Beyond Landsat: an assessment of four satellite sensors for detecting burn severity in ponderosa pine forests of the Gila Wilderness, NM, USA.

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Abstract

Methods of remotely measuring burn severity are needed to evaluate the ecological and environmental impacts of large, remote wildland fires. The uncertain future of the Landsat program highlights the need to evaluate alternative sensors for characterizing post-fire effects. We compared pre- and post-burn imagery from four satellite sensors with varying spatial-resolutions; Quickbird Multi-spectral, the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), Landsat Thematic Mapper (TM), and the Moderate Resolution Imaging Spectroradiometer (MODIS), using a subset of the 2003 Dry Lakes Fire in the Gila Wilderness, NM. Where spectrally feasible, burn severity was evaluated using the differenced enhanced vegetation index (dEVI), differenced Normalized Difference Vegetation Index (dNDVI) and the differenced Normalized Burn Ratio (dNBR). We use 55 Composite Burn Index (CBI) plots to assess burn severity on the ground. Both the dEVI derived from Quickbird and the ASTER-derived dNBR showed similar or slightly improved correlations over the dNBR derived from Landsat TM data (r^2 = 0.82, 0.84, and 0.78, respectively). The relatively coarse resolution MODIS-derived NDVI image was weakly correlated with ground data (r^2 = 0.38). Our results suggest that moderately high-resolution satellite sensors like Quickbird and ASTER have potential for providing accurate information about burn severity. Future research should further develop stronger links between higher resolution satellite data and burn severity across a range of environments.

Keywords: ASTER, Quickbird, Landsat, MODIS, Fire, Burn Severity

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