Brooke B. Osborne

Assistant Professor Department of Environment and Society Utah State University, Moab, Utah brooke.osborne@usu.edu | 435.797.1539 0000-0003-4771-7677

Professional experience

Assistant Professor of Human Dimensions of Environmental Change	2022 – Present
Utah State University, Department of Environment and Society, Moab, UT	
Postdoctoral Research Associate	2019 –2022
United States Geological Survey, Southwest Biological Science Center, Moab, I	JT

Education

Ph.D. in Ecology	2013 –	2019
Brown University, Department of Ecology and Evolutionary Biology, Providence, RI		
M.S. in Ecology	2009 -	2012
Colorado State University, Graduate Degree Program in Ecology, Fort Collins, CO		
B.S. in Ecotoxicology; B.S. in Spanish Language; B.S. in International Studies	2004 – :	2008
Pennsylvania State University, University Park, PA		

Teaching

- *ENVS 4750/6750: Global Change Ecology,* 11 students Spring 2025 Providing upper-level undergraduate and graduate students with a working understanding of the causes, impacts, and potential mitigation strategies of global change drivers.
- *ENVS 1350: Introduction to Environmental Science,* average 172 students Fall 2023, 2024 Leading an online, asynchronous, Breadth Life Science course examining the complex and consequential interactions between humans and the environment.
- Native American Tribes Upholding Restoration and Education (NATURE) Summer 2023 Designed and facilitated two weeks of hands-on curriculum for Indigenous undergraduate interns interested in natural resources. Led three learning activities and mentored two students through capstone projects, including fieldwork and presentation skills.
- *ENVS 6910: Humans and Global Change Ecology,* 4 graduate students Spring 2023 Introduced graduate students to recent "hot topics" in Global Change Ecology and facilitated in-depth discussions related to students' research interests and career goals.

ENVS 1350 Concurrent Enrollment advising, support and observation	
Cottonwood High School, 24 students	Fall 2024
Fremont High School, 17 students	Fall 2024
Weber High School, 12 students	Fall 2024
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Instructor of record, Wheaton College (MA)

PHYS 198: Environmental Geology, 16 students Fal Led an experimental course that applied systems thinking to examine how geological

processes influence the occurrence of hazards and the availability of resources.

Fall 2018

Guest lecturerHEP 2500: Health and Wellness, Utah State UniversityState UniversityDEEPS 1970: Geology field trip, Brown UniversityState UniversityBIOL 510: Current Topics in Biology, New Mexico State UniversityState UniversityENVS 0490: Environmental Science in a Changing World, Brown UniversityState University	Spring 2024 Spring 2022 Spring 2021 Fall 2013 Immer 2011
Teaching assistant, Brown University	
BIOL 1408: Terrestrial Biogeochemistry and the Functioning of Ecosystems ENVS 0490: Environmental Science in a Changing World	Fall 2014 Fall 2013
Trainee, Utah State University	
Statewide Faculty Development Workshop: Institutional Assessment, Performance	Indicators,
and Student Achievement	2024
Statewide Faculty Development Workshop: Teaching Documentation	2024
Teaching Documentation Workshop	2024
Four-day mentoring workshop in documenting teaching and pedagogy.	
Online Course Development Bootcamp	2023
Seven-week intensive design and development workshop to build a high-quality from the ground-up following the Backward Design model.	course
Beyond the Diversity Assignment	2023
Workshop to "revolutionize a course using critical and intersectional pedagogy le	enses".
"Powerful Teaching" Learning Circle	2023
Discussed a recent book about the science of learning with faculty from across I	JSU.
Empower Teaching Excellence Conference	2023
Learned from USU experts regarding "The Activities, Roles, and Relationships of Successful College Students."	ıf
Trainee Brown University Harriet W. Sheridan Center for Teaching and Learning	
Course Design Seminar	2018
Beflective Teaching (Certificate I)	2010
	2017

Advising and mentoring (Utah State University unless otherwise noted)

Graduate advising	
Nate Ducasse, MS (co-advising)	2025 – Present
Savannah Adkins, PhD	2022 – Present
Graduate committee membership	
Jerin TeKolste, PhD, Department of Wildland Resources	2024 – Present
Ally Marrs, PhD, Biology Department	2023 – Present
Keven Griffin, PhD, Northern Arizona University	2023 – Present
Undergraduate Teaching Fellow (UTF) mentoring	
Essence Barnes, ENVS 1350	Fall 2024
Haylie Belliston, ENVS 1350	Fall 2023
Supervisor	
Nikita Daly, Biogeochemistry technician	Fall 2024 - Present

Undergraduate research mentoring non labonstaber

James Johanntoberns (NATURE Program), Fort Lewis College	2023
Marilyn Harrney (NATURE Program), University of Idaho	2023
Alexandra Swanson (senior honors thesis), Brown University	2014 – 2016
Brenna Cannon (undergraduate technician, Brown University	2014 – 2016
Julia Spencer (undergraduate technician), Colorado State University	2010 – 2011
Matthew Schoolmeester (undergraduate technician), Colorado State University	2010

Research interests

I am an ecosystem ecologist with broad skills in biogeochemistry and soil science. I seek to advance our quantitative understanding of how terrestrial ecosystems respond to and shape our changing world. I am motivated by the urgent need for improved forecasts of ecosystem responses to disturbance and global change and for innovative solutions to pressing environmental challenges. For these reasons, my research emphasizes dryland and tropical forest ecosystems, which provide crucial services, play dominant roles in global biogeochemical cycling, and are predicted to be exceptionally sensitive to disturbance and global change. Yet, they represent large unknowns in our predictions of future carbon cycling and climate across spatial scales.

