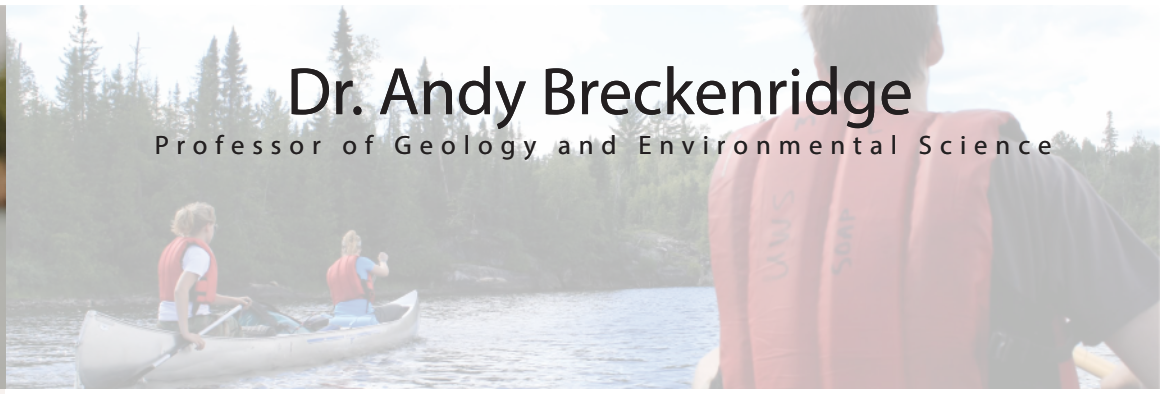

Dr. Andy Breckenridge

Professor of Geology and Environmental Science

ABOUT ME

I was raised within a family of educators and veterans who value public education and the potential for education to transform lives. I am passionate about the science underlying the natural world, and enjoy sharing this fascination. I am inspired by my students, most of whom lead lives less-privileged than my own. Understanding their struggles, and knowing that I can play a small role in helping them realize their dreams, is a fulfilling life endeavor.

EDUCATION

Ph.D. Geology
University of Minnesota (2006)
Lake Superior's Varve Stratigraphy: a record of regional ice margin dynamics and Lake Agassiz overflow
Advisor: Dr. Tom Johnson

M.S. Geology
University of Minnesota (1999)
Using Paleolimnological Methods to Document Maya Landscape Alteration
Advisor: Dr. Kerry Kelts

B.S. Geology (with distinction)
Purdue University (1994)

TEACHING

TEACHING PHILOSOPHY

I was turned to geology as a child on church outings to collect fossils along Indiana roadcuts. Finding remains of organisms that once thrived on coral reefs, next to a rural highway, stoked an enduring fascination for geology. Too many children once held captive by the flutter of a butterfly or the splatter of raindrops, become jaded with the natural world as an adult; the amazing becomes mundane. The natural world, particularly the history of the Earth and the connectedness of its systems, is infinitely more fantastic than the delights that amaze children, but require a modest foundation in geology to appreciate. Much of this foundation is relevant to our daily lives, whether it's learning where we get our drinking water, or understanding how our actions affect global climate. Basic geologic instruction helps build responsible citizens, but I also strive to rekindle an amazement with the natural world within my classroom. All scientific disciplines are to some extent concerned with reawakening the human spirit by revealing the extraordinary in the ordinary, but I find that the field of geology is better suited than many other disciplines to accomplish these ends.

WORK EXPERIENCE

University of Wisconsin-Superior (a small, regional public university within the UW-system)

Professor | 2018-present Associate Professor | 2014-2017 Assistant Professor | 2010-2014	Originally hired to help run a geology minor, which was eliminated by university-wide prioritization. I spearheaded the creation of an Environmental Science major that I now coordinate. The program has rapidly grown to include 50 students. 24-contact hour load.

Mercyhurst College (a Catholic, liberal arts college in Erie, PA)

Assistant Professor | 2005-2010	I helped re-invigorate a small geology program run by two faculty. Around 50% of the graduates completed advanced degrees. I left to return to the Upper Midwest.

