Geophysical Research Abstracts
Vol. 21, EGU2019-366-1, 2019
EGU General Assembly 2019

Exploring patch dynamics and dynamic connectivity of a fragmenting alluvial wetland in the Ganga Plains, India

Manudeo Narayan Singh and Rajiv Sinha
Indian Institute of Technology Kanpur, Department of Earth Sciences, Kanpur, India (manudeo@iitk.ac.in)

Among the numerous alluvial wetlands in the eastern Ganga Plains, the Kaabar Tal (or, Kanwar Lake) is the largest with a total catchment of 250 km^2 and wetland area of 51 km^2. Once a single waterbody, it is now highly fragmented and currently appears like a mosaic of small wetlands with variable hydroperiods. Primarily, it is a monsoon-fed wetland and, therefore, its patch dynamics (fragmentation) has been traced at two different temporal scales by keeping the monsoon-season as focal point. First, the seasonal patch dynamics has been traced for three different time periods (1976-77, 1989-90, 2016-17) by identifying the wet areas of the wetland in non-monsoonal months (Oct-May) using Landsat satellite imageries. Second, an interannual analysis of the patches has been carried out specifically for the pre-monsoon season (April-May) for the years 1990 to 2017 using Landsat satellite imageries. At both temporal scales, the patch-formation and patch-connectivity have been traced by calculating six landscape matrices, 'percent wet area (PLAND),' 'patch density (PD),' 'largest patch index (LPI),' 'patch cohesion (COHESION),' 'patch division (DIVISION),' and 'patch split (SPLIT)' using the FRAGSTATS software. The last three matrices are the indices for the patch-connectivity. To understand the causal factors of the increasing fragmentation of this wetland, a detailed geomorphic map was prepared and the dynamic geomorphic connectivity between the wetland and its catchment was calculated using the connectivity response unit (CRU) approach.

The results for seasonal wet areas show that, on average, the wetland was drying at the rate of 3.9 ha/day in the year 1976-77, which increased to 5.5 ha/day in the year 1989-90. In the recent times (2016-17), it is drying at the rate of 7.5 ha/day. The patch-connectivity is exhibiting a decreasing and then increasing trend for the year 1976-77, while for other two years, it has a continuously decreasing trend. The loss of patch-connectivity is highest in the year 2016-17. The patch-dynamics analysis shows that with time, the wetland is getting more fragmented and the patches are less-connected.

Geomorphic mapping of the wetland has revealed that this wetland is an assemblage of different fluvio-geomorphic units like oxbows, meander scrolls, and abandoned channels. The uneven morphometric characteristics of these units have enhanced the fragmentation of this wetland. Furthermore, the dynamic connectivity analysis of the wetland with its catchment shows that the connectivity potential is the highest and even increasing in the proximal parts of the catchment. The wetland catchment has been undergoing extensive agricultural practices, and therefore, generates high volume of sediments. A highly connected proximal catchment with high flux of loose sediment can potentially increase the fragmentation within the wetland through siltation. A very high degree of anthropogenic activities has also contributed significantly to the increased fragmentation of this wetland that has been a potential candidate for a Ramsar site.