Peer-reviewed journal articles

H-index: 17 Total citations: 1,658 Last updated: January 14, 2025 [†]Denotes students or technicians advised or mentored

Published or accepted for publication

- 30. Chen, Q, [along with 45 members of the Nutrient Network, including B Osborne]. Local nutrient addition drives plant biodiversity but not biotic homogenization in global grasslands. Accepted: Nature Communications
- 29. Nelson, RA, [along with 51 members of the Nutrient Network, including B Osborne]. Forb diversity globally is harmed by nutrient enrichment but can be rescued by large mammalian herbivory. Accepted: Communications Biology (pre-print available).
- 28. Lopez A, M Anthony, J Catalon-Dibene, S Ferrenberg, S Jordan, B Osborne, S Reed, A Romero-Olivares. (2024) Dryland fungi are spatially heterogeneous and resistant to global change drivers. Ecosphere, 15(12). DOI: 10.1002/ecs2.70031
- 27. Romero-Olivares A, A Lopez, J Catalan-Dibene, S Ferrenberg S Jordan[†], **B Osborne**. (2024). Effects of global change drivers on the expression of pathogenicity and stress genes in dryland soil fungi. *mSphere*, 0:e00658-24. DOI: 10.1128/msphere.00658-24
- 26. Zheng Y, J Jian, A Frew, J Chen, **BB Osborne**, G Zhou, Q Xu, Z Zheng, Q Yang, L Ma, X He, SM Bell, G Zhao. (2024). Tree functional group mediated the effects of nutrient addition on soil nutrients and fungal communities beneath decomposing wood. Plant and Soil, DOI: 10.1007/s11104-024-06959-2

- 25. Shi B, M Delgado-Baquerizo, AK Knapp, MD Smith, SC Reed, **B Osborne**, FT Maestre, Y Zhu, A Chen, K Wilkins, M Holdrege, DF Cusack, A Patraglia, A Kulmatiski, C Picon-Cochard, C Roscher, M Carbognani, SA Power, T Forte, K Byrne, A Churchill, A Jentsch, H Henry, KH Beard, M Schuchardt, N Eisenhauer, R Otfinowski, Y Hautier, H Shen, SL Flory, Y Wang, Z Wang, C Wang, P Hou, T Zhang, W Gao, W Sun. (2024). <u>Aridity drives the response of soil particulate and mineral associated organic carbon to drought worldwide</u>. *Science Advances*, 10(40), eadq2654. DOI: 10.1126/sciadv.adq2654
- 24. Díaz-Martinez P, FT Maestre, E Moreno-Jiménez, M Delgado-Baquerizo, DJ Eldridge, H Saiz, N Gross, Y Le Bagousse-Pinguet, B Gozalo, V Ochoa, E Guirado, M García-Gómez, E Valencia, S Asensio, M Berdugo, J Martínez-Valderrama, BJ Mendoza, JC García-Gil, C Zaccone, M Panettieri, P García-Palacios, W Fan, I Benavente-Ferraces, A Rey, N Eisenhauer, S Cesarz, [along with 100 members of the BIODESERT Network, including **BB Osborne**], C Plaza. (2024). <u>Vulnerability of mineral-associated soil organic carbon to climate across global drylands</u>. *Nature Climate Change*, 1-7. DOI: 10.1038/s41558-024-02087-y
- 23. Terry T⁺, O Sala, S Ferrenberg, S Reed, **B Osborne**, S Jordan⁺, S Lee⁺, P Adler. (2024) <u>Disturbance amplifies sensitivity of dryland productivity to precipitation variability</u>. *Science Advances*, 10(30), easm9732. DOI: 10.1126/sciadv.adm9732
- 22. Eldridge D, J Ding, J Dorrough, M Delgado-Baquerizo, O Sala, N Gross, Y Le Bagousse-Pinguet, M Mallen-Cooper, H Saiz, S Asensio, V Ochoa, B Gozalo, E Guirado, M García-Gómez, E Valencia, J Martínez-Valderrama, C Plaza, [along with 101 members of the BIODESERT Network, including **BB Osborne**], MT Maestre. (2024). <u>Hotspots of</u> <u>biogeochemical activity linked to aridity and plant traits across global drylands</u>. *Nature Plants, 1-11*. DOI: 10.1038/s41477-024-01670-7
- 21. Phillips M, C Lauria[†], T Spector, J Bradford, C Gehring, **B Osborne**, A Howell[†], E Grote, R Rondeau, G Trimber[†], S Reed. (2024). <u>Trajectories and tipping points of piñon-juniper</u> <u>woodlands after fire and thinning</u>. *Global Change Biology*, 30(2), e17149. DOI: 10.1111/gcb.17149*
 *Covered by *Sierra Magazine*
- 20. Smith, MD, K Wilkins, MC Holdrege, P Wilfahrt, SL Collins, AK Knapp, OE Sala, JS Dukes, RP Phillips, L Yahdjian, LA Gherardi, TOhlert, C Beier, LH Fraser, A Jentsch, ME Loik, FT Maestre, SA Power, Q Yu, AJ Felton, SM Munson, Y Luo, [along with 149 members of the International Drought Network, including B Osborne], W Sun. (2024). Extreme drought impacts have been underestimated in grasslands and shrublands globally. *PNAS*, 121(4), e2309881120. DOI: 10.1073/pnas.2309881120
- Young KE, **BB Osborne**, M Phillips, DE Winkler. (2023). <u>Restoration research actions to</u> <u>address rapid change in drylands: insights from the Colorado Plateau</u>. *Restoration Ecology*, 31(4), e13855. DOI: 10.1111/rec.13855
- Hu M, J Wang, L Lu, P Shao, Z Zhou, D Wang, S Han, **BB Osborne**, J Chen. (2022). <u>Post-fire soil extracellular enzyme activities in subtropical-warm temperature climate transitional forests</u>. *Land Degradation and Development*. 34(7), 1973-1983. DOI: 10.1002/ldr.4582*
 *In top 10% of most highly cited articles for *Land Degradation and Development*

