Researchers find dissimilar forests are vital for delivery of ecosystem services

March 15 2016

A team of ecologists from Royal Holloway, University of London has taken part in a large collaborative EU project to find out what the effects of forest tree species diversity are on ecosystem services. These services, which include timber production, carbon storage, and forest resistance to pests and diseases, are crucial to human well-being.

One of the key novel findings of the project published yesterday (March 14) in the journal *Proceedings of the National Academy of Sciences*, is the consistently negative impact a similarity in tree species composition across the landscape (biotic homogenization) has on the ability of forests to deliver multiple ecosystem services.

Forests are becoming dominated by a small number of tree species as a result of species extinctions, tree species selection by forest managers, and invasions or planting of exotic species. This process of biotic homogenization is similar to cultural globalization with the global consumer market becoming dominated by the small number of chains (the so-called McDonald's Effect).

Researchers from Royal Holloway's School of Biological Sciences worked collaboratively with 29 other institutions and combined field data from 209 forest plots across six European countries (Germany, Finland, Poland, Romania, Italy and Spain) with computer simulations to study the consequences of both local tree species loss and biotic homogenization on 16 ecosystem functions, including timber production, carbon storage, bird diversity, forest regeneration and resistance to insect and mammalian pests.

The researchers found that while the effects of local tree species loss were highly variable, the effects of biotic homogenization were almost always detrimental for provisioning of multiple ecosystem services. This means that landscapes containing more dissimilar forests provide more ecosystem services than landscapes where all forest patches were dominated by the same tree species. This is because different tree species are needed to provide different services; for example, in Poland, the Norway spruce provides high quality timber whereas hornbeam forests are better at supporting the diversity of attractive plant species in the understorey that may appeal to tourists.

While many studies have investigated the consequences of species loss for human well-being, this is the first study to show the consequences of biotic homogenization for forest ecosystem services.

Professor Julia Koricheva from the School of Biological Sciences at Royal Holloway, whose team contributed measurements of forest

resistance to mammalian herbivores, said: "This study shows how important it is to maintain biodiversity in forests not only at the local scale but also at the landscape level".

The findings have implications for forest management and suggest that stopping and reversing the McDonald's Effect in forestry, by planting forests containing a range of dominant species, will encourage the maintenance of ecosystem processes and services that human well-being depends on.

More information: Biotic homogenization can decrease landscape-scale forest multifunctionality, www.pnas.org/cgi/doi/10.1073/pnas.1517903113

Provided by Royal Holloway, University of London