Samuel E. Muñoz

Assistant Professor
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I. EDUCATION

2010-2015	Ph.D. Physical Geography (Minor: Quaternary Science) University of Wisconsin-Madison (Madison, Wisconsin) Advisor: John (Jack) Williams
2008-2010	M.Sc., Geography University of Ottawa (Ottawa, Canada) Advisor: Konrad Gajewski
2004-2008	B.Sc. (Honors), Physical Geography (Minor: Geomatics) Carleton University (Ottawa, Canada) Advisor: Michael Pisaric

II. PROFESSIONAL APPOINTMENTS

2017-present	Assistant Professor Department of Marine & Environmental Sciences Department of Civil & Environmental Engineering Northeastern University
2017-present	Adjunct Scientist Department of Geology & Geophysics Woods Hole Oceanographic Institution
2015-2017	Weston Howland Jr. Postdoctoral Scholar Department of Geology & Geophysics Woods Hole Oceanographic Institution Sponsors: Jeffrey P. Donnelly & Liviu Giosan

III. PUBLICATIONS

In Review/In Revision

[21] **Munoz SE**, Giosan L, Blusztajn J, Rankin C, Stinchcomb G (In Review) Radiogenic fingerprinting reveals anthropogenic and buffering controls on sediment dynamics of the Mississippi River system. *Geology*.

[20] White AJ, Stevens LR, Lorenzi V, **Munoz SE**, Schroeder (In Review) Fecal stanols show simultaneous flooding and seasonal precipitation change correlate with Cahokia's population decline. *Proceedings of the National Academy of Sciences*.

[19] Giosan L, Orsi WD, Coolen M, Dunlea AG, Thirumalai K, **Munoz SE**, Clift PD, Donnelly JP, Galy V, Fuller DQ (In Review) Neoglacial climate anomalies and the Harappan metamorphosis. *Climate of the Past*.

[18] Wilhelm B, Ballesteros Cánovas JA, MaDonald N, Toonen WHJ, Baker V, Barriendos M, Benito G, Brauer A, Corella JP, Denniston R, Glaser R, Ionita M, Kahle M, Liu T, Luetscher M, Macklin M, Mudelsee M, **Munoz SE**, Schulte L, St. George S, Stoffel M, Wetter O. (In Review) Interpreting historical, botanical, and geological evidence to aid preparations for future floods. *WIREs Interdisciplinary Reviews*.

[17] Walsh JR, Corman JR, **Munoz SE** (In Revision) Coupled long-term limnological data and sedimentary records reveal novel control on water quality in a eutrophic lake. *Limnology & Oceanography*.

[16] Brugam R, **Munoz SE**. (Accepted) A 1,600-year record of human impacts on a floodplain lake in the Mississippi River valley. *Journal of Paleolimnology*.

Published

[15] White AJ, Stevens LR, Lorenzi V, **Munoz SE**, Lipo CP, Schroeder S (2018) A test of fecal stanols as indicators of population change. *Journal of Archaeological Science* 93: 129-134.

[14] **Munoz SE**, Giosan L, Therrell MD, Remo JWF, Shen Z, Sullivan RM, Wiman C, O'Donnell M, Donnelly JP. (2018) Climate variability, river engineering, and unprecedented flood risk along the Mississippi River. *Nature,* doi: 10.1038/nature26145.

[13] **Munoz SE**, Dee SG. (2017) El Niño increases the risk of lower Mississippi River flooding. *Scientific Reports*, doi:10.1038/s41598-017-01919-6s.

[12] Walsh JR, **Munoz SE**, Vander Zanden MJ. (2016) Outbreak of an undetected invasive species triggered by a climate anomaly. *Ecosphere*, doi:10.1002/ecs2.1628.

[11] Beach T, Johnson KM, McCusker Hill M, **Munoz SE**, Peros M (2016) The view from the "Anthropocene": New perspectives in human-induced environmental change. *Anthropocene*, doi:10.1016/j.ancene.2016.09.004.

