

Katherine J. Skalak

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Research interests

Landscape dynamics and fluvial geomorphology, generally focused on understanding and predicting changes in the patterns and functions of landforms in response to human impacts and restoration efforts. In particular, dynamics of fine sediment and particle associated nutrients and contaminants on varying temporal and spatial scales, flow and vegetation effects, and disturbance.

Education

University of Delaware, Newark, DE

Ph.D. in Geological Sciences, August, 2009.

Dissertation Title: "*Fine-grained channel margin deposits in a typical gravel bed river: Spatial and temporal controls on the distribution, quantity, and residence time and implications for Centennial-scale Sediment and Mercury Cycling.*"

Adviser: Dr. James E. Pizzuto

University of Delaware, Newark, DE

M.S. in Geology, August, 2004.

Thesis Title: "*The effects of dams on downstream channel characteristics in Pennsylvania and Maryland: assessing the potential consequences of dam removal.*"

Adviser: Dr. James E. Pizzuto.

St. Joseph's University, Philadelphia, PA

B. S. in Environmental Science, May, 2001.

Research and Work Experience

U.S. Geological Survey, National Research Program.

Research Hydrologist, 2011 to present.

U.S. Geological Survey, National Research Program.

Post-doctoral research fellow in the Hydroecology of Flowing Waters Project, National Research Program, 2009 to 2011.

- **Quantifying and Predicting Vegetative Flow Resistance in the Everglades.** Purpose is to determine the role of hydrology, plant community and architecture, phosphorus, and seasonality in governing the spatial and temporal variations in vegetative flow resistance. This involves development of an innovative photographic method for rapid assessment of vegetation frontal area and empirical relationships between biomass and flow resistance parameters. The goal is to use these predictive relationships to scale from quadrat biomass estimates to broader areas through remote

- sensed vegetation indices, and improvement of hydrologic modeling parameters at the landscape scale.
- **DECOMP Physical Model (DPM).** The DPM is a landscape scale flow release study to determine the ecologic benefits of sheetflow in the Everglades. For this research, I have assembled a small team to install and monitor 20 hydrologic monitoring stations equipped with velocimeters including ADVs, Argonaut ADVs, and Vectrinos. The stations also include staff gauges and pressure transducers. For sediment monitoring, we use Laser In Situ Scattering and Transmissiometry (LISST) particle analyzers. The natural particle tracer will involve benchtop experiments to fluorescently label natural floc particles with dye and determine the natural fluorescent properties of floc through excitation and emission matrices (EEMs). These particles will be released during ambient and high-flow events.

University of Delaware, Department of Geological Sciences.

Visiting scholar, The Johns Hopkins University, 2006 to 2009.

- **Physical Modeling experiments.** Goal of research is to construct and develop a physical model of the prototype South River. Experiments analyzed the transport, erosion, and deposition of silt and clay controlled by large, woody debris (LWD). This involved geometric and distorted Froude scaling of the prototype, constructing the model channel and LWD, and running several experiments to observe fine sediment and flow dynamics.

Research Assistant, January 2005 to June 2006.

- **Geomorphic mapping of a gravel bed river.** Goal of this research was to map geomorphic features and fluvial landforms for a 25-mile reach of a typical mid-Atlantic gravel bed river in Virginia. This research involved using aerial photos and qualitative field observation.
- **Fine-grained sediment budget for South River.** Purpose of this research was to estimate a sediment budget for silt and clay for South River, VA. This involved creating a regional sediment rating curve to estimate upstream inputs, LIDAR measurement of bank erosion rates, mapping and coring fine-grained sediment deposits, and measuring floodplain sedimentation rates using dendrochronology.

Research Assistant, September 2002 to September 2003.

- **The effects of dams on downstream channel characteristics.** Goal of this research was to identify differences in grain size distributions on the channel bed above and below existing dams as well as identify differences in channel morphology presumably due to the influence of dams. This involved conducting pebble counts and channel surveys of width and slope.
- **The effects of dams on reservoir sedimentation.** Goal of this work was to characterize the type of sediment in a typical impoundment behind an existing dam. This involved using CHIRP sonar to map the sediments on the bottom of the impoundment.

Environmental Management Group, Media, PA.

Environmental Consultant, January to August 2002.

- Phase I Environmental Site Assessments (ESA). Purpose of a Phase I ESA was to identify environmental conditions of a property prior to entering into a contract.
- Stormwater Discharge Compliance. This included renewing permits, ensuring compliance with existing NPDES and SPDES permits, and working with site managers to incorporate BMPs.

Biological Treatment Systems, Bala Cynwyd, PA.

Lab Coordinator, September 2001 to January 2002

- The effects of anaerobic fluidized bed reactors (AFBRs) on the treatment of high BOD wastewater. Goal of research was to test the performance of four bench-scale anaerobic fluidized bed reactors on the treatment of wastewater with extremely high organic content from the food and beverage processing industry. This was accomplished by monitoring treated wastewater samples for VOC, TOC, BOD, and gas chromatography.

