

Sarah S. Roley, Ph.D.

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Research Interests

Watershed biogeochemistry: nitrogen cycling; associative nitrogen fixation; agriculture; restoration; floodplain biogeochemistry; invasive species and ecosystem function; freshwater mussel conservation

Education

Ph.D. Biological Sciences	2013
<i>University of Notre Dame, Notre Dame, IN</i>	
M.S. Conservation Biology	2005
<i>University of Minnesota, St. Paul, MN</i>	
B.S. Biology	2003
B.A. English	2003
<i>Bemidji State University, Bemidji, MN, Magna cum laude</i>	

Professional Experience

Assistant Professor	2017-present
<i>School of the Environment, Washington State University</i>	
Post-Doctoral Research Associate	2012-2017
<i>Great Lakes Bioenergy Research Center, Michigan State University</i>	
Visiting Scholar	2011
<i>Monash University Water Studies Centre, Melbourne, Australia</i>	
NSF IGERT Fellow	2007-2012
<i>Global Linkages of Biology, the Environment, and Society, University of Notre Dame</i>	
Water Resource Technician	2006-2007
<i>Capitol Region Watershed District, St. Paul, MN</i>	
Water Quality Assistant	2005-2006
<i>Minnehaha Creek Watershed District, Deephaven, MN</i>	
Research Specialist	2005-2006
<i>University of Minnesota, St. Paul, MN</i>	
Graduate Research Assistant	2004-2005
<i>University of Minnesota, St. Paul, MN</i>	

Awards and Fellowships

- Nominee, Shaheen Award for Best Dissertation, *College of Science, U. Notre Dame* 2013
- Eco-DAS X Early Career Fellow 2012
- Best Student Oral Presentation, MWGL Chapter, *Society for Ecological Restoration* 2012
- Center for Aquatic Conservation (CAC) Fellowship, *University of Notre Dame* 2008, 2011
- Arthur J. Schmitt Fellowship, *University of Notre Dame* 2007-2011
- Nominee, Biology Student of the Year, *Bemidji State University* 2003

Grants

- National Science Foundation, DEB-Ecosystems, PI (\$483,000) with co-PIs D.H. Buckley and G. P. Robertson, "The ecological significance of nitrogen fixation in perennial grasses" 2018-2021
- Doctoral Dissertation Improvement Grant, National Science Foundation (\$14,611) 2010-2011

- North American Benthological Society Student Conservation Award (\$1,000) 2009
- North American Benthological Society President's Award (\$1,000) 2008

Publications

Peer-reviewed journal articles, in review or revision

Roley, S.S., Xue, C., Hamilton, S.K., Tiedje, J.M., and Robertson, G.P. Episodic nitrogen fixation in switchgrass (*Panicum virgatum*). *In review*.

Peer-reviewed journal articles, published and in press

16. **Roley, S.S.**, Duncan, D.S., Liang, D., Garoutte, A., Tiedje, J.M., Jackson, R.D., and Robertson, G.P. 2018. Associative nitrogen fixation (ANF) in switchgrass (*Panicum virgatum*) across a nitrogen input gradient. 2018. PLoS ONE 13(6): e0197320. doi: 10.1371/journal.pone.0197320

15. **Roley, S.S.**, Tank, J.L., Cook, P., and Grace, M.R. 2018. The influence of an invasive plant on denitrification in an urban wetland. *Freshwater Biology*. doi: 10.1111/fwb.13073

14. Sanford, G.R., Jackson, R.D., Oates, L.G., Robertson, G.P., **Roley, S.S.**, and Thelen, K.T. 2017. Bioethanol yields and quality components in seven lignocellulosic biomass crops grown in the North Central USA. *Agronomy Journal*. 109:1-12. doi:10.2134/agronj2016.08.0454.

13. Zhang, B., Penton, C.R., Xue, C., Quensen, J., **Roley, S.S.**, Guo, J., Garoutte, A., Zheng, T., and Tiedje, J.M., 2017. Depth-related analyses of soil bacterial communities under ten biofuel cropping systems. *Soil Biology and Biochemistry*. 112: 140-152. doi: 10.1016/j.soilbio.2017.04.019

12. **Roley, S.S.** and Tank, J.L. 2016. Pore water physicochemical constraints on the endangered clubshell mussel, *Pleurobema clava*. *Canadian Journal of Fisheries and Aquatic Sciences*. 73: 1712-1722. doi: 10.1139/cjfas-2015-0442.

