

Integrative Science and Solutions for Freshwater Systems

Concept Paper - A plan to build a signature-strength in Freshwater Systems

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J.D. Ivory, College of Liberal Arts and Human Sciences

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Natural Resources and Environment

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Submitted May 15, 2017

Global Systems Science Destination Area

Vision

Virginia Tech is poised to become a global leader in the pursuit and application of new knowledge to inform management and restoration of waterbodies and their watersheds. Despite our notable strengths in specific disciplines, we have not yet facilitated nor nurtured an interdisciplinary program whereby a holistic perspective of freshwater systems can permeate into VT-shaped students and bridge the gaps among water-relevant biophysical, social sciences, and the arts. We know of no other major research university with a signature-strength in integrated freshwater systems science.

Sustainable management of water resources at local, regional, and global scales is one of the key challenges of the 21st century; dealing with the challenges of providing clean water in the face of floods, droughts, and degraded waterways to foster resilient communities is a critical societal need. Only through an integrated systems science perspective can we hope to make strides to address this wicked problem. Requisite skills to address these challenges are not contained in a single discipline, yet all students in all regions of the globe need these skills to help effectively contribute to solving this pressing global problem. As global population swells from 7 billion today to an estimated 9 billion by 2050, increasing pressure will be placed on freshwater ecosystems to provision society with water, food, and energy. Unless we have a holistic perspective on how to manage these systems, maintaining a vibrant economy, clean water, and productive and diverse ecosystems will become increasingly difficult. We envision **Integrative Science and Solutions for Freshwater Systems** as an ideal signature-strength of Virginia Tech, propelling VT to the forefront of what it means to be a societally relevant global land-grant institution. As such, we must develop an interdisciplinary and integrated (research, education, and outreach) program that advances science and provides professionals to solve four critical problems faced by many socio-ecological systems: **anthropogenic pressures on watersheds, inadequate quantity and quality of fresh water, losses of biodiversity and biosphere integrity, and transmission of water-borne disease**. In the spirit of Beyond Boundaries, we will create a unique collaborative infrastructure to integrate faculty, students, and stakeholders across disciplines. We will build on existing disciplinary strengths, across six colleges and nine departments, to hire and train new interdisciplinary experts who can collaborate with diverse and increasingly conflicted stakeholders. Our overarching goal is to bridge research, policy, and practice to meet pressing challenges facing freshwater ecosystems (lakes, river networks, and wetlands).

Today's freshwater practitioners use many tools (e.g., remote sensing, in situ sensors, process models, and data visualization) to explore how the human condition depends on functioning aquatic ecosystems and to effectively identify, discuss, and manage fundamental social choices regarding living and working within watersheds. Furthermore, the program will investigate the role of information campaigns, art, and science communication in enhancing public awareness, eliciting policy support, and encouraging behavioral change regarding use of water resources. VT-shaped students, grounded in a suite of natural, social, human health, and computing sciences, will be uniquely equipped to address the complex, ever-shifting problems of managing water resources in the context of coupled human and natural systems.

Relevance

Many foundations, governments, and industries have invested significantly in order to conserve and restore freshwater systems and adapt to our changing climate. In addition to traditional research funding, this work currently supports a \$25 billion dollar industry in stream and wetland restoration. Sustainable freshwater systems are also a recognized priority by philanthropic

programs of major foundations, including: The David and Lucille Packard Foundation (The Freshwater Trust: Investing in River and Stream Restoration), Charles Stewart Mott Foundation (Addressing the Freshwater Challenge), Turner Foundation (Protecting and Restoring the Natural World), Chesapeake Bay Trust (Environmental Education, Demonstration-based Restoration, and Community Engagement), and the Rivers Foundation of the Americas. These foundations recognize that population growth, particularly in high-density urban areas, degrades the condition of vital freshwater ecosystems while exerting extreme demands for clean water supplies, increased agricultural production, and restoration of many impaired freshwater ecosystems.

Integrative Science and Solutions for Freshwater Systems addresses many of the current threats to freshwaters. To meet such threats requires restoration and management at watershed scales, focusing on ecosystem services that provide natural capital for society. Watershed restoration, the reestablishment of biophysical processes or features, is a common tactic in natural resource management used to confront these threats. Common activities, such as the protection of riparian infrastructure and improvement and maintenance of ecosystem services (e.g., contaminant removal, productive fisheries, support of rare biota, and recreational opportunities), necessitate multiple disciplines and coordination among scientists, practitioners, and stakeholders. Fisheries are major food, employment, and cultural components of rivers and lakes.

Many restoration and management projects fail because they lack adequate interdisciplinary scientific input and guidance. While the subsurface-surface, upstream-downstream, and channel-riparian-upland hydraulic connectivity within river systems control catchment-scale biotic integrity and ecosystem services, many management and restoration projects occur at the limited scale of surface water habitats or stream reaches. Furthermore, the short timescale over which projects are assessed often limits our knowledge of long-term project successes or failures with regards to biophysical targets and societal needs. We seek to develop a framework where disciplinary silos are eliminated, allowing meaningful engagement from multiple disciplines and multiple publics in complex issues. We seek additional understanding about how scientific expertise on watershed management can be more effectively integrated in to watershed management and to guide human decision-making. We also seek to maintain existing and develop new long-term watershed-scale laboratories to enable research and education on the spatial and temporal scales relevant to natural systems.

Importantly, successful projects employ the best available social science to manage inevitable conflicts among a wide range of goals and to better integrate science and watershed policy-making. Restoration and management of freshwater resources for future human needs will require improved and expanded science for water resource management. Virginia Tech's programs can rise in prominence by addressing water-relevant gaps in social science, policy, law, communication, conflict resolution, and structured decision-making to have on-the-ground impacts through holistic approaches.

The proposed program will have important synergies, overlaps, and partnerships with existing destination areas. These include **Data Analytics and Decision Science** and **Intelligent Infrastructure for Human-Centered Communities**. Furthermore, there are important synergies that can be developed with strategic growth areas, in particular the **Creative Technologies and Experiences through Integration of Innovative Visualization**, and **Policy**. We envision potential for partnerships with the National Capital Region's Metrolab in

Arlington County and the ICTAS Wind Energy Lab in Chennai, India; the latter will strengthen our international relevance in water-related research.

Curriculum Opportunities

Maintaining or restoring sustainable water supplies to support population growth, while minimizing the negative effects on the functions and subsequent services provided by freshwater ecosystems, requires both a thorough understanding of the underlying processes, mechanisms, and feedback loops within aquatic and adjacent ecosystems, as well as an understanding of the interface of water with social, economic, political, and cultural systems. The next generation of water experts, including water scientists, engineers, policy makers, communicators, and managers, must therefore receive in-depth training not only in a single primary discipline, but also in working at the interface among numerous scientific and social systems that interact to determine the state of our water resources. To this end, Virginia Tech is already recognized as a national leader through its recently established interdisciplinary B.S. degree program in Water: Resources, Policy, and Management. To build upon this successful water curriculum at Virginia Tech, our team proposes continued support of ongoing interdisciplinary efforts centered on water education at the university, including development of innovative interdisciplinary graduate degree programs in Water, tailoring proposed Pathway courses to focus on water-related problems, and leading externally-funded summer research programs for undergraduates centered on water sustainability (e.g., NSF-REU, USDA-REEU). In addition, we propose developing complex design problems centered on living laboratories that illustrate water sustainability issues. These will be incorporated in capstone Pathways Innovation Studios and in multi-semester interdisciplinary graduate water project courses, which would be team-taught by groups of faculty members from different disciplines; faculty teams would simultaneously be able to model interdisciplinary collaboration for students and be well-equipped to provide diverse perspectives and feedback. Finally, we also propose that new faculty hired as part of this freshwater restoration thrust within the Global Systems Science Destination Area will add new dimensions to our water curricula portfolio at Virginia Tech.

Description of Resource Needs

The assembled team is very strong in traditional sciences related to hydrology and ecology; however, we see critical gaps in areas of social sciences, arts, informatics, and humanities. We propose a strategic hire in the arts to help us communicate how water inspires us. In addition, we will need an organizing structure to facilitate enduring connections between researchers, policymakers and industry practitioners. Our vision demands that we promote meaningful engagement with state and federal government, municipalities, nonprofit environmental organizations, and private sector restoration companies. Space is needed in the Global Systems Science building to serve as a hub for our activities. This building will contain faculty and graduate student offices, laboratories, and space for instruction and outreach with partners; an ideal location for this building would be proximate to facilities near the Stream Restoration, Education, and Management (StREAM) Lab on Stroubles Creek.

To fully integrate our existing expertise and establish Virginia Tech as a world leader in **Integrative Science and Solutions for Freshwater Systems**, we must maintain signature disciplinary strengths and make strategic hires in new growth areas. Key individuals are needed to develop the research, educational, and outreach potential in this area. We propose to hire Collegiate or Tenure-Track Faculty to (1) organize and link faculty members, and assist with

large proposal development; and (2) to develop stakeholder collaborations and support via workshops on meaningful public engagement. In addition, we see need to increase support for key laboratory (and field) infrastructure to support a robust Integrative Freshwater Systems effort and scholarships and fellowships for meritorious students. Faculty Hiring Needs are listed below.

Signature Strengths to Grow	Strategic New Growth Hires
Water policy and law	Conflict management and meaningful public participation
Water resource economics	Watershed information systems, remote sensing, and sensor analytics
Land economics	Behavioral economics and environmental psychology
Aquatic entomology and biological monitoring	Participatory design, visioning, and scenario building
Environmental education and pedagogy	Integrative and collaborative modeling and structured decision making
Sensor and simulation analytics	Public advocacy and media relations
Human-computer interaction and GIS visualization	Expertise in technology and services design to deliver interfaces for exploring solutions, analyzing tradeoffs, and decision making
Systems science and computational thinking	Contemporary fine arts and design in multiple media

Appendix I: Biosketches

Paul L. Angermeier

Current position (since 2006): Research Scientist (GS-15), US Geological Survey, Cooperative Fish and Wildlife Research Unit; Professor, Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061-0321
Telephone: (540) 231-4501 Fax: (540) 231-7580 Email: biota@vt.edu

Previous position (1996 - 2006): Research Scientist, US Geological Survey, Cooperative Fish and Wildlife Research Unit; Associate Professor, Department of Fisheries and Wildlife Sciences, Virginia Tech.

Education: BS Purdue University, Environmental Science, 1975
MS University of Illinois, Ecology, 1979; PhD University of Illinois, Ecology, 1983

Team Teaching Experience at Virginia Tech (since 2007):

- 2007 – 2011 - Constructing Sustainability
- 2007 - Fish Ecology
- 2013 – 2014 - Biodiversity Conservation & Environmental Sustainability

Selected Professional service (since 2007):

- Editorial Board, *Freshwater Biology*, 1997-present
- Editorial Board, *Conservation Biology*, 2000-present
- USGS-USFS workgroup to examine effects of climate change on freshwater fish assemblages and ecosystem services, 2011-2012
- American Fisheries Society liaison to Society for Conservation Biology, 2007-present

Selected Awards (since 2006):

- U. S. Geological Survey Cooperative Research Unit Outstanding Science Award, 2007
- U. S. Department of the Interior Star Award for superior annual performance, 2008

Selected Grants as Principal or Co-principal Investigator (out of 22 since 2013):

- Development and assessment of tools for evaluating stream and watershed responses to climate change along thermal gradients. United States Forest Service. \$70,000.
- Regulating services as measures of ecological resilience on DoD lands. United States Department of Defense. \$308,359.
- Comparison of habitat suitability among sites supporting strong, localized, and extirpated populations of candy darters (*Etheostoma osburni*). Virginia Department of Game and Inland Fisheries. \$12,500.
- Evaluating air-water temperature linkages in Shenandoah National Park streams. United States Geological Survey. \$75,191.
- Assessing post-construction impacts of the Roanoke River Flood Reduction Project on the endangered Roanoke logperch. United States Army Corps of Engineers. \$254,453.
- Population viability analysis for Roanoke logperch. United States Fish and Wildlife Service. \$17,710.
- Assessment of apparent survival and abundance of Roanoke logperch in response to short-term changes in river flow. Virginia Department of Game and Inland Fisheries. \$21,000.
- Development and application of a multiscale model of habitat suitability for Roanoke logperch. Virginia Department of Game and Inland Fisheries. \$19,000.
- Cost-effectiveness of riparian restoration as a recovery tactic for Roanoke logperch. Virginia Department of Game and Inland Fisheries. \$20,000.
- Phenology and habitat use of larval darters in the upper Roanoke River basin. Virginia Department of

Game and Inland Fisheries. \$38,000.
Impact of mining effluent on fish populations. Appalachian Research Initiative for Environmental Science. \$50,000.
Demographic status and population genetic differentiation of candy darter populations in Virginia. Virginia Department of Game and Inland Fisheries. \$98,000.
Relating fine sediment dynamics and best management practices (BMPs) to instream habitat conditions for priority fishes and mussels in the Copper Creek drainage. Virginia Department of Game and Inland Fisheries. \$50,000.
How does current management of water quality align with ecological health and human well-being? A preliminary study of Virginia. Virginia Tech Global Change Center. \$23,750.

Selected refereed publications since 2013 (out of >125 total):

Lapointe, N.W.R., J. S. Odenkirk, and P.L. Angermeier. 2013. Seasonal movement, dispersal, and home range of Northern Snakehead *Channa argus* (Actinopterygii, Perciformes) in the Potomac River catchment. *Hydrobiologia* 709: 73-87.

Roberts, J.H., P.L. Angermeier, and E.M. Hallerman. 2013. Distance, dams and drift: What structures populations of an endangered, benthic stream fish? *Freshwater Biology* 58: 2050-2064.

Villamagna, A.M., P.L. Angermeier, and E.M. Bennett. 2013. Capacity, pressure, demand, and flow: a conceptual framework for analyzing ecosystem service provision and delivery. *Ecological Complexity* 15: 114-121.

Villamagna, A.M., B. Mogollon, and P.L. Angermeier. 2014. A multi-indicator framework for mapping cultural ecosystem services: the case of freshwater recreational fishing. *Ecological Indicators* 45: 255-265.

Villamagna, A.M. and P.L. Angermeier. 2015. A methodology for measuring and mapping ecosystem services provided by watersheds. Pages 151-180 in L. Chicharo, F. Muller, N. Fohrer, and E. Wolanski (eds.), *Ecosystem Services and River Basin Ecohydrology*, Springer.

Howeth, J.G., C.A. Gantz, P.L. Angermeier, E. A. Frimpong, M. H. Hoff, R.P. Keller, N.E. Mandrak, M.P. Marchetti, J.D. Olden, C.M. Romagosa, and D.M. Lodge. 2016. Predicting invasiveness of species in trade: climate match, trophic guild, and fecundity influence establishment and impact of non-native freshwater fishes. *Diversity and Distributions* 22: 148–160.

Jachowski, D.S., J.J. Millsbaugh, P.L. Angermeier, and R. Slotow, editors. 2016. *Reintroduction of fish and wildlife populations*. University of California Press.

Lapointe, N.W.R., P.L. Fuller, M. Neilson, B.R. Murphy, and P.L. Angermeier. 2016. Pathways of fish invasions in the Mid-Atlantic region of the United States. *Management of Biological Invasions* 7: in press.

Mogollón, B., E. Frimpong, A. Hoegh, and P.L. Angermeier. 2016. An empirical assessment of which inland floods can be managed? *Journal of Environmental Management* 167: 38-48.

Mogollón, B., A.M. Villamagna, E.A. Frimpong, and P.L. Angermeier. 2016. Mapping technological and biophysical capacities of watersheds to regulate floods. *Ecological Indicators* 16: 483-499.

Roberts, J.H., G.B. Anderson, and P.L. Angermeier. 2016. A long-term study of ecological impacts of a flood reduction project to an endangered riverine fish: lessons learned for assessment and restoration. *Water* 8, 240; doi:10.3390/w8060240.

Roberts, J.H., P.L. Angermeier, and G.B. Anderson. 2016. Population viability analysis for endangered Roanoke logperch. *Journal of Fish and Wildlife Management* 7:46-64.

Roberts, J.H., P.L. Angermeier, and E.M. Hallerman. 2016. Extensive dispersal of Roanoke logperch (*Percina rex*) inferred from genetic marker data. *Ecology of Freshwater Fish* 25: 1-16.

Villamagna, A.M., B. Mogollon, and P.L. Angermeier. 2017. Equity in delivery of ecosystem services: socioeconomic gaps in our public-private conservation network. *Ecology and Society* 22 (1):36 [online] <http://www.ecologyandsociety.org/vol22/iss1/art36/>.

Dean R. Bork, Associate Professor
College of Architecture and Urban Studies
School of Architecture + Design
Landscape Architecture Program

Curriculum Vita – Executive Summary

Awards School of Architecture + Design
Design Lab Teaching Excellence, 2016

School of Architecture + Design
Lecture or Seminar Teaching Excellence Award, 2012

University Outreach Award
College of Architecture and Urban Studies Recipient, 2010

Publications Buchholz, Tracy, David A. Madary, Dean Bork, Tamim Younos,
“Stream Restoration in Urban Environments: Concept, Design Principles
and Case Studies of Stream Daylighting” in *Water Management in Urban
Environments*, Springer, 2016.

