

Dr. Laura Toran
Temple University, Philadelphia, PA 19122
Department of Earth and Environmental Science
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215-204-2352

Education

1982 - 1986 Univ. of Wisconsin Madison, WI

Ph.D. Geology

THESIS: Sulfate contamination in groundwater near an underground mine:
hydrogeochemical modeling, microbiology, and isotope geochemistry

1976 - 1980 Macalester College St. Paul, MN

B.A. Geology Summa Cum Laude

Professional experience

1997 - present Temple University, Philadelphia, PA

Dept of Earth and Environmental Science

Weeks Chair in Environmental Geology, Associate and Full Professor

2011-2012 National Sciences Foundation

Program Officer Hydrologic Sciences (rotator)

1986 - 1997 Oak Ridge National Laboratory Oak Ridge, TN

Wigner Fellow and Research Associate

1980 - 1982 U.S. Geological Survey Water Resources Division Reston, VA

Research associate for Dr. William Back

Awards Received

- Distinguished Research Award, College of Science and Technology, 2018
- American Association of State Highway and Transportation Officials, High Value Research Award, 2018
- Teaching Award, College of Science and Technology, 2015
- University Service Award, 2012
- Faculty Mentor Award, Temple College of Science and Technology, 2007
- Fellow, Geological Society of America, 2005
- Weeks Chair in Environmental Geology (Temple University)
- Wigner Fellowship (Oak Ridge National Laboratory)
- American Geophysical Union Horton Research Grant, 1985

RECENT FUNDING (last 6 years):

2022-2025 Toran, L. Delaware River Watershed Initiative - Phase 2+. \$655,000. William Penn Foundation.

2020-2025 Welty, Claire, Toran, L. et al. Urban Critical Zone processes along the Piedmont-Coastal Plain transition. National Science Foundation, \$4,999,766, Temple portion \$228, 218

2020-2022 McKenzie, E.R.; Toran, L. Stormwater Nitrogen Management - Considering the Intersection Between Stormwater Management Practice (SMP) Design And Nitrogen Speciation. Pennsylvania Sea Grant, \$120,000

2019-2024 Martin, J., Toran, L., Covington, M. CZ RCN: Research coordination in carbonate critical zones. National Science Foundation, \$499,121, Temple portion \$75,673

2016-2023 Toran, L, McKenzie, E., Caplan, J., Nyquist, J., and Eisenmann, S. Stormwater control management and monitoring. Pennsylvania Department of Transportation, IDEA grant \$500,000 and subcontract from AECOM. \$4,598,953 (includes \$597,850 subcontract to Villanova)

2019 Gilbert, M., Solecki, W., Toran, L, Brondizo, E., Hoque, S. Workshop: How Does Infrastructure Shape Equity And Well-Being Across The Urban-Rural Gradient? National Science Foundation, \$50,000

2018-2022 Toran, L. Evaluating urban stream stressors and mitigation strategies in the Upstream Suburban Philadelphia Cluster. William Penn Foundation, \$1,424,896

2016-2020. Toran, L, Nyquist, JE, Davatzes, AK, and Brandt, CB. GP Impact: Career Paths for Urban Geoscientists: Recruitment, Retention, and Apprenticeship. National Science Foundation (NSF) \$358,773.

2016-2018 Toran, L. Wissahickon Watershed Improvement Plan. Wm Penn Foundation through Pennsylvania Environmental Council. \$497,384

2014-2018 Toran, L and Herman, E.K. A new classification system for karst springs using storm hysteresis. National Science Foundation (NSF) \$319,478 (\$235,940 to Temple)

2013-2018 Featherstone, J., Mandarano, L., Toran, L., Weir, M. Performance and Effectiveness of Green Infrastructure Stormwater Management Approaches in the Urban Context: A Philadelphia Case Study, Environmental Protection Agency (EPA). \$999,995. (Became PI in 2016)

PROFESSIONAL ACTIVITIES

National Academy of Sciences, Review of the Edwards Aquifer Habitat Conservation Program 2014 – 2018

