REBECCA L. HALE

Department of Biological Sciences
Idaho State University
Pocatello, ID
halereb3@isu.edu

Education

2013 Ph.D. Biology
Arizona State University, Tempe, AZ
Advisor: Nancy Grimm
Dissertation: Coupled hydrology and biogeochemistry in social-ecological watersheds

2005 B.A. Ecology and Environmental Studies
Hampshire College, Amherst, MA
Advisor: Charlene D'Avanzo
Thesis: Urban stream ecology, restoration, and management

Professional Employment

2019- Assistant Professor, Department of Biological Sciences
Idaho State University, Pocatello, ID

2015-19 Research Assistant Professor, Department of Biological Sciences
Idaho State University, Pocatello, ID

2013-15 Postdoctoral Fellow, Global Change and Sustainability Center
University of Utah, Salt Lake City, UT

2008-09 Research Assistant, Central-Arizona Phoenix LTER
Arizona State University, Tempe, AZ

2007 Summer Research Assistant, Ecosystems Center
Marine Biological Laboratory, Woods Hole, MA

2005-06 Research Technician
University of Notre Dame, Notre Dame, IN

Peer-Reviewed Journal Publications (supervised graduate student (underscore), undergraduate student*)

34. Hill S, **RL Hale**, J Grinath, B Folk*, R Nielson*, K Reinhardt. *Accepted*. Looking Beyond Leaves: Species diversity and nutrient leaching potential of seasonal litterfall within an urban forest. *Urban Ecosystems*.

33. Choat B, A Pulido, A Bhaskar, **R Hale**, H Zhang, T Meixner, L McPhillips, K Hopkins, J Cherrier, C Cheng. 2021. A call to record stormwater control functions and to share network data. *Journal of Sustainable Water in the Built Environment* 8(2): 02521005

32. Dohman J, S Godsey, **RL Hale**. 2021. Three-dimensional subsurface flow path controls on intermittence. *Water Resources Research* 57(10): e2020WR028270. https://doi.org/10.1029/2020WR028270

31. Calder RSD, C Grady, M Jeuland, CJ Kirchhoff, **RL Hale** and RL Muenich. 2021. COVID-19 reveals vulnerabilities of the food-energy-water nexus to viral pandemics. *Environmental Science and Technology*

30. Honious S, **RL Hale**, J Guilinger, B Crosby, CV Baxter. 2021. Turbidity structures the controls of ecosystem metabolism and associated metabolic process domains along a 75-km segment of a semiarid stream. *Ecosystems* doi: 10.1007/s10021-021-00661-5

29. Warix S, S Godsey, K Lohse, **RL Hale**. 2021. Influence of groundwater and topography on stream drying in semi-arid headwater streams. *Hydrological Processes*. 35(5):e14185. https://doi.org/10.1002/hyp.14185

28. Spring A, K Domingue, T Kerber, M Mooney, **R Hale**, K Lemmer, K Docherty. 2021. Land use effects on airborne bacterial communities are evidence in both near-surface and higher-altitude air. *Diversity* 13(2):85. https://doi.org/10.3390/d13020085

27. Hammond J, M Shanafield, MC Mims, J Olden, M Zimmer, K Kaiser, S Kampf, SE Godsey, SC Zipper, CN Jones, **RL Hale**, CA Krabbenhoft, DC Allen, G Allen, R Burrows, W Dodds, M Bogan, KS Boersma, K Costigan, J Hosen, T Datry, A Price, AS Ward. 2021. Spatial patterns and drivers of non-perennial flow regimes in the contiguous U.S. *Geophysical Research Letters* 48(2): e2020GL090794. https://doi.org/10.1029/2020GL090794

26. Zimmer M, K Kaiser, J Blaszczak, S Zipper, J Hammond, K Fritz, K Costigan, J Hosen, S Godsey, G Allen, S Kampf, R Burrows, C Krabbenhoft, W Dodds, **R Hale**, J Olden, M Shanafield, A DelVecchia, A Ward, M Mims, T Datry, M Bogan, K Boersma, M Busch, C Jones, A Burgin, D Allen. 2020. Zero or not? Causes and consequences of zero-flow stream gage readings. *WIRES Water* DOI: 10.1002/wat2.1436

    ***Related media story in *Advance Science News*: https://www.advancedsciencenews.com/is-the-river-really-dry-scientific-interpretations-of-zero-flow-readings/

25. Shanafield M, S Godsey, T Datry, **R Hale**, SC Zipper, K Costigan, CA Krabbenhoft, WK Dodds, M Zimmer, DC Allen, M Bogan, KE Kaiser, RM Burrows, JC Hammond, M Busch, S Kampf, MC Mims, A Burgin, and JD Olden. 2020. Science Gets Up to Speed on Dry Rivers. *Eos*. 101. https://doi.org/10.1029/2020EO139902.

24. Macek CL, **RL Hale**, CV Baxter. 2020. Dry Wetlands: Nutrient Dynamics in Ephemeral Constructed Stormwater Wetlands. *Environmental Management*. 65(1):32-45 https://doi.org/10.1007/s00267-019-01227-x.