Serpati, David and Dean R. Bork, "Understanding Local Places in a
Globalizing Context". *Spaces and Flows: An International Journal of
Urban and ExtraUrban Studies*, Vol. 2, 2012.

Bork, Dean R., Josh Franklin, “Revitalizing Urbanized Watersheds through
Densification: A City of Fairfax Case Study”. *Documentation Set #63:
Nature and the Sustainable City*, International Making Cities Livable
Conference, 2010

Bork, Dean R., “Landscape Architecture: the Corpus is Alive but the Mind
is Ailing”. *Kerb 17: Journal of Landscape Architecture*, RMIT, 2009

Buchholz, Tracy, Dean Bork, Tamim Younos, "Urban Stream Daylighting
Design Application to Stroubles Creek, Blacksburg, Virginia" *Virginia
Water Resources Center*, SR36-2007.

Conference Presentations

“Green Street Oriented Planning and Design Process: Promoting Multiple
Benefits”, CELA 2015

Joowon Im, Dean Bork, Patrick Miller
 “Green Street Oriented Planning and Design Process: Promoting Multiple Benefits for Community Sustainability”, EDRA 2015
 Joowon Im, Dean Bork, Patrick Miller
 “Revitalizing Urban Watersheds: The Fairfax Boulevard Case Study”,
 w/ Josh Franklin, Virginia Stormwater Symposium, 2010

Invited Lectures “The Mysteries of Cluster Development”
 New River Valley Planning District Commission, Planning Commissioner Training Session, 2009

“Watershed Sensitive Site Design: Case Studies, Clues and Questions”,
 Ecological Engineering 101 Workshop
 American Society of Ecological Engineers Conference, 2008.

Courses Taught LAR 3154/ Watershed Sensitive Site Design
 5304G 2010 to present

LAR 4244/ Landscape Technology II- Hydrology
 5304G 2007 – 2009

LAR 5314 Contemporary Research Topics in LA
 (Regenerative/Ecological Design Module, w/ Mintai Kim)
 2010, 2011

**Outreach/
 Service Learning** “Lakewood Park Master Plan – Phase III – Pond Reclamation Feasibility Assessment and Constructed Wetland Design”, w/ Tess Wynn, Gene Yagow, BSE Students, 2009, 2010

“Lakewood Park Master Plan – Phase II – Master Site Plan Development”, w/Ashleigh Marshall, Roanoke Parks and Recreation Department, 2009

“Lakewood Park Master Plan – Phase I – Schematic Design”,
 w/Zin Wang, Xiaomin Huang, Wenjia Jiao, and Ting Cheng, Roanoke Parks and Recreation Department, 2008

“Master Plan for a Children’s Nature Education Outdoor Classroom”, w/ Sruthi Atmakur, U. S. Forest Service – Jefferson National Forest – Blacksburg Ranger District, 2008

**Professional/
 Academic Service** Stormwater Best Management Practices Clearinghouse Committee,
 Virginia Department of Conservation and Recreation, 2006 – 2012

LEANDRO CASTELLO

Assistant Professor, Department of Fish and Wildlife Conservation,
College of Natural Resources and Environment
Virginia Polytechnic Institute and State University

E-mail: leandro@vt.edu | Phone: +1-540-231-5046 | Website: <http://fishwild.vt.edu/faculty/castello.htm>

Professional Preparation:

Universidade Federal do Rio Grande	Oceanography	B.S., 1998
Syracuse University	Public Administration & Environmental Policy	M.P.A, 2004
State University of New York (ESF)	Conservation Biology	Ph.D., 2007
The Woods Hole Research Center	Postdoc (Amazon ecology)	2008-2013

Appointments:

2013 - Assistant Professor, Virginia Polytechnic Institute and State University
1998-2002 Fisheries Biologist, Instituto de Desenvolvimento Sustentável Mamirauá, Tefé, AM, Brazil.

Products

Five Most Relevant Publications

- Irvine, K., **Castello, L.**, Junqueira, A., Moulton, T. 2016. *Linking ecology with social development for tropical aquatic conservation. Aquatic Conservation: Marine and Freshwater Ecosystems* 26: 917–941
- Castello, L.**, Macedo, M.N. 2016. Large-scale degradation of Amazonian freshwater ecosystems. *Global Change Biology*. doi: 10.1111/gcb.13173
- Petersen, T.A., Brum, S.M., Rossoni, F., Silveira, G.F.V., **Castello, L.**, et al. 2016. Recovery of arapaima populations by community-based management in a tropical floodplains. *Journal of Fish Biology*.
- Cavole, L., Arantes, C.C., **Castello, L.** 2015. How illegal are tropical small-scale fisheries? An estimate for arapaima in the Amazon. *Fisheries Research* 168: 1–5
- Castello, L.**, McGrath, D.G., Arantes, C.C., Almeida, O.T. 2013. Accounting for heterogeneity in small-scale fisheries management: the Amazon case. *Marine Policy* 38: 557–565.

Five Other Publications

- Winemiller, K., McIntyre, P., **Castello, L.**, and 29 other authors. 2016. Balancing hydropower and biodiversity in the Amazon, Congo and Mekong. *Science* 351: 128-129
- Nepstad, D.C., McGrath, D.G., Stickler C.M., Alencar, A., Azevedo, A., Swette, A., Bezerra, T., DiGiano, M., Shimada, J., da Motta, J.S., Armijo, E., **Castello, L.**, Brando, P., Hansen, M., McGrath-Horn, M., Carvalho, O., Hess, L. 2014. *Slowing Amazon deforestation through public policy and interventions in beef and soy supply chains. Science* 344 (6188): 1118-1123
- Castello, L.**, Stewart, D.J., Arantes, C.C. 2011 a. Modeling population dynamics and conservation of arapaima in the Amazon. *Reviews in Fish Biology and Fisheries* 21: 623-640.
- Castello, L.**, Viana, J.P., Watkins, G., Pinedo-Vasquez, M., Luzadis, V.A. 2009. Lessons from integrating fishers of arapaima in small-scale fisheries management at the Mamirauá Reserve, Amazon. *Environmental Management* 43: 197-209.
- Castello, L.** 2008 a. Lateral migration of *Arapaima gigas* in floodplains of the Amazon. *Ecology of Freshwater Fish* 17: 38-46.

Synergistic Activities

- Member of Board Editors of journal: *Aquatic Conservation: Marine and Freshwater Ecosystems*
- Developed innovative stock assessment method for *Arapaima* spp., which has led to three regional fisheries management policies in the Amazon
- Led the development of a report, entitled 'Review of the impacts caused by hydroelectric dams on the integrity of Amazonian freshwater ecosystems,' commissioned by the World Wide Fund for Nature (WWF) to guide its policy work in the seven countries comprising the Amazon Basin during the next five years.
- Organized five symposia at international scientific events

Jonathan A. Czuba

Assistant Professor of Watershed Engineering
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Virginia Polytechnic Institute and State University (Virginia Tech)
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PROFESSIONAL PREPARATION

University of Illinois at Urbana-Champaign	Civil Engineering	B.S., 2007
University of Illinois at Urbana-Champaign	Civil Engineering	M.S., 2009
University of Minnesota, Twin Cities	Civil Engineering	Ph.D., 2016
University of Minnesota, Twin Cities	Civil Engineering	Postdoc 2016
Indiana University, Bloomington	Earth & Atmos. Sci.	Postdoc 2016-2017

APPOINTMENTS

2017-present	Assist. Prof. , Department of Biological Systems Engineering, Virginia Tech, Blacksburg
2016-2017	Postdoc. Research Fellow , Dept. of Earth & Atmos. Sciences, Indiana U., Bloomington
2016	Postdoctoral Associate , St. Anthony Falls Laboratory, U. Minnesota, Twin Cities
2015-2016	Interdisciplinary Doctoral Fellow , Institute on the Environ., U. Minnesota, Twin Cities
2015-2016	Edward Silberman Fellow , St. Anthony Falls Laboratory, U. Minnesota, Twin Cities
2012-2013	Graduate Fellow , Department of Civil Engineering, U. Minnesota, Twin Cities
2009-2012	Hydrologist , U.S. Geol. Survey, Washington Water Science Center, Tacoma, Wash.
2007-2009	Hydrologist , U.S. Geol. Survey, Illinois Water Science Center, Urbana, Illinois

PUBLICATIONS

Five Publications Most Related to Proposal

- Czuba, J.A., A.T. Hansen, E. Foufoula-Georgiou, and J. Finlay (*in review*), Watershed-scale nitrate removal through an interconnected complex of wetlands within a river network, *Water Resources Research*.
- Czuba, J.A., E. Foufoula-Georgiou, K.B. Gran, P. Belmont, and P.R. Wilcock (2017), Interplay between spatially-explicit sediment sourcing, hierarchical river-network structure, and in-channel bed-material sediment transport and storage dynamics, *Journal of Geophysical Research – Earth Surface*, accepted, doi:10.1002/2016JF003965.
- Hansen, A.T., J.A. Czuba, J. Schwenk, A. Longjas, M. Danesh-Yazdi, D.J. Hornbach, and E. Foufoula-Georgiou (2016), Coupling freshwater mussel ecology and river dynamics using a simplified dynamic interaction model, *Freshwater Science*, 35(1), 200-215. doi:10.1086/684223.
- Czuba, J.A., and E. Foufoula-Georgiou (2015), Dynamic connectivity in a fluvial network for identifying hotspots of geomorphic change, 51(3), 1401-1421, *Water Resources Research*, doi:10.1002/2014WR016139.
- Foufoula-Georgiou, E., Z. Takbiri, J.A. Czuba, and J. Schwenk (2015), The change of nature and the nature of change in agricultural landscapes: Hydrologic regime shifts modulate ecological transitions, *Water Resources Research*, 51(8), 6649-6671, doi:10.1002/2015WR017637.
- [INVITED].

Five Other Publications

- Gran, K.B., and J.A. Czuba (2017), Sediment pulse evolution and the role of network structure, *Geomorphology*, 277, 17-30. doi:10.1016/j.geomorph.2015.12.015. [INVITED].
- Czuba, J.A., T.D. Straub, C.A. Curran, M.N. Landers, and M.M. Domanski (2015), Comparison of fluvial suspended-sediment concentrations and particle-size distributions measured with in-stream laser diffraction and in physical samples, *Water Resources Research*, 51(1), 320-340, doi:10.1002/2014WR015697.
- Czuba, J.A., and E. Foufoula-Georgiou (2014), A network-based framework for identifying potential synchronizations and amplifications of sediment delivery in river basins, *Water Resources Research*, 50(5), 3826-3851, doi:10.1002/2013WR014227.
- Parsons, D.R., P.R. Jackson, J.A. Czuba, F.L. Engel, B.L. Rhoads, K.A. Oberg, J.L. Best, D.S. Mueller, K.K. Johnson, and J.D. Riley (2013), Velocity Mapping Toolbox (VMT): a processing and visualization suite for moving-vessel ADCP measurements, *Earth Surface Processes and Landforms*, 38(11), 1244-1260, doi:10.1002/esp.3367.
- Czuba, J.A., J.L. Best, K.A. Oberg, D.R. Parsons, P.R. Jackson, M.H. Garcia, and P. Ashmore (2011), Bed morphology, flow structure, and sediment transport at the outlet of Lake Huron and in the upper St. Clair River, *Journal of Great Lakes Research*, 37(3), 480-493, doi:10.1016/j.jglr.2011.05.011. (Awarded 2012 IAGLR Chandler-Misener Award as “most notable” paper.)

SYNERGISTIC ACTIVITIES

1. Student Member of the Executive Committee of the Earth and Planetary Surface Processes (EPSP) Focus Group of the American Geophysical Union (2015-2016) where I spearheaded the creation of a T-shirt Logo Design Contest to engage the EPSP student community and raise money for student programs.
2. Assisted in the management of a \$4.3 million, 10-PI, 7-institution, NSF collaborative research project in the Minnesota River Basin; including coordinating project cyberseminars, compiling a synthesis of project research, and planning a project retreat (2012-2016).
3. Packaged my watershed-scale, river/wetland-network model in the development of an interactive, online computer-simulation tool (2016-2017). This tool is being used in high school environmental science classrooms in the Minnesota River Basin for students to explore the impact of land-management practices on nitrate concentrations and loads (<http://maps.umn.edu/le-sueur-nitrates/>).
4. Sculptural artist Adrien Segal transformed the meandering planform pattern of a reach of the Molalla River in Oregon, from a USGS study I contributed to, into a work of art (2013) (<http://www.adriensegal.com/molalla-meander>).
5. Released my code for modeling bed-material sediment dynamics on river networks in the Community Surface Dynamics Modeling System (CSDMS) as free and available to the public (2017) (http://csdms.colorado.edu/wiki/Model:River_Network_Bed-Material_Sediment).

C. Andrew Dolloff, Professor

Project Leader, US Forest Service

Southern Research Station, Coldwater Fisheries Research Unit

1710 Research Center Dr

Blacksburg, VA 24060

Web page: <http://www.fishwild.vt.edu/faculty/dolloff/>

Education

B.S., University of Maine (1975)

M.S., North Carolina State Univ. (1979)

Ph.D. Montana State Univ. (1983)

Recent and Relevant Publications

Dolloff, C.A., C. Roghair, C. Krause, J. Moran, A. Cochran, M. Warren, S. Adams, and W. Haag. Spatio-temporal variation in distribution of aquatic species and their habitats in a reservoir transition zone. In: C.E. Stringer, K.W. Krauss, J.S. Latimer, eds. 2016. *Headwaters to estuaries: advances in watershed science and management -Proceedings of the Fifth Interagency Conference on Research in the Watersheds*. March 2-5, 2015, North Charleston, South Carolina. e-General Technical Report SRS-211. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 302 p.

Lakel, W.A., W.M. Aust, III, C.A. Dolloff, and P.D. Keyser. 2015. Residual timber values within Piedmont streamside management zones of different widths and harvest levels. *Forest Science* doi: 10.5849/forsci.13-608

McDonnell, T.C., M.R. Sloat, T.J. Sullivan, C.A. Dolloff, P.F. Hessburg, N.A. Povak, W.A. Jackson, and C. Sams. 2015. Downstream Warming and Headwater Acidity May Diminish Coldwater Habitat in Southern Appalachian Mountain Streams. *PLoS ONE* 10(8): e0134757.

McManamay, R.A., B.K. Peoples, D.J. Orth, C.A. Dolloff, and D.C. Mathews. 2015. Isolating causal pathways between flow and fish in the regulated river hierarchy. *Canadian Journal of Fisheries and Aquatic Science*. 72:1731-1748.

McManamay, R. A., D. J. Orth, and C. A. Dolloff. 2013. Application of the ELOHA (Ecological Limits of Hydrologic Alteration) framework to the Cheoah River, a regulated system in the Little Tennessee River basin *Environmental Management* 51(6): 1210-1235.

Timm, A., E. Hallerman, C.A. Dolloff, M. Hudy, and R. Kolka. 2015. Identification of a barrier height threshold where brook trout population genetic diversity, differentiation, and relatedness are affected. *Environmental Biology of Fishes* 99:195 doi:10.1007/s10641-015-0467-4

VERL R. EMRICK III
Research Scientist-Ecologist
Conservation Management Institute
Virginia Tech College of Natural Resources and Environment
1900 Kraft Drive, Suite 250, Moss Building Blacksburg, Va. 24061
(ph) 540-231-8851 (cell) 276-613-1424 vemrick@vt.edu

CURRENT and RECENT POSITIONS

2013-Present. Research Scientist/Ecologist, Conservation Management Institute- College of Natural Resources and Environment, Virginia Polytechnic Institute and State University. 1900 Kraft Drive, Suite 250, Blacksburg, VA, 24061.

Primary Duties: As a Research Scientist/Ecologist at the Virginia Tech-CMI. I have been the Principle investigator or Co-PI on over 60 externally funded projects from 2000-2016 that accounted for over \$12.5 million in project funding for the university.

May 2008-2013: Research Associate-Ecologist-Project Manager. Conservation Management Institute-Military Lands Division College of Natural Resources, Virginia Polytechnic Institute and State University. 1900 Kraft Drive, Suite 250, Blacksburg, VA, 24061.

-May 2000-2008: Research Associate-Ecologist-Military Lands Director. Conservation Management Institute-Military Lands Division College of Natural Resources, Virginia Polytechnic Institute and State University. 1900 Kraft Drive, Suite 250, Blacksburg, VA, 24061.

