ANALYSIS OF FUEL VARIABILITY WITHIN THE ROCKY MOUNTAIN REGION: INTEGRATION OF FIELD DATA, GEOSPATIAL INFORMATION, AND SPATIAL STATISTICS

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ABSTRACT

The integration of spatial information (remotely sensed data, geographic information system [GIS], Global Positioning System [GPS]), and spatial statistics are effective for modeling coarse-scale and fine-scale ecological variability and for the prediction of fuel loading, variability, and vegetation characteristics. We proposed new techniques to conduct fuel–vegetation surveys based on pixel nested sampling (20 × 20-m) designs at different landscape-scale levels at Grand Teton National Park (GRTE)–Bridger Teton National Forest (BTNF), Wyoming, and (15 × 15-m) at Rocky Mountain National Park (ROMO), Colorado. Through geospatial statistical modeling and mapping, fuel loadings will be forecast across the landscape. To predict the fuel parameters and forest characteristics at GRTE–BTNF, we will use a new geospatial statistics model using spatial autocorrelation and cross-correlation statistics, trend-surface analysis, and stepwise regression. This process is based on the ordinary least squares or spatial autoregressive, generalized least squares estimates, and generalized linear models. Field data, environmental characteristics, remote sensing, and GIS data will be integrated with spatial statistics to estimate coarse-scale variability in vegetation, fuel parameters, and forest characteristics. Modeling of the spatial continuity of fine-scale variability will be based on binary regression classification trees, kriging, and co-kriging. Semi-variogram models will be selected for the lowest values of corrected Akaike Information Criterion statistics when kriging is used. Using this method, we hope to define a new protocol for fuel modeling and mapping within GRTE–BTNF. The new approach will also provide a cost-effective tool for identifying areas currently affected or vulnerable to invasion by exotic species, as well as assist with other issues of landscape management (i.e., forest fuel loading, wildfire in relation to weeds occupying the landscape, and other factors of concern to resource management teams at GRTE–BTNF and ROMO). This research also provides a growing body of knowledge upon which park managers may base decisions that best preserve the park's natural richness while allowing its beauty to be enjoyed.

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