

Scott D. Hamshaw, P.E., Ph.D.

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EDUCATION

PH.D., CIVIL & ENVIRONMENTAL ENGINEERING University of Vermont, Burlington, VT Dissertation: "Fluvial Processes in Motion: Measuring Streambank Erosion and Suspended Sediment Flux with Advanced Geomatics and Machine Learning"	2018
M.S., CIVIL & ENVIRONMENTAL ENGINEERING University of Vermont, Burlington, VT Thesis: "Suspended Sediment Prediction Using Artificial Neural Networks and Local Hydrometeorological Data"	2014
B.S., CIVIL ENGINEERING, <i>cum laude</i> University of Vermont, Burlington, VT Area of Concentration: Environmental Engineering	2006
B.A., ENGINEERING, <i>magna cum laude</i> St. Michael's College, Colchester, VT Minor: Mathematics	2006

RESEARCH INTERESTS

The application of advanced computational methods and field investigations to mitigate or prevent environmental problems. Use of artificial neural networks including deep belief networks, counter-propagation networks, and self-organizing maps to enhance understanding of hydrological data. Identifying spatial and temporal patterns in meteorological sensor data using machine learning approaches. Understanding the spatial extent and rate of streambank erosion using advanced surveying methods and estimating its impact on water quality. Bayesian methods for data-driven modeling and quantifying the uncertainty in estimates of watershed erosion and sediment transport.

RESEARCH EXPERIENCE

POST-DOCTORAL ASSOCIATE University of Vermont, Vermont EPSCoR, Burlington, VT <i>Basin Resilience to Extreme Events (BREE) Project</i> Investigation of the use of machine learning and deep learning methods with hydrological data to learn about watershed processes and inform agent based modeling.	2017 – Present
GRADUATE RESEARCH ASSISTANT University of Vermont, School of Engineering, Burlington, VT <i>Characterization and prediction of suspended sediment flux using artificial neural networks</i> This study investigates of use of artificial neural networks and deep learning for prediction of suspended sediment in river systems. Field data collection on the Mad River in Vermont including collection of turbidity, stage, discharge, TSS, and meteorological data. <i>System-wide rapid quantification of streambank erosion using unmanned aerial systems</i> Investigation of suitability of unmanned aerial system (UAS) for measurement of streambank erosion. Collection and analysis of 3D point cloud data collected using UAS and terrestrial laser scanner in the Mad River watershed.	2011 – 2017

SPATIAL ANALYST

2011 – 2012

University of Vermont, Department of Community Development & Applied Economics, Burlington, VT
Building Resilience through Community-based Action Research: Identifying Vulnerabilities and Facilitating Change in Rural Mobile Home Parks, P.I. Dan Baker

As part of a three-year USDA Disaster Resilience for Rural Communities Grant, performed GIS spatial analysis of the risk of Vermont mobile home park communities to natural hazards including floods.

AWARDS/HONORS

Switzer Environmental Fellowship	2015
National Science Foundation Graduate Research Fellowship	2011 – 2016
Edward H. Phelps Award, University of Vermont	2006
Chi Epsilon Civil Engineering Honor Society	
Tau Beta Pi Engineering Honor Society	

TEACHING EXPERIENCE

CE10 – GEOMATICS	2016
(Fall 2016) Instructor, 4 credits, 81 Students, two lecture sections, four lab sections <i>Sophomore level engineering course introducing land surveying and mapping for engineering applications</i> Teaching evaluation: 4.7/5.0	

