

BRENDAN P. MURPHY, PhD

Research Associate, Utah State University, Department of Watershed Sciences

EDUCATION

- Ph.D., Geological Sciences**, The University of Texas at Austin, Austin, TX **2016**
NSF Graduate Research Fellow
Dissertation Title: 'Feedbacks among chemical weathering, rock strength and erosion with implications for the climatic control of bedrock river incision'
Advisor: Dr. Joel Johnson
- B.S., Geology**, The College of William & Mary, Williamsburg, VA **2010**
Magna cum laude, Phi Beta Kappa, High Honors in Geology

PROFESSIONAL EXPERIENCE

- Research Associate** **2019 – present**
Department of Watershed Sciences, Utah State University
- Postdoctoral Fellow** **2016 – 2019**
Department of Watershed Sciences, Utah State University
Supervisor: Dr. Patrick Belmont
- Graduate Research and Teaching Assistant** **2011 – 2013**
Department of Geosciences, The University of Texas at Austin
- Research Technician** **2010 – 2011**
Biosphere2, The University of Arizona

PUBLICATIONS

- B. P. Murphy**, T. E. Walsworth, P. Belmont, M. M. Conner & P. Budy (*in press*). Dynamic Habitat Disturbance and Ecological Resilience (DyHDER): modeling population responses to habitat condition, *Ecosphere*. DOI: 10.1002/ecs2.3023
- B. P. Murphy**, J. A. Czuba & P. Belmont (2019). Post-wildfire sediment cascades: a modeling framework linking debris flow generation and network-scale sediment routing, *Earth Surface Processes and Landforms*, 44(11), 2126-2140.
- B. P. Murphy**, L. L. Yocom & P. Belmont (2018). Beyond the 1984 perspective: narrow focus on modern wildfire trends underestimates future risks to water security. *Earth's Future*, 6(11), 1-6.
- B. P. Murphy**, J. P. Johnson, N. M. Gasparini, G. S. Hancock & E. E. Small (2018). Weathering and abrasion of bedrock streambed topography. *Geology*, 46(5), 459-462.
- S. B. DeLong, A. M. Youberg, W. M. DeLong & **B. P. Murphy** (2018). Post-wildfire landscape change and erosional process from repeat terrestrial lidar in a steep headwater catchment, Chiricahua Mountain, Arizona, USA. *Geomorphology*, 300, 13-30.
- B. P. Murphy**, J. P. Johnson, N. M. Gasparini & L. S. Sklar (2016). Chemical weathering as a mechanism for the climatic control of bedrock river incision. *Nature*, 532, 223-227.

- L. A. Pangle, S. B. DeLong, et al., [including **B. P. Murphy**] (2015). The Landscape Evolution Observatory: A large-scale controllable infrastructure to study coupled Earth-surface processes. *Geomorphology*, 224, 190-203.
- J. Han, N. M. Gasparini, J. P. Johnson & **B. P. Murphy** (2014). Modeling the influence of rainfall gradients on discharge, bedrock erodibility, and river profile evolution, with application to the Big Island, Hawai'i. *JGR: Earth Surface*, 119, 1418-1440.

REPORTS & OTHER PUBLICATIONS:

- P. Wilcock, T. Atwood, P. Belmont, J. Epperly, J. Gaeta, E. Hammill, J. Jones, **B. Murphy**, J. Stout (2019). Comprehensive Study and Recommendations for Instream Flow Requirements on Sixth Water Creek and Diamond Fork River. Final project report.

RESEARCH FUNDING

CURRENT GRANTS (*pending proposals):

Dollar amount listed as: (total award/my portion)

Co-PI, Joint Fire Science Program, 2020-2022

L. L. Yocom, **B. P. Murphy**, P. Belmont, Evaluating fuel treatment efficacy in reducing risk of high-severity fire and downstream impacts (**\$445,159/\$135,930**)

Lead-PI, National Science Foundation, 2019-2021

B. P. Murphy, P. Belmont & J. A. Czuba. *Collaborative Research: Predicting post-wildfire sedimentation of reservoirs: probabilistic modeling of debris flow generation and downstream sediment routing*. (**\$480,033/\$160,000**)

Co-PI, National Council for Air & Stream Improvement, 2019-2020

P. Belmont, L. MacDonald & **B. P. Murphy**. *Analysis of discharge-suspended sediment relationships to examine effects of geologic setting and management practices*. (**\$60,000/\$30,000**)

