

# **The Global Systems Science (GSS) Destination Area Concept Paper**

**May 2017**

**TITLE | Stresses and Instability in Coastal Systems: Sustaining Prosperity, Increasing Diversity and Achieving Resilience.**

## **Team**

### **COS**

**Robert Weiss<sup>1</sup>** (Geosciences)

### **CNRE**

**Anamaria Bukvic<sup>1</sup>** (Geography)

Ashley Dayer (Fish and Wildlife Conservation)

Jim Fraser (Fish and Wildlife Conservation)

Sarah Karpanty (Fish and Wildlife Conservation)

Daniel Catlin (Fish and Wildlife Conservation)

Luke Juran (Geography, Virginia Water Resources Research Center)

Randy Wynne (Forest Resources and Environmental Conservation,  
Center for Environmental Applications of Remote Sensing)

### **VM**

Julia Gohlke (Population Health Sciences)

### **CALS**

Kevin Boyle (Director, Program in Real Estate)

Venkat Sridhar (Sri) (Biological Systems Engineering, CALS/COE)

### **COE**

Jennifer Irish (Civil and Environmental Engineering)

Roberto Leon (Civil and Environmental Engineering)

### **COB**

Christopher Zobel (Business Information Technology)

Loren Rees (Business Information Technology)

### **CAUS**

Yang Zhang (Urban Affairs and Planning)

Todd Schenk (School of Public and International Affairs)

### **CLAHS**

Priya Dixit (Political Science)

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<sup>1</sup> Team leader

## VISION

More than half of the world's human population lives within 40 miles of the sea. Coastal cities are the backbone of global finance, trade, manufacturing, and transportation. Millions of people worldwide travel to beaches for recreation. Coastal fisheries and aquaculture are key sources of food, and the chief source of protein in most developing countries. The coast is home to a diverse range of plants and animals, some commercially valuable, some threatened or endangered, and all part of unique ecosystems. Coastal livelihoods, tourism, fish and wildlife species, and ecosystem services are threatened by climate change and its associated impact on coastal hazards. Flooding and coastal disasters from New York to Kolkata have killed thousands of people and cost trillions of dollars. By 2100 more than 100 million people could be displaced by sea-level change, 13 million in the U.S. alone<sup>2</sup>. The stability of the global economy is threatened by sea-level change.

As the land-grant University in a strategically important coastal state, Virginia Tech is perfectly positioned to leverage its research excellence and intellectual capital to become a leader in coastal systems research, teaching, outreach, and innovation. Expanding on the already well-established research programs of faculty across a variety of disciplines at Virginia Tech (Appendix II, Table 2), we will build linkages with other Destination Areas and GSS themes in food, infectious diseases, and water to develop a truly integrated and holistic framework for solving contemporary and emerging wicked problems in the coastal zone. We envisage this concept area to be an incubator for cutting-edge research and teaching, advancing technology, policy creativity and facilitating knowledge exchange as well as for forging sustained and long-lasting partnerships with industry and philanthropic organizations with similar missions. This will position Virginia Tech at the forefront of an effort to address a paramount challenge of this century, which threatens the diversity, stability and prosperity of all coastal systems.

## RELEVANCE

With a rising global population and intense economic development in all coastal zones, as well as emerging climate challenges around the globe that threaten prosperity and vitality, there is significant demand for skills and advanced knowledge in coastal environmental, social and health sciences, as well as coastal engineering and geosciences. An inevitable intensification of societal and environmental challenges, in addition to increased economic losses, will follow projected changes in coastal zones, including those resulting from sea-level rise, and altered frequency and intensity of storms. The cascading effects of all these stressors emanate from the complexity of the coastal system and its components (ecosystems, water quality, civil and military infrastructure, public health and safety, and economic sustenance) and are capable of turning even small and local perturbations, for example from a coastal hazard, into a global disaster. These urgencies are exacerbated by the importance of large port facilities to the global economy, and coastal military installations to national and global security. For example, the U.S. ports and marine transportation accommodated 75% of imports and exports by weight and \$1.7 trillion worth of goods in 2014<sup>3</sup>. A reasonable projected three feet of sea-level rise will inundate 128 military bases, including nine major Navy bases, causing around \$100 billion in damages<sup>4</sup>. Metropolitan areas, towns, small fishing, and tribal villages will also experience persistent inundation. More than 50% of socioeconomically vulnerable areas will be subject to unplanned displacement under

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<sup>2</sup> Hauer M. (2017) Migration induced by sea-level rise could reshape the US population landscape. *Nature Climate Change* 7, 321-325.

<sup>3</sup> Department of Commerce (2016) U.S. Ports: Investing in Engines of Economic Development and American Competitiveness. Retrieved from <https://www.commerce.gov/news/blog/2016/03/us-ports-investing-engines-economic-development-and-american-competitiveness>

<sup>4</sup> Spanger-Siegfried E., Dahl K., Caldas A., Udvardy S. (2016) The US Military on the Front Lines of Rising Seas. Report, Union of Concerned Scientists. Retrieved from <http://www.ucsusa.org/sites/default/files/attach/2016/07/front-lines-of-rising-seas-key-executive-summary.pdf>

one to four feet of sea-level rise<sup>5</sup>, suggesting emerging social justice, equity, and moral challenges. There will be questions of whom and what to protect, how and at what cost?

The cascading impacts of accelerating sea-level rise, ocean acidification, population growth, and rapid economic development represent an inherently wicked problem. A problem at this scale and scope can only be resolved by coordinated investment in research, teaching, outreach and broad engagement efforts, funded by industry, foundations, non-governmental organizations, and other partners. Considering that the business sector has already been experiencing significant pressures from coastal hazards, they will likely be willing partners in projects and the development of new technologies that increase coastal-zone resilience. As potential partners can be named big energy producers, such as Dominion Energy, but also big oil and gas companies as they will have to diversify their portfolio more in the future. A number of foundations already have funding opportunities that support coastal projects, including the Doris Duke Foundation, National Fish and Wildlife Foundation, Chesapeake Bay Trust, Kresge Foundation, MacArthur Foundation, and Rockefeller Foundation. Similarly, the non-profit sector has well-established research programs on coastal resilience, many of which emerged after experiences with major disasters like Katrina, Sandy and Deepwater Horizon. The coastal system theme is inherently linked with the Data Analytics and Decision Sciences, Intelligent Infrastructure for Human-centered Communities, and Integrated Security Destination Areas. Collaboration across these Destination Areas will be vital to the development of new methods (e.g., advanced quantitative techniques, scenario planning), technologies (e.g., autonomous vehicles), and tools to better communicate hazards, risk, adaptation and resilience in the coastal zone.

## **TRANSDISCIPLINARY CURRICULUM ON COASTAL SYSTEMS**

The traditional discipline-centered approach to education creates inertia against developing holistic understandings of and solutions to the unprecedented challenges related to coastal systems. We require a common language, set of objectives, and new ways of thinking to address coastal risk and improve resilience. This requires a dynamic, adaptable, transdisciplinary educational approach that transcends the confines of disciplinary boundaries. Educating students with a holistic understanding of coastal systems is also a basic duty of a global and comprehensive land grant university with a twenty-first century vision of scholarship, teaching, and public service.

We envision that the new Transdisciplinary Coastal Systems curriculum (Appendix II, Table 1) will open to all undergraduates at Virginia Tech, and become a distinguishing trademark of Virginia Tech's undergraduate education. Students participating in this destination area will gain competency in the concepts, perspectives, and innovative tools needed to increase coastal disaster resilience via informed, sustainable decisions and actions. The curriculum will teach students to holistically consider environmental, social, and economic drivers and their complex impacts on coastal systems, culminating in a field-based capstone experience. This knowledge will enable students to work more collaboratively with each other, as well as with local stakeholders and decision-makers in a problem-based environment. Further, students will have an opportunity to work with coastal partners and communities in a real-world context and participate in transdisciplinary problem-solving activities using novel technologies and innovative research methods. The proposed curriculum builds from several established Pathways courses (Appendix II, Table 1). As the undergraduate public health degree develops, additional courses on emerging public health issues and environmental justice could be added.

## **DESCRIPTION OF RESOURCE NEEDS**

What clearly differentiates Virginia Tech, with respect to its ability to address contemporary and emerging challenges in the coastal zone, is the existing disciplinary excellence and incredible potential

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<sup>5</sup> Melillo, J.M., Richmond T., Yohe G.W. (eds.) (2014) Climate Change Impacts in the 12 United States: The Third National Climate Assessment. U.S. Global Change Research Program<sup>4</sup>

for interdisciplinary collaboration across a broad spectrum of different academic perspectives. No other school in the Commonwealth, and very few in the United States, share this critical combination of existing depth and breadth of potential in this area. With the help of the Interdisciplinary Graduate Education Program (IGEP) on Disaster Resilience and the Interdisciplinary Coastal Hazards Research Team, we were able to lay the pivotal groundwork to foster and establish a truly interdisciplinary mindset among those working on coastal-zone challenges. Because of the programmatic assistance delivered by the IGEP program, we were not only able to overcome disciplinary boundaries, but also identify important disciplinary gaps for research and education that need to be included in the interdisciplinary network at VT. One of the most prominent gaps concerns sea-level change. The highest priority is to hire an Assistant or Associate Professor who employs the geologic record to reconstruct past sea levels and helps to establish and refine sea-level projections. This FTE would be housed in COS with important links to IS, DADS and IIHCC DAs. Other gaps are in coastal system economics (could be joint between COS and CNRE), ecosystem services (CRNE), coastal zone policy (could be joint between CLAHS important link to IS DA), as well as environmental security (joint between COS and CLAHS, important link to IS and DADS DAs). These hires can be made at an Assistant or Associate Professor level depending on College and Departmental needs. Furthermore, the interdisciplinary team needs a common space, outside departmental boundaries, to develop collaborative interdisciplinary proposals, to brainstorm and research, as well as create the experiential and individualized learning environment required for this interdisciplinary topic.

Appendix I:

**Bio Sketches**

**BIOGRAPHICAL SKETCH**  
**DO NOT EXCEED FIVE PAGES.**

NAME: Boyle, Kevin John

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Director and professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Maine	B.A.	05/1978	Economics
Oregon State University	M.S.	12/1981	Agricultural and Resource Economics
University of Wisconsin	Ph.D.	05/1985	Agricultural Economics

**A. Personal Statement**

I am a leading expert in the valuation of natural assets that do not have market values, and have considerable expertise in applications to coastal resources. I have worked on the development and validations, as well as application, of the major methods used to value changes in the condition of such resources. I am the co-editor of the primary textbook on these methods, "A Primer on Nonmarket Valuation", and am a co-author on the most recent paper for setting implementation guidelines for stated-preference studies, "Contemporary Guidance for Stated Preference Studies". I have worked with applications of these methods to inform decision making for over 30 years.

1. Bishop, R.C., Boyle, K.J., Carson, R.T., Chapman, D., Hanemann, W.M., Kanninen, B., Kopp, R.J., Krosnicj, J., List, J., Meade, N., Paterson, R., Presser, S., Smith, V.K., Tourangeau, R., Welsh, M., & Wooldridge, J.M. (2017). Putting a value on injuries to natural assets: the BP Oil Spill. *Science*, 356(6335), 253-254.
2. Börger, T., Beaumont, N.J., Pendleton, L., Boyle, K.J., Cooper, P., Fletcher, S., Haab, T., Hanemann, M., Hooper, T.L., Salman Hussain, S., Portela, R., Stithou, M., Stockill, J., Taylor, T. & Austen, M.C. (2014). Incorporating Ecosystem Services in Marine Planning: The Role of Valuation. *Marine Policy*, 46,161-170.
3. Raheem, N., Colt, S., Fleishman, E., Talberth, J., Swedeen, P., Boyle, K.J., Rudd, M., Lopez, R.D., Crocker, D., Bohan, D., O'Higgins, T., Willer, C., & Boumans, R. (2012). Applications of Non-Market Valuation to California's Coastal Policy Decisions." *Marine Policy*, 36(5), 1166-1171.
4. Parson, G., Kang, A., Leggett, C. & Boyle, K.J. (2009). Valuing Beach Closures on the Padre Island National Seashore. *Marine Resource Economics*, 24(3), 213-235.

