

# Chapter 1

# Ecological and Evolutionary Impacts of Invasive Grasses: Disrupting Ecosystems and Shaping Species Adaptation

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## **ABSTRACT**

*Invasive grasses exert profound ecological and evolutionary impacts on native ecosystems, altering species composition, disrupting trophic interactions, and modifying fire regimes. Their rapid proliferation outcompetes native flora, leading to habitat homogenization and biodiversity loss. These grasses drive evolutionary shifts in native species through selection pressures such as competition, hybridization, and*

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*altered soil microbiomes. Additionally, their influence extends to ecosystem processes, including nutrient cycling, hydrology, and carbon sequestration. This chapter synthesizes current research on the mechanisms by which invasive grasses reshape ecological dynamics and evolutionary trajectories, emphasizing case studies across diverse biomes. Understanding these impacts is critical for developing effective management strategies and mitigating biodiversity threats in a rapidly changing global landscape.*

## **1. INTRODUCTION**

Biological invasions by non-native species are among the leading causes of biodiversity loss and ecosystem degradation in the Anthropocene. While much attention has been devoted to invasive woody plants and aquatic weeds, the role of invasive grasses remains under-explored despite their significant and often cascading effects on terrestrial systems (D'Antonio & Vitousek, 1992; Pyšek et al., 2020). Grasses have been intentionally introduced across continents for forage improvement, erosion control, bioenergy crops, and land stabilization, often without fully considering their ecological consequences (Strömberg, 2011). Once established, these grasses can outcompete native vegetation, restructure trophic dynamics, and transform disturbance regimes, especially fire. Their impacts are not only ecological but also evolutionary, as they impose strong selection pressures on native species, drive hybridization, and even affect the evolution of the invasive species themselves (Maron et al., 2004). Despite these broad effects, invasive grasses have received disproportionately less attention in both the literature and policy frameworks, particularly in tropical and subtropical regions such as Sub-Saharan Africa, Southeast Asia, and South America. These areas, often rich in biodiversity and ecological complexity, are increasingly vulnerable to grass-driven habitat homogenization, fire amplification, and loss of ecosystem services (Hardy et al., 2025; Gaertner et al., 2009).

By situating invasive grasses within both ecological and evolutionary dimensions, we argue that managing grass invasions demands not only removal or containment strategies but also an understanding of long-term, system-wide change.

## **2. CHARACTERISTICS OF INVASIVE GRASSES**

Invasive grasses spread rapidly due to their fast growth, prolific seed production, and efficient dispersal through wind, animals, and human activity. Their adaptability allows them to thrive in diverse environments, withstand extreme conditions, and recover from disturbances. Competitive traits such as allelopathy, dense mat for-

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