Detecting Landscape Changes Pre- and Post Surface Coal Mining in Indiana, USA

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Abstract

The objective of this study is to gain knowledge about landscape changes on surface coal mines following reclamation in southwestern Indiana, USA using satellite and airborne remote sensing. Three Landsat Thematic Mapper (TM) images acquired in 1989, 2000 and 2006 were used to map the land use/cover pre- and post-surface mining using both unsupervised and supervised classification algorithms. The post-classification comparison change detection algorithm was used to determine the land use/cover changes over time. A portable spectroradiometer was used to record reflectance spectra of vegetated surfaces in the field for calibration and training site selection. The land use/cover maps derived from satellite images were assessed using high-resolution color orthophoto and field-collected data. The overall accuracies for the 1989, 2000 and 2006 land use/cover maps are 91, 90 and 85 percent with kappa statistic of 0.87, 0.86 and 0.80, respectively. Finally, a number of landscape metrics were calculated using FRAGSTATS to characterize pattern changes at the landscape level. The results indicated that the vegetation planted on the mined surfaces in the reclamation process were mainly croplands and grasses, while most of the forest land used for surface coal mining was not reclaimed to its original use.

Keywords

Indiana, landscape metrics, remote sensing, surface coal mining