STUDENT MENTORING & SUPERVISING

Graduate teaching assistant, Ian Anderson, <i>University of Vermont</i>	2016
Undergraduate teaching assistant, Jeff Lewis, <i>University of Vermont</i>	2016
Undergraduate VT EPSCoR Internships, Mike Greenough, Christina Gandia, Carly Robbins, Joanne Velez Otoro <i>University of Vermont</i>	2016
M.S. Civil & Environmental Engineering Student, Thomas Bryce, <i>University of Vermont</i>	2016
Undergraduate VT EPSCoR Internships, Wimara Rubia Sa Gomes, <i>University of Vermont</i>	2015
Undergraduate Barrett Internships, Anna Waldron, Kira Kelley, <i>University of Vermont</i>	2015
Undergraduate VT EPSCoR Internships, Nathan Callas, Alex Morton, Hanna Anderson, <i>University of Vermont</i>	2014
Undergraduate Barrett Internships, Hanna Anderson, <i>University of Vermont</i>	2013

PROFESSIONAL EXPERIENCE

CIVIL ENGINEER	2007 – 2010
Engineered Solutions, Inc., Winooski, VT Responsible for permitting, design, and management for diverse array of civil engineering projects including water distribution, wastewater systems, site and roadway design, stormwater, and erosion control.	

PROJECT ENGINEER	2005 – 2009
University of Vermont, Department of Community Development & Applied Economics, Burlington, VT Traveled to Honduras multiple times. Examined community water systems and developed design for slow sand filter to purify drinking water. Oversaw construction and startup of filter. Performed follow-up visits in 2008 and 2009 to assess operation and maintenance of the filter and provide further training to water system operators	

PEER-REVIEWED PUBLICATIONS

Hamshaw S.D., Bryce T., Rizzo, D.M., O'Neil-Dunne, J., Frolik, J., & Dewoolkar, M. (2017). Quantifying streambank movement and topography using unmanned aircraft system (UAS) photogrammetry with comparison to terrestrial laser scanning (TLS). *River Research & Applications*, 33(8)
doi.org/10.1002/rra.3183

Baker, D., **Hamshaw, S. D.**, and Hamshaw, K. (2014). Rapid Flood Exposure Assessment of Vermont Mobile Home Parks Following Tropical Storm Irene. *Natural Hazards Review*, 15(1).
[doi.org/10.1061/\(ASCE\)NH.1527-6996.0000112](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000112)

SUBMITTED AND IN PROGRESS MANUSCRIPTS

Ross, D.S., Wemple, B.C., Willson, L.J., Balling, C., Underwood, K.L., & **Hamshaw, S.D.** (2017) Tropical Storm Irene's Impact on Streambank Erosion and Phosphorus Loads in Vermont's Mad River. *Journal of Geophysical Research: Biogeosciences*. Under Review

Hamshaw, S.D., Engel, T., Rizzo, D., O'Neil-Dunne, J., & Dewoolkar, M.M. (2017) Application of unmanned aircraft systems for streambank erosion monitoring along river corridors. *Geomatics, Natural Hazards, & Risk*. Under Review.

Hamshaw, S.D., Dewoolkar, M.M., Schroth, A.W., Wemple, B.C., & Rizzo, D.M., (2017). A new machine-learning approach for classifying hysteresis in suspended sediment-discharge relationships using high-frequency monitoring data. *Environmental Science & Technology*. Under Review

Hamshaw, S.D. & Rizzo, D.M. (2017). Predicting suspended sediment loads in a river using hydrometeorological variables and counterpropagation neural networks. *Hydrological Processes*. Under Review

REFEREED CONFERENCE PAPERS

Hamshaw S.D., Bryce T., O'Neil-Dunne, J., Rizzo, D.M., Frolik, J., Engel, T. & Dewoolkar, M. (2017) *Quantifying streambank erosion using unmanned aerial systems at the site-specific and river network scales*. Paper presented at the Geotechnical Frontiers conference, Orlando, FL. doi.org/10.1061/9780784480458.051

Hamshaw, S.D. (2005). The Lamoille Valley Railroad, Past, Present, and Future. *Proceedings of the New England-St. Lawrence Valley Geographical Society*. Paper presented at The NESTVAL Annual Conference, Portland, ME

ACADEMIC PRESENTATIONS

Hamshaw, S.D., Rizzo, D.M., Underwood, K.L., Wemple, B.C. (2016). *Classification and prediction of event-based suspended sediment dynamics using artificial neural networks*. (Poster), American Geophysical Union 2016 Fall Meeting, San Francisco, California.

