

SARA GRAN MITCHELL

Curriculum Vitae

Department of Biology
PO Box B
College of the Holy Cross
1 College St.
Worcester, MA 01610

EDUCATION

Ph.D., 2006, Department of Earth and Space Sciences, University of Washington

M.Sc., 2000, Department of Geology, University of Vermont

B.A., 1996, Department of Geology, *magna cum laude*, Carleton College

RESEARCH AND TEACHING INTERESTS

I am a broadly-trained geomorphologist with expertise in geographic information systems (GIS) analysis, numerical modeling, fluvial field work, and geochemical and isotopic dating methods. My research currently has two directions. The first is using GIS to analyze the evolution and controls on landscape development, particularly the effects of glaciers and climate on the topography of mountain ranges. The second is using field and laboratory methods to analyze the morphology, sediment transport, and microplastics content of local rivers, with an emphasis on human impacts.

My teaching interests include geomorphology, introductory geology, geohazards, hydrology, and paleoclimatology.

EXPERIENCE

2013-present: Associate Professor, Department of Biology, College of the Holy Cross

2015-2018: Director of Environmental Studies program, College of the Holy Cross

2006 - 2013: Assistant Professor, Department of Biology, College of the Holy Cross

2003-2004: Visiting Instructor, Geology Department, Carleton College

TEACHING

COURSES TAUGHT

Department of Biology, College of the Holy Cross, Worcester, MA 10610

Geohazards (GEOS 120)
Environmental Geology (GEOS 140)
Introduction to Geology with lab (GEOS 150)
Geomorphology with lab (GEOS 210)
Watershed Hydrology with lab (GEOS 270)
Paleoclimatology (GEOS 310)
Independent Research (GEOS 401)
College Honors (GEOS 407, 408)
Directed Reading (GEOS 407)

Department of Geology, Carleton College, Northfield, MN 55057

Geomorphology (GEOL 210), Fall 2003
Introduction to Geology (GEOL 110), Spring 2004

UNDERGRADUATE RESEARCH ADVISING

College Honors research projects, College of the Holy Cross

- 2016-2017: Xinyi Zeng (ENVS/GEOS 2017). “The ArcGIS-based analysis of the presence and distribution of ice-filled cirques.”
- 2015-2016: Benjamin Ritter (ENVS 2016). “The Sagavanirktok River: Geomorphological responses to amplified arctic warming.”
- *Second reader* 2017-2018: Cara Donovan (MATH 2018). “A Dynamical Systems Approach to Climate Modeling.”

Independent research projects (BIOL 401, ENVS 401, GEOS 401), College of the Holy Cross

- Fall 2021: Charlie Green-McCallum (ENVS/Geo 2022) and Livia Graham (Biology/ENVS/Geo 2022). “Microplastics in the Blackstone River Watershed, Worcester and Millbury, Massachusetts.”
- Spring 2021: Kate O’Donnell (Biology/ENVS/Geo 2021). “The impact of road salt application on the salinity and the suspended sediment concentration of the Middle River, Worcester, MA.”
- Fall 2020: Alexandra Nazzaro (CIS/Earth and Environmental Science 2021). “Impact of beaver dams on stream temperature in the Knife River Watershed, Minnesota, USA.”
- Fall 2014: Nicholas Bradley (ENVS/GEOS 2015). “Suspended sediment during storm events in the Blackstone River, Millbury, MA.”
- Fall 2011: Elizabeth Humphries (ENVS 2012). “Latitudinal variation in glacial cirque altitudes.” Elizabeth won the College of the Holy Cross Crompton Gold Medal award for her paper for this project.
- Fall 2010: Katherine Ginsbach (ENVS 2011). “Sediment and particulate organic matter in Bigelow Brook and Beaver Brook.”
- Fall 2009 and Spring 2010: Renee Harkins (ENVS, 2010). “A paired watershed analysis of suspended sediment in Harvard Forest and Worcester, Massachusetts.”

