Russell P. Callahan (he/him/his)
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Department of Earth Sciences
University of Connecticut
Storrs, CT 06269

Education:

Ph.D.	2021, University of Wyoming, Geology
B.S.	2015, Montana State University, Environmental Science, *highest honors*

Appointments:

2023- present	Assistant Professor, University of Connecticut
2022-2023	Postdoctoral Researcher, University of California, Santa Cruz
2021-2022	Postdoctoral Researcher, University of Wyoming
2015-2021	Graduate Research Assistant, University of Wyoming
2017-2018, 2020	Graduate Teaching Assistant, University of Wyoming
2013-2015	Undergraduate Research Assistant, Montana State University

Publications:

In print

Donaldson, A. M., Zimmer, M., Huang, M.H., Johnson, K. N., Hudson-Rasmussen, B., Finnegan, N., Barling, N., & Callahan, R. P. (2023). Symmetry in hillslope steepness and saprolite thickness between hillslopes with opposing aspects. *Journal of Geophysical Research Earth Surface*, *128*(7). https://doi.org/10.1029/2023jf007076

Callahan, R. P., Riebe, C. S., Sklar, L. S., Pasquet, S., Ferrier, K. L., Hahm, W. J., Taylor, N. J., Grana, D., Flinchum, B. A., Hayes, J. L., & Holbrook, W. S. (2022). Forest vulnerability to drought controlled by bedrock composition. *Nature Geoscience*, *15*(9), 714–719. https://doi.org/10.1038/s41561-022-01012-2

Grana, D., Parsekian, A.D., Flinchum, B.A., Callahan, R.P., Smeltz, N.Y., Li, A., Hayes, J.L., Carr, B.J., Singha, K., Riebe, C.S. and Holbrook, W.S. (2022). Geostatistical Rock Physics Inversion for Predicting the Spatial Distribution of Porosity and Saturation in the Critical Zone. *Mathematical Geosciences*. https://doi.org/10.1007/s11004-022-10006-0

Riebe, C. S., Callahan, R. P., Granke, S. B.-M., Carr, B. J., Hayes, J. L., Schell, M. S., & Sklar, L. S. (2021). Anisovolumetric weathering in granitic saprolite controlled by climate and erosion rate. *Geology*, *49*(5), 551–555. https://doi.org/10.1130/G48191.1

Callahan, R. P., Riebe, C. S., Pasquet, S., Ferrier, K. L., Grana, D., Sklar, L. S., Taylor, N. J., Flinchum, B. A., Hayes, J. L., Carr, B. J., Hartsough, P. C., O'Geen, A. T., & Holbrook, W. S.

(2020). Subsurface Weathering Revealed in Hillslope-Integrated Porosity Distributions. *Geophysical Research Letters*, *47*(15). https://doi.org/10.1029/2020GL088322

Leone, J. D., Holbrook, W. S., Riebe, C. S., Chorover, J., Ferré, T. P. A., Carr, B. J., & Callahan, R. P. (2020). Strong slope-aspect control of regolith thickness by bedrock foliation. *Earth Surface Processes and Landforms*, *45*(12), 2998–3010. https://doi.org/10.1002/esp.4947

Callahan, R. P., Ferrier, K. L., Dixon, J., Dosseto, A., Hahm, W. J., Jessup, B. S., Miller, S. N., Hunsaker, C. T., Johnson, D. W., Sklar, L. S., & Riebe, C. S. (2019). Arrested development: Erosional equilibrium in the southern Sierra Nevada, California, maintained by feedbacks between channel incision and hillslope sediment production. *GSA Bulletin*, *131*(7-8), 1179–1202. https://doi.org/10.1130/B35006.1

In review

Briglio, J., Flinchum, B.A., Callahan, R.P., Holbrook, W.S., Sklar, L.S., & Riebe, C.S., Links between fracturing and weathering in saprolite and weathered rock revealed by ground penetrating radar and seismic refraction surveys. In review at *Earth Surface Processes and Landforms*

In preparation

Callahan, R.P., Huang, M.H., Donaldson, A., Hudson-Rasmussen, B., & Zimmer, M., Tectonic rock damage influences deep critical zone weathering in the central California Coast Range. In prep

