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Changes of land use and of ecosystem service values in Sanjiang Plain, Northeast China.

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Abstract

Agricultural activities, especially reclamation, are considered major threats to the wetland ecosystems in Sanjiang Plain, the largest concentrated area of the freshwater wetlands in China. In the past decades, the area of the cultivated land and its grain production have been increased at the cost of wetlands shrinkage. The large-scale land reclamation severely affected the ecosystems in this region. However, such effects at the regional scale are seldom evaluated quantitatively. We used three datasets of LANDSAT MSS and/or TM imagery to estimate the area changes and the transition of land use types from 1980 to 2000. We also valued changes in ecosystem services delivered by each land category using value coefficients published by Costanza et al. Sensitivity analysis suggested that these estimates were relatively robust. Finally, the contribution of various ecosystem functions was ranked to the overall value of the ecosystem services in this study. According to our estimates, the total annual ecosystem service values in Sanjiang Plain have declined by about 40% between 1980 and 2000 (156284-182572.18 million US dollars in total over 20 years). This substantial decline is largely attributed to the 53.4% loss of wetlands. For individual ecosystem functions, waste treatment, water supply and disturbance regulation account for more than 60% to the total ecological values. During those two decades, the contribution of disturbance regulation, cultural and recreation decreased, while the contribution of water regulation, nutrient cycling, food production, raw materials and climate regulation increased during the same period. We also put forward a few proposals concerning the future land use policy formulation and sustainable ecosystems. They are adjusting the 'food first' agricultural policy, establishing more nature reserves for wetlands, creating systems for the rational use of water, harnessing the degraded cultivated land and encouraging eco-tourism.

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