Hamshaw, S. D., Dewoolkar, M., Rizzo, D. M., O'Neil-Dunne, J., Rizzo, D.M., Frolik, J., Underwood, K.L., Bryce, T., & Engel, T. (2016). *Comparison of Unmanned Aircraft Systems (UAS) to Lidar for Streambank Erosion Measurement at the Site-Specific Scale*. (Poster), American Geophysical Union 2016 Fall Meeting, San Francisco, California.

Hamshaw, S.D., Guilbert, J., Rizzo, D.M., Bomblies, A. (2016). *Prediction of suspended sediment in rivers using artificial neural networks and future climate scenarios*. (Poster), NOAA's 14th Annual Climate Prediction Applications Science Workshop, Burlington, Vermont.

Hamshaw, S. D., Dewoolkar, M., Rizzo, D. M., O'Neil-Dunne, J., Rizzo, D.M., Frolik, J., Underwood, K.L., Bryce, T., Engel, T., & Waldron, A. (2015). *Quantifying streambank erosion: a comparative study using an unmanned aerial system (UAS) and a terrestrial laser scanner*. (Poster), American Geophysical Union 2015 Fall Meeting, San Francisco, California.

- Hamshaw, S.D.**, Underwood, K.L., Rizzo, D.M., Dewoolkar, M. (2015). *Sediment Loading and Sources in the Mad River: Implications for sediment-bound nutrient management*. (Poster), International Association for Great Lakes Research 58th Annual Conference, Burlington, Vermont.
- Hamshaw, S. D.**, Underwood, K. L., Rizzo, D. M., Wemple, B. C., & Dewoolkar, M. (2014). *Using Distributed Continuous Turbidity Monitoring to Inform Sediment and Sediment-bound Nutrient Budgets in a Small Watershed*. (Poster), American Geophysical Union 2014 Fall Meeting, San Francisco, California.
- Anderson, H. V., **Hamshaw, S. D.**, Rizzo, D. M., Dewoolkar, M., Schroth, A., Bomblies, A., Miatke, B. (2014). *Quantifying Sediment and Phosphorous Loading from Streambank Erosion using Terrestrial Laser Scanning to Support Sediment and Nutrient Budgets*. (Poster), American Geophysical Union 2014 Fall Meeting, San Francisco, California.
- Hamshaw, S. D.**, Rizzo, D. M., Underwood, K. L., Wemple, B. C., & Dewoolkar, M. (2014). *Suspended Sediment Prediction Using Artificial Neural Networks and Local Hydrometeorological Data*. (Poster), New England Association of Environmental Biologists 2014 Conference, Burlington, Vermont
- Hamshaw, S. D.**, Rizzo, D. M., Underwood, K. L., Wemple, B. C., & Dewoolkar, M. (2014). *High Frequency Turbidity Monitoring to Quantify Sediment Loading in the Mad River*. New England Association of Environmental Biologists 2014 Conference, Burlington, Vermont
- Hamshaw, S. D.**, Underwood, K. L., Rizzo, D. M., Wemple, B. C., & Dewoolkar, M. (2013). *Prediction of suspended sediment in rivers using artificial neural networks: Implications for development of sediment budgets*. American Geophysical Union 2013 Fall Meeting, San Francisco, California.
- Anderson, H. V., **Hamshaw, S. D.**, Underwood, K. L., Rizzo, D. M., Dewoolkar, M., Bomblies, A., Wemple, B. C. (2013). *Terrestrial LiDAR Used to Quantify Streambank Erosion*. (Poster), American Geophysical Union 2013 Fall Meeting, San Francisco, California.
- Baker, D., Hamshaw, K., & **Hamshaw, S. D.** (2013). *Building Resilience to Disaster: Learning from the Experience of Vermont's Mobile Home Parks in the Flood Events of 2011*. 38th Annual Natural Hazards Research and Applications Workshop, Broomfield, Colorado.