Callahan, R. P., Riebe, C. S., Sklar, L. S., Ferrier, K. L., & Holbrook, W. S., Climatic and lithologic control on subsurface weathering. In prep

Weinhemer, N. L., Lukens, C. E., Callahan, R. P., Neely A.B., Noren, A. J., Richter, D. D., Holbrook, W. S., Moon, S., Norton, K. P., Sklar, L. S., & Riebe, C.S., Soils in the balance: Using cosmogenic nuclides to test for steady state in soil-mantled landscapes. In prep

Non-refereed Reports and Publications:
Jones, C, and many others (including Callahan, R.P.), 2022, Sierra Nevada Field Forum. Field Trip Guidebook. Geological Society of America. Boulder, CO.

Data Repositories:

Callahan, R.P., & Riebe, C.S. (2020). D102 geophysical and core data. *Mountain Scholar,* https://doi.org/10.15786/20.500.11919/7140

Department Seminars:

Digging deeper: quantifying deep weathering to understand ecosystems, water, and erosion in mountain landscapes. University of Connecticut, Storrs, CT. March 2 2023.

The role of bedrock composition and subsurface weathering in controlling forest drought response in the southern Sierra Nevada, California. University of California, Merced, Merced, CA. January 27 2023.

The role of deep weathering in ecological and hydrological processes across the mountains of California. University of California, Santa Cruz, Santa Cruz, CA. January 17 2023.

Bedrock composition and subsurface weathering control forest drought response in the southern Sierra Nevada, California. Clemson University, Clemson, SC. April, 29 2022.

Conference Presentations:

first author presentations [10]:

Callahan, R.P., Huang, MH., Donaldson, A.M., Rempe, D.M., Barling, N.B., Zimmer, M.A. (2023). Deep weathering in the California Coast Range: Implications for water movement and storage in the critical zone, presented at 2023 CUAHSI Biennial Meeting, Tahoe City, California, 11-14 June.

Callahan, R.P., Huang, MH., Donaldson, A.M., Hudson-Rasmussen, B., Rempe, D.M., Schmidt, J., Zimmer, M.A. (2022). Deep critical zone weathering influenced by rock damage from active faults: Implications for catchment water balances. Abstract H22E-08, presented at 2022 Fall Meeting, AGU, Chicago, Illinois, 12-16 Dec.

Callahan, R.P., Grana, D., Holbrook, W.S., Flinchum, B.A., Carr, B.J., Hayes, J.L., Ferrier, K.L., Sklar, L.S., Riebe, C.S. (2021). Interpreting critical zone properties from near-surface geophysics and rock physics modeling: Progress, challenges, and prospects (**Invited**). Abstract EP54B-06, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec.

Callahan, R.P., Riebe, C.S., Granke, S.B.-M., Carr, B.J., Hayes, J.L., Schell, M.S., & Sklar, L.S. (2020). Anisovolumetric weathering is the norm, not the exception, in granitic saprolite. Abstract EP036-0004, presented at 2020 Fall Meeting, AGU, Virtual, 1-17 Dec.

Callahan, R.P. & Riebe C.S., (2019). Strong lithologic and climatic control on deep subsurface weathering revealed in landscape-scale porosity distributions. Abstract NS23A-05, presented at 2019 Fall Meeting, AGU, San Francisco, California, 9-13 Dec.

Callahan, R.P., Riebe, C.S., Holbrook, W.S., & Goulden, M. (2018). Climatic and lithologic controls on critical zone structure and ecosystem productivity in the Sierra Nevada, California, evaluated using geophysical and geochemical measurements. Abstract EP11D3-2084 presented at 2018 Fall Meeting, AGU, Washington D.C., 10-14 Dec.

Callahan, R.P., Riebe, C.S., & Ferrier, K.L. (2017). Mountain erosion over decades and millennia: new insights from cosmogenic nuclides and sediment yields. Abstract EP33C-0982 presented at 2017 Fall Meeting, AGU, New Orleans, Louisiana, 11-15 Dec.

