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

307 Mansfield House, 25 Colchester Ave, Burlington, VT 05405 | 802.324.6221 | scott.hamshaw@uvm.edu

EDUCATION

PH.D., CIVIL & ENVIRONMENTAL ENGINEERING — 2018
University of Vermont, Burlington, VT
Dissertation: "Fluvial Processes in Motion: Measuring Streambank Erosion and Suspended Sediment Flux with Advanced Geomatics and Machine Learning"
Advisor: Donna M. Rizzo

M.S., CIVIL & ENVIRONMENTAL ENGINEERING — 2014
University of Vermont, Burlington, VT
Thesis: "Suspended Sediment Prediction Using Artificial Neural Networks and Local Hydrometeorological Data"

B.S., CIVIL ENGINEERING, — 2006
University of Vermont, Burlington, VT
Area of Concentration: Environmental Engineering; *Cum Laude*

B.A., ENGINEERING — 2006
St. Michael's College, Colchester, VT
Minor: Mathematics; *Magna Cum Laude*

APPOINTMENTS

RESEARCH ASSISTANT PROFESSOR — 2019 – PRESENT
Department of Civil & Environmental Engineering
University of Vermont, Burlington, VT

POST-DOCTORAL ASSOCIATE — 2017 – 2019
Vermont EPSCoR, Basin Resilience to Extreme Events (BREE) Project
University of Vermont, Burlington, VT
Researched the application of machine learning methods to water quality sensor data to improve spatial awareness in socio-ecological models. Oversaw undergraduate research interns and mentored graduate students. Taught undergraduate Geomatics course.

RESEARCH ASSISTANT — 2011 – 2017
University of Vermont, School of Engineering, Burlington, VT
As part of PhD dissertation and MS thesis program, investigated the suitability of unmanned aerial system (UAS) for measurement and mapping of streambank erosion. Developed artificial neural networks for prediction of suspended sediment in river systems. Supervised undergraduate research interns as well as taught Geomatics course.

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.

GRANTS & FELLOWSHIPS

AWARDED

CUAHSI Hydroinformatics Innovation Fellowship — 2019

Title: "Improvements to Event-based Analysis of High-Frequency Turbidity and Suspended Sediment Monitoring Data"

PI: **Hamshaw, S.D.**, Award amount: $5,000

Switzer Environmental Fellowship — 2015

Award amount: $15,000

National Science Foundation Graduate Research Fellowship — 2011 – 2016

Award amount: $130,500

IN-REVIEW

National Science Foundation Computer & Information Science and Engineering (CISE): Core Program

Title: "IIS Core: Medium: A Novel Framework for Spatiotemporal Analysis of Complex Time Series Events in Environmental Sensor Data"

PI: Lee, B. Co-PIs: **Hamshaw, S.D.,** Rizzo, D.M.; Award amount: $1,104,002

UVM REACH

Title: "Enhancing Event-based Hydrological Studies through Automating Water Quality Event Detection & Delineation"

PI: **Hamshaw, S.D.** Co-PIs**:** Lee, B.; Award amount: $24,758

National Science Foundation Major Research Infrastructure (MRI) Program

Title: "Acquisition of a Laser Scanning Unmanned Aircraft System"

PI: O'Neil-Dunne, J.P. Co-PIs: **Hamshaw, S.D.**.; Award amount: $180,103

PEER-REVIEWED PUBLICATIONS

Weiss, H., Bierman, P., Dubief, Y., & **Hamshaw, S.D. (**2019). Optimization of over-summer snow storage at low latitudes and low elevations. *The Cryosphere, 13*(12). doi.org/10.5194/tc-13-3367-2019

Hamshaw, S.D., Engel, T., Rizzo, D., O'Neil-Dunne, J., & Dewoolkar, M.M. (2019) Application of unmanned aircraft systems for streambank erosion monitoring along river corridors. *Geomatics, Natural Hazards, & Risk, 10*. doi.org/10.1080/19475705.2019.1571533

