *Science Writer for Science News for Students*, January 2020 – present
<https://www.sciencenewsforstudents.org/author/ellie-broadman>
- *Science Writer for “Vanishing River” Project*, Spring 2019, Northern Arizona University
<https://nauvirtualreality.wixsite.com/vanishingriver/story-of-change>
- *Co-organizer for MBARI Earth Satellite Workshop*, February 2019, Sinagua Middle School
<https://www.mbari.org/products/educational-resources/earth/earth-workshops/satellite-workshop-020219-flagstaff-az/>
- *Mentor for Scientists in the Classroom*, Fall 2017 – Spring 2020, Sinagua Middle School
- *Researcher for PolarTREC*, 2016–2017, Escalante High School/ARCUS
<https://www.polartrec.com/expeditions/arctic-glacial-lakes>

MEDIA COVERAGE

- *Broadman et al. 2020 (PNAS): "SES PhD student leads paleoclimate study of precipitation and sea ice in Arctic Alaska."* <https://nau.edu/nau-research/paleoclimate-study/>
- *Kenai Peninsula fieldwork:*
 - "Getting a Masters in Mud" (also featured in the *Sawyer County Record* and the *Duluth Reader*). <http://cablemuseumnaturalconnections.blogspot.com/2018/07/getting-masters-in-mud-main-article.html>
 - "Sediment coring 101." <http://cablemuseumnaturalconnections.blogspot.com/2018/07/sediment-coring-101.html>
- *Kenai Peninsula PhD project: Continental Science Drilling Facility Story Map.* <https://storymaps.arcgis.com/stories/2e9c660b23964abba7f60ce557e37671>
- *Arctic PolarTREC collaboration: "Outside the lab: NAU field researchers provide school teachers hands-on education."* <https://news.nau.edu/nau-field-researchers/>