Chapter 9
Mechanism of Invasion: How Non-Native Species Establish and Spread

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ABSTRACT

Invasive species, known as non-native species, are a significant global challenge due to their influences on ecosystems, economies, and human health. The mechanisms enabling these species to establish, spread, and disrupt ecological balance, emphasizing the importance of understanding their pathways, stages of invasion, impacts and provides a foundational understanding of invasive species. A detailed examination of the mechanisms facilitating invasion and give invasive species a viable edge over native flora. It also highlights the significant impacts like invasive plants modifying natural habitats. Recent studies highlight the importance in combating specific invasions and concludes that proper management and control measures, advocating for a proactive approach that combines prevention, early detection, and rapid response. Integrated strategies, such as biological control, habitat restoration, and public education, are emphasized as vital tools for mitigating the impacts of

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invasive species and protect global biodiversity in an increasingly interconnected and changing world.

1. INTRODUCTION

As opposed to native species, alien species are those whose presence in a particular location may be ascribed to deliberate or inadvertent human actions that enabled them to transcend biogeographical boundaries (Álvarez-Tostado et al., 2024). The basis for the categorization of invasive species is the rapid spread of a subset of alien species across large distances from introduction sites. Aliens that procreate often to create self-replacing populations are said to establish themselves. A second definition supported by the (IUCN), the World Trade Organization, and the Convention on Biological Diversity states that an alien species is only thought "invasive" if it has a detrimental effect on the environment, the economy, or human health (Wang, 2025).

North American grasslands have been altered by invading exotic species and other human changes to past processes and landscapes. By altering and decreasing the resources available to native species in affected habitats, exotic-invasive species may have an effect on biodiversity (Deeksha et al., 2024). Furthermore, invading species have the ability to exploit existing environmental changes and modify historical processes, endangering species that rely on them. In many grasslands, the mix of plant species has altered due to dominant alien grass species in particular (Świerszcz et al., 2024). Alterations in the nitrogen cycle, favorable growth circumstances, and modified grassland disturbances required to sustain plant variety are the means by which these changes are accomplished. Global biodiversity is being threatened by invasive species (Roy et al., 2024). In addition to causing indirect environmental consequences such altered litter characteristics, water and nutrient cycling, and climate regulatory services, invasive species may cause the extinction of whole species (Zhao & Riaz, 2024). Systems are affected by invasive grasses through changes in community composition and structure, competitive relationships between species, disturbance regimes (e.g., fire frequency and intensity), and ecosystem processes. These invasive species frequently occur in nature preserves, where they change fire regimes, decrease native plant biomass, alter the microhabitat structure, and negatively impact native plant communities (Dezotti et al., 2024). Due to their ability to adapt to a variety of environmental circumstances, invasive plants are also predicted to benefit from climate change.

The associations with blooming forb species, may have indirect interactions with pollination insects like bees. For instance, decreased native plant species diversity has been linked to abundances of the invasive, exotic, *Poa pratensis* L. and smooth