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Biological Conservation

Volume 136, Issue 1, April 2007, Pages 33-43

Historical land use and environmental determinants of nonnative plant distribution in coastal southern New England

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<https://doi.org/10.1016/j.biocon.2006.10.044>

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Abstract

The factors that influence the invasion of natural habitats by nonnative plants remain poorly understood. We investigated abiotic, biotic, and human influences on the distribution and abundance of nonnative species in coastal upland habitats of southern New England and adjacent New York, US. We censused vegetation and sampled soils in 776, 20 m × 20 m plots in natural areas and constructed a spatially referenced GIS database of the region that included land-use history, distance from roads, and surficial geology. Our results indicate that the modern distribution of nonnative plants is influenced by multiple, interdependent current and historical factors. Glaciolacustrine landforms had greater nonnative species richness and cover than beach-dune, moraine, and glacial outwash sand plain landforms. Extant open-canopied areas (i.e., grasslands, dunes, heather barrens, and old fields) harbored significantly greater nonnative species

richness and cover than closed-canopy forests, heathlands, and shrublands. Additionally, soil calcium levels and native species richness were positively associated with nonnative species richness. Sites that were cultivated historically or experienced other soil disturbance had higher nonnative species richness than areas without soil disturbance. Overall, abiotic, biotic and historical land use affected levels of nonnative species richness whereas nonnative cover was largely associated with abiotic conditions, particularly soil characteristics. Because many rare coastal sandplain plants reach their greatest abundance on extant open-canopied habitats, efforts to restore native plants will involve tradeoffs between the benefits of expanded habitat for these species and increased risk of invasion by nonnative species.



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Keywords

Disturbance; Invasion; Landscape; Land-use history; Plant invasion

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