23. McPhillips L, S Earl, **RL Hale**, NB Grimm. 2019. Urbanization in semi-arid Arizona watersheds results in decreased stream flashiness. *Water Resources Research* 55(11):9436-9453. https://doi.org/10.1029/2019WR025835

22. **Hale RL**, EM Cook, BJ Beltrán. 2019. Cultural ecosystem services provided by rivers across diverse social-ecological landscapes: a social media analysis. *Ecological Indicators* 107: 105580. https://doi.org/10.1016/j.ecolind.2019.105580

21. Jovanovic T, **RL Hale**, J Gironas, A Mejia. 2019. Hydrological functioning of an evolving urban stormwater network: Connectivity, heterogeneity, and scaling. *Water Resources Research* 55(8):6517-6533. https://doi.org/10.1029/2019WR025236

20. **Hale RL** and S Godsey. 2019. Dynamic stream network intermittence explains emergent dissolved organic carbon chemostasis in headwaters. *Hydrological Processes* 33(13): 1926-1936. doi: 10.1002/hyp.13455

19. Corman, J, SL Collins, E Cook, X Dong, LA Gherardi, NB Grimm, **RL Hale**, T Lin, J Ramos, LG Reichmann, OE Sala. 2019. Foundations of ecosystem science: Legacy of a classic paper (Odum 1969). *Ecosystems* 22: 1160-1172. doi: 10.1007/s10021-018-0316-3

18. Docherty KM, DS Pearce, KM Lemmer, **RL Hale**. 2018. Distributing regionally, distinguishing locally: Examining the underlying effects of local land use on airborne bacterial biodiversity. *Environmental Microbiology* 20(10): 3529-3542. doi: 10.1111/1462-2920.14307

17. **Hale RL**, CG Flint, DB Jackson-Smith, J Endter-Wada. 2018. Social Dimensions of Urban Flood Experience, Exposure, and Concern. *Journal of the American Water Resources Association* 54(5): 1137-1150. DOI: 10.1111/1752-1688.12676.

16. Metson G, SM Powers, **RL Hale**, J Sayles, G Oberg, N Springer, GK MacDonald, Y Kuwayama, T Weatherly, K Jones, K Hondula, RB Chowdhury, A Beusen, L Bouwman. 2017. Socio-environmental consideration of phosphorus flows in the urban sanitation chain of contrasting cities. *Regional Environmental Change* 18(5): 1387-1401. https://link.springer.com/article/10.1007/s10113-017-1257-7

15. Grimm NB, STA Pickett, **RL Hale**, M Cadenasso. 2017. Does the Ecological Concept of Disturbance Have Utility in Urban Social-Ecological-Technological Systems? *Environmental Health and Sustainability* 3(1): e01255. DOI:10.1002/ehs2.1255

14. Flint C, X Dai, D Jackson-Smith, J Endter-Wada, SK Yeo, **RL Hale**, M Dolan. 2017. The Social and Geographic Contexts of Water Concerns in Utah. *Society and Natural Resources.* 30(8): 885-902. DOI: 10.1080/08941920.2016.1264653

13. **Hale RL.** 2016. Spatial and temporal variation in local stormwater infrastructure use and stormwater management paradigms over the 20th century. *Water* 8(7): 310.

12. Walsh, CJ, DB Booth, MJ Burns, TD Fletcher, **RL Hale**, LN Hoang, G Livingston, MA Rippy, AH Roy, M Scoggins, A Wallace. 2016. Principles for urban stormwater management to protect stream ecosystems. *Freshwater Science* 35(1): 398-411. Available online: http://www.journals.uchicago.edu/doi/full/10.1086/685284

11. **Hale RL**, M Scoggins, N Smucker, A Suchy. 2016. Effects of climate on the expression of the urban stream syndrome. *Freshwater Science*. 35 (1): 421-428.

10. Hall SJ, **RL Hale**, MA Baker, DR Bowling, JR Ehleringer. 2015. Riparian plant isotopes reflect anthropogenic nitrogen perturbations across watershed land use gradients in northern Utah. *Ecosphere* 6:art200. http://dx.doi.org/10.1890/ES15-00319.1

9. **Hale RL**, A Armstrong, MA Baker, S Bedingfield, D Betts, C Buahin, M Buchert, T Crowl, RR Dupont, JR Ehleringer, J Endter-Wada, C Flint, J Grant, S Hinners, JS Horsburgh, D Jackson-Smith, AS Jones, C Licon, SE Null, A Odame, DE Pataki, D Rosenberg, M Runburg, P Stoker, C Strong. 2015. Integrated structure-actor-water framework for socio-eco-hydrological systems research. *Earth's Future* 3(3):110-132. DOI: 10.1002/2014EF000295

8. **Hale RL**, NB Grimm, B Fekete, CJ Vörösmarty. 2015. Nitrogen and phosphorus fluxes from watersheds of the northeastern United States from 1930-2000: Role of anthropogenic nutrient inputs, infrastructure, and runoff. *Global Biogeochemical Cycles*. DOI: 10.1002/2014GB004909

7. **Hale RL**, L Turnbull, S Earl, DL Childers, NB Grimm. 2015. Stormwater infrastructure controls runoff and dissolved material export from arid urban watersheds. *Ecosystems* 18(1): 62-75. DOI: 10.1007/s10021-014-9812-2

6. **Hale RL**, L Turnbull, S Earl, N Grimm, K Riha, G Michalski, KA Lohse, D Childers. 2014. Sources and transport of nitrogen in arid urban watersheds. *Environmental Science & Technology* 48(11): 6211–6219. DOI: 10.1021/es501039t

5. **Hale RL**, J Hoover, WM Wollheim, CJ Vörösmarty. 2013. History of nutrient inputs to the northeastern United States, 1930-2000. *Global Biogeochemical Cycles* 27:578–591.

4. Bain DJ, **RL Hale**, WM Wollheim. 2012. Hotbeds of biogeochemical diversity: Insights from urban long-term ecological research. *Elements* 8:435-438.

3. Metson G, **RL Hale**, D Iwaniec, EM Cook, J Corman, C Galletti, D Childers. 2012. Phosphorus in Phoenix: a budget and spatial representation of phosphorus in an urban ecosystem. *Ecological Applications* 22(2):705-721.

2. McDonald RI, I Douglas, C Revenga, **RL Hale**, NB Grimm, J Grönwall, B Fekete. 2011. Global urban growth and the geography of water availability, quality, and delivery. *Ambio* 40(5):437-446.

1. **Hale RL** and PM Groffman. 2006. Chloride effects on nitrogen dynamics in forested and suburban stream debris dams. *Journal of Environmental Quality* 35:2425-2432.