- Spring 2008: Neil Shea (BIOL, 2009). “Bedload sediment transport in Beaver Brook, Worcester, MA.”
- Fall 2007: Vanessa Dagley (BIOL, 2008). “Grain size analysis of channel sediments in Beaver Brook, Worcester MA.”

Undergraduate summer research fellowships, College of the Holy Cross

- Summer 2016: Xinyi Zeng (ENVS/GEOS 2017) “The ArcGIS-based analysis of the presence and distribution of ice-filled cirques.”
- Summer 2015: Hannah Yeates (BIOL/ENVS 2016) “Locating the source of suspended sediment in the upper Blackstone watershed, Worcester MA.”
- Summer 2014: Nickolas Bradley (ENVS/GEOS 2015) “Topographic analysis of talus slopes in the Sierra Nevada, California USA.”
- Summer 2011: Elizabeth Humphries (ENVS 2012). “Latitudinal variation in glacial cirque altitudes.”
- Summer 2009: Renee Harkins (ENVS, 2010). “Grain size characteristics & potential mobility of road traction sand in Worcester, Massachusetts.”
- Summer 2008: Neil Shea (BIOL, 2009). “GIS investigation of glacial erosion processes in Glacier National Park, Montana.”

PROFESSIONAL DEVELOPMENT IN TEACHING

- 3rd Annual Earth Educator’s Rendezvous, run by SERC (July 2017)
- Teaching Environmental Geology Workshop, sponsored by SERC (June 2-6, 2012)
- Science Education Research Center (SERC) Early Career Faculty Workshop, June 2007.
- Teaching workshop for new faculty, December 2003, Perlman Center for Learning and Teaching, Carleton College.
- Teaching workshop for graduate teaching assistants, 2000. University of Washington Center for Instructional Development and Research.

AWARDS AND HONORS

- *Howard A. Coombs Fellowship for Teaching Excellence*: 2005. Teaching award given by the UW ESS department to one graduate teaching assistant a year, based on teaching evaluations, professor recommendations, and student letters.
- *Outstanding Graduate Student Paper Award*: 2005, Geological Society of America conference, North-Central section.
- *Joseph A. Vance Graduate Student Fellowship*: 2004, UW, Department of ESS
- *UW NASA Space Grant Fellowship*: 2000
- *National Science Foundation Graduate Research Fellowship*: 1998-2002
- *Sigma Xi* (nominated by Carleton College, 1996)

PROFESSIONAL SOCIETIES

- American Geophysical Union (AGU), Geological Society of America (GSA), Quaternary Geology and Geomorphology Section, National Association for Geoscience Teachers (NAGT)

FUNDING

FUNDED PROPOSALS

- Hewlett Mellon Discretionary Fund award for 1 day ENVIS faculty retreat, 2018 (\$2900).
- Hewlett Mellon Discretionary Fund award for 1.5 day ENVIS faculty retreat, 2017 (\$5082).
- Batchelor Faculty Summer Research Fellowship, College of the Holy Cross, 2016 (\$3500).
- Travel awards (funded by Dean's office and Center for Teaching) to attend geology conferences and teaching workshops, 2006-present.
- Robert L. Ardizzone Junior Faculty Summer Fellowship (\$3500 summer salary), 2012.
- 3M Foundation Grant (\$7,500 for summer salary and equipment for curriculum development involving the Blackstone River Watershed), 2008.
- Batchelor Faculty Summer Research Fellowship, College of the Holy Cross, 2007 (\$3500).
- University of Vermont SUGR/FAME grant, for chemical analyses of M.S. thesis samples (\$5,000), 1998.
- National Science Foundation Graduate Research Fellowship, 1998-2002.

