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The role of extreme drought events in modelling the distribution of beech at its xeric limit

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Context: Projections of species distribution models (SDMs) for future climate conditions are based on long term mean climate data. For management and conservation issues SDMs have been extensively used, but it is not tested whether models that are successful in predicting current distributions are equally powerful in predicting distributions under future climates.

Methods: Observations after 2003 confirms that extreme drought events played an important role in driving beech mortality at low-elevation xeric limits. The objective of this study was (1) to set up a simple extreme drought event based vitality model (EDM) using sanitary logging information as a proxy of vitality response of beech and (2) to compare the spatial pattern of the predicted vitality loss provided by the EDM with the distribution limits of the SDMs for three terms (2025, 2050 and 2100) in Hungary to assess model performance.

Results: Prediction for vitality loss for 2025 obtained from the EDM was in agreement with those of the SDM, but for the end of the century the EDM predicted a more serious decline in almost all regions of Hungary.
Conclusion: The result of the comparison suggests that the increasing frequency and severity of extremes might play a more important role in limiting the distribution of beech in the future near to the xeric limit than long-term means.