Refereed Book Chapters

4. Grimm NB, EM Cook, **RL Hale**, DM Iwaniec. 2016. Ecosystem services in cities: the built and the natural. *In* Seto, KC, WD Solecki, CA Griffith, Eds. *Handbook on Urbanization and Global Environmental Change*. Routledge.

3. Cook EM, **RL Hale**, JM Grove, AP Kinzig. 2013. Urban-suburban biodiversity. *In* S Levin, Ed. *Encyclopedia of Biodiversity, 2nd Edition*. Elsevier.

2. Larson EK, S Earl, E Hagen, **R Hale**, H Hartnett, M McCrackin, M McHale, and NB Grimm. 2012. Beyond restoration and into design: hydrologic alterations in aridland cities. *In* Pickett, STA, Cadenasso, M., McGrath, B., and Hill, K., Eds. *Urban Ecological Heterogeneity and its Application to Resilient Urban Design.* Future Cities Series, Springer.

1. Grimm NB, **RL Hale**, EM Cook, D Iwaniec. 2011. Urban biogeochemical flux analysis. *In* I Douglas, D Goode, M Houck, and R Wang, Eds. *The Routledge Handbook of Urban Ecology*. Routledge.

Publications in Review/Revision

Scoggins M., D.B. Booth, T. Fletcher, M. Fork, A. Gonzalez, **R. Hale**, R.J. Hawley, A.H. Roy, E. Bilger, N. Bond, M.J. Burns, K.G. Hopkins, K.H. MacNeale, E. Martí, S. K. McKay, M.W. Neale, M.J. Paul, B. Rios-Touma, K.L. Russell, R.F. Smith, S. Wagner. *In revision*. Community-

powered urban stream restoration: A vision for sustainable and resilient urban ecosystems. *Freshwater Science*.

Warix SR, SE Godsey, HC Bottenberg, XS Chu, G Flerchinger, **R Hale**, S Havens, KA Lohse, M Seyfried. *In Revision.* Evapotranspiration and baseflow control the timing of diel cycling of stream drying during low-flow periods. Submitted to *Geophysical Research Letters* 10/3/2020.

Choat B, A Pulido, A Bhaskar, **R Hale**, H Zhang, T Meixner, L McPhillips, K Hopkins, J Cherrier, C Cheng. A cross-city comparison to understand selection of stormwater controls in United States cities. Submitted to *Journal of Sustainable Water in the Built Environment* 3/4/2021.

Graves R, M Burnham, C Wardropper, J Brandt, N Carter, **RL Hale**, AV Hillis, MA Williamson. *In revision.* Adoption of conservation practices on private rangelands in the western United States: the influence of ranchers' dependence on public lands and beliefs about private property and conservation. Submitted to *Society and Natural Resources* 6/25/2021.

Millard A, **RL Hale**, M Burnham. *In Revision*. Diverse stakeholders navigate divergent perspectives on stream restoration success in Western rangelands. Submitted to *Restoration Ecology* 3/29/2021.

Published Datasets

Honious, SAS, **R Hale**, J Guilinger, B Crosby, CV Baxter. 2021. Stream Metabolism in Marsh Creek, Idaho, USA 2016-2017 ver 1. Environmental Data Initiative. https://doi.org/10.6073/pasta/c5dcdde09dbbee91764e3e6f5ee81696

Warix S, S Godsey, G Flerchinger, C Bottenburg, X Chu, K Lohse, **R Hale**, and M Seyfried. 2021. Dataset for Riparian Evapotranspiration and NDVI: Murphy Creek, Idaho. (MS #1023) Reynolds Creek Critical Zone Observatory Data. https://scholarworks.boisestate.edu/reynoldscreek/24

McPhillips L, **R Hale**, S Earl, N Grimm. 2019. Flashiness of urban and desert streams in semi-arid Arizona watersheds (2003-2016). *Environmental Data Initiative*. https://doi.org/10.6073/pasta/81b376483df96e9f15f794a569a23ed2.

Childers D, S Earl, N Grimm, **R Hale**, L Turnbull. 2018. Long-term monitoring of stormwater runoff and water quality in urbanized watersheds of the greater Phoenix metropolitan area, ongoing since 2008. *Environmental Data Initiative*. https://doi.org/10.6073/pasta/fd554f184fc9fa2f0bfd7b5fe175f98b

Shorts D and **RL Hale**. Determinative factors of denitrification in a urban, arid wash of central Arizona (2012-2013). *Environmental Data Initiative*. https://doi.org/10.6073/pasta/23161f1bba07248c558a2ef0e4c914f4

Metson GS, **RL Hale**, DM Iwaniec, EM Cook, JR Corman, CS Galletti, DL Childers. 2012. A budget and spatial representation of Phosphorus in the central Arizona-Phoenix area. *Environmental Data Initiative*. https://doi.org/10.6073/pasta/6056693feb1947e18c46125fe8f3984d

Awards and Fellowships

2011	North American Benthological Society (now Society for Freshwater Science) General Endowment Award, $900
2010	Graduate and Professional Student Association Research Award, Arizona State University, Tempe, AZ, $2,000
2010	Central Arizona Phoenix Long Term Ecological Research, Graduate Grant, Arizona State University, Tempe, AZ, $5,000
2009-11	IGERT in Urban Ecology Senior Fellow, Arizona State University, Tempe, AZ.
2008-12	IGERT in Urban Ecology Fellow, Arizona State University, Tempe, AZ.
2007-08	IGERT in Urban Ecology Associate, Arizona State University, Tempe, AZ.