**B. Positions and Employment**

1986-1991     Assistant Professor, Department of Agricultural and Resource Economics and Department of Wildlife, University of Maine, Orono, ME

1992-1993     Visiting Scholar, Resource and Environmental Economics Program, Department of Agricultural and Resource Economics, North Carolina State University, Raleigh, NC

1992-1994	Faculty Associate, Center for Economics Research, Research Triangle Institute, Research Triangle Park, NC
1991-1997	Associate Professor, Department of Resource Economics and Policy and Department of Wildlife, University of Maine, Orono, ME
1999-2000	Visiting Scientist, Rocky Mountain Experiment Station, USDA Forest Service, Fort Collins, CO.
1997-2002	Libra Professor of Environmental Economics, Department of Resource Economics and Policy, Department of Wildlife Ecology, and Ecology and Environmental Sciences Program, University of Maine, Orono, ME
2002-2005	Distinguished Maine Professor, Department of Resource Economics and Policy, Department of Wildlife Ecology, and Ecology and Environmental Sciences Program, University of Maine, Orono, ME
2003-2005	Chair, Department of Resource Economics and Policy, University of Maine, Orono, ME
2005-2012	Head, Department of Agricultural and Applied Economics, Virginia Tech, Blacksburg, VA
2005-	Professor, Department of Agricultural and Applied Economics, Virginia Tech, Blacksburg, VA
2012-	Founding Director, Program in Real Estate, Virginia Tech, Blacksburg, VA
2013-	Principal Faculty, Myers-Lawson School of Construction, Virginia Tech, Blacksburg, VA

### **Example Other Experience**

1996-1999	Associate Editor, Journal of Environmental Economics and Management
1997-1999	Associate Editor, Marine Resource Economics, 1997-99
2000-2001	Reviewer, Willingness to Pay for Coastal Water Quality Improvements, U.S. EPA
2002-2004	Committee on Assessing and Valuing Services of Aquatic and Related Terrestrial Ecosystems, NRC
2009	Rosenberg Forum on Water Resources Management, Northwest Territories, Canada
2011-2013	Science Advisory Board Advisory Council on Clean Air Compliance, U.S. EPA
2013	Review, Chesapeake Bay TMDL Hedonic Analysis, U.S. EPA
2015-2018	Clean Air Scientific Advisory Committee Particulate Matter Review Panel, U.S. EPA
2013-2019	Science Advisory Board Environmental Economics Advisory Committee, U.S. EPA

### **Example Honors**

2004	U.S. Professor of the Year, Maine, Carnegie Foundation for the Advancement of Teaching and Council for Advancement and Support of Education
2014	Publication of Merit, Environmental and Resource Economics.
2015	Service Award, Land, Water and Environmental Economics Section, Agricultural and Applied Economics Association
2016	Scholar of the Week, Office of the Vice President for Research and Innovation, Virginia Tech

## **C. Contribution to Science**

1. I have extensive experience with the development and validation of stated-preference methods to value environmental assets. These are methods used to elicit use and nonuse values for environmental assets when markets do not exist to provide economic values. Such values are used in benefit-cost analyses to support public and private decision-making. Examples might include valuing the damages from an oil spill for those who use coastal resources for recreation (use values) and those who do not use coastal resources directly but still value protection of the integrity of these ecosystems (nonuse or passive-use values).
  - a. Johnston, R.J., Boyle, K.J., Adamowicz, W., Bennett, J., Brouwer, R., Cameron, T.A., Hanemann, W.M., Hanley, N., Ryan, M. Scarpa, R., Tourangeau, R., & Vossler, C.A. (2017). Contemporary Guidance for Stated Preference Studies. Journal of the Association of Environmental and Resource Economics (forthcoming).
  - b. Boyle, K.J., Paterson, R.W., Carson, R.T., Leggett, C., Kanninen, B., Molenar, J. & Neumann, J. (2016). Valuing Shifts in the Distribution of Visibility in National Parks and Wilderness Areas in the United States. Journal of Environmental Management, 173, 10-22.
  - c. Kotchen, M.J., Boyle, K.J., & Leiserowitz, A.A. (2013). Policy-Instrument Choice and Benefit Estimates for Climate-Change Policy in the United States. Energy Policy, 55, 617-625.
  - d. Leggett, C.G., Kleckner, N.S., Boyle, K.J., Duffield, J.W. & Mitchell, R.C. (2003). Social Desirability Bias in Contingent Valuation Surveys Administered Through In-Person Interviews." Land Economics, 79(4), 561-575.

## **D. Additional Information: Research Support and/or Scholastic Performance**

### **Ongoing Research Support**

“Linking land use decision-making, water quality, and lake associations to understand human-natural feedbacks in lake catchments.” Investigators: Kelly Coburn, Kevin J. Boyle, Cayelan Carey, Christopher J. Duffy, and Paul C. Hanson. Sponsor: National Science Foundation. Amount: \$1,799,931.

“A National Study of the Effects of Tree Canopy, Diversity and Health on Property Values.” Investigators: Kevin J. Boyle, Kelly Coburn, Andrew McCoy, Eric Wiseman and Thomas Holmes. Sponsor: U.S. Forest Service. Amount: \$84,593.

“Modeling Sociobehavioral Resilience during Epidemics to Reduce Health Disparities.” Investigators: Achla Marathe, Kaja M. Abbas, Kevin J. Boyle, Jiangzhou Chen, Stephen G. Eubank, Bryan L. Lewis, Pamela M. Murray-Tuite, Hazhir Rahmandad and Samarath Swarup. Sponsor: National Institutes of Health. Amount: \$1,032,334.

### **Completed Research Support**

“Large-scale Hedonic Property Value Analysis of Forest Pest Impacts Related to Climate Change, Phase II.” Investigators: Kevin J. Boyle, Klaus Moeltner, Randolph Wynne and Christine Blinn. Sponsor: U. S. Forest Service. Duration: 2012-2013. Amount: \$140,000.

“Dynamic Interactions of Monetary and Non-monetary Incentives in Weight Loss Interventions.” Investigators: You, Wendy, Kevin J. Boyle and Christopher Parameter. Sponsor: NIH. Duration: 2010-2012. Amount: \$407,586.

“Integrated Management of Zoospore Pathogens and Irrigation Water Quality for a Sustainable Green Industry.” Investigators: Hong, Chuanxue, Kevin Boyle, and Gary Moorman. Sponsor: USDA-Specialty Crops. Duration: 2010-2015. Amount: \$2,729,649.



## BIOGRAPHICAL SKETCH

### Anamaria Bukvic

#### PROFESSIONAL PREPARATION

University of Zagreb	Zagreb, Croatia	Landscape Architecture	BE	1998
University of Cincinnati	Cincinnati, OH	Biological Sciences	MS	2002
University of Cincinnati	Cincinnati, OH	Community Planning	MCP	2006
Virginia Tech, VA	Blacksburg, VA	Planning, Governance, Globalization	PhD	2012

#### APPOINTMENTS

Research Assistant Professor	Virginia Tech, Geography	2015-present
Visiting Assistant Professor	Virginia Tech, Urban Affairs and Planning	2012-2015
Adjunct Faculty	Virginia Tech, Urban Affairs and Planning	2011-2012

#### PUBLICATIONS

1. Bukvic, A. (2016) Towards the Sustainable Climate Change Population Movement: the Relocation Suitability Index. *Climate and Development*, DOI: 10.1080/17565529.2017.1291407
2. Bukvic, A., Owen, G. (2016) Attitudes towards relocation following Hurricane Sandy: should we stay or should we go? *Disasters* 41:1. DOI: 10.1111/disa.12186
3. Bukvic, A. (2015) Identifying Gaps and Inconsistencies in the Use of Relocation Rhetoric: A Prerequisite for Sound Relocation Policy and Planning. *Mitigation and Adaptation Strategies for Global Change* 20(7), pp. 1203-1209, DOI: 10.1007/s11027-013-9532-5
4. Bukvic, A., Smith, A., Zhang, A. (2015) Evaluating Drivers of Coastal Relocation in Hurricane Sandy Affected Communities. *International Journal of Disaster Risk Reduction*, pp. 215-228, DOI: 10.1016/j.ijdr.2015.06.008
5. Bukvic, A. (2015) Integrated Framework for the Relocation Potential Assessment of Coastal Communities (RPACC): Application to Hurricane-Sandy Affected Areas. *Environment, Systems and Decisions* 35(2): pp. 264-278, DOI 10.1007/s10669-015-9546-5

#### FIVE OTHER RELATED PRODUCTS

1. Bukvic, A. (2017) Facilitating Stakeholders' Engagement in Climate Change Relocation Planning: the Coastal Relocation Leaf. *Coastal Management* (submitted, under review)
2. Bukvic, A. (Lead author) (2017) Hurricane Sandy (Chapter); In: *The Oxford Handbook of Complex Disaster Risks*, ed. James Shultz, Oxford University Press (commissioned)

#### SYNERGISTIC ACTIVITIES

1. ***Affiliations that foster interdisciplinary research*** with the Center for Global Change and associated Interdisciplinary Graduate Education Program (IGEP)—Interfaces of Global Change since 2013; Disaster Resilience IGEP since 2014, and the Center for Gerontology (all at Virginia Tech).
2. ***Recipient of Curriculum Development Grant*** from the Virginia Tech's Global Education Office for the development of course on Global Climate Change and Societal Impacts.

3. ***Public outreach initiative*** – organizing screening of the documentary *Climate Refugees* for Virginia Tech and Blacksburg community and expert panel discussing the implications of disaster-induced population movement.
4. ***Recipient of the Richard E. Zody Award for Outstanding Dissertation in Planning, Governance, and Globalization*** in April 2013 for development of relocation decision-support tools (relocation scenario and relocation suitability index).
5. ***Facilitating engagement*** with science on coastal hazards and response options (adaptation and disaster risk reduction) among local decision-makers, emergency managers, and other stakeholders (e.g., invited presentations at the Hampton Roads Sea Level Rise/Flooding Adaptation Forum, Suffolk, VA, October 30, 2015, and at the Mitigation and Adaptation Research Institute, Suffolk, VA, August 11-13, 2015).

**Daniel H. Catlin**

Research Assistant Professor, Department of Fish and Wildlife Conservation  
Virginia Tech

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**(a) Professional Preparation**

Hamilton College	Biology	B.A.	2001
Oregon State University	Wildlife	M.S.	2004
Virginia Tech	Wildlife	Ph.D.	2009

**(b) Appointments**

2010 – Pres. Research Assistant Professor, Department of Fisheries and Wildlife Sciences,  
Virginia Polytechnic Institute and State University  
2009 – 2010 Research Associate, Department of Fisheries and Wildlife Sciences, Virginia  
Polytechnic Institute and State University

**(c) Publications**

(i) 5 Products Closely Related to Proposal

Zeigler, S.L., D.H. Catlin, M. Bomberger Brown, J.D. Fraser, L.R. Dinan, K.L. Hunt, J.G.  
Jorgensen, S.M. Karpanty. In Press. Effects of climate change and anthropogenic  
modification on a disturbance-dependent species in a large riverine system. *Ecosphere*.

Catlin, D. H., J. D. Fraser, and J. H. Felio. 2015. Demographic responses of piping plovers to  
habitat creation on the Missouri River. *Wildlife Monographs*: 192: 1–42.

Catlin, D. H., O. Milenkaya, K. L. Hunt, M. J. Friedrich, and J. D. Fraser. 2014. Can river  
management improve the piping plover's long-term survival on the Missouri River?  
*Biological Conservation* 180: 196–205.

McGowan, C. P., D. H. Catlin, T. L. Shaffer, C. L. Gratto-Trevor, and C. Aron. 2014.  
Establishing endangered species recovery criteria using predictive simulation modeling.  
*Biological Conservation* 177: 220–229.

Catlin, D. H., R. Jacobson, M. Sherfy, M. Anteau, J. Felio, J. Fraser, C. Lott, T. Shaffer, and J.  
Stucker. 2010. Discussion of "Natural hydrograph of the Missouri River near Sioux City  
and the least tern and piping plover" by Donald Jorgensen. *Journal of Hydrological  
Engineering*, 15:1076 – 1078.

(ii) 5 Other Significant Products

Davis, K.D, K. Schoenemann, D.H. Catlin, K.L. Hunt, M.J. Friedrich, S.J. Ritter, J.D. Fraser, and  
S.M. Karpanty. 2017. Hatch year Piping Plover (*Charadrius melodus*) prospecting and  
habitat quality influence second year nest-site selection. *The Auk* 134(1): 92–103.

Friedrich, M. J., K. L. Hunt, D. H. Catlin, and J. D. Fraser. 2015. The importance of site to mate  
choice: mate and site fidelity in piping plovers. *Auk* 132: 265–276.

Gieder, K. D., S. M. Karpanty, J. D. Fraser, D. H. Catlin, B. T. Gutierrez, N. G. Plant, A. M. Turecek, E. R. Thieler. 2014. A Bayesian network approach to predicting nest presence of the federally-threatened piping plover (*Charadrius melodus*) using barrier island features. *Ecological Modeling*: 276:36–50.

Catlin, D. H., J. H. Felio, and J. D. Fraser. 2013. Effects of water discharge on fledging times, growth, and survival of piping plovers on the Missouri River. *Journal of Wildlife Management*, 77: 525–533.

Gratto-Trevor, C., D. Amirault-Langlais, D. Catlin, F. Cuthbert, J. Fraser, S. Maddock, E. Roche, and F. Shaffer. 2012. Connectivity in piping plovers: Do breeding populations have distinct winter distributions? *Journal of Wildlife Management* 76: 348 – 355.

#### **(d) Synergistic Activities**

Member and Organizer, Local Planning Committee for the Western Hemisphere Shorebird Group Meeting, September 2015.

Member, Missouri River Ecosystem Restoration Program Technical Team, 2010–2013.

Expert Panelist, Missouri River Recovery Implementation Committee. 2011–present.

Member, Great Plains Piping Plover Recovery Team. 2010–present.

## ASHLEY ANNE DAYER

Department of Fish and Wildlife Conservation  
Virginia Tech  
Cheatham Hall, 310 West Campus Drive  
Blacksburg, VA 24061

Phone: 540-231-8847  
Fax: 540-231-7580  
E-mail: dayer@vt.edu

### (a) Professional Preparation:

Harvard University	Cambridge, MA	Environmental Science & Public Policy	B.A. 2001
Colorado State University	Fort Collins, CO	Human Dimensions of Natural Resources	M.S. 2006
Cornell University	Ithaca, NY	Natural Resources	Ph.D. 2013
Cornell Lab of Ornithology	Ithaca, NY	Conservation Science	Postdoc 2013-2015

### (b) Appointments:

Assistant Professor of Human Dimensions, Department of Fish and Wildlife Conservation, Virginia Tech. 2016-current.

Affiliated Faculty Member, Global Change Center, Virginia Tech. 2016-current

Visiting Assistant Professor, State University of New York-Environmental Science & Forestry. 2014-2016.

Conservation Social Scientist/Research Associate, Cornell Lab of Ornithology. 2015-2016.

