USING FOREST INVENTORY AND ANALYSIS DATA TO UNDERSTAND BIOTIC RESISTANCE TO PLANT INVASIONS ACROSS THE EASTERN UNITED STATES

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Abstract—Biological invasions and their impacts are likely to increase with the expansion of global commerce, making the need to identify key drivers and regulators of invasion perhaps greater than ever. One of the most enduring, and tested, hypotheses for explaining invasions is the "biotic resistance hypothesis." Broadly, this hypothesis states that communities having greater biodiversity have fewer unfilled niches, making them less invasible. Using data from 46,071 Forest Inventory and Analysis plots located across the forests of the Eastern United States, we tested for associations between native trees and invasive plants that would suggest the presence of biotic resistance. For both invasive species richness and cover, we determined: 1) if accounting for the spatial heterogeneity nested within a large geographic area improves models of biotic resistance, 2) if the direction, magnitude, and spatial variability of associations pertaining to biotic resistance differ based on how biotic resistance is measured, and 3) if the direction and magnitude of associations pertaining to biotic resistance vary with either scale or location. These determinations will provide clarity regarding the role of biotic resistance in regulating invasion patterns across large geographic areas. We found that accounting for heterogeneity allowed for better models of biotic resistance, and that both invasion measures were negatively associated with native tree biomass and evolutionary diversity, but positively associated with native tree species richness. A few sub-regions, however, exhibited opposite associations. Association size tended to be greatest for evolutionary diversity. Strong negative associations were aggregated within and near the Appalachian Mountains. Finally, association size and direction were affected by both scale and location, although location seemed more influential. As forests and the services they provide are increasingly harmed by invasive plants, particularly in our study region, the findings of this investigation will have implications for both invasive species management and policy.

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