Habitat restoration requires landscape-scale planning

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Abstract

Habitat restoration cannot be considered simply as an act of re-creating the original environmental conditions and biota, neglecting the significance of the context of the surrounding landscape and overlooking the need to recreate metapopulation dynamics for target species. In this issue, Prach et al. show the importance of the availability of target species in the surrounding landscape to achieve successful restoration.

Prach et al. (2015, this issue) have conducted an interesting study of spontaneous colonization of grassland species following the restoration of 82 previously arable fields in the White Carpathians, Czech Republic. The aim was to investigate to what extent the occurrence of target species, i.e. the presence of the habitat-specific species pool in the surrounding landscape, facilitates the recovery of grasslands. They found that irrespective of the restoration technique, the number of target species in the restored sites was positively related to the occurrence of target species in the surroundings. This emphasizes the need to consider landscape composition and the availability of a characteristic species pool when planning habitat restoration. No matter how detailed and expensive the effort, restoration cannot be successful in the long term when habitat is treated as a stand-alone ‘museum’.

The importance of the surrounding landscape and its species composition on habitats has long been recognized in ecological literature (Tscharntke et al. 2012). For example, according to the species pool hypothesis, the availability of ecologically suitable species in the surrounding landscape is directly related to the small-scale species richness of a given habitat (Zobel et al. 2011). In human-transformed European landscapes there have historically been a large number of grassland species (Dengler et al. 2014), and a network of sufficiently large populations that are connected via dispersal or pollen exchange is now vital for the long-term persistence of many (Brückmann et al. 2010). Prach et al. (2015) found that the presence of target species in the nearest surroundings of the restoration site was the most important factor for post-restoration colonization success, whereas more distant regions had no effect. This indicates that grassland species require a relatively dense habitat network for effective movement between habitat patches. Thus, for a successful outcome, target species should be present in the vicinity (<1–2 km) of the restored habitat. The necessity for a well-connected landscape has also been shown in other studies. Aavik et al. (2013) found that gene flow between restored and natural populations of grassland species occurred only within distances up to 3 km.

Some of the restored fields in Prach et al. (2015) were sown with a commercial seed mixture that contained only grasses and clover, while others were sown with a seed mixture rich in regional target species. A third group of ex-arable fields were left for spontaneous succession. Likely due to the fact that the species characteristic of grasslands were still very abundant in the studied landscape, colonization of target species to differently restored habitat patches did not differ in the long term. Still, sowing of the regional species-rich seed mixture enabled faster establishment of target species than the other two methods. This indicates that in regions where the grassland species pool is still present, sowing of regional seed mixtures rich in characteristic species, while not essential, could hasten the recovery of grasslands. However, when restoring completely isolated habitats, the aim has to be to create a viable habitat network and its characteristic species pool in order to support species long-term persistence. Sowing of target species seems to be vital in this case: spontaneous succession is unlikely to lead to a successful result when there are no characteristic species available in the surrounding landscape. Artificially boosting seed dispersal between restored sites, whether via rotation of grazing animals or via repeated seed sowing, might also be necessary to establish good connectivity.

European grasslands are on the verge of disappearing, and more of them need to be restored in the coming years. Important practical guidelines for this task can be obtained from the Prach et al. study and other similar approaches. First, to ensure success, habitat restoration should always be planned at a landscape scale. Landscape-scale factors
and the availability of a habitat-specific species pool in the vicinity of restoration sites must be considered when selecting appropriate restoration techniques (Fig. 1). Second, follow-up monitoring should include indicators of the surrounding landscape and species pool composition (e.g. de Bello et al. 2010; Helm et al. 2015). Only then can verifiable assumptions about actual restoration success be made. Third, ‘building up’ characteristic diversity following restoration can take decades or even centuries, so time is needed for both monitoring and to achieve expected outcomes (Redhead et al. 2014).

References


