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Effects of long-term land use change on regional hydrological regime of the Reno River Catchment (Italy).

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Both climate and land use/cover change have great impact on the hydrological response of a watershed, especially regarding water infiltration capacity and runoff. The rapid population growth has led to change in land use in terms of urbanization and consequent soil sealing, as well as decrease of agricultural land. Within this work we analyse the long-term land use change for the Reno River catchment (Northeastern Italy) and quantify the effects on the hydrological regime with particular attention to the potential infiltration. Infiltration processes determine the rates and amounts of water availability for all different components of the water cycle and it is crucial to have good estimates of them. First, a statistical analysis of the land use database was performed from 1954 to 2014 and total and annual land use change and artificialization indexes were calculated. The analysis then focused on the hydrogeological aspect by investigating the impacts of the water infiltration in the catchment-alluvial fan systems, which are the main recharge areas of the deep aquifers used locally. The SCS Curve Number method, designed for small- and medium-sized watershed, was used to estimate the cumulative infiltration based on an empirical rainfall-runoff model. Data input and values required by the SCS-CN method are related to the physical characteristics of the watershed, as well as different land uses and soil types. Our results show that the last 60 years were characterized by an increase in urbanization and a decrease in cultivated soils that might have influenced the different hydrological parameters. Decreasing trends are observed within the basin for the initial abstraction and the potential maximum retention capacity of the alluvial fan systems that is a function of the land use. The decrease of initial abstraction since 1954 is probably due to deforestation and urbanization, which would cause the reduction of vegetation cover and consequently the amount of water intercepted at the beginning of rainfall events. The decrease in the potential retention capacity seems to be due to an increasing inability of soils to store water: over-exploitation of soils and frequent changes in land use, often, cause compaction and early soil impoverishment. At the same time, increasing trends are observed for the rainfall excess (i.e. runoff) and the cumulative volume of infiltrated water. Surprisingly, artificialization and urbanization appear to have a positive effect on the deep infiltration into the aquifer. The infiltrating water seems to percolate and reach the aquifer faster than in the past due to the reduction in storage capacity, providing the recharge of aquifers but decreasing its availability within the soil.