- Osborne BB, BT Bestelmeyer, HL Throop, KE Young, PM Homyak, CM Currier[†], SC Reed (2022). <u>The consequences of climate change for dryland biogeochemistry</u>. *New Phytologist*, 236(1), 15-20. DOI: 10.111/nph.18312
- 16. Osborne BB, C Roybal, CD Collier, E Geiger, ML Phillips, RH Reibold[†], MN Weintraub, SC Reed. <u>Biogeochemistry and ecosystem properties in three adjacent semiarid grasslands are resistant to nitrogen deposition but sensitive to edaphic variability</u> (2022). *Journal of Ecology*, *110(7)*, *1615-1631*. DOI: 10.1111/1365-2745.13896
- 15. Carroll O, E Batzer, S Bharath, ET Borer, S Campana, E Esch, Y Hautier, T Ohlert, EW Seabloom, PB Adler, JD Bakker, L Biederman, MN Bugalho, M Caldeira, Q Chen, K Davies, PA Fay, JMH Knops, K Komatsu, J Martina, KA McCann, JL Moore, JW Morgan, TO Muraina, **BB** Osborne, AC Risch, C Stevens, PA Wilfhart, L Yahdjian, AS MacDougall (2021). <u>Nutrient identity modifies the destabilising effects of eutrophication in grasslands</u>. *Ecology Letters*, 25(4), 754-765. DOI: 10.1111/ele.13946
- 14. Osborne BB, FM Soper, MK Nasto, D Bru, S Hwang, M Lopez Morales, MB Machmuller, L Philippot, BW Sullivan, GP Asner, CC Cleveland, AR Townsend, S Porder (2021). <u>Litter inputs</u> <u>drive patterns of soil nitrogen heterogeneity in a diverse tropical forest: results from a litter</u> <u>manipulation experiment</u>. *Soil Biology and Biochemistry*, 158, 108247. DOI: 10.1016/j.soilbio.2021.108247
- Phillips ML, DE Winkler, RH Reibold[†], BB Osborne, SC Reed (2020). <u>Muted responses to</u> <u>chronic experimental nitrogen deposition on the Colorado Plateau</u>. *Oecologia*, 195(2), 513-524. DOI: 10.1007/s00442-020-04841-3
- 12. **Osborne BB**, MK Nasto, FM Soper, GP Asner, CS Balzotti, CC Cleveland, PG Taylor, AR Townsend, S Porder (2020). <u>Leaf litter inputs reinforce islands of nitrogen fertility in a lowland</u> <u>tropical forest</u>. *Biogeochemistry*, 147(3), 293-306. DOI: 10.1007/s10533-020-00643-0
- Soper FM, BW Sullivan, **BB Osborne**, AN Shaw, L Philippot, CC Cleveland (2018). Leaf-cutter ants engineer hot spots of nitrous oxide emissions in tropical forests. *Proceedings of the Royal Society B*, 286(1894), 20182504*. DOI: 10.1098/rspb.2018.2504
 *Covered by *Science* magazine, *New Scientist*, and *Gizmodo*.
- Soper FM, MK Nasto, **BB Osborne**, CC Cleveland (2018). <u>Nitrogen fixation and foliar nitrogen</u> do not predict phosphorus acquisition strategies in tropical trees. *Journal of Ecology*, 107(1), 118-126. DOI: 10.1111/1365-2745.13044
- Soper FM, BW Sullivan, MK Nasto, **BB Osborne**, D Bru, CS Balzotti, PG Taylor, GP Asner, AR Townsend, L Philippot, S Porder, CC Cleveland (2018). <u>Remotely sensed canopy nitrogen</u> <u>correlates with nitrous oxide emissions in a lowland tropical rainforest</u>. *Ecology*, 99(9), 2080-2089. DOI: 10.1002/ecy.2434
- Hall EK, ES Bernhardt, R Bier, MA Bradford, CM Boot, JB Cotner, PA del Giorgio, SE Evans, EB Graham, SE Jones, JT Lennon, K Locey, D Nemergut, **BB Osborne**, JD Rocca, JS Schimel, MS Waldrop, MW Wallenstein (2018). <u>Understanding how microbiomes influence the</u> <u>systems they inhabit: moving from a correlative to a causal research framework</u>. *Nature Microbiology*, 3(9), 977-982. DOI: 10.1038/s41564-018-0201-z

- Nasto MK, **BB Osborne**, Y Lekberg, GP Asner, CS Balzotti, S Porder, PG Taylor, AR Townsend, CC Cleveland (2017). <u>Nutrient acquisition, soil phosphorus partitioning, and</u> <u>competition among trees in a lowland tropical rain forest</u>. *New Phytologist*, 214(4), 1506-1517. DOI: 10.1111/nph.14494
- Osborne BB, MK Nasto, GP Asner, CS Balzotti, CC Cleveland, BW Sullivan, PG Taylor, AR Townsend, S Porder (2017). <u>Climate, topography, and canopy chemistry exert hierarchical</u> <u>control over soil N cycling in a Neotropical lowland forest</u>. *Ecosystems*, 20(6), 1089-1103. DOI: 10.1007/s10021-016-0095-7
- Conant RT, CEP Cerri, **BB Osborne**, K Paustian (2017). <u>Grassland management impacts on</u> soil carbon stocks: a new synthesis. *Ecological Applications*, 27(2), 662-668. DOI: 10.1002/eap.1473
- Balzotti CS, GP Asner, PG Taylor, R Cole, **BB Osborne**, CC Cleveland, S Porder, AR Townsend (2017). <u>Topographic distributions of emergent trees in tropical forests of the Osa</u> <u>Peninsula, Costa Rica</u>. *Ecography*, 40(7), 829-839. DOI: 10.1111/ecog.02062
- Balzotti CS, GP Asner, PG Taylor, CC Cleveland, R Cole, RE Martin, MK Nasto, **BB Osborne**, S Porder, AR Townsend (2016). <u>Environmental controls on canopy foliar nitrogen distributions</u> in a Neotropical lowland forest. *Ecological Applications*, 26(8), 2451-2464. DOI: 10.1002/eap.1408
- Osborne BB, JS Baron, MD Wallenstein (2016). <u>Moisture and temperature controls on</u> <u>nitrification differ among ammonia oxidizer communities from three alpine soil habitats</u>. *Frontiers of Earth Science*, 10(1), 1-12. DOI: 10.1007/s11707-015-0556-x
- Bier RL, ES Bernhardt, CM Boot, EB Graham, EK Hall, JT Lennon, DR Nemergut, BB Osborne, C Ruiz-González, JP Schimel, MP Waldrop, MD Wallenstein (2015). <u>Linking</u> microbial community structure and microbial processes: an empirical and conceptual overview. *FEMS Microbiology Ecology*, 91(10). DOI: 10.1093/femsec/fiv113

