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Landscape anthropogenic disturbance in the Mediterranean ecosystem: is the current landscape sustainable?

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Mediterranean landscape during the last centuries has been subject to strong anthropogenic disturbances who shifted natural vegetation cover in a cultural landscape. Most of the natural forest were destroyed in order to allow cultivation and grazing activities. In the last century, fast growing conifer plantations were introduced in order to increase timber production replacing slow growing natural forests. In addition, after the Second World War most of the grazing areas were changed in unmanaged mediterranean conifer forest frequently spread by fires. In the last decades radical socio economic changes lead to a dramatic abandonment of the cultural landscape.

One of the most relevant result of these human disturbances, and in particular the replacement of deciduous forests with coniferous forests, has been the increasing in the number of forest fires, mainly human caused. The presence of conifers and shrubs, more prone to fire, triggered a feedback mechanism that makes difficult to return to the stage of potential vegetation causing huge economic, social and environmental damages.

The aim of this work is to investigate the sustainability of the current landscape. A future landscape scenario has been simulated considering the natural succession in absence of human intervention assuming the current fire regime will be unaltered.
To this end, a new model has been defined, implementing an ecological succession model coupled with a simply Forest Fire Model. The ecological succession model simulates the vegetation dynamics using a rule-based approach discrete in space and time. In this model Plant Functional Types (PFTs) are used to describe the landscape. Wildfires are randomly ignited on the landscape, and their propagation is simulated using a stochastic cellular automata model. The results show that the success of the natural succession toward a potential vegetation cover is prevented by the frequency of fire spreading. The actual landscape is then unsustainable because of the high cost of fire fighting activities. The right path to success consists in development of suitable land use planning and forest management to mitigate the consequences of past anthropogenic disturbances.