Ross, D.S., Wemple, B.C., Willson, L.J., Balling, C., Underwood, K.L, & **Hamshaw, S.D.** (2019) Tropical Storm Irene's Impact on Streambank Erosion and Phosphorus Loads in Vermont's Mad River. *Journal of Geophysical Research: Biogeosciences*. doi.org/10.1029/2018JG004497

Hamshaw, S.D., Dewoolkar, M.M., Schroth, A.W., Wemple, B.C., & Rizzo, D.M., (2018). A new machine-learning approach for classifying hysteresis in suspended sediment-discharge relationships using high-frequency monitoring data. *Water Resources Research, 54*(6). doi.org/10.1029/2017WR022238

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.**, & 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

SUBMITTED AND IN PROGRESS MANUSCRIPTS

Javed, A., **Hamshaw, S.D.,** Rizzo D.M., & Lee. B.S. (2019). Spatiotemporal Clustering Approach to Categorizing Storm Events. *Journal of Hydrology*. In preparation, pre-print published

Hamshaw, S.D., Denu, D., Holthuijzen, M., Wshah, S., & Rizzo D.M. (2019). Applying Deep Learning to Event Concentration-Discharge Hysteresis Patterns to Reveal Differences in Sediment Dynamics across Contrasting Watersheds. In preparation

REFEREED CONFERENCE PAPERS (with presentations)

Hamshaw, S.D., Denu, D., Holthuijzen, M., Wshah, S., & Rizzo D.M. (2019) *Automating the Classification of Hysteresis in Event Concentration-Discharge Relationships*. Paper presented at the SedHyd 2019 Conference, Reno, NV.

Hamshaw, S.D., Underwood, K.L., Rizzo, D., O'Neil-Dunne, J., & Dewoolkar, M.M. (2019) Unmanned Aircraft System (UAS) Photogrammetry for Tracking Streambank Erosion and Geomorphic Change Along a Protected River Corridor. Paper presented (by co-author Dewoolkar) at the Geo-Congress 2019 conference, Philadelphia, PA. doi.org/10.1061/9780784482070.015

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.

CONFERENCE ABSTRACTS (with presentations or posters)

2019

Hamshaw, S.D., & Javed, A. (2019). *Hydrological Event Detection and Analysis (HEDA) Tool for Water Quality Time Series.* CUAHSI Conference on Hydroinformatics, Provo, UT.

2018

Hamshaw, S.D., Denu, D., Holthuijzen, M., Wshah, S., Dewoolkar, M., & Rizzo D.M. (2018). Applying Deep Learning to Event Concentration-Discharge Hysteresis Patterns to Reveal Differences in Sediment Dynamics across Contrasting Watersheds. (Poster), American Geophysical Union 2018 Fall Meeting, Washington, D.C.

Javed, A., **Hamshaw, S.D.**, Lee B.S., & Rizzo D.M. (2018). *Spatiotemporal trajectories as a new approach for studying concentration-discharge relationships of hydrological events.* (Poster), American Geophysical Union 2018 Fall Meeting, Washington, D.C.

Romero, E.T., Dávila Torres, N.M., **Hamshaw, S. D.,** Denu D., Rizzo, D. M., & Dewoolkar, M. (2018). *Evaluating the Visual Classification of Suspended Sediment – Discharge Hysteresis via Crowd-sourcing and In-stream Monitoring.* (Poster), American Geophysical Union 2018 Fall Meeting, Washington, D.C.

Hamshaw, S. D., Underwood, K.L., Rizzo, D. M., O'Neil-Dunne, J., & Dewoolkar, M. (2018). *Quantifying reach-scale erosion and deposition using unmanned aircraft system (UAS) photogrammetry and airborne lidar.* (Poster), American Geophysical Union 2018 Fall Meeting, Washington, D.C.

Weiss, H., Bierman, P., **Hamshaw, S.D.,** & Dubief, Y. (2018). *Optimizing over-summer snow storage at low latitudes and low altitudes.* (Poster), American Geophysical Union 2018 Fall Meeting, Washington, D.C.

Jobin-Davis, E., Dewoolkar, M., Rizzo, D. M., **Hamshaw, S. D.,** Garcia, L., & Underwood, K.L. (2018). *Educational Applications of an Enhanced Augmented Reality Sandbox.* (Poster), American Geophysical Union 2018 Fall Meeting, Washington, D.C.