Education & Outreach Director, Klamath Bird Observatory. 2006-2009.

### (c) Publications:

(i): five products most closely related to the proposed project (undergrads, graduate students\*)

Dayer, A.A., Williams, A., Cosbar, E.A., & Racey, M. (In press). Endangered species being blamed: The media portrayal of human wildlife conflict. *Oryx*.

Field, C.R.\*, Dayer, A.A., & Elphick, C. (In revision). How will social factors influence the effectiveness of common conservation strategies for facilitating ecosystem migration? *Proceedings of the National Academy of Sciences*.

Dayer, A.A., Rodewald, A.R., Stedman, R.C., Cosbar, E.A., & Wood, E.M. (2016). Wildlife conservation and land trusts: The discrepancy between mission statement content analysis and perceptions of land trusts. *Environmental Management*, 58(2): 359-364.

Dayer, A.A., Bright, A.D., Teel, T.L., Manfredi, M.J. (2016). The impact of wildlife species characteristics on public preferences for conservation funding: A stated choice approach. *Human Dimensions of Wildlife*, 21(5): 379-390.

Dayer, A.A., Allred, S.B., & Stedman, R.C. (2014). Developing tools to encourage private forest landowner participation in early successional forest habitat management. *Human Dimensions of Wildlife*, 19(4), 355-370.

(ii) five other significant products:

Sullivan, B.E., Phillips, T., Dayer, A.A., Wood, C.L., Farnsworth, A., Illiff, M.J., Davies, I.J., Wiggins, A., Fink, D., Hochachka, W., Rodewald, A.D., Rosenberg, K.V., Bonney, R., & Kelling, S. (2017). Using open access observational data for conservation action: A case study for birds. *Biological Conservation*, 208, 5-14.

Dayer, A.A., Stedman, R.C., Allred, S.B., Rosenberg, K.V., & Fuller, A.R. (2016). The social psychology of landowner behavior: Understanding intentions to create early successional forest habitat. *Wildlife Society Bulletin*, 40 (1), 59-68.

## ASHLEY ANNE DAYER

- Cooper, C., Larson, L., Dayer, A.A., Stedman, R.C., & Decker, D. (2015). Are wildlife recreationists conservationists? Linking birdwatching, hunting, and pro-environmental behavior. *The Journal of Wildlife Management*, 79(3), 446-457.
- Dayer, A.A., Stedman, R.C., & Allred, S.B. (2014). A comparative analysis and assessment of forest landowner typologies based on behaviors, motivations, and cognitions. *Society & Natural Resources*, 27(11), 1200-1212.
- Manfredo, M.J. & Dayer, A.A. (2004). Concepts for exploring the social aspects of human-wildlife conflict in a global context. *Human Dimensions of Wildlife*, 9(4), 317-328.

### (d) Synergistic Activities:

As an applied conservation social scientist and communications practitioner and scholar, my research is designed to have both scholarly and policy/programmatic impacts. I work closely with my colleagues in conservation agencies (international, national, and state levels) and organizations to co-produce research that is usable and necessary. Five key examples:

- Science review panel member on invasive animal species, National Park Service, 2017.
- Board member, Society for Conservation Biology, Social Science Working Group, 2016-present.
- Winner of competitive Land Grant Fellow, 2010-2012 at Cornell University, conducting research and extension to inform the New York State Department of Environmental Conservation's Young Forest Initiative.
- Science and Communications Teams for the first four U.S. *State of the Birds* reports, released with the Secretary of the Interior and/or Agriculture, culminating in congressional briefings and national media coverage.
- Awarded international Partners in Flight leadership award for Public Engagement, 2012.

### e) Collaborators & Other Affiliations:

- Graduate and Postdoctoral Advisors. Shorna Allred (Cornell University), Michael Manfredo (Colorado State University), Amanda Rodewald (Cornell University/Lab of Ornithology), Richard Stedman (Cornell University)
- Thesis Advisor and Postgraduate-Scholar Sponsor. Total Students Advised (3): Seth Lutter (Virginia Tech), Lara Mengak (Virginia Tech), Mary Sketch (Virginia Tech). Research Associate Advised (1): Ashley Gramza (Virginia Tech).

## **James D. Fraser**

Professor, Department of Fish and Wildlife Conservation  
Virginia Tech

106 Cheatham Hall (0321), Blacksburg, VA 24061  
[fraser@vt.edu](mailto:fraser@vt.edu), (540) 231-6064, Fax: (540) 231-7580

### **(a) Professional Preparation**

University of Minnesota	Wildlife	Ph.D.	1981
University of Minnesota	Wildlife	M.S.	1978
University of Idaho	Wildlife-Fishery Res.	B.S.	1974

### **(b) Appointments**

2013-Present	Visiting professor, Nanchang University, Jiangxi, China
1992 – Present	Professor, Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University
1986 - 1992	Associate Professor, Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University.
1981 - 1986	Assistant Professor, Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University.

### **Expertise**

Population ecology of birds 43 years of experience  
Shorebird/coastal ecology 31 years of experience  
Foraging ecology of birds 26 years of experience  
Scientific publication; > 90 publications in refereed literature

### **(c) Publications 5 Related to Proposal**

Gibson, D., Catlin, D. Fraser, J. Karpanty, S. Hubnt, K. Friedrichm, M. Bimbi, M. Maddock, S. and Cohen J. 2017. Evaluating the impact of man-made disasters on imperiled species: Piping plovers and the Deepwater Horizon oil spill. Biological conservation. in press.

Catlin, D.H., J.D. Fraser, and J.H. Felio\*. 2015. Demographic responses of piping plovers to habitat creation on the Missouri River. Wildlife Monographs 192: 1–42.

Friedrich, M.J.\* , K.L. Hunt\*, D.H. Catlin, and J.D. Fraser. 2015 The importance of site to mate choice: Mate and site fidelity in Piping Plovers. The Auk: Ornithological advances. 132: 265-276.

Catlin, D.H. O.Milenkaya\*, K.L. Hunt\*, M.J. Friedrich\*, and J.D. Fraser. 2014. Can river management improve the piping plover's long-term survival on the Missouri River?

Gieder, K.D.\* , S.M. Karpanty, J.D. Fraser, D.H. Catlin, B.T. Guttrierrez, N.G. Plant, A.M. Turecek and E. R. Thieler. 2014. A Bayesian network approach to predicting nest presence of the threatened piping plover (*Caradrius melodus*) using barrier island features. Ecological modelling 276: 38-50.

Cohen, J.B.\* , L.M. Houghton, and J. D. Fraser. 2009. Nesting density and reproductive success of piping plovers in response to storm and human-created habitat changes. Wildlife Monographs. 173:1-24 Won The Wildlife society's monograph award, 2011

## 5 Additional Publications

Zeigler, Sara; Thieler, E.; Gutierrez, Benjamin; Plant, Nathaniel; Hines, Megan; Fraser, James; Catlin, Daniel. 2017. Smartphone technologies and Bayesian networks to assess shorebird habitat selection. *Wildlife Society Bulletin*. In press.

Zeigler, S.L. D.H. Catlin, M. Bomberger Brown, J.D. Fraser, L.R. Dinan, K.L. Huint, J.G. Jorgenson. 2016. Metapopulation viability of an endangered shorebird depends on dispersal and human-created habitats: piping plovers and Prairie Rivers. *Movement ecology*. 4:6.

Davis, K.L., D. K.L. Schohoezman, D. Catlin, K.L. Hunt, M. Friedrich, S.J. Ritter, J.D. Fraser, S.M. Karpanty. 2017. Hatch-year Piping Plover prospecting and habitat quality influence second year nest site selection. *Auk*. 134: 92-103.

Fraser, J.D., S.M. Karpanty, J.B. Cohen, B. R. Truitt. 2013. The Red Knot (*Calidris canutus rufa*) decline in the Western Hemisphere: is there a lemming connection? *Canadian Journal of Zoology* 91:13-16.

Karpanty, S.M., Cohen, J., Fraser, J.D., and Berkson, J. 2011. Evidence of sufficient horseshoe crab eggs for a reduced red knot population during spring migration stopover in Delaware Bay USA. *Journal of Wildlife Management* 75: 984-994.

### (d) Synergistic Activities

- Member, Delaware Bay Ecosystem Technical Committee. Advises the Atlantic State Marine Fisheries Commission on scientific matters relating to the management of shorebirds and horseshoe crabs on the Delaware Bay. 2011-
  - Member Atlantic Flyway conservation Action Plan Committee. 2011-
  - Consultant (pro bono) to the Great Plains and Atlantic Piping Plover Recover teams 1986-present.
  - Interagency task force for management of piping plovers and other endangered species on Long Island, New York. 1999-2005.
  - U.S. House of Representative, subcommittee on National Parks and Public Lands. Testified on the Snake River Birds of Prey Area Bill (H.R. 2141), on behalf of the International Council for Bird Preservation and the Raptor Research Foundation. September 26, 1991.
- Visiting Professor Nanchang University, Jiangxi Province, China



**BIOGRAPHICAL SKETCH**

Provide the following information for the Senior/key personnel and other significant contributors.  
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Gohlke, Julia M

eRA COMMONS USER NAME (credential, e.g., agency login): jgohlke

POSITION TITLE: Assistant Professor of Environmental Health

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Michigan, Ann Arbor, MI	B.S.	12/1997	Biology
University of Washington, Seattle, WA	M.S.	12/2001	Environmental Health
University of Washington, Seattle, WA	PhD	12/2004	Environmental Health
National Institute of Environmental Health Sciences, RTP, NC	Postdoc	08/2009	Environmental Health

**A. Personal Statement**

For the Global Systems Science destination area concept in coastal systems, Dr. Gohlke's expertise in environmental exposure measurement in environmental epidemiology and toxicity pathways will play a critical role to the development of the theme. Her broad depth of knowledge in environmental health is established by research methods she employs, which includes utilization of epidemiological, bioinformatics, and toxicology techniques. Regarding work in coastal areas, she evaluated seafood safety following the Deepwater Horizon blowout. After outlining a set of data gaps and recommendations for further state and federal monitoring, samples collected from fishermen were also evaluated and compared to federal level testing. She is on the advisory board for the Gulf of Mexico Reef Fish Shareholders Alliance, a NOAA Coastal Response Research Center panel on the safety of dispersant use in Arctic waters, and is a member of the recently formed NAS *Committee on the Evaluation of the Use of Chemical Dispersants in Oil Spill Response*. She is currently performing research on the effects of human exposure to high temperatures and volatile organic compounds in urban versus rural settings in Alabama. As PI of an R21 award under the inaugural NIH Climate Change and Health Program, and subsequent R01 awardee, her research team is developing risk estimates for preterm birth and non-accidental mortality using 20 years of Alabama birth and death records, satellite-derived climate data, and personal exposure techniques. Several additional accomplishments and recognitions make her particularly suited for her role in this application. Dr. Gohlke has served on the Board of Scientific Counselors for the National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (NCEH/ATSDR), Centers for Disease Control. Her previous work developed bioinformatics techniques combining genomics and genetics datasets to prioritize environmentally regulated molecular pathways important in human toxicity.

**B. Positions and Honors****Positions and Employment**

08/98 to 12/98	Research Assistantship	University of Michigan, Ann Arbor, MI
06/01 to 09/01	Research Assistantship	University of Washington, Seattle, WA
03/02 to 06/02	Research Assistantship	Environmental Protection Agency, RTP, NC
09/02 to 12/02	Teaching Assistantship	University of Washington, Seattle, WA

2002 to 2004	Research Assistantship	University of Washington/EPA , Seattle, WA
2002 to 2004	Research Internship	Environmental Protection Agency, RTP, NC
01/05 to 08/09	Postdoctoral Fellowship	NIEHS/ National Institutes of Health, NC
07/08 to 08/08	Temporary Advisor	World Health Organization, Switzerland
09/09 to 08/10	AAAS Fellow	Department of State, Washington DC
8/10 to 07/15	Assistant Professor	University of Alabama at Birmingham
8/15 to present	Assistant Professor	Virginia Polytechnic Institute and State University

### **Other Experience and Professional Memberships**

2012-2015	Member of the Board of Scientific Counselors, National Center for Environmental Health/Agency for Toxic Substances and Disease Registry
2016	Army Corps of Engineers Engineer Research and Development Center FY 16 Basic Research Proposal Reviews
2016	NIOSH Special Emphasis Panel (PAR 15-353: Centers for Agricultural Safety and Health)
2016	NASA ROSES 2015 A.46 Health and AQ Applied Sciences Team (H-AQAST) review panel
2015	Environmental Protection Agency, Science to Achieve Results (STAR) Graduate Fellowship Program review panel member
2014-	Editorial Board member, <i>Journal of Health and Pollution</i> , Blacksmith Institute, NY
2014-	Review Editor, <i>Frontiers in Public Health-Radiation and Health</i> specialty section, Frontiers, Lausanne, Switzerland
2014	Invited Reviewer: National Science Foundation Graduate Research Fellowship Program
2013,2012	Invited Reviewer: NIH Climate Change and Health Special Emphasis Panel (ZRG1 PSE-D (56)), NIH Behavioral Interventions to Address Multiple Chronic Health Conditions in Primary Care (ZRG1 HDM-T(02)); Army Corps of Engineers Engineer Research and Development Center FY 14 Basic Research Proposal Reviews; EPA's draft "Next Generation Risk Assessment: Incorporation of Recent Advances in Molecular, Computational, and Systems Biology Interim Report."
1/08-12/12	Editorial Board member, <i>Reproductive Toxicology</i> , Elsevier, NY
2011-	Gulf of Mexico Reef Fish Shareholders' Alliance Advisory Board member
2010	Ad Hoc Expert Reviewer, Centers for Disease Control and Prevention, Environmental Health Tracking Branch, Atlanta GA
2009-2010	Member of the U.S. Interagency Working Group on Climate Change and Health
2009	External Review Panel Member for EPA Toxicogenomics in Risk Assessment Report
2006-	Invited Reviewer: <i>Nature Communications</i> , <i>Neurotoxicology</i> , <i>Current Anthropology</i> , <i>Birth Defects Research</i> , <i>Environmental Health Perspectives</i> , <i>Environmental Research</i> , <i>Gene Regulation and Systems Biology</i> , <i>Toxicological Sciences</i> , <i>Food and Chemical Toxicology</i> , <i>Obesity</i> , <i>Environment International</i> , <i>Mathematical Biology</i> , <i>Environmental Health</i> , <i>Journal of Health and Pollution</i> , <i>Reproductive Toxicology</i> , <i>American Journal of Public Health</i> , <i>Frontiers in Public Health</i> , <i>International Journal of Molecular Sciences</i> , <i>Journal of Occupational Medicine and Toxicology</i> , <i>Neurobiology of Aging</i> , <i>PeerJ</i> , <i>Science of the Total Environment</i> , <i>Toxicology and Applied Pharmacology</i> , <i>BMC Public Health</i> , <i>International Journal of Environ Res Public Health</i> , <i>Regional Environmental Change</i> , <i>American Journal of Human Biology</i> , <i>American Journal of Clinical Nutrition</i> , <i>Frontiers in Ecology</i>
1999-	Society of Toxicology member
1999-	Teratology Society member