PUBLICATIONS (*Undergraduate co-author)

PEER-REVIEWED PUBLICATIONS

- Mitchell, S.G.** and *Humphries, E.E., 2015. Glacial cirques and the relationship between equilibrium line altitudes and mountain range height: Forum Reply. *Geology*, v. 43 no. 7, p. e368-e369.
- Mitchell, S.G.** and *Humphries, E.E., 2015. Glacial cirques and the relationship between equilibrium line altitudes and mountain range height. *Geology*, v. 43, p. 35-38.
- Kelly, M.H., Anders, A.M., and **Mitchell, S.G.**, 2014. Influence of bedding dip on glacially-eroded steps, Uinta Mountains, USA. *Geografiska Annaler, Series A: Physical Geography*, v. 96, no. 2, p. 147-159.
- Mitchell, S.G.** and Ober, K.A., 2013. Evolution of *Scaphinotus petersi* (Coleoptera: Carabidae) and the role of climate and geography in the Arizona Sky Islands, USA. *Quaternary Research*, v. 79, is. 2, pg. 274-283.
- Anders, A.M., **Mitchell, S.G.**, and Tomkin, J.H. 2010. Cirques, peaks, and precipitation patterns in the Swiss Alps: Connections between climate, glacial erosion, and topography. *Geology*, v. 38, p. 239-242.
- Mitchell, S.G.**, Montgomery, D.R., and Greenberg, H.M., 2009. Erosional unloading, hillslope geometry, and the height of the Cascade Range, Washington USA. *Earth Surface Processes and Landforms*, v. 34, p. 1108-1120.
- Mitchell, S.G.** and Montgomery, D.R., 2006b. Polygenetic topography of the Cascade Range, Washington State, USA, *American Journal of Science*, v. 306, p. 736-768.
- Mitchell, S.G.** and Montgomery, D.R., 2006a. Influence of a glacial buzzsaw on the height and morphology of the Cascade Range in central Washington State, USA, *Quaternary Research*, vol. 65, p. 96-107.
- Mitchell, S.G.** and Reiners, P.W., 2003. Influence of wildfires on apatite and zircon (U-Th)/He ages, *Geology*, vol. 31, no. 12, p. 1025-1028.

- Reiners, P.W., T.A. Ehlers, **S.G. Mitchell**, D.R. Montgomery, 2003. Coupled spatial variations in precipitation and long-term erosion rates across the Washington Cascades, *Nature*, v. 426, p. 645-647.
- Reiners, P.W., T.A. Ehlers, J.I. Garver, **S.G. Mitchell**, D.R. Montgomery, J.A. Vance, and S. Nicolescu, 2002. Late Miocene exhumation and uplift of the Washington Cascade Range, *Geology*, v. 30, no. 9, p. 767-770.
- Mitchell, S.G.**, A. Matmon, P. R. Bierman, Y. Enzel, and M. Caffee, D. Rizzo, 2001. Displacement history of the Nahef East fault, northern Israel, using cosmogenic ^{36}Cl , *Journal of Geophysical Research*, v. 106, no. B3, p. 4247-4264.
- Gran, S.E.**, K. K. Nichols and P. R. Bierman, 1999. Teaching winter geohydrology in Vermont using frozen lakes and snowy mountains. *Journal of Geoscience Education*, v. 47, no. 5, p. 420-437.

