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Title of doctoral dissertation: *The impact of invasive tree biomass on forest natural regeneration, understory plant biodiversity, and aboveground biomass increments of native trees*

Abstract

Invasive species are considered one of the greatest threats to native ecosystems. Although they can provide various positive ecosystem services, their impact on biodiversity is often described as negative. Trees, being long-lived and large, can have long-lasting impacts on ecosystems and lead to long-term and extreme changes, for example, in soil chemistry and light conditions. Most current studies focus on comparing invaded forests with non-invaded forests, neglecting the abundance of invasive trees. Biomass, in particular, is rarely used as a quantitative indicator of invasion, and it most accurately reflects the actual amount and the actual impact on modifying environmental conditions and resource usage. The study focused on two North American species: black locust *Robinia pseudoacacia* L. and black cherry *Prunus serotina* Ehrh, and was conducted on 160 study plots in managed forests in western Poland. In addition to differing in the aboveground biomass of invasive species, the plots were also placed in two contexts: habitat context (nutrient-rich habitats with *Quercus robur/petraea* and nutrient-poor habitats with *Pinus sylvestris*) and stand age context (middle and close to rotation age). Vegetation surveys were conducted on all 160 plots using the Braun-Blanquet method, and natural

regeneration, both seedlings and saplings, was counted. Core samples were collected from *P. sylvestris* and *Quercus* spp. on 72 plots using a Pressler borer, and the relative aboveground biomass increments were calculated at the individual tree and stand levels. It was demonstrated that the aboveground biomass of the invasive species was positively related to the densities of natural regeneration of shrubs and admixture trees, and negatively related to the densities of natural regeneration of the main forest-forming species typical of the studied habitats. Nitrophilous, ruderal, and edge understory plants were associated with the increasing biomass of invasive trees, while acidophilous plants typical of nutrient-poor sites decreased their cover as the aboveground biomass of *P. serotina* and *R. pseudoacacia* increased. We did not demonstrate a significant effect of the proportion of invasive species biomass in the total stand biomass on the relative aboveground biomass increments of *P. sylvestris* and *Quercus* spp. The results obtained as part of the submitted doctoral dissertation are important for the management of *R. pseudoacacia* and *P. serotina* populations in stands dominated by *P. sylvestris* and *Quercus* spp. Neither species studied nor their increasing biomasses should alter the carbon sequestration capacity of *P. sylvestris* and *Quercus* spp. Studies indicate that the most vulnerable to the increasing aboveground biomass of the studied neophytes are acidophilous species in the understory in nutrient-poor habitats, as well as natural regeneration of the main forest-forming species, i.e., *P. sylvestris* in nutrient-poor forest habitats and *Q. petraea* in nutrient-rich forest habitats. By taking species abundance into account, it is possible to more precisely estimate the balance of gains and losses, as well as economic and ecological gains, and to better plan management and conservation measures.