Spatial Predictions of Cover Attributes of Rangeland Ecosystems Using Regression Kriging and Remote Sensing

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Sound rangeland management requires accurate information on rangeland condition over large landscapes. A commonly-applied approach to making spatial predictions of attributes related to rangeland condition (e.g., shrub or bare ground cover) from remote sensing is via regression between field and remotely-sensed data. This has worked well in some situations but has limited utility when correlations between field and image data are low and does not take advantage of all information contained in the field data. I compared spatial predictions from generalized least-squares (GLS) regression to a geostatistical interpolator, regression kriging (RK), for three rangeland attributes (percent cover of shrubs, bare ground, and cheatgrass [*Bromus tectorum* L.]) in a southern Idaho study area. The RK technique combines GLS regression with spatial interpolation of the residuals to improve predictions of rangeland condition attributes over large landscapes. I employed a remote-sensing technique, object-based image analysis (OBIA), to segment Landsat 5 Thematic Mapper images into polygons (i.e., objects) because previous research has shown that OBIA yields higher image-to-field data correlations and can be used to select appropriate scales for analysis. Spatial dependence, the decrease in autocorrelation with increasing distance, was strongest for percent shrub cover (samples autocorrelated up to a distance [i.e., range] of 19,098 m), but present in all three variables (range of 12,646 m and 768m for bare ground and cheatgrass cover, respectively). As a result, RK produced more accurate results than GLS regression alone for all three attributes when predicted versus observed values of each attribute were measured by leave-one-out cross-validation. The results of RK could be used in assessments of rangeland conditions over large landscapes. The ability to create maps quantifying how prediction confidence changes with distance from field samples is a significant benefit of regression kriging and makes this approach suitable for landscape-level management planning.