[10] Radeloff VC, Williams JW, Bateman BL, Burke KD, Carter SK, Childress ES, Cromwell KJ, Gratton C, Hasley AO, Kraemer BM, Latzka AW, Marin-Spiotta E, Meine CD, **Munoz SE**, Neeson TM, Pidgeon AM, Rissman AR, Rivera RJ, Szymanski LM, Usinowicz J (2015). The rise of novelty in ecosystems. *Ecological Applications* 25(8): 2051-2068.

[9] **Munoz SE,** Gruley KE, Fike DA, Schroeder S, Williams JW (2015) Reply to Baires et al.: Shifts in Mississippi River flood remain a contributing factor to Cahokia's emergence and decline. *Proceedings of the National Academy of Sciences*, doi: 10.1073/pnas.1509404112.

[8] **Munoz SE**, Gruley KE, Massie A, Fike DA, Schroeder S, Williams JW (2015). Cahokia's emergence and decline coincided with shifts of flood frequency on the Mississippi River. *Proceedings of the National Academy of Sciences* 112(20): 6319-6324.

[7] **Munoz SE**, Mladenoff DJ, Schroeder S, Williams JW (2014). Defining the spatial patterns of land use associated with the indigenous societies of eastern North America. *Journal of Biogeography*, 41(12): 2195-2210.

[6] **Munoz SE**, Schroeder S, Fike DA, Williams JW (2014). A record of sustained prehistoric and historic land use from the Cahokia region, Illinois, USA. *Geology* 42(6): 499-502.

[5] **Munoz SE** (2013) Review of 'Surviving Sudden Environmental Change (J. Cooper & P. Sheets, eds.)'. *Heritage & Society* 6(2): 203-204.

[4] Gajewski K, **Munoz SE**, Peros M, Viau A, Morlan R, Betts M (2011) The Canadian Archaeological Radiocarbon Database (CARD): archaeological radiocarbon dates in North America and their paleoenvironmental context. *Radiocarbon* 53(2): 371-394.

[3] **Munoz SE**, Gajewski K, Peros M (2010) Synchronous environmental and cultural change in the prehistory of the northeastern United States. *Proceedings of the National Academy of Sciences*, doi: 10.1073/pnas.1005764107.

[2] **Munoz SE**, Gajewski K (2010) Distinguishing prehistoric human influence on late Holocene forests in southern Ontario, Canda. *The Holocene* 20(6): 967-981.

[1] Peros M, **Munoz SE**, Gajewski K, Viau AE (2010) Prehistoric demography of North America inferred from radiocarbon data. *Journal of Archaeological Science* 37: 656-664.

IV. GRANTS, SCHOLARSHIPS & AWARDS

Grants

2019-2022 National Science Foundation (NSF) Hydrologic Sciences (HS), "Collaborative Research: Re-evaluating precipitation extremes and flood hazard in the wake of Hurricane Harvey", (PI): $259,140 ($199,936 to Northeastern)

2018-2021 National Science Foundation (NSF) Paleo-Perspectives on Climate Change (P2C2), "Collaborative Research: Extreme floods on the lower Mississippi River in the context of late Holocene climatic variability", (PI): $586,529 ($292,959 to Northeastern).

2018-2020 Global Resilience Institute (GRI) of Northeastern University, "Coastal flooding prediction and mitigation: Integrating high-fidelity computer models with field observations", (Co-PI): $100,000.

2016-2018 Ocean and Climate Change Institute (OCCI), "Fingerprinting Mississippi River sediment flux to the Gulf of Mexico", (PI): $67, 342.

