Burn Severity Mapping Using Simulation Modeling and Satellite Imagery

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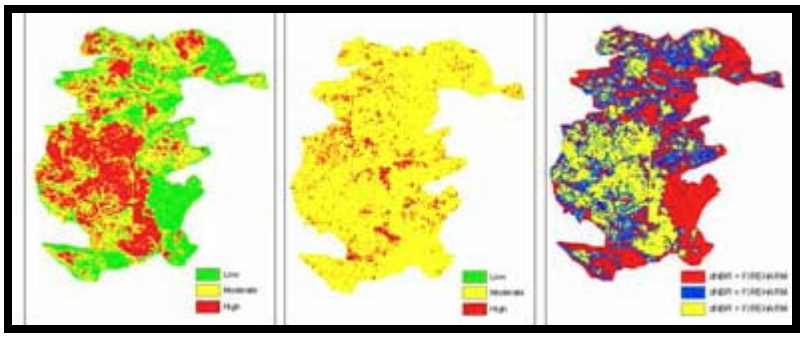
Executive Summary



Unplanned wildfires have become an increasingly important issue affecting our nation's landscapes, and fire managers must quickly assess possible adverse fire effects to efficiently allocate resources for suppression, rehabilitation, and remediation. Burn severity maps derived from satellite imagery provide a landscape view of relative fire impacts, but they are difficult to make and require imagery that may not be available in a timely manner. Spatial fire effects simulation models may be a potential alternative to image-based approaches because burn severity maps can be made quickly and provide the biotic context in which to interpret severity. In this project we evaluated two methods of mapping burn severity: 1) an image-based burn severity mapping approach and 2) a fire effects simulation approach. The image-based approached used Landsat 7 Thematic Mapper data to calculate the differenced Normalized Burn Ratio to then create burn severity maps. The simulation approach used a new model called FIREHARM (FIRE HAzard and Risk Model) to simulated fire severity using the embedded FOFEM model and data inputs taken from the LANDFIRE effort. We compared the ability of these two approaches to predict fire effects measured for several wildfires in the northern Rocky Mountains. While image-based severity maps appeared more correct, we found that neither approach appeared superior when evaluated over the diverse criteria that are relevant to fire managers including accuracy, timeliness, context, and application. And since there are limitations to both approaches, we believe these techniques could be merged synergistically to improve burn severity mapping capabilities of land managers, enabling them to quickly and effectively meet wildfire management objectives. Imagery can be used to realistically portray burn severity and simulation modeling can be used to improve the imagery assessment and provide the context for interpreting the imagery results. An advantage of the simulation approach is that FIREHARM can be used to simulate fire hazard and risk over large landscapes for fuel treatment prioritization, planning, and implementation.