Funded Grants and Contracts

2021	Hale (PI). Research Experience for Post-baccalaureate Scholars (REPS) Supplement. National Science Foundation $65,000.
2020	Godsey SE (PI), RL Hale (co-I), Y You (co-I), K Aho (co-I), K Lohse (SP). RII Track-2 FEC: Aquatic Intermittency effects on Microbiomes in Streams (AIMS). National Science Foundation EPSCoR. $1,307,907. (ISU is a subaward on larger $6M award to University of Kansas).
2020	Hale RL (PI), Kristina Hopkins (co-PI). Collaborative Research: Scales and drivers of variability in dissolved organic carbon across diverse urban watersheds. National Science Foundation. $934,992. (ISU is the lead institution on 5-institution collaborative proposal totaling $1,412,039).
2020	Hale RL (PI) and SE Godsey (co-PI). Network-scale streamflow intermittence controls on dissolved organic carbon concentrations and processes. National Science Foundation. $199,999.
2020	Hale RL (PI). Assessing the effectiveness of stormwater wetlands for sediment and total phosphorus retention in the City of Pocatello. City of Pocatello. $156,779.
2019	Hale RL (PI). Contributions of urban street trees to stormwater phosphorus. City of Pocatello. $6,000.
2018	Hale RL (PI). What is Success? Defining Social and Ecological Measures of Stream Restoration Success. ISU College of Science and Engineering Internal Research Grant. $2,500.
2017	Hale RL (PI). Forest Service Contract: Using Social Media to Characterize Cultural Ecosystem Services in the Salmon-Challis National Forest. USDA Salmon-Challis National Forest. $9,851.
2016	Hale RL (PI). Urban Stormwater Quantity and Quality across a Gradient of Streamflow Permanence in Pocatello, ID. ISU Internal Seed Grant. $20,000.

2015 Hale RL (PI). Purchase of HOBO Tidbits to Determine Flow Stability of Streams in Gibson Jack Watershed. ISU College of Science and Engineering Internal Research Grant. $1,995.

2015 Docherty K, K Lemmer, R Hale (Senior Personnel). EAGER-NEON: Exploring Ecosystem Contributions of Microbial Diversity to the Vertical Atmosphere. National Science Foundation, $299,995 (ISU subaward $8,114).

2010 Frontiers in Life Sciences Conference Grant, School of Life Sciences, Arizona State University, Tempe, AZ, $30,000.

Grant Proposals Not Funded

2019 Hale RL (PI). Collaborative Proposal: MRA: Identifying scales and drivers of variability in dissolved organic carbon across diverse urban watersheds. National Science Foundation. $423,571. (ISU is the lead institution on 5-instituion proposal totaling $1.63M).

2018 Kuwayama Y (PI), RL Hale (co-PI), C Speir (co-PI), K Kroetz (co-PI). CNH-S: Linking Economic, Hydrologic, and Ecological Models to Inform Management of Water-Limited Environments with Ecosystem Thresholds. National Science Foundation. $748,254 (ISU subaward: $220,826).

2018 Hale RL (PI). Monitoring street sweeping effectiveness from gutter to river, Pocatello, ID. National Fish and Wildlife Foundation. $48,349.

2017 Hale RL (PI). Collaborative Research: MSB-FRA: Identifying scales and drivers of variability in dissolved organic carbon across diverse urban watersheds. National Science Foundation. $977,710. (ISU is the lead institution on 5-instituion proposal totaling $2.65M).

2017 Hale RL (PI), M Burnham, J Brandt, M Whitfield, B Beltran. Indicators for success: developing social-ecological indices to identify priority stream conservation areas in the High Divide. Great Northern Landscape Conservation Cooperative. $79,716.

2017 Hale RL (PI). Collaborative Research: MSB-FRA: Organic Carbon Inputs and Transformations in Urban Streams from Reach to Continental Scales. National Science Foundation. $694,020. (ISU is lead institution on 5-instituion proposal totaling $1.73M).

2017 Burnham M and RL Hale. Indicators for success: developing social-ecological indices to identify priority stream conservation areas in the High Divide. ISU Office of Research Seed Grant. $20,000.

2017 Hale RL (PI) and SE Godsey (co-PI). Preliminary proposal: Headwater heterogeneity within urban stream networks: effects on organic matter dynamics. National Science Foundation Ecosystems Science. Full proposal not invited.

2016 Kuwayama Y (PI), RL Hale (co-PI), C Speir (co-PI), E Danner (co-PI), K Kroetz (co-PI), B Martin (Senior Personnel). CNH-S: Linking economic, hydrologic, and ecological models to inform management of water-limited environments with

ecosystem thresholds. National Science Foundation. $500,000 (ISU Subaward $191,858).

2016 Kawayama Y (PD), R Hale (co-PD), K Kroetz (co-PD) and C Speir (co-PD). Managing the impacts of irrigation on streams: The importance of ecological thresholds and water quality. USDA AFRI. $500,000 (ISU Subaward $191,326).

2016 Hale RL (PI) and Sarah Godsey (co-PI). Preliminary Proposal: Vertical and lateral fluxes of water, nitrogen, and carbon across stream permanence gradients: point-scale processes to network-scale patterns. NSF Ecosystems Science Cluster. Full proposal not invited.

2016 Running T (PI), A Castro (co-PI), RL Hale (co-PI). Testing the Stress Reduction Benefits of Diverse Riparian City Parks. EPA STAR, $514,095.

Invited Presentations and Seminars

Hale RL. Heterogeneity in stream carbon processing at reach to continental scales. Idaho Water Resources Seminar. Idaho Water Resources Research Institute, University of Idaho. 1 November 2021. (Webinar)

Hale RL. Cultural Ecosystem Services from Idaho's Rivers: A Social Media Analysis. Natural Capital Conversations, Stanford University. 2 February 2021. (Webinar)

Hale RL. *Invited Panelist*. The Good News about the Future of Recreation in Greater Yellowstone. Our Shared Place: The Present and Future of Recreation in Greater Yellowstone. 24 April 2018. Bozeman, MT.

Hale RL. Evaluation of cultural ecosystem services using social media data. Crowdsource Data Workshop, Idaho State University. 30 March 2018. Pocatello, ID.

Hale RL. Within-event dissolved material delivery in urban stormwater variation across watershed and storm characteristics. Concentration-Discharge Workshop, Idaho State University. 12 March 2018. Pocatello, ID.

