

Predicting the distribution of plant associations under climate change: A case study on *Larix gmelinii* in China

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Abstract

Association is the basic unit of plant community classification. Exploring the distribution of plant associations can help improve the understanding of biodiversity conservation. Different associations depend on different habitats. Studying the association level is significant for ecological restoration, regional ecological protection, regulating the ecological balance, and maintaining biodiversity. However, previous studies have focused only on the suitable distribution areas of species and not on the distribution of plant associations. *Larix gmelinii* is a sensitive and abundant species spread in the southern margin of Eurasian boreal forests, and its distribution is closely related to permafrost. In this study, 420 original plots of *L. gmelinii* forests were investigated. We used Maxent model and ArcGIS software to project the potential geographical distribution of *L. gmelinii* associations in the future (by 2050 and 2070) according to the climate scenarios RCP 2.6, RCP 4.5, and RCP 8.5. The causes for the changes in spatial distribution were analyzed using multinomial logistic regression analysis. The results revealed that temperature is the most important factor affecting the distribution of *L. gmelinii* forests and most of its associations under different climate scenarios. Further, the suitable areas for each association type are shrinking by varying degrees, especially due to habitat loss at high altitudes in special terrains. For different *L. gmelinii* associations, management measures should also be different based on the different site conditions, composition structure, growth, development, and renewal succession trends. Furthermore, subsequent research should consider data on biological factors to obtain more accurate prediction results.

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