Rapid Response Tools and Datasets for Post-fire Hydrological Modeling

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Rapid response is critical following natural disasters. Flooding, erosion, and debris flows are a major threat to life, property and municipal water supplies after moderate and high severity wildfires. The problem is that mitigation measures must be rapidly implemented if they are to be effective, but they are expensive and cannot be applied everywhere. Fires, runoff, and erosion risks also are highly heterogeneous in space, so there is an urgent need for a rapid, spatially-explicit assessment. Past post-fire modeling efforts have usually relied on lumped, conceptual models because of the lack of readily available, spatially-explicit data layers on the key controls of topography, vegetation type, climate, and soil characteristics.

The purpose of this project is to develop a set of spatially-explicit data layers for use in process-based models such as WEPP, and to make these data layers freely available. The resulting interactive online modeling database (http://geodjango.mtri.org/geowepp/) is now operational and publically available for 17 western states in the USA. After a fire, users only need to upload a soil burn severity map, and this is combined with the pre-existing data layers to generate the model inputs needed for spatially explicit models such as GeoWEPP (Renschler, 2003). The development of this online database has allowed us to predict post-fire erosion and various remediation scenarios in just 1-7 days for six fires ranging in size from 4-540 km2. These initial successes have stimulated efforts to further improve the spatial extent and amount of data, and add functionality to support the USGS debris flow model, batch processing for Disturbed WEPP (Elliot et al., 2004) and ERMiT (Robichaud et al., 2007), and to support erosion modeling for other land uses, such as agriculture or mining. The design and techniques used to create the database and the modeling interface are readily repeatable for any area or country that has the necessary topography, climate, soil, and land cover datasets.