SELECTED ABSTRACTS

- *Nazzaro, A., Mitchell, S., Behar, H., Burgeson, E., Dumke, J., Dymond S., Gran, K., and Teasley, R., 2021. Impact of beaver dams on stream temperature in the Knife River Watershed, Minnesota USA. *Geological Society of America Abstracts with Programs*. Vol. 53, No. 3. doi: 10.1130/abs/2021NC-362695
- *Zeng, X. and Mitchell, S.G., 2016. Preliminary GIS-based analysis of the presence and distribution of ice-filled cirques. *Geological Society of America Abstracts with Programs*. Vol. 48, No. 7. doi: 10.1130/abs/2016AM-285647
- *Yeates, H.K. and Mitchell, S.G., 2016. Locating the source of suspended sediment in the upper Blackstone River watershed, Worcester, MA. *Geological Society of America Abstracts with Programs*, v. 48, no. 2, doi: 10.1130/abs/2016NE-272312.
- *Bradley, N., and Mitchell, S.G., 2015. Changes in suspended sediment concentrations in the urbanized Blackstone River watershed during rainfall events, Millbury, Massachusetts. *Geological Society of America Abstracts with Programs*, v. 47, no. 3, p. 58.
- Mitchell, S.G. and *Humphries, E.E., 2013. Global trends in glacial cirque floor altitudes and their relationships with climate, equilibrium line altitudes, and mountain range heights. *Eos Transactions, AGU*, v. 94, Fall Meeting Supplement.
- Mitchell, S.G. and Ober, K.A., 2012. Role of climate and topography in the evolution of *Scaphinotus petersi* in the Sky Islands of Coronado National Forest, Arizona. *Geological Society of America Abstracts with Programs*, v. 44, no. 7, p. 92.
- Mitchell, S.G. and Sobczak, W.V., 2012. "Urban stream syndrome" in the headwaters of the Blackstone River. *Geological Society of America, Abstracts with Programs*, v. 44, no. 2, p. 107.
- *Humphries, E.E. and Mitchell, S.G., 2011. Latitudinal variation in glacial cirque altitudes. *Geological Society of America, Abstracts with Programs*, v. 43, no. 5, p. 474.
- Mitchell, S.G. and Kelley, J.A., 2011. Mars Rocks! Using laser-induced breakdown spectroscopy (LIBS) in an introductory geology course. *Geological Society of America, Abstracts with Programs*, v. 43, no. 5, p. 134.
- Mitchell, S.G. and *Harkins, R.H., 2010. Paired watershed investigation of suspended sediment and particulate organic carbon in central Massachusetts: Implications for storm runoff and export of organic carbon. *Geological Society of America, Abstracts with Programs*, v. 42, no. 7.
- *Harkins, R.H. and Mitchell, S.G., 2010. Dirty Water: A paired watershed study of the impact of urbanization on suspended sediment concentrations in central Massachusetts. Harvard Forest Symposium Abstracts.

- *Harkins, R.H and Mitchell, S.G., 2010. Dirty Water: A paired watershed study of the impact of urbanization on suspended sediment concentrations in central Massachusetts. 2nd Annual Northeast Undergraduate Research and Development Symposium (NURDS).
- *Harkins, R.H and Mitchell, S.G., 2009. Grain size characteristics and potential mobility of road traction sand in Worcester, Massachusetts. *Geological Society of America, Abstracts with Programs*, v. 41, no. 7, p. 673.
- Mitchell, S.G. and Riihimaki, C.A., 2009. Goals and challenges of establishing a successful geoscience curriculum in a biology department. *Geological Society of America, Abstracts with Programs*, v. 41, no. 7, p. 537.
- *Shea, N.S. and Mitchell, S.G., 2009. No glacial buzzsaw at Glacier National Park, Montana USA. *Geological Society of America, Abstracts with Programs*, v. 41, no. 3, p. 25.
- Tomkin, J.H., Mitchell, S.G., Anders, A.M., *Reynout, S., 2008. Spatial gradients of precipitation and erosion in the Swiss Alps: Direct evidence and mechanistic explanation for the glacial buzzsaw. *Eos Transactions, AGU*, v. 89, Fall Meeting Supplement.
- Mitchell, S.G. and *Dagley, V., 2008. Sediment transport in a cobble- and boulder-bed urban headwater channel, preliminary results from Worcester, MA. *Geological Society of America, Abstracts with Programs*, v. 40, no. 2, p. 58.