### **Honors**

- 2001-2006 Six Society of Toxicology awards from Risk Assessment Specialty Section and Biological Modeling Specialty Section for papers, presentations, and posters of predoc and post-doc research results.
- 2004 Dose-Response Specialty Group best poster presentation award, Society for Risk Analysis
- 2005 James C. Bradford Memorial Post-doc Poster Award, Teratology Society
- 2009 Best Publication in *Birth Defects Research* in 2008
- 2011 Invited participant in NIH Director's 'Innovation Brainstorm: Transforming Discovery into Impact' to develop ideas for scientific programs for the NIH Common Fund
- 2011 Invited participant in NIEHS Strategic Planning meeting, July 12-14<sup>th</sup> and Oct 13-14<sup>th</sup>, RTP, NC
- 2011 Winner of UAB NORC "Creativity is a Choice" Award
- 2013 Future Leader Award, International Life Sciences Institute, N.A.
- 2014 F. Clarke Fraser New Investigator Award, Teratology Society, Reston, VA
- 2016 First prize, NIEHS Climate Change and Environmental Exposures Challenge for PIE Viz, Populations, Infrastructures, and Exposures Visualization Tool with Samarth Swarup and Dawen Xie, Biocomplexity Institute, VT

### C. Contributions to Science

**Throughout my career, my primary interest has been determining how environmental processes impact health outcomes. To pursue this interest I have employed a variety of computational, bioinformatic, and epidemiological approaches.**

**Quantitative methods for estimating interspecies differences in brain development.** Early in my career, I was interested in understanding how datasets generated in model species can be used to predict effects in humans. The current methods for determining risk associated with environmental pollutants relies heavily on testing conducted in rodent species. Chemicals are evaluated for neurodevelopmental effects through exposure in rodents and subsequent behavioral testing and pathology exams. Compared to the neocortex of the rodent brain, the primate neocortex is overdeveloped and this is thought to underlie higher order processes such as executive functioning present in primates but not rodents. To address this translational issue, I developed computational models to predict neuronal cell number in the developing rat, mouse, monkey, and human neocortex based on cell cycle kinetics and apoptosis during neurogenesis. We examined the effects of ethanol on neuronal proliferation, differentiation, and death as a case study for use in assessing the risk of chemicals using rodent datasets to predict effects in humans.

- Gohlke JM, Griffith, WC, & Faustman, EM (2005). A systems-based computational model for dose-response comparisons of two mode of action hypotheses for ethanol-induced neurodevelopmental toxicity. *Toxicological Sciences*, 86(2), 470-484
- Gohlke JM, Griffith, WC and Faustman, EM (2007). Computational Models of Neocortical Neuronogenesis and Programmed Cell Death in the Developing Mouse, Monkey and Human. *Cerebral Cortex*, 17: 2433-2442

**Bioinformatic techniques for disseminating the molecular underpinnings of environmental effects on human health.** After exploring interspecies differences in cellular processes during neocortical development, I became interested in understanding the molecular changes necessary to produce these cellular differences. Collaborating with Francois Guillemot's lab, who produced transcriptomics datasets in several proneural bHLH loss of function and gain of function mice, I was able to develop a gene regulatory network describing differentiation into glutamatergic and GABAergic neurons. This work led to a broader application of network theory and pathway analysis to define hypotheses of the most likely molecular targets of environmental factors affecting disease processes based on available datasets from genetic association studies in humans and toxicology studies performed in rodent and other model organisms. We are currently evaluating lifespan and transcriptomic differences associated with early-life exposures to mixtures using *D. pulex* as a model organism.

- Gohlke, JM, O Armant, FM Parham, MV Smith, D Castro, L Nguyen, JS Parker, G Gradwohl, CJ Portier, F Guillemot. (2008). A Gene Regulatory Network for Telencephalon Development Combining Experimental and Bioinformatics Approaches. *BMC Biology* 6(1): 15. PMID: PMC2330019

- Gohlke JM, R Thomas, Y Zhang, MC Rosenstein, AP Davis, C Murphy, CJ Mattingly, KG Becker, CJ Portier (2009). Genetic and Environmental Pathways to Complex Diseases. *BMC Systems Biology* 3: 46. PMCID: PMC2680807
- Thomas R, JM Gohlke, F Parham, CJ Portier. (2009). Choosing the right path: Enhancement of biologically-relevant sets of genes or proteins using pathway structure. *Genome Biology* 10(4):R44. PMCID: PMC2688935
- Hudson SL, DA Doke, JM Gohlke. (2016). The effect of a low iron diet and early life methylmercury exposure in *Daphnia pulex*. *Food Chem Toxicol.* 89: 112-119. PMID: 26806633.

**Human health implications of global environmental change.** Traditionally the field of environmental health has focused on health outcomes associated with exposure to single chemicals. More recently, large-scale changes in the environment such as climate change, urbanization, and land use change have been characterized by earth and physical scientists but have been largely unexplored by human health scientists. I have developed a research program examining health outcomes associated with large-scale environmental changes across urban and rural landscapes. Using a combination of satellite-derived datasets and vital records, we have confirmed associations between mortality and extreme heat events and we were also able to detect an association between preterm birth and extreme heat events. Importantly, we were able to detect mediation of the association by rurality, suggesting persons in urban centers may be more at risk. To assess adaptation strategies in human populations, community engaged research is being conducted in underserved urban and rural communities in Alabama, where we have piloted a method for measuring individual level exposure using a small device attached to the shoe.

- Gohlke JM, R Thomas, A Woodward, D Campbell-Lendrum, A Prüss-Üstün, S Hales, CJ Portier. (2011). Estimating the global health implications of electricity and coal consumption. *Environ Health Perspect.* 119(6): 821-6. PMCID: PMC3114817
- Smith, TT, BF Zaitchik, JM Gohlke. (2013). Heat waves in the United States: definitions, patterns and trends. *Climatic Change* 118: 811-825 PMCID: PMC3711804
- Kent ST, McClure LA, Zaitchik BF, Smith TT, & JM Gohlke. (2013). Heat Waves and Health Outcomes in Alabama (USA): The Importance of Heat Wave Definition. *Environ Health Perspect.* 122(2): 151-8 PMCID: PMC3914868.
- Bernhard, MC, ST Kent, MA Sloan, MB Evans, McClure LA, JM Gohlke. (2015). Measuring personal heat exposure in an urban and rural environment. *Environmental Research* 137: 410-418 PMCID: PMC4355189.

**Assessing human health risk after a large-scale oil spill.** Applying my expertise in risk assessment, I evaluated seafood safety protocols used following the Deepwater Horizon blowout. After outlining a set of data gaps and recommendations for further state and federal monitoring, samples collected from fishermen were also evaluated and compared to federal level testing. Our assessment concluded there was minimal human health risk associated with seafood consumption after waters were re-opened for fisheries.

- Gohlke JM, D Doke, M Tipre, M Leader, T Fitzgerald. (2011). A review of seafood safety after the Deepwater Horizon blowout. *Environ Health Perspect.* 119(8): 1062-9 PMCID: PMC3237364
- Fitzgerald TP, JM Gohlke. (2014). Contaminant levels in Gulf of Mexico reef fish after the Deepwater Horizon oil spill as measured by a fishermen-led testing program. *Environ. Sci. Technol.* 48(3): 1993-2000 PMID: 24401096

#### List of published work in Google Scholar:

<https://scholar.google.com/citations?hl=en&user=RKwPrDoAAAAJ>

### D. Research Support

#### Ongoing Research Support

NIH/NIEHS R01ES023029

Gohlke (PI)

02/01/15 – 10/31/19

Project Title: Environmental exposures across urban and rural communities in the Deep South

Working with community groups, we will determine whether significant differences in vulnerability to heat-related health impacts exist between underserved urban and rural communities in the Deep South.

ICTAS Diversity Seed Grant (Virginia Tech) Gohlke (PI) 11/01/16 – 6/30/17  
Project Title: Radon Education, Testing, and Mitigation in Rural Communities  
Working with Bluefield State College, we are running educational sessions, recruiting homes for radon testing, and providing mitigation to selected homes with high radon levels in Tazewell Cty, VA and Mercer Cty, WV.

NSF 1605355 Dietrich (PI) 07/01/16 - 06/30/19  
Project Title: Assessing Inhalation Exposure to Aerosolized Contaminants from Drinking Water.  
The project is determining exposure and assessing potential health risks from inhalation of metals from humidifier use.

### **Selected Recently Completed Research Support**

NIH/NIEHS 1R21ES020205 Gohlke (PI) 08/15/11 – 07/31/2014  
Extreme Heat Events-Evolving risk patterns in urban and rural communities  
This study examined the impacts of heatwaves in urban versus rural communities in Alabama using retrospective analysis of birth and death records and satellite-derived datasets.

Red Cross Gohlke and Zaitchik (Co-PIs) 09/01/15-02/15/16  
American Red Cross and Red Crescent Climate Center Contract  
Project title: Health impacts of extreme heat in the informal settlements of Nairobi  
The goal of this project was to estimate a threshold temperature that would like increase mortality due to extreme heat exposure in Nairobi via a meta-analysis of studies conducted elsewhere.

NIH/NIOSH 2 T42 OH008436 08 Lungu(PI) 07/01/13 – 6/30/15  
Deep South Occupational Safety and Health Education and Research Center  
Developing professionals who protect and promote the health and safety of workers through interdisciplinary education, research, and outreach programs.

EPA/VDH Marmagas(PI) 03/25/16-7/15/16  
Environmental Protection Agency/Virginia Department of Health Contract  
Project title: Home radon testing in Tazewell County, VA  
The goal of this work was to evaluate radon exposure in Tazewell County by randomly recruiting 300 homeowners to conduct home radon testing.

VT GCC Krometis(PI) 01/01/16-09/30/16  
Global Change Center at VT Seed Grant  
Project title: How does environmental landscape change shape community and ecological health in the Central Appalachian Coalfields? A pilot study in Tazewell County, Virginia.  
The goal of this pilot project is to analyze VA vital statistics (birth, death records) for trends in birth weight and primary causes of mortality as it relates to landuse/land cover changes over the past 30 years.

UAB CSCH ROSA Award Gohlke(PI) 09/01/15-08/30/16  
UAB Center for the Study of Community Health Researchers Omnibus Survey of Alabama  
Project Title: An environmental health phone survey of Alabama residents and public health professionals  
The aim of this work is to determine urban and rural environmental health priorities, preferred methods for addressing those priorities.

UAB ETM pilot Gohlke(PI) 10/01/12 – 09/30/13  
UAB Environmental and Translational Medicine Program  
Project Title: Geospatial analysis of health outcomes in North Birmingham: A spatial time-series analysis of birth and death records (1990-2010) to determine whether living in close proximity to coke facilities.

NIH Fogarty 5 D43 TW05497-09 Sathiakumar(PI) 10/01/12 – 10/30/13  
Project Title: UAB International Training and Research in Environmental and Occupational Health in South East Asia: the Aga Khan University in Karachi, Pakistan; Manipal University (MU) in Manipal, India; and University of Kelaniya (UKe) in Sri Lanka.

