

Machine Learning-Based Assessment of Mountain Wetland Vulnerability: A Case Study of Dayet Aoua, Middle Atlas, Morocco

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ABSTRACT

Despite the variety of ecosystem services they provide, inland water ecosystems—including rivers, lakes, and other wetlands—are facing unprecedented levels of threat and degradation. In fact, wetlands are among the most vulnerable ecosystems to climate change, they are disappearing and degrading faster than any other ecosystem. Hence, assessing wetland vulnerability is crucial for understanding and mitigating environmental change. To this end, a variety of methods have been applied across different contexts, including Geographic Information Systems (GIS), Machine Learning (ML), Spatial Principal Component Analysis (SPCA), and the Driver–Pressure–State–Impact–Response (DPSIR) framework. In this study, based on the analysis of multiple environmental and anthropogenic factors, machine learning models were used to map and predict the vulnerability of mountain wetlands in the municipality of Dayet Aoua. Using satellite time-series data from 1980 to 2018, this study provides a holistic analysis of wetland changes. Results show that the water body area decreased by 91.88% between 1985 and 2018 in the study area.

Keywords: Inland water ecosystems; Mountain Wetland; Climate change; Vulnerability; environmental change; Machine Learning.