Franklin Medal selection committee (International Award) 2014-present
Executive Editor, Groundwater, 2021-2023
Editorial board, Groundwater, 1990-1992, & 1997-2020
Technical Program Committee, Geological Society of America 2004-2006
Board of Directors, Consortium of Universities for Advancement of Hydrologic Research, Inc. (CUAHSI), 2005-2008
Editorial board, Hydrogeology Journal, 2003-2007
National Science Foundation Panelist (1995, 1996, 1998, 2000-2003, 2013, 2017)
National Academy of Sciences, Committee on Accelerated Cleanup of High Level Radioactive Waste 2003-2004
Geological Society of America O.E. Meinzer Award selection committee 2001-2003
American Geophysical Union Spring Meeting Program Chair- Hydrology 2000
Associate Editor, Water Resources Research, Oct 1996 - 2000
Homepage editor, American Geophysical Union Hydrology Section 1996-1999
Registered Professional Geologist, Pennsylvania
Certified Drone Pilot

UNIVERSITY SERVICE

University Tenure and Promotion Committee 2021-2022
College merit committee, 2006-2011, 2018-2020
College Space Committee, 2018
University Climate Leadership Working Group, 2017
Environmental Science Program Director, 2008- 2017
College tenure and promotion committee, 2010-2016 (chair 2012- 2016)
Faculty Steering Committee, Research provost office, 2012-2014
Visual Temple Committee on Emerging Disciplines, 2013
Presidential Committee on Dysfunctional Rules, 2009-2010
Executive Committee, University Academic Planning 2008-2009
Gened executive committee, 2005-2007
Library Prize committee, 2010
University Marshall, 2007- 2012
Environmental Studies committee, 1997-2008
Department. web master 1997-2017
Department alumni newsletter 2005-2013
Freshman Summer Reading Program, 2004-2006
Graduate committee, 2000-2003 (oversaw conversion of program from MA to MS degree)
Intro Geology lab book coordinator, 2000-2007
Facilitated founding of student chapter of AIPG, 2006
Online learning faculty, 1998-2000

CST faculty responsibility committee, 2003-2004, 2015

COURSES TAUGHT: Groundwater Hydrology, Advanced Hydrogeology, Groundwater Modeling, Environmental Science Senior Seminar, Climate Change, Physical Geology, Drone Shortcourse

PEER-REVIEWED PUBLICATIONS:

Kirker, A.N. and Toran, L., 2023. When impervious cover doesn't predict urban runoff: Lessons from distributed overland flow modeling. *Journal of Hydrology*, 621, p.129539. DOI: 10.1016/j.jhydrol.2023.129539

Donaghue, A.G., Morgan, N., Toran, L., and McKenzie, E.R., 2023. *In situ* monitoring of internal water storage reveals nitrogen first flush phenomena, intermittent denitrification, and seasonal ammonium flushing. *Journal of Environmental Management*, 341: 117957. doi.org/10.1016/j.jenvman.2023.117957

Oswald, C.J., Kelleher, C., Ledford, S.H., Hopkins, K.G., Sytsma, A., Tetzlaff, D., Toran, L., Voter, C., 2023. Integrating urban water fluxes and moving beyond impervious surface cover: A review. *Journal of Hydrology*, 618: doi.org/10.1016/j.jhydrol.2023.129188

C. Eric Humphrey, C.E., Gardner, P.M., Spangler, L.E., Nelson, N.C., Toran, L. Solomon, D.K., 2023. Quantifying stream-loss recovery in a spring using dual-tracer injections in the Snake Creek Drainage, Great Basin National Park, Nevada, USA. *Hydrogeology Journal*, 31: 1-16.

