Perennial pasture conflicts: is there a way through?

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Summary Buffel grass (Cenchrus ciliaris and C. pennisetiformis) is an exotic perennial grass. Many cultivars have been introduced to rangeland Australia over the past century, including several that have been actively promoted for pasture. It is widely naturalised and is now one of the most important pasture species in rangeland Australia, with a net present value exceeding $1.5 billion over a 60 year period. However, it is also widely recognised as one of the greatest environmental threats, especially through impacts on biodiversity and fire cycles. As such, it is a quintessential example of where conflicting interests between users (in this case pastoralists) and the environmental sector have prevented constructive progress towards mitigating environmental impacts. As a direct result of conflicts, there are no national or state/territory strategies to mitigate environmental impacts, on ground actions are generally limited and underpinning research lacks strategic direction. We discuss the nature of the conflict, and identify steps that could be taken to move the debate to a more constructive footing.

Keywords Cenchrus ciliaris, buffel grass, social conflict, perennial grasses, environmental weed, pasture grass.

INTRODUCTION Buffel grass (Cenchrus ciliaris L. and C. pennisetiformis Hochst. & Steud. ex Steud.) are exotic perennial grasses. Many cultivars have been introduced to rangeland Australia over the past century, including several that have been actively promoted for pasture. Although widely planted, buffel grass has also become established across over 3 million ha through natural spread (Chudleigh and Bramwell 1996), which is often assisted by disturbance from flood, fire and heavy grazing. Its ‘reach’ in the landscape is illustrated by the high proportion of some land systems that have already transformed into buffel-dominated grasslands (Table 1). This level of coverage by an exotic species is extraordinary. Furthermore, predictions based on climate and soil type requirements suggest 68% of Australia is suitable or highly suitable for buffel grass establishment (Lawson et al. 2004).

Buffel grass is now a key pasture species in rangeland Australia and, arguably, one of the key environmental threats. As such, it is a prominent example where unresolved conflicts between the positive and negative impacts of an exotic species have resulted in limited actions to mitigate its negative environmental consequences. In this paper we give a brief overview of the benefits and costs of buffel grass, the current perspectives on buffel grass as a weed, and offer a potential solution for moving towards a more constructive position on buffel grass.

POSITIVE PASTORAL IMPACTS Buffel grass is now one of the most important pasture species in rangeland Australia, with an estimated net present value exceeding $1.5 billion (1960–2020) (Chudleigh and Bramwell 1996). Benefits include increased productivity for cattle and sheep and soil conservation. Buffel grass has also been valuable for rehabilitating land degraded through over-stocking and mining, and for dust-suppression.

NEGATIVE ENVIRONMENTAL IMPACTS Although not well studied, numerous individual studies, together with anecdotal observations, suggest that the environmental impacts of buffel grass are wide-ranging and severe. Many of the impacts are a result of replacement of the existing herbaceous layer and/or increased frequency and intensity of wild-fires that are caused by enhanced biomass and late-curing. For example, buffel grass is listed as posing a threat to ANZECC-rated rare and threatened plants species (Groves et al. 2003), to diverse and extensive woodlands (Fensham and McCosker 2000, Miller 2003) and to wetlands (INRMP-NT 2005), and has caused

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<th>Table 1. Proportion of land dominated by buffel grass for the top three buffel-dominated land systems within the Ashburton Catchment, Western Australia (Payne et al. 2004). Range expansion was largely the result of a large flood in 1997.</th>
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<tbody>
<tr>
<td>Land system</td>
</tr>
<tr>
<td>Ashburton</td>
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<td>Nanyarra</td>
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<td>Cheela</td>
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the decline of all native growth forms (nine classes of ground layer species) and species richness at Simpsons Gap NP (Clarke et al. 2005). Buffel grass has also been identified as a threat to several endangered animal species, including Slaters skink, the desert sand skipper and land snails (Pavey 2002a, 2002b, Wilson and Pavey 2002). Also, long-term successional changes resulting from nutrient decline are likely, especially in grazing systems.

Furthermore, these negative impacts may be exacerbated because the genetic diversity and physical variability of buffel grass suggests that the grass is capable of change and adaptation to local conditions.

NEGATIVE PASTORAL IMPACTS
In addition to environmental impacts, there are also several documented concerns regarding the sustainability of a production system that is heavily reliant on buffel grass. Some of these risk factors were identified in a recent Queensland Department of Primary Industries buffel grass symposium (Kyte et al. 2000), but their consequences remain poorly understood and quantified. They include soil nutrient rundown resulting in successional change to less productive systems, susceptibility to disease, including a root disease that has resulted in the widespread decline in buffel dominance in parts of America, and increasing dominance in areas where greater pasture diversity is desirable. In addition, there is the potential risk that strong selective pressure may result in less palatable buffel grass cultivars invading or hybridising with existing productive buffel pastures, thereby lowering carrying capacities.

CURRENT STATUS AS A WEED
Buffel grass was identified by Humphries et al. (1991) as a category one weed (a terrestrial species capable of destroying an ecosystem), with an extensive continental distribution. It is also widely recognised as a serious threat in specific regions across Australia (Table 2). However, it was not among the 71 species considered under the Weeds of National Significance process (Thorpe and Lynch 2000). Furthermore, it is only one of four species (all pasture grasses) that were listed by Humphries et al. (1991) as Category 1 weeds but were not listed as one of the 20 Weeds of National Significance. Buffel grass is also conspicuously absent from most state and territory weed strategies.

