Plinius Conference Abstracts
Vol. 19, Plinius19-86, 2026, updated on 08 Nov 2026
https://doi.org/10.5194/egusphere-plinius19-86
19th Plinius Conference on Mediterranean Risks
© Author(s) 2026. This work is distributed under
the Creative Commons Attribution 4.0 License.

Multi-temporal NBR Analysis and Neural Network-Based Wildfire Risk Assessment for Ecologically Sensitive Protected Areas: The Case of Vesuvius National Park

Claudio Sossio De Simone[1,2], Pasquale Giugliano[1], Antonia Longobardi[3,4], and Maria Ronza[5]

[1]Vesuvius National Park, Ottaviano (Naples), Italy
[2]ISPC - Institute of Cultural Heritage Sciences -National Research Council, Tito Scalo (Potenza), Italy
[3]Department of Civil Engineering, University of Salerno, Fisciano (Salerno), Italy
[4]C.U.G.RI. Inter-University Center for the Forecasting and Prevention of Major Risks, Fisciano (Salerno), University of Salerno Campus, Italy
[5]University of Naples Federico II – Department of Humanities, Naples, Italy

The Vesuvius National Park (Campania, southern Italy) represents an ecologically and culturally significant protected landscape in the central Mediterranean, encompassing Natura 2000 sites and priority habitats designated under the EU Habitats and Birds Directives. These ecologically valuable areas are increasingly exposed to the growing frequency and severity of wildfire events driven by climate change. Recent fire seasons, including the catastrophic events of 2017 and the large-scale fires of August 2025, have caused extensive damage to forest ecosystems within the protected perimeter, confirming a pattern documented at national level by ISPRA: a substantial proportion of the forest areas affected by fires in Italy falls within the Natura 2000 network.

This contribution presents a multi-temporal remote sensing approach aimed at mapping wildfire impact and monitoring post-fire vegetation recovery within the ecologically sensitive zones of the Vesuvius National Park. The Normalised Burn Ratio (NBR), derived from Sentinel-2 multispectral imagery (Copernicus), is computed for two reference periods using an automated PyQGIS workflow. The differencing of pre- and post-fire NBR values (dNBR) enables the spatial classification of burn severity and the identification of habitat units showing incomplete ecological recovery.

Furthermore, a composite Wildfire Risk Index (WRI) is derived by integrating dNBR-based burn severity with topographic, climatic, and habitat variables as input features to an Artificial Neural Network (ANN) classifier trained on historical fire occurrence data, producing a spatially explicit fire susceptibility map. This methodology, well established in the Mediterranean wildfire literature, allows the identification of high-susceptibility zones within ecologically sensitive habitats, supporting conservation planning and post-fire restoration prioritisation.

The entire workflow relies on an Open Science framework and freely accessible Copernicus Earth Observation data, making it scalable and transferable to other ecologically valuable protected areas across the Mediterranean basin. Results are intended to inform habitat management under the Habitats Directive and to contribute to early-warning and preparedness protocols consistent with the Sendai Framework for Disaster Risk Reduction