Kirker, A.N. and Toran, L. 2023. Dual isotopes of nitrate reveal varying flow paths to stormwater retention basins. *Catena* 220: 106681. doi.org/10.1016/j.catena.2022.106681

Covington, M.D., Martin, J.D., Toran, L., Macalady, J.L., Sekhon, N., Sullivan, P.L., Garcia Jr., A.A., Heffernan, J.B., and Graham, W.D. 2022. Carbonates in the Critical Zone. *Earth's Future* 11(1) DOI: 10.1029/2022EF002765

Pope, G.G., Nyquist, J.E., and Toran, L. 2023. Time lapse resistivity monitoring of a simulated runoff test in a bioswale located in Philadelphia, PA. *Journal of Sustainable Water in the Built Environment*. 9(1): 04022018

Donaghue, A.G. ,Morgan, N., Toran, L., and McKenzie, E.R., 2022. The impact of bioretention column internal water storage underdrain height on denitrification under continuous and transient flow. *Water Research*, 214: 118205. https://doi.org/10.1016/j.watres.2022.118205

Ledford, S.H. Diamond, J.S., and Toran, L. 2021. Large spatiotemporal variability in metabolic regimes for an urban stream draining four wastewater treatment plants with implications for dissolved oxygen monitoring. *PLOS ONE*. 16(8) e0256292 https://doi.org/10.1371/journal.pone.0256292

Martin, J.B., Carton De Grammont, P., Covington, M.D., and Toran, L. 2021. A new focus on the neglected carbonate critical zone. *EOS*, 102. https://doi.org/10.1029/2021EO163388

- Beganskas, S., and Toran, L. 2021. Urban stream temperature patterns: Spatial and temporal heterogeneity in the Philadelphia region, Pennsylvania, USA. *Hydrological Processes*. 35(2): e14039
- Ledford, S.H. Kurz, M., and Toran, L. 2021. Contrasting Raz–Rru stream metabolism and nutrient uptake downstream of urban wastewater effluent sites. *Freshwater Science*. 40(1): 103-119
- Beganskas, S., Ryan, R.J., Walters, E., Soro, M., Cushman, E., and Toran, L. 2021 Coupling PCSWMM and WASP to Evaluate Green Stormwater Infrastructure Impacts to Storm Sediment Loads in an Urban Watershed. *Journal of the American Water Resources Association*. 57 (1): 134-153.
- Martin, J.B., Covington, M., Toran, L., Carton de Grammont, P., and Wicks, C. 2021. Carbonate Critical Zone Research Coordination Network Workshop Report. *Karst Waters Institute Special Publication* 20, 19 pp.
- Pearsall, H. et al., 2021. Perspective: Advancing equitable health and well-being across urban-rural sustainable infrastructure systems. *Urban Sustainability* 1(1): 1-6.
- Berglund, J.L., Toran, L. and Herman, E.K., 2020. Can Karst Conduit Models be Calibrated? A Dual Approach Using Dye Tracing and Temperature. *Groundwater*. 58:924-937.
- Ledford, S.H. and Toran, L. 2020. Downstream evolution of wastewater treatment plant nutrient signals using high-temporal monitoring. *Hydrological Processes* 34: 852-864.
- Toran, L. 2019. Groundwater-surface water interactions. In Maurice, P. ed. *Encyclopedia of Encyclopedia of Water: Science, Technology, and Society*. John Wiley and Sons. <https://doi.org/10.1002/9781119300762.wsts0027>
- Guo, L., Lin, H., Fan, B., Nyquist, J., Toran, L., Mount, G.J., 2019. Preferential flow through shallow fractured bedrock and a 3D fill-and-spill model of hillslope subsurface hydrology. *Journal of Hydrology* 576: 430-442.
- Rossi, R.J. and Toran, L. 2019. Exploring the potential for groundwater inundation in coastal US cities due to interactions between sewer infrastructure and global change. *Environmental Earth Sciences* 78: 258. <https://doi.org/10.1007/s12665-019-8261-9>
- Berglund, J.L., Toran, L., and Herman, E.K. 2019. Deducing Flow Path Mixing by Storm-Induced Bulk Chemistry and REE Variations in Two Karst Springs: With Trends Like These Who Needs Anomalies? *Journal of Hydrology*, 571: 349-364.
- Arnold, E., & Toran, L. 2018. Effects of Bank Vegetation and Incision on Erosion Rates in an Urban Stream. *Water*, 10(4), 482.
- Nyquist, J. E., Toran, L., Pitman, L., Guo, L., & Lin, H. 2018. Testing the fill-and-spill model of subsurface lateral flow using ground-penetrating radar and dye tracing. *Vadose Zone Journal*, 17(1).
- Berglund, J.L., Toran, L., and Herman, E.K. 2018. Using stable isotopes to distinguish sinkhole and diffuse storm infiltration in two adjacent springs. In Sasowsky, I.D., Byle, M. and Land, L. Eds. 15th *Sinkhole Conference Proceedings*. National Cave and Karst Research Institute.

