Black locust (*Robinia pseudacacia* L.) in Austria: the interplay of climate, climate change and range expansion

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Under predicted climate warming biogeographical range dynamics are likely to become a widespread phenomenon. Among the plant species that will most rapidly respond to increasing temperatures may be alien invaders which already have proven to have considerable migration capacity within their introduced ranges. In this case study we focused on black locust (*Robinia pseudacacia* L.), a leguminous tree species native to North America and introduced to Europe during the 17th century. Black locust has first been planted in the comparatively warm and dry Pannonic region of eastern Austria at the end of the 18th century for both ornamental and economical purpose. During the 20th century, it has become the most problematic introduced tree species in Austria: apart from being a severe silvicultural pest that competitively excludes valuable timber trees, its spread is of considerable conservation concern, because the species invades rare and endangered plant communities, in particular species-rich dry and semi-dry, nutrient poor grasslands and thermophilous oak forests. Successful establishment of founder individuals results in a rapid increase in population density due to efficient vegetative reproduction by root suckering, which makes further spread difficult to control. Hence, post-hoc management of black locust invasions causes considerable costs, often combined with limited success. In contrast, identifying regions and habitats at risk of becoming invaded under a warmer climate may assist in probably more effective precautionary conservation attempts. We used predictive species distribution modelling to assess such regions at risk within Austria. An environmental envelop of black locust was constructed by combining information on its current distribution in Austria (presence/absence data, grid: 2612 3’x5’ quadrants) and various spatially explicit datasets on climate, topography and land use. Response of black locust to these environmental conditions was analysed using Generalised Linear Models (GLMs). Parameterised response functions were then used to predict changing probabilities of occurrence under altered climatic conditions, exploring the differences between a couple of different climate change scenarios at different time scales. Among used predictors temperature is by far the strongest, while the others, i.e. precipitation, land use, topography, add little explanatory value to the model. Results indicate that potential habitats for black locust will expand considerably when assuming an increase in mean spring-temperature (April) of +2.9°C / +4.1°C, respectively, until the end of the 21st century. The percentage of quadrants with a probability of black-locust occurrence > 0.75 increases from 24 % to 66 % / 24 % to 77 %, respectively.