Hale RL. Cultural Ecosystem Services in the Salmon Challis National Forest: a social media analysis. Salmon Challis National Forest. 12 February 2018. Salmon, ID.

Hale RL. Evolving Paradigms for Stormwater Infrastructure and the Ecological Effects of Urbanization. USGS Eastern Geographic Science Center Webinar. 9 August 2017. Webinar.

Hale RL. Heterogeneity in Urban Stormwater Infrastructure at City, Regional, and National Scales. HydroEco 2017. 21 June 2017. Birmingham, UK.

Hale RL. Evaluation of Cultural Ecosystem Services Using Social Media Data. Great Northern Landscape Conservation Cooperative Webinar. 10 May 2017. Webinar.

Hale RL. Heterogeneity in Urban Stormwater Infrastructure at City, Regional, and National Scales. US-International Association for Landscape Ecology. 10 April 2017. Baltimore, MD.

Hale RL. Evolving Paradigms for Stormwater Infrastructure and the Ecological Effects of Urbanization. Civil and Environmental Engineering Seminar. Rensselaer Polytechnic Institute. 8 March 2017. Troy, NY.

Hale RL and SE Godsey. Intermittent streams across land use gradients. Geosciences Colloquium. Idaho State University. 15 February 2017. Pocatello, ID.

Hale RL. Watershed Science for the Anthropocene. Geosciences Colloquium. Idaho State University. 17 February 2016. Pocatello, ID.

Hale RL. Changing Perceptions of Flooding and Stormwater as a Driver of Urban Hydrology and Biogeochemistry. American Geophysical Union Fall Meeting. 16 December 2015. San Francisco, CA.

Hale RL. Stormwater infrastructure as social-ecological systems. National Socio-Environmental Synthesis Center. 5 May 2015. Annapolis, MD.

Hale RL. Water science for the Anthropocene. Geosciences Seminar. University of Texas at Austin. 23 March 2015. Austin, TX.

Hale RL. Stormwater infrastructure as a social-ecological system. Biology Seminar. Idaho State University. 12 February 2015. Pocatello, ID.

Hale RL. Contemporary freshwater ecology: science for the Anthropocene. Biology Seminar. Rensselaer Polytechnic Institute. 29 January 2015. Troy, NY.

Hale RL, NB Grimm, C Vörösmarty. Spatial-temporal heterogeneity in regional watershed phosphorus cycles driven by changes in human activity over the past century. American Geophysical Union Fall Meeting. 17 December 2014. San Francisco, CA.

Hale RL, L Turnbull, S Earl, NB Grimm, D Childers, D Pataki. Stormwater management as a source of urban watershed heterogeneity. Symposium on Urbanization and Stream Ecology. 15 May 2014. Portland, OR. *Invited Plenary*.

Hale RL. Evolution and consequences of stormwater management in arid and semi-arid urban watersheds. Watershed Sciences Seminar, Utah State University. 21 January 2014. Logan, UT.

Hale RL. Coupled hydrology and biogeochemistry in social-ecological watersheds. Earth Sciences Seminar, Utah Valley University. 5 Nov 2013. Orem, UT.

Hale RL. Infrastructure as a coupled human-natural system: Insights from urban and regional case studies. Global Change and Sustainability Center. University of Utah. 27 February 2013. Salt Lake City, UT.

Hale RL, L Turnbull, S Earl, VK Turner, N Grimm. Stormwater dynamics in a southwestern city. Long Term Ecological Research All Scientist Meeting, Graduate Student Symposium. 9 September 2012. Estes Park, CO.

Hale RL, L Turnbull, N Grimm, S Earl. Effects of urban stormwater infrastructure on nutrient export and runoff from semi-arid urban catchments. American Geophysical Union Fall Meeting. 8 December 2011. San Francisco, CA.

Contributed Oral Presentations (postdoc‡, graduate student (underscore), undergraduate student*)

Hale RL, K Capps, K Hopkins, J Kominoski, J Morse, A Roy, S Chen, A Quick, A Blinn, D Cross, B Folk, L Ortiz, C Pendergast, C Rizzie. Scales and Drivers of Variability in Dissolved Organic Carbon across Diverse Urban Watersheds. Joint Aquatic Sciences Meeting. Grand Rapids, MI. May 2022

And co-author on 10 presentations, including 5 student and 3 post-doc presentations.

McPhillips LE, M Palta, AK Suchy, **RL Hale**, S Earl and NB Grimm. How does urbanization influence stream hydrology in a desert city? Insights on high and low flows from Phoenix, Arizona. American Geophysical Union (virtual). December 2020.

Choat B, A Pulido, A Bhaskar, C Cheng, J Cherrier, C Flynn, **R Hale**, K Hopkins, L McPhillips, T Meixner, J Ripplinger, H Zhang. Synthesizing Stormwater Infrastructure in United States Cities: Are we speaking the same language? American Geophysical Union (virtual). December 2020.

Hill S and **RL Hale**. Looking Beyond Leaves: Nutrient Leaching Potential of Various Types of Seasonal Litterfall Within an Urban Forest. Ecological Society of America (virtual). August 2020.

Grimm, NB, SR Earl, **RL Hale**, HH Hartnett, K Kemmitt, LE McPhillips, MM Palta. Ecohydrological and biogeochemical dynamics of urban stormwater in arid central Arizona. American Geophysical Union. San Francisco, CA. December 2019.

Hale RL and SE Godsey. Dynamic stream network intermittence explains emergent dissolved organic carbon chemostasis in headwaters. Society for Freshwater Science. 21 May 2019. Salt Lake City, UT.

Hale RL. Causes and Consequences of Urban Headwater Heterogeneity. Society for Freshwater Science. 21 May 2018. Detroit, MI.

