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Symposium

Measuring the Effects of Invasive Plants on Ecosystem Services: Challenges and Prospects

Valerie T. Eviner, Kelly Garbach, Jill H. Baty, and Sarah A. Hoskinson *

Abstract

Plant invasions can have large effects on ecosystem services. Some plant invaders were introduced specifically to restore key services to ecosystems, and other invaders are having unintended, detrimental effects on services, such as the quantity and quality of water delivered, flood control, erosion control, and food production. Many ecosystem services are difficult to measure directly, and although there are extensive studies on plant invaders and ecosystem processes, a number of challenges prevent us from confidently extrapolating those processes as proxies for services. To extrapolate local, short-term measures of processes to ecosystem services, we must: (1) determine which processes are the key contributors to a service, (2) assess how multiple processes interact to provide a given service, (3) determine how vegetation types and species affect those processes, and (4) explicitly assess how ecosystem services and their controls vary over space and time, including reliance of ecosystem services on “hot spots” and “hot moments” and a minimum size of a vegetation type in the landscape. A given invader can have positive effects on some services and negative effects on others. It is important to consider that, in some systems, shifting environmental conditions may no longer support native species and that invasive species may be critical contributors to the resilience of ecosystem services.

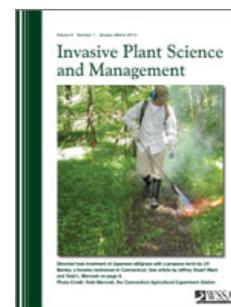
Management Implications: There is increasing interest in managing for multiple ecosystem services, but ecosystem science cannot yet provide the information needed by managers to select management approaches that can reliably provide a given service at a given site, or even to reliably measure the effects of management practices on some services. Few studies have quantified the effects of invasive species on ecosystem services (the benefits provided to humans), although many have documented effects on ecosystem processes, which are the fundamental drivers of services. In order to use ecosystem processes as proxies for estimating ecosystem services, we must:

1. Understand which processes are key contributors to a service
2. Assess how multiple processes interact to provide a service
3. Determine how vegetation types and species affect those processes, and
4. Understand how ecosystem services and their controls vary over space and time.

This approach will improve our ability to measure and predict the effects of invasive

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plants, improving our criteria for prioritizing invasive species management. It is important to consider that invaders can have positive effects on some services and negative effects on others, relative to native species. Invasive species may degrade some systems, but in others, shifting environmental conditions may no longer support native species, making invasive species critical contributors to the resilience of ecosystem services.

Key words: [Carbon sequestration](#), [climate regulation](#), [context dependence](#), [ecosystem processes](#), [erosion control](#), [invader effects](#), [net primary productivity](#), [nutrient supply](#), [plant community composition](#), [resilience](#), [soil fertility](#), [spatial scale](#), [temporal scale](#), [water supply](#), [water quality](#)

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