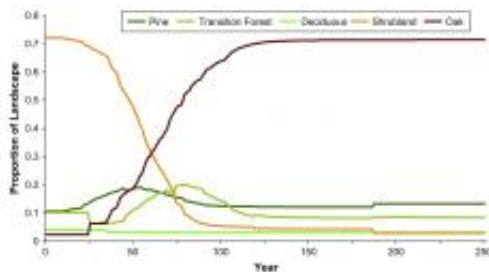


# Model predicts evolution of Mediterranean landscape following fires

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An international research team has developed a mathematical and cartographical model that make it possible to view how Mediterranean landscapes evolve in the aftermath of forest fires. In order to carry out this research study, published recently in the journal *Environmental Modelling & Software*, the authors studied a Special Protection Area for Birds to the south west of Madrid.

"We have developed a model that shows on maps how various types of plants develop in a Mediterranean landscape, with the role of fire included as an integral feature in Mediterranean vegetation dynamics", Raúl Romero Calcerrada, a researcher in the Department of Chemical and Environmental Technology at the King Juan Carlos University in Madrid, and co-author of the study published online in the journal *Environmental Modelling & Software*, tells SINC.

The area studied was Special Protection Area for Birds (SPAB) number 56, which covers the Holm oak woodland along the Alberche and Cofio rivers to the south west of Madrid. "Although these results could also be extrapolated to other Mediterranean regions", Romero points out.

The model is an original one, which predicts the most probable way in which vegetation will develop according to the variables introduced. It takes into consideration parameters such as the dispersal of plants (by shoots or seeds), their distribution over space and time, and the resources they compete for (primarily light and water).

Such ecosystems can generally evolve from grassland to scrubland (with rock rose, lavender and broom), later to transitional woodland (with pines, juniper and some Holm oaks) and finally to a Holm oak forest over a period of around 100 years. However, this evolution may be affected by a range of factors.

The results show, for example, that if the ground is dry, or there is a lack of Holm oak acorns, a burned area can turn into a pine forest within 30 years. However, in good water and soil conditions, the ecosystem could develop into a deciduous chestnut and melojo oak forest.

"The intensity and number of fires have a direct effect on how the vegetation evolves and the types of plants that grow", says Romero, who also points to the significant influence of humans on this and other factors affecting Mediterranean areas. In fact, this research study is part of a broader study into changes in soil use in rural areas, and will be incorporated into other models to help decision making about land use in these areas.

Cellular automata to represent fire

"We used 'cellular automata' to represent how fires spread, bearing in

mind the flammability of the ground cover, the gradient of the land, wind speed and moisture levels of the vegetation", the lead author of the study, James D. A. Millington, from Michigan State University in the United States, tells SINC. 'Cellular automata' are mathematical tools used in artificial intelligence to track the movement of linked objects within a grid (in this case a map).

Millington says this model is able to represent landscapes over areas in excess of 1,000 hectares on a map with high spatial resolution (of 0.01 - 10 ha) and over timescales ranging from annual to more than a century.

Aside from these two researchers, other scientists from the University of Auckland (New Zealand), and Sheffield University and King's College in London, in the United Kingdom, also took part in the study.

More information: James D. A. Millington, John Wainwright, George L. W. Perry, Raul Romero-Calcerrada y Bruce D. Malamud. "Modelling Mediterranean landscape succession-disturbance dynamics: A landscape fire-succession model". *Environmental Modelling & Software* 24 (10): 1196-1208, 2009

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