Invasive grasses increase fire occurrence and frequency across US ecoregions

Emily J. Fusco, John T. Finn, Jennifer K. Balch, R. Chelsea Nagy, and Bethany A. Bradley

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Significance

One of the most notorious impacts of nonnative, invasive grasses is the alteration of fire regimes. Yet, most evidence of these impacts comes from local-scale studies, making it unclear whether they have broader implications for national and regional fire management. Our analysis of 12 invasive grasses documents regional-scale alteration of fire regimes for 8 species, which are already increasing fire occurrence by up to 230% and fire frequency by up to 150%. These impacts were demonstrated across US ecoregions and vegetation types, suggesting that many ecosystems are vulnerable to a novel grass-fire cycle. Managing existing grass invasions and preventing future introductions presents a key opportunity to remediate the ecological and economic consequences of invasive species and fire.

Abstract

Fire-prone invasive grasses create novel ecosystem threats by increasing fine-fuel loads and continuity, which can alter fire regimes. While the existence of an invasive grass-fire cycle is well known, evidence of altered fire regimes is typically based on local-scale studies or expert knowledge. Here, we quantify the effects of 12 nonnative, invasive grasses on fire occurrence, size, and frequency across 29 US ecoregions encompassing more than one third of the conterminous United States. These 12 grass species promote fire locally and have extensive spatial records of abundant infestations. We combined agency and satellite fire data with records of abundant grass invasion to test for differences in fire regimes between invaded and nearby “uninvaded” habitat. Additionally,

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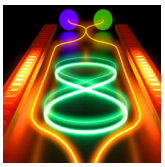

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we assessed whether invasive grass presence is a significant predictor of altered fire by modeling fire occurrence, size, and frequency as a function of grass invasion, in addition to anthropogenic and ecological covariates relevant to fire. Eight species showed significantly higher fire-occurrence rates, which more than tripled for *Schismus barbatus* and *Pennisetum ciliare.* Six species demonstrated significantly higher mean fire frequency, which more than doubled for *Neyraudia reynaudiana* and *Pennisetum ciliare*. Grass invasion was significant in fire occurrence and frequency models, but not in fire-size models. The significant differences in fire regimes, coupled with the importance of grass invasion in modeling these differences, suggest that invasive grasses alter US fire regimes at regional scales. As concern about US wildfires grows, accounting for fire-promoting invasive grasses will be imperative for effectively managing ecosystems.

invasive grass nonnative plant fire regime grass-fire cycle

Footnotes

↵[1]To whom correspondence may be addressed. Email: efusco@cns.umass.edu.

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The authors declare no competing interest.

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