Submitted or in review

Ohlert T, M Smith, S Collins, A Knapp, JS Dukes, S Munson, M Anderson, M Avolio, A Chen, M Hayden, MC Holdrege, O Sala, I Slette, P Wilfahrt, K Wilkins, C Beier, L Frase, r A Jentsch, M Loik, Y Luo, F Maestre, R Phillips, SA Power, L Yahdjian, Q Yu, A Chen, A Felton, L Gherardi, N Lyon, [along with 138 members of the International Drought Network, including B Osborne]. Drought severity interacts with duration to erode ecosystem resistance. In review: *Science*

Chen H, Q Xu, K Jan van Groenigen, BA Hungate, P Smith, D Li, DL Moorhead, **BB Osborne**, Z Ma, JE Olesen, C Wang, J Liu, X Sun, C Chu, J Chen. Linking soil extracellular enzymes with soil respiration under altered litter inputs. In review: *Agriculture and Forest Meteorology*

Stemkovski M, JR Bernhardt, BW Blonder, JB Bradford, K Clark-Wolf, LE Dee, MEK Evans, V Iglesias, LC Johnson, AJ Lynch, SL Malone, **BB Osborne**, MA Pastore, M Paterson, ML Pinsky, CR Rollinson, O Selmoni, JJ Venkiteswaran, AP Walker, NK Ward, JW Williams, CM Zarakas, PB Adler Ecological acclimation: a framework to integrate fast and slow responses to climate change. Submitted: *Functional Ecology* In advanced stages of preparation (full text available upon request)

Osborne BB*, ML Phillips*, MA Cavaleri, J Pett-Ridge, TE Wood, SC Reed. Lowland tropical forest subsurface soils have the potential to respire large quantities of carbon in response to warming.

*Equal author contribution

Zheng Y, Z Hu, J Jian, Jinshi, J Chen, **B Osborne**, G Zhou, Q Xu, Z Zheng, L Ma, X He, S Bell, A Frew. A. Distinct phosphorus-driven impacts of decomposition on soil nutrients and fungi under angiosperms deadwood. Preparing for resubmission with major revisions: *Plant and Soil*

Osborne BB, FM Soper, GP Asner, CC Cleveland, AR Townsend, S Porder. Nutrient constraints on nitrous oxide emissions differ over fine spatial scales in a diverse tropical forest. *With coauthors.*

Ferrenberg S, A Faist, **B Osborne**, S Lee[†], S Reed. Quantifying potential abiotic drivers of the nurse-plant effect in two dominant shrub species of the northern Chihuahuan Desert. *With coauthors.*

Grants, fellowships, and awards

Awarded: \$1,124,576

USDA, Natural Resources Conservation Service (\$492,749) *Incorporating above- and belowground carbon into terrestrial dryland state and transition models to better understand, predict, and manage for carbon.* PI. 2023 – 2028

Research to characterize carbon stocks for key groups of NRCS Ecological Sites and the integration of carbon storage and sequestration into associated State and Transition Models. This grant supports one Postdoctoral Fellow.

BLM, Rangeland Management Program (\$250,000) *The carbon sequestration potential of western* U.S. rangelands in the face of climate change. Co-PI 2022 – 2028 Research exploring the effects of livestock grazing on publics lands for above- and below-ground carbon stocks across large spatial scales. This grant supports one PhD student.

USGS, North Central Climate Adaptation Science Center (\$49,919) Nitrogen deposition and its interactions with invasive species and soil microbial communities in Dinosaur National Monument. Co-PI 2022 – 2027

Research to quantify nitrogen deposition in Dinosaur National Monument and its impact key invasive plant species.

INCyTE Lab Exchange Fellowship for Early Career Scientists (\$1,607) 2022 Awarded to support early career scientists doing innovative work to bridge the gap between experimental research and Earth System Modeling.

U.S. Department of the Interior Star Award

2022

Award to recognize noteworthy accomplishments based on an employee's annual performance appraisal.

L'Oréal USA for Women in Science Fellowship* (\$60,000) 2021 – 2022 (PI) Selected from thousands of applicants across the U.S. as one of five postdoctoral women in STEM in recognition of academic excellence, research potential, and dedication to supporting the next generation of women in STEM. *Covered by multiple educational advertisements that have received over 3 million views.

USGS, Core Systems Science Program (\$2,300) 2021 Awarded to support multi-disciplinary, big data approaches to addressing pressing global challenges. This funding will support my collaboration with a team of ecosystem modelers to address soil carbon questions.

USGS, North Central Climate Adaptation Science Center (\$208,263) Determining successful management and restoration strategies for maintaining pinyon-juniper communities in the face of change. Co-PI 2020 - 2022Research to generate novel, actionable science to address ongoing management challenges for pinyon-juniper woodlands, especially in the face of climate change and growing wildfire intensity across the southwestern U.S. This grant supports one PhD student. NPS (\$24,942) Pollution in the parks: assessing nitrogen deposition consequences in the southeast Utah National Parks, Co-PL 2020 - 2022An assessment of nitrogen deposition effects on native plants and soils, air and water quality, and greenhouse gas emission in the National Park lands of southeastern Utah. Brown University/Wheaton College Faculty Fellowship (\$10,000) 2018 An opportunity for outstanding, advanced Brown graduate students to experience faculty life firsthand by teaching and participating in the intellectual life of a liberal arts college. Brown University EEB Dissertation Improvement Grant (\$9,851) 2018 A competitive internal grant following the application format of the discontinued NSF DDIG. 2018 Ecological Society of America Travel Awards (\$1,000)

Travel support from the Microbial Ecology (accepted) and Biogeosciences sections (declined).

New Phytologist Best Student Presentation Award (\$500) 2017 Awarded by the ESA Biogeosciences section for an outstanding oral presentation of research conducted as a graduate student.

