ABSTRACT

Remote sensing techniques offer the opportunity to study fire effects and vegetation recovery dynamics over large areas, providing essential information for effective management strategies development over fire-prone landscapes. Chios, the fifth largest of the Greek islands, has experienced recurring forest fires during the recent years, resulting in significant risk of environmental degradation. During the summer of 2016, the island experienced two severe wildfires, with the biggest one recorded in the southern part of the island. The affected area was mostly covered by maquis and phrygana (formations of low shrubs), while open forests (Phusoida) represented 15.5% of the burned area.

The aim of this study was to estimate and analyze the rate of post-fire vegetation recovery in the island of Chios following major fire events identified during the summer of 2016. A pairwise WorldView-2 image was collected over Chios, representing a geographical area-based classification approach. To perform post-fire vegetation recovery assessment, a random forest modeling procedure was performed for estimating post-fire vegetation recovery in the burned area, as well as the amount of high risk areas.

We identified VNDSI, NDVI and the second red edge band of Sentinel-2 as the most important spectral indicators for predicting vegetation recovery within the burned areas, in the presence of pre-fire areas with clouds, along the NDSI, the NDVI and the red edge band. The results revealed that vegetation recovery was more pronounced within the post fire pine forest areas, while woody species and broad-leaf species regeneration patterns were found to be more widespread in the former fire areas, as evidenced by the increase in the vegetation density, understory cover, and grassland restoration.

Post-fire vegetation recovery in the island of Chios was classified into four categories: dense, medium, sparse, and no vegetation. Recovery rates were found to be highest in the dense forest areas, followed by the medium forest areas, while sparse shrubs were mostly covered by phrygana. Dense shrubs are mostly covered by maquis, while sparse shrubs are mostly covered by phrygana. Sparse canopy forests that were burned only once during the last 40 years, with medium fire severity.

Vegetation recovery in the island of Chios was classified into four (4) categories: dense (D), medium (M), sparse (S), and no vegetation (N). The density of pine seedlings (ind/m²) of this site suggests that the post-fire regeneration will be high enough to result in complete natural vegetation recovery. Most of the shrub species regenerated through resprouting.