Co-PI, Utah Public Lands Initiative, 2018-2020

P. Belmont & **B. P. Murphy**. *Assessing vulnerability of reservoirs to post-wildfire sedimentation in the Wasatch Front*. (**\$52,000/\$26,000**)

COMPLETED GRANTS:

Contributor, National Council for Air & Stream Improvement, 2017-2018

P. Belmont & L. MacDonald. *Developing a Sediment Budget for the Upper Elk River*. (**\$33,800**)

PI, National Science Foundation Graduate Research Fellowship, 2013-2016

B. P. Murphy, *The influence of climate on landscape evolution: Quantifying the effects of spatially variable precipitation on topography*. (**\$130,000**)

PI, National Center for Airborne Laser Mapping Seed Grant, 2013

B. P. Murphy, *Precipitation effects on landscape evolution: Quantifying the role of spatially variable climate in bedrock fluvial incision, Kohala Peninsula, Hawaii*. (**Awarded 40 km² of airborne lidar**)

AWARDS, HONORS & FELLOWSHIPS

FELLOWSHIPS & SCHOLARSHIPS:

National Science Foundation Graduate Research Fellowship, 2013-2016 (\$130,000)
Walter B. Sharp Memorial Scholarship, 2015 (\$10,300)
Ronald K. DeFord Field Scholarship, 2015 (\$1,950)
Fred Bullard Prestigious Graduate Fellowship, 2014 (\$10,300)
Dean's Prestigious Supplemental Award, 2014 (\$1,000)
Laura T. Barrow Graduate Fellowship, 2013 (\$9,900)
Ronald K. DeFord Field Scholarship, 2013 (\$1,300)
William & Mary Charles Center Scholarship for Domestic Research, 2009 (\$3,000)

AWARDS & HONORS:

Staff Researcher of the Year, Quinney College of Natural Resources, 2020
National Science Foundation Graduate Research Fellowship, Honorable Mention, 2012
Phi Beta Kappa, Alpha Chapter of Virginia, 2010
William & Mary Alumni Association Student Academic Prize for Geology, 2010
Sigma Gamma Epsilon, Delta Alpha Chapter, 2008
Youth Volunteer of the Year, Round Rock School District, 2006
Sportsman-Scholar Award, Friends of Central Texas Lacrosse, 2006

PRESS & INTERVIEWS

NPR's Mountain West News Bureau, Sep. 2019, *How Wildfires May Muck Up The West's Reservoirs*: <https://www.kunc.org/post/how-wildfires-may-muck-west-s-reservoirs>

Utah State Magazine (feature story), Aug. 2019, *The Aftermath of Us*:
<https://utahstatemagazine.usu.edu/environment/the-aftermath-of-us/>

UnDisciplined on Utah Public Radio, Dec. 2018, *The Evolutionary Anatomist And The Geomorphologist*: <https://www.upr.org/post/undisciplined-evolutionary-anatomist-and-geomorphologist>

NPR's Mountain West News Bureau, Nov. 2018, *Language Around West's 'Unprecedented' Wildfires Often Lacks Context, Study Says*: <http://www.kunc.org/post/language-around-west-s-unprecedented-wildfires-often-lacks-context-study-says>

Utah Public Radio, Nov. 2018, *More Smaller Wildfires May Increase Water Resources In The West, Study Says*: <http://www.upr.org/post/more-smaller-wildfires-may-increase-water-resources-west-study-says>

Sacramento Bee (& other McClatchy nationally distributed newspapers), Oct. 2018, *Think modern wildfires are bad? Fires once burned up to 36 times more of the West, study says*:
<https://www.sacbee.com/latest-news/article220810830.html>

Environmental Monitor, Apr. 2016, *Chemical Weathering of Bedrock River Erosion Linked To Precipitation*: <https://www.fondriest.com/news/chemical-weathering-bedrock-river-erosion-linked-precipitation.htm>

TEACHING EXPERIENCE

GEOG 1000: Physical Geography (enrollment: 148) **Fall 2018**
Utah State University, Principle coordinator

GEOG 1005: Physical Geography Lab (enrollment: 8) **Fall 2018**

Utah State University, Co-field instructor

WATS 3600: Geomorphology **Fall 2018**

Utah State University, Guest Lecturer

WATS 3700: Fundamentals of Watershed Science (enrollment: 65) **Spring 2017**

Utah State University, Co-coordinator

Climate Adaptation Science Graduate Seminar **Spring 2017**

Utah State University, Guest Lecturer

Earth Surface Processes **Fall 2014**

The College of William & Mary, Teaching Assistant

Earth's Environmental Systems: Physical Geography **Fall 2014**

The College of William & Mary, Guest Lecturer

Freshman Seminar: Geology **Fall 2014**

The College of William & Mary, Guest Lecturer

Landscape Process & Form **Fall 2013**

The University of Texas at Austin, Teaching Assistant

Whitewater Kayaking I **2009 - 2010**

The College of William & Mary, Teaching Assistant

Geology Tutor **2009 - 2010**

Sigma Gamma Epsilon - Founded and ran honors society tutoring program

Outdoor Trip Leader & Climbing Instructor **2008 - 2010**

William & Mary Outdoor Recreation Program & Pathways Program

MENTORING

CURRENT GRADUATE STUDENTS:

