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Cross-scale modelling of alien and native vascular plant species richness in Great Britain: where is geodiversity information most relevant?

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We assess the scale-dependency of the relationship between biodiversity and novel geodiversity information by studying spatial patterns of native and alien (archaeophytes and neophytes) vascular plant species richness at varying spatial scales across Great Britain. Instead of using a compound geodiversity metric, we study individual geodiversity components (GDCs) to advance our understanding of which aspects of 'geodiversity' are most important and at what scale.

Terrestrial native (n = 1,490) and alien (n = 1,331) vascular plant species richness was modelled across the island of Great Britain at two grain sizes and several extent radii. Various GDCs (landforms, hydrology, geology) were compiled from existing national datasets and automatically extracted landform coverage information (e.g. hollows, valleys, peaks), the latter using a digital elevation model (DEM) and geomorphometric techniques. More traditional predictors of species richness (climate, widely-used topography metrics, land cover diversity, and human population) were also incorporated. Boosted Regression Tree (BRT) models were produced at all grain sizes and extents for each species group and the dominant predictors were assessed. Models with and without geodiversity data were compared.

Overarching patterns indicated a clear dominance of geodiversity information at the smallest study extent (12.5km radius) and finest grain size (1x1km), which substantially decreased for each increase in extent as the contribution of climatic variables increased. The contribution of GDCs to biodiversity models was chiefly driven by landform information from geomorphometry, but hydrology (rivers and lakes), and to a lesser extent materials (soil, superficial deposits, and geology), were important, also. GDCs added significantly to vascular plant biodiversity models in Great Britain, independently of widely-used topographic metrics, particularly for native species. The wider consideration of geodiversity alongside biodiversity, as part of a more holistic approach to nature conservation and biodiversity science, is wholly encouraged by the authors.