Science for Environment Policy
DG Environment News Alert Service
European Commission

28 July 2011

# Fragmented pine woodland boosts Mediterranean biodiversity

**Scientists have proposed** new recommendations to increase the species diversity and sustainability of Mediterranean forests, since programmes to enhance reforestation by planting vast areas of pine trees have not been as successful as planned.

**Since the 19th century**, pine trees have been planted as "pioneer species" in reforestation projects, which now cover more than 12 per cent of the forested area in the Mediterranean Basin. When first planted, they were expected to generate a diverse and multi-functioning ecosystem, but it is now apparent that they support low species diversity and are poor at adapting to changing climate conditions. This has prompted scientists to look for ways to convert pine forests into more resilient and diverse habitats.

The scientists studied 275 pine plantation sites in the Sierra Nevada National Park (Southeast Spain). At each site, they identified possible influences on plant diversity, such as the size and shape of the site, the density of tree cover and the distance from other (non-pine) vegetation. They also measured altitude and average sunlight in order to correct for climatic differences between sites.

Using a computer model, they determined which combination of factors was most favourable to improving wild plant diversity. Plant diversity was calculated from the number of species and their abundance over the plot area (between 300 to 400 $m^2$). Oak forests are known to be more biologically diverse than pine forests, so the scientists looked at the ways in which new, natural growth of oak trees could be encouraged close to pine plantations, called oak regeneration.

Plant diversity was found to be high in pine plantations closest to oak forests, shrublands and riverbanks, which the scientists attributed to wind dispersal of seeds from these areas into the pine plantations. They also found that the abundance of oak seedlings – indicating oak regeneration - was higher in sites close to oak forests, with 90 per cent of successful regeneration sites occurring within 500 m of oak vegetation. The scientists suggest that the *amount* of non-pine vegetation may be an important influence on oak regeneration and plant diversity, as well as how close the pine and non-pine sites are to each other.

The shape and size of the pine sites were also important influences on plant diversity. On average, smaller sites had a greater range of plants. Sites with a complex shape, i.e. with a large outer border relative to area covered, also scored high on the biodiversity scale. The likely explanation is that these features allow greater contact with surrounding vegetation and different light conditions, promoting a greater range of species. In contrast, the scientists found that neither size nor shape of the pine site influenced oak regeneration.

The main source of seed dispersal for oak trees is the European Jay bird, which collects acorns and buries them elsewhere in forested areas. Since Jays use habitat elements, such as pine trees, to locate buried food, they are likely to prefer sites with higher density of trees. This may be one explanation for the fact that dense tree cover appeared to encourage oak regeneration. In contrast, tree density had a negative effect on plant diversity, because dense tree cover reduces light availability, which is likely to support a more diverse community.

From these results, the scientists recommend that existing and new pine plantations are "fragmented" into small, irregularly shaped areas. They also recommend active sowing projects for plantations that are more than 500 metres away from other vegetation, since these are unlikely to attract greater plant diversity or oak regeneration naturally.

**Source**: González-Moreno, P., Quero, J.L., Poorter, L. *et al*. (2011). Is spatial structure the key to promote plant diversity in Mediterranean forest plantations? *Basic and Applied Ecology*. Doi: 10.1016/j.baae.2011.02.012.
**Contact**: pgonzalez@ebd.csic.es
**Theme(s)**: Biodiversity, Forests

**The contents and views included in Science for Environment Policy are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.**
**To cite this article/service:** "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.