Academy of Natural Sciences, Philadelphia, PA

Research Internship, May to September 2000.

- The effects of various preservation medium on the internal organs of bird species. Goal of research was to identify the most suitable preservation medium for the internal organs of various bird species that had been collected and stored.

Teaching Experience

University of Delaware, Department of Geological Sciences.

Fellow, National Science Foundation's GK-12 program, June 2006 to 2008.

- June 2007 to 2008. Engaged in forming a professional learning community centered on the practice of lesson study with the science department at Howard High School of Technology in Wilmington, DE. Administered formative assessment probes and conducted classroom research on student learning and engagement.
- June 2006 to June 2007. Engaged in coteaching of Physical Science (freshmen) and Integrated Science (juniors) at Howard High School. Developed and administered lessons, laboratories, transfer tasks, and demonstrations. Was instrumental in introducing focused journaling. Graded tests and assignments.

Teaching Assistant, 2003 to 2004. Graded assignments, administered labs, assisted with field trips, organized and lead help sessions for the following courses: GEOL 303: Earth Surface Processes, GEOL 113: Earth Science

- Geology 303: Surficial Processes. Students learn about processes of uplift, weathering, sediment transport, depositional processes and selected depositional environments. Quaternary history and geochronology are also included. The class consisted predominantly of geology majors in their junior and senior year.
- Geology 113: Earth Science. Students learn about Earth materials and structure and the geologic phenomena that produce them. The laboratory included examination of rocks, minerals and fossils as well as experiments in geological processes and interpretation of geologic maps. The class consisted of sophomore and junior Earth Science education majors.

Selected Publications

Published Research Papers

Skalak, K. Pizzuto, J., Egan, J., Allmendinger, N. 2011. The Geomorphic Effects of Existing Dams and Historic Dam Removals in the mid-Atlantic Region, USA. *In Sediment Dynamics Following Dam Removal*. American Society of Civil Engineers (ASCE) monograph.

Skalak, K. and Pizzuto, J. in review, *Geology*. Modeling Legacy Mercury Contamination of Stream Sediments: Application of Reservoir Theory with Geological and Historical Data.

Flanders, J.R., Turner, R.R., Morrison, T., Jensen, R., Pizzuto, J., Skalak, K., and Stahl, R. 2010. Behavior, distribution, and transport of inorganic and methyl mercury in a high gradient stream. *Applied Geochemistry*, 25:11. 1756-1769.

Skalak, K., and Pizzuto, J. 2010. The distribution and residence time of suspended sediment stored within the channel margins of a gravel-bed bedrock river. *Earth Surface Processes and Landforms*. DOI: 10.1002/esp.1926.

Skalak, K., Pizzuto, J., and Hart, D. 2009. Influence of small dams on downstream channel characteristics in Pennsylvania and Maryland: implications for the longterm geomorphic effects of dam removal. *Journal of American Water Resources Association* 5(1): 97-109.

Skalak, K. and Pizzuto, J. 2005. The Geomorphic Effects of Existing Dams and Historic Dam Removals in the mid-Atlantic Region, USA. *"Managing Watersheds for Human and Natural Impacts: Engineering, Ecological, and Economic Challenges"* EWRI & ASCE, Proceedings.

Technical Report

Pizzuto, J.E., Skalak, K.J., O'Neal, M., Narinesingh, P., Rhoades, R., and Hess, J. 2006. Geomorphology of the South River between Waynesboro and Port Republic, VA: Geomorphic characterization and sediment budget for silt and clay. Technical Report, 14 chapters.

Published Abstracts

Skalak, K., J. W. Harvey, L. G. Larsen, G. B. Noe, and J. W. Jones. 2010. Controls on vegetative flow resistance in wetlands and low-gradient floodplains *Eos Trans. AGU*, Fall Meet. Suppl., Abstract EP43D-0767.

Skalak, K., J. W. Harvey, L. G. Larsen, G. B. Noe, and J. W. Jones. 2010. Quantifying and Predicting Vegetative Flow Resistance in the Everglades. Greater Everglades Ecosystem Restoration Meeting: Abstracts, July, 2010.

Skalak, K. and Pizzuto, J. 2009. Modeling a century of pollution in the South River; a geological approach. Geological Society of America *Abstracts with Programs*, Vol. 41, No. 7, p. 80.

Skalak, K., and Pizzuto, J. 2008. The importance of Fine-Grained Channel Margin (FGCM) Deposits in assessing multiple residence times of suspended sediments and contaminants in gravel-bed rivers. *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract H51J-04.

