

## Feature Review

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# The Role of Habitat Fragmentation in Facilitating Amphibian Invasions

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**Abstract** This study analyzed how habitat fragmentation affects amphibian invasion, including the formation of new habitats caused by fragmentation, the destruction of local biological communities, and the increase in opportunities for invasive species to spread. It explored the interaction between fragmentation and environmental stressors such as climate change, pollution, and disease, and how to further promote amphibian invasion. Taking the American bullfrog (*Lithobates catesbeianus*) as a case study, this study analyzes its invasion patterns globally and the role of fragmentation in its spread, and summarizes relevant management and protection strategies. It has shown that enhancing habitat connectivity, strengthening monitoring of invasive species, utilizing environmental DNA (eDNA) technology for early detection, and optimizing land use planning are effective response measures. This study can provide theoretical support for the prevention and control of amphibian invasion, and provide practical guidance for habitat management and biodiversity conservation.

**Keywords** Habitat fragmentation; Amphibian invasion; Ecological niche transformation; Biodiversity conservation; Intrusion Management

## 1 Introduction

Amphibian invasions are a growing concern globally, with significant ecological consequences. These invasions can lead to declines in native species through mechanisms such as competition, predation, and disease transmission, ultimately disrupting local ecosystems and biodiversity (Falaschi et al., 2020). The introduction of invasive species often results in altered community structures and can exacerbate existing environmental challenges, such as habitat degradation and climate change (Gallardo et al., 2016).

Habitat fragmentation is increasingly recognized as a critical driver of amphibian invasions. Fragmentation results in the division of continuous habitats into smaller, isolated patches, which can facilitate the spread of invasive species by creating new niches and reducing the resilience of native populations (Cushman, 2006). The effects of fragmentation are particularly pronounced in amphibians due to their specific habitat requirements and limited dispersal abilities, making them vulnerable to changes in landscape connectivity (Zheng, 2023). Understanding the role of habitat fragmentation in facilitating invasions is essential for developing effective conservation strategies and mitigating the impacts of invasive species on native amphibian populations (Belasen et al., 2019).

This study attempts to identify key patterns and mechanisms by which fragmentation affects invasion dynamics, and to reveal the extent to which habitat fragmentation promotes amphibian invasion. By integrating existing literature, it is expected to provide insights that contribute to conservation efforts and guide future research directions for more effective management and conservation of amphibian biodiversity in fragmented landscapes.

## 2 Mechanisms of Habitat Fragmentation

### 2.1 Definition and causes of habitat fragmentation

Habitat fragmentation can occur through natural processes such as geological events, but it is predominantly driven by anthropogenic activities. Human-induced fragmentation is primarily due to land-use changes, which include urbanization, agriculture, and infrastructure development. These activities lead to the division of continuous habitats into smaller, isolated patches, significantly impacting biodiversity and ecosystem functions (Cushman, 2006).