Price, J. R., Ledford, S. H., Ryan, M. O., Toran, L., & Sales, C. M. 2018. Wastewater treatment plant effluent introduces recoverable shifts in microbial community composition in receiving streams. *Science of the Total Environment*, 613, 1104-1116.

Toran, L., Herman, E.K., and Berglund, J.L. 2018. Advances in monitoring to understand flow paths in karst: comparison of historic and recent data from the Valley and Ridge of Pennsylvania. In: Younos, T., Schreiber, M., Kosic-Ficco, K. Eds. 2018. *Karst Water Environment: Advances in Research, Management and Policy*. Handbook of Environmental Chemistry Series V 68. Heidelberg, Germany: Springer International.

Toran, L. and Jedrzejczyk, C. 2017. Water level monitoring to assess the effectiveness of stormwater infiltration trenches. *Environmental and Engineering Geosciences*. 23(2): 113-124.

Toran, L. 2016. Water level loggers as a low-cost tool for monitoring of stormwater control measures. *Water*. 8, 346; doi:10.3390/w8080346 (10 pp)

Klein, TI, and Toran, L. 2016. Collocation of hydrological and biological attenuation of nitrate in an urban stream. *Hydrological Processes*. 30(17): 2948-2957.

Toran, L., Nyquist, J., Rosenberry, D., Gagliano, M., Mitchell, N., & Mikochik, J., 2015. Geophysical and Hydrologic Studies of Lake Seepage Variability. *Groundwater*. 53(6): 841-850. DOI: 10.1111/gwat.12309

Reisch, C. E. and Toran, L., 2014. Characterizing snowmelt anomalies in hydrochemographs of a karst spring, Cumberland Valley, Pennsylvania (USA): evidence for a changing recharge pathways. *Environmental Earth Science* 72(1): 47-58.

Toran, L., and Reisch, C. E., 2013. Using Stormwater Hysteresis to Characterize Karst Spring Discharge. *Ground Water* 51: 575-587.

Toran, L., Hughes, B., Nyquist, J., and Ryan, R., 2013. Freeze Core Sampling to Validate Time-Lapse Resistivity Monitoring of the Hyporheic Zone. *Ground Water*, 51: 635-640.

Herman, E. K., Toran, L., and White, W. B., 2012. Clastic sediment transport and storage in fluviokarst aquifers: an essential component of karst hydrogeology. *Carbonates and Evaporites*, 27(3-4), 211-241.

Toran, L., Hughes, B., Nyquist, J.E. Ryan, R. 2012. Using hydrogeophysics to monitor change in hyporheic flow around stream restoration structures. *Environmental & Engineering Geoscience*, 18, 83-97.

Toran, L., Nyquist, J.E., Fang, A. C., Ryan, R.J., and Rosenberry, D.O. 2012. Observing heterogeneity in hyporheic flow with electrical resistivity and subsurface well sampling during a stream tracer test. *Hydrologic Processes*, DOI: 10.1002/hyp.9269.

Rosenberry, D.O., Toran, L., and Nyquist, J.E. 2010. The effect of surficial disturbance on exchange between groundwater and surface water in near-shore margins. *Water Resources Research*, 46, W06518, doi:10.1029/2009WR008755.

Toran, L, Johnson, M., Nyquist, J., and Rosenberry, D. 2010. Delineating a road salt plume in lakebed sediments using electrical resistivity, piezometers, and seepage meters at Mirror Lake, NH. *Geophysics*, 75 (4), 73-85.

