

Western Society of Weed Science 64th Meeting, Symposium: "Ecological Effects of Invasive Plants", March 7-10, 2011, Spokane, Washington. p33[invited].

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Impacts of Exotic Plants in Natural Systems: Methods and Findings of Experimental Research.

Over 1,000 plant species have been reported as invasive in natural areas of the United States, and many of these cause substantial ecological and economic impacts. However, the broad spectrum of exotic plant species and the extent of invasions preclude comprehensive control and necessitate evaluation of species and population impacts to help prioritize management. We reviewed the literature for all exotic plant impacts research from 2001 to 2010 with the goal of synthesizing both the methods and findings of experimental research. Here we present the results of U.S.A. and Canadian studies. Overall we found 75 experimental impact studies conducted across 24 states and 2 Canadian provinces. Most experiments (57%) examined impacts on individual species, followed in descending order by impacts on community structure, ecosystem properties, and ecosystem processes. The research examined 76 exotic species; with C₃ annual grasses (20%) and perennial forbs (17%) the most frequently studied growth forms. Approximately half of all experiments were carried out in constructed communities, either in the field or greenhouse. Of the experiments conducted in natural systems, hardwood forests and grasslands were the predominant community types. Exotic plants caused a decrease in response variables in 39%, an increase in 12%, and had no significant effect in 49% of all experiments. Of the negative impacts, community properties (particularly plant and arthropod abundance and composition) were the most frequently affected, and ecosystem processes the least. Annual forbs led to disproportionately more and C₃ annual grasses disproportionately fewer negative impacts relative to their frequency across all experiments. Impacts were context-specific, varying among different exotic and native species, as well as environmental conditions. While methodologies are improving, future studies that examine impacts across multiple sites and address the effects of other interacting factors will strengthen our understanding of the consequences of exotic plant establishment and assist in developing effective management strategies.