Sara Wall, *Utah State*, MS started Oct. 2019, Post-wildfire sediment dynamics and impacts on water supply reservoirs

SERVICE

Session Convener:

AGU Fall Meeting 2019

Hydrology: Wildfire Effects on Water Resources, Landscapes, and Ecosystems

Conveners: Nina Oakley, Brendan Murphy, Alicia Kinoshita, Kevin Bladon, Ryan

Niemeyer, Francis Rengers, Luke McGuire (50 abstracts: 2 oral + 1 poster session)

Student Advising, *Utah State*, 2016 - present

Research advising, training in coding, and professional mentorship for 2 PhD students, 4 MS students and several undergraduates in Dr. Patrick Belmont's lab, as well as teaching undergraduate courses, both while he was on sabbatical and ongoing. Additionally, I have advised one PhD and 4 MS students in other labs at Utah State.

Undergraduate Teaching Fellow (UTF) Program, *Utah State*, Aug. 2018 – Dec. 2018

Mentor for the Undergraduate Teaching Fellows (UTF) program, which pairs faculty/staff instructors with undergraduate students who assist in classroom management and teaching tasks. The program affords teaching and leadership opportunities for

undergraduate fellows and facilitates a learner-centered classroom experience for students enrolled in the course.

GeoFORCE Graduate Mentor, *University of Texas*, 2015-2016

Provided out of the classroom mentorship for UT undergraduates who were formally members of GeoFORCE – a K-12 outreach program designed to increase the number and diversity of students pursuing STEM degrees from rural and inner city Texas.

K-12 Outreach, *Kohala Institute, Hawai'i*, 2012-2013

Worked with programs coordinator, Kerry Balaam, to develop educational programming, materials, and field activities for her outreach with Hawaiian K-12 school groups that regularly visit the private land where I worked during my dissertation fieldwork.

Field Supervisor, *University of Texas*, 2011-2016

Mentored, taught basic field methods, directed daily activities, and provided instruction on the use of field equipment for summer field assistants ranging from college freshman to new graduate students as part of my dissertation field research.

Undergraduate Geologic Society, *University of Texas*, 2014-2016

Graduate co-coordinator for the Undergraduate Geologic Society, organizing monthly graduate student research talks for the undergraduate geology students.

Public Outreach & Mentorship, *Biosphere2*, 2010-2011

Led educational tours for public and K-12 school groups, as well as designed science exhibits for the Landscape Evolution Observatory. Provided in-the-field education and training, as well as organized field and lab activities, for fellow technicians, undergraduate interns, and REU students in the establishment and maintenance of erosional monitoring projects across southern Arizona.

PEER-REVIEWER FOR:

Geology
Earth's Future
Geophysical Research Letters (GRL)
Earth Surface Processes & Landforms (ESPL)
Geochemistry, Geophysics, Geosystems (G³)

PRESENTATIONS

INVITED PRESENTATIONS:

B. P. Murphy, P. Belmont, P. Budy, J. Czuba & T. Walsworth, Post-wildfire sediment dynamics and fish population response to habitat disturbance. American Fisheries Society & The Wildlife Society 2019 Joint Annual Conference, Abstract 38797, Oct. 2019.

B. P. Murphy, P. Belmont & J. A. Czuba, Post-wildfire sediment cascades: watershed-scale dynamics and the vulnerability of reservoirs. The Geologic Society of America, 2019 Annual Meeting, Abstract 338078, Sept. 2019.

B. P. Murphy, *Fire & Water: Climate driven mechanisms of landscape change*, SUNY Fredonia, Fredonia, NY, 2018.

B. P. Murphy, *Feedbacks among chemical weathering, rock strength, and erosion in bedrock rivers*, Graduate Student Speaker Series, Undergraduate Geological Society at the University of Texas, Austin, TX, 2016.