Callahan, R.P., Taylor, N.J., Pasquet, S., Dueker, K.G., Riebe, C.S., & Holbrook, W.S. (2016). Probing the critical zone using passive-and active-source estimates of subsurface shear-wave velocities. Abstract EP43C-0966, presented at 2016 Fall Meeting, AGU, San Francisco, California, 12-16 Dec.

Callahan, R.P., Riebe, C.S., & Dosseto, A., (2016) Using Cosmogenic and U-Series Nuclides in Stream Sediment to test hypotheses about mountain landscape evolution. Abstract 347, presented at 2016 Goldschmidt Meeting, Yokohama, Japan, Jun 16-Jul 1.

Callahan, R.P. & Hartshorn, A.S. (2014) Soil geochemistry controls fire severity: A soil approach to improved understanding of forest fire consequences in southwest Montana. Abstract GC33E-0571, presented at 2014 American Geophysical Union Fall Meeting, San Francisco, CA 15-19 Dec.

contributing author presentations [18]:

Weinheimer, N., Riebe, C.S., Callahan, R.P., Neely, A.B. (2022). Steady-state Erosion and Soil Production in the South Carolina Piedmont Inferred from Cosmogenic Nuclide Depth Profiles Abstract EP55C-0839, presented at 2022 Fall Meeting, AGU, Chicago, Illinois, 12-16 Dec.

Kitimikado, C., Carr, B.J., Noren, A.J., Callahan, R.P., Holbrook, W.S., Hayes, J.L., Riebe, C.S. (2022). Understanding the deep critical zone in the South Carolina Piedmont using borehole sampling and imaging. Abstract EP55C-0805, presented at 2022 Fall Meeting, AGU, Chicago, Illinois, 12-16 Dec.

Flinchum, B.A., Holbrook, W.S., Grana, D., Carr, B.J., Callahan, R.P., (2022). Characterizing Deep CZ Structure and Saturation in the Piedmont using P-wave and S-wave Seismic Refraction. Abstract H52H-0542, presented at 2022 Fall Meeting, AGU, Chicago, Illinois, 12-16 Dec.

Holbrook, W.S., Bemis, S.P., Callahan, R.P., Carr, B.J., Flinchum, B.A., Grana, D., Harman, C.J., Hayes, J.L., Moon, S., Neely, A.B, Noren, A.J., Riebe, C.S, Rajaram, H., Richter, D.D., Singha, K., Sklar, L.S. (2021). Controls on critical zone thickness in the Appalachian Piedmont: lithology, vegetation, and state of stress. Abstract EP43B-06, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec.

Sklar, L.S., Callahan, R.P., Carr, B.J., Chiavello, A., Cist, N., Davis, E., Flinchum, B.A., Harman, C.J., Hayes, J.L., Holbrook, W.S., Litwin, D.G., Moon, S., Neely, A.B., Plante, Z. Richter, D.D., Riebe, C.S., Singha, K., Weinheimer, N. (2021). Variation in Hillslope Sediment Size Controlled by Differences in Subsurface Weathering in a Transient Piedmont Landscape, South Carolina, USA. Abstract EP45G-1573, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec.

Bemis, S.P., Holbrook, W.S., Hayes, J.L., Harman, C.J., Flinchum, B.A., Callahan, R.P., Riebe, C.S., Carr, B.J. (2021). Growing an Oasis: The Role of Trees in Driving Regolith Production in a Bedrock Landscape, Panola Mountain, Georgia. Abstract EP45G-1573, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec.

Flinchum, B.A., Holbrook, W.S., Eppinger, B.J., Hayes, J.L., Richter, D.D., Harman, C.J., Callahan, R.P., Moon, S., Singha, K., Ferguson, T.A., Carr, B.J., Bemis, S.P. (2021). Connecting the deep and shallow critical zone: Quantifying inherited heterogeneity of the CZ structure. Abstract EP45G-1585, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec.

Brigilio, J., Flinchum, B.A., Callahan, R.P., Riebe, C.S., Holbrook, W.S. (2021), Differing Subsurface Fracture Characteristics Inferred from Ground Penetrating Radar at Two Granitic Sites in the Southern Sierra Nevada, California. Abstract EP55G-1182, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec.