Stalder S, **RL Hale**, C Baxter, B Crosby. Metabolism in an agricultural stream: impacted riverscapes retain longitudinal complexity. Society for Freshwater Science. 21 May 2018. Detroit, MI.

Macek C, **RL Hale**, C Baxter, M Burnham. Nutrient dynamics in semiarid constructed stormwater wetlands. Society for Freshwater Science. 24 May 2018. Detroit, MI.

Hale RL, C Baxter, M Burnham, K Marsh. Co-producing urban river imaginaries over time: an Idaho river and its community. Society for Freshwater Science. 8 June 2017. Raleigh, NC.

Stalder S, **RL Hale**, B Crosby, C Baxter. Metabolism in an agricultural stream: even impacted riverscapes retain longitudinal complexity. Society for Freshwater Science. 8 June 2017. Raleigh, NC.

Larson D‡, S Godsey, C Ohr, J Welhan, K Lohse, S Kobs-Nawtoniak, D Lybecker, **R Hale**, J Stoutenborough. Integration of social perceptions, behaviors, and economic valuations of groundwater quality following exurban development. American Geophysical Union. December 2015. San Francisco, CA.

Hale RL, E Cook, B Beltrán. Using Big Data to Understand Ecosystem Services at Landscape Scales. Ecological Society of America. 11 August 2016. Ft Lauderdale, FL.

Hale RL, NB Grimm, S Pickett, M Cadenasso. Urban Ecosystem Disturbance. Ecological Society of America. 12 August 2015. Baltimore, MD.

Hale RL, L Turnbull, S Earl, NB Grimm, D Childers, D Pataki. Stormwater management as a source of urban watershed heterogeneity. Workshop on Urbanization in Watersheds: Ecological and Environmental Responses. 16 October 2014. Xiamen, China.

Hale RL, D Pataki. Historical urban flood management to understand urban ecosystem disturbance: a comparative study. Ecological Society of America. 13 August 2014. Sacramento, CA.

Hale RL, S Moratto*, D Shorts*, L Turnbull, S Earl, NB Grimm. Stormwater infrastructure effects on urban nitrogen budgets. American Geophysical Union. 7 December 2012. San Francisco, CA.

Hale RL, L Turnbull, S Earl, NB Grimm. Effects of urban stormwater infrastructure on dissolved nitrogen export from semi-arid urban watersheds. Ecological Society of America. 9 August 2012. Portland, OR.

Hale RL, J Hoover, C Vörösmarty, and W Wollheim. Anthropogenic nutrient loading to the Northeastern US, 1920-2000. Ecological Society of America. 12 August 2011. Austin, TX.

Hale RL, L Turnbull, S Earl, NB Grimm. Urban stormwater infrastructure: Effects on nutrient export and runoff. North American Benthological Society. 24 May 2011. Providence, RI.

Hale RL and J Hoover. Anthropogenic nutrient loading to the northeastern US, 1920-2000. American Society of Environmental Historians. 14 April 2011. Phoenix, AZ.

Hale RL, RI McDonald, I Douglas, C Revenga, NB Grimm, J Grönwall, B Fekete. Global urban growth and the geography of water availability, quality, and delivery. Urbanization and Global Environmental Change. 16 October 2010. Tempe, AZ.

Hale RL and PM Groffman. Chloride and nitrogen dynamics in urban streams. Baltimore Ecosystem Study Annual Meeting. October 2004. Baltimore, MD.

Hale RL and D Swanson. Nesting success of neotropical migratory birds. National Conference for Undergraduate Research. March 2003. Salt Lake City, UT.

Poster Presentations

Hale RL, RL Muenich, C Grady, R Calder, J Bielicki, M Burnham, B Hannibal, D Jackson-Smith, M Jeuland, S Keerthi, C Kirchhoff, C Prasse, B Thiede, A Stillwell. Typology of Food-Energy-Water Systems in the United States. American Geophysical Union (Virtual). December 2020.

Hale RL, S Godsey, J Dohman, S Warix. Synchronous and asynchronous changes in fluorescent dissolved organic matter along a perennial-intermittent streamflow transition. American Geophysical Union. 13 December 2019. San Francisco, CA.

Milstein I*, SE Godsey, SR Warix, HC Bottenberg, KA Lohse, RB MacNeille, RL Hale. Can High-Resolution Vegetation Greenness Serve as an Indicator for Stream Drying? American Geophysical Union. December 2019. San Francisco, CA.

Warix SR, SE Godsey, KA Lohse, RL Hale. Influence of baseflow on stream drying. American Geophysical Union. December 2019. San Francisco, CA.

Milstein I*, SE Godsey, SR Warix, HC Bottenberg, KA Lohse, RB MacNeille, RL Hale. Using Vegetation Greenness as an Indicator for Stream Drying. Idaho Conference for Undergraduate Research. 2019. Boise, ID.

Saxton W*, P Karmacharya, P Kerner, L Long, T Herup-Wheeler, S Hill, R Hale, Y You. Urban Impacts on Surface Water Microbiome in the Lower Portneuf River Valley Watershed. Idaho Conference for Undergraduate Research. 2019. Boise, ID.

Earl SE, KL Kemmitt, LE McPhillips, **RL Hale**, NB Grimm. Patterns of stormwater runoff and biogeochemistry in a highly urbanized catchment of the Phoenix metropolitan area. Ecological Society of America. August 2019. Louisville, KY.

Hill S, K Reinhardt, **RL Hale**. Nutrient implications of street-side vegetation to surface waters. Society for Freshwater Science. 22 May 2019. Salt Lake City, UT.

McLane E*, S Godsey, **RL Hale**, R Flock, J Dohman, JC Morgan. Controls on in-stream and riparian carbon fluxes in a wetted intermittent reach. American Geophysical Union. December 2018. San Francisco, CA.

Dohman J, S Godsey, G Thackray, **R Hale**, E McLane*, J Morgan. Subsurface Controls on Stream Intermittency in a Semi-Arid Landscape. American Geophysical Union. December 2018. San Francisco, CA.