Nyquist, J., Heaney, M. and Toran, L, 2009. Characterizing Lakebed Seepage and Geologic Heterogeneity Using Resistivity Imaging and Temperature Measurements. *Near Surface Geophysics*. 7 (5-6): 487-498.

Herman, E.K., Toran, L., and White, W.B., 2009. Quantifying the place of karst aquifers in the groundwater to surface water continuum: a time series analysis study of storm response in Pennsylvania water resources. *Journal of Hydrology*, 376 (1-2), 307-317.

Gagliano, M., Nyquist, J., Toran, L., Rosenberry, D. 2009 Assessment of electrical resistivity method to map groundwater seepage zones in heterogeneous sediments. *Proceedings of the Annual Symposium on the Application of Geophysics to Engineering and Environmental Problems*. 9 pp.

Toran, L., Gross, K., and Yang, Y. 2009. Effects of restricted recharge in and urban karst system. *Environmental Geology*. DOI 10.1007/s00254-008-1500-0, 58: 131-139.

Mitchell, N., Nyquist, J., Toran, L., Rosenberry, D., and Mikochik, J. 2008. Electrical resistivity as a tool for identifying geologic heterogeneities which control seepage at Mirror Lake, NH. *Proceedings of the Annual Symposium on the Application of Geophysics to Engineering and Environmental Problems*, 11 pp.

Nyquist, J. E., Freyer, P. A., and Toran, L. , 2008 Stream Bottom Resistivity Tomography to Map Ground-Water Discharge. *Ground Water*, 46 (4), 561-569.

Herman, E.K., Toran, L., and White, W.B., 2008 Threshold events in spring discharge: evidence from sediment and continuous water level measurement. *Journal of Hydrology*. 351 (1-2), 98-106.

Heaney, Matthew J., Nyquist, Jonathan E., and Toran, Laura, 2007. Marine resistivity as a tool for characterizing zones of seepage at Lake Lacawac, PA. *Proceedings of the Annual Symposium on the Application of Geophysics to Engineering and Environmental Problems* Reno, Nevada, March 23-26, 1997, 11 pp.

Toran, L, Herman, E.K., and White, W.B., 2007. Comparison of Flow Paths to a Well and Spring in a Karst Aquifer. *Ground Water*. 45: 281-287.

- Fan, Y., Toran, L., and Schlische, R. 2007. Groundwater flow and groundwater-stream interaction in fractured and dipping sedimentary rocks: insights from numerical models. *Water Resources Research*. 43: doi:10.1029/2006wr004864
- Toran, L. and Grandstaff, D. 2007. Variation of nitrogen concentrations in stormpipe discharge in a residential watershed. *Journal of the American Water Resources Association*. 43(3): 630-641.
- Herman, EK Tancredi, JH, Toran, L and White, WB, 2007. Mineralogy of suspended sediment in karst springs in relation to spring water chemistry. *Hydrogeology Journal*. 15: 255-266
- Freyer, Paul A., Nyquist, Jonathan E., and Toran, Laura, 2006. Use of underwater resistivity in the assessment of groundwater-surface water interaction within the Burd Run Watershed. *Proceedings of the Annual Symposium on the Application of Geophysics to Engineering and Environmental Problems*, Seattle, Washington, April 2-6, 2006, 8 pp.
- Ham, Jeffrey, Toran, Laura, and Cruz, Jay, 2006. Effect of upstream ponds on stream temperature. *Environmental Geology*. DOI: 10.1007/s00254-006-0186-4
- Toran, L., Tancredi, J., Herman, E.K., and White, W.B. 2006. Conductivity and sediment variation during storms as evidence for pathways in karst springs. *Geological Society of America Special Paper 404* in honor of Derek Ford and William B. White, no 14: 169-176.
- Toran, L., and Roman, E. 2006. CO₂ outgassing in a combined fracture and conduit karst aquifer near Lititz Spring, PA. *Geological Society of America Special Paper 404* in honor of Derek Ford and William B. White, no 23: 275-282.
- Toran, L and White W B. 2005. Variation in nitrate and calcium as indicators of recharge pathways in Nolte Spring, PA. *Environmental Geology*. 48: 854-860.
- Grassi, V., Toran, L., Stevens, G., Bednar, A., and Young, C., 2005. A case study of uranium mobility in groundwater at the Dupont Chambers works site. *Waste Management 05 Conference*, February-March 3, 2005, Tucson, AZ, WM-5355.
- Toran, L. and Hooper, R. 2005. Forum: What's new with CUAHSI? *Ground Water* 42: 638-640.
- Toran, Laura, Lipka, Charles, Baehr, Arthur, Reilly, Timothy, and Baker, Ronald. 2003. Seasonal and daily variations in concentrations of methyl-tertiary-butyl ether (MTBE) at Cranberry Lake, New Jersey. *Water Research*. 37: 3756-3766.
- Toran, Laura. 2003. Book Review: Groundwater Science by Charles Fitts. *Ground Water*. 41: 406.
- Toran, Laura and Grandstaff, David. 2002. PHREEQC and PHREEQCI: Geochemical Modeling with an Interactive Interface. *Ground Water*. 40: 462-464.