Harman, C.J., Bemis, S.P., Callahan, R.P., Carr, B.J., Eppinger, B.J., Flinchum, B.A., Hayes, J.L., Holbrook, W.S., Litwin, D.G., Moon, S., Riebe, C.S., Singha, K., Sklar, L.S. (2021). Panola Mountain revisited: intensive geophysical and geochemical studies reveal the structure of the deep critical zone at a classic hydrologic study site Abstract H41B-06, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec

Hayes, J.L., Carr, B.J., Holbrook, W.S., Callahan, R.P., Harman, C.J., Riebe, C.S., Bemis, S.P., Flinchum, B.A., Moon, S., Singha, K., Sklar, L.S. (2021). Geophysical imaging reveals lithologic controls on weathering at the Panola Mountain Research Watershed, Georgia, USA Abstract NS35D-0396, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec

Del Vecchio, J., Hassenruck-Gudipati, H.J., Roth, D.L., Merritts, D., Hill, K.M., Sun, X., Kwang, J., Koppes, M.N., Mahon, R., Madoff, R., Gaspirini, N.M., Lehnigk, K., McDowell, C., Callahan, R.P., Mukherjee, U., Sklar, L.S., Gagliardi, J., Luna, L., Straub., K.M. (2021). URGE Pod Outcomes for the AGU EPSP Section. Abstract U35A-2265, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec

Gaspirini, N.M., Roth, D.L., Madoff, R., Mukherjee, U., Callahan, R.P., Mahon, R., Sklar, L.S., Gagliardi, J., Lehnigk, K., Luna, L., Merritts, D., Kwang, J., Del Vecchio, J., Sun, X., Koppes, M.N., McDowell, C., Straub., K.M., Hassenruck-Gudipati, H.J. (2021). Lessons learned from the AGU EPSP URGE pod on how to structure an equitable, inclusive, and safe committee space. Abstract U35A-228, presented at 2021 Fall Meeting, AGU, New Orleans, Louisiana, 13-17 Dec

Brigilio, J., Flinchum, B.A., Callahan, R.P., & Riebe, C.S. (2020). Ground Penetrating Radar Reveals Differences in Fracture Spacing Across Two Geochemically Distinct Granitic Lithologies. Abstract NS014-0009 presented at 2020 Fall Meeting, AGU, Virtual, 1-17 Dec.

Riebe, C.S. & Callahan, R.P., (2019). Mountain ecosystem response to drought moderated by lithologic and climatic controls on subsurface water-storage capacity. Abstract B22E-03, presented at 2019 Fall Meeting, AGU, San Francisco, California, 9-13 Dec.

Riebe, C.S. & Callahan, R.P., (2019). Lithologically mediated feedbacks between subsurface weathering and ecosystem productivity. Abstract 2831, presented at 2019 Goldschmidt Meeting, Barcelona, Spain 18-23 August. (R.P. Callahan served as speaker)

Riebe, C.S., Callahan, R.P., & Arvin L.J, (2018). Built on bedrock, running on dust: Controls on ecosystem productivity and vulnerability in the Sierra Nevada, California. Abstract 2157, presented at 2018 Goldschmidt Meeting, Boston, Massachusetts, 12-17 August.

Riebe, C.S., Callahan, R.P., Goulden M.L., Pasquet S., Flinchum B.A., Taylor N.J., & Holbrook W.S. (2017). The influence of subsurface porosity and bedrock composition and ecosystem productivity in the Sierra Nevada Batholith. Abstract EP53D-1762 presented at 2017 Fall Meeting, AGU, New Orleans, Louisiana, 11-15 Dec.

Taylor, N. J., Riebe, C. S., Dueker, K. G., Goulden, M., Flinchum, B. A., Pasquet, S., Callahan, R.P., Hahm, W.J. & Holbrook, W. S. (2016). Comprehensive seismic surveys suggest that subsurface water-holding capacity is secondary to bedrock nutrient content as a regulator of vegetation productivity in the Sierra Nevada Batholith, California. Abstract EP43C-0964, presented at 2016 Fall Meeting, AGU, San Francisco, California, 12-16 Dec.