Brown University travel awards and small grants (\$1,500) 2015 – 2017 Multiple small international and conference travel awards and research grants from the Brown Graduate Student Council, Biomedical Department, and the Institute at Brown for Environment and Society.

NSF IGERT Traineeship: Reverse Ecology: Computational Integration of Genomes, Organisms, and Environments 2013 – 2016 Immersive training in community genome assembly. Led a project using genomics to study the effects of wastewater effluent on microbial community composition in salt marsh sediments. Francis Clark Soil Biology Scholarship (\$1,945)

Awarded by the Natural Resources Ecology Laboratory at Colorado State University.

Program of Research and Scholarly Excellence Award (\$10,000) 2009 – 2010 Support from the Graduate Degree Program in Ecology from Colorado State University.

Under review: \$12,457,360

NSF Biodiversity on a Changing Planet (\$2,457,360) *Collaborative Research: How grassland soil food webs, carbon and functional diversity respond to physical disturbance and climatic change at a global scale.* Co-Pl

We propose to quantify how physical disturbance changes grassland belowground food webs, their ecosystem functions, and their responses to future global change across the edaphic and climatic ranges of grasslands. This grant would support two PhD students and one Postdoctoral Fellow.

Virtual Institute for the Carbon Cycle (\$10,000,000) Carbon Below the Horizon: A Global Exploration of Grassland Community and Carbon Dynamics. Co-PI

We propose to significantly reduce uncertainties in the global carbon budget and provide the mechanistic insights needed to develop process-based models that accurately forecast the future of grassland carbon.

Not awarded: \$5,285,880

USDA, Agriculture and Food Research Initiative (\$750,000) *Evaluating soil carbon resilience to grazing in sagebrush ecosystems*. Co-PI 2024

USDA Higher Education Grant (\$150,000) *Food, Energy, Water, Security, and Sovereignty (FEWSS) for Indigenous and Rural Communities in Times of Changing Climate.* Co-PI 2024

NSF Research and Mentoring for Postbaccalaureates in Biological Sciences (\$3,000,000) *Global change biology.* Mentor 2024

USGS, North Central Climate Adaptation Science Center (\$312,210) The short- and long-term consequences of stand thinning and mastication for ecosystem function in old-growth piñon-juniper woodlands. PI 2023

USGS, North Central Climate Adaptation Science Center (\$311,670) *Managing for carbon on public and tribal lands in a time of change*. Co-PI 2023

USGS, Northwest Climate Adaptation Science Center (\$312,000) The effects of drought and physical disturbance on the sagebrush steppe Co-PI 2023

USDA, Agriculture and Food Research Initiative Seed Grant (\$300,000) *Evaluating soil carbon resilience to grazing in sagebrush ecosystems* Co-PI 2023

USDA, Higher Education Grants (\$150,000) *Food, Energy, Water, Security, and Sovereignty (FEWSS) for Indigenous and Rural Communities in Times of Changing Climate.* Co-PI 2023

2011

USGS John Wesley Powell Center for Synthesis and Analysis: *Why are shrubs so successful in the Anthropocene? Examining the role of climate change, land-use history, and ecosystem feedbacks across terrestrial ecosystems.* Working group member 2023

USGS John Wesley Powell Center for Synthesis and Analysis: Interactive controls of climate, vegetation, and soils on the coupled cycling of carbon and water in terrestrial ecosystems of the Colorado River Basin. Working group member 2023

USGS John Wesley Powell Center for Synthesis and Analysis: *Why are shrubs so successful in the Anthropocene? Examining the role of climate change, land-use history, and ecosystem feedbacks in Artic, grassland, and savannah ecosystems.* Working group member 2022

Synergistic activities

Working group member, Rangeland Carbon Tech Transfer Project 2024 – Present Collaborating on effort to synthesize the state of the science and provide technical transfer related to best practices for managing carbon in sagebrush rangelands

Working group member, NSF Biodiversity on a Changing Planet-Design track: *Climate change and ecosystem functioning: reducing critical uncertainties about ecosystem acclimation.* 2023 – Present Collaborating with experts in paleoecology, long-term observation studies, experiments, and simulation models to synthesize knowledge about ecosystem acclimation, identify key knowledge gaps, and develop research to fill those gaps.

Research network site leader, <u>Nutrient Network</u>, <u>DRAGNet</u>, <u>Bromecast</u>, and <u>International Drought</u> <u>2021 – Present</u> Leading the set-up, maintenance, and data collection for field sites in the Desert Southwest for four global cooperative research networks.

Research network collaborator, Bromecast Network 2022 – Present 2022 – Present Designed protocols for the sampling and analysis of soil and biological soil crust for the network.

Working group member, USGS John Wesley Powell Center for Synthesis and Analysis: A global
synthesis of multi-year drought effects on terrestrial ecosystems.2021 – 2024Contributing to a network to better understand and forecast the consequences of drought across
ecosystems and through time and to assist land managers.

Working group member, USGS John Wesley Powell Center for Synthesis and Analysis: *Identifying the next generation of ecological indicators* 2012 – 2015 Worked to improve the application of microbial data in ecosystem studies. Compiled a database of ecosystem constraints on microbial turnover rates.

Research team co-founder, School of Global Environmental Sustainability: *Women, Population, and* the Environment 2010 – 2012

Brought together an interdisciplinary research team and designed and executed events focused on promoting women in leadership to address issues of community health, climate uncertainty, and sustainable livelihoods.