Hamshaw, S.D., Dewoolkar, M.M., Schroth, A.W., Wemple, B.C., & Rizzo, D.M. (2018). *Unraveling Sediment Dynamics within Watersheds from Patterns in Suspended-Sediment Discharge Relationships.* Northeast Geological Society of America 2018 Meeting, Burlington, Vermont.

Hamshaw, S.D. and Dewoolkar, M.M., (2018). *Monitoring fluvial geomorphic change using unmanned aircraft system (UAS) photogrammetry and laser scanning.* Northeast Geological Society of America 2018 Meeting, Burlington, Vermont.

Weiss, H., Bierman, P., Dubief, Y., & **Hamshaw, S.D.** (2018). *Feasibility of over summer snow storage at the Craftsbury Outdoors Center in Craftsbury, Vermont*. Northeast Geological Society of America 2018 Meeting, Burlington, Vermont.

Hamshaw, S.D. (2018). Identification of Patterns of Hysteresis in Suspended Sediment-discharge Relationships to Infer Watershed Sediment Dynamics. Lake Champlain Research Conference, Burlington, Vermont.

Hamshaw, S.D. and Dewoolkar, M.M. (2018). *Using Unmanned Aircraft System (UAS) Photogrammetry to Monitor Bank Erosion along River Corridors.* Lake Champlain Research Conference, Burlington, Vermont.

2016

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., 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.

2015

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.

2014

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.

2013

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., Rizzo, D.M., Underwood, K.L., O'Neil-Dunne, J., Wemple, B. C. & Dewoolkar, M. (2019) *Measuring Streambank Erosion and Suspended Sediment Yields in the Mad River Watershed.* Presentation at Vermont Geological Society Winter Meeting: Focus on Water Quality and Quantity Challenges in the Mad River Valley. Northfield, Vermont.

Hamshaw, S.D., Rizzo, D.M., Underwood, K.L., & Dewoolkar, M. (2018) Unraveling sediment dynamics in the Mad River watershed through event concentration-discharge relationships and multi-temporal UAS surveys. Invited presentation to the Catskill Environmental Monitoring and Research (CERM) Conference. Highmount, New York.

Hamshaw, S.D. (2018) *Sediment-Related Studies in the Mad River and Vermont*. Invited presentation to the New York City Department of Environmental Protection (NYC DEP), Kingston, New York.

Hamshaw, S.D. (2018) *Exploring our Watersheds through the Use of Machine Learning*. Invited presentation to the SMC Department of Mathematics Colloquium, Colchester, Vermont.

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.

GRADUATE STUDENT RESEARCH SUPERVISION

Thomas Bryce, M.S. Civil & Environmental Engineering 2016
Project: Terrestrial laser scanning for measurement of streambank erosion in the Mad River Valley

UNDERGRADUATE RESEARCH SUPERVISION

Richard Barrett Internship Program

Undergraduate summer research experiences for exceptional UVM civil and environmental engineering students. Students receive $8,000 in stipend and research support to work full time during the summer with a faculty member.

Anna Waldron (co-advisor) 2015
Kira Kelley (co-advisor) 2015
Hanna Anderson (co-advisor) 2013

EPSCOR Undergraduate REU

Undergraduate summer research experience for students to work on active Vermont EPSCoR research projects. Students receiver a $5,000 stipend over the eight-week duration.

Raquel Lugo Bendezú, *University of Puerto Rico in Mayagüez* 2019
Nicole Dávila, *Universidad Metropolitana* 2018
Eric Romero, *University of Vermont* 2018
Carly Robbins, *Clark University* 2016
Joanne Velez Otoro, *Universidad Interamericana de Puerto Rico, San Germán* 2016
Wimara Rubia Sa Gomes, *University of Vermont* 2015
Nathalie Simoes, *Texas A&M* 2015
Nathan Callas, *University of Vermont* 2014
Alex Morton, *University of Vermont* 2014
Hanna Anderson, *University of Vermont* 2014

UVM College of Engineering and Mathematical Sciences REU program

Program within the College of Engineering and Mathematical Sciences for undergraduates to engage in research with a faculty member during either an academic semester or during summer.

