

Sara K McMillan, Ph.D., P.E.
Purdue University
Department of Agricultural and Biological Engineering
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EXPERTISE

Monitoring and modeling of stormwater best management practices in urban and agricultural watersheds; nutrient cycling in wetlands, streams, and floodplains; ecological success of stream and watershed restoration; greenhouse gas emissions in riparian zones

EDUCATION

2007 PhD, University of North Carolina at Chapel Hill, Department of Environmental Sciences and Engineering, Advisors: Hans Paerl and Michael Piehler.
Influence of hydrology and denitrification on nutrient dynamics in coastal headwater streams.

1998 MS, University of Iowa, Department of Civil and Environmental Engineering.
Advisor: Jerald Schnoor.
Phytoremediation of methyl tert-butyl ether (MTBE) by hybrid poplar trees.

1997 BSCE, University of Iowa, Department of Civil and Environmental Engineering.

PROFESSIONAL APPOINTMENTS

2014-present Assistant Professor, Department of Agricultural and Biological Engineering,
Purdue University

2013-2014 Assistant Professor, Department of Civil and Environmental Engineering,
University of North Carolina at Charlotte

2009-2012 Assistant Professor, Department of Engineering Technology, University of North
Carolina at Charlotte

2009-2014 Faculty Fellow and Advisory Board Member, Infrastructure, Design, Environment
and Sustainability (IDEAS) Center, University of North Carolina at Charlotte

2008-2009 Water Resources Engineer, Black & Veatch, Charlotte, NC

2003-2007 Research Assistant, Institute of Marine Sciences, UNC at Chapel Hill

2000-2002 Project Engineer, Limno-Tech, Inc. Ann Arbor, Michigan

1998-2000 Environmental Engineer, Howard R. Green Company, Cedar Rapids, Iowa

HONORS & AWARDS

- 2016 IMPACT Fellow, Purdue University
- 2016-17 Teaching for Tomorrow Fellow, Purdue University
- 2016 Frontiers of Engineering Education Symposium of the National Academy of Engineering. Invited as one of 50 emerging engineering education leaders in the United States.
- 2015 Violet B. Haas Fellowship, Purdue University
- 2010 College of Engineering Excellence in Undergraduate Teaching Award, University of North Carolina at Charlotte. Award is given to one faculty member each year in the College of Engineering in recognition for student learning and engagement.
- 2002 Board of Governors Fellowship, University of North Carolina
- 1997 Iowa Water Pollution Control Association Scholarship, University of Iowa
- 1996 Tau Beta Pi National Engineering Honor Society Initiation
- 1995 Chi Epsilon National Civil Engineering Honor Society Initiation

PUBLICATIONS (*indicates invited presentation; underline indicates student co-author)