COURSES TAUGHT

People and the Environment | 2021	Social science class for Env. Sci majors; taught as a sabbatical substitute
Environmental Science | 2019-present	General education class, on-campus & online
Dynamic Earth | 2005-present	General education lab class taught on-campus; includes field trips
Earth Science for Teachers | 2017-2020	Course for elementary education majors; online & on-campus
Geomorphology | 2008-present	300-level class, covers soils and landforms
Climatology | 2017-present	300-level class for Earth Science and/or geology majors
Historical Geology | 2015-2017	General education lab class about Earth history and fossils
Geology of MN and WI | 2011-2018	Field trip intensive course on our regional geology
Western Field Experience | 2007-2018	Geology field trip to locales in the western US (UT, WY, CO, NM, CA, AZ, SD)
Natural History of the BWCAW | 2011	First-year seminar that included a Boundary Waters canoe trip
Lake Superior Rocks | 2012	First-year seminar with a weeklong geology field trip around Lake Superior
Fundamentals of GIS | 2006-2010, 2012	Introductory GIS class using ArcGIS
Oceanography | 2013-2016	200-level class for Earth Science minors and Elementary Education majors
Sedimentology | 2005-2010	Core class for Geology majors, focused on clastic Paleozoic sequences of PA
Stratigraphy | 2006-2010	Core geology class, but popular with Mercyhurst archaeology majors
Petrology | 2008	Core class for Geology majors
Geologic Field Methods | 2006-2010	Field-based class required for Geology majors
Structural Geology | 2007	Core geology class with a field trip to the Appalachians
Applied GIS | 2007- 2009	Graduate-level course required for Forensics Science students

SCHOLARSHIP

RESEARCH PROFILE

I study lake sediment in order to understand past climates and environments. My skill sets and research interests cross into the fields of physics, biology, chemistry, geography, and archaeology. I specialize in understanding the large glacial lakes that rimmed former ice sheets. Through the study of these lakes, we can learn how the land is rebounding from the weight of the ice sheets, how former ice sheets responded to global warming, and assess linkages between freshwater runoff and ocean circulation. This information not only helps us understand the modern Earth system, but also helps predict future responses to global warming such as sea level rise, the decay of our ice sheets, and the impact of ocean freshening in the North Atlantic and Arctic Oceans.

PEER-REVIEWED PUBLICATIONS (Google Scholar Link)

in prep. Breckenridge, A., Birschbach, P., Lowell, T., Wattrus, N. Glacial varve teleconnections between the Laurentide and Fennoscandian Ice Sheets during the Younger Dryas. To be submitted to the Journal of Quaternary Science

2021. Gauthier, M., Breckenridge, A., Hodder, T. Deglacial patterns for the MIS 2 Laurentide Ice Sheet in Manitoba, Canada. Boreas, https://doi.org/10.1111/bor.12571

2021. Lewis, M., Breckenridge, A., Teller, J.T. Reconstruction of isostatically-adjusted paleo-strandlines along the southern margin of the Laurentide Ice Sheet. Canadian Journal of Earth Sciences, https://doi.org/10.1139/cjes-2021-0005

2021. Keenan, B., Imfeld, A., Johnston, J., Breckenridge, A., Gelinas, Y., Douglas, P., Molecular evidence for human population change associate with climate events in the Maya lowlands. Quaternary Science Reviews 258

2021. Breckenridge, A., Lowell, T., Peteet, D., Wattrus, N., Moretto, M., Norris, N. A new glacial varve chronology from along the southern Laurentide Ice Sheer that spans the Younger Dryas-Holocene boundary. Geology

2020. Colman, S.M., Breckenridge, A., Zoet, L.K., Wattrus, N.J., and T.C. Johnson. Moraines and late-glacial stratigraphy in central Lake Superior. Quaternary Research, https;// doi.org/1.1017/qua.2020.36

2020. Wittkop, C., Bartley, J.K., Krueger, R., Bouvier, A., Georg, R.B., Knaeble, A.R., St. Clair, K., Piper, C., and Breckenridge, A., Influence of provenance and transport process on the geochemistry and radiogenic (Hf, Nd, and Sr) isotopic composition of Pleistocene glacial sediments, Minnesota, USA Chemical Geology 532

2020. Dalton et al., An updated radiocarbon-based ice margin chronology for the last deglaciation of the North American Ice Sheet Complex. Quaternary Science Reviews 234, 106, 106223. https://doi.org/10.1016/j.quascirev.2020.106223

2018. Douglas, P.M., Pagani, M., Eglington, T., Brenner, M., Curtis, J., Breckenridge, A., Johnston, K., 2018. A long-term decrease in the persistence of soil carbon caused by ancient Maya land use. Nature Geoscience, 11, 645-649.