Peter Bailey 2020
Calvin Blackwell 2020
Eric Romero (Spring and Fall semester) 2018

TEACHING EXPERIENCE

CE10 – GEOMATICS 2016, 2018 - 2019

Sophomore level engineering course introducing land surveying, GIS, and mapping for engineering applications. Required course for all civil & environmental engineering majors and fulfills requirement of geospatial technologies minor.

(Fall 2019) Instructor, 4 credits, 65 Students, one lecture section, three lab sections

(Fall 2018) Instructor, 4 credits, 69 Students, two lecture sections, three lab sections

(Fall 2016) Instructor, 4 credits, 81 Students, two lecture sections, four lab sections

Overall ratings of course evaluations for CE10:

Overall effectiveness of instructor: **4.3/5.0**
How academically and intellectually challenging was the course? **3.8/5.0**
How much did you learn in the class? **4.4/5.0**

UVM GRADUATE TEACHING PROGRAM 2018

Professional development program for teaching in higher education with requirements in teaching practice, observation, and training in high-impact practices, technology, and diversity

TEACHING ASSISTANT SUPERVISION

Graduate Teaching Assistants

Yuxiang Shen, (CE10)	2019
Maziar Foroutan, (CE10)	2018 - 2019
Elliot Maker (CE10)	2018
Logan Werner (CE10)	2018
Ian Anderson (CE10)	2016

Undergraduate Teaching Assistants

Amy DeCola (CE10)	2019
Rose O'Brien (CE10)	2019
Peter Bailey (CE10)	2019
Harrison Lucas (CE10)	2019
Shannon Geary (CE10)	2018
Jeff Lewis (CE10)	2016
Matthew Truehart (CE10)	2016

GUEST LECTURES

A Mapping Introduction to Bristol, Vermont — 2015, 2019

University of Vermont – Local Community Initiatives (CDAE295)
Guest lecturer on use of GIS and mapping for community projects in Bristol, Vermont

Drinking Water Treatment in Rural Honduras — 2011 – 2012, 2018

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

Unraveling Sediment Dynamics within Watersheds — 2018

University of Vermont – Applied River Engineering (CE295)
Guest lecturer on suspended sediment transport and tools for understanding the relationship between suspended sediment concentration and streamflow

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

ADDITIONAL PROFESSIONAL PROJECT EXPERIENCE

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.

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

PROFESSIONAL SOCIETY MEMBERSHIPS

American Geophysical Union, *Member*

AWARDS/HONORS

Gund Institute for Environment Postdoctoral Fellow	2018
Edward H. Phelps Award, University of Vermont	2006
Chi Epsilon Civil Engineering Honor Society	
Tau Beta Pi Engineering Honor Society	

CERTIFICATIONS

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

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

PROFESSIONAL DEVELOPMENT

Fundamentals of POGIL (Process Oriented Guided Inquiry Learning) Workshop	2019
Core Principles of Data Visualization Workshop (PolicyViz – Jon Schwabish)	2019
The Intercultural Classroom: Issues, Perceptions, Teaching Effectiveness (UVM)	2017
Alan Alda Center for Communicating Science – 1 Day Workshop at UVM	2018
Policy Communications Training Workshop (COMPASS, Washington, D.C.)	2016
Alan Alda Center for Communicating Science – 2 Day Workshop at UVM	2016
Supporting the Writing & Communication Skills of Emerging Scientists (Lisa Emerson)	2015

PROFESSIONAL SERVICE

Leveraging Distributed Research Networks to Understand Watershed Systems 2019

Invited workshop participant and white paper contributor

Department of Energy, Washington D.C.

Time, Space, and Hydrologic Influences on Sediment and Nutrient Dynamics: From Sources to Delivery 2018

Conference Session Co-Convener

American Geophysical Union Fall 2018 Meeting, Washington D.C.

Journal Reviews

Water Resources Research, Hydrological Processes, ASCE Journal of Surveying Engineering, Journal of Environmental Quality
see Publons Profile (https://publons.com/a/1356880/)

Proposal and Panel Reviews

MS-AL Sea Grant