## JENNIFER L. IRISH

### PROFESSIONAL PREPARATION

Lehigh University	Bethlehem, PA	Civil Engineering	B.S. 1992
Lehigh University	Bethlehem, PA	Civil Engineering	M.S. 1994
University of Delaware	Newark, DE	Civil Engineering	Ph.D. 2005

### APPOINTMENTS

<i>Aug 2016 – present:</i>	Professor, Civil and Environmental Engineering, Virginia Tech
<i>Aug 2011 – Aug 2016:</i>	Associate Professor, Civil and Environmental Engineering, Virginia Tech
<i>Aug 2006 – Aug 2011:</i>	Assistant Professor, Civil Engineering, Texas A&M University
<i>Oct 2001 – Jul 2006:</i>	Coastal Engineering Regional Technical Specialist, U.S. Army Corps of Engineers New York District and North Atlantic Division
<i>Aug 1998 – Sep 2001:</i>	Research Coastal Engineer, Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center
<i>Aug 1997 – Aug 1998:</i>	Research Assistant, Center for Applied Coastal Research, University of Delaware
<i>Jul 1994 – Aug 1997:</i>	Coastal Engineer, Coastal Engineering Research Center, U.S. Army Engineer Waterways Experiment Station

### PRODUCTS (OF 46 JOURNAL PUBLICATIONS AND 34 CONFERENCE PAPERS)

\*Indicates Irish graduate student

#### Most Closely Related to Proposed Project

1. Smallegan\*, S.M., **Irish**, J.L., van Dongeren, A.R., den Bieman, J.P. (2016) Morphological response of a sandy barrier island with a buried seawall during Hurricane Sandy, *Coast. Eng.*, **110**, 102-110.
2. Taylor\*, N. R., **Irish**, J. L., Udoh\*, I. E., Bilskie\*, M. V., Hagen, S. C. (2015) Development and uncertainty quantification of hurricane surge response functions for hazard assessment in coastal bays, *Nat. Hazards*, **77**, 1103-1123.
3. Woodruff, J.D., Irish, J.L., and Camargo, S.J. (2013). Coastal flooding by tropical cyclones and sea level rise, *Nature*, **504**, 44-52.
4. **Irish**, J.L., Resio, D.T., Cialone, M.C. (2009). A surge response function approach to coastal hazard assessment. Part 2: Quantification of spatial attributes of response functions, *Nat. Hazards* [Special Issue, Numerical modelling of storm surges, the latest developments, V. Swail (ed.)], **51**(1), 183-205.
5. Cañizares, R., **Irish**, J.L. (2008) Simulation of storm-induced barrier-island morphodynamics and flooding, *Coast. Eng.*, **55**(12), 1089-1101.

#### Other Significant Products

1. **Irish**, J.L., Lynett, P.J., Weiss, R., Smallegan\*, S.M., Cheng\*, W. (2013). Buried relic seawall mitigates Hurricane Sandy's impacts, *Coast. Eng.*, **80**, 79-82.
2. Mousavi\*, M.E., **Irish**, J.L., Frey\*, A.E., Olivera, F., Edge, B.L. (2011). Global warming and hurricanes: The potential impact of hurricane intensification and sea level rise on coastal flooding. *Clim. Change*, **104**(3-4), 575-597.
3. Augustin\*, L.N., **Irish**, J.L., Lynett, P.L. (2009). Laboratory and numerical studies of wave damping by emergent and near-emergent wetland vegetation, *Coast. Eng.*, **56**(3), 332-340.
4. **Irish**, J.L., Resio, D.T., Ratcliff, J.J. (2008). The influence of storm size on hurricane surge. *J. Phys. Oceanogr.*, **38**(9), 2003-2013.
5. **Irish**, J.L., Lillycrop, W.J. (1999). Scanning laser mapping of the coastal zone: The SHOALS system. *ISPRS J. Photogramm.*, **54**, 123-129.

## SYNERGISTIC ACTIVITIES

1. *Recruitment, retention, and graduation of women graduate students*: When I started as faculty in 2006, women made up just 10% of the Ocean Engineering senior class and 12% of the Ocean Engineering graduate student body at Texas A&M University. I am passionate about increasing women participation in the engineering profession and specifically within the Civil and Coastal Engineering fields. Research indicates that for ethnicity, gender, etc. to become a nonfactor in the classroom and in the workplace that demographic must make up about one third of the total group. To that end, I have actively recruited women students; 50% of my graduate students to receive their degrees have been women, and 40% of students in my research group--graduate and undergraduate--are women. My current graduate student group at Virginia Tech is 50% women. I have exceeded the critical one-third fraction within my research group thereby creating an environment that promotes learning in a bias-free environment. I am committed to the continued recruitment of women students.
2. *Appointed Member*, Strategic Sciences Group--Operation Group Sandy, U.S. Department of Interior (2013-2014). This group reports directly to the Secretary of the Interior, who in turn reports directly to the Hurricane Sandy Rebuilding Taskforce (established by President Obama by executive order).
3. *Appointed Chair* of the American Society of Civil Engineers (ASCE) Committee on Technical Advancement (2016-present; *Appointed Vice Chair* 2015-2016; *Appointed Member* 2014-present) | *Elected Member* of ASCE Coasts, Oceans, Ports, and Rivers Institute (COPRI) Coastal Engineering Research Council (2014-present) | *Elected Secretary* of the COPRI Governing Board (2008-2012) | *Nominated Secretary* of the ASCE COPRI Coastal and Estuarine Hydroscience (formerly Tidal Hydraulics) Committee (2005-2012; *Member* 2005-present) | *Member*, ASCE COPRI Sustainability Committee (2012-present).
4. *Department of the Army Superior Civilian Service Award* (2008) for serving as an expert on the Interagency Performance Evaluation Task Force (IPET) forensic investigation of hurricane surge, wave, and levee failure impacts to New Orleans, LA, during Hurricane Katrina (2005-2006). | *Department of the Army Commander's Award for Civilian Service* (2006) for distinguished and meritorious service as a coastal engineer for the U.S. Army Corps of Engineers (1992-2006). | *U.S. Army Corps of Engineers Commander's Outstanding Scientific Achievement Award* (2004) for development of an improved wind-stress formulation to advance coastal storm surge modeling.
5. *Elected Member*, Board of Trustees, Academy of Coastal, Ocean, Port and Navigation Engineers, which awards Diplomate certification beyond the Professional Engineering license (2012-2015).

**Luke Juran, Ph.D.**  
Assistant Professor  
Dept. of Geography and Virginia Water Resources Research Center  
Virginia Tech  
Blacksburg, VA 20461 (USA)  
Ph: 540-231-0265, Fax: 540-231-2089, [ljuran@vt.edu](mailto:ljuran@vt.edu)

Education	Subject	Degree / Year
University of Northern Iowa	Social Science Education	B.A. 2003
University of Iowa	International Studies	M.A. 2008
Indian Institute of Tech-Madras	Env't. Water Res. Engineering	2008-09 & 2011-12
University of Iowa	Geography	Ph.D. 2012

### Appointments

2013-Present - Assistant Professor, Dept. of Geography, Virginia Tech  
2013-Present - Assistant Professor, Virginia Water Resources Research Center, Virginia Tech  
2013 - Adjunct Assistant Professor, Dept. of Geography, University of Iowa  
2012 - Instructor, Dept. of Geography, University of Iowa

### Products Most Relevant to Proposed Project

1. **Juran, L.** In Press. Disaster, development, and water: the reconstruction and (re)fabrication of hazardous waterscapes in post-tsunami India. In *The Asian tsunami and post-disaster aid*, (eds.) S. Reddy & H. Naraindas. Singapore: Springer Nature.
2. **Juran, L.**, M.C. MacDonald, N.B. Basu, S. Hubbard, R. Rajagopal, P. Rajagopalan, and L. Philip. 2016. Development and application of a multi-scalar, participant-driven Water Poverty Index in post-tsunami India. *International Journal of Water Resources Development*. doi: 10.1080/07900627.2016.1253543
3. **Juran, L.** 2015. A framework for integrating water projects in disaster reconstruction processes in the international context. *Public Works Management & Policy* 20(4): 305-321.
4. **Juran, L.** and J. Trivedi. 2015. Women, gender norms, and natural disasters in Bangladesh. *Geographical Review* 105(4): 601-611.
5. **Juran, L.** 2012. The gendered nature of disasters: women survivors in post-tsunami Tamil Nadu. *Indian Journal of Gender Studies* 19(1): 1-29.

### Other Significant Products

1. MacDonald, M.C., **L. Juran**, J. Jose, S. Srinivasan, S.I. Ali, K.J. Aronson, and K. Hall. 2016. The impact of rainfall and seasonal variability on bacteria removal by a point-of-use drinking water treatment intervention in Chennai, India. *International Journal of Environmental Health Research* 26(2): 208-221.
2. **Juran, L.** 2015. Women, gender norms, and natural disasters: examples from South Asia. VTechWorks, Virginia Tech.
3. **Juran, L.** and M.C. MacDonald. 2014. An assessment of boiling as a method of household water treatment in South India. *Journal of Water & Health* 12(4): 791-802.
4. **Juran, L.** 2012. Women, gender and disaster: global issues and initiatives. *Indian Journal of Gender Studies* 19(2): 341-344.



5. **Juran, L.** 2012. *Churning the water after the wave: water components of housing reconstruction in post-tsunami South India*. Ph.D. Dissertation, Department of Geography and Sustainability Sciences, University of Iowa.

### **Synergistic Activities**

1. Appointment at Virginia Water Resources Research Center requires synergistic work across Virginia Tech, with >85 water faculty from >15 departments represented (e.g., secured approval for new interdisciplinary B.S. degree in “Water Resources, Policy, Management”). This Appointment also entails collaborations, information dissemination, and regular meetings with water stakeholders throughout Virginia (e.g., state agencies, local governments, nonprofits, industry, farmers, etc.).
2. Steering Committee member of Virginia Geographic Alliance, which supports geographic and environmental literacy in Virginia through workshops, student competitions, and grant programs (also previous Steering Committee member of Geographic Alliance of Iowa).
3. Executed 24 water quality and quantity workshops among marginalized communities suffering from water insecurity in coastal Tamil Nadu, India, which was accompanied by meetings, presentations, and reports to governments and nonprofits in the region.
4. Active service learning projects with the Virginia Department of Health (composting and community gardens for food security in Appalachia); Plenty! (a food pantry that promotes food security in Appalachia); Harding Avenue Elementary (education dissemination on natural resource use); and 10+ other local entities..
5. Delivered 50+ presentations to civil society organizations (e.g., Rotary, Lion’s Club, libraries, not for profit hospitals).

**Sarah M. Karpanty, Ph.D.**  
**540-231-4586; [Karpanty@vt.edu](mailto:Karpanty@vt.edu)**

**Education**

Miami University	Zoology	BS	1998
SUNY Stony Brook	Ecology and Evolutionary Biology	PhD	2003

**Academic Positions**

2012-Present Associate Professor (with tenure), Assistant Department Head,  
Graduate Program Coordinator, Department of Fish and Wildlife Conservation,  
Virginia Tech.

2006-2012 Assistant Professor, Department of Fish and Wildlife Conservation,  
Virginia Tech.

2004-2006 Postdoctoral Associate, Department of Fish and Wildlife Conservation,  
Virginia Tech.

**Selected External Funding as a PI** (Total grants and contracts awarded:  
\$14,139,087; Total as Lead PI: \$3,242,472. Total as Co-PI: \$10,896,615)

Karpanty, S.M., O'Rourke, M., Sorice, M. 5/15-4/19. Harnessing plant biodiversity at  
Multiple Spatial Scales To Increase Ecosystem Services In Agricultural  
Systems. USDA NIFA. \$150,390.

Karpanty, S.M., Fraser, J., Catlin D. 05/15-04/20. Fire Island Inlet to Moriches Inlet  
(FIMI) Stabilization Project: Red Fox Ecology, Behavior and Interactions with  
Piping Plovers. \$1,800,000.

Karpanty, S.M. 8/1/14-7/31/18. VCR Long Term Ecological Research on Shorebirds  
and Predators. NSF LTER via University of Virginia. \$150,000.

Karpanty, S.M. 06/14-05/17. Assessing the effects of human disturbance on hatch-  
year Roseate Terns staging at Cape Cod National Seashore. National Park  
Service. \$330,039.

Karpanty, S.M., Fraser, J.D., Catlin, D., and Cohen, J. 10/10-09/13. Forecasting  
effects of accelerating sea-level rise on the habitat of Atlantic Coast piping  
plovers and identifying responsive conservation strategies. USFWS/USGS,  
\$408,890.

Karpanty, S.M., Simons, T., and Fraser, J.D. 08/09-07/12. Assessing the responses  
of breeding shorebirds to military jet overflights of the Core MOA at Cape  
Lookout National Seashore. U.S. Marine Corps, \$1,025,007 total, \$678,583  
to VT.

Karpanty, S.M., and Fraser, J.D. 07/07-07/11. Defense Coastal Estuarine Research  
Program: Understanding the Top-down and Bottom-up Influences on  
Shorebird Productivity, Survival, Habitat Use, Foraging Dynamics and  
Demography in Relation to Beach Management Practices on MCBCL. RTI  
International, \$230,900.

**Selected External Funding as a co-PI**

Fraser, J.D., Karpanty, S.M., Hopkins, B., Catlin, D., Cohen, J., and Felio, J. 08/10-  
10/11. Natural Resource Damage Assessment for Determining Damage to  
the Piping Plover from the MC 252 Spill. USFWS, \$4,116,704

Hallerman, E., Karpanty, S.M., Fraser, J.D., Hata, D., and Cohen, J. 07/06-03/12.  
Horseshoe Crab Research and Monitoring Program. Subaward: Migratory  
Shorebirds and Horseshoe Crabs: Linking foraging and habitat ecology in the  
Delaware Bay to population dynamics of birds and crabs throughout their  
range, National Marine Fisheries Service, \$1,585,002.

**Selected Coastal-Focused Journal Publications** (43 peer-reviewed journal publications total; \*graduate, \*\*undergraduate student, \*\*\*post-doctoral associate under my direction)

Hillman, M.\*, **Karpanty, S.M.**, Fraser, J.D., and Deroose-Wilson, A. 2015. Effects of aircraft and recreation on colonial waterbird nesting behavior. *Journal of Wildlife Management*. 79(7): 1192-1198.

Gieder, K.\*, **Karpanty, S.M.**, Fraser, J.D., Catlin, D.H., Gutierrez, B.T., Plant, N.G., Turecek, A.M., and Thieler, E.R. 2014. A Bayesian network approach to predicting nest presence of the federally-threatened piping plover using barrier island features. *Ecological Modelling* 276: 38-50.

