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Geodiversity information enhances biodiversity conservation

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Geodiversity describes the diversity of the non-biological parts of the natural world such as rocks, soils, landforms and the processes which shape them over time. New research on how geodiversity information has been used to examine or inform conservation policy has been explored through eight different case studies. The research shows the variety and utility of geodiversity information to support biodiversity protection, both now and in the future.

Scientists can use geodiversity information to design conservation networks based on the different physical environments within a region. These networks can reveal the non-biological variation which is necessary to maintain a diversity of species and ecological processes. Conservation networks based on geodiversity can also show changes in species composition caused by climate change.

However, there is no standard approach to designing these networks. In this study, the researchers illustrated the variety of ways scientists have approached this challenge through eight different case studies, each integrating geodiversity into conservation plans aimed at protecting biodiversity.

The first two studies described different methods for mapping different areas of land called 'ecological land units' — defined based on the types of different geology and landforms, such as hills or mountains, in a given area — and 'land facets', areas of land divided up into smaller units based on the types of ecological processes and geology found there. These studies illustrated how ecological land units and land facets have been used to design conservation portfolios and identify corridors connecting different wildlife populations. For example, the second case study linked 22 pairs of large protected areas in the US, using habitat corridors. This was intended to better understand the need and use of corridors, to help maintain interactions between species across land units, under both current climate and periods of rapid change.

Cases three, four and five compared the prioritisation of conservation of different areas based on geodiversity to prioritisation based on biodiversity. For example, case study five assessed how biodiversity-based conservation sites captured various elements of geodiversity in four areas of the US Pacific Northwest. They concluded that networks of conservation areas designed to conserve biodiversity also captured much of the geodiversity.

Cases six and seven examined how different ways of defining and examining geophysical information resulted in different conservation sites being prioritised. For example, case study seven characterised the geodiversity of the south-western US and assessed how this characterisation would change if the data were classified differently, for example by changing the choice of physical variables examined (e.g. how hot or wet an area was) or the spatial resolution. They found that, although different classifications resulted in differences, their results were still very similar, and that the approach could be used to identify and correct for biases in how land has already been prioritised for conservation.

Case eight developed a general method for evaluating trade-offs in conservation planning, using a variety of different geodiversity data as surrogates for overall biodiversity. This was used to address forestry planning issues in New South Wales, Australia. The approach allowed estimates of the consequences of different land uses for biodiversity.

The authors conclude that geodiversity information can add new dimensions to conservation planning, enhancing traditional biodiversity-based approaches and helping to ensure effective conservation strategies.