2014 Competitive Innovation Incentive Fund (CIIF) of the IGERT: $625

2013-2015 National Science Foundation (NSF), Doctoral Dissertation Research Improvement Grant, BCS-1333070: $14,509

2013 Geological Society of America (GSA), Graduate Student Research Grant: $1,980

2011-2012 National Geographic Society (NGS), Young Explorer's Grant, YEG-9008-11: $2,844

2011 University of Wisconsin-Madison, Trewartha Research Award: $600

2011 National Lacustrine Core Facility (LacCore), Graduate Student Travel Grant: $1,000

2011-2014 University of Wisconsin-Madison, Trewartha Travel Award: $2,000

Scholarships & Fellowships

2015-2017 Woods Hole Oceanographic Institution (WHOI), Postdoctoral Scholarship: $93,000

2013-2015 Novel Ecosystems NSF-IGERT Traineeship: $60,000

2011 American Association of Geographers (AAG), Paleoenvironmental Change Specialty Group Graduate Student Award: $500

2010-2012 National Science and Engineering Research Council (Canada), Canada Graduate Scholarship [declined to study abroad]: $70,000

2010-2012 National Science and Engineering Research Council (Canada), Post-Graduate Scholarship: $42,000

2010 University of Ottawa, Dean's Scholarship: $1,500

2008-2010 Ontario Ministry of Training, Colleges, and Universities, Ontario Graduate Scholarship [declined for NSERC-PGS]: $30,000

2008-2010 National Science and Engineering Research Council (Canada), Post-Graduate Scholarship: $35,000

2006 University of Toronto, Center for Global Change Studies Scholarship: $5,000

2006-2007 Carleton University, Chalmers Jack Mackenzie/Hyman Soloway Scholarship: $2,000

Honors & Awards

2015 Geological Society of America North-Central Section, Best Graduate Student Oral Presentation of NC-GSA meeting

2013 Geological Society of America, Quaternary Geology & Geomorphology Division, John Montagne Award

2012 University of Wisconsin-Madison, Honored Instructor Award

2012 University of Wisconsin-Madison, Early Excellence in Teaching Award [nominated]

2011 University of Wisconsin-Madison, Dept. of Geography, Trewartha Award for best student paper (*Munoz et al., 2010*)

V. TEACHING & MENTORING

Teaching

2018 Instructor of record, Northeastern University, Dynamic Earth (ENVR 1200/1201)

2016 Guest Lecturer, MIT/WHOI Joint Program, Geological Oceanography (12.710)

2014 Instructor, Quaternary period in the Great Lakes Summer Short-Course, Kenosha Public Museum, Kenosha, WI

2011-2012 Teaching Assistant and Laboratory Instructor, University of Wisconsin–Madison, Department of Geography, Course: Geography 120 (Global Physical Environments)

2011-2014 Guest Lecturer, University of Wisconsin–Madison, Geography 120 (Global Physical Environments), Geography 338 (Environmental Biogeography) and Geography 331 (Climatic Environments of the Past)

2011-2014 Reader & Grader, University of Wisconsin–Madison, Geography 331 (Climatic Environments of the Past)

2009-2010 Teaching Assistant and Laboratory Instructor, University of Ottawa, Department of Geography, courses: Geography 1301 (The Physical Environment), Geography 2304 (Climatology)

Mentoring

2018 Daniel Litchmore (B.S. Northeastern U.), Senior Capstone Project, "Industrial contaminant mobilization in the Hudson River valley"

2015 Michelle O'Donnell (B.S. Northeastern U.), WHOI/Northeastern Undergraduate Internship Program, "A sedimentary record of overbank floods along the lower Mississippi River, 1722–1950"

2014 Ashtin Massie (B.S. UW–Madison), Directed Study "Preliminary particle size analyses from Horseshoe Lake, Illinois: A late Holocene record of flooding from the central Mississippi River"

2014 Christopher Morgan (B.S., UW–Madison), Research Experience for Undergraduates "Cryptotephra: An alternative to radiocarbon dating"

2014 Brigitta Rongstad (B.S., UW–Madison), Senior Undergraduate Thesis (co-advised w/ J. Williams) "A methodology for cryptotephra detection in a lacustrine sediment core from Spicer Lake, Indiana"

2013 Mason Martinez (Madison East High School), High School Science Research Internship Program, "Recording patterns of prehistoric land use using the loss-on-ignition method in lake sediment cores from the Cahokia region, Illinois, USA"