Hillman, M.D.\*, **Karpanty, S.M.**, Fraser, J.D. 2013. Nest and breeding population abundance of Least Terns: Assessing bias and variation in timing and methods. *Journal of Field Ornithology*, 84(3): 287-298.

**Karpanty, S.M.**, Cohen, J.\*\*\*, Fraser, J.D., and Berkson, J. 2011. Evidence of sufficient horseshoe crab eggs for a reduced red knot population during spring migration stopover in Delaware Bay USA. *Journal of Wildlife Management* 75: 984-994.

Cohen, J.B.\*\*\*, **Karpanty, S.M.**, Fraser, J.D., Watts, B.D., and Truitt, B.R. 2009. Residence probability and population size of red knots during spring stopover in the mid-Atlantic region of the United States. *Journal of Wildlife Management* 73: 939-945.

**Karpanty, S.M.**, Fraser J.D., Berkson, J., Niles, L.J., Dey, A., and Smith, E.P. 2006. Horseshoe crab eggs determine red knot distribution in Delaware Bay habitats. *Journal of Wildlife Management* 70(6): 1704-1710.

#### **Selected Teaching, Mentoring and Curriculum Development Experience**

- Advised and graduated 5 M.S., 1 M.N.R., 2 Ph.D. students; Currently advising 2 M.S. and 4 Ph.D. students.
- Recipient of Outstanding Teaching Award (2015-2016); Outstanding Advisor Award (2013-2014); Certificate of Teaching Excellence (2011) in Virginia Tech's College of Natural Resources and Environment
- Lead Instructor at Virginia Tech for Principles of Fish and Wildlife Management (FiW 2114, Fall 2006-present), Vertebrate Population Ecology and Management (FiW 5314, Fall 2007-present), Conservation Biology (FiW 4314, Fall 2014-present)
- Co-Instructor at Miami University and SUNY Stony Brook for Behavioral Ecology, Biodiversity Field Research in a Tropical Rainforest and Ornithology, teaching assistant for introductory biology

#### **Selected Leadership , Service, Outreach Initiatives**

- Science Review Panel Member, New Jersey Sea Grant Committee Regarding Conflicts between Red Knots and Oyster Aquaculture, October 2016-present.
- Chair, Atlantic States Marine Fisheries Commission Shorebird Advisory Panel, Commonwealth of Virginia appointee, 2010-present.
- Virginia Tech Faculty Senate President (2012-2013)

**Roberto T. Leon`**

**a. Professional Preparation**

1978	B.S.C.E.	Civil Engineering	University of Massachusetts - Amherst
1979	M.S.C.E.	Structural Engineering	Stanford University
1983	Ph.D.	Civil Engineering	University of Texas at Austin

**b. Appointments**

1/12-	Burrows Professor	Virginia Polytechnic Institute and State University
1/95- 12/11	Professor	Georgia Institute of Technology
9/89 - 12/94	Associate Professor	University of Minnesota
9/83 - 8/89	Assistant Professor	University of Minnesota
9/79 – 8/83	Research Assistant	University of Texas at Austin

**c. Products**

PRODUCTS MOST CLOSELY RELATED

1. Leon, R. T. and Gao, Y., 2016. Resiliency of steel and composite structures. *Frontiers of Structural and Civil Engineering*, 10(3): 239-253.
2. Perea, T., Leon, R.T., Hajjar, J.F., and Denavit, M.D., 2014. Full-Scale Tests of Slender Concrete-Filled Tubes: Interaction Behavior, *Journal of Structural Engineering*, 140(9), (doi: [http://dx.doi.org/10.1061/\(ASCE\)ST.1943-541X.0000949](http://dx.doi.org/10.1061/(ASCE)ST.1943-541X.0000949))
3. Chuhaviriyakul, P., MacRae, G.A., Anderson, D., Clifton, C.G., Leon, R.T., 2015. Suitability of CFT Columns for New Zealand Moment Frames. *Bulletin of the New Zealand Society for Earthquake Engineering*, 48(1).
4. Kang, L., Leon, R.T. and Lu, X., 2014. A general analytical model for steel beam-to-CFT column connections in OpenSEES, *Journal of Constructional Steel Research*, v. 100, 82–96 (<http://dx.doi.org/10.1016/j.jcsr.2014.04.022>)
5. Kurata, M., Leon, R.T. and DesRoches, R., (2012). Rapid Seismic Rehabilitation Strategy: Concept and Testing of Cable Bracing with Couples Resisting Damper, *Journal of Structural Engineering*, 138(3), 354-362

OTHER SIGNIFICANT PRODUCTS

1. Leon, R.T., Kam, W.Y., and Pampanin, S., (2014). Performance of Reinforced Concrete Beam-Column Joints in the 2010-2012 Christchurch Earthquake, in *ACI SP-296: Contributions in Structural Concrete*, ACI, Farmington Hills, MI.
2. Leon, R. T. Rossberg, J., 2012. Evolution and Future of Building Codes in the USA. *Structural Engineering International*, 22(2), 265-269
3. Hu, J.W., Leon, R.T., and Park, T., (2012). Mechanical models for the analysis of bolted T-stub connections under cyclic loads, *Journal of Constructional Steel Research*, v 78, p 45-57, November 2012
4. Zareian, F.; Sampere, C.; Sandoval, V.; McCormick, D.L.; Moehle, J., and Leon, R. (2012)

Reconnaissance of the Chilean wine industry affected by the 2010 Chile offshore Maule earthquake, *Earthquake Spectra*, v 28, n 1, p 503-512, June 2012

5. Leon, R. T., Rassati, G. A., Perea, T. and Lange, J. (eds.), 2010, *Composite Construction in Steel and Concrete VI*, ASCE, Reston (VA).

#### **d. Synergistic Activities**

1. Experimental testing, advanced analysis and development of design recommendations for partially restrained steel connections, bolted T-stub connections, and concrete-filled composite columns.
2. Leadership in the development of the Network for Earthquake Engineering Simulation Consortium: Past President, Board of Director, Past Chair, Committee on Site Operations and Shared Use of Facilities; co-PI MOM contract FY04-FY09
3. Development of innovative composite construction systems and involvement in technical committees: American Institute of Steel Construction (AISC): Member, Specification Committee; Past Chairman and member, TC5 – Composite Construction
4. Professional leadership: American Society of Civil Engineers (ASCE): Chair, Executive Committee, Technical Activities Division; President, Board of Governors, Structural Engineering Institute
5. Leadership in seismic design: Building Seismic Safety Council (BSSC): Past Chairman, TS 11 – Composite Construction; Past Member, TC 6 – Steel and Composite Structures; Past Member, Provisions Update Committee; American Institute of Steel Construction (AISC): Member, TC 9 – Seismic Design; Past Member, Connection Prequalification Review Panel (CPRP).5.

## LOREN PAUL REES

### **Professional Preparation:**

Georgia Institute of Technology	School of Electrical Engineering	B.E.E., 1970
Polytechnic Institute of Brooklyn	Department of Electrical Engineering	M.S.E.E., 1972
Georgia Institute of Technology	School of Industrial & Systems Engineering	Ph.D., 1980

### **Appointments:**

<b>1995 - Present</b>	Andersen Professor of Business Information Technology	Virginia Tech
<b>1989 - 1995</b>	Professor of Management Science	Virginia Tech
<b>1984 - 1989</b>	Associate Professor of Management Science	Virginia Tech
<b>1981 - 1984</b>	Assistant Professor of Management Science	Virginia Tech
<b>1977 - 1980</b>	Teaching/Research Assistant	Georgia Tech
<b>1970 - 1976</b>	Member of Technical Staff	Bell Telephone Laboratories

## **PRODUCTS**

### **Most Closely Related to Proposed Project**

1. Rakes, T.R., Deane, J.K., Rees, L.P., and Fetter, G. (2014), "A Decision Support System for Post-disaster Interim Housing," Decision Support Systems, accepted June 21, 2014.
2. Rakes, T. R., Deane, J., & Rees, L. P. (2012). IT security planning under uncertainty for high-impact events. Omega, 40(1), 79-88.
3. Rees, L., J. Deane, T. Rakes and W. Baker (2011), Decision Support for Cybersecurity Risk Planning, Decision Support Systems, 51(3), 493-505.
4. Baker, Wade H., Rees, Loren Paul, and Tippet, Peter (2007), "Necessary Measures: Metric-Driven Information Security Risk Assessment and Decision Making," Communications of the ACM, Vol. 50, No. 10 (October 2007), pp. 101-106.
5. Rakes, T.R., Chacko, J., Deane, J.K., and Rees, L.P. (2015), "Modeling Disaster Uncertainty with Fuzzy Goal Programming," Proceedings of the 2015 Meeting of the Southeast Decision Sciences Institute, (Savannah, GA: 2015), to appear.

### **Other Significant Products**

1. Porter, Alan L., Rees, Loren P., Park, Choon Y., Rao, Srikanth, and Larson, Thomas D., "Transportation Funding Structures and Policies," Transportation Research, Vol. 15A (March, 1981), p. 139-153.
2. Crouch, Ingrid W. M., Greenwood, Allen G., and Rees, Loren Paul, "Use of a Classifier in a Knowledge-Based Simulation Optimization System," Naval Research Logistics, Vol. 42 (1995), p. 1203-1232.
3. Greenwood, Allen G., Rees, Loren P., and Crouch, Ingrid W. M., "Separating the Art and Science of Simulation Optimization: A Knowledge-Based Architecture Providing for Machine Learning," IIE Transactions, Vol. 25, No. 6 (1993), p. 70-83.
4. Leu, Yow-Yuh, Rakes, Terry R., Rees, Loren P., and Ceccucci, Wendy A., "Modelling Resource Allocation in a Decentralized Organization with an AI-Based, Goal-Directive Model," Decision Sciences, Vol. 23, No. 5 (1992), p. 1027-1049.

5. Huang, Philip Y., Rees, Loren P., and Taylor, Bernard W., "A Simulation Analysis of the Japanese Just-in-Time Technique (with Kanbans) for a Multi-Line, Multi-Stage Production System," Decision Sciences, Vol. 14, No. 3 (July, 1983), p. 326-344.

## **SYNERGISTIC ACTIVITIES**

1. Winner of Stanley T. Hardy Award, national award for the journal article in *Decision Sciences* making the greatest contribution to the field of production and operations management
2. Virginia Tech Finalist, State Council of Higher Education for Virginia, Outstanding Faculty in Virginia Award, five years; State Finalist in 1990
3. Distinguished Service Award winner, Past President, and past meeting Program Chair for the Southeastern Chapter of INFORMS
4. Featured expert on "Just in Time" television production, TV program aired on educational and cable television in Virginia and West Virginia
5. Contributor of a review article to *Handbook of Decision Support Systems*

## **COLLABORATORS & OTHER AFFILIATIONS**

### **Collaborators and Co-Editors (Collaborators during the past 48 months)**

Arnette, Andrew N. (Wyoming), Baker, Wade H. (Cybertrust, Inc; Virginia Tech), Blanton, B. (UNC Chapel Hill), C. Briggs (Global Inter. LLC), Bukvic, A. (Virginia Tech), Chacko, J (Virginia Tech), Deane, Jason K. (Virginia Tech), Fetter, Gary (Deceased), Goldberg, David M. (Virginia Tech), Hertweck, Bryan M. (Virginia Tech), Holt, Brandon (1901 Group, CRC, Blacksburg, VA), J. Irish (Virginia Tech), Ragsdale, Cliff T. (Virginia Tech), Rakes, Terry R. (Virginia Tech), Donald Resio (Univ. of North Florida), Russell, Roberta S., (Virginia Tech), Scheibe, Kevin P. (Iowa State), Sforza, Peter (Virginia Tech), R. Weiss (Virginia Tech), Zhang, Y. (Virginia Tech), Zobel, Christopher W. (Virginia Tech).

### **Graduate Advisors and Postdoctoral Sponsors**

Porter, Alan L. (PhD), and Heikes, Russell G. (PhD), Georgia Tech

### **Thesis Advisor (2 advisees) and Postgraduate-Scholar Sponsor (none) during the past 5 years**

*Thesis committee member:* Arnette, Andrew (Wyoming), Awaysheh, Abdullah (Virginia Tech), Falasca, Mauro (East Carolina University), Fetter, Gary (Deceased), Kennedy, Trevor (Unknown), Santamaria, Suzanne (International Health Terminology Standards Development Organization, Virginia Tech), Vance, David (Redeemer Presbyterian Church, Blacksburg, VA) | *PhD Thesis Advisor:* J. Chacko (Virginia Tech), W. H. Baker (Verizon, Virginia Tech)

**Toddd Schenk, Ph.D., M.C.P.**

Assistant Professor, School of Public and International Affairs, Virginia Tech

<http://www.toddschenk.com>

[tschenk@vt.edu](mailto:tschenk@vt.edu)

**(a) Professional Preparation**

University of Guelph                      Guelph, Canada Geography (Intl. Development minor) B.A.    2002

Massachusetts Institute of Tech. Cambridge, MA Dept. of Urban Studies and Planning M.C.P. 2009

Massachusetts Institute of Tech. Cambridge, MA Public Policy and Planning (DUSP)    Ph.D. 2015

**(b) Appointments**

2015-Present      School of Public and International Affairs, Virginia Tech              Assistant Professor

2014-2015              Program on Negotiation at Harvard Law School                      Graduate Research Fellow

2013-2014              MIT Science Impact Collaborative                                      Assistant Director

**(c) Select Publications**

**i. Five Related Publications**

1. Chu, E., and Schenk, T. Communicating About Climate Change with Urban Populations and Decision-Makers. *Oxford Research Encyclopedia of Climate Science*. **2017**.
2. Matsuura, M., and Schenk, T., eds. *Joint Fact Finding in Urban Planning and Environmental Disputes*. London and New York: Routledge. **2017**.
3. Schenk, T., Czaika, E., Rumore, D., and Russo, M. Joint fact-finding: An approach for advancing interactive governance when scientific and technical information is in question. *Critical Reflections on Interactive Governance*. Edelenbos, J., and van Meerkerk, I., eds. Cheltenham, UK: Edward Elgar Publishing. **2016**.
4. Rumore, D., Schenk, T., and Susskind, L. Role-play simulations: A tool for climate adaptation education and engagement. *Nature Climate Change*. **2016**, 6: 745-750.
5. Schenk, T., Vogel, R.A.L., Maas, N., and Tavasszy, L. Joint Fact-Finding in Practice: Review of a Collaborative Approach to Climate-Ready Infrastructure in Rotterdam. *European Journal of Transport and Infrastructure Research*. **2016**, 16(1): 273-293.