- B. P. Murphy**, *Precipitation and the erosion of bedrock rivers*, Austin Gem and Mineral Society Speaker Series, Austin, TX, 2015.
- B. P. Murphy**, *Chemical weathering as a mechanism for climatic control of bedrock river incision*, Geology Department Seminar, The College of William & Mary, Williamsburg, VA, 2014.
- B. P. Murphy**, *Chemical weathering, rock mechanics and the geomorphic response across an extreme precipitation gradient*, San Francisco State University, San Francisco, CA, 2014.

ORAL PRESENTATIONS:

- B. P. Murphy**, L. L. Yocom & P. Belmont, Beyond the 1984 perspective: narrow focus on modern wildfire trends underestimates future risks to water security. American Geophysical Union, Fall Meeting 2018, Abstract H21F-07, Dec. 2018.
- B. P. Murphy**, J. Johnson, N. Gasparini & L. Sklar, Modeling the feedbacks among chemical weathering, rock strength, and abrasional wear in bedrock rivers. American Geophysical Union, Fall Meeting 2016, Abstract EP32A-06, Dec. 2016.
- B. P. Murphy**, J. Johnson, N. Gasparini, G. Hancock, & E. Small, Reach-scale evidence for feedbacks among chemical weathering, rock strength, and erosion in bedrock rivers across Kohala Peninsula, Hawai'i. American Geophysical Union, Fall Meeting 2015, Abstract EP52A-07, Dec. 2015.
- B. P. Murphy**, J. Johnson, N. Gasparini, & L. Sklar, Climatic controls on mechanical rock strength and channel incision due to bedrock weathering. American Geophysical Union, Fall Meeting 2013, Abstract EP52A-04, Dec. 2013.
- B. P. Murphy**, J. Johnson, & N. Gasparini, Climate-dependent sediment production: numerical modeling and field observations of variable grain size distributions from heterogeneous hillslope weathering of fractured basalt flows, Kohala Peninsula, Hawaii. American Geophysical Union, Fall Meeting 2012, Abstract EP43E-06, Dec. 2012.

POSTERS, CO-AUTHORED, & OTHER PRESENTATIONS:

- B. P. Murphy**, T. E. Walsworth*, P. Budy, M. M. Conner, and P. Belmont. DyHDER: a spatio-temporally dynamic stream population modeling framework. Advances in Population Ecology of Stream Salmonids Symposium V. Granada, Spain. Oral. May 2019.
- N. Gillard, P. Belmont & **B. P. Murphy**, Effects of post-wildfire changes in hydrology and sediment transport on fish habitat across western United States: American Geophysical Union, Fall Meeting 2018, Abstract H23L-2116, Dec. 2018.
- B. P. Murphy**, J. A. Czuba, P. Belmont, P. Budy, & C. Finch, Fish and fire: Post-wildfire sediment dynamics and implications for the viability of trout populations: American Geophysical Union, Fall Meeting 2017, Abstract EP33B-1936, Dec. 2017.
- B. P. Murphy**, C. Finch, P. Belmont, & P. Budy, Fish & Fire, spatially explicit, stage-structured trout population viability model, CSDMS Annual Meeting: Modeling Coupled Earth and Human Systems - The Dynamic Duo, Boulder, Colorado, May 2017.
- B. P. Murphy**, J. P. L. Johnson, N. M. Gasparini, & L. S. Sklar, Climate-dependent chemical weathering as a control on bedrock river incision. Feedbacks Among Climate, Erosion & Tectonics (FACET) Workshop, Taipei, Taiwan, May 2015.
- M. T. Cunningham, M. S. Sparacino, **B. P. Murphy**, & G. S. Hancock, Variable erodibility in bedrock-floored channels produced by differential weathering. The Geologic Society of America, 2012 Annual Meeting, Abstract 210474, Nov. 2012.

- B. P. Murphy**, & S. DeLong, High-resolution topographic change detection of an active earthflow using airborne and terrestrial lidar, Mill Gulch, California. American Geophysical Union, Fall Meeting 2011, Abstract EP41A-0584, Dec. 2011.
- S. DeLong, W. Henderson, **B. P. Murphy**, & I. Yokelson, Quantifying Landscape Evolution from Terrestrial lidar and Environmental Process Monitoring. American Geophysical Union, Fall Meeting 2011, Abstract EP33E-02, Dec. 2011.
- S. B. DeLong, **B. P. Murphy**, W. M. Henderson, I. N. Yokelson, & M. D. Ferre, Storms, floods and fire: Changing dryland landscapes during the North American monsoon. The Geological Society of America, 2011 Annual Meeting, Abstract 197351, Oct. 2011.
- B. P. Murphy**, G. S. Hancock, & E. E. Small, Spatially variable erodibility in bedrock channels produced by weathering. American Geophysical Union, Fall Meeting 2009, Abstract EP21C-0615, Dec. 2009.
- G. S. Hancock, E. E. Small, & **B. P. Murphy**, The influence of weathering on erosion and cross-channel geometry in bedrock channels. American Geophysical Union, Fall Meeting 2009, Abstract EP21C-0614, Dec. 2009.