INVITED AND PROFESSIONAL PRESENTATIONS

- Hamshaw, S.D.** (2017) *Fluvial Processes in Motion: Measuring Streambank Erosion and Suspended Sediment Flux with Advanced Geomatics and Machine Learning*. Invited presentation to the Lake Champlain Basin Program Technical Advisory Committee, Grand Isle, Vermont.
- Hamshaw, S.D.** & Dewoolkar, M. (2016) *Use of Unmanned Aircraft Systems (UAS) to Monitor Streambank Erosion in Vermont*. Invited presentation to Vermont Agency of Natural Resources, Montpelier, Vermont.
- Hamshaw, S.D.** (2016). *Terrestrial Laser Scanning Introduction and Demonstration*. 2016 Historic Preservation and Downtown Conference, Montpelier, Vermont
- O'Neil-Dunne, J., & **Hamshaw, S.D.** (2015). *LiDAR roundtable*. Vermont Society of Professional Land Surveyors December Roundtable, Montpelier, Vermont.
- Hamshaw, K., Bond, J., & **Hamshaw, S. D.** (2015). *Strategies for Emergency Planning with Mobile Home Park Communities*. 2015 Vermont Emergency Preparedness Conference, Jay, Vermont.
- Hamshaw, S. D.**, & Baker, D. (2014). *Access to and Use of Maps in Community Planning*. Vermont Mapping Forum, Colchester, VT.
- Hamshaw, S. D.**, Underwood, K. L. Rizzo, D. M., Dewoolkar, M., & Wemple, B. C. (2014). *Research Efforts to understand Sediment and Nutrients in the Mad River Watershed*. Invited presentation to Vermont Agency of Natural Resources and U.S. Geological Survey staff and scientists, Montpelier, Vermont
- Baker, D., Hamshaw, K., Woodward, S., & **Hamshaw, S. D.** (2012). *Emergency Management Issues for Mobile Home Parks*. 2012 Vermont Emergency Preparedness Conference, Killington, Vermont.

Hamshaw, S. D. (2012). *Rapid Assessment of Flood Risk in Vermont Mobile Home Parks*. NEURISA Ignite Spatial Vermont 2012, Montpelier, Vermont.

GUEST LECTURES

GUEST LECTURER – “New Technologies in Remote Sensing & Surveying” 2015, 2017
 University of Vermont – Geomatics Course (CE10)
 Guest lecturer on unmanned aircraft systems (UAS) and terrestrial laser scanners and the use of the technologies in surveying

GUEST LECTURER – “Drinking Water Treatment in Rural Honduras” 2011 – 2012
 St. Michael’s College – Environmental Problems Course (ES201)
 Invited guest lecturer on past research in international development projects related to drinking water in rural Honduras

PROFESSIONAL SOCIETY MEMBERSHIPS

American Society of Civil Engineers, *Student Member*
 American Geophysical Union, *Student Member*
 Engineers without Borders, *Student Member*
 International Association of Great Lakes Research, *Student Member*

CERTIFICATIONS

PROFESSIONAL ENGINEER May 27, 2015
 State of Vermont License No. 100919

ENGINEER IN TRAINING July 7, 2006
 State of Vermont License No. 3355

COMMUNITY SERVICE

Vermont Family Forests, Bristol, VT
 Board of Directors 2017 – Present

The Watershed Center, Bristol, VT
 Secretary, Board of Directors 2011 – Present

AFTER the Track, Hinesburg, VT
 Treasurer, Board of Directors 2015 – Present

Partners of the Americas, Burlington, VT
 Treasurer, Trustee 2006 – Present

Engineers without Borders, Vermont Professional Chapter
 Vice-President 2009-2012