2018. Leydet, D., Carlson, A., Teller, J., Breckenridge, A., Barth, A., Ulman, D., Sinclair, G., Milne, G., Caffee, M., Eastward routing of glacial Lake Agassiz runoff caused the Younger Dryas cold event . Geology, 46(2), 155-158.

2015. Breckenridge, A., The Tintah-Campbell gap and implications for glacial Lake Agassiz drainage during the Younger Dryas. Quaternary Science Reviews, 117, 124-134.

2014. Douglas, P., Pagani, Eglinton, T., Brenner, M, Hodell, D., Curtis, J., Breckenridge, A. Pre-aged plant waxes in tropical lake sediments and their influence on compound specific stable isotope records. Geochemica et Cosmochimica Acta 141, 346-364.

2013. Breckenridge, A. An analysis of late glacial lake levels within the western Lake Superior basin based on digital elevation models. Quaternary Research 80(3), 383-395.

2013. Stroup, J.S., Lowell, T.C., Breckenridge, A. Stratigraphy from the demise of a large glacial lake: the Lake Ojibway, Ontario, Quebec example. Journal of Paleolimnology.

2012. Breckenridge, A., Lowell, T.C., Evans, G. A review and analysis of varve thickness records from glacial Lake Ojibway (Ontario and Quebec, Canada). Quaternary International 260, 43-54.

2012. Breckenridge, A., Lowell, T., Fisher, T., and S. Yu. A Late Minong transgression in the Lake Superior basin as documented by sediments from Fenton Lake, Ontario. Journal of Paleolimnology 47(3), 313-326.

2012. Fisher, T.G., Weyer, K.A., Boudreau, A.M., Martin-Hayden, J.M., Krantz, D.F., and Breckenridge, A. Constraining Holocene-aged lake levels in the Michigan Basin. Journal of Paleolimnology 47 (3), 373-390.

2011. Hobbs, H. and Breckenridge, A. Ice advances and retreats, inlets and outlets, sediments and strandlines of the western Lake Superior basin. In J.D. Miller, G.J. Hudak, C. Wittkop, and P.I. McLaughlin (eds), Archean to the Anthropocene: Field Guides to the Geology of the Mid-Continent of North America, GSA Field Guide 24, 299-315.

2010. Yu, S., Colman, S., Lowell, T.V., Milne, G.A., Fisher, T.G., Breckenridge, A., Boyd, M., and Teller, J.T. Freshwater outburst from Lake Superior as a trigger for the cold event 9300 years ago. Science 328, 1262-1266.

2009. Breckenridge, A., and Johnson, T.C. Paleohydrology of the Great Lakes during retreat of the Laurentide Ice Sheet: insights from Lake Superior's oxygen isotope record. Quaternary Research 71(3), 397-408.

2007. Breckenridge, A. Lake Superior varve stratigraphy and implications for eastern Lake Agassiz outflow from 10,700 to 9,040 cal ybp (9.5-8.1 14C ka). Palaeogeography, Palaeoclimatology, Palaeoecology 246, 45-61.

2004. Breckenridge, A., Johnson, T.C., Beske-Diehl, S., and J.S. Mothersill. The timing of regional late glacial events and post-glacial sedimentation rates from Lake Superior. Quaternary Science Reviews 23(23-24), 2355-2367.

2002. Johnston, K. J., Breckenridge, A. J., and B. C. Hansen. Paleoecological Evidence of an Early Postclassic Occupation in the Southwestern Maya Lowlands: Laguna Las Pozas, Guatemala. Latin American Antiquity 12(2), 149-166.

