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Effective control of biological invasions requires considering humans as a part of the invaded landscape

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Controlling biological invasions has become one of the key priorities in environmental management to protect biodiversity, ecosystem functioning and human well-being. Scientists and environmental managers typically seek ecological solutions to problems caused by biological invasions. However, some ecosystems or landscapes are more vulnerable to biological invasions than others because of the characteristics of the local social system, such as landowners' willingness to control invasive species. Thus, social factors could provide an important lever for improving the success of managing biological invasions.

In this study, we use social survey data and social-ecological modelling to estimate how the success of controlling invasive plant species is influenced by social factors relating to individual local landowners, such as attitudes and beliefs, social interactions and economic ability to participate in control efforts. Our approach is based on allowing the diverse, adaptive behaviours of landowners to interact with the dynamics of biological invasion. The collective success of landowners' individual control efforts is measured by their capacity to decrease the density and area of invasion at landscape level.

Using New Zealand's conifer invasion as a case study, we found that social factors can determine the success of invasive species control to the extent that higher-level management strategies, such as early detection of the invasion, become irrelevant. However, successfully leveraging social context in invasive species management requires researchers to have extensive knowledge about differences in landowners attitudes, capacity to control invasive species, and the ways landowners adapt their behaviors in response both to other landowners´ actions and invasion dynamics.

Our research shows that lack of consideration for social factors and for local landowners' social-ecological interactions can lead to suboptimal management programs and irreversible environmental changes. Social-ecological perspectives on biological invasions will significantly improve our ability to manage biological invasions.

Uncontrolled spread of conifers threatens New Zealand's natural landscapes and conservation outcomes. Photo: Manaaki Whenua / Bradley White.

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