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Abstract

Monitoring the spatiotemporal changes in wetlands and assessing their causal factors is critical for developing robust strategies for the conservation and restoration of these ecologically important ecosystems. In this study, the spatiotemporal changes in the land cover system within a Himalayan wetland and its catchment were assessed and correlated using a time series of satellite, historical, and field data. Significant changes in the spatial extent, water depth, and the land system of the Hokersar wetland were observed from the spatiotemporal analysis of the data from 1969 to 2008. The wetland area has shrunk from 18.75 km² in 1969 to 13 km² in 2008 with drastic reduction in the water depth of the wetland. The marshy lands, habitat of the migratory birds, have shrunk from 16.3 km² in 1969 to 5.62 km² in 2008 and have been colonized by various other land cover types. The land system and water extent changes within the wetland were related to the spatiotemporal changes in the land cover and hydrometeorological variables at the catchment scale. Significant changes in the forest cover (88.33–55.78 km²), settlement (4.63–15.35 km²), and water bodies (1.75–0.51 km²) were observed in the catchment. It is concluded that the urbanization, deforestation, changes in the hydrologic and climatic conditions, and other land system changes observed in the catchment are the main causes responsible for the depleting wetland extent, water depth, and biodiversity by adversely influencing the hydrologic erosion and other land surface processes in the catchment. All these causes and effects are manifest in the form of deterioration of the water quality, water quantity, the biodiversity changes, and the decreasing migratory bird population in the wetland.