Hill S, **RL Hale**. Spatial and temporal heterogeneity in organic carbon within a semi-arid urban stream. Society for Freshwater Science. 24 May 2018. Detroit, MI.

Millard A, **RL Hale**, M Burnham. Defining social and ecological measures of stream restoration success. Society for Freshwater Science. 24 May 2018. Detroit, MI.

Jovanovic R, J Leon, **R Hale**, A Mejia. Dendritic connectivity, heterogeneity, and scaling in urban stormwater networks: Implications for socio-hydrology. American Geophysical Union. December 2017. San Francisco, CA.

Dohman J, S Godsey, G Thackray, **R Hale**, K Wright*, J Morgan. Subsurface Controls on Stream Intermittency in a Semi-Arid Landscape. American Geophysical Union. December 2017. San Francisco, CA.

Martinez D*, R Hale, and S Godsey. Specific Conductivity Along Intermittent and Ephemeral Streams in Southeastern Idaho. Idaho Conference on Undergraduate Research. 26 July 2017. Boise, ID.

Hawkes KS*, S Stalder, and R Hale. Instream vegetation survey of Marsh Creek. Idaho Conference on Undergraduate Research. 26 July 2017. Boise, ID.

Guthrie JD*, C Macek, and R Hale. Impact of Road Salt on Stormwater Wetlands. Idaho Conference on Undergraduate Research. 26 July 2017. Boise, ID.

Durfee C*, R Hale, and S Godsey. CO2 Flux along an Intermittent Stream in SE Idaho. Idaho Conference on Undergraduate Research. 26 July 2017. Boise, ID.

Macek C, **RL Hale**. Constructed stormwater wetlands in semi-arid climates: Nutrient cycling and uptake and their use in the Intermountain West. Symposium on Urbanization and Stream Ecology. 1 June 2017. Browns Summit, NC.

Jovanovic R, J Leon, **R Hale**, A Mejia. Spatial connectivity, scaling, and temporal trajectories as emergent urban stormwater impacts. American Geophysical Union. December 2016. San Francisco, CA.

Hale RL, C Lopez-Morales, C Vorosmarty. Contribution of nutrient pollution to water scarcity in the water-rich Northeastern United States. American Geophysical Union Fall Meeting. 13 December 2015. San Francisco, CA.

Hale RL et al. Integrated structure-actor-water framework for socio-eco-hydrological systems research. American Geophysical Union Fall Meeting. 17 December 2014. San Francisco, CA.

Hale RL, L Turnbull, S Earl, NB Grimm. Effects of urban stormwater infrastructure on dissolved nitrogen export from semi-arid urban catchments. Central Arizona Phoenix Long Term Ecological Research Poster Symposium. 11 January 2013. Tempe, AZ.

Hale RL, L Turnbull, S Earl, NB Grimm. Effects of urban stormwater infrastructure and spatial scale on nutrient export and runoff from semi-arid urban catchments. Central Arizona Phoenix Long Term Ecological Research Poster Symposium. 13 January 2012. Tempe, AZ.

Hale RL, L Turnbull, S Earl, NB Grimm. Effects of urban stormwater infrastructure and spatial scale on nutrient export and runoff from semi-arid urban catchments. Central Arizona Phoenix Long Term Ecological Research Poster Symposium. 13 January 2011. Tempe, AZ.

Hale RL, J Hoover, B Thomas, M Ng, R Vogel. Anthropogenic nutrient loading to the Northeastern US, 1920-2000. American Geophysical Union Fall Meeting. 16 December 2010. San Francisco, CA.

Hale RL, L Turnbull, S Earl, NB Grimm. Effects of urban stormwater infrastructure and spatial scale on nutrient export and runoff from semi-arid urban catchments. Central Arizona Phoenix Long Term Ecological Research Poster Symposium. 13 January 2011. Tempe, AZ.

Hale RL. Urban disturbance: infrastructure-climate interactions, socio-ecological feedbacks, and implications for future change. Conference for Sustainability IGERTs 2. 9 October 2009. Tempe, AZ.

Hale RL and NB Grimm. Spatial and temporal variability of runoff chemistry: land use effects. Central Arizona Phoenix Long Term Ecological Research Poster Symposium. 15 January 2011. Tempe, AZ.

Hale RL, Toke N, Grimm NB, Arrowsmith R. Aridland urban hydrology in Phoenix, AZ. Central Arizona Phoenix Long Term Ecological Research Annual Poster Symposium. 10 January 2008. Tempe, AZ.

Teaching Experience

Instructor

BIOL 1102 Biology II, Idaho State University, Pocatello, ID (S2020, F2021, S2022)

BIOL 4491 Senior Seminar, Idaho State University, Pocatello, ID (F2020)

BIOL 6606 Scientific Writing, Idaho State University, Pocatello, ID (F2018, F2020)

BIOL 6691 Proposal Seminar, Idaho State University, Pocatello, ID (S2019, S2020, S2022)

BIOL 5540/CMP 6610 Urban Ecology, University of Utah, Salt Lake City, UT (S2015)

Teaching Assistant

BIO 182 Introduction to Biology for Majors, Arizona State University

BIO 320 Fundamentals of Ecology, Arizona State University

Postdoctoral and Graduate Scholars Supervised

Postdoctoral Scholars
Annika Quick (co-advised with Allison Roy, UMass and Jen Morse, Portland State), 2021-
Shuo Chen (co-advised with Krista Capps, UGA and John Kominoski, FIU), 2021-

Advisor
Andrew Blinn (Advisor, PhD Biology, Idaho State University) – current student
Riley Lanfear (Advisor, MS Biology, Idaho State University) – current student
Justin Miller (Advisor, MS Biology, Idaho State University) – current student
Kevin Gauthier (Advisor, MS Biology, Idaho State University) – current student
Sophie Hill (Advisor, DA Biology 2021, Idaho State University)
Alyssa Millard (Advisor, MS Biology 2019, Idaho State University)
Sarah Stalder (Advisor, MS Biology 2018, Idaho State University)
Carolyn Macek (Advisor, MS Biology 2018, Idaho State University)