**ii. Other Relevant Publications**

1. Schenk, T., and Susskind, L. Using role-play simulations to encourage adaptation: Serious games as tools for action research. *Action Research for Climate Change Adaptation: Developing and applying knowledge for governance*. van Buuren, A., Eshuis, J., and van Vliet, M., eds. London and New York: Routledge. **2015**.
2. Eriksen, C., Sword-Daniels, V., Doyle, E.E.H., Alaniz, R., Adler, C., Schenk, T., and Vallance, S. Embodied Uncertainty: Living with Complexity and Natural Hazards. *Journal of Risk Research*. **2016**, doi:10.1080/13669877.2016.1200659



3. Shi, L., Chu, E., Anguelovski, I., Aylett, A., Debats, J., Goh, K., Schenk, T., Seto, K.C., Dodman, D., Roberts, D., Roberts, J.T., and VanDeveer, S.D. Roadmap towards justice in urban climate adaptation research. *Nature Climate Change*. **2016**, 6: 131–137.
4. Schenk, T. Boats and Bridges in the Sandbox: Using Role Play Simulation Exercises to Help Infrastructure Planners Prepare for the Risks and Uncertainties Associated With Climate Change. *Infranomics: Sustainability, Engineering Design and Governance*. Gheorghe, A.V., Masera, M., and Katina, P.F., eds. Berlin, Germany: Springer. **2014**.
5. Schenk, T., and Stokes, L.C. The Power of Collaboration. *IEEE Power & Energy*. **2013**, May/June: 56-65.
6. Bollinger, L.A., Bogmans, C.W.J., Chappin, E.J.L., Dijkema, G.P.J., Huibregtse, J.N., Maas, N., Schenk, T., Snelder, M., van Thienen, P., de Wit, S., Wols, B., and Tavasszy, L.A. Climate Adaptation of Interconnected Infrastructures: A Framework for Supporting Governance. *Regional Environmental Change*. **2013**, 13(1), doi: 10.1007/s10113-013-0428-4.

**(d) Synergistic Activities**

1. *Affiliations at Virginia Tech*: Global Change Center; the Center for Communicating Science (advisory board member); and the Global Forum on Urban and Regional Resilience.
2. Organizing *Joint Fact-Finding Network*, including hosting network meeting. Ongoing activities with members of network around the world.
3. PI on *#CivilityVT* and the *Frenemies Project*, which are engaging students, staff and faculty from across the university and beyond.

**Venkataramana Sridhar, Ph.D., P.E., D.WRE**

Assistant Professor, Biological Systems Engineering Department,

Virginia Tech, Blacksburg, Virginia 24061

Tel: (540) 231-1797; Fax: 540-231-3199; E-mail: [vsri@vt.edu](mailto:vsri@vt.edu)

**(a) Professional Preparation**

Tamil Nadu Agricultural Univ.	Coimbatore, India	Ag Engineering	B.S., 1991
Asian Institute of Technology	Bangkok, Thailand	Irrigation Engineering	M.Eng., 1994
Oklahoma State University	Stillwater, OK	Biosystems Engineering	Ph.D., 2001

**(b) Appointments**

2014-Present	Biological Systems Engineering, Virginia Tech	Assistant Professor
2012-2013	Civil Engineering, Boise State University	Associate Professor
2007-2012	Civil Engineering, Boise State University	Assistant Professor
2003-2007	School of Natural Resources, U. Nebraska	Research Assistant Prof.
2001-2003	Civil and Environmental Engineering, U. Washington	Postdoc

**(c) Select Publications****i. Five Related Publications**

1. Sridhar, V., K.A. Anderson (2017) Human-induced modifications to boundary layer fluxes and their water management implications in a changing climate, *Agricultural and Forest Meteorology*, 234, 66-79, DOI:10.1016/j.agrformet.2016.12.009
2. Sehgal, V., V. Sridhar, A. Tyagi (2017) Stratified drought analysis using a stochastic ensemble of simulated and in- situ soil moisture observations, *Journal of Hydrology*, 10.1016/j.jhydrol.2016.12.033
3. Seong, C.H., V. Sridhar (2016) Hydroclimatic variability and change in the Chesapeake Bay watershed, *Journal of Water and Climate Change*, International Water Association 7(4), jwc2016008, DOI: 10.2166/wcc.2016.008.
4. Sridhar, V. (2013) Tracking the influence of irrigation on land surface fluxes and boundary layer climatology, *Journal of Contemporary Water Research & Education*, Issue 152, Pages 79-93, Dec 2013.
5. Hoekema, D. J., V. Sridhar (2013) A system dynamics model for conjunctive management of water resources in the Snake River basin, *Journal of American Water Resources Association*, Vol 49, No. 6: 1327-1350, DOI: 10.1111/jawr.12092.

**ii. Other Relevant Publications**

1. Jaksa, W.T., V. Sridhar (2015) Effect of irrigation in simulating long-term evapotranspiration climatology in a human-dominated river basin system, *Agricultural and Forest Meteorology*, 200, 109-118.
2. Jaksa, W.T., V. Sridhar, J. L. Huntington and M. Khanal (2013) Evaluation of the Complementary Relationship using Noah Land Surface Model and North American Regional Reanalysis (NARR) Data to Estimate Evapotranspiration in Semiarid Ecosystems, *Journal of Hydrometeorology*, Vol 14, Issue 1, 345-359, Feb 2013 DOI: 10.1175/JHM-D-11-067.1
3. Sridhar, V., X. Jin, W.T. Jaksa (2012) Explaining the hydroclimatic variability and change in the Salmon River basin, *Climate Dynamics*, DOI 10.1007/s00382-012-1467-0
4. Hoekema, D., V. Sridhar (2011) Relating climatic attributes and water resources allocation: A study using surface water supply and soil moisture indices in the Snake River basin, Idaho, *Water Resources Research*, 47, W07536, doi:10.1029/2010WR009697.
5. Sridhar, V., D.B. Loope, J.A. Mason, J.B. Swinehart, R.J. Oglesby, C.M. Rowe (2006) Large Wind Shift on the Great Plains During the Medieval Warm Period, *Science*, Vol. 313. no. 5785, pp. 345 – 347, DOI: 10.1126/science.1128941.

**(d) Synergistic Activities**

1. Providing leadership with ICTAS Center in India in the water sector through collaboration with colleagues (Lohani, Pruden and others), the Lower Mekong Basin (Cambodia, Thailand, Lao, Vietnam) for food-energy-water nexus impacted by hydropower development projects.
2. ITRA-Water, Government of India, Review Panel Member to review five major water projects funded across India from 2013 to 2016.
3. Editorships: Editor, Journal of Water and Climate change, IWA Publishing, ISSN Print: 2040-2244 | ISSN Online: 2408-9354 Co-Editors: Fransje L. Hooimeijer, Junguo Liu, Chris Perera, Damien Serre.
4. Reviewer of Journals (International Journal of Climatology, Journal of Hydrometeorology, Remote Sensing of Environment, Journal of American Water Resources Association and Water Resources Research).
5. Review Panel Member, Horton Award Committee, American Geophysical Union, 2009-12.

**Total number of students mentored/advised: 8**

Biographical Sketch  
**Dr. Robert Weiss**

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Department of Geosciences, Virginia Tech, e-mail: weiszr@vt.edu, tel: +1-540-231-2334

**(a) Professional Preparation**

Friedrich-Schiller University, Jena, Germany; Geosciences; Pre-Diploma (equivalent to B.S.), 1999  
Friedrich-Schiller University, Jena, Germany; Geosciences; Diploma (equivalent to M.S.), 2002  
Westfalia-Wilhelms University, Münster, Germany; Geosciences; Dr. rer. nat. (Summa Cum Laude, equivalent to Ph.D.), 2005

**(b) Appointments**

2014–present: **Associate Professor**, Virginia Tech, Blacksburg, VA  
2011–2014: **Assistant Professor**, Virginia Tech, Blacksburg, VA  
2008– 2011: **Assistant Professor**, Texas A&M University, College Station, TX  
2005–2008: **Visiting Scholar**, NOAA Center Tsunami Research, University of Washington, Seattle, WA

**(c) Products (40 Journal Papers and 2 Conference Papers)**

**(c).1 Most Closely Related to the Proposed Project**

1. Tang, H. and Weiss, R., A Model for TSUnami FLOW INversion from Deposits (TSUFLIND), *Marine Geology*, **370**, 55–62, 2015.
2. Weiss, R., Diplas, P., Untangling boulder dislodgment in storms and tsunamis: Is it possible with simple theories?, *Geophysics, Geochemistry, Geosystems*, **16(3)**, 890–898, 2015.
3. Weiss, R. and Bourgeois, J., Understanding Sediments – Reducing Risk *Science*, **336**, 1117–1118, 2012.
4. Weiss, R., Fritz, H. and Wünnemann, K., Hybrid modeling of the mega tsunami runup in Lituya Bay after half a century, *Geophysical Research Letters*, **36**, L09609, 2009.
5. Weiss, R., Krastel, S., Anesetti, A. and Wünnemann, K., Constraining the characteristics of tsunami waves from deformable landslides, *Geophysical Journal International*, **194(1)**, 316–321, 2013.

**(c).2 Other Significant Products**

1. Li, L., Switzer, A.D., Wang, Y., Weiss, R., Qui, Q., Chan, Ch-H., Tapponnier, P., What caused the mysterious 18th century tsunami that struck the southwest Taiwan coast?, *in press at Geophysical Research Letters*, 2015.
2. Wei, C. and Weiss, R., On sediment extent and runup of tsunami waves, *Earth and Planetary Science Letters*, **362(1)**, 305–309, 2013.
3. Weiss, R., The mystery of boulders moved by tsunami and storm, *Marine Geology*, **295-298**, 28–33, 2012.
4. Bourgeois, J and Weiss, R. (2009): “Chevrons” are not mega-tsunami deposits – a sedimentologic assessment, *Geology*, **37(5)**, 403-406.
5. Weiss, R., Sediment grains moved by passing tsunami waves: Tsunami deposits in deep water, *Marine Geology*, **250**, 251-257, 2008.

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#### (d) Synergistic Activities

- 1. International Tsunami Survey Team (ITST):** These teams visit tsunami affected areas as soon as possible after a tsunami event to inspect the fresh physical evidence. The range of physical evidence ranges from impact on harbor structures and houses, erosion and deposition characteristics to the impact on ecological systems. As an example of the latter, the PI visited the Galapagos and the Midway Atoll to study the impact of the 2011 Tohoku Tsunami on the near-beach ecosystem. Findings from all the surveys have been presented on very different levels ranging from K-12 institutions and university seminars.
- 2. UNESCO:** The PI was member of the steering committee for the IOC/UNESCO workshop Post-Disaster Assessment and Monitoring of Changes in the Coastal, Ocean and Human Systems in the Indian Ocean and Asian Waters (Feb. 20-23, 2006), in which the PI chaired the workshop Ocean Data, Observations, Disaster Warning and Risk Reduction.
- 3. Creation of Knowledge:** In terms of creation of knowledge, the PI has contributed to the evaluation of oceanic impacts as sources of tsunamis. The PI and Dr. Kai Wünnemann (Free University of Berlin, Germany) developed a hybrid computer code system that is able to simulate the generation, propagation and inundation of tsunami waves. In this model system, the simulation of impact processes with the state-of-the-art hydrocode iSALE is coupled to a non-linear propagation model and eventually to the MOST code, the standard code for inundation computations at the NOAA Center for Tsunami Research. Results published in 2006 indicated that even for waves initially hundreds of meters high, after propagation of approximately 1,000 km those waves were damped to amplitudes that correspond to amplitudes of the 2004 Sumatra Tsunami off Sumatra.

## **RANDOLPH HAMILTON WYNNE**

Professor

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## **EDUCATION**

University of North Carolina at Chapel Hill	B.S.	Env. Science & Engineering	1986
University of Wisconsin-Madison	M.S.	Environmental Monitoring	1993
University of Wisconsin-Madison	Ph.D.	Environmental Monitoring	1995

## **CURRENT POSITIONS**

Professor, Virginia Tech Forest Resources and Environmental Conservation, 2008-present

Program Co-Lead, Interdisciplinary Graduate Program in Remote Sensing, 2012-present

## **HONORS/AWARDS (ALL SHARED WITH COLLEAGUES)**

- First Honorable Mention for the 2005 American Society for Photogrammetry and Remote Sensing Talbert Abrams Award for best 2004 article in *PE&RS*
- Second Place, American Society for Photogrammetry and Remote Sensing Leica Geosystems Award for Best Scientific Paper in Remote Sensing in 2006
- First Place, American Society for Photogrammetry and Remote Sensing ERDAS Award for Best Scientific Paper in Remote Sensing in 2008
- High Performance Computing Best Paper Award, 2011 Spring Simulation Multiconference, Boston, Massachusetts (Phillips, R.D., L.T. Watson, and R.H. Wynne, An SMP Soft Classification Algorithm...)