INVITED TALKS

- Worcester State University, Earth Sciences Department seminar, October 20, 2014.
- University of Illinois Urbana-Champaign, Department of Geology Seminar, “How the formation of glacial cirques might control mountain height,” January 30, 2014.
- Lafayette College, Department of Geology seminar series, “Mountains vs. Glaciers: The role of climate and erosion in limiting the height of mountain ranges,” March 15, 2013
- Holy Cross Faculty Scholarship Lunch Series, “Mountains vs. Glaciers: The role of climate and ice in limiting the height of mountain ranges,” Nov. 15, 2012
- Harvard Forest Long Term Ecological Research Site speaker series, October 2010
- Middlebury College, Department of Geology seminar, January 2010
- University of Minnesota-Duluth, Geomorphology guest lecture, November 2008
- Boston College, Department of Geology and Geophysics seminar series, September 2007

SERVICE

Biology Department

- Coordinator for Geosciences minor, including advising students, promoting the program, developing the curriculum. 2014-present
- Search committee member for tenure-track position in ecology, Fall 2021
- Search committee chair for visiting position in geosciences, Spring 2020.
- Search committee member for tenure-track position in vertebrate organismal biology, Fall 2019.
- Biology Department collections committee 2009-present.
- Chaired search for a Consortium for Faculty Diversity post-doc in geosciences, Spring 2017.
- Organized Schaeffer Family Biology Department seminar series, Spring 2015.
- Successfully proposed new minor in geosciences to be offered starting in Fall 2014.
- Designed new geoscience classroom, Swords 210, 2013-2014.

- Chaired department Assessment Committee, 2012-2013.
- Hosted Dr. David Montgomery (University of Washington, Department of Earth and Space Sciences) for a well-attended evening seminar on soil erosion and society (“Dirt: The Erosion of Civilizations”). February 2012.
- Search committee chair for tenure-track faculty position in marine organismal biology, Fall 2011.

Environmental Studies

- Environmental Studies Executive Committee 2018-2019, 2021-2022.
- Director of ENVIS program, 2015-2018.
- Coordinated the ENVIS program’s first External Review, Spring 2018.
- Co-organized ENVIS panel on the Papal Encyclical, Sept. 2015.

College service

- Curriculum Committee, 2011-2013, 2021-2023.
- Committee on Tenure and Promotion, 2017-2019.
- Ad-hoc Faculty Governance Committee, 2015-2016. Proposal for governance changes approved by the Faculty Assembly April, 2016.
- Committee on Faculty Affairs, Fall 2009-Fall 2010, 2012-2013, Spring 2015.
- Cantor Art Gallery Advisory Board, 2014-2016.
- Ad-hoc committee to develop criteria for “Independent Multidisciplinary Programs,” 2012-2013.
- Co-organizer of the Holy Cross 16th and 18th Annual Undergraduate Summer Research Symposia, 2009 and 2011.

Professional service

- NSF proposal review panelist and ad-hoc reviewer (multiple programs and years).
- Quaternary Geology and Geomorphology division of the Geological Society of America’s Diversity Equity and Inclusion *ad hoc* committee, 2020-2021.
- Manuscript reviewer for *Geomorphology*, *Geology*, *Quaternary Research*, *GSA Bulletin*, and *The Journal of Geophysical Research—Earth Surface*. 2006-present.
- Reviewed student research proposals for the Howard Award, given by the Geomorphology and Quaternary division of the GSA, 2016 and 2008.
- Geological Society of America Quaternary Geology and Geomorphology Division advisory panel, 2012-2014.
- External review committee member for the Environmental Studies program at Connecticut College, March 2017.
- Editorial Expert for Chapter 2 of the *Shortbook of Geomorphology*, a new Geomorphology textbook authored by David R. Montgomery (University of Washington) and Paul R. Bierman (University of Vermont), 2010-2013.
- Organized the 5th Annual William Morris Davis Lecture, February 2012

Community service

- Guest “rock and glacier expert” for a Seattle Montessori elementary school class, November 2020.
- Guest Reader for Read Across America Day for 3rd grade class at Vernon Hill Elementary School, Worcester, March 2019.
- Guest presentations on geosciences to preschool and elementary students at the Worcester JCC, 2012 – 2016 and Midland Street Elementary School in Worcester, 2015, 2017, 2019.
- Guest lectures for the Improving Teacher Quality program at Holy Cross, 2010 and 2012.
- Guest speaker for the Worcester Arts Magnet School’s “Science Literacy Day,” April 2010.