Estimating Patterns of Species Richness in a Burned area by High-Resolution images

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Resumen

The effect of disturbances on biological diversity is one of the major concerns of conservational planning. Unfortunately, spatial data on species richness are often sparse and landscape patterns of species richness insufficiently known. Landscapes are complex systems which exhibit characteristic patterns depending on their scale of observation. Therefore, hierarchical approaches that allow extract the natural scales of patterns emergence are required. The aim of this work is to propose a multi-scale method able to estimate patterns of species richness in the landscape from high-resolution images (i.e., QuickBird). The study area was located in the Central West part of Spain (Anchuras, Ciudad Real), and was affected by a large forest fire on August 2002. Data on species richness was obtained from two 90x180 m plots located in two valleys at north of the site, that were sampled in a stratified way using quadrats of 1 m2 (n= 324, two valleys) one year after fire. Satellite data was processed through an object-oriented image analysis that allowed work with spatially discrete entities (segments), obtaining spectral and textural information from them. Our approach is a hierarchical (bottom-up) decision tree analysis that decomposes the landscape into functional (focal) patches through a recursive partitioning procedure. We intersected ground data (sampling-plots) with image segments, and iteratively split cluster of segments based on their ability to predict species richness from their spectral-textural data. This recursive process resulted in predictive models driven by local scale features, that were non-linear neither additive. By the successive aggregation of segments, higher hierarchical levels of landscape patterns of species richness were obtained, and new spatial gradients were observed. Main results indicated that contextual properties related to entropy and contrast were the main variable driving the patterns of species richness at broad scale in the landscape.

Keywords: species richness, hierarchical patterns, object-oriented image analysis, decision tree analysis.

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