Landscape pattern dynamics in Wuhan, China

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ABSTRACT

Landscape pattern has changed significantly in Wuhan, the largest mega-city in central China during the last decade due to the rapid urbanization process. In this paper, landscape pattern dynamics were investigated by the integration of satellite imageries and geographical information systems. The purpose of this paper is to quantify the changes of various landscape metrics and the trend of urban growth in Wuhan. The Landsat TM image acquired in 1991 and the Landsat ETM image acquired in 2002 were used to monitor Landscape dynamics. The images were geo-referenced with the RMS errorless than 1 pixel, by using scale 1:50,000 topographical maps. The method of supervised maximum likelihood classification was performed to classify the images to seven land use types: cultivated land, forest land, grassland, urban and villages, transportation, water bodies and barren land, the classification results will be transformed to polygon layers and input into geographic information system (GIS) software. The further change detection analysis at a later stage was performed in ArcGIS, the transition matrix was produced and the quantitative measurement of land use change from one type to another was made. The patch-based landscape indices (Patch size coefficient variation, Landscape shape index, and Area-weighted mean patch fractal dimension) were calculated using FRAGSTATS. Based on the derived indices, a general trend of landscape change was revealed. For example, the conversion of land use from cultivated land to urban was prominent. The rapid urban sprawl has occupied a lot of cultivated land and water bodies. The urban area significantly increased by 30%, most of which were converted from cultivated land. The paper finally concluded that the valuable cultivated land need careful protection by providing the prudent land use. The results also indicate that the monitoring of land use change is essential for land use planning, and GIS-based landscape index, along with satellite imagery analysis, proved the unique value and effectiveness in assessing landscape pattern dynamics.

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