FIELD EXPERIENCE

Postdoctoral Research, 2016 – present

- Alaska – based out of the Toolik Field Station on the North Slope, assisted in the collection and sampling of Arctic fish as part of a long-term ecological monitoring and research program focused on the effects of climate warming
- Utah – supervised graduate and undergraduate students in the mapping of debris flow deposits, collection of drone aerial imagery, and the sampling and grain size analysis for debris flow, in-stream, and overbank floodplain deposition following a wildfire in southern Utah.
- California – met with redwood timber companies and evaluated potential field sites as part of the establishment of a new research project investigating the impacts of legacy and contemporary logging practices on erosion and sediment budgets in coastal rivers of northern California

Graduate Research, 2011 – 2016

- Hawai‘i – dissertation fieldwork involving *in situ* rock mechanics, bedrock coring, grain size characterization, topographic surveying, environmental monitoring, and RFID particle tracking across Kohala Peninsula on the Big Island; directed work activities, including teaching equipment use and field methods, for field assistants ranging from college freshman to graduate students
- Mexico – repeat terrestrial lidar surveys, topographic surveying, SfM drone flights, and environmental monitoring as part of an ongoing and long-term monitoring project of river restoration in San Bernardino Valley
- Arizona – repeat terrestrial lidar surveys and long-term environmental monitoring of a small watershed in actively eroding badlands along Roosevelt Lake; additionally trained other UT graduate students on terrestrial lidar scanning
- Idaho – terrestrial lidar surveys of Reynolds Creek Experimental Watershed and RFID particle tracking as part of Graduate Research Assistantship

Utah – characterizing grain sizes in numerous ephemeral streams in the Henry Mountains as part of Graduate Research Assistantship

Texas –site evaluation for a potential erosional monitoring project in Bastrop State Park after the 2011 wildfires

New Zealand –site evaluations for a potential project evaluating the role of climate on large landslides (>1 km³) across the rainfall gradient of the Southern Alps

Field Technician, 2010 – 2011

Arizona – repeat terrestrial lidar surveying for projects monitoring erosion in active and perturbed landscapes including badlands, arroyos, post-wildfire catchments and restoration projects; managed a team of technicians

California – terrestrial lidar survey of a large, active earthflow along the San Andreas Fault and comparison with airborne lidar surveys in order to constrain decadal sediment contribution to river network of Mill Gulch

Mexico – repeat terrestrial lidar surveys, topographic surveying, and environmental monitoring as part of an ongoing and long-term monitoring project of river restoration in San Bernardino Valley

Undergraduate Research, 2009

Colorado, Utah & Virginia – measured rock mechanical properties, collected rock geochemistry samples, and surveyed channels for undergraduate honors thesis

Regional Field Geology Courses

Colorado Plateau (Structural Geology), 2008

California (Geomorphology), 2009

Fennoscandia (Economic Geology), 2014

TECHNICAL SKILLS

SOFTWARE & COMPUTING:

MATLAB, Python, R, ArcGIS, ArcPad, Adobe Photoshop & Illustrator, Golden Surfer, TerraScan, Leica Cyclone, and JMP for geospatial and statistical data analysis, construction of mathematical and numerical models, geospatial analysis, comparison of terrestrial and airborne lidar datasets, and topographic change detection analysis.

FIELDWORK:

Repeat topographic surveying – includes Leica C10 ground-based lidar scanner, Leica RTK-GPS, Trimble GeoXT with paired laser rangefinder, and Trimble total station. RFID particle tracking using "smart rocks" developed by Dr. Joel Johnson. The installation and operation of environmental sensor networks collecting climate, soil and stream flow data (Onset, Campbell, etc.). Measurements of *in situ* compressive rock strength using Schmidt hammer. Bedrock sampling using Pomeroy portable coring drill.

LABORATORY:

Uniaxial, unconfined compressive strength and indirect tensile strength properties using ELE Versa-Loader. ED-XRF elemental analysis using Bruker handheld Tracer series spectrometer.

PROFESSIONAL MEMBERSHIP

American Geophysical Union
Geological Society of America
American Fisheries Society