NON PEER-REVIEWED REPORTS

2020. Wagner, K., McDonald, J., Breckenridge., A. Sediments, Landforms, and Proglacial Lake History in Western St. Louis County, Minnesota, Field Trip for NC-GSA in Duluth, 45 pgs (cancelled)

2016. Breckenridge, A., Kremmin, T., Dott, E., Mossberger, I. Duluth harbor geologic history boat cruise – Pleistocene to Anthropocene. Institute for Lake Superior Geology Field Trip Guidebook v. 62: 160-187.

2015. Breckenridge, A., Myrbo, A., Sediment core recovery from Lake Kabetogama (Voyageurs National Park), National Park service report VOYA-2015-SCI-0001

2015. Breckenridge, A. Analysis of Post-Flood Landslides within the Nemadji/Red River Clay Plain. Report to Wisconsin Coastal Management, # NA12NOS4190091

2014. Breckenridge, A., Wattrus, N., Testing the potential to constrain Lake Superior lake levels before and after the Nipissing highstand from the study of sediments from former embayments of Lake Superior (Pine, Second, and Conway Lakes). Report to the Huron Mountain Wildlife Foundation.

EXTERNAL GRANTS

2016-present. Breckenridge, A., Lowell, T., and Wattrus, N. 8/2016-8/2020. Collaborative Research: Testing Laurentide Ice Sheet Climate Response and Younger Dryas Trigger with Glacial Varves, P2C2, National Science Foundation, $146,746 (total amount: $465,819)

2017. Wickert, A., Breckenridge, A, #Callaghan, K.," Testing connections between abrupt climate change and glacial Lake Agassiz routing by identifying unmapped beach ridges in central Saskatchewan". TanDEM-X digital elevation model data access.

2017. Gran, K., Jennings, C., et al. "Landslide Hazards and Impacts on Minnesota's Natural Environment" Legislative-Citizen Commission on Minnesota Resources grant, $6674 (total amount: $672,408)

2014. Huron Mountain Wildlife Foundation, "Testing the potential to constrain Lake Superior lake levels before and after the Nipissing highstand from the study of sediments from former embayments of Lake Superior (Pine, Second, and Conway Lakes)", $2400

2013. Wisconsin Coastal Management Program #13.40, An assessment of the relative impact of the June 2012 flood on triggering mass wasting across the Nemadji clay plain", 7/1/2013-6/30/2014, $6,578.75

2007-2011. NSF-EAR #0642944, "Glacial Lake Ojibway Chronology to Test the 8,200-yr Cold-Event Trigger", 2007-2010, $57,431

CONFERENCE PROCEEDINGS

Over 50 conference abstracts published since 2003.

SERVICE

SERVICE PHILOSOPHY

Faculty are responsible for many of the critical university functions, particularly at the small universities at which I have worked. This work can vary from bureaucratic tasks to initiatives that have profound impacts on the student experience. I have done both, but whether frivolous, routine, or groundbreaking, much of this service is thankless. Above all else, I strive to be a colleague that I would value. I volunteer for my fair share or more, find tasks for which my skills are well-suited, listen to others, treat everyone with respect, and contribute only when my words or efforts might have an impact.

DEPARTMENT SERVICE

Natural Science Department Associate Chair (2021-present)
Environmental Sciences program coordinator (2018-present)
Department secretary (2018-2021)
Earth Science program coordinator (2010-2017)
Drafted changes to department bylaws concerning annual reviews (2017)
Drafted B.S. Environmental Science Authorization Proposal (2016)
Differential Tuition and Student Research Fund subcommittee (2011-2015)
Science Symposium co-organizer (2012, 2013)
Geology program webmaster, Mercyhurst (2009-2010)
Geology work study supervisor, Mercyhurst (2005-2010)
Geology curriculum assessment and planning, Mercyhurst (2006-2010)
Departmental brochure co-designer, Mercyhurst (2008)
Geology hiring committee chair, Mercyhurst (2007-2008)

