



Collective action in invasive species control, and prospects for community-based governance: The case of serrated tussock (*Nassella trichotoma*) in New South Wales, Australia

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ABSTRACT

Responsibility for solving collective action problems in invasive species control has conventionally been assigned to government. The large continuing costs arising from invasive species demonstrate the limitations of government-centred (monocentric) approaches to governance in this domain, and indicate a need for polycentric alternatives which complement government capacities with those of landholders and their community organisations. We sought to add to existing knowledge about collective action problems for invasive species management, and to explore the potential for community-based, polycentric approaches to improve management in this domain, through workshops and a survey of landholders regarding the weed serrated tussock (*Nassella trichotoma*) in two regions of New South Wales, Australia. Serrated tussock threatens the private interests of a substantial proportion of landholders in the two regions. Private landholders recognise how management of this weed on their own properties poses a collective action problem, where success is dependent on the diligent control efforts of neighbouring private and public landholders. They are more likely to consider issues relating to horizontal social capital (e.g. relationships with public and private neighbours) as barriers to effective serrated tussock control on their own property, than issues relating to information and education about this species. Community-based approaches to this weed have the potential to improve its management across the landscape, and a great majority of private landholders appear willing to participate in such a program. Such an approach will require the active participation of public land managers, continued coercion of non-cooperative landholders, and can be developed from the foundation of existing institutional arrangements for land management, taking into account unique regional relationships and characteristics. It should complement and build on, rather than replace existing legislative, research, and extension approaches.

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1. Introduction

Invasive species cause serious socio-economic damage around the world, and threaten biodiversity and ecosystem function (McLeod, 2004; Low, 2009; Driscoll et al., 2014). Climate change, globalisation, and human activity cause ever-increasing numbers of species to move to new regions (Lodge et al., 2006; Epanchin-Niell et al., 2010). The global significance of these challenges is recognised by target 15.8 of the 2015 Sustainable Development Goals: 'by 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water

ecosystems, and control or eradicate the priority species' (Osborn et al., 2015).

The annual economic damages of invasive species in the USA have been estimated at \$US120 billion, while around 42% of species on that nation's threatened or endangered species lists are primarily at risk due to invasive species (Pimentel et al., 2005; Driscoll et al., 2014). In Australia, the focus of this article, the annual costs imposed by invasive plant and animal species have been estimated at \$AUD4 billion (Sinden et al., 2004) and \$AUD1 billion (NLWRA and IACRC, 2008), respectively.

The benefits of controlling invasive species typically constitute a collective good (Ravnborg et al., 2002; Ravnborg, 2004). Despite beneficiaries sharing a common interest in seeing an invasive species controlled, the 'often taken for granted' presumption that each beneficiary necessarily has a self interest in contribut-

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ing towards control efforts is mistaken (Olson, 1965, p.1). The propensity of members of invasive species populations to traverse property boundaries means that control efforts on any one property confer benefits to other properties, although landholders normally lack legal rights to seek recompense for their efforts. It means also that lack of control on any property imposes costs on other properties, and it is normally infeasible for landholders to seek compensation for these costs. These symmetric externalities create a collective action dilemma by encouraging self-interested landholders to undertake less control than is in their common interest, unless they trust other landholders to reward (punish) them in-kind by reciprocating their control (lack of control) efforts (Pannell et al., 2006; Marshall, 2009).

Achieving mutual trust among landholders is often challenged considerably by the temptation that each faces to ‘free ride’ on others’ control efforts. The problem of collective action in these circumstances thus involves establishing sufficient mutual trust to motivate an effective aggregate level of reciprocal control effort (Marshall, 2002). In the absence of this trust, individuals will expect the outcomes of controlling an invasive species on their own properties to be diminished at best, or futile at worst, due to reinfestation from uncontrolled populations on neighbouring lands.

Responsibility for solving collective action problems in invasive species control has conventionally been assigned to government. However, the large continuing costs arising from invasive species demonstrate the limitations of government-centred (monocentric) approaches to governance in this domain, and indicate a need for polycentric alternatives able to complement government capacities with those of landholders and their community organisations. The complexity of identifying what form such alternatives should take in particular settings requires policy makers and researchers to broaden their focus in solving invasive species problems from one that has primarily been technological (with the government-centred approach to governance taken as given) to one that concurrently explores opportunities for institutional innovation. Ravnborg et al. (2002) observed accordingly that ‘the search for alternative solutions or management practices [in invasive species control] cannot be seen as a purely technical endeavor, taking into consideration only the technical effectiveness and the economic and financial aspects of potential solutions. Alternative solutions must also include mechanisms that stimulate and facilitate coordinated or collective management at various levels’ (see also Marshall, 2011).