1. Liu, Y., B.A. Engel, D.C. Flanagan, M.W. Gitau, S.K. McMillan, I. Chaubey, and S. Singh. Modeling framework for representing long-term effectiveness of best management practices in improving hydrology and water quality - development and demonstration. In review at Journal of Hydrology. submitted January 23, 2017.
2. McMillan, S.K., H.F. Wilson, C.L. Tague, D.M. Hanes, S. Inamdar, D.L. Karwan, T. Loecke, J. Morrison, S.F. Murphy, P. Vidon. Before the storm: Antecedent conditions as regulators of hydrologic and biogeochemical response to extreme climate events. In review at Biogeochemistry; submitted October 31, 2017.
3. Rivers, E.L., S.K. McMillan, and C.D. Bell. Effects of urban stormwater control measures on instream denitrification in receiving streams. In review at Freshwater Science; submitted September 27, 2017.
4. Hanrahan, B.R., J.L. Tank, M.M. Dee, M.T. Trentman, E.M. Berg, and S.K. McMillan. Restored floodplains enhance denitrification compared to naturalized floodplains in agricultural streams. In review at Biogeochemistry; submitted September 21, 2017.
5. Welsh, M., S. McMillan, and P. Vidon. 2017. Denitrification along the stream-riparian continuum in restored and unrestored agricultural streams. Journal of Environmental Quality 46(5): 1010-1019, doi:10.2134/jeq2017.01.0006.
6. McMillan, S. and G. Noe. 2017. Increasing floodplain connectivity through urban stream restoration increases nutrient and sediment retention. Ecological Engineering 108: 284-295, doi:10.1016/j.ecoleng.2017.08.006.
7. Liu, Y., B. Engel, D. Flanagan, M. Gitau, S. McMillan, and I. Chaubey. 2017. A review on effectiveness of best management practices in improving hydrology and water quality: needs and opportunities. Science of the Total Environment 601:580-593, doi:10.1016/j.scitotenv.2017.05.212.
8. Bell, C., S. McMillan, and C. Tague. 2017. A model of hydrology and water quality in stormwater control measures. Environmental Modeling and Software 95:29-47, doi:10.1016/j.envsoft.2017.05.007.
9. *Jefferson, A., A. Bhaskar, K. Hopkins, R. Fanelli, P. Avellaneda, and S. McMillan. 2017. Stormwater management network effectiveness and implications for urban watershed function: A critical review. Hydrological Processes, doi: 10.1002/hyp.11347.
10. Vidon, P., S. Marchese, M. Welsh, S. McMillan. 2016. Impact of precipitation intensity and riparian geomorphic characteristics on greenhouse gas emissions at the soil-atmosphere interface in a water-limited riparian zone. Water, Air and Soil Pollution. 227(1):1-12. DOI: 10.1007/s11270-015-2717-7.
11. Bell, C., S. McMillan, S. Clinton and A. Jefferson. 2016. Hydrological response in urban watersheds with stormwater control measures. Journal of Hydrology. 541: 1488-1500. DOI: 10.1016/j.jhydrol.2016.08.049.
12. Bell, C., S. McMillan, S. Clinton and A. Jefferson. 2016. Characterizing the effect of stormwater mitigation on nutrient export and stream concentrations. Environmental Management. DOI:10.1007/s00267-016-0801-4.
13. Vidon, P., S. Marchese, M. Welsh, S. McMillan. 2015. Short-term spatial and temporal variability in greenhouse gas fluxes in riparian zones. Environmental Monitoring and Assessment. 187(8):1-9. DOI: 10.1007/s10661-015-4717-x.

14. *Jefferson, A., C. Bell, S. Clinton and S. McMillan. 2015. Application of isotope hydrograph separation to understand urban stormwater dynamics. *Hydrological Processes, Annual Review Issue on Tracer Advances in Catchment Hydrology*. 29(25): 5290-5306. DOI: 10.1002/hyp.10680.
15. Tuttle, A. K., S.K. McMillan, A. Gardner and G. D. Jennings. 2014. Channel complexity and nitrate concentrations drive denitrification rates in urban restored and unrestored streams. *Ecological Engineering*, 73:770-777.
16. *McMillan, S. K., A. K. Tuttle, G. D. Jennings, and A. Gardner. 2014. Influence of Restoration Age and Riparian Vegetation on Reach-Scale Nutrient Retention in Restored Urban Streams. *Journal of the American Water Resources Association*, 50(3): 626-638.
17. *McMillan, S. K. and P. G. Vidon. 2014. Taking the pulse of stream restoration practices: moving towards healthier streams. *Hydrological Processes* 28:398-400.
18. McMillan, S.K., M.F. Piehler, S.P. Thompson and H. W. Paerl. 2010. Denitrification of nitrogen released from senescing algal biomass in coastal agricultural headwater streams. *Journal of Environmental Quality*, 39(1): 274-281.
19. *O'Driscoll M., S. Clinton, A. Jefferson, A. Manda and S. McMillan. 2010. Review: Urbanization effects on watershed hydrology and in-stream processes in the southern United States. *Water*, 2:605-648.
20. Ensign, S.H., S.K. McMillan, S.P. Thompson, M.F. Piehler. 2006. Nitrogen and phosphorus attenuation within the stream network of a coastal, agricultural watershed. *Journal of Environmental Quality*, 35(4):1237-1247.
21. Winnike-McMillan, S.K., Q. Zhang, L. C. Davis, L. E. Erickson and J. L. Schnoor. 2003. Phytoremediation of Methyl Tertiary-Butyl Ether. *Phytoremediation: Transformation and Control of Contaminants*. Editors: J. L. Schnoor and S. C. McCutcheon, Wiley-Interscience.
22. Hong, M. S., W. F. Farmayan, I. J. Dortch, C. Y. Chiang, S. K. McMillan and J. L. Schnoor. 2001. Phytoremediation of MTBE from a Groundwater Plume. *Environmental Science and Technology* 35(6): 1231-1239.