- Toran, Laura and Colten-Bradley, Virginia. 2000. Evaluation of hydrogeochemical conditions for development of nuclear criticality in low-level waste disposal facilities. *Ground Water Monitoring and Remediation*. 20(3): 58-67.
- Toran, Laura. 2000. CRAFT: A computer program for calibrating CRAFLUSH, a 1D fracture flow and transport model. *Ground Water*. 38: 430-434.
- Heebner, David and Laura Toran. 2000. Sensitivity analysis of 3-dimensional steady-state and transient spray irrigation models. *Ground Water*. 38: 20-28
- Toran, Laura and James A Saunders, 1999. Modeling alternate evolution paths of Na-HCO₃-type ground water near Oak Ridge, Tennessee. *Hydrogeology Journal*, 7: 355-364.
- Toran, L.E., Bryant, S.L., Saunders, J.A., and Wheeler, M.F., 1998. Sr mobility under variable pH: Application of a coupled geochemistry and transport model. *Ground Water*. 36: 404-408.
- Stafford, P.L., Toran, L.E., and McKay, L.D., 1998. Influence of fracture truncation on dispersion: A dual permeability model. *Journal of Contaminant Hydrology*. 30/1-2: 79-100.
- McKay, L.D., Stafford, P.L. and Toran, L.E., 1997. EPM modeling of a field-scale tritium tracer experiment in fractured, weathered shale. *Ground Water*. 35:997-1007.
- James, B.R., Gwo, J.-P., and Toran, L.E., 1996. An economic decision framework for aquifer remediation design. *ASCE Journal of Water Resources Planning and Management*. 144: 404-420.
- Gwo, J.-P., Toran, L.E., Morris, M.D., and Wilson, G.V., 1996. Subsurface stormflow modeling with sensitivity analysis using a Latin-hypercube sampling technique. *Ground Water*. 34: 811- 818.
- Toran, L.E. and Sjoreen, A.L., 1996. CHEMFORM: A formatting program for geochemical data. *Ground Water*, 34: 552-553.
- Toran, L.E., Sjoreen, A.L., and Morris, M.D., 1995. Sensitivity analysis of solute transport in fractured porous media. *Geophys. Res. Let.*, 22: 1433-1436.
- Saunders, J.A. and Toran, L.E. 1995. Modeling of radionuclide and heavy metal sorption around low- and high-pH waste disposal sites at Oak Ridge, Tennessee. *Applied Geochem.*, 10: 673-684.
- Toran, L.E., 1994. Radionuclide contamination in groundwater: Is there a problem? In *Groundwater Contamination and Control*, U. Zoller, ed. New York: Marcel Dekker. pp 437-455.
- Saunders, J.A. and Toran, L.E., 1994. Evidence of dedolomitization and mixing in Paleozoic carbonates near Oak Ridge, Tennessee. *Ground Water*. 32: 207-214.
- Toran, L.E., 1994. Discussion of "The use of conditional simulation in nuclear waste site performance assessment" by Carol A. Gotway. *Technometrics*. 36: 150-152.
- Drake, J.B., Geist, G.A., Hicks, H.R., Kliever, K.L., Stocks, G.M., Toran, L.E., and Worley, P.H., 1993. Centers of supercomputing -- The Center for Computational Sciences (CCS) at Oak Ridge National Laboratory (ORNL). *International Journal of Supercomputing*. 7: 3-14.

