EGU25-14001, updated on 21 May 2025
https://doi.org/10.5194/egusphere-egu25-14001
EGU General Assembly 2025

Invasive winners and losers: the influence of traits on climate-driven invasive plant range changes

Gabriela Nunez-Mir[1], Eduardo Tovar[1], Jenica Allen[2], and Amanda Suzi-Simmons[3,4]

[1]Department of Biological Sciences, University of Illinois at Chicago, Chicago, Illinois, USA
[2]Department of Environmental Conservation, University of Massachusetts - Amherst, Amherst, Massachusetts, USA
[3]Department of Environmental Studies, Antioch University New England, Keene, New Hampshire, USA
[4]Department of Ecosystem Science and Management, Pennsylvania State University, University Park, Pennsylvania, USA

Climate change is expected to impact the distribution of invasive plants, with certain species forecasted to expand, contract and/or shift their invasive ranges. However, the mechanisms and associated species traits driving these distinct biogeographical responses are not well understood. In this study, we investigate the relationships between functional and niche traits of invasive plant species and their forecasted range responses to climate change. We leveraged previously published species distribution models for invasive terrestrial plants in the United States, as well as a comprehensive invasive traits database, to assemble a dataset of current and future ranges (based on average projected climate in 2040-2060) of 476 invasive plants. We also compiled functional and niche traits for these species, such as specific leaf area, dispersal vectors and environmental tolerances. Our findings indicate that species with larger current ranges, moderately thick, resource-efficient leaves, and long-distance animal dispersal capabilities showed smaller range centroid shifts. Conversely, changes in range area were smaller for species with broad hardiness zone ranges, a preference for higher elevations, and tolerance to extreme precipitation regimes. Minimum hardiness zone emerged as the strongest predictor of range expansion or contraction within the U.S., with species adapted to warmer climates and with restricted current ranges more likely to expand. This work provides valuable insights into the mechanisms underlying invasive plant range responses to climate change and offers a framework for integrating trait-based approaches with predictive modeling to inform management strategies.