EDUCATION

Ph. D. May 2013 **Virginia Tech**, Department of Biological Sciences 2013

Advisors: Robert H. Jones, John Barrett

Dissertation title: *Disturbance, Functional Diversity, and Ecosystem Processes: Does Species Identity Matter*

B.S. May 1994 University of North Carolina-Asheville, Environmental Science, minor Biology,
Graduated with Honors as a Research Scholar

SELECTED RECENT ACTIVE SPONSORED RESEARCH AT VIRGINIA TECH

1. Removal, Propagation and Transplantation of Michaux's Sumac Colonies from Range 12 and the IPBC at Fort Pickett, Virginia. September 2015-July 2017. **VR Emrick \$174,898.**

2. Bat Survey for Fort Pickett-MTC, Virginia: Distribution, Abundance, and Diversity. **VR Emrick \$159,139**

3. Ecosystem Management Research and Technical Assistance at U.S. Marine Corps (USMC) Base Quantico, VA (MCBQ). September 2014 – August 2016. **VR Emrick \$499,488**

4. Research and Support to the Fort Pickett Integrated Training Area Management Program. May 2015 – May 2016 **VR Emrick : \$29,500**

5. Update NWI and Functionally Assess Wetlands at Aberdeen Proving Ground September 2014-August 2015: **VR Emrick: \$35,460.**

6. Develop Enhanced Wetland Maps to Better Assess Ecosystem Services: How Land-use and Disturbance Affects Soil Carbon Sequestration in Delmarva Bay Wetlands. September 2014–September 2015 **VR Emrick: \$32,329.**

7. Assessment of the Ecological Effects of Conversion of Agriculture Lease Lands to Warm Season Grasses at Merck, Sharp and Dohme Corp. Property in Elkton, VA. April 2013– July 2015. **VR Emrick** , JB Barrett, GN Stevens: **\$408,693**

Selected journal articles

Emrick, Verl R., Scott Tweddle and Michael St. Germain 2010. Characterization of Golden-cheeked Warbler (*Dendroica chrysoparia*) Habitat at Fort Hood, Texas. *Endangered Species Research*. 11: 215–220.

Emrick Verl R. and Jeff Jones. 2008. Influence of competition on the density of the federally endangered Michaux's Sumac (*Rhus michauxii*) at Fort Pickett, Virginia. *Southeastern Naturalist*. 7:61-68.

Copenheaver, Carolyn A. , Matthew W. Yancey, Eva Pantaleoni, and Verl Emrick. 2007. Dendroclimatic analysis of a bottomland hardwood forest: Floodplain vs. terrace responses. *Journal of the Torrey Botanical Society*. 134:505-511.

Stanton, Tyler P., Rebecca L. Murray, Verl R. Emrick. 2004. Bachman's Sparrows mimic the vocalizations of the Common Yellowthroat and the Indigo Bunting. *Journal of Field Ornithology*. 75:51-52.

Vose, James, Barry Clinton and Verl Emrick. 1995. Soil CO₂ Evolution Across Environmental and Species Gradients. Proceedings of the Tenth Annual Central Hardwoods Conference USFS Gen Tech. Report NE-197. March 5-8 Morgantown, West Virginia.

Emrick, Verl R. and Garrett Smathers. 1993. The Phytogeography of the Craggy Mountains, Southern Appalachians. Proceedings of the Seventh Annual Conference on Undergraduate Research. University of Utah, Salt Lake City, Utah.

Popular Articles

Wolf, Eric and Verl Emrick. 2011. Defending Mussel Populations on Military Lands: Taking the Initiative on Managing Species at Risk. *Endangered Species Bulletin*. 48-49.

Selected Recent Technical Reports-Primary Authorship

Emrick, Verl R. and Aaron Teets. 2014. **Project Design and Monitoring for Yacumama Forest Carbon Project, Peru.** Conservation Management Institute- College of Natural Resources and Environment, Virginia Polytechnic Institute and State University.

Emrick, Verl R. 2014. **Assessment of the Impact of Military Vehicle Traffic and Fire Frequency on the Stem Density and Habitat Structure of the Federally Endangered**

Michaux's Sumac (Rhus michauxii): Phase 1 Colony Assessment. Conservation Management Institute- College of Natural Resources and Environment, Virginia Polytechnic Institute and State University.

Emrick, Verl R. 2008. **Experimental Manipulation of Habitat to Increase Sexual Reproduction of Federally Endangered Michaux's Sumac (Rhus michauxii) at Fort Pickett Virginia.** Conservation Management Institute-Military Lands Division College of Natural Resources, Virginia Polytechnic Institute and State University. **CMI-MLD-2008-R-73.**

Emrick, Verl R. 2008. **Botanical Survey of the Dune Ecosystem, State Military** Emrick, Verl R. 2008. **Investigation into the Relationship between Military Disturbance, Plant Species Composition and Soil Fertility at Fort Pickett Maneuver Training Center, Blackstone, Virginia.** Conservation Management Institute-Military Lands Division College of Natural Resources, Virginia Polytechnic Institute and State University. **CMI-MLD-2008-R-64.**

Emrick, Verl R. and Rebecca Murray. Oct. 2007. **Integrated Natural Resources Management Plan for Fort Pickett Maneuver Training Center, Virginia.** Conservation Management Institute-Military Lands Division College of Natural Resources, Virginia Polytechnic Institute and State University. Report Presented to the Virginia Department of Military Affairs. **CMI MLD-2001-R-66.** 252 pages plus appendices.

Technical Reports-Secondary Authorship

Teets, Aaron and Verl Emrick 2013. **Composition of Grassland Communities in Response to Military and Land Management Disturbance at Marine Corps Base Quantico, VA.** Conservation Management Institute- College of Natural Resources and Environment, Virginia Polytechnic Institute and State University. Report Presented to Marine Corps Base Quantico.

Wolf, Eric and Verl Emrick. 2013. **Watershed Rapid Biological Assessment of MTC-Fort Pickett.** Conservation Management Institute- College of Natural Resources and Environment, Virginia Polytechnic Institute and State University. Report Presented to the Virginia Department of Military Affairs.

Copeland, Timothy and Verl R. Emrick. 2004. **Pond Fisheries Sampling Protocol for Army National Guard Maneuver Training Center Fort Pickett.** Conservation Management Institute-Military Lands Division College of Natural Resources, Virginia Polytechnic Institute and State University. Report Prepared for the Fort Pickett -Natural Resources Department. **CMI-MLD-2004-25.**

Stanton, Tyler P., Verl Emrick, and Jennifer Cooke. April 2001. **Best Management Practices for Erosion Control at Fort Pickett-Maneuver Training Center.** Conservation Management Institute-Military Lands Division; College Of Natural Resources Virginia Polytechnic Institute and State University. Report Prepared For the Virginia Department of Military Affairs and Fort Pickett-MTC. **CMI -MLD-2001-R-03.**

Tweddale, Scott, Verl Emrick, and William Jackson. May 2001. **Integrating Remote Sensing and Field Data to Monitor Changes in Vegetative Cover on a Multipurpose Range Complex and Adjacent Training Lands at camp Grayling, Michigan.** ERDC/CERL Technical Report TR-01-45.

PROFESSIONAL ASSOCIATIONS

- Association of Southeastern Biologists
- Ecological Society of America

W. Cully Hession

Biological Systems Engineering, Virginia Tech
540-231-9480; chession@vt.edu

A. Professional Preparation

Virginia Tech	Agricultural Engineering	B.S. 1984
Virginia Tech	Agricultural Engineering	M.S. 1988
Oklahoma State University	Biosystems Engineering	Ph.D. 1995

B. Appointments

2012 – present	Professor, Biological Systems Engineering, Virginia Tech
2005 – 2012	Assoc. Professor, Biological Systems Engineering, Virginia Tech
1999 – 2005	Assist. & Assoc. Professor, Civil and Environmental Eng., Univ. of Vermont
1995 – 1999	Assist. Curator, Patrick Center, Academy of Natl. Sciences, Philadelphia, PA
1992 – 1995	PhD Candidate, Biosystems Engineering, Oklahoma State University
1989 – 1992	Sr. Environ. Engineer, VA-DCR, Richmond, VA.
1987 – 1989	Watershed Modeler, USDA-ARS, Morris, MN

C. Publications (** indicates undergraduate students; * indicates graduate students)

(i) Five Relevant Publications

Polys, N.F., P. Sforza, W.C. Hession, and J. Munsell (2016), Extensible experiences: Fusality for stream and field, Proceedings of the 21st International Conference on Web3D Technology, 179-180. doi: 10.1145/2945292.2945320.

Abel, S., L.C. Hopkinson, W.C. Hession (2016), Hydraulic and physical structure of runs and glides following stream restoration, River Res. App., 32, 1890-1901.

Jones, C.N.*, D.T. Scott, C. Guth*, E.T. Hester, and W.C. Hession (2015), Seasonal variation in floodplain biogeochemical processing in a restored headwater stream, Environmental Science & Technology, 49, 13190-13198.

Hofmeister, K.L.***, C.M. Cianfrani, and W.C. Hession (2015), Complexities in the stream temperature regime of a small mixed-use watershed, Blacksburg, VA, Ecological Engineering, 78, 101-111.

Liao, H.*, L.H. Krometis, W.C. Hession, R. Benitez**, R. Sawyer**, E. Schaberg**, E. Wagoner**, and B.D. Badgley (2015), Storm loads of culturable and molecular fecal indicators in an inland urban stream, Science of the Total Environment, 530-531, 347-356.

(ii) Five Other Significant Publications

Ludwig, A.L., W.C. Hession, D. Scott, and D. Gallagher (2016), Simulated flood of a small constructed floodplain wetland in Virginia: Even-scale pollutant attenuation, Trans. ASABE, 59(5), 1321-1331.

Ludwig, A.L.*, and W.C. Hession (2015), Groundwater influence on water budget of a small constructed floodplain wetland in the Ridge and Valley of Virginia, USA, Journal of Hydrology: Regional Studies, 4, 699-712.

- Liao, H.*, L.H. Krometis, W.C. Hession, L.L. House, K. Kline, and B.D. Badgley (2014), Hydrometeorological and physicochemical drivers of fecal indicator bacteria in urban stream bottom sediments, *Journal of Environmental Quality*, 43, 2034–2043.
- Fahrenfeld N., K. Knowlton, L.A. Krometis, W.C. Hession, K. Xia, E. Lipscomb*, K.B. Libuit**, K.B. Green**, and A. Pruden-Bagchi (2014), Effect of manure application on abundance of antibiotic resistance genes and their attenuation rates in soil: Field-scale mass balance approach. *Environmental Science & Technology*, 48, 2643-2650.
- Brown, K.R.*, K.J. McGuire, W.C. Hession, and W.M. Aust (2016), Can the Water Erosion Prediction Project model be used to estimate best management practice effectiveness from forest roads? *Journal of Forestry*, 114(1), 17-26.

D. Synergistic Activities

Research Infrastructure Development, Design, and Construction:

- *Stream Research, Education, and Management Laboratory* (StREAM Lab, Blacksburg, VA). Installing extensive monitoring/sensor array for real-time website access for research, education, and outreach. Includes four flow and water quality monitoring stations, a full weather station, groundwater wells, and web cameras utilizing wireless communication technologies.
- *Prices Fork Research Farm* (Blacksburg, VA). Reviving three small watershed hydrology research sites. Currently conducting interdisciplinary research related to pasture management.
- *Urban Horticultural Center* (Blacksburg, VA). Designed and installed 33 small, flexible plots (3 x 3 m) with collection systems for evaluating water and sediment runoff from various land use practices.

Interdisciplinary Research and Education:

- *Director of Virginia Tech's StREAM Lab* (Blacksburg, VA; 2010-current). Utilized to promote interdisciplinary research, education, and outreach. Sixteen classes from across campus use the lab for field excursions, laboratories, and research projects. More than 20 graduate students have done all or portions of MS or PhD research using data from the site. <http://vtstreamlab.weebly.com/>.
- *Director NSF-REU Site: Dynamics of Water and Societal Systems, An Interdisciplinary Research Program at the Virginia Tech StREAM Lab* (Blacksburg, VA; 2012-14). An interdisciplinary undergraduate research experience.
- *PI USDA-REEU: Training Future Leaders to Solve Resource Challenges at the Confluence of Water and Society* (Blacksburg, VA; Due March 24, 2016). Interdisciplinary research and extension training program with five co-PIs and fifteen Faculty Mentors from eleven different departments.
- *Co-PI USDA-AFRI: Identification and Management of Critical Control Points in the Spread of Antibiotic Resistance from Manure to Raw Produce* (Virginia Tech; 2015-2017). Extremely interdisciplinary research effort (~\$2.25 M) seeks to identify critical control points for the spread of antibiotic resistance from farm to fork. Includes eight co-PIs from six different departments.
- *Co-PI Virginia Tech-ICAT Science, Engineering, Art, and Design Grant: Fusality for Stream and Field* (Virginia Tech; 2015-17). Interdisciplinary effort to collect, fuse, and deliver of geo-referenced data to Web3D environments for research, education, and

outreach. We are working to publish environmental monitoring data and citizen sensors to create compelling and scientific experiences of local places using human-centered computing.

- *Member University Water Degree Steering Committee* (Virginia Tech; 2011-current). University-wide committee that developed a new interdisciplinary undergraduate degree at Virginia Tech – “Water: Resources, Policy, and Management”.

Erich T. Hester, Ph.D., P.E.

Associate Professor

Via Department of Civil and Environmental Engineering, Virginia Tech
220-D Patton Hall, 750 Drillfield Drive, Mail Code 0105

Blacksburg, VA 24061-0105

Email: ehester@vt.edu Phone: 540-231-9758 Fax: 540-231-7532

Website: www.flow.cee.vt.edu

Professional Preparation

Dartmouth College (Hanover, NH), Biology, A.B., 1992

Stanford University (Stanford, CA), Civil and Environmental Engineering, M.S., 1998

University of North Carolina (Chapel Hill, NC), Ecology, Ph.D., 2008

Appointments

2016-present Associate Professor, Department of Civil and Environmental Engineering,
Virginia Tech

2009-2015 Assistant Professor, Department of Civil and Environmental Engineering,
Virginia Tech

2002-2003 Water Resources Engineer, Herrera Environmental Consultants

2001-2002 Water Resources Engineer, Philip Williams and Associates

1998-2001 Project Engineer, LFR, Inc.

1993-1995 Staff Scientist, Ecology and Environment

1992 Water Quality Intern, East Bay Municipal Utilities District

Products (*= student from Hester Lab)

Most relevant

Hester, E. T., *B. Hammond, and D.T. Scott. 2016. Effects of inset floodplains and hyporheic exchange induced by in-stream structures on nitrate removal in a headwater stream. *Ecological Engineering* 97:452-464.

Jones, C.N., D.T. Scott, *C.R. Guth, E.T. Hester, and W.C. Hession. 2015. Seasonal variation in floodplain biogeochemical processing in a restored headwater stream. *Environmental Science & Technology* 49:13190-13198.

*Azinheira, D.L., D.T. Scott, W.C. Hession, and E.T. Hester. 2014. Comparison of effects of inset floodplains and hyporheic exchange induced by in-stream structures on solute retention. *Water Resources Research* 50(7):6168-6190.

Hester, E.T., and *E.N. Cranmer. 2014. Variation of hyporheic exchange potential among urban region streams: implications for stream restoration. *Environmental & Engineering Geoscience* 20(3): 287-304.

Hester, E. T. and M. N. Gooseff. 2010. Moving beyond the banks: Hyporheic restoration is fundamental to restoring ecological services and functions of streams. *Environmental Science & Technology* 44: 1521-1525.

Other

Hester, E.T., *C.G. Guth, D.T. Scott, and C.N. Jones. 2016. Surface water-groundwater exchange processes in an experimental floodplain along a restored headwater stream. *Hydrological Processes* 30: 3770-3787.

*Menichino, G.T., and E.T. Hester. 2014. Hydraulic and thermal effects of in-stream structure-induced hyporheic exchange across a range of hydraulic conductivities. *Water Resources Research* 50(6): 4643-4661.

Hester, E. T. and M. N. Gooseff. 2011. Hyporheic restoration in streams and rivers. in A. Simon, S. J. Bennett, and J. M. Castro, editors. *Stream Restoration in Dynamic Fluvial Systems: Scientific Approaches, Analyses, and Tools*. American Geophysical Union, Washington, DC.

Hester, E.T., M.W. Doyle, and G.C. Poole. 2009. The influence of in-stream structures on summer water temperatures via induced hyporheic exchange. *Limnology and Oceanography* 54(1): 355-367.

Hester, E.T., and M.W. Doyle. 2008. In-stream geomorphic structures as drivers of hyporheic exchange. *Water Resources Research* 44: W03417.

Synergistic Activities

Professional Service: Dr. Hester is Associate Editor for *Water Resources Research* and on the Board of Directors of the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI).

Related Research: Dr. Hester is PI on an existing National Science Foundation project (ENG-CBET-Environmental Sustainability, Award #1066817) that is evaluating the ability of various stream restoration practices (e.g., in-stream structures, floodplain reconnection) to enhance removal of nutrients in surface runoff by enhancing retention in hyporheic zones and backwater areas. Both modeling and field experiments have occurred to evaluate the effect of in-stream structures, inset floodplains, and bankfull floodplain reconnection on water quality. Publications thus far include Azinheira et al 2014, Hester et al 2015, Jones et al 2015, and Hester et al 2016 (above). The results of this earlier project are a great foundation for the proposed work.