Toran, L.E., 1993. Book Review of Ground-water microbiology and geochemistry by Francis H. Chapelle. *Ground Water*, v. 31: 685.

Toran, L.E. and Palumbo, A.V. 1992. Transport of bacteria-sized particles through fractured and unfractured laboratory sand columns. *Journal of Contaminant Hydrology*, 9: 289-303.

Toran, L. and Harris, R.F., 1989. Interpretation of sulfur and oxygen isotopes in biological and abiological sulfide oxidation. *Geochemica Cosmochemica et Acta*, 53, 2341-2348.

Toran, L., 1989. Carbon isotope mass transfer as evidence for contaminant dilution. In R.L. Bassett and D.C. Melchior, eds. *Chemical Modeling in Aqueous Systems II*. ACS Symposium Series 416, Chapter 14, 190-201.

Toran, L. and Bradbury, K.R., 1988. Groundwater flow model of drawdown and recovery near an underground mine. *Ground Water*, v. 26, 724-733.

Toran, L., 1987. Sulfate contamination in groundwater from a carbonate-hosted mine. *Journal of Contaminant Hydrology*, 2:1-29.

Toran, L., 1982. Isotopes in ground-water investigations. *Ground Water*, 20:740-745.

Not listed: Over 20 reports, mostly from ORNL

RECENT ABSTRACTS (Last 6 years only)

Toran, L. and Ledford, S. 2023. Marching to different drummers: nitrate and phosphorous variation downstream of WWTPs in an urban stream. Gordon Research Conference on Catchment Science, Andover NH, June 18-23, 2023.

Kirker, A.N. and Toran, L. 2023. Lessons from distributed overland flow modeling: Why impervious cover doesn't predict urban runoff. Gordon Research Conference on Catchment Science, Andover NH, June 18-23, 2023.

Moore, J., Bain, D., Duncan, J., Fork, M., Gomes, M., Groffman, P., Hopkins, K., Miller, A., O'Donnell, E., Prestegard, K., Shanley, J., Toran, L., and Welty, C., 2023. Elevated sulfate concentrations in urban streams: an underexplored and important phenomenon. Gordon Research Conference on Catchment Science, Andover NH, June 18-23, 2023.

Kirker, A.N., Toran, L., and Cushman, L. 2023. Can we quantify reductions in sediment and nutrients due to stormwater control measures? A pre- and post-installation study on an urban hillslope. Joint Southeastern/Northeastern Section Geological Society of America Meeting, Reston, VA March 17-19, 2023.

Tannert-Schmidt, Emilie, Kirker, A.N., and Toran, L. 2023. Dust variation along an urban gradient in Philadelphia. Joint Southeastern/Northeastern Section Geological Society of America Meeting, Reston, VA March 17-19, 2023.

Ledford, S.H., Fanelli, R., Hopkins, K., Kelleher, C., Oswald, C., Sytsma, A., Tetziuff, D., Toran, L., and Voter, C.B., 2022. The need for integrated critical zone process understanding of water flow in cities. AGU Fall Meeting Chicago, Dec 12-16, 2022.

Raabe, M., Caplan, J.S., Mohanty, S.K., Toran, L., and Ravi, S., 2022. Amending bioswale soil media with biochar mitigated the negative effects of compaction on hydraulic conductivity. Villanova Stormwater Symposium, Oct 12-13, 2022.