REPRESENTATIVE PRESENTATIONS (*invited presentation; underline student co-author)

1. *McMillan, SK, E Rivers, C Bell, R Scarlett, S Clinton, A Jefferson (2018) "Stormwater biogeochemistry in urban stream networks." Association of Environmental Engineering & Science Professors Distinguished Lecturer Conference. West Lafayette, Indiana USA.
2. *McMillan, SK (2018) "Characterizing the influence of green infrastructure on water quality of urban stream networks." Invited seminar for the Easter Water Science Seminar Series at the U.S. Geological Survey, Reston, VA.
3. Vinson, D.S., N. Allison, D. Haydin, T. Kiker, C. Starnes, E. Wickliff, S. McMillan, S.M. Clinton. (2017) "Stream chemistry and groundwater-surface water interactions in Piedmont headwater streams (Charlotte, NC) prior to whole-watershed restoration." American Geophysical Union Annual Fall Meeting, New Orleans, NA.
4. Welsh, M., S. McMillan, P. Vidon (2017). "Changes in riparian and stream hydrology and biogeochemistry following storms in an agricultural watershed". American Geophysical Union Chapman Conference on Extreme Climate Event Impacts on Aquatic Biogeochemical Cycles and Fluxes, San Juan, PR.
5. McMillan, S. C. Bell, S. Clinton, A. Jefferson (2017). "Influence of stormwater control measures on receiving stream ecosystems". American Geophysical Union Chapman Conference on Extreme Climate Event Impacts on Aquatic Biogeochemical Cycles and Fluxes. San Juan, PR.

6. *McMillan, S., V. Merwade, S. Saksena, G. Noe. (2017) “Nitrogen and phosphorus flux in restored riverine floodplains in intensively managed watersheds.” Society of Wetland Sciences Annual Meeting, San Juan, PR.
7. Ma, Z., S.K. McMillan, J. Domenech, R. Scarlett (2017) “Combining societal acceptance and biophysical drivers of conservation practices to improve water quality in multi-use landscapes.” Soil and Water Conservation Society Annual Conference, Madison, WI.
8. Alford, C., S. McMillan. (2017) “The effect of floodplain creation on soil processes in agricultural channels.” Indiana Water Resources Association Symposium, Marshall, IN.
9. Ortiz de Zarate, M.L., S. McMillan. (2017) “Nutrients dynamics in riparian zones of agricultural watershed in North Carolina”. Indiana Water Resources Association Symposium, Marshall, IN.
10. Scarlett, R., J. Domenech, Z. Ma, S. McMillan. (2017) “Assessing factors shaping residents’ adoption of water quality improvement practices across different types of landownership.” Indiana Water Resources Association Symposium, Marshall, IN.
11. Welsh, M., S. McMillan, P. Vidon. (2016). “Impact of agricultural stream restoration on riparian hydrology and biogeochemistry”. American Geophysical Union Annual Fall Meeting, San Francisco, CA.
12. Clinton, S.M., S.K. McMillan, J. Hunt, and K. Hall. (2016) “Pre-restoration monitoring of a forested urban watershed provides knowledge of how urban streams should function”. EcoStream Annual Meeting, Asheville, NC.
13. Vidon, P., S. Marchese, M. Welsh, S. McMillan. (2016). “Impact of precipitation intensity and riparian geomorphic characteristics on greenhouse gas emissions at the soil-atmosphere interface in a water-limited North Carolina riparian zone”. American Geophysical Union Joint Assembly, Montreal, QC.
14. Ortiz de Zarate, M.L., S. McMillan, M. Welsh, P. Vidon (2016). “Nutrient dynamics in riparian zones of agricultural watersheds in North Carolina”. American Ecological Engineering Society Annual Meeting, Knoxville, TN.
15. McMillan, S., M. Welsh, G. Downs, P. Vidon (2016). “Effect of stream restoration on reach scale water quality improvements”. American Society of Agricultural and Biological Engineers Annual International Meeting. Orlando, FL.
16. McMillan, S., E. Looper, C. Bell, S. Clinton, A. Jefferson. (2016). “Influence of stormwater control measures on instream denitrification rates”. American Ecological Engineering Society Meeting, Knoxville, TN.
17. Clinton, S., S. McMillan (2016) “Seasonal patterns in stream macroinvertebrates in urban watersheds with stormwater control measures”. American Ecological Engineering Society Meeting, Knoxville, TN.
18. Bell, C., S. McMillan, S. Clinton, A. Jefferson (2016). “Urban stormwater control measures effect on watershed hydrology” American Ecological Engineering Society Meeting, Knoxville, TN.
19. Bell, C., S. McMillan, S. Clinton, A. Jefferson (2016). “Hydrologic response to urban stormwater control measures”. American Society of Agricultural and Biological Engineers Annual International Meeting. Orlando, FL.
20. Welsh, M., S. McMillan, P. Vidon (2015). Environmental Drivers of Denitrification in North Carolina Streams and Riparian Zones. Society for Freshwater Science Annual Conference, Milwaukee, WI.