Innovations in Teaching: Dr. Hester has developed a new graduate class which focuses on surface water-groundwater interaction. Simultaneous consideration of surface water and groundwater dynamics is a cutting edge area of research and analysis that is critical to solving many environmental and water resources issues. This is the first time this topic has been taught at Virginia Tech, and the topic is not yet common at other universities. This class will be a great platform to disseminate the results of the proposed project.

Undergraduate Research and Diversity: Dr. Hester has a history of including undergraduate students in research starting during his PhD program, where four undergraduates assisted him with field work and data analysis. He also has consistently utilized undergraduates in his research as a faculty member with nine participating so far, two of which were involved for several semesters. All but one of these nine undergraduates were either racial/ethnic minorities, women, or both.

ERIN R. HOTCHKISS

Assistant Professor, Department of Biological Sciences
Virginia Polytechnic Institute and State University, Blacksburg, VA 24061 USA
Phone: 540-231-7005, Email: ehotchkiss@vt.edu

RELATED EXPERTISE:

Ecosystem function, water quality, carbon metabolism, nutrient cycling and transport, stable isotopes, ecology of invasive species, process-based modeling, time series analyses

PROFESSIONAL PREPARATION:

Emory University, GA, USA	Environmental Studies	B.Sc., 2003
University of Wyoming, WY, USA	Zoology & Physiology	M.Sc., 2007
University of Wyoming, WY, USA	Ecology	Ph.D., 2013
Umeå University, Sweden	Freshwater Biogeochemistry	2013-2015
Université du Québec à Montréal, Canada	Freshwater Biogeochemistry	2015-2016

PROFESSIONAL APPOINTMENTS:

2016-Present	Assistant Professor, Department of Biological Sciences, Virginia Tech
2016-Present	Faculty Affiliate, Global Change Center, Virginia Tech
2015-2016	Postdoctoral Research Fellow, Carbon biogeochemistry of boreal river networks, Université du Québec à Montréal, Canada
2013-2015	Postdoctoral Research Fellow, CO ₂ fluxes in aquatic networks, Umeå University, Sweden

PRODUCTS (10 MOST RELEVANT):

- Hall, R.O. & E.R. Hotchkiss (In Press). Stream Metabolism. Chapter 34 In: *Methods in Stream Ecology*, 3rd Edition. Hauer, F.R. & G.A. Lamberti, Eds. Academic Press.
- Hall, R.O., J.L. Tank, M.A. Baker, E.J. Rosi-Marshall, & E.R. Hotchkiss. 2016. Metabolism, gas exchange, and carbon spiraling in rivers. *Ecosystems* 19: 73-86.
- Hotchkiss, E.R., R.O. Hall, R.A. Sponseller, D. Butman, J. Klaminder, H. Laudon, M. Rosvall, & J. Karlsson. 2015. Sources of and processes controlling CO₂ emissions change with the size of streams and rivers. *Nature Geoscience* 8: 696-699.**
- Burrows, R.M., E.R. Hotchkiss, M. Jonsson, H. Laudon, B.G. McKie, & R.A. Sponseller. 2015. Nitrogen limitation of heterotrophic biofilms in boreal streams. *Freshwater Biology* 60: 1237-1251.
- Hotchkiss, E.R. & R.O. Hall. 2015. Whole-stream ¹³C tracer addition reveals distinct fates of newly fixed carbon. *Ecology* 96: 403-416.
- Jonsson, M., P. Hedström, K. Stenroth, E.R. Hotchkiss, F. Vasconcelos, J. Karlsson, & P. Byström. 2015. Climate change modifies the size structure of assemblages of emerging aquatic insects. *Freshwater Biology* 60: 78-88.
- Hotchkiss, E.R. & R.O. Hall. 2014. High rates of daytime respiration in three streams: Use of $\delta^{18}\text{O}_{\text{O}_2}$ and O₂ to model diel ecosystem metabolism. *Limnology & Oceanography* 59: 798-810.
- Hotchkiss, E.R. & R.O. Hall. 2010. Linking calcification by exotic snails to stream inorganic carbon cycling. *Oecologia* 163: 235-245.

- Solomon, C.T., E.R. Hotchkiss, J.M. Moslemi, A.J. Ulseth, E.H. Stanley, R.O. Hall, & A.S. Flecker. 2009. Sediment size and nutrients regulate denitrification in a tropical stream. *Journal of the North American Benthological Society* 28: 480-490.
- Hubbard, K.A., L.K. Lautz, M.J. Mitchell, B. Mayer, & E.R. Hotchkiss. 2010. Evaluating nitrate uptake in a Rocky Mountain stream using labelled ¹⁵N and ambient nitrate chemistry. *Hydrological Processes* 24: 3322-3336.

SYNERGISTIC ACTIVITIES:

Service to professional societies: Member of ad hoc Early Career Committee, Society for Freshwater Science (SFS) (2016-Present); Co-Chair of SFS Public Information Publicity Committee (2012-2015); Public outreach via SFS social media accounts (e.g., @BenthosNews, 2010-Present); member of the SFS Publications Committee (2012-2015); and Graduate Student Representative to the SFS Board of Directors (2011-2012). Also served on the Strategic Planning Committee for the *Journal of the North American Benthological Society*, now *Freshwater Science* (2008-2009).

Broader education and outreach: Organized and ran “What’s in the Water?” interactive lessons for annual Wyoming Women in Science Workshop (grades 6-12, 2007-2013); advised Science Education undergraduates during their summer research experience with Wyoming EPSCoR’s Science Teacher Education Program (2007-2010); served as a judge and member of the Scientific Review Committee for Wyoming State Science Fair (2006-2012).

Peer review: *Aquatic Sciences, Biological Reviews, Biogeochemistry, Biogeosciences, Canadian Journal of Fisheries and Aquatic Sciences, Chemical Geology, Ecological Applications, Ecology, Ecology Letters, Ecosphere, Ecosystems, Environmental Science & Technology, Estuaries and Coasts, Freshwater Biology, Freshwater Science, Global Biogeochemical Cycles, Geophysical Research Letters, Journal of the American Water Resources Association, Journal of Ecology, Limnologica, Limnology & Oceanography, Limnology & Oceanography Letters, Limnology & Oceanography: Methods, Oecologia, Science of the Total Environment, Water Resources Research, Western North American Naturalist*

Member, Working Group: Time Series in Stream Ecosystems, Stream Resilience Research Coordination Network (2016-Present)

Conference special session organizer: (1) Conference Special Session: “Towards a predictive freshwater ecology: using time-series data to understand and forecast responses to a changing environment.” Society for Freshwater Science Conference, Raleigh, NC (2017; with primary convener C Ruffing, co-conveners T Royer, A Ruhi, and A Smits). (2) Biogeosciences Special Session: “Linking dissolved organic matter quality with biogeochemical cycles.” American Geophysical Union Conference, San Francisco, CA (2010; primary convener with co-conveners K Goodman, W McDowell, and J Fellman).

RECENT HONORS

2016. Hynes Award for New Investigators, Society for Freshwater Science. *Recognizes a young scientist for an outstanding primary publication. Awarded for Hotchkiss & Hall (2015).*
2016. Raymond L. Lindeman Award, Association for the Sciences of Limnology and Oceanography. *Recognizes an outstanding paper written by a young aquatic scientist. Awarded for Hotchkiss & Hall (2014).*

James D. Ivory

Associate Professor, Dept. of Communication, Virginia Polytechnic Institute and State U.
111 Shanks Hall (0311), Blacksburg, VA 24061

Phone: 540.231.6507 Email: jivory@vt.edu Fax: 540.231.9817

a. Professional Preparation

Institution	Major	Degree	Year
University of Wyoming, Laramie, WY	Journalism	B.S.	2000
University of Wyoming Laramie, WY	Communication	M.A.	2002
University of North Carolina at Chapel Hill, Chapel Hill, NC	Mass Communication	Ph.D.	2005

b. Appointments

2012-Present	Associate Professor, Department of Communication, Virginia Tech
2005-2012	Assistant Professor, Department of Communication, Virginia Tech

c. Publications

(i) Five most closely related to proposal project:

- Elson, M., Breuer, J., Ivory, J. D., & Quandt, T. (2014). More than stories with buttons: Narrative, Mechanics, and Context as determinants of player experience in digital games. *Journal of Communication, 64*, 521-542.
- Ivory, J. D., & Kalyanaraman, S. (2007). The effects of technological advancement and violent content in video games on players' feelings of presence, involvement, physiological arousal, and aggression. *Journal of Communication, 57*, 532-555.
- Kalyanaraman, S., & Ivory, J. D. (2009). Enhanced information scent, selective discounting, or consummate breakdown: The psychological effects of Web-based search results. *Media Psychology, 12*, 295-319.
- Kalyanaraman, S., Penn, D. L., Ivory, J. D., & Judge, A. (2010). The virtual doppelganger: Effects of a virtual reality simulator on perceptions of schizophrenia. *Journal of Nervous and Mental Disease, 198*, 437-443.
- Limperos, A., Waddell, T. F., Holz Ivory, A., & Ivory, J. D. (2014). Psychological and physiological responses to stereoscopic 3D presentation in handheld digital gaming: Comparing the experiences of frequent and infrequent game players. *Presence: Teleoperators and Virtual Environments, 23*, 341-353.

(ii) Five other significant publications:

- Ivory, J. D. (2006). Still a man's game: Gender representation in online reviews of video games. *Mass Communication and Society, 9*(1), 103-114.
- Ivory, J. D. (2012). *Virtual lives: A reference handbook*. (Contemporary World Issues Series). Santa Barbara, CA: ABC-CLIO.
- Ivory, J. D., Williams, D., Martins, N., & Consalvo, M. (2009). Good clean fun? A content analysis of profanity in video games and its prevalence across game systems and ratings. *CyberPsychology and Behavior, 12*, 457-460.

Quandt, T., van Looy, J., Vogelgesang, J., Elson, M., Ivory, J., Mäyrä, F., & Consalvo, M. (2015). Digital games research: A survey study on an emerging field and its prevalent debates. *Journal of Communication*, 65, 975-996.

Waddell, T. F., & Ivory, J. D. (2015). It's not easy trying to be one of the guys: The effect of avatar attractiveness, avatar sex, and user sex on the success of help-seeking requests in an online game. *Journal of Broadcasting and Electronic Media*, 59, 112-129.

d. Synergistic Activities

Editorial board member, *Mass Communication and Society*, *Journal of Broadcasting and Electronic Media*, *Journal of Computer-Mediated Communication*, *Journal of Media Psychology*, *Media Psychology*, *Review of Communication Research*, *Sex Roles*.

Chair, Game Studies Division, International Communication Association, 2013-2015. (Vice Chair 2011-2013).

Head, Communication Technology Division (CTEC), Association for Education in Journalism and Mass Communication, 2008-2009.

Founding director, Virginia Tech Gaming and Media Effects Research Laboratory (G.A.M.E.R. Lab).

Affiliate Faculty Member, Virginia Tech Center for Human-Computer Interaction, Virginia Tech Institute for Creativity, Arts, and Technology, and Virginia Tech Center for Peace Studies and Violence Prevention.

Jess Walter Jones

U.S. Fish and Wildlife Service
106a Cheatham Hall
Department of Fisheries and Wildlife Sciences
Virginia Tech University
Blacksburg, Virginia 24061-0321

Office number: (540)-231-2266
Lab number: (540)-231-7241
Fax: (540)-231-7580
Email address: Jess_Jones@fws.gov

Education:

2004-2009 Ph.D. Fisheries Science, Virginia Polytechnic Institute and State University
2001-2004 M.Sc. Fisheries Science, Virginia Polytechnic Institute and State University
1993-1996 B.Sc. Fisheries Science, Virginia Polytechnic Institute and State University

Background and Work Interest:

I am a Restoration Biologist with U.S. Fish and Wildlife Service, stationed in the Department of Fish and Wildlife Conservation at Virginia Tech University, Blacksburg, where I also serve as an Associate Professor and Director of the Freshwater Mollusk Conservation Center.

My research focuses on conservation biology of freshwater mussels, with an emphasis on: (1) restoration ecology, (2) population demography and modeling, (3) population genetics and phylogenetics, (4) ecotoxicology, (5) conservation aquaculture, and (6) quantitative monitoring and field techniques. I am particularly interested in improving field and laboratory techniques to restore mussel populations to enhance the capability of the Department of Interior Natural Resource Damage Assessment and Restoration (NRDAR) program, including applying small- and large-scale mesocosms to improve captive growing and experimental conditions for endangered mussels and fishes.

Employment:

2004-Present Restoration Biologist, U.S. Fish and Wildlife Service, Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg. The primary duties of this position include:

- Provide project oversight and conduct contracting with university, state and non-governmental cooperators to restore endangered mussel and fish populations in fulfillment of the restoration goals of two multi-million dollar NRDAR case settlements.
- Design and implement complex studies and projects to quantitatively monitor and restore mussel populations in the Clinch and Powell Rivers, including ecotoxicological assessments of damaged and degraded sections of each river.
- Provide technical assistance to federal and state agencies that participate in the restoration and conservation of mussels in the southeastern United States.
- Disseminate project results to agency cooperators, the scientific community and public through written reports, publications, presentations and briefings

Recent publications in peer-reviewed journals:

2017 D.E. Schilling, A.T. Phipps, J.W. Jones, and E.M. Hallerman. 2017. A Survey of Freshwater Mussels (Unionidae) in Little River, Blount County, Tennessee. *Southeastern Naturalist* 16:105-116.

Michalak, P., L. Kang, S. Ciparis, W. Henley, J. Jones, A. Phipps, and E. Hallerman. Freshwater mussels exposed to arsenic and sulfate show contrasting patterns of gene expression. *InTech-Open Science, Malacology* (Accepted January 24, 2017).

- Callil C.T., M.C.S. Leite, L.A.F. Mateus and J.W. Jones. Influence of the flood-pulse on reproduction and growth of *Anodontites trapesialis* (Lamarck, 1819) (Bivalvia: Mycetopodidae) in the Pantanal wetland, Brazil. *Hydrobiologia* DOI: 10.1007/s10750-017-3097-3
- D. Smith, B. Butler, J. Jones, C. Gatenby, R. Hylton, M. Parkin, C. Schulz and P. Shute. Developing a landscape-scale, multi-species, and cost-efficient conservation strategy for imperiled aquatic species in the Upper Tennessee River Basin, USA. *Aquatic Conservation: Marine and Freshwater Ecosystems* (Accepted March 7).
- 2016** Henley, W.F., J.J. Schmerfeld, S.A. Budischak, C.M. Hall, R.J. Neves, S. Ciparis, J.W. Jones. Freshwater mussel (Unionidae) abundance and diversity upstream and downstream of a superfund site on the North Fork Holston River, Saltville, Virginia, U.S.A. *Journal of Shellfish Research* 35:875-883.
- D. Hua, Y. Jiao, R.J. Neves, J.W. Jones. Modeling of periodic growth and growth cessations in the federally endangered Cumberlandian combshell (*Epioblasma brevidens*) using a hierarchical Bayesian approach. *Endangered Species Research* 31:325-336.
- Hylton, R., L. Koch, J. Jones. Race to Save the Golden riffleshell. *Endangered Species Bulletin*. Summer 2016.
- Ahlstedt, S.A., M. Fagg, R.S. Butler, J.F. Connell and J.W. Jones. Quantitative monitoring of freshwater mussel populations from 1979-2004 in the Clinch and Powell Rivers of Tennessee and Virginia, with miscellaneous notes on the fauna. *Journal of Mollusk Biology and Conservation* 19:1-18.
- Lane, T.W., E.M. Hallerman, J.W. Jones. Phylogenetic and taxonomic assessment of the endangered Cumberland bean (*Villosa trabalis*) and purple bean (*Villosa perpurpurea*). *Journal of Conservation Genetics* 5:1109-1124.
- Zipper, C.E., P.F. Donovan, J.W. Jones, J. Li, J.E. Price, R.E. Stewart. Spatial and temporal correspondences among watershed mining, water quality, and freshwater mussel status in an Eastern USA River. *Science in the Total Environment*. 541:603-615.
- 2015** Jones, J.W. Freshwater mussels of Virginia (Bivalvia: Unionidae): an introduction to their life history status and conservation. *Virginia Journal of Science* 66 (3 & 4):1-23.
- S. Ciparis, A. Phipps, D. Soucek, C. Zipper, J.W. Jones. 2015. Effects of environmentally relevant mixtures of major ions on a freshwater mussel. *Environmental Pollution* 207:280-287
- Jones, J.W., *N. Johnson, Grobler, P., *D. Schilling, R.J. Neves and E.M. Hallerman. The endangered rough pigtoe (*Pleurobema plenum*) (Bivalvia: Unionidae): Assessment of phylogenetic status and genetic differentiation of two geographically isolated populations in the Ohio River basin, U.S.A. *Journal of Fish and Wildlife Management* 6:338-349.
- *Carey, C.S., J.W. Jones, B. Butler, E. Hallerman. Restoring the Endangered Oyster Mussel (*Epioblasma capsaeformis*) to the Upper Clinch River, Virginia: An Evaluation of Population Restoration Techniques. *Restoration Ecology* 23:447-454
- A.E. Pinkney, D.A. Cristol, C.T. Driscoll, D.C. Evers, M.J. Hooper, J.W. Jones, R.S. Lazarus, A. Milliken, B.A. Rattner, J. Schmerfeld, D.W. Sparling, T.H. Tear. Interactive Effects of Climate Change with Nutrients, Mercury, and Freshwater Acidification on Key Taxa in the North Atlantic Landscape Conservation Cooperative Region. *Integrated Environmental Assessment and Management* 11:355-369.
- Hua, Dan, Y. Jiao, R.J. Neves, J. Jones. Using PIT tags to assess individual heterogeneity in a mark-recapture study of laboratory-reared juveniles of the endangered Cumberlandian combshell (*Epioblasma brevidens*). *Ecology and Evolution* 5:1076-1087.
- Jones, J.W., R.J. Neves and E.M. Hallerman. Historical demography of freshwater mussels (Bivalvia: Unionidae): genetic evidence for population expansion and contraction during the late Pleistocene and Holocene. *Biological Journal of the Linnean Society* 114:376-397.

