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ORIGINAL PAPER

Developing restoration strategies in Jazmurian wetland by remote sensing

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Abstract
Jazmurian wetland is located in an endorheic basin at the southern edge of the Dasht-e-Lut. Several factors such as high evaporation, overexploitation of groundwater, dam construction on the rivers feeding the wetland, and the effect of drought and climate changes have caused this wetland to dry out during the recent years. Accordingly, this wetland has become one of the main sources of dust generation in the south east of Iran. In this study, several strategies are adopted to prevent dust loading and restore the wetland. For this purpose, the time series of SMOS surface soil moisture (SMOS SSM) and aerosol optical depth of MODIS (MYD08) were used to determine the critical soil moisture for prevention of dust loading. In addition, the temporal monitoring of wetland water area was performed in a 30-year period of 1987–2017 using Landsat Data Series (MSS, TM, ETM+, and OLI). Further, the relationship between wetland water area, rainfall, as well as inflow water the wetland in this period was investigated. Finally, different strategies were evaluated for supplying water to moisten the soil. The results suggested that the rainfall has the most substantial effect on the wetland water area. It was suggested that in order to control the dust loading, the wetland soil moisture content should be equal to the critical soil moisture. Using the SMOS SSM and MYD08, the critical soil moisture content for prevention of dust loading was estimated as 10%. The design of a rainwater catchment system to harvest rainfall and drilling some wells in Jazmurian wetland were the final strategies for restoration of the wetland.

Keywords Jazmurian wetland · Remote sensing · Wetland restoration and conservation · Dust

Introduction

Drought, increasing demand, extra exploitation of groundwater resources, and land use change have a considerable effect on seasonal and perennial rivers feeding wetlands. All these result in a significant decrease in the wetland water area (Jafari et al. 2018; Taheri et al. 2019; Zou et al. 2017). In response to the reduction of inflow water, some parts of the wetlands have been dried and other parts with vegetation cover have become sensitive to winding; therefore, the dust loading is increasing (Mardi et al. 2018; Shen et al. 2018). Most of the dust sources are located in the great deserts of Asia (Yang et al. 2014; Yaseen et al. 2018; Zhang et al. 2017).

The Jazmurian dried wetland is located in a closed drainage basin in the southern border of Lut Desert. This wetland is located in migratory flight direction of birds from Siberia to India and had valuable application in the past. Further, it played an important role for preservation of native plant communities and vegetation buffers, animal and birds (Rahdari et al. 2014). Unfortunately, the wetland has lost many of these functions, and it is currently changing to a dust source in southeast of Iran (Qaderi Nasab and Rahnama 2018; Rashki et al. 2017). Dried wetland is a source for generation of dust storms, affecting the surrounding areas (Rashki et al. 2017). Dust causes cutaneous, cardiovascular, and respiratory diseases (Tam et al. 2012; Watanabe et al. 2011; Sajani et al. 2011). Dust storm may also affect the aviation and airport management (Khalifa 2016). In addition, it intensifies the immigration of the people (Weil et al. 2017). Reduced income, unemployment, and tourism disturbance are the other consequence of wetland drying.

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