VI. PRESENTATIONS

Invited

2017 Northeastern University, Dept. Marine & Environmental Sciences, Boston MA
2017 Rowan University, Dept. of Geology, Glassboro NJ
2017 University of North Carolina at Charlotte, Dept. Geography & Earth Science, Charlotte NC
2016 University of Colorado at Boulder, Dept. of Geological Sciences, Boulder CO
2016 Coastal Carolina University, Dept. of Marine Science, Conway SC
2016 Geological Society of America annual meeting, Denver CO [keynote]
2016 Woods Hole Oceanographic Institution, Dept. of Geology & Geophysics, Woods Hole MA
2015 Brown University, Dept. of Earth, Environmental, and Planetary Sciences, Providence RI
2015 Worcester State University, Dept. of Earth, Environmental and Physics, Worcester MA
2015 University of Alabama, Dept. of Geography, Tuscaloosa AL
2015 Geological Society of American annual meeting, Baltimore MD [keynote]
2015 University of Minnesota, Department of Earth Sciences, Minneapolis MN
2015 Chicago Archaeological Society, Evansville IL
2014 University of Wisconsin–Platteville, Dept. of Geography, Platteville WI
2014 Illinois State Museum, Springfield IL
2014 Cahokia Mounds State Historic Site & Interpretive Center, Collinsville IL
2011 Geological Society of America annual meeting, Minneapolis MN
2010 University of Ottawa, Department of Geography, Ottawa ON

Contributed Talks

2018 American Quaternary Association, Ottawa, Canada
2017 American Geophysical Union annual meeting, New Orleans LA
2017 American Association of Geographers annual meeting, Boston MA
2016 American Geophysical Union annual meeting, San Francisco CA
2016 Geological Society of America annual meeting, Denver CO
2016 European Geosciences Union general assembly, Vienna, Austria
2015 Association of American Geographers annual meeting, Chicago, IL
2014 American Geophysical Union fall annual meeting, San Francisco, CA

2014 Midwestern Archaeology Conference annual meeting, Champaign, IL
2014 Society for American Archaeology annual meeting, Austin, TX
2013 Geological Society of America annual meeting, Denver, CO.
2011 American Association of Geographers annual meeting, Seattle, WA

Posters

2016 PAGES cross community workshop on past flood variability, Grenoble, France.
2014 American Quaternary Association biannual meeting, Seattle, WA
2012 Midwest Geobiology Conference, St. Louis, MO
2012 American Quaternary Association biannual meeting, Duluth, MN
2009 Past Global Changes Open Science meeting, Corvallis, OR

VII. MEDIA COVERAGE

05/21/2018 National Public Radio – "Levees make Mississippi River floods worse, but we keep building them" Rebecca Hersher
04/06/2018 Science Friday – "Unequal levees could leave some towns to drown" National Public Radio
04/04/2018 Associated Press – "Study: flood control engineering likely has worsened floods" Janet McConnaughey
04/04/2018 *Nature*News – "Mississippi River flooding worse now than any time in the past 500 years" Emma Marris
04/04/2018 ScienceNews – "Efforts to contain Mississippi floods may have made them worse" Carolyn Gramling
04/04/2018 Washington Post – "Scientists say the Mississippi is flooding more than it has in 500 years – and we caused it" Chris Mooney
02/01/2016 Smithsonian Channel (US)/Channel 5 (UK) – "Ancient Mysteries: America's Hidden Pyramid City" Blink Films.
06/19/2015 Wisconsin Public Television – "Wednesday Nite @ the lab", Wisconsin Alumni Research Foundation
05/19/2015 National Geographic News – "New evidence may solve mystery of America's huge ancient city" Kristin Romey
05/04/2015 *Nature* News – "Floods might have doomed prehistoric American city" Emma Marris
05/04/2015 St. Louis Public Radio – "New insights into the curious disappearance of the Cahokia Mounds builders" Durrie Bouscaren
04/25/2014 LiveScience – "City's Mysertious Fate Explained by Flood" Becky Oskin
12/03/2013 MadGeogNews – "Williams, Munoz mentor junior from Madison East" Karen Tuerk
10/31/2013 National Geographic News – "Did a Mega-Flood Doom Ancient American City of Cahokia?" Glenn Hodges
01/16/2011 Columbus Dispatch – "Climate had a role in changing cultures" Bradley T. Lepper
01/05/2011 Lake Effect, Milwaukee Public Radio – "Climate & cultural changes occurred at same time" Stephanie Lecci
12/07/2010 USA Today – "Climate shifts change paleo-indian cultures" Elizabeth Weise.
12/06/2010 Boston Globe – "Climate, culture linked in prehistoric Northeast" Carolyn Y. Johnson
12/04/2010 InsideScience.org – "Indigenous peoples adapt to climate change" Joel Shurkin
12/03/2010 *Science*Now – "Did climate change drive prehistoric culture change?" Michael Balter