The focal invasive species challenge in this article is control of the weed serrated tussock (*Nassella trichotoma*) in two regions of New South Wales, Australia. Our goal is to add to the limited pool of existing knowledge about collective action problems, and prospective governance solutions, in this domain.

The remainder of the article is organised as follows. Section 2 presents a review and synthesis of literature on the challenge of collective action in controlling invasive species, and options for more effective governance responses (including community-based approaches) to this challenge. Section 3 provides details of: the serrated tussock control problem in Australia; the two case-study contexts; and the research method (involving telephone interviews of landholders, as well as stakeholder workshops in each of the two regions). Section 4 presents findings from the survey and workshops, which are discussed in Section 5. Concluding remarks are offered in Section 6.

2. The collective action problem in invasive species control

2.1. The government-centred response

The net private benefits that landholders expect from their own contributions to invasive species control are affected posi-

tively by their trust that surrounding landholders will reciprocate their contributions. Where individuals monitor and sanction (i.e., reward or punish) each other’s reciprocation, a virtuous cycle of trust-building can develop such that they become more willing to reciprocate others’ actions as a means of enhancing their reputation for trustworthiness in the eyes of their peers (Ostrom, 1998). Sanctioning in these circumstances typically involves social inclusion as a reward, or social exclusion as a punishment (Marshall, 2004).

For the kinds of large-group problems of collective action normally encountered in managing invasive species, it can be difficult for individuals themselves to directly monitor and sanction each other. The time and cost involved in attempting to monitor and sanction the control efforts of all surrounding landholders poses a real obstacle, as does the practical (and legal) difficulty of accessing their properties to enable monitoring beyond the property boundary. Monitoring each property by multiple surrounding landholders can also be inefficient. Moreover, inter-landholder monitoring and sanctioning of this kind can endanger local relationships that are important to maintain for current social cohesion and future shared problems. No matter how well-meant, encouragement from one landholder to another to strengthen control efforts can be seen as a reproach and create conflict (Ravnborg et al., 2002; Marshall, 2004).

Often, therefore, a key element in promoting collective action in such settings is governance by a third party. Third-party governance of this kind meets the need identified by Ravnborg (2004 p. 1) ‘to create institutions through which to encourage neighbouring farmers to participate in coordinated pest management so that the individual farmer does not need to approach his or her neighbours’. Whether self-organised by the group or provided by some external entity, such governance can increase the likelihood of free riders being identified and sanctioned and thus of achieving the levels of collective action required for effective invasive species control (North, 1990; Marshall, 2005).

The conventional approach to solving collective action problems in controlling invasive species presumes that government should monopolise the third-party governance role. To perform this role, governments tend to enact laws requiring landholders to control defined invasive species on their properties, and create and resource agencies by which compliance can be monitored and enforced (Parsons and Cuthbertson, 2001; Graham, 2013). In support of this approach, governments provide: research and development (R&D) programs to provide landholders with the technology required to enable compliance; extension programs to ensure landholders are aware of this technology, their legal obligations, and the consequences of non-compliance; and sometimes also financial incentives for private landholders to adopt control technologies (Auld et al., 1987; Smith, 1987; Carter, 2000; Simberloff et al., 2005; Graham, 2013). Government interventions in invasive species control therefore involve a particular way of organising collective action, rather than providing a substitute for collective action as implied by some authors (e.g. Graham, 2013).¹

As noted above, major challenges in invasive species control persist despite decades of this conventional, government-centred approach. Compliance with laws and regulations has often not been at the levels required, in part due to the reluctance of governments to enforce laws that challenge agrarian fundamentalist presumptions regarding the primacy of private property rights (Bromley, 1996). Associated with this has been insufficient government pro-

¹ For Graham (2013) the term *collective action* was interpreted narrowly in the context of weed control as *community-based* collective action in the form of landholders cooperating by: adopting control practices on their own properties; sharing information with one another; providing support to other landholders (e.g. encouragement, advice, labour); and applying peer pressure on others to adopt control practices.

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