## **PROFESSIONAL ACTIVITIES**

- Member, Landsat Science Team, 2006 to present
- Co-Author, *Introduction to Remote Sensing*, 5<sup>th</sup> edition, Guilford
- Senior Associate Editor, *Remote Sensing*

## **PROJECT MANAGEMENT EXPERIENCE**

Principal investigator for over \$10,000,000 in grants and contracts on which all deliverables were met with quantifiable science outcomes.

## **RECENT REFEREED ISI PUBLICATIONS**

- Banskota, A., S.P. Serbin, R.H. Wynne, V.A. Thomas, M.J. Falkowski, N. Kayastha, J.P. Gastellu-Etchegorry, and P.A. Townsend, 2015. An LUT-based inversion of DART model to estimate forest LAI from hyperspectral data. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* 8(6):3147-3160.
- Brooks, E.B., J.W. Coulston, R.H. Wynne, and V.A. Thomas, 2016. Improving the precision of dynamic forest parameter estimates using Landsat. *Remote Sensing of Environment* 179: 162-169.

- Coulston, J.W., C.E. Blinn, V.A. Thomas, and R.H. Wynne, 2016. Approximating prediction uncertainty for random forest regression models. *Photogrammetric Engineering & Remote Sensing* 82: 189-197.
- Gopalakrishnan, R., V.A. Thomas, J.W. Coulston, and R.H. Wynne, 2015. Prediction of canopy heights over a large region using heterogeneous lidar datasets: Efficacy and challenges. *Remote Sensing* 7(9):11036-11060.
- Ling, J., C.E. Zipper, P.F. Donovan, R.H. Wynne, and A.J. Oliphant, 2015. Reconstructing disturbance history for an intensively mined region by time-series analysis of Landsat imagery. *Environmental Monitoring and Assessment* 187(9):Article No. 557.
- Oliphant, A. J., R.H. Wynne, C.E. Zipper, W.M. Ford, P.F. Donovan, and J. Li, 2017. Autumn olive (*Elaeagnus umbellata*) presence and proliferation on former surface coal mines in Eastern USA. *Biological Invasions*, 19(1), 1–17.
- Schott, J.R., A. Gerace, C.E. Woodcock, S.X. Wang, Z. Zhu, R.H. Wynne, and C.E. Blinn, 2016. The impact of improved signal-to-noise ratios on algorithm performance: Case studies for Landsat class instruments. *Remote Sensing of Environment* 185:37-45.
- Subedi, S., T.R. Fox, and R.H. Wynne, 2015. Determination of fertility rating (FR) in the 3-PG model for loblolly pine plantations in the southeastern United States based on site index. *Forests* 6(9):3002-3027.
- Sumnall, M.J., T.R. Fox, R.H. Wynne, C.E. Blinn, and V.A. Thomas, 2016. Estimating leaf area index at multiple heights within the understory component of loblolly pine forests from airborne discrete-return lidar. *International Journal of Remote Sensing* 37(1):78-99.
- Sumnall, M, A. Peduzzi, T.R. Fox, R.H. Wynne, V.A. Thomas, and B. Cook, 2016. Assessing the transferability of statistical predictive models for leaf area index between two airborne discrete return LiDAR sensor designs within multiple intensely managed Loblolly pine forest locations in the south-eastern USA. *Remote Sensing of Environment* 176: 308-319.
- Yang, Y., M.C. Anderson, F. Gao, C.R. Hain, K.A. Semmens, W.P. Kustas, A. Noormets, R.H. Wynne, V.A. Thomas, and G. Sun, 2017. Daily Landsat-scale evapotranspiration estimation over a forested landscape in North Carolina, USA using multi-satellite data fusion. *Hydrology and Earth System Sciences*.
- Yu, L., S.B. Ball, C.E. Blinn, K. Moeltner, S. Peery, V.A. Thomas, and R.H. Wynne, 2015. Cloud-sourcing: using an online labor force to detect clouds and cloud shadows in landsat images. *Remote Sensing* 7(3):2334-2351.

## DIVERSITY HIGHLIGHTS

- Member, Virginia Tech Equal Opportunity/Affirmative Action Committee, 2002-2003.
- CNRE Diversity Award, 2008.
- Virginia Tech Human Diversity and Community Committee, 2008-2010.

## STUDENT ADVISING

I have completed 24 graduate students as major professor, 11 M.S. (two co-chaired) and 13 Ph.D. (five co-chaired) Five graduate students are currently under my direction, four Ph.D. and one M.S. I also have the normal load of undergraduate advising in the department (Environmental Resource Management and Environmental Informatics majors).

## **YANG ZHANG**

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School of Public and International Affairs  
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Blacksburg, VA 24060  
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### **Professional Preparation:**

Peking University	Beijing, China	Geography	B.S. 1997
Peking University	Beijing, Chin	Geography	M.S. 2000
Texas A&M University	College Station, TX	Urban and Regional Science	Ph.D. 2006

### **Professional Appointments:**

2015 to present	Associate Professor, Urban Affairs and Planning, Virginia Tech, VA
2008 to 2015	Assistant Professor, Urban Affairs and Planning, Virginia Tech, VA
2006 to 2008	Assistant Professor, Environmental Studies, University of Illinois at Springfield Director, Geographic Information System Laboratory

### **Products (related):**

1. Zhang, Y., W. Drake, Y. Xiao, R. Olshansky, Y. Song (2016) "Disaster Recovery Planning after Two Catastrophes: The 1976 Tangshan Earthquake and the 2008 Wenchuan Earthquake." *International Journal of Mass Emergencies and Disasters* 34(2): 174-203.
2. Zhang, Y. (2012) "Will Natural Disasters Accelerate Neighborhood Decline?" *Environment and Planning B* 39(6): 1084-1104.
3. Zhang, Y. (2011) "Land Use Planning and Resilient City: Lessons from U.S. Experiences." *Journal of International Urban Planning*, 26(4): 2-11.
4. Zhang, Y. (2010) "Residential Housing Choice in a Multihazard Environment: Implications for Natural Hazards Mitigation and Community Environmental Justice." *Journal of Planning Education and Research*, 30(2): 1-15
5. Zhang, Y., & W.G. Peacock (2010) "Planning for Housing Recovery? Lessons Learned from Hurricane Andrew." *Journal of American Planning Association*, 76(1):5-24.

### **Products (Other Significant):**

1. Zhang, C. & Y. Zhang. (2012). "Recovery following the Tangshan Earthquake" *Urban Development Research*, 19(5): 119-126.
2. Zhang, Y. (2010) "Hazard Proximity or Risk Perception? Evaluating Environmental Hazards' Effect on Housing Value." *Environment and Behavior*. 42(5): 579-624.
3. Zhang, Y., M.K. Lindell & C.S. Prater (2009) "Modeling and Managing the Vulnerability of Community Businesses to Environmental Disasters." *Disasters*, 33(1): 38-57.



4. Peacock, W.G., N. Dash. & Y. Zhang (2006) "Sheltering and Housing Recovery Following Disaster." pp. 258 – 274. In Russell Dynes, Havidan Rodriguez, and Enrico Quarantelli (Eds.) *Handbook of Disaster Research*, New York: Springer.
5. Arlikatti, S., M.K. Lindell, C.S. Prater, & Y. Zhang (2006) "Risk Area Accuracy and Hurricane Evacuation Expectations of Coastal Residents." *Environment and Behavior*, 38(2): 226-247.

### **Synergistic Activities**

1. Founding member of Virginia Tech's Interdisciplinary Graduate Education Program in Disaster Resilience (DR-IGEP)
2. Board of Directors for the International Association of China Planning (IACP), spring 2015 to present.
3. PI for NSF grant: "Developing an intergovernmental management framework for sustainable recovery following catastrophic disasters," 2010 – 2014.
4. Co-PI for Virginia Tech ISCE Global Issues Initiative grant: "Building a common language around the dynamic resilience of coastal communities," 2014.
5. Co-PI for Virginia Sea Grant project: "Climate Change Adaptation Strategies For Middle Peninsula Counties in the Virginia Coastal Community," 2010-2012

## **BIOGRAPHICAL SKETCH**

### **Christopher W. Zobel**

#### **PROFESSIONAL PREPARATION**

Colgate University	Hamilton, NY	Mathematics	B.A. 1991
University of North Carolina	Chapel Hill, NC	Mathematics	M.S. 1993
University of Virginia	Charlottesville, VA	Systems Engineering	Ph.D. 1998

#### **APPOINTMENTS**

R.B. Pamplin Professor of Business Information Technology, Virginia Tech, 2013-Present  
Professor, Dept. of Business Information Technology, Virginia Tech, 2012-Present  
Associate Professor, Dept. of Business Information Technology, Virginia Tech, 2004-2012  
Assistant Professor, Dept. of Business Information Technology, Virginia Tech, 1998-2004

#### **PRODUCTS (RELATED):**

1. MacKenzie, C.A. and C.W. Zobel. "Allocating Resources to Enhance Resilience, with Application to Superstorm Sandy and an Electric Utility," *Risk Analysis*, 36(4), 2016, 847-862.
2. Zobel, C.W., "Quantitatively Representing Non-linear Disaster Recovery," *Decision Sciences*, 45(6), 2014, 1053–1082.
3. Pant, R., K. Barker, and C.W. Zobel, "Static and dynamic metrics of economic resilience for interdependent infrastructure and industry sectors," *Reliability Engineering & System Safety*, 125(1), 2014, 92-102.
4. Dottore, M.L. and C.W. Zobel, "Analyzing Economic Indicators of Disaster Resilience Following Hurricane Katrina," *International Journal of Business Analytics*, 1(1), 2014, 67-83.
5. Zobel, C.W. "Representing perceived tradeoffs in defining disaster resilience," *Decision Support Systems*, 50(2), 2011, 394-403.

#### **PRODUCTS (OTHER SIGNIFICANT):**

1. Baghersad, M. and C.W. Zobel. "Economic impact of production bottlenecks caused by disasters impacting interdependent industry sectors" *International Journal of Production Economics*, 168, 2015, 71-80.
2. Zobel, C.W. and L.Z. Khansa. "Quantifying Cyberinfrastructure Resilience against Multi-event Attacks," *Decision Sciences*, 43(4), 2012, 687-710.
3. Falasca, M. and C.W. Zobel. "An Optimization Model for Volunteer Assignments in Humanitarian Organizations," *Socio-Economic Planning Sciences*, 46(4), 2012, 250-260.
4. Arnette, A.N. and C.W. Zobel. "An Optimization Model for Regional Renewable Energy Development," *Renewable & Sustainable Energy Reviews*, 16(7), 2012, 4606-4615.
5. Falasca, M. and C.W. Zobel. "A Two-Stage Procurement Model for Humanitarian Relief Supply Chains," *Journal of Humanitarian Logistics and Supply Chain Management*, 1(2), 2011, 151-169.

## **SYNERGISTIC ACTIVITIES**

- Co-Director of Virginia Tech's Interdisciplinary Graduate Education Program in Disaster Resilience (DR-IGEP)
- NSF Review Panelist, Infrastructure Management and Extreme Events, 2017
- Treasurer for ISCRAM (International Association for Information Systems for Crisis Response and Management), and Scientific and Technical Advisory Board member for IDRC 2016 (International Disaster and Risk Conference) and ISCRAM 2016.
- President of the Southeast Decision Sciences Institute, 2013-2014
- Fulbright Senior Scholar to Germany, Spring 2015

## Appendix II

Table 1. Example of Coastal Systems Curriculum

<b>COURSE</b>	<b>COURSE TITLE</b>	<b>NOTE</b>
GEOG/NR 2004	Water, Environment & Society	Pathways
FiW 2114	Principles of Fish and Wildlife Management	Pathways
SPIA 2XXX	Collaborative Policy and Planning	Pathways process (forthcoming)
SPIA 2XXX	Coastal Planning: Environment, Economy, Society, & Security	New course, Pathways
GEOG 3104	Environmental Problems, Population & Development	Pathways
UAP 4344	Law of Critical Environmental Areas	
NR 4444	Practicing Sustainability	Service Learning course
FiW 4464	Human Dimensions of Fish and Wildlife	
GEOG 4984/5984	Water, Hazards & Development	New course
GEOG 4984/5984	Climate Change & Societal Impacts	New course
GEOS 3034	Oceanography	
GEOS 2104	Elements of Geosciences	In preps for Pathways
GEOS 4984	Quantitative geosciences	
GEOS	Imprints and consequences of sea-level change	Taught by new FTE
New course	I Resilience Capstone Field Experience	New field experience/project-based course

## Appendix III

### Job Ad:

More than half of the world's human population lives within 40 miles of the sea. Coastal cities are the backbone of global finance, trade, manufacturing, and transportation. Millions of people worldwide travel to beaches for recreation. By 2100 more than 100 million people could be displaced by sea-level change, 13 million in the U.S. alone. The stability of the global economy is threatened by sea-level change.

We seek to hire an Assistant or Associate Professor who employs the geologic record to reconstruct past sea levels and helps to establish and refine sea-level projections.

The position will be integrated within an interdisciplinary network of faculty spanning over eight colleges within Virginia Tech who work on contemporary and emerging challenges in the coastal zone. This interdisciplinary network is the backbone of the theme "*Stresses and Instability in Coastal Systems: Sustaining Prosperity, Increasing Diversity and Achieving Resilience*" within the Global System Science Destination Area. We seek an individual who is highly motivated and skilled in coastal geosciences, but also capable of integrating in interdisciplinary research and education programs.