21. McMillan, S., P. Vidon, M. Welsh, S. Marchese. (2015). Characterization of stream restoration impacts on trade-offs in nutrient biogeochemistry. American Society of Agricultural and Biological Engineering Annual International Meeting, New Orleans, LA.
22. McMillan S., P. Vidon, S. Marchese, M. Welsh (2015). "Impact of Agricultural Stream Restoration on Riparian Hydrology and Biogeochemistry". USDA – AFRI - Renewable, Energy, Natural Resources and Environment (RENRE) Foundational Program Meeting, Greensboro, NC.
23. *McMillan, S. and G. Noe. (2015). Hydrologic connectivity increases sedimentation and nutrient transformations in the floodplains of restored urban streams. Society of Wetland Scientists Annual Meeting, Providence, RI.
24. *McMillan, S. (2015). "Watershed scale approach to water quality and quantity improvements: Perspectives from a Phase 1 community". Indiana Association for Floodplain and Stormwater Management Annual Conference. Angola, IN. *Invited, plenary speaker*.
25. Welsh, M., S. McMillan, and P. Vidon. (2015). "Differences in geomorphic structure in restored and unrestored streams influence denitrification potential." Gordon Research Conference: Catchment Science. Andover, NH.
26. Welsh, M., S. McMillan, P. Vidon (2014). "Impact of stream restoration on riparian soil and stream sediment denitrification potential in the Piedmont region of North Carolina". Water Resources Research Institute Annual Meeting, Raleigh, NC. **2nd place in student poster competition**
27. Looper, E., S. McMillan (2014). "Patterns of denitrification activity in urban streams with stormwater management structures." British Hydrological Society National Symposium 2014. Birmingham, UK
28. Looper, E., S. McMillan (2014). "Denitrifying community response to storm disturbances in an urban stream receiving discharge from a stormwater control measure". North Carolina Water Resources Research Institute Annual Meeting, Raleigh, NC. **1st Place in student poster competition**.
29. Bell, C., S. McMillan, S. Clinton, A. Jefferson (2014). "Identifying controls on stormflow, nutrient and carbon export from urban watersheds in the Southeastern U.S. with Sustainable Drainage Systems (SUDS)." British Hydrological Society National Symposium. Birmingham, UK
30. *McMillan, S., A. Jefferson (2014). "Evaluating success of urban stream restoration in an ecosystem services context". British Hydrological Society National Symposium. Birmingham, UK
31. Bell, C.D., S. McMillan, S. Clinton, A. Jefferson, C. Tague (2013). "Water and nitrogen export patterns of urban watershed with stormwater control measures." American Geophysical Union Fall Meeting, San Francisco, CA
32. Bell, C., S. McMillan, S. Clinton, A. Jefferson (2013). "Urban stream nutrient and carbon quality responses to stormwater control measures." North Carolina Water Resources Research Institute Annual Meeting, Raleigh, NC. **1st Place in student poster competition**
33. *McMillan, S., G. Noe, A. Tuttle, G. Jennings (2013). "Influence of restoration age on nutrient processing in urban streams and floodplains following restoration." American Geophysical Union Annual Meeting. San Francisco, CA
34. *McMillan, S., G. Noe, A. Tuttle (2013). "Nutrient processing and floodplain connectivity following restoration in urban streams". Society of Wetland Sciences Annual Meeting. Duluth, MN
35. Bell, C., S. McMillan, S. Clinton, A. Jefferson, C. Tague (2012). "Using watershed modeling to optimize management of urban stormwater to control nitrogen." American Ecological Engineering Society Meeting, Syracuse, NY

