Using Object-based Image Analysis to Guide the Selection of Field Sample Locations

Jason W. Karl, Research Ecologist, Jornada Experimental Range, USDA Agricultural Research Service
David W. MacFarlane, Associate Professor, Department of Forestry, Michigan State University

One of the most challenging tasks for resource management and research is designing field sampling schemes to achieve unbiased estimates of ecosystem parameters as efficiently as possible. This study focused on the potential of fine-scale image objects from object-based image analysis (OBIA) to be used as sampling units. If image objects represent homogeneous areas on the ground with respect to sampling objectives, then their use as sampling units may have the potential to decrease sample variances, increase efficiency, and incorporate landscape information for sampling proportional to objectives while achieving unbiased estimates of rangeland parameters. We evaluated the use of image objects to define sampling units for measuring percent cover of plants in a southern Idaho sagebrush (*Atremisia* spp.) ecosystem. Using a fine-scale segmentation of an IKONOS image, we selected 24 pairs of adjacent image objects that spanned a range from very similar to very different with respect to the spectral mean and standard deviation of each object in the pair. In the field, 10 downward-looking photos were taken at random locations within each object (20 per pair). Percent cover of five functional groups was calculated from each photo, and mean and variance of percent cover was calculated for each object in the pair and for the pair as a whole (i.e., ignoring the boundary between the two objects). We found that variances in percent cover measurements were lower for individual objects than for object pairs. Additionally, we found that the mean in percent cover between adjacent image objects increased with the spectral difference between objects. These results suggest that objects derived from OBIA can be used as sampling units and that placing sample sites within objects can help avoid sampling across ecological boundaries.