Leigh-Anne Krometis, Ph.D., E.I.T.

Assistant Professor

Department of Biological Systems Engineering

Virginia Tech

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krometis@vt.edu

(a) Professional Preparation

Virginia Tech	Blacksburg, VA	Biological Systems Engineering	B.S. 2002
Virginia Tech	Blacksburg, VA	Biological Systems Engineering	M.S. 2004
U. of North Carolina	Chapel Hill, NC	Environmental Sci. & Eng.	PhD 2009

(b) Appointments

2011-Present	Biological Systems Engineering, Virginia Tech	Assistant Professor
2009-2011	Biological Systems Engineering, Virginia Tech	Research Assistant Professor
2009	Environmental Science & Eng, Univ of NC	Postdoctoral Researcher

Select Publications (out of 32 total peer-reviewed, H Index=11)

i. Five Related Publications

1. Smyntek, P, L. Krometis, R. Wagner, S. Carvajal, T. Thompson, and W. Strosnider. Passive biological treatment of mine water to reduce conductivity: Potential designs, challenges, and research needs. *Journal of Environmental Quality*, **2017**, 46: 1-9.
2. Liao, H., L. Krometis, K. Kline. 2016. Coupling a continuous watershed-scale microbial fate and transport model with a stochastic dose-response model to estimate risk of illness in an urban watershed. *Science of the Total Environment*. **2016**, (551/552): 668-675.
3. Liao, H., L. Krometis, K. Kline, C. Hession. Long-term impacts of bacteria-sediment interactions in watershed-scale microbial fate and transport modeling. *Journal of Environmental Quality*. **2015**, 44(5): 1483-1490.
4. Smith, T., L. H. Krometis, C. Hagedorn, B. Benham, A. H. Lawrence, E. Ling, P. Ziegler, S. W. Marmagas. Associations between fecal indicator bacteria prevalence and demographic data in private water supplies in Virginia. *Journal of Water and Health*. **2014**, 12(4): 824-834.
5. Fahrenfeld, N., K. Knowlton, L. Krometis, W. C. Hession, K. Xia, E. Lipscomb, K. Libuit, B. Green, A. Pruden. Manure application's effect on levels of antibiotic resistance genes and their attenuation rates in soil: Field-scale mass balance approach. *Environmental Science and Technology*. **2014**, 48(5): 2643-2650.

ii. Other Relevant Publications

1. Cook, N., E. Sarver, L. Krometis, J. Huang. Habitat and water quality as drivers of ecological system health in Central Appalachia. *Ecological Engineering*. **2015**, 84: 180-189.
2. Liao, H., L. Krometis, C. Hession, R. Benitez, R. Sawyer, E. Schaeberg, E. von Wagoner, B. Badgley. Storm loadings of general and human-specific fecal indicators in an inland urban stream. *Science of the Total Environment*. **2015**, (530/531): 347-356.

3. Liao, H., L. Krometis, C. Hession, L. House, K. Kline, B. Badgley. Hydrometeorological and physicochemical drivers of fecal indicator bacteria in urban stream bottom sediments. *Journal of Environmental Quality*. **2014**, 43: 2034-2043.
4. Coffey, R., B. Benham, L. Krometis, M. L. Wolfe, E. Cummins. Assessing the effects of climate change on waterborne microorganisms: Implications for EU and USA water policy. *Human and Ecological Risk Assessment*. **2014**, 20: 724-742.
5. Allevi, R. P., L. Krometis, C. Hagedorn, B. Benham, A. Lawrence, E. Ling, P. Ziegler. Quantitative analysis of microbial contamination in private drinking water supply systems. *Journal of Water and Health*. **2013**, 11(2): 244-255.

(d) Synergistic Activities

- *Co-Director*, NSF StREAM REU (“Dynamics of Water and Societal Systems: An Interdisciplinary Research Program at the Virginia Tech StREAM Lab”), 2012-2014. Co-led summer research program focused on interdisciplinary watershed management; hosted 28 undergraduates from 18 different home institutions representing 18 different disciplinary degrees.
- *Virginia Tech Imagination Camp Faculty Volunteer*, 2010-2014. Designed and led hands-on field and lab-scale activities focused on environmental microbiology and public health for 100 middle-school students participating in a Virginia Tech summer camp.
- *Faculty Member*, Virginia Tech Center for Global Change, 2014-present. (steering committee for Interfaces of Global Change PhD Program, 2014-2015).
- *Team Member and Research Student Advisor*, Cooperative Extension Virginia Household Water Quality Program, 2011-2015. Provides education and low cost water quality testing to homeowners reliant on private water supplies (e.g. wells, springs); program received the Florence Hall Award from the National Extension Association of Family and Consumer Science in May 2013; six resultant peer-reviewed publications led by students.
- *Faculty Fellow*, Virginia Tech Honors Residential Commons, 2010-present. Broad aim is to support the development of interdisciplinary residential colleges that will house and nurture students academically throughout their college career.

DANIEL L. McLAUGHLIN, ASSISTANT PROFESSOR DEPARTMENT OF
FOREST RESOURCES AND ENVIRONMENTAL CONSERVATION VIRGINIA
POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
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(A) PROFESSIONAL PREPARATION

B.S. Mathematics	2002 Lander University, Greenwood, SC
B.S. (<i>summa cum laude</i>) Civil Engineering	2002 Clemson University, Clemson, SC
M.S. Environmental Engineering	2004 Clemson University, Clemson, SC
Ph.D. Environmental Engineering Sciences	2009 University of Florida, Gainesville, FL

(B) APPOINTMENTS

Assistant Professor (Forest and Env. Conservation, VT)	<i>October 2014 - present</i>
Assistant Research Scientist (Forest Res. & Conservation, UF)	<i>July 2013 – October 2014</i>
Adjunct Lecturer (Env. Eng. Sciences, UF)	<i>August 2010 – Dec 2013</i>
Postdoctoral Research Associate (Forest Res. & Conservation, UF)	<i>May 2009 – July 2013</i>
Graduate Research Assistant (Env. Eng. Sciences, UF)	<i>August 2004 – May 2009</i>
Graduate Research Assistant (Env. Eng., CU)	<i>January 2003 – May 2004</i>

(C) CURRENT RELEVANT RESEARCH

McLaughlin, D.L. *U.S. Department of Agricultural, Agriculture Research Service*. Comparing and refining models of wetland hydrologic connectivity (2015-2018)

McLaughlin, D.L. *U.S. Fish and Wildlife Service*. Forest inventory and monitoring at the Great Dismal Swamp (2016-2018)

McLaughlin, D.L. *Florida Department of Agricultural and Consumer Services via Subaward from University of Florida*. Managing forests for increased water yield (2014-2018)

McLaughlin, D.L. *National Science Foundation via Subaward from University of Florida*. The ecological drill hypothesis: Biotic control on carbonate dissolution in a low relief patterned landscape (2013-2017)

(D) PRODUCTS

i. (5 most relevant)

Golden, H.E., Creed, I.F., Ali, G., Basu, N.B., Neff, B., Rains, M.C, McLaughlin, D.L., Alexander, L.C., Ameli, A.A., Christensen, J.R., Evenson, G.R., Jones, C.N., Lane, C.R., Lang, M (*in press*) Scientific tools for integrating geographically isolated wetlands into land management decisions. *Frontiers in Ecology and the Environment*.

Hensley, R.T., McLaughlin, D.L., Cohen, M.J., Decker, P.H. (2017) Stream phosphorus dynamics of minimally impacted coastal plain watersheds. *Hydrological Processes*: doi: 10.1002/hyp.11132.

Cohen, M.J., Creed, I., Alexander, L., Basu, N., Calhoun, A., Craft, C., D'Amico, E., DeKeyser, E., Fowler, L., Golden, H., Jawitz, J., Kalla, P., Kirkman, K., Lane, C., Lang, M., Leibowitz, S., Lewis, D., Marton, J., McLaughlin, D.L., Mushet, D., Rannan-Kiperwas, H., Rains, M., Smith, L., Walls, S. (2016) Do geographically isolated wetlands influence landscape functions? *Proceedings of the National Academy Sciences* 113(8): 1978-1986, doi: 10.1073/pnas.1512650113.

McLaughlin, D.L., Kaplan, D.A., Cohen, M.J. (2014). A significant nexus: geographically isolated wetlands influence landscape hydrology. *Water Resources Research*: doi: 10.1002/2013WR015002
McLaughlin, D.L., Kaplan, D.A., Cohen, M.J. (2013) Managing forests for increased regional water yield in the southeastern U.S. coastal plain. *The Journal of the American Water Resources Association* 49(4):953-965, doi: 10.1111/jawr.12073.

ii. (5 other significant contributions)

Chandler, H. C., McLaughlin, D.L., Gorman, T.A., McGuire, K.J., Feaga, J.B., Haas, C.A. (2017) Drying rates of ephemeral wetlands: implications for breeding amphibians. *Wetlands*: doi: 10.1007/s13157-017-0889-1.

Van Meter, K.J., Basu, N.B., McLaughlin, D.L., Steiff, M. (2016) The socio-ecohydrology of rainwater harvesting tanks in India: understanding water storage and release dynamics at tank and catchments scales. *Hydrology and Earth System Sciences* 20: 2629-2647, doi:10.519/hess-20-2629-2016.

Rains, M.C., Leibowitz, S.G., Cohen, M.J., Creed, I.F., Golden, H.E., Jawitz, J.W., Kalla, P., Lane, C.R., Lang, M.W., McLaughlin, D.L. (2015) Geographically isolated wetlands are part of the hydrological landscape. *Hydrological Processes*: doi: 10.1002/hyp.10610.

McLaughlin, D.L., Cohen, M.J. (2014) Ecosystem specific yield for estimating evapotranspiration and groundwater exchange from diel surface water variation. *Hydrological Processes* 28: 1495-1506, doi:10.1002/hyp.9672.

McLaughlin, D.L., Cohen, M.J. (2013) Realizing ecosystem services: Wetland hydrologic function along a gradient of ecological condition. *Ecological Applications* 23(7): 1619-1631.

(E) SYNERGISTIC ACTIVITIES

Scientific Review (last 5 years): Proposal review: National Science Foundation (Hydrology), USGS 104- G; Reviewer for scholarly journals: Hydrological Processes, Wetlands, International Journal of Forestry Research, PLOS ONE, Journal of Hydrologic Engineering, Forest Science, Canadian Journal of Forest Research, Ecohydrology, Journal of Hydrology, Estuaries and Coasts.

Society Memberships: American Geophysical Union, Society of Wetland Scientists, American Water Resources Association, Society of Freshwater Scientists, and American Ecological Engineering Society.

Outreach and Advisory Committees: USGS Powell Center-North American Connectivity Workgroup; EPA Hydrological Modeling Working Group for Wetland Connectivity and Cumulative Effects; Geographically Isolated Wetlands Research Workgroup; Delegate, Universities Council on Water Resources; Virginia Water Quality Academic Advisory Committee; Co-director, Conserved Forest Ecosystems: Outreach and Research Cooperative; Wetland Modeling Project Peer Advisory Workgroup for the Florida Department of Environmental Protection.

Ron Meyers

Research Assistant Professional, Department of Fish and Wildlife Conservation, Lecturer, School of Public and International Affairs, Virginia Tech
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 540-570-9535
 rbmeyers@vt.edu

(a) Professional Preparation

A list of the individual's undergraduate and graduate education and postdoctoral training as indicated below:

The Ohio State University	Columbus, Ohio	Watershed and River Basin Planning and Policy	B.S. 1986
The Ohio State University	Columbus, Ohio	Public Policy and Management	M.A. 1996
The Ohio State University	Columbus, Ohio	Natural Resources	Ph.D. 2002

(b) Appointments

In reverse chronological order, list the individual's academic/professional appointments.
 Research Assistant Professional, Department of Fish and Wildlife Conservation, Lecturer, School of Public and International Affairs, Virginia Tech
 Assistant Professor, Director, Energy Programs, Jefferson Community College
 Assistant Professor, Director, Center for Energy and Natural Resources, American University in Kosovo/Rochester Institute of Technology
 Assistant Professor, Clinton School of Public Service, Department of Political Science, University of Arkansas
 Research Associate, Office of the Undergraduate Provost, Carnegie Mellon University
 Visiting Assistant Professor, Environmental Studies Program, Chatham College (University)
 Research Associate and Lecturer, Harris School of Public Policy Studies, Environmental Studies Program, University of Chicago

(c) Products *[this section may be titled Publications if only publications are listed]*

(i)

- Meyers, Ronald B. "Environmental Learning: Reflections of practice, research and theory." Environmental Education Research, Special Issue: Researching education and the environment: retrospect and prospect, v12, n3-4, 459-470. 2006. <http://dx.doi.org/10.1080/13504620600799216>.
- Marcinkowski, Thomas, Erdogan, Mehmet, Volk, Trudi, and Meyers, Ronald B. "National Environmental Literacy Assessment in Four Countries: Israel, Korea, Turkey and the USA". In, Handbook of Environmental Education Research. American Educational Research Association. 2011.
- Meyers, Ronald B., Brody, Michael, Dillon, Justin, Hart, Paul, Krasny, Marianne, Monroe, Martha, Russell, Constance and Wals, Arjen. "Towards creating an inclusive community of researchers: the first three years of the North American Association for Environmental Education research symposium", Environmental Education Research, v13, n5, 639 - 661. 2007. <http://dx.doi.org/10.1080/13504620701659095>.
- McBeth, William, Hungerford, Harold, Marcinkowski, Thomas, Meyers, Ronald, and Volk, Trudi. National Environmental Literacy Assessment Project: Year 1 National Baseline Study of Middle Grades Students. Final Research Report. Office of Environmental Education, U.S. Environmental Protection Agency: Washington, D.C. 2007.

http://www.oesd.noaa.gov/outreach/reports/NAEE_Report/Final_NELA%20minus%20MSELS_8-12-08.pdf.

Meyers, Ronald B. "A Pragmatic Epistemology for Free Choice Learning." Environmental Education Research, Special Issue on free choice learning, v11, n3, 309-320. 2005.
<http://dx.doi.org/10.1080/13504620500081178>.

(ii) List up to five (5) other significant products, whether or not related to the proposed project.

Jackson, Golden, and Meyers, Ronald B. "Challenges of Institutional Outreach: COPC Example." Cityscape: A Journal of Policy Development and Research, U.S. Dept. of Housing and Urban Development, v5, n1, 125-140. 2001. <http://www.jstor.org/stable/20868498>.

Meyers, Ronald B., and Toth, Susan. "EE to Improve the Environment, Build Democracy, and Improve our Urban Communities: A Theory-based View." In, Proc. of the 28th Annual Conference North American Association for Environmental Education: Linking EE and Education Reform, Cincinnati, Ohio, August 26-30, 1999. Atlanta, Georgia: North American Association for Environmental Education. 2000.

Meyers, Ronald B. "Summary of the 5th Annual North American Association for Environmental Education's Research Symposium." Journal of Education for Sustainable Development. V3, n1, 13-18. 2009.
<https://doi.org/10.1177/097340820900300106>.

Dayer, Ashley and Meyers, Ronald. Strategic Communications Plan. Appalachian Mountain West Joint Venture. 2013-2017. Skaneateles, NY. 2012.