11. **Roley, S.S.**, Tank, J.L., Tyndall, J.C., and Witter, J. 2016. How cost-effective are cover crops, wetlands, and two-stage ditches for nitrogen removal in the Mississippi River Basin? *Water Resources and Economics*. 15:43-56. doi: 10.1016/j.wre.2016.06.003

10. Mahl, U.H., Tank, J.L., **Roley, S.S.**, and Davis, R.T. 2015. Floodplains constructed via the two-stage ditch enhance N-removal capacity and reduce turbidity and dissolved P in streams. *Journal of the American Water Resources Association*. 1-18. doi: 10.1111/1752-1688.12340

9. Davis, R.T., Tank, J.L., Mahl, U.H., Winikoff, S.G., and **Roley, S.S.** 2015. The influence of floodplain construction via the two-stage ditch on water column nutrients and sediments in agricultural streams. *Journal of the American Water Resources Association*. 1-15. doi: 10.1111/1752-1688.12341

8. **Roley, S.S.**, Griffiths, J.R., Levi, P.S., Patrick, C.J., Sadro, S., and Zarnetske, J.P. 2014. Taking the pulse of the ecosystem: progress in quantifying aquatic ecosystem health. *Eco-DAS X Symposium Proceedings*. *Eco-DAS X Chapter 7*: 101-118. doi: 10.4319/ecodas.2014.978-0-9845591-4-5.xxx

7. **Roley, S.S.**, Tank, J.L., Griffiths, N.A., Hall, R.O., and Davis, R.T. 2014. The influence of floodplain restoration on whole-stream metabolism in an agricultural stream: insights from a 5-year continuous data set. *Freshwater Science*. 33: 1043-1059. doi:10.1086/677767.

6. Griffiths, N.A., Tank, J.L., Royer, T.V., **Roley, S.S.**, Rosi-Marshall, E.J., Whiles, M.R., Beaulieu, J.J., and Johnson, L.T. 2013. Agricultural land use alters the seasonality and magnitude of stream metabolism. *Limnology and Oceanography*. 58:1513-1529. doi: 10.4319/lo.2013.58.4.1513
5. **Roley, S.S.**, Tank, J.L., and Williams, M.A. 2012. Hydrologic connectivity increases denitrification in the hyporheic zone and restored floodplains of an agricultural stream. *Journal of Geophysical Research – Biogeosciences*. 117, G00N04, doi: 10.1029/2012/JG001950.
4. Griffiths, N.A., Tank, J.L., **Roley, S.S.**, and Stephen, M.L. 2012. Decomposition of maize leaves and grasses in restored agricultural streams. *Freshwater Science*. 31: 848-864. doi: 10.1899/11-095.1
3. **Roley, S.S.**, Tank, J.L., Stephen, M.L., Johnson, L.T., Beaulieu, J.J., and Witter, J.D. 2012. Floodplain restoration enhances denitrification and reach-scale nitrogen removal in an agricultural stream. *Ecological Applications* 22:281-297. doi:10.1890/11-0381.1
2. **Roley, S.S.** and R.M. Newman. 2008. Predicting Eurasian watermilfoil invasions in Minnesota. *Lake and Reservoir Management*. 24: 361-369. doi: 10.1080/07438140809354846
nominee, LaBounty Award for Best Paper, North American Lake Management Society
1. **Roley, S.S.** and R.M. Newman. 2006. The developmental performance of the milfoil weevil, *Euhrychiopsis lecontei* (Coleoptera: Curculionidae), on Eurasian, northern, and hybrid (Eurasian x northern) watermilfoils. *Environmental Entomology*. 35:121-126.