Service (Utah State University unless otherwise noted)

Faculty search committee member, ENVS Department	2024 – Present
Faculty advisor, Environmental Science and Sustainability B.S.	2024 – Present
Steering committee member, The Disturbance and Resources Across Global Grass Network (DRAGNet)	slands Research 2024 – Present
Graduate Student Selection Committee member, ENVS Department	2022 – Present
Statewide Campuses Research Initiative Committee member	2024
Tenure Reviewer, The Cary Institute	2024
Mentor, Speed Mentoring event, Ecological Society of America Southwest Chapter	2024
Moderator, Science on Screen Panel, Science Moab	2024
Environmental Science curriculum working group member, ENVS Department Developed a popular new BS offering in Environmental Science and Sustainab	2023 bility.
Council representative, Ecological Society of America Southwest Chapter	2021-2023
Chair, Ecological Society of America Southwest Chapter	2021-2022
Vice-chair, Ecological Society of America Southwest Chapter	2020 – 2021
Judge, Ecological Society of America: Buell and Braun student presentation awards	s 2021
Co-convener of special session, Biennial Conference of Science and Management Plateau and Southwest Region: <i>Feeling the burn: the interacting effects of fire a</i> <i>pinyon-juniper woodlands of the Southwest</i>	on the Colorado and warming on 2022
Co-convener of organized oral session: Ecological Society of America annua interactive effects of global change drivers on dryland ecosystems of the western U	al meeting: <i>The</i> <i>I.S.</i> 2021
Judge, American Geophysical Union: Outstanding Student Presentation Award	2021
Co-convener of organized oral session, American Geophysical Union Fall Meeting in drylands: new findings and emerging frontiers	<i>Carbon cycling</i> 2021
Convener of organized oral session: Ecological Society of America annual consequences of climate change for dryland biogeochemistry	l meeting: <i>The</i> 2020
Interviewer, Brown University Alumni Interviewing Program	2019 – 2020
Judge, Ecological Society of America: Sulzman and Likens awards	2019

Co-founder and leader, 500 Women Scientists, Providence RI Pod Started a local chapter to organize and promote Rhode Island women in STEM.	2017 – 2019
Facilitator, Brown University Student and Employee Accessibility Services Proctored for students with medical, physical, psychological, and learning disabilit	2013 – 2019 ies.
Vice-president, Brown University Department of Ecology and Evolutionary Biology gra association	duate student 2017
Co-organizer of Forum, Osa Conservation Tropical Reforestation Forum Co-designed and organized a public, four-day workshop in rural Costa Rica, whi scientists and land managers from the U.S. and Central America to discuss carbon and reforestation.	2015 ich connected sequestration
Planning committee member, Front Range Student Ecology Symposium Annual multi-day gradient student-focused symposium at Colorado State Univers	2009 – 2011 ity.
Science outreach	
Artist in residence science collaborator, Canyonlands Research Center Partnering with a local artist to create work expressing the ecology of Southwester rangelands.	2025 rn
Storymap co-creator, Conserving Carbon in Sagebrush Country	2025
Planning committee member, Moab Festival of Science 20 Organizing and promoting four days of free hands-on science events in Moab, Ut)19 – Present ah.
Invited speaker, Science Moab, Science on Tap Delivered a one-hour public educational talk to over 200 attendees about the bio of dryland ecosystems, like those in Moab, and their role in climate change.	2023 ogeochemistry
Co-organizer of public event: <i>Moab and Spanish Valley's Groundwater Conditions</i> Worked with community collaborators to create a well-attended public education the availability of water in Moab and Spanish Valley with USU hydrogeologist Dr. 7	2023 n event about Fom Lachmar.
Art installation co-creator, Canyonlands Research Center Artist in Residence collabor Collaborated with visual artist Jorge Rojas and other scientists to create an ir immersive traveling museum exhibit about biological soil crust.	ation 2023 Iteractive and
Curriculum designer, Science Moab, Science for Guides Program Created a curriculum for educating local guides about the biogeochemisti ecosystems in the Moab area to promote responsible, informed recreation.	2022 ry of dryland
Radio play contributor, Radio Play Festival, KZMU Served as a voice actor in a radio play about the importance of biological soil crus	2022 st.
Educator, Moab Festival of Science, "STEMonstrations" booth about biocrust	2022

Creator, #ESAWatchParty 20 Created the #ESAWatchParty challenge, which hundreds of graduate students and e ecologists used to amplify their science during distanced, virtual meetings.)20 – 2021 arly career
Panelist, National Academies of Sciences Roundtable: Mentoring Matters: Supporting to of Women in STEM Invited by the Committee on Women in Science, Engineering, and Medicine to importance of mentorship for early career women in STEM with a broad audience	he Careers 2021 explore the
Panelist, Girl Scouts of Greater New York Virtual Career Panel Invited by the Girl Scouts of America to meet with college-age alumnae and dis toward careers in science.	2021 cuss paths
Panelist, Girl Scouts of Greater New York Virtual STEM Workshops Invited by the Girl Scouts of America to inspire the next generation of STEM pioneers fun and educational virtual science workshops related to Ecology.	2021 by leading
Panelist, L'Oréal USA x Luminary Roundtable: <i>Staying Power: Women in Science on Wl to Succeed</i> Spoke with a collaborative of professional women about female leadership in STEM	nat it Takes 2021
Panelist, Moab Festival of Science, Women in Science Panel Discussed challenges faced by women in STEM following a screening of the film <i>Scientist</i> for the Moab Festival of Science.	2021 n <i>Picture a</i>
Educator, Moab Festival of Science, "Scientist Workbook" for elementary students	2021
Art installation co-creator: Rhode Island School of Design Art-Science partnerships 2 Partnered with two MFA students from the Rhode Island School of Design to co complex concepts in ecosystem ecology through works of art, including large print i and furniture pieces, viewed by thousands in Providence, RI galleries.	014 – 2019 mmunicate nstallations
Creator and mentor, Wild Ones Science Education Program 20 Founded creative education program that uses narrative to connect fourth grader concepts in Ecology and to encourage environmental stewardship. Received funding and mentor two undergraduate interns interested in elementary education.	011 – 2019 s with core to support
Guest instructor, Brown Earth Science Department-Vartan Elementary Partnership	2016
Volunteer, Significant Opportunities in Atmospheric Research and Science (SOARS)	2011
Judge, Bella Romero Elementary School Science Fair	2010, 2011
Educator, STEMapalooza Science Fair Soil Science Booth	2009
Guest instructor, Laurene Edmondson Elementary School Soil Science unit	2009
Presentations (first or last author only)	