Skalak, K. and Pizzuto, J. 2008. The Distribution, Residence Time, and Fate of Hg and Sediment in Fine-Grained Channel Margin (FGCM) Deposits within a Steep, Gravel-Bed River . Geological Society of America's Joint Annual Meeting. Abstract 165-4.

Skalak, K., Wilcock, P. and Pizzuto, J. 2007. Trapping of fine-grained sediment in a gravel-bed river by large woody debris: a physical modeling study. *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract H51E-0811

Skalak, K, Pizzuto, J., Flanders, J.R, Morrison, T., Turner, R., Jensen, R., and Grosso, N., 2007. Conceptual models of particulate and mercury transport and storage for S. River, VA. Geological Society of America *Abstracts with Programs*, Vol. 39, No. 6, p. 249

Skalak, K. and Pizzuto, J. 2006. Fine-grained channel margin (FGCM) deposits conditioned by large, woody debris (LWD) in a gravel-bed river. *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract H41H-05.

Skalak, K., Pizzuto, J., Narinesingh, P., Rhoades, E. and O'Neal, M., 2006. Application of a sediment budget approach to evaluate sources and sinks of Hg-contaminated sediment in a gravel-bed river, S. River, VA. Geological Society of America *Abstracts with Programs*, Vol. 38, No. 7, p. 55

Skalak, K. and Pizzuto, J. 2004. The Influence of Dams on Streams of the Mid-Atlantic Region, USA: *Eos Trans. AGU*, 85(47), *Fall Meeting Suppl.*

Skalak, K., Pizzuto, J., Jenkins, P. 2004. The effects of dam removal on downstream channel characteristics in Pennsylvania and Maryland: assessing the potential consequences of dam removal. *GSA Northeastern and Southeastern Section Abstracts with Programs*, Joint Spring Meeting Vol. 36, No. 2, March 2004.

Skalak, K., Pizzuto, J., Jenkins, P. 2003. The effects of dam removal on downstream channel characteristics in Pennsylvania and Maryland: assessing the potential consequences of dam removal. *Eos Trans. AGU*, 84(46), *Fall Meeting Suppl.*, Abstract H52A-1168.

Skalak, K., Pizzuto, J., Jenkins, P. 2003. The effects of dam removal on downstream channel characteristics in Pennsylvania and Maryland: assessing the potential consequences of dam removal. *GSA Abstracts with Programs*, National Meeting. November 2003.

In preparation

Research Papers

Skalak, K., Harvey, J., Larsen, L., Noe, G., Rybicki, N., and Jones, J. Predicting vegetative flow resistance from commonly measured plant community characteristics in wetlands and low gradient floodplains.

Skalak, K. Pizzuto, J, and Hess, J. The spatial and temporal controls on in-channel sediment storage: the role of large, woody debris, channel geometry, and historic land use.

Pizzuto, J., Chen, C., Skalak, K., Narinesingh, P., and Yoo, K. Radionuclide dating of mercury-contaminated fine sediment stored in the hyporheic zone of the gravel-bedded South River, VA.

Other

Skalak, K. "Lesson study at Howard High School" for GK-12 Monograph.

Skalak, K. "Applying a geomorphic perspective to a current environmental contamination in South River, VA." & "Long-term effects of dam-removal in the mid-Atlantic region". Vignettes for *Topics in Geomorphology* textbook.

Selected Presentations

INVITED K. Skalak. February, 2011. Feedbacks among critical drivers of geomorphic pattern and ecological function in rivers and wetlands. USGS Technical Seminar, Reston, VA.

INVITED K. Skalak. November, 2010. Assessing the Causes of Ecosystem Degradation and Restoration Potential in the Everglades Using a Landscape Scale Flow Experiment. University of Delaware Department Seminar Series.

Skalak, K., Harvey, J., Larsen, L., Noe, G., Rybicki, N., and Jones, J. 2010. Quantifying and predicting vegetative flow resistance using commonly measured plant characteristics and remote sensing. Greater Everglades Ecosystem Restoration Conference, July 2010. Naples, Florida.

INVITED K. Skalak, Stotts, S. 2009. On the retreat of forested, cohesive riverbanks, Pizzuto, J., O'Neal, M., and Stotts, S. 40th Binghampton Symposium.

INVITED Skalak, K. and Pizzuto, J. November, 2008. The Distribution, Residence Time, and Fate of Hg and Sediment in Fine-Grained Channel Margin (FGCM) Deposits within a Steep, Gravel-Bed River. USGS Technical Seminar, Reston, VA.

INVITED Skalak, K. and Pizzuto, 2008. The fate and transport of mercury and sediment in a gravel-bed river. Fine sediment in the Chesapeake Bay Conference. Annapolis, MD.

INVITED Skalak, K. and Pizzuto, J. 2008. The distribution, residence time, and fate of mercury and sediment in fine-grained channel margin (FGCM) deposits within a steep, gravel-bed river: South River, Virginia. *Society of Environmental Toxicology and Chemistry*. Regional meeting.