(d) Synergistic Activities

- Served as Chair of The North American Association for Environmental Education Research Commission (2006-2007)
- Served as Chair of The North American Association for Environmental Education Research Commission's Research Symposium (2006-2009)
- Served as reviewer for Environmental Education Research, Journal of Environmental Education, Journal of Education for Sustainable Development (2003-2010)
- Served as reviewer for U.S. Environmental Protection Agency Office of Environmental Education Grants Program(2003 – 2010)

Donald J. ORTH

Fish and Wildlife Conservation, Virginia Tech
540-231-5919, dorth@vt.edu

EDUCATION:

Year	Degree	Institution	Area
1980	PhD	Oklahoma State University	Zoology, Environmental Science, Statistics
1977	MS	Oklahoma State University	Zoology
1975	BS	Eastern Illinois University	Environmental Biology

ACADEMIC AND PROFESSIONAL APPOINTMENTS:

2003 – present	Thomas H. Jones Professor, Virginia Tech
1999 – 2006	Department Head, Fisheries and Wildlife Sciences, Virginia Tech
1993 - 2003	Professor, Virginia Polytechnic Institute and State University
1995 - 1996	Visiting Scientist, Environmental Science Division, Oak Ridge National Laboratory
1986 - 1993	Associate Professor, Virginia Polytechnic Institute and State University
1980 - 1986	Assistant Professor, Virginia Polytechnic Institute and State University
1976-1980	Graduate Research Assistant, Oklahoma State University

Scholarly Citations Google Scholar 3,697 h-index =31; i10-index =67 Total: 220
Since 2012 908 18 32

Five Relevant Publications

- Huang, J., E.A. Frimpong, and D.J. Orth. 2016. Temporal transferability of stream fish distribution models: can uncalibrated SDMs predict distributional shifts over time? *Diversity and Distributions* 22:651-662.
- McManamay, R.A., B.K. Peoples, D.J. Orth, C.A. Dolloff, and D.C. Mathews. 2015. Isolating causal pathways between flow and fish in the regulated river hierarchy. *Canadian Journal of Fisheries and Aquatic Science*. 72:1731-1748.
- McManamay, R. A., D. J. Orth, and C. A. Dolloff. 2013. Application of the ELOHA (Ecological Limits of Hydrologic Alteration) framework to the Cheoah River, a regulated system in the Little Tennessee River basin *Environmental Management* 51(6): 1210-1235.
- Orth, D.J. in review. Ten things you need to know about stream restoration. *Fisheries*
- Peoples, B.K., R. A. McManamay, D. J. Orth, and E. A. Frimpong. 2014. Spawning habitat use by river chubs in a hydrologically variable Appalachian tailwater. *Ecology of Freshwater Fish* 23(2):283-293.

Five Other Significant Publications

- Brewer, S. K., and D. J. Orth. 2015. Smallmouth Bass *Micropterus dolomieu* Lacepède, 1802. Pages 9-26 in Tringali et al. Black Bass Diversity: Multidisciplinary Science for Conservation. Proceedings of the Symposium Black Bass Diversity: Multidisciplinary Science for Conservation, American Fisheries Society, Bethesda, Maryland
- Dickinson, B.D., D.J. Orth, and S.L. McMullin. 2015. Characterizing the human dimensions of a hidden fishery: riverine trotline fishers. *Fisheries* 40(8):386-394.
- Moore, M.J., E.M. Hallerman, and D.J. Orth. 2017. Densities and population sizes of Clinch Dace *Chrosomus* sp. cf. *saylori* in the upper Clinch River basin of Virginia. *Copeia* 105:92-99.

Persinger, J. W., D. J. Orth, and A. W. Averett. 2011. Using habitat guilds to develop habitat suitability criteria for a warmwater stream fish assemblage. *River Research and Applications* 27(8):956-966.

Schmitt, J.D., Z. Moran, J.A. Emmel, A. Bunch, and D.J. Orth. 2017. Predation and prey selectivity by non-native catfish on migrating alosines in an Atlantic slope estuary. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science* 9:108-125.

Synergistic Activities

Director of Fluvial Fishes Lab (2006-present). Promote interdisciplinary research, education, and outreach on fluvial systems ecology. Advise research technicians and graduate students on studies of fishes of regional and local importance. Advise and comment on water use and development projects and policies. Administered 55 awards of \$9,268,537, responsible for \$4,462,007

Public Outreach and Engagement

Write and promote greater awareness of fishes via public writing for Virginia Tech Ichthyology and Chesapeake Catfish.

Developed a graduate course in Stream Habitat Management that integrates problem solving and findings from population and community ecology, stream fish ecology and behavior, regulated rivers, modeling and simulation, instream flow and stream habitat assessment, fisheries management, and fish population dynamics.

Member University Water Degree Steering Committee (Virginia Tech; 2011-current). University-wide committee that developed a new interdisciplinary undergraduate degree at Virginia Tech – “Water: Resources, Policy, and Management”.

Member of University Water Degree Steering Committee (Virginia Tech; 2016-current). University-wide committee to develop interdisciplinary graduate degrees in Water.

Board of Professional Certification. Professional Development SubCommittee, American Fisheries Society 2014-2017

RECENT HONORS AND AWARDS:

2016	Excellence in Fisheries Education Award
2016	Fellow of the American Fisheries Society
2014	William E. Wine Teaching Achievement Award
2014	Edward S. Diggs Teaching Scholar Award
2014	Certificate of Teaching Excellence
2013	University Exemplary Program Award (group award for First Year Experience)
2013	Outstanding Faculty Award, College of Natural Resources and Environment
2013	VT CIDER Teacher of the Week
2010	Thank a Teacher Award, CIDER
2008	Making a Difference Award, Instream Flow Council “for significant contributions to the protection of streams and their fisheries for public benefit”
2006	US Fish and Wildlife Service Regional Director’s Conservation Award “in recognition of your outstanding support to aquatic resource conservation in Virginia”

Certified Fisheries Professional, American Fisheries Society, since 1984

Nicholas F. Polys

Advanced Research Computing
Virginia Tech
Wright House (MC 0531)
Blacksburg, VA 24060

(540) 231-0968
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Education

Vassar College	Cognitive Science	B.A.	1996
Virginia Tech	Computer Science	Ph.D.	2006

Appointments

Virginia Tech

Director of Visual Computing	Advanced Research Computing	08/01/08 – present
Affiliate Professor	Dept. of Computer Science	08/01/08 – present
Faculty	Health Sciences	06/01/16 – present
Catalyst Fellow	Institute for Creativity, Arts, and Technology	01/01/12 – present
Post-doctoral Researcher	Advanced Research Computing	08/01/06 – 08/01/08

Closely Related Products

- **Polys**, Sforza, Hession, Munsell (2016) “Extensible Experiences: Fusality for Stream and Field”. In *Proceedings of the 21th International Conference on 3D Web Technology (Web3D '16)*. ACM, New York, NY, USA.
- **Nicholas F. Polys**, Benjamin Knapp, Matthew Bock, Christina Lidwin, Dane Webster, Nathan Waggoner, and Ivica Bukvic (2015). “Fusality: an open framework for cross-platform mirror world installations”. In *Proceedings of the 20th International Conference on 3D Web Technology (Web3D '15)*. ACM, New York, NY, USA, 171-179.
- Nikita Sharakhov, Vuk Marojevic, Ferdinando Romano, **Nicholas Polys**, and Carl Dietrich. (2014). “Visualizing real-time radio spectrum access with CORNET3D”. In *Proceedings of the Nineteenth International ACM Conference on 3D Web Technologies (Web3D '14)*. ACM, New York, NY, USA, 109-116.
- Ji-Sun Kim, **Nicholas Polys**, and Peter Sforza. (2015). “Preparing and evaluating geospatial data models using X3D encodings for web 3D geovisualization services”. In *Proceedings of the 20th International Conference on 3D Web Technology (Web3D '15)*. ACM, New York, NY, USA, 55-63.
- Tilden, D., A. Singh, **N. F. Polys**, and P. Sforza. (2011). "Multimedia mashups for mirror worlds", *Web3D '11 Proceedings of the 16th International Conference on 3D Web Technology*, Paris, ACM.

Other Products

- **Polys**, Sforza, & Singh (2016). “A Novel level-Of-Detail Technique for Virtual City Environments”. In *Proceedings of the 21th International Conference on 3D Web Technology (Web3D '16)*. ACM, New York, NY, USA.
- Nikita Sharakhov, Vuk Marojevic, Ferdinando Romano, **Nicholas Polys**, and Carl Dietrich. (2014). “Visualizing real-time radio spectrum access with CORNET3D”. In *Proceedings of the Nineteenth International ACM Conference on 3D Web Technologies (Web3D '14)*. ACM, New York, NY, USA, 109-116.
- Sharakhov, Nikita, **Polys, Nicholas**, and Sforza, Peter. (2013) “GeoSpy: a Web3D Platform for Geospatial Visualization” *MapInteract*, ACM SIGSPATIAL, Orlando, FL.
- **Polys, Nicholas F.** “Information Visualization in Virtual Environments: Tradeoffs and Guidelines”. In: *Handbook of Virtual Environments, Second Edition* (eds.) Kelly Hale and Kay Stanney. CRC Press, 2014.
- Nikita Sharakhov, **Nicholas Polys**, and Peter Sforza. (2013). “SpeedSpy: a mobile Web3D platform for visualizing broadband data”. In *Proceedings of the 18th International Conference on 3D Web Technology (Web3D '13)*. ACM, New York, NY, USA, pg. 208.

Synergistic Activities

- **Co-Principle Investigator** on several undergraduate education and hardware infrastructure grants: NSF Computing Research Infrastructure (CRI II-New): *Living Lab for Asynchronous and Synchronous Investigation of Virtual and Real Environments*, NSF Research Experience for Teachers (RET) *New Dimensions in e-Learning*; NSF IUSE: *Wireless Testbeds for Authentic STEM Learning*; VT Visionarium Lab Director
- **President** (elected): Web3D Consortium international standards not-for-profit (2009-present) driving the standardization of ISO/IEC Extensible 3D (X3D) and X3DOM
- **Chair: General:** ACM Web3D 2014, 2008; **Program:** Web3D 2007, 2010, 2011; **Tutorial / Workshop:** IEEE VR 2007, Web3D 2006, 2012, 2013; **Publicity:** VR 2008; **Finance:** VR 2009, 2010, Web3D 2016
- **Member:** ACM, IEEE, VT Interdisciplinary Center for Applied Mathematics (ICAM) and the Center for Human-Computer Interaction (CHCI) (since 2006); Institute for Creativity, Arts, and Technology (ICAT) (since 2013), Web3D Consortium (since 2000)
- **Reviewer: Conferences:** (2002-present) Web3D, VIS, VAST, InfoVis, 3DUI, VR, VRST, SVR, SIGGRAPH, CHI, Graphics Interface; **Journals:** (2004-present) International Journal of Human-Computer Studies, Virtual Reality, Computer Graphics and Applications, Computers & Graphics, Computer Graphics Forum, VIRE, Information Visualization, Computer-Aided Civil and Infrastructure Engineering (Special Issue), Transactions on Applied Perception

Stephen H. Schoenholtz
Director and Professor
Virginia Water Resources Research Center and
Department of Forest Resources and Environmental Conservation
Virginia Tech

Phone (540) 231-0711; Fax (540) 231-6673; Email Stephen.Schoenholtz@vt.edu

A. Professional Preparation

Pennsylvania State University	Forest Science	B.S. with Distinction, 1979
Pennsylvania State University	Biology	B.S. with Distinction, 1979
Virginia Tech	Forest Biology	M.S. 1983
Virginia Tech	Forest Soils	Ph.D. 1990
Virginia Tech	Restoration Ecology	Postdoc. 1990

B. Appointments

Virginia Tech, Blacksburg, Virginia

Virginia Water Resources Research Center, *Director*, 2006-Present

Department of Forest Resources and Environmental Conservation, *Professor*, July 2006 to Present

Oregon State University, Corvallis, Oregon

Department of Forest Engineering, Resources, and Management, *Associate Professor, Professor*, 2001-2006, *Courtesy Professor*, 2006-2012

Mississippi State University, Mississippi State, Mississippi

Department of Forestry, *Assistant Professor, Associate Professor, Professor*, 1990-2001, *Adjunct Professor*, 2001-Present

Mississippi Water Resources Research Institute, *Director*, 2001

New Zealand Forest Research Institute, Rotorua, New Zealand

Soil and Site Productivity Research Group, *Visiting Senior Research Fellow*, January-July 1998 and January-February 2015

Virginia Tech, Blacksburg, Virginia

Department of Crop and Soil Environmental Sciences, *Postdoctoral Research Associate* 1990

Texas Forest Service, College Station, Texas

Staff Forester II, 1984-1986

Columbia University, Palisades, New York

Lamont-Doherty Earth Observatory, Tree-Ring Laboratory, *Research Assistant*, 1983-1984

C. Recent Relevant Refereed Journal Publications

Krenz III, R.J., **S.H. Schoenholtz**, and C.E. Zipper. 2016. Riparian subsidies and hierarchical effects of ecosystem structure on leaf breakdown in Appalachian coalfield constructed streams. *Ecological Engineering* 97:389-399.

Boehme, E.A., C.E. Zipper, **S.H. Schoenholtz**, D.J. Soucek, and A.J. Timpano. 2016. Temporal dynamics of benthic macroinvertebrate communities and their response to elevated specific conductance in Appalachian Coalfield headwater streams. *Ecological Indicators* 64: 171-180.

Christopher, S.F., **S.H. Schoenholtz**, and J.E. Nettles. 2015. Water quantity implications of regional-scale switchgrass production in the southeastern U.S. *Biomass and Bioenergy* 83: 50-59.

Evans, D.M., C.E. Zipper, E.T. Hester, and **S.H. Schoenholtz**. 2015. Hydrologic effects of surface coal mining in Appalachia (USA). *Journal of American Water Resources Association* 51(5): 1436-1452.

Slesak, R.A., **S.H. Schoenholtz**, and D.M. Evans. 2015. Hillslope erosion from high-risk sites following wildfire and salvage logging in southern Oregon, USA. *Forest Ecology and Management* 342: 1-7.

- Timpano, A.J., **S.H. Schoenholtz**, D.J. Soucek, and C.E. Zipper. 2015. Salinity as a limiting factor for biological condition in mining-influenced Central Appalachian headwater streams. *Journal of American Water Resources Association* 51(1): 240-250.
- Little, C., J.G. Cuevas, A. Lara, M. Pinto, and **S. Schoenholtz**. 2014. Buffer effects of streamside native forests on water provision in watersheds dominated by exotic forest plantations. *Ecohydrology*. doi: 10.1002/eco.1575
- Evans, D.M., **S.H. Schoenholtz**, P.J. Wigington, Jr., S.M. Griffith, and W.C. Floyd. 2014. Spatial and temporal patterns of dissolved nitrogen and phosphorus in surface waters of a multi-land use basin. *Environmental Monitoring & Assessment* 186(2):873-887.
- Danehy, R.J., R.E. Bilby, R.B. Langshaw, D.M. Evans, T.R. Turner, W.C. Floyd, **S.H. Schoenholtz**, and S.D. Duke. 2012. Biological and water quality responses to hydrologic disturbances in third order forested streams. *Ecohydrology* 5(1):90-98.
- Northington, R.M., E.F. Benfield, **S.H. Schoenholtz**, A.J. Timpano, J.R. Webster, and C.E. Zipper. 2011. An assessment of structural attributes and ecosystem function in restored Virginia coalfield streams. *Hydrobiologia* 671(1):51-63.
- Floyd, W.C., **S.H. Schoenholtz**, S.M. Griffith, J.P. Wigington, Jr., and J.J. Steiner. 2009. Nitrate-N, landuse/landcover, and soil drainage associations at multiple spatial scales. *Journal of Environmental Quality* 38(4): 1473-1482.

D. Grants and Contracts Received

- Virginia Tech -- \$3,030,000 for my individual research program
 - Administer annual budget for Virginia Water Resources Research Center of \$750,000-\$1,000,000
- Oregon State University -- \$1,164,000 for my individual research program
- Mississippi State University -- \$2,198,000 for my individual research program

E. Graduate Students and Post-docs Supervised

- Virginia Tech – 8 MS 5 PhD 2 Post-docs
- Oregon State University – 9 MS 3 PhD
- Mississippi State University – 13 MS 2 PhD

F. Synergistic Activities

- Developed new courses: Properties and Processes of Forested Watersheds, Forest Hydrology, Forest Soils, Advanced Forest Soils, Wetland Ecology and Management at Mississippi State Univ. & Oregon State Univ.
- Coordinated development and now oversee new interdisciplinary B.S. degree program in Water: Resources, Policy, and Management, Virginia Tech.
- *National Institutes for Water Resources*, President-Elect 2015-2016, President 2016-2017
- *Soil Science Society of America*, Former Chair, Forest, Range, and Wildland Soils Division
- *American Water Resources Association*, Ad Hoc Science Advisory Council member
- External reviewer for promotion and tenure: Univ. Alberta, Oregon State Univ., Univ. Arizona, Univ. Colorado, Univ. Georgia, SUNY-ESF, Louisiana State Univ., Texas A&M Univ., West Virginia Univ.
- Testified on behalf of the Mississippi State Univ. Forest and Wildlife Research Center before U.S. House of Representatives Subcommittee on Forests and Forest Health
- Organizing Committee, 10th, 12th, and 13th North American Forest Soils Conferences
- Committee Chair, Virginia Department of Environmental Quality Academic Advisory Committee
- International water-resources service activities in Armenia, Chile, Costa Rica, New Zealand, Sweden

Durelle T. Scott, Department of Biological Systems Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061; e-mail dscott@vt.edu

Professional Preparation:

B.S. Villanova University, University of Colorado at Boulder, 1996

M.S. University of Colorado at Boulder, 1997

Ph.D. University of Colorado at Boulder, 2001

Appointments:

Associate professor, Virginia Polytechnic Institute and State University, 2014 – present.