(Invited) **Osborne BB**, S Adkins, J Burgess-Conforti, MF Cotrufo, M Duniway, K Jensen, S Lohman, T Maxwell, T Nauman, R O'Connor, WK Smith, S Wills, S Reed (2024). Understanding and managing dryland soil carbon in a time of rapid change. Ecological Society of America annual meeting (oral presentation)

Adkins S, S Reed, J Burgess-Conforti, R O'Connor, S Lohman, R Reibold, **BB Osborme** (2024). Implications of grazing intensity for dryland soil carbon storage on the Colorado Plateau. Ecological Society of America annual meeting (oral presentation)

(Invited) **Osborne BB**, M Dannenberg, S Jordan, S Lee, O Sala, W Smith, T Terry, S Ferrenberg, S Reed (2023). Effects of drought and physical disturbance on dryland biogeochemistry across regions and within microhabitats. Ecological Society of America annual meeting (oral presentation).

(Invited) **Osborne BB** (2023). Understanding and managing dryland soil carbon in a time of rapid change. USGS Headquarters (oral presentation).

(Invited) **Osborne BB**, M Dannenberg, S Jordan, S Lee, O Sala, W Smith, T Terry, S Ferrenberg, S Reed (2022). Climate regulates the consequences of drought and physical disturbance for drylands. American Geophysical Union Fall Meeting (oral presentation).

(Invited) **Osborne BB** (2022). The consequences of global change for dryland carbon and nitrogen cycling. USGS Menlo Park Soil Microbial Ecology Laboratory Seminar (oral presentation).

(Invited) **Osborne BB,** P Adler, M Dannenberg, S Jordan, S Lee, OE Sala, W Smith, T Terry, S Ferrenberg, S Reed (2022). The consequences of co-occurring global change drivers for dryland biogeochemistry differ fundamentally along an aridity gradient. Morley Nelson Snake River Birds of Prey National Conservation Area Symposium (oral presentation).

Osborne BB, C Roybal, CD Collier, E Geiger, ML Phillips, R Reibold, MN Weintraub, SC Reed (2022). Long-term simulated atmospheric nitrogen deposition has minimal impacts on biogeochemical and ecosystem properties in three semiarid grasslands on the Colorado Plateau. Biennial Conference of Science and Management on the Colorado Plateau and Southwest Region (oral presentation).

Osborne BB, C Roybal, CD Collier, E Geiger, ML Phillips, R Reibold, MN Weintraub, SC Reed (2022). Three semiarid grasslands are resistant to nitrogen deposition but sensitive to edaphic variability. Ecological Society of America annual meeting (oral presentation).

Osborne, BB, P Adler, M Dannenberg, S Ferrenberg, S Jordan, S Lee, S Reed, O Sala, W Smith, T Terry, D Yan (2021). In hot deserts, drought is a stronger short-term regulator of biogeochemistry than physical disturbance. American Geophysical Union Fall meeting (oral presentation).

(Invited) **Osborne, BB** (2021). The consequences of drought and land use change for dryland biogeochemistry in the desert Southwest. Biology Departmental Seminar, New Mexico State University, Las Cruces, NM (oral presentation).

(Invited) **Osborne, BB** (2021). Nutrient limitations on dryland soil carbon cycling. Cotrufo Lab Meeting, Natural Resources Ecology Laboratory, Colorado State University, Fort Collins, CO (oral presentation).

Osborne, BB, P Adler, M Dannenberg, S Ferrenberg, S Jordan, S Lee, S Reed, O Sala, W Smith, T Terry, D Yan (2021). Climate dictates the effects of increased drought and physical disturbance on dryland soil biogeochemistry. Ecological Society of American annual meeting (oral presentation).

Osborne, BB, P Adler, M Dannenberg, S Ferrenberg, S Jordan, S Lee, S Reed, O Sala, W Smith, T Terry, D Yan (2021). Forecasting dryland ecosystem vulnerability to change: a cross-system assessment of vegetation and process responses to disturbance and climate variability on DoD lands. SERDP and ESTCP (DoD) Symposium (poster).

Osborne, BB, P Adler, M Dannenberg, S Ferrenberg, S Jordan, S Lee, S Reed, O Sala, W Smith, T Terry, D Yan (2020). Forecasting dryland ecosystem vulnerability to change: a cross-system assessment of vegetation and process responses to disturbance and climate variability on DoD lands. SERDP and ESTCP (DoD) Symposium (oral presentation).

Osborne BB, C Roybal, E Geiger, ML Phillips, SC Reed (2020). Nitrogen inputs are quickly lost from a semiarid grassland on the Colorado Plateau. Ecological Society of America annual meeting (oral presentation).

Osborne BB, FM Soper, MK Nasto, D Bru, S Hwang, MB Machmuller, L Philippot, BW Sullivan, GP Asner, CC Cleveland, AR Townsend, S Porder (2019). Effects of litterfall inputs on soil nitrogen cycling in a diverse tropical forest. American Geophysical Union Fall meeting (oral presentation).

Osborne, BB, P Adler, M Dannenberg, S Ferrenberg, S Jordan, S Lee, S Reed, O Sala, W Smith, T Terry, D Yan (2019). Forecasting dryland ecosystem vulnerability to change: a cross-system assessment of vegetation and process responses to disturbance and climate variability on DoD lands. SERDP and ESTCP (DoD) Symposium (poster).

Osborne, BB, P Adler, M Dannenberg, S Ferrenberg, S Jordan, S Lee, S Reed, O Sala, W Smith, T Terry, D Yan (2019). A cross-site assessment of dryland ecosystem vulnerability to physical disturbance and drought. Morley Nelson Snake River Birds of Prey National Conservation Area Symposium (poster).

Osborne BB (2018). Abiotic and biotic controls of nitrogen cycling in a lowland tropical forest. Brown University EEB Departmental Seminar (oral presentation).

Osborne, BB, GP Asner, CC Cleveland, FM Soper, A Townsend, S Porder (2018). Remotely sensed canopy N predicts differences in soil microbial community composition and activity at the sub-hectare scale in a lowland tropical forest. Ecological Society of America annual meeting (oral presentation).

