



## **From the study of fire effects on individual soil properties to the development of soil quality indices. 2. Application of indices**

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Wildfires are one of the most serious environmental problems in the Mediterranean region. The loss of vegetation and the progressive incapability of soils to appropriately regenerate the vegetative cover have led to severe degradation. Therefore, the establishment of soil quality indices is needed at sites affected by forest fires in order to evaluate the state of degradation so that we can enhance the soil quality. The use of soil quality indices is useful since the integration of several indicators of different nature is expressed as one value, being more effective than individual soil properties for land management. Soils from natural ecosystems have specific physical, chemical and biochemical properties determined by the conditions in which these soils develop. Thus, the creation of a model that represents the established balance among different soil properties from stable forest ecosystems can be used as a soil quality index. In addition, any perturbation, such as wildfires, must lead to modifications in this natural balance. Two models with soils from five undisturbed forest regions in eastern Spain were developed, which represented the balance between organic carbon and some physical, chemical and biochemical properties (aggregate stability, water holding capacity, cation exchange capacity, available phosphorus, electrical conductivity and acid phosphatase activity). These models have been applied to soils affected by different wildfires sampled at different dates after the wildfire to evaluate how this perturbation can modify the natural balance among organic matter and different soil properties. Our results confirm that wildfires, either directly or indirectly, have provoked an imbalance among organic carbon content and physical, chemical and biochemical properties. Moreover, soils affected by recent fires showed the greatest deviation in the natural balance, indicating higher perturbation. Hence, these models (indices) are sensitive to changes provoked by fire. Therefore we suggested its potential use to evaluate wildfire effects on soil and its recovery. Nonetheless, several issues are still unknown and more research is needed to gain knowledge about the use of this tool to properly assess the degradation of soil after wildfires and be reliable for land management. Could be these indices indicators of wildfire temperature, duration or intensity? Could be they used to estimate the need of human intervention? Are they also bound to vegetation cover recovery? Are they sensitive in soils and climate areas different from those in which they were calibrated? Could be they improved by inclusion of other soil characteristics?

*Key words: soil quality indices, wildfire, Mediterranean soils, soil degradation*