UNIVERSITY SERVICE

University Studies Committee (2021-present)
Ecology Hiring Committee (2019)
Faculty Senate (2015, 2016, 2017, 2018, 2019)
Technology Committee (2017-2018)
Academic Affairs committee (2013-2016, present)
UWS Intuitional Review Board (2010-2014, 2015-2017)
Faculty Research committee, Mercyhurst (2009-2010)
Student Research committee (chair), Mercyhurst (2008-2010)
Computing Instructional Technology committee, Mercyhurst (2006-2008)

Students of Science Adviser (2014-2015)
Hive Night (2011, 2014)
Science Night participant (2011-2016)
Faculty Adviser: UWS Men's Club Hockey (2011-2012)
Faculty Adviser: UWS Men's Curling Club (2011-2012)
Faculty Adviser: Mercyhurst Outdoor Adventurer Club (2006-2010)
Mercyhurst Major Day (2006-2010)
Roundtable discussion member, James Kunstler (2006)
Strategic Vision planning committee, Mercyhurst (2007)

COMMUNITY SERVICE

Minnesota Geological Society presentation "Formation of the Great Lakes" (2020)
Developed service learning partnerships with teachers at elementary schools in Superior, WI to create a collaborative learning environment between UWS students & elementary students. UWS students created rock boxes and exchanged pen pal letters with local students to learn and teach students about the rock cycle and rock identification (2015-2019)
Manoomin Camp field trip guest leader – (NASA/NSF funded camps for kids) (2011, 2017)
Science workshop for Educators at the Duluth Aquarium on rocks (2016)
Minnesota Earth Science Teacher Association Conference Presented (Minneapolis), "The Nature of the Scientific Process" (2016)
Minnesota Earth Science Teacher Association Conference Presented (Duluth), "Teaching Climate Change" (2015)
Geologist in the Park field trip leader – Taylors Falls, MN (2014)
UWS spring camporee, Geology Merit badge (counselor (2012)
Duluth Children's Museum, National Fossil Day presenter (2010)
Erie Poverty Initiative, GIS specialist (2009)

PROFESSIONAL SERVICE

AMQUA officer (elected), (2016-2018)
NSF review panelist
American Quaternary Association organizing committee member (2012)
Regional GSA session co-chair (2010, 2015, 2019, 2020)
Invited contributor to TMI - Tool for Microscope Identification, an online resource for identification of lacustrine and marine sedimentary components using microscopy (www.laccore.umn.edu)
Manuscript Referee: Geology, Sedimentology, Earth Surface Dynamics, GSA Bulletin, Limnology and Oceanography, National Environment Research Council (UK), Journal of Paleolimnology, Aquatic Ecosystems and Health, Ontario Archaeology, Quaternary Research, Journal of Great Lakes Research, Canadian Journal of Earth Sciences, GSA special publications, National Science Foundation, GFF, Quaternary Science Reviews, Journal of Quaternary Science

FORMER AND CURRENT COLLABORATORS

Chad Wittkop, Minnesota State Mankato
Dorothy Peteet, Lamont Doherty
Carrie Jennings, Freshwater Initiative Institute
Andrew Wickert, University of Minnesota
Karen Gran, University of Minnesota Duluth
Harry Jol, UW-Eau Claire
Tim Fisher, Toledo University
Michael Lewis, emeritus Dalhousie University
Thomas Lowell, University of Cincinnati
Justin Stroup, Tufts University
Nigel Wattrus, University of Minnesota Duluth
Elmo Rawling, Wisconsin Geological and Natural History Survey
Steve Colman, emeritus University of Minnesota Duluth
Peter Douglas, McGill University
Benjamin Keenan, McGill University
Jim Teller, emeritus University of Manitoba
John Johnston, Wilfred Laurier University
Sue Beske-Diehl, Michigan Tech University
Erik Brown, University of Minnesota Duluth
David Scott, Dalhousie University
Harvey Thorleifson, Minnesota Geological Survey
Kerry Kelts (deceased), University of Minnesota
Barbara Hanson, the Pollen Connection
Howard Hobbs, Minnesota Geological Survey
Tom Johnson, emeritus University of Minnesota Duluth
Kevin Johnston, formerly at Ohio State University
Fred Longstaffe, Western Ontario University
Gaywood Matile, Manitoba Geological Survey
Amy Myrbo, University of Minnesota
Michelle Gauthier, Manitoba Geological Survey