Osborne, BB, MK Nasto, GP Asner, C Balzotti, CC Cleveland, P Taylor, AR Townsend, S Porder (2017). Canopy trees influence local biogeochemistry in a lowland tropical forest. Ecological Society of America annual meeting (oral presentation).

Osborne, BB, J Capano, KC Cushman, TR Dial, J Rehm (2017). Ecology and Conservation in East Africa. Brown University EEB Departmental Seminar (oral presentation).

Osborne, BB, MK Nasto, GP Asner, C Balzotti, CC Cleveland, P Taylor, AR Townsend, S Porder (2016). Canopy tree species drive local heterogeneity in soil nitrogen availability in a lowland tropical forest. American Geophysical Union Fall meeting (oral presentation).

Osborne, BB (2016). Topography, climate, and canopy chemistry influence soil nitrogen availability in lowland tropical forests of the Osa Peninsula. Osa Conservation Reforestation Forum (oral presentation).

Osborne, BB (2016). Controls of nitrogen availability in lowland tropical forests. Osa Conservation seminar for the public (oral presentation).

Osborne, BB, MK Nasto, GP Asner, CC Cleveland, BW Sullivan, P Taylor, AR Townsend, S Porder (2015). Geomorphology and canopy chemistry influence soil nitrogen availability on variable time scales in a lowland tropical forest. Ecological Society of America annual meeting (oral presentation).

Osborne, BB, MK Nasto, GP Asner, CC Cleveland, BW Sullivan, P Taylor, AR Townsend, S Porder (2015). Short and long-term controls on tropical forest nitrogen cycling in the Osa Peninsula, Costa Rica. Institute at Brown for Environmental Science Annual Retreat (oral presentation).

Osborne, BB (2014). Composition and diversity of microbial communities in salt marsh sediments. Brown-MBL Partnership Symposium (poster).

Osborne, BB (2013). Diversity and distribution of ammonia oxidizing bacteria in salt marsh sediments. Brown-MBL Partnership Symposium (poster).

Osborne, BB (2013). Moisture and temperature controls on nitrification differ among three alpine soil habitats. Brown University EEB departmental seminar series (oral presentation).

(invited) **Osborne, BB** (2013). The effects of temperature and moisture on alpine microbial processes across a gradient of soil development. University of Pennsylvania, Department of Earth and Environmental Science (oral presentation).

(invited) **Osborne, BB** (2013). The effects of temperature and moisture on alpine microbial processes across a gradient of soil development. University of Zurich, Department of Geography (oral presentation).

Osborne, BB, JS Baron, WD Wallenstein, ER Richer (2011). Alpine microbial community responses to summer warming. American Geophysical Union Fall Meeting (poster).

Osborne, BB, JS Baron, MD Wallenstein (2011). Alpine microbial responses to summer warming in Rocky Mountain National Park. Western Mountain Initiative (oral presentation).

Osborne, BB, JS Baron, MD Wallenstein (2011). Alpine microbial responses to summer warming in Rocky Mountain National Park. Mountain Research Initiative (USGS) Workshop (oral presentation).

Osborne, BB, JS Baron, MD Wallenstein, ER Richer (2011). Alpine microbial community responses to summer warming. Ecological Society of America annual meeting (poster).

Osborne, BB. JS Baron, MD Wallenstein, ER Richer (2010). Alpine microbial community responses to climate change and atmospheric nitrogen deposition in Rocky Mountain National Park. American Geophysical Union Fall Meeting (poster).

Osborne, BB, MD Wallenstein, JS Baron (2010). A survey of alpine microbial community response to climate change and atmospheric nitrogen deposition. Rocky Mountain National Park Research Conference (poster).

Osborne, BB, MD Wallenstein, ER Richer, JS Baron (2010). Microbial linkages between nitrogen deposition, glacier melt, and variable nitrate concentration trends. Front Range Student Ecology Symposium (poster).

Media coverage (selected)

News features

Pitts, E (2024). The Colorado River is in a custody battle with 7 states. Deseret News.

Emerson, T (2024). <u>What's up with our dirt?: USU researchers are helping look into how</u> climate change is effecting biological soil crust. Utah State University YouTube

Gilbert, L (2024). <u>Heat of the Moment: Deciphering Biological Soil Crusts to Protect Dryland</u> <u>Ecosystems.</u> Utah State TODAY

Langlois, K (2023). Future Forests of America. Sierra Magazine.

Hardford, A (2023). Searching for answers in the field with Brooke Osborne. Moab Sun News.

Fisher, S (2022). <u>Carbon, climate and 'charismatic' crusts: The woman-powered world of</u> <u>Moab's biocrust research</u>. Moab Times-Independent.

Haimowitz, M (2022). <u>Treading Lightly: Moab Utah – How the city has changed and how</u> visitors can be mindful of their impact. Tripadvisor.

Baron, J, SC Reed (2021). Brooke Osborne and her quest to understand the responses of soils to climate change. USGS Science Spotlights

(2015) <u>Graduate student Osborne collaborates with RISD colleague to create artistic analogue of Costa Rican rainforest</u>. Institute at Brown for Environment and Society Magazine.

Book quotes and contributions

Lindsey, ALM (2024). Reading and Writing the Climate Future in the Appalachian Forest. Climate Change Recipe Book.

Porder, S (2023). Elemental: How Microbes, Plants, and People Harnessed Five Essential Elements to Change the World. Princeton University Press.

Marzluff, JM (2020). In Search of Meadowlarks: Birds, Farms, and Food in Harmony with the Land. Yale University Press.

Peer reviews

Soil Biology and Biochemistry Global Change Biology New Phytologist Biogeochemistry Geoderma Plant and Soil

Ecosystems Journal of Sustainable Forestry Elementa: Science of the Anthropocene Journal of Plant Ecology Microorganisms USGS Internal reviews (many)

Professional affiliations

Ecological Society of America American Geophysical Union American Association for the Advancement of Science 500 Women Scientists Graduate Women in Science Earth Science Women's Network