One cannot have it all: trading-off ecosystem services and biodiversity bundles in landscape connectivity restoration

Margot Neyret*[1], Daniel Richards[2], Marie-Caroline Prima[1], Tom Etherington[2,3], and Sandra Lavorel[1,2]

[1]Laboratoire d'Ecologie Alpine – Université Savoie Mont Blanc, Centre National de la Recherche Scientifique, Université Grenoble Alpes – France

[2]Manaaki Whenua – Landcare Research, Lincoln, New Zealand – Nouvelle-Zélande

[3]Te Pūnaha Matatini, A New Zealand Centre of Research Excellence, Auckland, New Zealand – Nouvelle-Zélande

Résumé

Countering the impacts of habitat loss and fragmentation on ecosystems requires complementing conservation areas with Other Effective area-based Conservation Measures within landscapes to promote biodiversity and multiple ecosystem services (ES). However, critical knowledge gaps persist in where and how natural elements should be restored to improve landscape connectivity to simultaneously support, and reduce trade-offs between biodiversity and ES. In virtual landscape experiments that allow exploring the effects of spatial pattern systematically, we generated alternative landscape restoration scenarios aimed at fostering ecological connectivity. Scenarios varied in the location and size of restored areas complementing existing natural areas. We analysed the impact of these scenarios on four bundles representing distinct priorities of target ES and biodiversity-related values. All bundles were favoured by increasing restored area in the landscape, but were promoted by different spatial configurations. Restoration scenarios that fostered high aggregation of natural habitats promoted biodiversity and cultural value-related bundles, while smaller natural elements dispersed throughout the landscape were more beneficial for the sustainable production and climate adaptation bundles. These contrasts were most pronounced at low restoration efforts, where landscape configuration had greatest impacts on biodiversity and ecosystem processes. Effective spatial planning of restoration initiatives within landscapes should consider these trade-offs, along with context-specific constraints, when prioritizing areas for restoration or conservation. Our findings contribute to a more comprehensive understanding of how protected and restored areas can be integrated within landscapes to jointly support connectivity for both biodiversity and people.

Mots-Clés: Landscape simulations, ecosystem services, restoration, functional connectivity, landscape configuration, Other Effective area, based Conservation Measures

*Intervenant