Technical reports and non-peer-reviewed articles

8. **Roley, S.S.** 2010. Natural history informing research: a review of The Freshwater Mussels of Ohio. *American Midland Naturalist* 164:348.
7. 2006 Storm Water Monitoring Report. April 2007. Capitol Region Watershed District. 150 pp.
6. Newman, R.M. **S.S. Roley** and J. A. Johnson. 2006. Continued assessment of curlyleaf pondweed turion distribution, viability, and longevity. Completion Report to the Minnesota Department of Natural Resources, Division of Ecological Services. 36 pp.
5. 2005 Storm Water Monitoring Report. May 2006. Capitol Region Watershed District. 95 pp.
4. **Roley, S.S.** and L.K. Hatch. 2006. Hydrodata Monitoring Report. Minnehaha Creek Watershed District. 120 pp.
3. Newman, R.M. and **S.S. Roley**. 2005. A preliminary assessment of curlyleaf pondweed turion distribution, viability, and longevity. Completion Report to the Minnesota Department of Natural Resources, Division of Ecological Services. 23 pp.
2. Newman, R.M., W.R. Herb and **S.S. Roley**. 2004. Assessment of factors influencing the growth and abundance of Eurasian watermilfoil and development of predictive models. Completion report to the Minnesota Department of Natural Resources, Ecological Services.
1. **Roley, S.** 2003. The distribution of macroinvertebrates in the Schoolcraft-Mississippi river-lake system. *Bemidji State University Journal of Student Research*. 19:97-103.

Presentations

Invited

13. **Roley, S.S.** Too much of a good thing: ameliorating nitrogen pollution in agricultural watersheds. 29 March 2017. Washington State University, Richland, WA.
12. **Roley, S.S.** Too much of a good thing: managing nitrogen pollution in an agricultural landscape. 22 Feb 2016. Lake Superior State University, Department of Biology. Sault Sainte Marie, MI.
11. **Roley, S.S.** Linking streams and switchgrass: Nitrogen cycling in midwestern agricultural landscapes. 6 March 2015. University of Illinois, Department of Natural Resources. Champaign-Urbana, IL
10. **Roley, S.S.**, Tank, J.L., Mahl, U.H., and Davis, R.T. 9 Feb 2015. Floodplain restoration as a nutrient management strategy in the agricultural Midwest. Upper Midwest Stream Restoration Symposium. Dubuque, IA
9. **Roley, S.S.**, Tank, J.L., and Davis, R.T. 27 Feb 2013. The influence of the two-stage ditch on water quality. Two-Stage Ditch Short Course, Upper Midwest Stream Restoration Symposium. LaCrosse, WI
8. **Roley, S.S.** 10 Oct 2012. Unifying metrics of aquatic ecosystem health for improved management. Eco-DAS X Symposium. Honolulu, HI
7. **Roley, S.S.** 15 May 2012. Mitigating nutrient pollution in the agricultural Midwest. Poster presentation at the Coalition for National Science Funding Annual Exhibition. Washington, D.C.
6. **Roley, S.S.**, Tank, J.L., and Davis, R.T. 12 Mar 2012. The water quality benefits of two-stage ditches. University of Minnesota Extension Two-Stage Ditch Workshop. Adams, MN
5. **Roley, S.S.**, Tank, J.L., and Davis, R.T. 16 Sep 2011. The two-stage ditch and its influence on N removal, sediment transport, and habitat. Great Lakes Regional Water Program Meeting. Columbus, OH
4. **Roley, S.S.**, and Tank, J.L. 12 Jul 2010. Two-stage ditch efficacy: current knowledge and future directions. WLEB Joyce Foundation Meeting. Fort Wayne, IN
3. **Roley, S.S.**, Tank, J.L., and Stephen, M.L. 4 Jan 2010. Two-stage ditch design and concept. Annual Conference of Indiana Soil and Water Conservation Districts. Indianapolis, IN
2. **Roley, S.S.**, Stephen, M.L., and Tank, J.L. 23 Sep 2008. The ecological importance of floodplains and their influence on nitrogen dynamics. Two-Stage Ditch Seminar. Potawatomi Inn, Pokagon State Park, IN
1. **Roley, S.S.** and Newman, R.M. 7 Mar 2007. Predicting Eurasian watermilfoil infestations in Minnesota. Ecology and Management of Non-Native, Invasive, Submersed Aquatic Plants in Minnesota, Wisconsin and Elsewhere. Fort Snelling State Park, MN.

Submitted (first-author only)

18. **Roley, S.S.**, Tank, J.L., Hanrahan, B., Trentman, M.T. 21 May 2018. Restoring stream ecosystem function on working lands to improve water quality. Society for Freshwater Science annual meeting, Detroit, MI.
17. **Roley, S.S.**, Hamilton, S.K., and Kincaid, D. 5 June 2017. Phosphorus retention and release by reservoirs of a eutrophic river. Society for Freshwater Science annual meeting. Raleigh, NC.

