



Fragmented forests and grasslands: plant sensitivity to habitat loss

A new study exploring the sensitivity of grassland and forest plants to decreasing habitat size and isolation in north-central Europe concludes that an irreversible shift in the most dominant plant species may already be underway in forests and grassland, where forests are more vulnerable than grasslands.

General ecological theory suggests that shrinking the size of a habitat and cutting it off from surrounding patches of similar habitat – known as isolation - will reduce the population size of plant species. Isolation, or fragmentation, is a common feature of European agricultural landscapes and reports suggest that just 0.4-1.1% of original grassland remains.

While some scientific studies have revealed the link between habitat size and population size in forests, the effect on grassland species is less clear. The sensitivity of forest plants also appears to vary between species, leading scientists to look more closely at the underlying reasons for this. However, it can be difficult to separate the effects of isolation and habitat size from deterioration in habitat quality, which may occur in response to the same disturbance, i.e. land use change.

The scientists collected published data on how plant species in 19 previous studies responded to a decrease in habitat area and increased isolation. In total, they looked at 351 individual plant species, 177 of which were forest species and 174 of which were grassland species.

They looked for relationships between the severity of the impact on each species (positive or negative) and three different species characteristics: life span, mode of reproduction and seed weight. Individual studies have looked at these characteristics before, sometimes yielding contrasting results, but this is the first time a general analysis using all the available data has been conducted.

Overall, forest species were found to be more sensitive to changes in habitat area and isolation than grassland species. Out of the 121 area-sensitive species, 89 were from forests compared to 32 from grasslands. Similarly, of the 128 species found to be sensitive to isolation, 88 were from forests compared to 40 from grasslands.

The relationships between particular species traits and habitat were more complicated. Long-lived grassland species (perennials) appeared to be more sensitive to decreasing habitat area compared to short-lived species (annuals and biennials), but this was not the case for forest species.

The results also suggest that 'clonal' plants, those that mainly reproduce asexually, were more sensitive to a decrease in habitat size in forests and grasslands than non-clonal plants, which reproduce by dispersing seeds or spores. This result, which contrasts with previous studies, may be linked to a lower capacity to spread into new habitat.

For short-lived and non-clonal species, which were less sensitive to habitat size and isolation, habitat quality may be a more important factor, say the researchers.

Differences in seed weight across the species revealed no link with habitat area, but a strong link with isolation. Surprisingly, forest species with large seeds were more sensitive than those with small seeds, while the opposite was true for grassland species. The scientists relate this to different modes of seed dispersal in forests and grasslands, i.e. self-dispersal, by wind or attached to the fur of animals.

The researchers warn that the greater sensitivity of long-lived, clonal plants implies that a further decrease in habitat area and increased fragmentation in European forests and grasslands may lead to an irreversible change in plant community composition, perhaps resulting in local extinctions.

Source: Lindborg, R., Helm, A., Bommarco, R., *et al.* 2011. Effect of habitat area and isolation on plant trait distribution in European forests and grasslands. *Ecography*, 34: 001-008.

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