On committee
Thane Kindred (on committee, MS Geosciences, Idaho State University) – current student
Lizzie Jossie (on committee, MS Biology, Idaho State University) – current student
Xavier Jenkins (on committee, MS Biology, Idaho State University) – current student
Jennifer Souza (on committee, MS Geosciences, Idaho State University)
Sara Warix (on committee, MS Geosciences 2020, Idaho State University)
Maia Chicherio (on committee, MS Sociology 2019, Idaho State University)
Jenna Dohman (on committee, MS Geosciences 2018, Idaho State University)
Graham Meese (on committee, MS Geosciences 2018, Idaho State University)

Post-Baccalaureate Scholars
Brittany Folk, NSF REPS, 2021-

Undergraduate Scholars Supervised

Tiffaney Jeske (ISU), Isreal Martinez (ISU), Adrian Chavez (U Idaho), Dane Buck (ISU), Ryan Neilson (ISU), Brittany Folk (ISU), Katelyn Gonzalez (ISU), Kyndra Hawkes (ISU), Cody Durfee (ISU), James Guthrie (ISU), Gibril Omar (ISU), Zachary Fishburn (ISU), César Resendiz (U Idaho), Marena Sampson (ASU), Danielle Shorts (ASU), Sarah Moratto (ASU)

Symposium and Workshop Contributions

2020	OSPA Liason. GC 041 Sustainability in FEW Nexus Systems Through Novel Interdisciplinary Research Advances, Earth Observations, and Policy Science for Adaptation Strategies. American Geophysical Union. Virtual. 1-17 December 2020.
2020	*Program Committee*: Symposium for Urban Stream Ecology. February 12-15, 2020. Austin, TX
2019-21	*Co-PI*: SESYNC Pursuit: Characterizing Food-Energy-Water system typologies across the continental U.S. for informed FEW research. SESYNC. Annapolis, MD.
2019	*Participant*: Dry Rivers Research Coordination Network Workshop. Sevilleta, NM.
2018	*Invited Participant*: Data to Motivate Synthesis Workshop. SESYNC. Annapolis, MD.
2018	*Participant:* Concentration-Discharge Workshop. Idaho State University. Pocatello, ID.
2016	*Participant:* Human Dimensions of Phosphorus Workshop. National Center for Socio-Environmental Synthesis. Annapolis, MD.
2014	*Participant*: 1st International Workshop on Urbanization in Watersheds: Environmental and Ecological Responses. Xiamen, China.
2014	*Participant:* Urban Sustainability Research Coordination Network (RCN) All scientists symposium. Tempe, AZ.
2011	*Conference Co-organizer:* Sustainable Phosphorus Summit: Phosphorus, food and our future, Frontiers in Life Sciences conference series; Arizona State University, Tempe, AZ.
2010	*Participant:* Summer Synthesis Institute, City College of New York at CUNY.
2009	*Participant:* Stable Isotopes in Ecology (Lecture Course). University of Utah, Salt Lake City, UT.
2009	*Workshop Co-organizer and Presenter:* Identifying the benefits and barriers to graduate student cross-site socio-ecological research in urban systems. LTER All Scientists Meeting, Estes Park, CO.
2009	*Conference Co-organizer:* Dynamic Deserts: Resource uncertainty in arid environments. Frontiers in Life Sciences conference series; Arizona State University, Tempe, AZ.

Professional Service and Outreach

Advisory Group, Northwest Climate Adaptation Science Center (NWCASC) Deep Dive (2021)

Committee member, ISU Biology Undergraduate Education Committee (2020-)

Member, Portneuf Watershed Advisory Group (2018-)

Board Member, Center for Ecological Research and Education, Idaho State University (2017-)

Representative, ISU Graduate Council (2018-20)

Volunteer, Bengal STEM day (2018)

Committee member, ISU Biology Graduate Education Committee (2017-19)

Presenter/Instructor, Using Social Media to Understand Cultural Ecosystem Services, Adventure Learning program for K-12 teachers, Idaho State University, Pocatello, ID. 2016.

Reviewer for Academic Journals, *Frontiers in Ecology and the Environment, Journal of Arid Environments, Environmental Science & Technology, Journal of Environmental Quality, Ecosystems, Ecology, Biogeochemistry, Journal of Hydrology, Journal of the American Water Resources Association, Ecology and Society, Freshwater Science, Elementa, Landscape Ecology, Hydrological Processes, Ecological Applications, PlosONE, Journal of Geophysical Research-Biogeosciences, Global Environmental Change, Environmental Research Letters, Journal of Hydrology: Regional Studies, Water Resources Research; City and Environment Interactions*

Grant Proposal Reviewer, NSF Hydrological Sciences ad hoc reviewer (2016, 2017, 2019, 2020); NSF Ecosystems Science panelist (2021); Maryland Sea Grant (2015); CAP LTER graduate grants (2010, 2011), Swiss National Science Foundation ad hoc reviewer (2018)

Vice President, School of Life Sciences Graduate Student Government, Arizona State University, 2011-2012.

Steering Committee Member, Graduates in Integrative Society and Environment Research, Arizona State University, 2010 - 2011.

Co-Representative to Graduate Student Ecology, Evolution and Biology Group, School of Life Sciences, Arizona State University, 2008 - 2009.

LTER Network Graduate Site Representative, CAP LTER, Tempe, AZ, 2009.

Volunteer, Ask-a-biologist, online biology resource for K-12 students and educators, askabiologist.asu.edu, 2009-2013.

Mentor, Graduate Partners in Science Education, Arizona State University, 2008.

Professional Memberships

Ecological Society of America, member since 2007
American Geophysical Union, member since 2009
Society for Freshwater Science, member since 2010