16. **Roley, S.S.**, Duncan, D.S., Liang, D., Jackson, R.D., and Robertson, G.P. 7 Feb 2017. Associative Nitrogen Fixation across a Nitrogen Input Gradient. Poster presentation at the Genomic Sciences Program Annual Principal Investigator (PI) Meeting. Arlington, VA.
15. **Roley, S.S.**, Duncan, D.S., Liang, D., Jackson, R.D., and Robertson, G.P. 12 Aug 2016. Nitrogen fixation in switchgrass responds to N fertilizer addition, plant N demand, and soil type. Ecological Society of America annual meeting. Fort Lauderdale, FL
14. **Roley, S.S.**, Tank, J.L., Tyndall, J.C., and Witter, J. 21 May 2015. The value of water quality improvements achieved with agricultural best management practices. Society for Freshwater Science annual meeting. Milwaukee, WI
13. **Roley, S.S.**, Xue, C., Tiedje, J.M., and Robertson, G.P. 23 Feb 2015. Switchgrass augments its nitrogen (N) supply with fixed N. Poster presentation at the Genomic Science Contractors-Grantees Annual Meeting XIII/USDA-DOE Plant Feedstock Genomics for Bioenergy Meeting. Tysons, VA
12. **Roley, S.S.**, Xue, C., Tiedje, J.M., and Robertson, G.P. 11 Aug 2014. Evidence of nitrogen fixation in switchgrass. Ecological Society of America annual meeting. Sacramento, CA
11. **Roley, S.S.**, Tank, J.L., Lipscomb, M., and Witter, J.D. 5 Aug 2013. How cost-effective are wetlands, cover crops, and two-stage ditches for nitrogen removal in the Mississippi River Basin? Ecological Society of America annual meeting. Minneapolis, MN
10. **Roley, S.S.** and Tank, J.L. 25 Mar 2013. The two-stage ditch and ecosystem function: A case study of Shatto Ditch. AWRA Agricultural Hydrology and Water Quality Spring Specialty Conference. St Louis, MO
9. **Roley, S.S.**, Tank, J.L., Grace, M.R., and Cook, P. 21 May 2012. The influence of invasive plants on denitrification in an urban wetland. Society for Freshwater Science Annual Meeting. Louisville, KY
8. **Roley, S.S.**, Tank, J.L., Davis, R.T., and Mahl, U.H. 05 May 2012. The influence of two-stage ditch floodplain restoration on nitrogen removal, turbidity reduction, and benthic habitat in agricultural streams. Midwest-Great Lakes Society for Ecological Restoration Chapter Meeting. Ann Arbor, MI
7. **Roley, S.S.**, Tank, J.L., Griffiths, N.A., Stephen, M.L., Johnson, L.T., Beaulieu, J.J. 23 May 2011. The influence of floodplain restoration on whole-stream metabolism in an agricultural stream. North American Benthological Society Annual Meeting. Providence, RI
6. **Roley, S.S.**, and Tank, J.L. 8 June 2010. Identifying physicochemical constraints on survival of the endangered clubshell mussel, *Pleurobema clava*. North American Benthological Society Annual Meeting. Santa Fe, NM
5. **Roley, S.S.**, Tank, J.L., Stephen, M.L., Johnson, L.T., and Beaulieu, J.J. 21 May 2009. Using denitrification to assess the functional significance of two-stage restoration for removal of agriculturally-derived nitrogen. North American Benthological Society Annual Meeting. Grand Rapids, MI.
4. **Roley, S.S.**, Tank, J.L., Johnson, L.T., Beaulieu, J.J., Stephen, M.L. 26 May 2008. Two-stage ditch restoration: a potential strategy to reduce nitrogen export from agricultural streams. North American Benthological Society Annual Meeting. Salt Lake City, UT

3. **Roley, S.S.** and Newman, R.M. 10 Nov 2005. Predicting Eurasian watermilfoil infestations in Minnesota. North American Lake Management Society Annual Meeting. Madison, WI

2. **Roley, S.S.**, and Newman, R.M. 17 May 2005. Developmental performance of the milfoil weevil, *Euhrychiopsis lecontei*, on Eurasian, northern, and hybrid (northern x Eurasian) watermilfoils. North American Benthological Society Annual Meeting. New Orleans, LA

1. **Roley, S.S.** Macroinvertebrate distribution in the Mississippi-Schoolcraft river-lake system. 20 Apr 2003. Bemidji State University Student Scholarship Conference. Bemidji, MN