Skalak, K. 2008. Lesson study at Howard High School. Presentation for the National Science Foundation's GK-12.

Skalak, K., 2007. University of Delaware's GK-12 project. Presentation for the Department of Geological Sciences 2007 fall seminar series.

Skalak, K., Pizzuto, J., and Narinesingh, P. 2005. Geomorphology of the South River. Presentation to EPA Region III, Wilmington, DE.

Pizzuto, J. E., Egan, J., and Skalak, K.J. 2003. Geomorphic effects of dam removal: summary of current knowledge. Presentation to *ASCE Workshop on Dam Removal*, Johns Hopkins University, Baltimore, MD, August 2003.

Pizzuto, J. E., Egan, J., and Skalak, K.J. 2003. Geomorphic effects of dam removal: summary of current knowledge, presentation to *ASCE Task Committee on Sediment Dynamics Upon Dam Removal*, EWRI Water Congress 2003, Philadelphia, PA.

Professional Activities and Service

American Geophysical Union annual meeting, session co-chair, Fall 2010.

Co-chairing and organizing session on "Vegetation and Flow in Fluvial and Wetland Environments" with Dr. Anne Lightbody at the annual fall meeting.

Geological Society of America annual meeting, session co-chair, Fall 2009.

Co-chaired and organized a session on "Streambanks in Theory and Practice" with Dr. Patrick Belmont at the annual fall meeting.

Advisory panel for the National Science Foundation, GK-12. 2008 to 2009.

Invited to serve on an advisory panel for the National Science Foundation's GK-12 annual meeting.

University Committee Service, Fall 2008.

Served on the following committees at the University of Delaware: Graduate Student Senate (GSS), Academic Council, General Education Committee, GSS Sustainability Committee.

Manuscript Reviewer, Journal of American Water Resources Association and Journal of Hydraulic Engineering. 2008-present.

Invited to review manuscripts and resubmissions for the journal.

Higher Education Teaching Certification (HETC) program, Fall 2008.

Participated in and successfully completed the HETC program at the University of Delaware.

Graduate research seminar, Department of Geological Sciences, 2007 to 2009.

Organize and facilitate a bimonthly graduate research seminar for students in the Department of Geological Sciences and related fields.

Professional Development Workshop for New Castle County Vo-tech Science teachers, November 2007.

Assisted with the planning, organization, and facilitation of a professional development workshop for science teachers in the Vo-tech school district centered on student journaling.

National Science Foundation Annual GK-12 meeting, March 2007 and March 2008.

Attended the NSF's annual GK-12 meeting in Washington, D.C. and presented posters of the DE GK-12 project.

Sigma Xi Scientific Research Society seminar and panel discussion, April 2007.

Attended a seminar and panel discussion sponsored by the Sigma Xi Scientific research society on the ethical conduct in scientific research.

American Geophysical Union Fall meeting, session co-chair, Fall 2006.

Co-chaired a session on "The Geomorphic Function of Wood in Rivers" with Dr. Ellen Wohl at the annual fall meeting.

Sediment Dynamics Following Dam Removal monograph, Spring 2006.

Assisted in the publication process of this monograph by organizing and obtaining reviewers. Also reviewed three manuscripts for the publication.

NIH and NSF Proposal Writing Workshop, October 2005.

Attended a workshop sponsored by the University of Delaware. Object of workshop was to instruct graduate students and recent faculty members how to write proposals and grants for scientific and technical funding agencies.

The Advancement of Women in Geosciences, Spring 2003.

Participated in a group conference call and answered questions regarding my experience as a female graduate student in Geology for a study conducted at the University of Nebraska. The

Katherine J. Skalak

information was used to form a basis of a study about the advancement of women in Earth and Physical Science.

Professional Memberships

Graduate Student Senate, University of Delaware, 2008-2009.

Geological Society of America, 2002 to present.

American Geophysical Union, 2002 to present.

Sigma Xi Scientific Research Society, 2001 to present.

Delaware chapter of the American Water Resources Association, 2005 to present.

Society of Women in Environmental Professions (SWEP), 2006.

Honors and Awards

College of Earth, Ocean, and the Environment top publication award, \$250, 2009.

Nominated for the Patricia Cross Leadership award, October 2008.

University of Delaware Dissertation Fellowship, \$22,000. 2008-2009.

Invited Panelist, NSF GK-12 program, 2009.

National Science Foundation GK-12 Fellowship, \$60,000. 2006-2008.

Prosser award, \$1000. 2007

SWEP Scholarship finalist, 2006.

Geology Teaching Assistant of the Year, 2004.

Nominated for University of Delaware university-wide Excellence in Teaching Award, 2003.

NWWA Scholarship, 2002, \$4000.

Presidential Scholarship, St. Joseph's University, 1997-2001.