

Pedology and plant provenance can improve predictions of species distributions of the Australian native flora: a calibrated and validated modelling exercise on 5,033 species

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Abstract

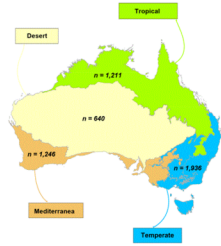
Species distribution models (SDMs) are valuable tools for assessing species' responses to environmental factors and identifying areas suitable for their survival. The careful selection of input variables is critical, as their interactions, and correlations with other environmental factors can affect model performance. This study evaluates the influence of climate and soil variables on SDMs' performance for 5,033 Australian plant species, selected to represent the largest phylogenetic diversity of native terrestrial vascular flora. Using an ensemble of correlative models, we assessed the predictive performance of climate and soil variables, individually and in combination, across four distinct ecoregions: Desert (n = 640 species), Mediterranean (n = 1,246), Temperate (n = 1,936), and Tropical (n = 1,211). Our results demonstrate that on a continental scale, climate variables have a greater influence on plant distributions than soil variables. Although incorporating soil and climate variables enhanced model performance in some ecoregions, our results indicate that relying solely on small-scale variables such as soil may increase the likelihood of overfitting. In soil-only models, Clay content (CLY), Nitrogen Total Organic (NTO), and Soil Organic Carbon (SOC) were important across modelled species, with their relevance varying by ecoregion. Our findings have significant implications for understanding the interplay between climate, soil, and plant distribution within diverse ecoregions. By highlighting the crucial role of climate in large-scale models, this study serves as a foundation for developing more accurate predictions of plant distributions, ultimately improving model accuracy for biodiversity assessments.

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plant-provenance-can-improve-predictions-of-species-distributions-of-the-australian-native-flora-a-calibrated-and-validated-modelling-exercise-on-5-033-species

Species distribution models on 5,033 Australian plant species



METHODS

three input variable datasets

I. CLIMATE DATA ALONE

II. SOIL DATA ALONE

III. BOTH

Soil Bulk Density, Cation Exchange Capacity, Clay Content, Depth of Soil, Nitrogen Total Organic, Total Phosphorus, Topographic Wetness Index, Soil Organic Carbon

The methods section lists three datasets: Climate Data Alone, Soil Data Alone, and Both. It includes icons for various soil and climate variables and a row of icons representing different species or models.

