Grasslands in the historic rural landscape of Lessinia Regional Park (Veneto, Italy): threats and sustainable management

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**Abstract.** Grasslands are distributed worldwide and provide important ecosystem services including animal husbandry, cultural and recreational needs, and potentially work as a carbon sink to alleviate greenhouse gas emissions.

However, under unsustainable management and climate change, grassland systems have become one of the most degradation-prone landscapes around the world. For example, 23% of China's grassland is facing the threat of degradation. In addition, grassland ecosystems of Italy, Mexico, Germany etc., are suffering from severe degradation as well. Thus, understanding and managing grassland degradation has become a worldwide concern. A valuable example of grassland landscape is the Lessinia highland, a geographical area of the Venetian Pre-Alps in northern Italy. This area plays an important role in cultural and historical value, as it was recognized by the Italian Ministry of Agricultural, Food and Forestry Policies as one of the important rural historical sites in September 2020. Ponds are an iconic land surface feature in Lessinia, providing water for livestock and helping vegetation to resist droughts. The key their importance is water, or–more specifically–the length of time a pond holds water (hydroperiod). Pond hydroperiods naturally vary with differing amounts of precipitation, ground water, and the type of substrate the pond sits on. Climate variability can cause pond hydroperiods to become more temporary, which is problematic for vegetation and livestock supply. Here, we explored the variability of hydroperiods and vegetation growth, focusing specifically on drought seasons. Specifically, this work leverages the Normalized Difference Vegetation Index from various remote sources (e.g., Sentinel-2, Landsat 8). This study can provide insights for water resource management in a typical grassland system. Such information is critical for policy maker, for a sustainable development of these valuable landscapes particularly considering climate change.