Assistant professor, Virginia Polytechnic Institute and State University, 2008 – 2014

Assistant professor, University of Nebraska - Lincoln, 2005-2008

National Research Council Fellowship at the U.S. Geological Survey, Reston, Virginia, 2003-2005

Landcare Research Fellowship, New Zealand, 2001-2003

Five products most closely related to the proposed project:

Scott, D., R. Keim, B. Edwards, N. Jones, and D. Kroes. 2014. Floodplain biogeochemical processing of floodwaters during the Mississippi River flood of 2011. *Journal of Geophysical Research – Biogeosciences*. DOI: 10.1002/2013JG002477.

Jones, N., D. Scott, B. Edwards, and R. Keim. 2014. Perirheic mixing and biogeochemical processing in flow-through and backwater floodplain wetlands. *Water Resources Research*. DOI: 10.1002/2014WR015647.

Harvey, J., J. Bohlke, M. Voytek, D. Scott, and C. Tobias. 2013 Hyporheic zone denitrification: Controls on effective reaction depth and contribution to whole-stream mass balance. *Water Resources Research*. DOI: 10.1002/wrcr.20492.

Inamdar, S., N. Finger, S. Singh, M. Mitchell, D. Levia, H. Bais, D. Scott, and P. McHale. 2012. Dissolved organic matter (DOM) concentration and quality in a forested mid-Atlantic watershed, USA. *Biogeochemistry* 108(1-3): 55-76.

Lenters, J. D., G. J. Cutrell, E. Istanbuluoglu, D. T. Scott, K. S. Herrman*, A. Irmak, and D. E. Eisenhauer. 2011. Seasonal energy and water balance of a *Phragmites australis*-dominated wetland in the Republican River basin of south-central Nebraska (USA). *Journal of Hydrology* 408(1-2): 19-34.

Five additional significant products:

- Mykleby, P., J. Lenters, G. Cutrell, K. Herrman, E. Istanbuluoglu, D. Scott, T. Twine, C. Kucharik, T. Awada, M. Soylu, B. Dong. Energy and water balance response of a vegetated wetland to herbicide treatment of invasive *Phragmites australis*, *Journal of Hydrology*, Volume 539, August 2016, Pages 290-303, ISSN 0022-1694. DOI: 10.1016/j.jhydrol.2016.05.015
- Fellman, J., S. Nagorski, S. Pyare, A. Vermilyea, D. Scott, and E. Hood. 2013. Stream temperature response to variable glacier coverage in coastal watersheds of Southeast Alaska. *Hydrological Processes*. DOI: 10.1002/hyp.9742
- Stubbins, A., E. Hood, P. Raymond, G. Aiken, R. Sleighter, P. Hernes, D. Butman, P. Hatcher, R. Streigel, P. Schuster, A. Vermilyea, D. Scott, and R. Spencer. 2012. Anthropogenic aerosols as a source of ancient dissolved organic matter in glaciers. *Nature Geoscience* 5(3): 198-201.
- Inamdar, S., S. Singh, S. Dutta, D. Levia, M. Mitchell, D. Scott, H. Bais, and P. McHale. 2011. Fluorescence characteristics and sources of dissolved organic matter for stream water during storm events in a forested mid-Atlantic watershed. *Journal of Geophysical Research-Biogeosciences* 116 doi: 10.1029/2011jg001735.
- Hood, E., J. Fellman, R. Spencer, P. Hernes, R. Edwards, D. D'Amore, D. Scott. 2009. Glaciers as a source of ancient and labile organic matter to the marine environment. *Nature* 462, 1044-1047. doi:10.1038/nature08580

Synergistic Activities:

Water Quality Laboratory Demonstrations to High School students, Fall 2015.

Secretary, 2013-2014, American Geophysical Union Biogeosciences section

Session convener for AGU (Fall 2005, Spring 2006, Fall 2006, Fall 2011), ASLO (Spring 2005: topical session on floodplain surface- subsurface interactions) and AGU-NABS (co-convening Nitrogen session with NABS colleagues)

2009 Joint Assembly meeting Biogeosciences program chair

2009 & 2010 Fall AGU meeting Biogeosciences asst. program chair

2011 Fall AGU meeting Biogeosciences program chair.

Collaborators and other affiliations

Graduate and Postdoctoral Advisors: George Aiken (USGS), Judson Harvey (USGS – postdoctoral advisor), Duane Hrncir (Mesa State), Diane McKnight (CU-Boulder – graduate advisor), Noel Trustrum (Landcare Research)

Collaborators: Alexander, Richard, USGS; Bencala, Ken, USGS; Briggs, Marty, USGS; Cook, Robert, Louisiana State U.; Edwards, Rick, USFS; Fellman, Jason, U. Alaska Southeast; Gooseff, Mike, PSU; Harvey, Judson, USGS; Hession, Cully, Virginia Tech; Hester, Erich, Virginia Tech; Hood, Eran, UAS; Inmandar, Shreeram, U. Delaware; Instanbulluoglu, Erkan, U Washington; Keim, Richard, Louisiana State U.; Kroes, Dan, USGS; Lenters, John, U. Nebraska; McGlynn, Brian, Duke; McGuire, Kevin, VT; McLaughlin, Daniel, VT; McKnight, Diane, UColorado Boulder; Noe, Greg, USGS; Nymann, Andy, Louisiana State U.; Runkel, Rob, USGS; Schwarz, Greg, USGS; Spencer, Rob, WHOI; Strahm, Brian, VT; Thomson, Tess, Virginia Tech; Vermilyea, Andrew, Castelton State; Voelker, Bettina, Colorado School of Mines

Graduate students: Martha Griffith, Stephen Walters, Sushil Guatam, Mike Nassry, Nathan Jones, Luke Wildfire, Jenae Pinnay, David McCann, Daniel Chuquin, Katie Brill, Tyler Keys, Breanne Ensor

Postdoctoral associates: Andrew Vermilyea (Castelton State), Kyle Herrman (University of Wisconsin)

Eric P. Smith
Professor, Statistics

Positions

Director of Computational Modeling and Data Analytics (2014-2015)

Department Head (2006-2015)

Director of Statistical Consulting (1995-2004)

Education

B.S., University of Georgia, Department of Mathematics, 1975

M.S., University of Washington, Biomathematics Group, 1982

Ph.D., University of Washington, Biomathematics Group, 1982

Dissertation Title: The Statistical Properties of Biological Indices of Water Quality

Advisor: Gerald van Belle

Awards & Honors

Elected member of the International Statistics Institute

Fellow of the American Statistical Association

Distinguished Achievement Award from the American Statistical Association

(Section on Environmental Statistics)

Relevant Current Grant

Improving the success of stream restoration practices. Wynn-Thompson, T. and E.P. Smith
\$217,322. Chesapeake Bay Trust. 2017-2019.

Five Relevant Publications

Boone, E., Ye, K., and Smith, E.P. 2009. "Using data augmentation via the Gibbs Sampler to incorporate missing covariate structure in linear models for ecological assessments." Environ Ecol Stat, 16: 75-87.

Hudy, M., Theling, T., Gillespie, N., and Smith, E.P. 2008. "Distribution, Status, and Land Use Characteristics of Subwatersheds within the Native Range of Brook Trout in the Eastern United States." *North American Journal of Fisheries Management*, 28: 1069-1085.

Zhang, H., Theling, T., Prins, S., Smith, E.P., and Hudy, M. 2008. "Model-Based Clustering in a Brook Trout Classification Study within the Eastern United States." *Transactions of the American Fisheries Society*, 137: 841-851.

Hagerthey, S., Newman, S., Rutchey, K., Smith, E.P., and Godin, J. 2008. "Multiple Regime Shifts in a Subtropical Peatland: Community-Specific Thresholds to Eutrophication." *Ecological Monographs*, 78(4): 547-565.

Prins, S., and Smith, E.P. 2007. "Using biological metrics to score and evaluate sites: a nearest-neighbor reference condition approach." *Freshwater Biology*, 52: 98-111.

Professional Memberships

International Statistics Institute

American Statistical Association

Society of Environmental Toxicology and Chemistry

The International Environmetric Society

Synergistic Activities

Associate Editor: *Environmetrics* 1989 to 2008, *Journal of Agricultural, Biological and Environmental Statistics*, 1994 to 2000

Associate Editor, *Journal of the American Statistical Association, Applications and Case Studies*, 1998 to 2004

Editorial Collaborator, *Ecological and Environmental Statistics*, 1996 to present

Secretary, The International Environmetrics Society (TIES), 1994 to 2000

Chair elect: Environmental Statistics Section of the American Statistical Association (2001)

Joel W. Snodgrass

Professional Preparation

Guilford College	Major in Biology	B.S. 1985
University of Central Florida	Major in Zoology	M.S. 1990
University of Georgia	Major in Ecology	Ph.D. 1996
Rutgers University	Ecology	Post Doc 1996-1999

Academic and Professional Experience

Aug 2014-present: Head and Professor, Department of Fish and Wildlife Conservation, Virginia Tech

Aug 2011-Aug 2014: Chair, Department of Biological Sciences, Towson University

Aug 2008-Aug 2014: Professor, Department of Biological Sciences, Towson University

Aug 2004-Aug 2008: Associate Professor, Department of Biological Sciences, Towson University

August 1999-August 2004: Assistant Professor, Department of Biology, Towson University

August 2002-August 2011: Graduate Program Co-director, Department of Biological Sciences, Towson University

August 1996 – May 1999 Lecturer, Department of Biology and Geology, University of South Carolina-Aiken

June 1996 – August 1999: Postdoctoral Research Associate, Division of Life Sciences and Environmental and Occupational Health Sciences Institute, Rutgers University, and Savannah River Ecology Laboratory, University of Georgia

June 1993 - June 1996: DOE Graduate Laboratory Fellow, Savannah River Ecology Laboratory

Sept. 1992 -- June 1993: Graduate Laboratory (teaching) Assistant, Department of Biology, University of Georgia

June 1992 - Sept. 1992: Graduate Research Assistant, Savannah River Ecology Laboratory

Sept. 1991 - May 1992: Graduate Research Assistant, University of Georgia

Jan. 1991 - Sept. 1991: Supervisor, Research, Management and Planning Section, Office of Natural Resources Management, Brevard County, Florida

Oct. 1987 - Jan 1991: Environmental Resources Specialist, Office of Natural Resources Management, Brevard County, Florida

Sept. 1985 - Oct. 1987: Environmental Resources Technician, Office of Natural Resources Management, Brevard County, Florida

Publications (graduate and undergraduate authors in bold):

Most relevant

- Snodgrass, J. W., J. Moore, S. M. Lev, R. E. Casey, D. R. Ownby, **R. F. Flora** and **G. Izzo**. 2017. Influence of modern stormwater management practices on transport of road salt to surface waters. *Environmental Science and Technology*.
- Gallagher, M.**, J. Snodgrass, **A. Brand**, R. Casey, S. Lev, and **R. Van Meter**. 2014. The role of pollutant accumulation in determining the use of stormwater ponds by amphibians. *Wetlands Ecology and Management* 22:551-564.
- Brand, A. B.**, and J. W. Snodgrass. 2010. Value of Artificial Habitats for Amphibian Reproduction in Altered Landscapes. *Conservation Biology* 24:295-301.
- Simon, J. A.**, J. W. Snodgrass, R. E. Casey, and D. W. Sparling. 2009. Spatial correlates of amphibian use of constructed wetlands in an urban landscape. *Landscape Ecology* 24:361-373.
- Snodgrass, J. W., R. E. Casey, **D. Joseph**, and **J. A. Simon**. 2008. Microcosm investigations of stormwater pond sediment toxicity to embryonic and larval amphibians: Variation in sensitivity among species. *Environmental Pollution* 154:291-297.

5 additional Publications

- Casey, R. E., S. M. Lev, and J. W. Snodgrass. 2013. Stormwater ponds as a source of long-term surface and ground water salinization. *Urban Water Journal* 3:145-153.
- Gallagher, M. T.**, J. W. Snodgrass, D. R. Ownby, **Adrienne B. Brand**, Ryan E. Casey, and S. M. Lev. 2011. Watershed-scale analysis of pollutant distributions in stormwater management ponds. *Urban Ecosystems* 14:469-484.
- Van Meter, R. J.**, C. M. Swan and **J. W. Snodgrass**. 2011. Salinization Alters Ecosystem Structure in Urban Stormwater Detention Ponds. *Urban Ecosystems* 14:723-726.
- Van Meter, R. J.**, C. M. Swan, J. Leips, and J. W. Snodgrass. 2011. Road Salt Stress Induces Novel Food Web Structure and Interactions. *Wetlands* 31:843-851.
- Camponelli, K. M.**, R. E. Casey, J. W. Snodgrass, S. M. Lev, E. R. Landa. 2009. Impacts of Weathered Tire Debris on the Development of *Rana sylvatica* Larvae. *Chemosphere* 74:717-722.

Synergistic Activities:

1. Managing Editor, Editorial Board, Section Editor, Associate Editor or Ad hoc assigning editor for *The Maryland Naturalist*, *Copeia*, *Wetlands* and *Conservation Biology*.
2. Manuscript reviews for 60 plus journals.
3. Proposal reviews and panel service for NSF, EPA, USGS, and USFWS.
4. Greater than \$4 million in research funding.

Kurt Stephenson

Professor, Department of Ag & Applied Economics
Virginia Polytechnic Institute and State University (Virginia Tech).
Blacksburg, Virginia 24061.
(540) 231-5381 kurts@vt.edu

Education

- 1986 B.S. Radford University, Radford VA. Economics.
1988 M.S. Virginia Polytechnic Institute and State University (Virginia Tech). Blacksburg, VA. Ag Economics
1994 Ph.D. University of Nebraska, Lincoln, Economics

Personal Statement

Kurt Stephenson studies incentive-based environmental policies, water resource economics and policy, and the role of analysis in public policy. His current work focuses on ecosystem service markets (including nutrient, stream, and wetland credit trading), stormwater management, and incentives and policies for enhancing watershed waste assimilation functions.

- Stephenson, K. and L. Shabman 2017. "Can Water Quality Trading Fix the Agricultural Nonpoint Source Problem?" *Annual Review of Resource Economics*.
- Deboe, G., E. Bock, K. Stephenson, and Z. Easton. 2017. "Nutrient Biofilters in the Virginia Coastal Plain: Nitrogen Removal, Cost, and Potential Adoption Pathways" *Journal of Soil and Water Conservation*. 72(2):139-149; doi:10.2489/jswc.72.2.139
- Stephenson, K. and L. Shabman. 2017. "Nutrient Assimilation Services for Water Quality Credit Trading Programs: A Comparative Analysis with Nonpoint Source Credits" *Coastal Management*. 45 (1): 24-43.
- Gonzalez G., Mosley, A., and Stephenson, K. 2016. "An Analysis of Stormwater Utility Incentive Programs in the Chesapeake Bay." *Watershed Science Bulletin*. December.
- Deboe, G. and K. Stephenson. 2016. "Transactions Costs of Expanding Nutrient Trading to Agricultural Working Lands: A Virginia Case Study" *Ecological Economics* 130 (Oct):176-185
- Stephenson, K. and L. Shabman, L. 2011. "Executing Computer-aided Dispute Resolution: Integration of Models with Negotiation Processes" *Converging Waters: Integrating Collaborative Modeling with Participatory Processes to Make Water Resources Decisions*, pp. 23-34. ed. Lisa Bourget, Maass-White Book Series, US. Government Printing Office: Washington, DC.
- Gowan, C., K. Stephenson, and L. Shabman 2006. "The Role of Ecosystem Valuation in Environmental Decision Making: Hydropower Relicensing and Dam Removal on the Elwha River." *Ecological Economics*. 56 (April): 508-523
- Stephenson, K. 2000. "Taking Nature into Account: Observations about the Changing Role of Analysis and Negotiation in Hydropower Relicensing" *William and Mary Environmental Law and Policy Review* 25:2 (Winter): 473 - 498.

Positions and Honors

Positions and Employment

2008 – present Professor, Ag & Applied Economics, Virginia Tech
2001 – 2008 Associate Professor, Ag & Applied Economics. Virginia Tech
1995 - 2001 Assistant Professor, Ag & Applied Economics. Virginia Tech
1994 - 1995 Research Associate, Ag & Applied Economics. Virginia Tech
1988 – 1989 Research Associate, Department Agricultural Economics, University of

Other Experience and Professional Memberships

2004-present Member, Academic Advisory Committee, Virginia Department of Environmental Quality
2013-present Member, Scientific and Technical Advisory Committee, Chesapeake Bay Program, Committee Member.
2015-2017 Member, Eastern Virginia Groundwater Management Advisory Committee, established by Virginia Senate Bill S 1341.
2011-2012 Member, National Research Council, *Committee on Review of EPA's Economic Analysis of Final Water Quality Standards for Nutrients for Lakes and Flowing Waters in Florida*
2011 Member, Chesapeake Bay Watershed Nutrient Credit Exchange Program Study. Senate Joint Resolution No. 334. Virginia Secretary of Natural Resources.
2009-2011 Member, National Research Council, *Evaluation of the Revisions to Federal Principles and Standards for Evaluation Water Resources Projects*
2006-2008 Member, National Research Council, *Urban Stormwater Management in the United States*

Honors

Best Theory-Oriented Paper for 2000, *Journal of Water Resources Planning and Management*.
L. Shabman and K. Stephenson, "Environmental Valuation and Its Economic Critics."
American Society of Civil Engineers.

