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Editorial: Landscape management can promote socioecological benefits and leverage environmental markets

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Editorial on the Research Topic

[Landscape management can promote socioecological benefits and leverage environmental markets](#)

Introduction

Forested landscapes around the world face ever growing challenges in restoring resilience in the face of climate change. Large-scale disturbances, including wildfires and insect infestations, continue to grow in magnitude and destructiveness. Wildfires specifically pose major risks to human life and wellbeing. At the same time, forested landscapes produce innumerable benefits for society, including climate regulation through carbon sequestration, recreational opportunities, water provisioning, wood products, and more. The continued and reliable provisioning of these benefits relies on forested ecosystems that are resilient and healthy. However, achieving and maintaining resilience is costly, and requires considerable investment in landscape restoration activities.

Public lands in particular provide numerous opportunities for conservation work, and the environmental benefits they deliver to communities are well-documented. Forest management and landscape restoration on public lands is primarily funded by governments. The scale of restoration work needed is considerable. As a result, the funds required to perform the work oftentimes are beyond the reach of any one agency or organization. Important work that could reduce the risk of catastrophic wildfire, improve the provisioning of environmental benefits, and enhance overall forest resilience goes unattended, potentially putting the lives and wellbeing of current and even future generations at risk.

Given the high stakes of sustaining forests into the future, considerable attention is being paid to efforts that scale up the quantity and rate of restoration work being accomplished through traditional and non-traditional funding sources and payment mechanisms. Specifically, a diversity of public and private entities across the globe are collaborating on creating and enhancing functioning markets for

environmental benefits that can facilitate new pathways for private investment into landscape restoration. In many countries, markets for environmental benefits have been established, though in many cases they are still emerging.

Research has a crucial role to play in developing and demonstrating methods and tools to credibly quantify costs and benefits in a manner that can support and bolster environmental markets and conservation finance. Demonstration landscapes have become an effective sandbox for research as a means of development and testing methods and tools to support real-time management and restoration activities. One such landscape—the Tahoe Central Sierra Initiative (TCSI), a 1-million-hectare landscape in the central Sierra Nevada, California, USA—inspired this Research Topic, including three of its papers. TCSI was established with the intention of reducing the risk of wildfire, improving forest health and sustainability, and serving as a demonstration and innovation landscape from which other landscape restoration projects could benefit. The development and implementation of conservation finance mechanisms is becoming a necessary element of large and complex landscape restoration efforts, particularly those dominated by public lands, such as TCSI.

Advancing research on environmental markets

We established the Research Topic, “*Landscape management can promote socioecological resilience and leverage environmental markets*” to solicit innovative approaches to estimating benefits and costs generated by investments in forest management and examine how those benefits may be used to expedite management activity and improve forest conditions. The goal of this Research Topic was to advance understanding of the linkages between forest health, landscape resilience, public and private benefits, environmental markets, and conservation finance. The studies presented cover a wide range of benefits, highlighting the importance of climate regulation and potential for emerging markets for carbon, water, and high value services.

Private investment has substantial potential to fill gaps in funding levels related to landscape investment. Though markets are emerging for water, biodiversity, and other environmental benefits, carbon management and land acquisition for conservation continue to dominate the field. This may be because of the more advanced nature of these markets, and the relative ease with which projects can contribute to those markets. Proximity and access to benefits is one factor affecting environmental markets. Another key factor is the ability to identify and quantify costs, benefits, and benefactors in a credible, feasible, and repeatable manner.

The topics covered in the Research Topic address many different aspects of how to quantify costs, benefits and benefactors associated with forest and landscape management toward the development of environmental markets. The seven papers in this Research Topic advance the study of metrics used to assess management costs and benefits on forested landscapes across multiple categories of benefit, with the most prevalent benefit

addressed being carbon sequestration. [Elias et al.](#) cover aspects of financing carbon sequestration projects, and [Yackulic et al.](#) show how conservation activities can stabilize carbon dynamics on forested landscapes. [Chen et al.](#) consider many ecosystem services impacted by bark beetle outbreaks, including carbon sequestration. [Guo and He](#) perform an optimization exercise that focuses on carbon. [Barker et al.](#) examine the costs of activities related to forest management, notably pile burning. [Wiarta et al.](#) look at changes in mangrove cover, which has clear implications for multiple ecosystem service-related benefits. [Peng et al.](#) look at another important benefit category, scenic values, in their analysis of cherry blossom sites. Finally, [Manley et al.](#) address the concept of return on investment (ROI) as it is being applied to forest management and landscape restoration, and how it could be strengthened to better reflect the diversity of values inherent in forest ecosystems and thereby foster environmental markets for bundled ecosystem benefits.

This Research Topic advances our understanding of environmental markets for forest management and landscape restoration on public lands, but it also highlights the need for continued and increased investment in research and policy development. Uncertainty commonly cripples market investments, and as a planning tool, ROI can be used to create strong linkages between landscapes and investors, but it must be based on credible estimates of benefits and costs. Future work directed at the incorporation of uncertainty into valuation estimates, coupled with the expansion of methods and applications of new approaches to enrich representations of system dynamics (e.g., prospect theory) and values (e.g., bequest values), is likely to have the greatest impact on helping environmental markets meet the needs of society now and into the future.

Author contributions

MS: Conceptualization, Project administration, Validation, Writing – original draft, Writing – review & editing. PM: Conceptualization, Project administration, Validation, Writing – original draft, Writing – review & editing. SE: Conceptualization, Project administration, Validation, Writing – original draft, Writing – review & editing.

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