Teaching Experience

Classroom Experience

- Instructor for: Global Biogeochemistry (SOE 412/512), Fall 2018; Limnology (NATRS 411), Spring 2018, WSU Tri-Cities campus
- Guest Lecturer (3 lectures), Agricultural Ecology, Michigan State University, 2014 - 2016
- Seminar Coordinator, Academic Success Series, WK Kellogg Biological Station, 2014
- Interpretive Naturalist, University of Notre Dame Summer Science Scholars, 2012
- Guest Lecturer (3 lectures), General Ecology, University of Notre Dame, 2011
- Teaching Assistant, Stream Ecology, University of Notre Dame, 2010
- Guest Lecturer (1 lecture), Stream Ecology, University of Notre Dame, 2010
- Seminar Leader, REU Summer Seminar on Science and Society, Summer 2010
- Teaching Assistant, Aquatic Ecology, University of Notre Dame, 2008

Mentoring Experience

- WSU Graduate Students: Erica Bakker, Aaron Pelly
- WSU Undergraduate research students: Bethany Karlsen, Cassandra Elkins, Rhenton Brimberry
- NSF REU mentor: Ivori Schley (2016), Lawrence Hsu (2015), Allison M. Truhlar (2010), Caroline E. Walz (2009), Maureen A. Williams (2008)
- University of Notre Dame undergraduate research mentor, 2008-2011

Service

Society Affiliations

Society for Freshwater Science

- Editorial Board, 2017 - present
- Constitutional Revisions Committee, 2014-present
- Graduate Resources Merchandise Committee, 2010-2012

Ecological Society of America

American Geophysical Union

Association for the Sciences of Limnology and Oceanography

Soil and Water Conservation Society

- Membership Committee, Michigan Chapter, 2015-2017

Manuscript Review

Associate Editor, *Freshwater Science*

Review for: *Biogeochemistry*, *Ecological Applications*, *Ecological Engineering*, *Ecology Letters*, *Ecosystems*, *Environmental Management*, *Environmental Science and Technology*, *Forests*, *Freshwater Science*, *Hydrobiologia*, *Hydrological Processes*, *Hydrological Sciences Journal*, *Journal of the American Water Resources Association*, *Journal of Applied Ecology*, *Journal of Environmental Quality*, *Journal of Great Lakes Research*, *Journal of Soil and*

Water Conservation, Limnology and Oceanography, Microbial Ecology, Nutrient Cycling in Agroecosystems, Pedosphere, PLoS ONE, Water

Committee Service

Examination Committees: Karrie Deal (M.S.), Jory Brookerson (M.S.), Jim Santo (Ph.D.)

Search Committee, WSU Laboratory Instructor, 2018

Great Lakes Bioenergy Research Center, Area 4 Scientific Meeting Planning Committee, 2015-2017

Seminar Committee, KBS, 2015-2016

Great Lakes Bioenergy Research Center, Scientific Meeting Planning Committee, 2013-2015

Post-doctoral Representative, KBS All-Personnel Committee, 2013-2014

Outreach

Legislative

- Coalition for National Science Funding Annual Exhibition, Ecological Society of America representative. Washington, DC, 15 May 2012.
- Indiana State Legislature, Natural Resources Study Committee meeting. The two-stage ditch and its influence on N removal, sediment transport, and habitat. Indianapolis, IN, 27 Oct 2011.
- Ohio Natural Resources Conservation Service State Technical Committee meeting. The two-stage ditch and its influence on N removal, sediment transport, and habitat. Columbus, OH, 18 Aug 2011.
- Indiana State Legislature, Environmental Service Quality Council Meeting. Two-stage ditch efficacy for nitrogen removal. South Bend, IN, 19 Oct 2010.

Talks and Tours

- Great Lakes Bioenergy Research Center, lead 10-12 tours/year, 2013-2017
- Speaker, KBS LTER New Investigators Tour, 27 Sept 2013 and 25 Sept 2015
- Speaker, KBS Volunteer Reception, 27 Aug 2013
- Speaker, Two-Stage Ditch Field Day, Clinton County (IN) Soil and Water Conservation District, 16 Aug 2011
- Speaker, Hoosier Chapter of the Soil and Water Conservation Society Summer Meeting, 12 Jun 2009.
- Speaker, Two-Stage Ditch Demonstration Days, hosted by The Nature Conservancy, 14 Nov 2007, 16 Jul 2008, and 13 Aug 2008