Additional Information: Research Support and/or Scholastic Performance

Completed Research Support

Stephenson, K. 06/15 - 9/16, "Can In Lieu Fee Programs Accelerate Off-site Compensatory Mitigation?" USDA, Office of Environmental Markets, Role: PI

Cooke W., K. Stephenson. 01/14 – 05/15. "Algal Aquaculture for Nutrient Assimilation and Removal." Center for Innovative Technology. Role: Co-PI

Stephenson K. 02/14 – 06/14. "An Investigation of the Economic Impacts of Coastal Plain Aquifer Depletion" Virginia Department of Environmental Quality, Role: PI

Stephenson, K. 05/14 – 09/14. "Analysis of Public Administration Costs of Nutrient Trading Programs in the Chesapeake Bay". USDA, Office of Environmental Markets, Role: PI

Theresa Wynn Thompson

Associate Professor, Turner Faculty Fellow, Assistant Department Head for Undergraduate Studies
Biological Systems Engineering, Virginia Tech

EDUCATION

- Ph.D. Biological Systems Engineering, Virginia Tech, 2004
- M.S. Civil Engineering, North Carolina State University, 1995
- B.S. Agricultural Engineering, Virginia Tech, 1992, summa cum laude

EMPLOYMENT HISTORY

- Asst. Dept. Head for Undergrad. Studies, Biological Systems Engineering, Virginia Tech, 2012-present
- Associate Professor, Biological Systems Engineering, Virginia Tech, 2011-present
- Assistant Professor, Biological Systems Engineering, Virginia Tech, 2004-2011
- Field Coordinator/Extension Associate, Maryland Cooperative Extension, 1996-1998
- Senior Staff Engineer, Woodward-Clyde, Gaithersburg, Maryland, 1995-1996
- Environmental Modeler, NC Division of Environmental Management, Raleigh, 1994-1995

SELECTED RESEARCH GRANT PROPOSALS

- Improving the success of stream restoration practices. Wynn-Thompson, T. and E.P. Smith \$217,322. Chesapeake Bay Trust. 2017-2019.
- Badgley, B., T. Thompson, and G. Evanylo. \$117,402. Opening the 'black box' in bioretention cells: how does understanding of microbial ecology translate to improved performance? ICTAS. 2014-2016.
- Improving the success of in-stream structures. Wynn-Thompson, T. \$88,075. Chesapeake Bay Trust. 2015-2017.
- Wetland water budget modeling. W.L. Daniels, T.M. Wynn, and R. Whittecar. \$1,024,875. Piedmont Wetlands Research Program. 2008-2016.
- Physicochemical effects of temperature and water chemistry on streambank erosion. Wynn-Thompson, T. and M. Eick. \$45,624. Virginia Tech Institute for Critical Technology and Applied Science. 2012-2013.
- Stremmer, M., J.R. Kuhn, P.P. Vlachos, R.V. Davalos, S.D. Ross. IGERT: MultiScale Transport in Environmental and Physiological Systems (MultiSTEPS). \$3,000,000. National Science Foundation. 2010-2015. Wynn Thompson is a Faculty Participant.
- Stroubles Creek Stream Restoration. T. M. Wynn, W.C. Hession, and E. Yagow. \$167,200. Virginia Department of Conservation and Recreation. 2007-2010.

RECENT REFEREED PUBLICATIONS

- Willard L., T. Wynn-Thompson, L.H. Krometis, T. Neher, and B. Badgley. 2017. Does it pay to be mature? Assessing the performance of a bioretention cell seven years post-construction. *Journal of Environmental Engineering* doi: 10.1061/(ASCE)EE.1943-7870.0001232.
- Smyntek P., R. Wagner R, L.H. Krometis, S. Carvajal, T. Wynn-Thompson, and W. Strosnider. 2017. Passive biological treatment of mine water to reduce conductivity: Potential designs, challenges, and research needs. *Journal of Environmental Quality* 46: 1-9, doi:10.2134/jeq2016.06.0216.
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DeBusk, K.M. and T.M. Wynn. 2011. Stormwater bioretention for runoff quality and quantity mitigation. *J. Environmental Engineering* 137(9): 800-808.

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SELECTED PROFESSIONAL ACTIVITIES

- American Ecological Engineering Society; Past-President, 15-16; President, 14-15; Vice-President, 13-14; Treasurer, 11-13; Conference co-chair: Beyond Wetlands: Engineering the Landscape, Blacksburg, Virginia, June 11-13, 2008
- International Ecological Engineering Society; Advisory Board, 17-present
- American Geophysical Union, member, Executive Committee of the Earth and Planetary Surface Processes Focus Group, 16-18
- American Society of Civil Engineers; Stream Restoration Committee, Secretary 16-18

TEACHING AND ADVISING EXPERIENCE

- Assistant Department Head for Undergraduate Studies for Biological Systems Engineering
- Currently major advisor for three PhD and one MS student
- Graduate students completed: three PhD and seven MS as major advisor; five MS as co-advisor
- Supervised two post-doctoral research associates
- Supervised 12 undergraduate research projects and 11 capstone senior design projects
- Currently instructor for BSE 2004 Introduction to Biological Systems Engineering, BSE 4984/5984 Fluvial Geomorphology, and BSE 5634 Stream Restoration

SELECTED INVITED TALKS

- Degradation of Eastern Headwater Streams: Past, Present, and Future. Invited presentation at the Amtrak Club "Soil to Sea Geomorphology" Symposium. Johns Hopkins University, May 17-18, 2013.
- Evaluation of the Multi-Angle Submerged Jet Test Device. Invited presentation at the 9th Federal Interagency Sedimentation conference, June 27-July 1, 2010, Las Vegas, NV.
- Reach-Scale Influence of Riparian Vegetation on Fluvial Erosion. Invited presentation at the 2009 American Geophysical Union Fall Meeting. December 14-19. San Francisco, CA.
- Stream Restoration Science? Keynote address at the 2007 Mid-Atlantic Stream Restoration Conference, November 6-8, 2007, Cumberland, MD.

Appendix II: Other support

Virginia Tech currently provides technical expertise to local, state, and federal agencies and has cooperative agreements and faculty supported by the US Forest Service, the US Geological Survey, and the US Fish and Wildlife Service. In addition, the Center for Watershed Studies develops watershed management plans [Total Maximum Daily Load (TMDL) plans] for Virginia and trains state personnel in TMDL development. Similarly, the Conservation Management Institute (CMI) has updated, enhanced, and expanded wetland hydro-geomorphic data throughout the eastern US. CMI and other units have performed aquatic surveys (macro-invertebrates, mussels, and fish) and developed management plans for a diverse set of sponsors ranging from the US DoD to private hydroelectric dam operators. We envision that additional University support and recognition for this signature-strength will permit us to leverage ongoing collaborations (Figure 1) into future grant proposals.

Catawba Sustainability Center



Blacksburg & Stroubles Creek



Figure 1. Existing sensors and modeling for watershed solutions at Virginia Tech.

Many indicators support the continued need for expertise in the growing field of watershed and stream restoration. The number of restoration projects is growing rapidly (see below).

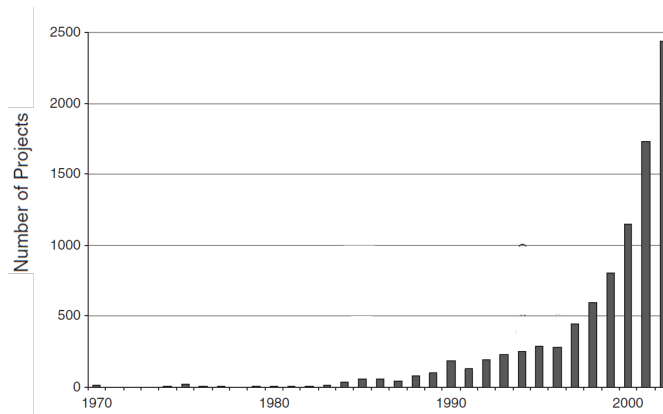


Figure 2. Number of stream restoration projects in the US, as reported by Bernhardt et al. 2005, *Science* 308:636-637

By combining the strengths of faculty across campus, Virginia Tech can expand on existing relationship (Figure 3) to become the “go-to” university for solving complex problems in watershed restoration. A local living laboratory along Virginia Tech Foundation land (photo below) has attracted major competitive funding and is an ideal platform for launching a new initiative. The developing \$25 billion dollar stream restoration industry supported 126,000 technical jobs in 2014. We see a growing need for technical training via continuing education workshops, which will provide funding to the university to support research, which then improves the educational programs, effectively linking the research, education, and outreach missions of the university. In addition to government agencies, nonprofit organizations (e.g. Trout Unlimited, The Nature Conservancy) and private recreational firms (e.g. Bass Pro Shops, Cabelas) support our vision. A diversity of sponsors including the Virginia Department of Military Affairs, USFWS, EPA, private companies, and the Strategic Environmental Research and Development program have funded applied and basic research related to watershed and stream restoration.

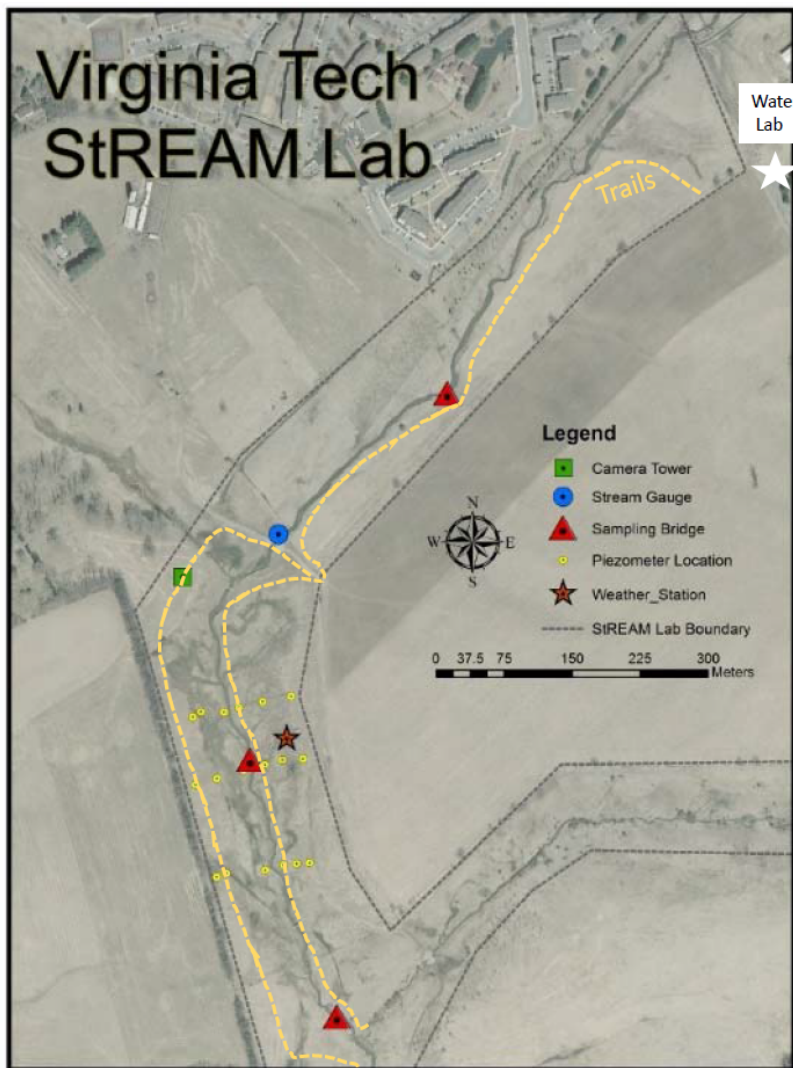


Figure 3. Photo shows segments of Stroubles Creek used by the StREAM lab and research infrastructure and trails. This is an ideal living laboratory for trails, interpretative signage, and arts to promote the **Integrative Science and Solutions for Freshwater Systems**.

Current and Potential Support Matrix for Integrative Science and Solutions for Freshwater Systems.

Tier 1-Non-competitive		Tier 2 Competitive			Tier 3 Broadly Competitive (RFP)	
State	Federal	State	Federal	Private	Federal	Private
VDGIF	USFWS	VDOT	AP Hill	Foundations	NSF	Doris Duke
DEQ	Quantico-MCB		Oak Ridge National Labs	Virginia Conservation Legacy Fund	SERDP	Blue Moon
VDMA and Fort Pickett	Fort AP Hill, Fort Eustis		ERDC-USACERL		DoD Legacy	Chesapeake Bay Trust
	USFS		NRCS-CIG		USDA	
	USFWS		ACOE		EPA	
	ACOE				ACOE	
					National Fish and Wildlife Federation	

-Tier 1-Non-competitive: The majority of the development effort associated with these sponsors is related to providing quality products and working with them to accomplish their management goals. VT usually receives a SOW and responds to the SOW.

-Tier 2-Competitive: Development with these sponsors requires responding to an RFP. These sponsors require substantial investment in terms of travel and/or time to develop these relationships. These sponsors are the ones most likely to evolve in to Tier 1 sponsors.

-Tier 3-Broadly Competitive: VT is responding to BAA and/or RFP's. These are typically the most difficult to obtain but normally are very well funded, pay full overhead, and typically involve some level of original research.

Appendix III: This draft job advertisement captures the essential features of **Integrative Science and Solutions for Freshwater Systems**

DRAFT subject to change

Assistant Professor

Virginia Tech is a public land-grant university, committed to teaching and learning, research, and outreach to the Commonwealth of Virginia, the nation, and the world. Building on its motto of *Ut Prosim* (that I may serve), Virginia Tech is dedicated to InclusiveVT—serving in the spirit of community, diversity, and excellence. We seek candidates who adopt and practice the Principles of Community, which are fundamental to our on-going efforts to increase access and inclusion, and to create a community that nurtures learning and growth for all of its members. Virginia Tech actively seeks a broad spectrum of candidates to join our community in preparing leaders for the world.

Virginia Tech invites candidates with interests in **Integrative Science and Solutions for Freshwater Systems**. This new synergistic, interdisciplinary approach integrates research, teaching, and public outreach in integrated freshwater systems. Sustainable management of water resources at local, regional, and global scales is one of the key challenges of the 21st century; dealing with the challenges of providing clean water in the face of floods, droughts, and degraded waterways to foster resilient communities is a critical societal need.

As part of a new university-wide emphasis on Global Systems Science, Virginia Tech is hiring ten faculty members in the area of integrated freshwater systems across multiple colleges. The Department of Fish and Wildlife Conservation in the College of Natural Resources and Environment invites applications for a tenure-track faculty position in the area of Conflict Management and Public Participation. The appointment is expected to be at the rank of assistant professor, although senior applicants will also be considered. We seek a scientist who uses modern approaches to evaluate approaches to facilitate meaningful public engagement among disparate stakeholders. Potential research questions may include, but are not limited to attitudes and behaviors of citizens and organizations with respect to watershed and streamside management practices. The successful candidate's research should complement existing strengths in fish and wildlife ecology and conservation, riverine fisheries, and endangered species, as well as complement University expertise in the new **Integrative Science and Solutions for Freshwater Systems**. The faculty member in this position is expected to help establish and grow the new Global Systems Science Destination Area (<http://provost.vt.edu/destination-areas/da-global-systems.html>). Opportunities to work with university-level programs such as the Global Change Center (<http://www.globalchange.vt.edu/>) as well as the Interfaces of Global Change (IGC), the Water Science and Policy graduate programs are also encouraged.

Required qualifications

Applicants must have a strong promise for developing a well-funded, distinguished research program focused on social science and conflict resolution; vision, creativity, and leadership skills; a desire to mentor and teach a student body that is diverse with respect to socio-economic status, interests, and abilities; and commitment and sensitivity to address issues of diversity in the university community. Applicants must have earned a doctorate in a relevant discipline at the time of appointment.

Preferred qualifications

Preference will be given to candidates with postdoctoral or industry experience, and those with a record of securing extramural funds to support research.

Applicants should submit a cover letter that includes a brief statement of how they can contribute to promotion of diversity and inclusion on the Virginia Tech campus, a curriculum vitae, and separate statements of research (3 page limit) and teaching interests (2 page limit) emphasizing career goals; they should also arrange for three letters of reference using our on-line system (<https://jobs.vt.edu>, search posting TR00000000).

Virginia Tech does not discriminate against employees, students, or applicants on the basis of age, color, disability, gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, genetic information, or veteran status; or otherwise discriminate against employees or applicants who inquire about, discuss, or disclose their compensation or the compensation of other employees, or applicants; or any other basis protected by law.

For inquiries regarding non-discrimination policies, contact the executive director for Equity and Access at 540-231-2010 or Virginia Tech, North End Center, Suite 2300 (0318), 300 Turner St. NW, Blacksburg, VA 24061.