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Forest and Agriculture Landscape Changes due to Petroleum Exploration

Daniel Unger, I-Kuai Hung, and Ken Farrish

The Haynesville Shale lies under areas of Louisiana and Texas and is one of the largest gas plays in the United States. Encompassing approximately 2.9 million ha, this area has been subject to intensive exploration for oil and gas, while over 90% of it has traditionally been used for forestry and agriculture. In order to detect the landscape change in the past few decades in particular in forest and agriculture lands, Landsat Thematic Mapper (TM) imagery for six years (1984, 1989, 1994, 2000, 2006, and 2011) was acquired. Unsupervised classifications were performed to classify each image to four cover types: agriculture, forest, well pad, and other. Change detection was then conducted between two classified maps of different years for a time series analysis. Finally, landscape metrics were calculated to assess landscape fragmentation. The overall classification accuracy ranged from 84.7% to 88.3%. The total amount of land cover change from 1984 to 2011 was 24%, with 0.9% of agricultural land and 0.4% of forest land changed to well pads. The results of Patch-Per-Unit index indicated that the well pad class was highly fragmented, while agriculture (4.4–8.6 per sq km) consistently showed a higher magnitude of fragmentation than forest (0.8 –1.4 per sq km).

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