36. Tuttle, A. and S. McMillan (2011). "Stream Sediment Denitrification Rates in Restored and Degraded Streams with Urbanized Watersheds" 11th Annual American Ecological Engineering Society Conference, Asheville, NC
37. Gardner, A., S. McMillan, G. Jennings, F. Birgand, and A. Tuttle (2011). "Enhancing Nutrient Retention/Removal in Stream Restoration Projects." 11th Annual Meeting for the American Ecological Engineering Society, Asheville, NC
38. McMillan, S., S. Clinton, N. Garris (2010). "Linking geomorphic and biological controls on denitrification in urban streams" North American Benthological Society Meeting, Santa Fe, NM
39. Garris, N., E. Long, S. Clinton and S. McMillan (2010). "Patterns of nitrogen and phosphorus uptake across urban headwater streams with varying levels of urbanization." North American Benthological Society Meeting, Santa Fe, NM
40. *McMillan, S. (2010). "Influence of land use on nutrient dynamics in headwater streams." University of North Carolina at Charlotte Geography and Earth Sciences Seminar Series. October 15, 2010.
41. McMillan, S., S. Thompson, H. Paerl and M. Piehler (2006). "Denitrification dynamics in coastal headwater streams: Influence of DOC and nitrate." American Society of Limnology and Oceanography Aquatic Sciences Meeting, Victoria, BC
42. Winnike, S. and J. Schnoor. (2000) "Phytoremediation of methyl tert-butyl ether (MTBE) by hybrid poplar trees." American Chemical Society, San Francisco, CA

TEACHING AND ADVISING

PhD/MS level

- Ecological Engineering and Ecosystem Restoration (Purdue University)
- Stormwater Design (Purdue University)
- Restoration Engineering & Biogeochemistry (Purdue University)
- Watershed Science (UNC Charlotte)
- Ecological Engineering (UNC Charlotte)

Advanced undergraduate level

- Environmental and Water Resources Engineering Design (UNC Charlotte)
- Hydraulics and Hydrology (UNC Charlotte)
- Sustainability: Principles and Applications (UNC Charlotte)
- Water and Wastewater Systems (UNC Charlotte)

Introductory undergraduate level

- Computations in Engineering Systems (Purdue University)
- Introduction to Environmental Engineering (UNC Charlotte)
- Environmental Laboratory (UNC Charlotte)
- Computer Applications for Engineers (UNC Charlotte)

Advisor, Society of Women Engineers (UNC Charlotte, 2010-2014)

