



Monitoring Ecological and Environmental Changes in Coastal Wetlands in the Yellow River Delta from 1987 to 2010 Using Remote Sensing Techniques

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Many wetlands in the world have degraded rapidly in recent years, especially in China. The Yellow River Delta (YRD) is one of the largest deltas in China. The YRD Nature Reserve is one of China's most complete, broadest, and youngest wetland ecological systems in the warm-temperate zone. Most previous studies have placed particular emphasis on ecological environment or landscape of the YRD based on the distribution of wetlands. In recent years, with the rapid development of the city of Dongying, located in the YRD, the impacts of human activities are increasingly significant, so that monitoring changes in the wetlands has become especially important. In this research, we applied an improved Support Vector Machine (SVM) approach to wetland classification based on feature band set construction and optimization using seven Landsat images. By extracting waterlines, classifying wetlands and deriving landscape parameters, we have achieved high-frequency comprehensive monitoring of the wetlands in the YRD over a relatively long period. It offers a better estimate of wetland change trends than certain previous studies. From 1987 to 2010, the natural waterline primarily experienced erosion due to precipitation abnormalities, as well as coastal exploitation, as the co-analyzed meteorological data suggest. Meanwhile, the artificial waterline barely changed. The wetland area decreased rapidly from approximately 4,607 km² to 2,714 km² between 1987 and 2000. Ecological resilience and landscape diversity also decreased significantly during this period. The major impact factors were most likely urbanization, population expansion and the exploitation of the wetlands. After 2000, ecological resilience exhibited a positive trend. However, because newly built aquatic farms and salt works caused serious damages and threatened the natural beach landscape, the landscape fragmentation of muddy and sandy beaches increased after 2000. According to the results, more effective policies and laws for wetland protection are urgently needed, and the water sources of these wetlands should be guaranteed in the future. In particular, there is an urgent need to establish a complete dynamic monitoring system of the land use/cover change in the YRD.