VIII. SYNERGISTICS

Symposia Organized	Paleofloods and related fluvial processes during the Late Quaternary: reconstructions and causes, Geological Society of America annual meeting, Denver CO, co-chaired with Matthew Therrell and Lisa Davis (2016)
	Paleo/Climate Seminar Organizer, Woods Hole Oceanographic Institution (2015-2017)
	New Perspectives in Paleoenvironmental Change and Geoarchaeology (5 sessions), *Association of American Geographers annual meeting*, Chicago, IL, co-chaired with Matthew Peros and Timothy Beach (2015).
Committee Service	IGERT Trainee Affairs (2014-2015); Departmental Seminar Committee (2013-2014); IGERT Social Committee (2013-2015); Graduate Student Peer Mentor Program (2012-2013); Geography Graduate Student Symposium (2011-2012)
Outreach	Panelist, WHOI screening of "Before the Flood" (2016); Speaker, WHOI Summer Student Lecture Series (2016); Featured scientist, "Ancient Mysteries" on Channel5 (UK)/Smithsonian Channel (US) (2016); Speaker, "Wednesday Nite @ the lab" on Wisconsin Public Television (2015); Environmental Education & Outreach Workshop Organizer, Aldo Leopold Nature Center (2014); Saturday Science volunteer, Wisconsin Institutes for Discovery (2014-2015); Mentor for the High School Science Research Internship Program (2013-2014); Water Sentinels program scientist volunteer, Sierra Club Four Lakes Group (2013-2014)
Journal Editor	*Geomorphology* (Historic and Palaeofloods Special Issue, Guest Co-Editor)
Manuscript Reviewer	*Anthropocene*; *Archeometry; Ecological Monographs*; *Earth Science Reviews*; *Frontiers in Earth Sciences*; *Geology*; *Geomorphology*; *Global and Planetary Change*; *Holocene*; *Journal of Biogeography*; *Journal of Ecology*; *Journal of Quaternary Science*, *Palaeogeography, Palaeoclimatology, Palaeoecology*; *PLOS ONE*; *Quaternary Science Reviews*; *Scientific Reports*; *Sustainability*; *Water*
Proposal Reviewer	National Science Foundation (GSS; EAR; P2C2; GLD); National Geographic Society*;* Minnesota Sea Grant

IX. SKILLS

Software/Statistics	ArcGIS, R, Python, ENVI, HEC-RAS, NetCDF, Access, NetLogo, Adobe Illustrator
Field/Laboratory	Lake, bog, and marine sediment coring, radiometric dating (^{137}Cs, ^{210}Pb, ^{14}C) & chronology building, x-ray fluorescence (XRF) spectroscopy and radiography, stable isotopes (δ^{13}C, δ^{15}N), radiogenic isotopes (^{87}Sr/^{86}Sr, ^{144}Nd/^{143}Nd), side-scan sonar, ground-penetrating radar, palynology, charcoal analysis, particle-size analysis, loss-on-ignition, magnetic susceptibility, vegetation sampling, chemical safety
Languages	English, Spanish, French

X. SOCIETY AFFILIATIONS

American Geophysical Union, American Quaternary Association, American Association of Geographers, Geological Society of America