PROFESSIONAL DEVELOPMENT IN TEACHING

- Teaching for Tomorrow Program (2016-17). Mentoring and faculty learning community in which Assistant Professors are matched with highly accomplished and experienced faculty who focus discussions on teaching pedagogy, student learning and provide opportunities for observation and feedback.
- IMPACT (Instruction Matters, Purdue Academic Course Transformation) Program (Fall 2016). Weekly mentoring and in-class instruction to provide faculty with the strategies and skills to transform their courses and create a student-centered learning environment by incorporating active and collaborative learning practices.
- National Academy of Engineering (NAE) Frontiers of Engineering Education (FOEE) 2016. Dr. McMillan was nominated by Dr. Michael Ladisch (Member of the NAE and Distinguished Professor of Agricultural and Biological Engineering) as one of 50 engineering educators from across the country to participate in this symposium held in Irvine, CA. The FOEE Symposium is designed to recognize accomplishment, facilitate learning, broaden collaboration, and promote dissemination of pioneering practices in engineering education.
- Guest Instructor for 2-week, field intensive course Integrated Catchment Analysis (Summer 2016). Helmutz Center for Environmental Research, Magdeburg, Germany.
- Teaching Enhancement to Improve Student Learning (Fall 2015). Focus of the course was on learning styles, student assessment, and strategies for enhancing student engagement the learning process. Workshop was led by Dr. Kirby Barrick, Professor of Agricultural Education and Communication, University of Florida.
- Effective College Teaching, Instructed by Richard Felder and Rebecca Brent (Spring 2015). Focus of this 2-day workshop was on integrating active learning strategies into the classroom at all levels.
- Engineering Teaching Workshop, Instructed by Dr. Jerry Samples (Spring 2011). The 3-day workshop was modeled after ASCE ExCEED and focused on course organization, learning objectives and in-class presentation of material.
- Multiple workshops and seminars related to teaching and mentoring including those sponsored by ADVANCE, Center for Teaching and Learning (UNC Charlotte) and Center for Instructional Excellence (Purdue University), including learning objectives, syllabus organization, and first day engagement.

SYNERGISTIC ACTIVITIES

- Panel Reviewer for National Science Foundation (CBET, Environmental Sustainability, Coupled Human and Natural Systems); NSF-EAR-Hydrologic Sciences ad-hoc reviewer; American Association for the Advancement of Science; Illinois Water Resources Center; Maryland Sea Grant; Wisconsin Water Resources Institute, Indiana Water Resources Center
- Environmental Law Institute Mitigation Advisory Committee, Academic Representative. Dr. McMillan was recognized as a national expert in the field of stream mitigation and served in a review and advisory capacity for the development of a Stream Mitigation handbook prepared by ELI in partnership with Stream Mechanics. The overall project goal was to support the development and refinement of science-based stream mitigation programs, best engineering practices and policies.
- Organizer: "Floodplain restoration: How does the diversity of approaches influence outcome?" Society of Wetland Scientists, June 2017, San Juan, Puerto Rico. Co-editor of special issue on this topic in the journal *Wetlands*.

- Organizer: “Riparian restoration science: processes, approach and management implications in stream and wetland ecosystems.” Society of Wetland Scientists, June 2015, Providence, RI.
- Organizer: “Coupled Biogeochemical Cycles in Terrestrial and Aquatic Ecosystems”, Co-chair with Philippe Vidon, SUNY-ESF. American Geophysical Union Annual Meeting, December 2011, San Francisco, CA.
- Current Chair and Investigator, Multistate Research Coordinating Committee: Quantification of best management practice effectiveness for water quality protection at the watershed scale. USDA-NIFA Hatch Project S-1063 (2015-present) Previously served as Secretary and Vice Chair.

SOCIETY MEMBERSHIP

- American Society of Agricultural and Biological Engineering
- American Ecological Engineering Society
- American Geophysical Union
- American Water Resources Association
- Society of Wetland Scientists

STUDENT RESEARCH ADVISED

PhD	Rachel Scarlett (current), Colin Bell (2016)
MS	Alex Johnson (current), Celena Alford (current), Gavin Downs (2017), Maria Laura de Zarate (2017), Colin Bell (2013), Erin Looper (2014), Molly Welsh (2014), Alea Tuttle (2012), Alexandra Apple (2012), Brandon Blue (2012), Joshua Moore (2011)
Undergraduate	Hannah Hawrot (current), Anne Hays (current), Caitlin Nelligan (current), Evan Pesut (2017), Nicole Ng (2014), Rachael Herndon (2014), Nikki Trainham (2014), Steven Dulin (2014), Xueying Wang (2014), Trey Riley (2013), Charles Safrit (2012), Brittany Marvel (2011), Katie Aldrich (2011 NSF REU), Melinda Cronenberger (2011 NSF REU), Nicole Garris (2011), Christopher Lattimore (2011), Leah Haithcock (2010)
Visiting Scholars	Ariana Montoya Lozano (2016)