The threat is not over yet: towards a model of future distribution of an invasive species under global change

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Abstract

The adverse impacts of invasive species on biodiversity and ecosystem functioning are expected to be worsened by other global change components, such as climate warming or land-use changes that may facilitate the colonization of still uninvaded areas. Identifying the potential future distribution of invasive species is thus crucial to plan efficient management and target control measures. In this study, we focused on the distribution of the Canadian waterweed, *Elodea canadensis*, in lakes of Sweden. This species is a submerged aquatic plant native only in temperate North America that invaded Europe during the 19th century. Using ecological niche models, we related presence-absence data extracted from a national monitoring program to a set of environmental parameters measured at the lake or catchment scale. Models outputs suggested that the distribution of *E. canadensis* is mostly positively influenced by the proportion of agriculture in catchment, the number of lakes upstream, the length of shorelines, and has a bell-shaped response to alkalinity. We identified several areas in northern Sweden where the waterweed has not been detected yet but with a high invasive risk under present conditions suggesting a high vulnerability to accidental release by human activities. Forecasting the potential distribution of *E. canadensis* under future climate and land-use changes scenarios highlighted an overall increase in habitat suitability of most lakes of Sweden. The species could expand its range further north than its known invaded limit resulting in an additional threat to these high-latitude aquatic ecosystems.

Keywords: Elodea canadensis, ecological niche models, climate change, land, use, invasion risk

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