Research on optimization of ecological security patterns based on natural and cultivated land disturbance

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Abstract

In previous research on the construction of ecological security patterns (ESPs), the positioning characteristics of urban development were rarely considered, resulting in the identification of key conservation areas that are insufficiently thorough to support the ecological security of the entire region and the overall development of urban functions. To solve this problem, this research created a "quality-importance-connectivity-balance" framework to identify ESPs, and chose Liaocheng City (LC), a typical main agricultural production area in China's Shandong Province's western plain, as the study area. The swat model was used to determine security levels from a watershed perspective using an integrated resistance assessment method that accounts for topography, human activities, distance, and agricultural environmental impacts. Then, the minimal cumulative resistance (MCR) and gravity models were used to identify and categorize corridors, while pinch points and barrier points were obtained by circuit theory. Finally, the comprehensive quality of cultivated land and the pattern of coordination between agriculture and ecology were divided. The results demonstrated that, as a result of the fragmentation of cultivated land, LC exhibited plain resistance characteristics and identified 181.16 km2 of sources and 174 potential corridors. A "six cores-seven belts-three zones" optimization pattern was constructed based on the components of ESPs and the distribution of cultivated land comprehensive quality. This study presents a novel approach for measuring ESPs and is an essential resource for ecological conservation and regional development planning in agroecologically complex regions.

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