Integrating Natural Resources and GeoHazards Management: Developing a Watershed Community Resilience Index against Extreme Events

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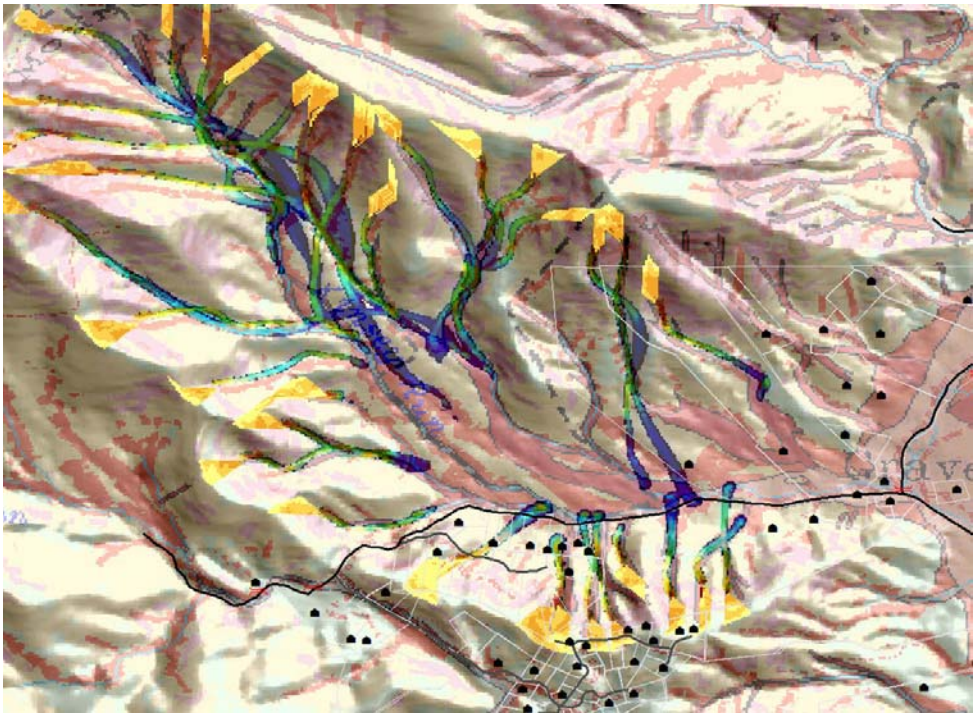

Surface Runoff driven debris flow simulations using GeoWEPP and Titan2D

Abstract: Field studies, Remote Sensing, Geographic Information Systems and process-based environmental models are increasingly used in combination for decision- and policy-making in natural resources or natural hazards management. The impact of extreme events on properties and processes of natural and managed ecosystems and its short- and long-term consequences have to be continuously assessed by a well coordinated interdisciplinary research and outreach activity. The communication between the various disciplines and stakeholders involved is therefore the most important key to a successful implementation of an integrated management plan. The development and integration of an integrated Watershed Community Resilience Index (WCRI) includes quantifying the status, exposure and recovery of physical, economic, socio-cultural, and ecological capital for a watershed community. The goal of this project is the development of a conceptual framework for measuring, assessing, and monitoring the WCRI, a toolkit that integrates quantitative and qualitative methods using spatial and non-spatial data to identify scientifically defensible indicators for community resilience, and an implementation plan that enables local and regional stakeholders to continuously monitor and enhance their resilience against episodic and slow-onset extreme events. The design and successful implementation of the Geospatial Interface for the Water Erosion Prediction Project (GeoWEPP) at the watershed scale illustrates the challenges and

solutions to build valid and useful assessment tools for cumulative watershed effects analysis. This research contributes to our fundamental understanding and ability to communicate how we (a) represent the spatiotemporal variability, extremes, and uncertainty of environmental properties and processes in the digital domain, how we (b) transform their spatiotemporal representation across scales during data processing and modeling in the digital domain, and how we design and develop tools for (c) geo-spatial data management and (d) geo-spatial process modeling and implement them to effectively (e) support decision- and policy-making in natural resources and hazard management at various spatial and temporal scales of interest. GeoWEPP enables natural resources managers of agricultural, grassland, rangeland, and forests to assess the spatial and temporal scheduling of management activities. The design, development, implementation and validation of GeoWEPP is based on a formulation of an integrated data transformation and scaling theory allowing scientists of various disciplines to effectively collaborate, to design flexible process-based modeling approaches and to implement them as useful decision support tools.

Short Biography: Chris S. Renschler is an Associate Professor in the Department of Geography at the University at Buffalo (UB) - The State University of New York (SUNY) in Buffalo, USA. He is a Research Scientist at three UB institutions: MCEER, the Center for GeoHazard Studies, and the National Center for Geographic Information and Analysis (NCGIA). Dr. Renschler is a Geoecologist and Geographer by training and received his Ph.D. from the Faculty of Natural Sciences and Mathematics at the University of Bonn in Germany. Prior to his current position, he was a post-doctoral researcher at the U.S. Department of Agriculture's National Soil Erosion Research Laboratory and the Department of Agricultural and Biological Engineering at Purdue University, West Lafayette, Indiana. He is currently a Visiting Fellow in the School of Geography, Planning and Architecture at the University of Queensland in Brisbane.