Teaching Experience:

Fall 2020 Teaching Assistant for Environmental Data Analysis (Online)

Responsibilities: Assisted in transition of course to online format, including revisions to the course's labs. Facilitated student discussions, assisted with student lab exercises in Python and JMP. Grading of homework and lab assignments.

Summer 2020 Teaching Assistant for Field Camp General Mapping (Online)

Responsibilities: Helping students with virtual exercises, holding office hours, and grading of virtual mapping projects.

Summer 2019 Teaching Assistant for Field Camp Geophysics Section

Responsibilities: Assistance in data collection, analysis, and interpretation of seismic refraction, electrical resistivity, ground penetrating radars, and magnetic geophysical data collected in a small mountainous watershed in the Laramie Range, Wyoming.

Spring 2018 Teaching Assistant for Energy and Society

Responsibilities: Teaching and grading of labs related to human energy consumption and energy sources from a geologic context.

Fall 2017 Teaching Assistant for Environmental Data Analysis

Responsibilities: Lead lab sessions for 20 students. Labs focused on analyzing datasets using JMP software. Grading of homework and lab assignments.

Fall 2013 & 2014 Teaching Assistant for Intro to Soils

Responsibilities: Instructor for labs on field description and physical and chemical characterization of soils.

Graduate Student Mentoring:

Sarah Granke (MS student, University of Wyoming) Project: Quantifying physical and chemical weathering saprolite of the southern Sierra Nevada, California.	2019-2020
Amanda Donaldson (Ph.D. student, University of California, Santa Cruz) Project: Microclimate controls on subsurface weathering in the central California Coast Range	2022-present

Undergraduate Student Mentoring:

Bryanna Pilkington (Concordia University, Montreal, Canada) Project: Climatic, lithologic, and weathering controls on forest drought response in the San Jacinto and San Gabriel Mountains, California.	2020-2021
Andrew Miller (University of Wyoming) Project: Geochemical characterization of subsurface weathering in the southern Sierra Nevada, California.	2018-2019

Grants & Awards (total = $58,000):

UW Carlton R. Barkhurst Fellowship ($11,000)	2021
Wyoming NASA Space Grant Graduate Fellowship ($20,000)	2019-2020
UW Roy J. Shlemon Fellowship ($20,000)	2017-2018
UW Arts and Sciences Graduate Scholars Award ($2,500)	2017-2018
John R. Hanley Memorial Scholarship ($1,500)	2017
John M. Hummel Memorial Scholarship ($1,500)	2017
Dick and Lynne Cheney Travel Grant ($250)	2016
Goldschmidt Travel Grant ($1,250)	2016

Montana State University Award for Excellence 2015

Service & Outreach:

Wyoming State Science Fair Judge (2020): Judging of presentations for the Senior Earth and Environmental Science category and NASA Earth System Science award.

Co-organizer of Quaternary Conversations (2019-2020): Organized a university-wide monthly lecture series hosted through the Roy J. Shlemon Center for Quaternary Studies at the University of Wyoming

Hands on the Land Volunteer (2019): Shared research and assisted six high schoolers with tree surveys for two days during the summer of 2019.

Prospective Graduate Student Recruitment Organizer (2018): Organized social events and lodging for prospective students visiting the University of Wyoming Geology & Geophysics Department.

PEAKS Mentor (2015): Mentored three gifted third grade students at Longfellow Elementary School in Bozeman, Montana on science related activities.

Montana Apprenticeship Program (2014): Mentored two Native American high school students on soils related research projects at Montana State University.

Synergistic Activities:

-Participant in AGU Earth and Planetary Surface Processes URGE pod

-Participant in 2022 GSA Thompson Field: "Old or Young the Topographic Evolution of the Sierra Nevada.

-Reviewer: *Earth Surface Processes and Landforms, Proceeding of the National Academies of Sciences, Agricultural and Forest Meteorology*

-Convenor: AGU 2021 EP041 Top-down and Bottom-up Controls on Critical Zone Structure, Processes, and Resilience

Membership in Professional Societies:

American Geophysical Union
Geological Society of America