Lam, E., Lynn, C., Toran, L., and Traver, R. 2022. I-95 Girard Avenue Interchange Stormwater Project: Lessons learned from collaborative research. Villanova Stormwater Symposium, Oct 12-13, 2022.

Davatzes, A., Ravi, S., Toran, L., and Tumarkin-Deratzian, A., 2022. Development of an alternative inclusive field camp. Geological Society of America Annual Meeting, Denver, CO, Oct 9-12, 2022.

Kirker, A.N. and Toran, L. 2021. Hydrologic Modeling to Identify Timing of Source Area Contributions to an Urban Stormwater Basin. AGU Fall Meeting New Orleans, Dec 13-17, 2021

Raabe, M., Caplan, J., Mohanty, S.K., Toran, L. and Ravi, S. 2021. Biochar alleviates the negative impact of compaction on hydraulic conductivity in a roadside bioswale. AGU Fall Meeting New Orleans, Dec 13-17, 2021

Pope, G., Caplan, J., Nyquist, Toran, L., and Eisenman, S.W. 2021. Spatiotemporal Patterns of Soil Electrical Conductivity in a Highway Stormwater Catchment Implicate Deicing Salts in Impaired Vegetation Performance. AGU Fall Meeting New Orleans, Dec 13-17, 2021

Weniger, A., M-H., Prestegard, K.L., Volz, S., Hudson-Rasmussen, B., Welty, C. and Toran, L. 2021. Using Seismic Refraction to Characterize the Urban Critical Zone in Eastern U.S. Watersheds. AGU Fall Meeting New Orleans, Dec 13-17, 2021.

Ledford, S.H., Diamond, J. and Toran, L. 2021. Spatiotemporal Heterogeneities In Metabolism Around Urban Wastewater Treatment Plants Are Missed With Current Regulatory Assessments. AGU Fall Meeting New Orleans, Dec 13-17, 2021.

Pope, G., Toran, L., and Nyquist, J. 2021. Hysteresis: Implications for soil moisture estimates based on electrical conductivity Symposium on Application of proximal and remote sensing technology for soil investigations. EEGS-SEG Aug 16-19 2021

Pope, G., Toran, L., and Nyquist, J. 2021. Time-lapse resistivity monitoring of a simulated runoff test of a bioswale in Philadelphia, Pennsylvania. Symposium on the Application of Geophysics to Engineering and Environmental Problems. March 14-19, 2021

Morgan, N., Toran, L., Donaghue, A., and McKenzie, E. 2021. Stable Isotope Analysis of Nitrate Patterns in Bioretention Basins, Northeastern Section Geological Society of America Meeting. March 14-16, 2021

Kirker, A and Toran, L. 2021. Using dual isotopes to identify sources of nitrate in suburban Philadelphia stormwater retention basins, Northeastern Section Geological Society of America Meeting. March 14-16, 2021

Ledford, S, Diamond, J., and Toran, L. 2021. Spatiotemporal variability in stream metabolism downstream of wastewater treatment plants. Society for Freshwater Science Annual Meeting , May 23-27.

Toran, L. and Beganskas, S. 2019. Evaluating relationships between land cover, stream temperature, and stormwater management at local and watershed scales in four urban catchments near Philadelphia, PA. American Geophysical Union Annual Meeting, San Francisco, CA 9-13 December.

Beganskas, S., Ryan, R.J., Walters, E., Soro, M., Toran, L. and Cushman, L. 2019. Combining SWMM and WASP modeling with high-resolution field measurements to evaluate stream water quality under different stormwater management scenarios in the Wissahickon Creek watershed, PA. American Geophysical Union Annual Meeting, San Francisco, CA 9-13 December.

Browning, C. and 13 coauthors. 2019. Thermal retardation in karst aquifers: Field observations. American Geophysical Union Annual Meeting, San Francisco, CA 9-13 December.

Becker, S.M and 12 coauthors. 2019. Field analysis of thermal retardation in karst aquifers. Geological Society of America Annual Meeting, Phoenix, AZ, 22-25 September.

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