We believe that there are at least three impediments to buffel grass being recognised as an important environmental threat. These are: i) the social conflicts between pastoral and environmental interests; ii) the view that the environmental threats are insurmountable, and therefore not worth investment, and; iii) the converse view that buffel is not a sufficient threat as it has not been identified in various prioritisation processes.

Furthermore, we believe that the direct results of these impediments include:
- lack of national or state/territory strategies (and action) to mitigate environmental impacts;
- on-ground actions, which often require coordinated acts by neighbouring land managers, frequently being impeded through unresolved conflicts; and
- research into impacts and management lacking in strategic direction.

BREAKING THE NEXUS
Buffel grass is both a key pasture species and an important environmental threat in rangeland Australia. Consequently, there are conflicts between stakeholders that have so far prevented efforts to ensure its sustainable use while simultaneously minimising environmental threats. We believe a national strategy for buffel grass is required. However, such a strategy needs to be founded on a fairly good understanding of what the management tool-kit would look like, an understanding of the attitudes regarding buffel grass and its management across Australia, and quantification of the costs and benefits of buffel grass. We discuss each of these in turn.

Determination of management options
To our knowledge there has been no specific research in Australia to develop tools for managing the negative impacts of buffel grass. There is, however, a wealth of anecdotal and experiential knowledge with regards to the effects of different types of fire, grazing practices, and mechanical and herbicide use on buffel spread and dominance. In addition, there is potentially a wide range of options that rely on limiting its use or movement, such as limiting the movement of particular less-palatable buffel grass cultivars, or preventing the use of buffel grass adjacent to environmentally protected areas. Identifying the range of feasible management tools, and their limitations, is necessary in order to determine what can be done to mitigate widespread impacts and to assess what management options are likely to receive community support. It will also be an important step in identifying knowledge gaps and research priorities.

Attitude-mapping of stakeholders
We believe that the main impediment to constructive progress on buffel grass is a sociological one. Anecdotal evidence suggests there is a wide diversity of opinion within and across regions regarding buffel grass, including within both the pastoral and conservation sectors. The
attitudes of stakeholders across Australia towards buffel grass, and towards the available management options (see above) should therefore be assessed, through the use of both qualitative and quantitative sociological techniques. Results from such a study could be used to identify areas of agreement and conflict, and thereby enable progress on areas of agreement and help to narrow down areas of contention.

**Cost and benefits** As already identified in a preliminary way in this paper, the social, environmental and economic costs and benefits of buffel grass are very large, and are likely to become increasingly so into the future. These need to be further quantified in order to inform resource and policy decisions. This is especially the case for environmental costs, potential risks and costs to pastoralism, and the social costs and benefits of buffel grass, all of which have so far received little attention.

**National strategy** National strategies have proven highly effective in focusing resources and efforts onto key problems (Thorpe and Lynch 2000). A national strategy, agreed upon by all key stakeholder groups, is therefore likely to provide a platform for constructive progress on buffel grass. Such a strategy must address the twin aims of both sustainable production and the mitigation of environmental impacts, and must include a set of short to long-term priorities for policy development, for addressing knowledge-gaps and for on-ground management.

**CONCLUSIONS** Buffel grass is probably one of the more extreme examples where conflicting values and views within the community impedes constructive progress in addressing a recognised weed problem. This class of problem is commonly encountered, for example in water-use issues, conservation reserve planning and salinity. The

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<th>Region</th>
<th>Plan</th>
<th>Statement</th>
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<tr>
<td>Arid Lands (SA)</td>
<td>Draft Pest Management Strategy</td>
<td>Buffel grass was the only weed species identified as a ‘very high weed risk’ (in five of six bioregions)</td>
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<td>Rangelands (WA)</td>
<td>NRM Strategy</td>
<td>Buffel grass is widespread throughout the Region and is used for soil stabilisation, dust suppression and reducing erosion and provides significant productivity benefits to pastoralists but it also an environmental weed of concern. It can also have a secondary impact of increasing the frequency and size of wildfires. [Its wholesale removal is probably impractical. Management solutions are [therefore] needed that provide biodiversity outcomes for productivity and biodiversity. There may however, be particular circumstances where eradication […] in localised areas is necessary to protect high value biodiversity assets.</td>
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<tr>
<td>Northern Territory</td>
<td>NRM Strategy</td>
<td>Buffel grass is listed as an ecologically invasive species. It has been deliberately introduced as a major pasture species and for dust suppression in central Australia, and has significantly spread outside its original area of use, replacing native plants and increasing fire fuel loads.</td>
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<tr>
<td>Uluru-Katu Tjuta NP</td>
<td>NA</td>
<td>Buffel grass is the most threatening weed in the Park and has spread to invade water and nutrient rich drainage lines. Where infestations are dense, it prevents the growth of native grasses – a source of food for animals and humans.</td>
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<tr>
<td>Fitzroy (Qld)</td>
<td>NRM Strategy</td>
<td>Buffel is the most important production asset to the grazing industry in Central Qld. Its ability to spread rapidly by seed and increase available feed also makes it a threat to biodiversity in some locations. The shift to a simplified vegetation community or structure, [which] tends to happen with the introduction of buffel […] reduces habitat diversity and also causes a decline in native fauna diversity. In uncollapsed communities of briselow and gidgee, buffel grass can greatly increase […] fuel loads which can dramatically increase the risk of fire. Since brigelow and gidgee communities are susceptible to long-term damage as a result of fire, the expansion of buffel grass in remnant communities is an issue in managing protected areas.</td>
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Table 2. Examples of how buffel grass is viewed in regional-level planning documents.
initial identification of, and focusing on, points of agreement as a way making constructive progress has proven a useful methodology for tackling these issues (S. Hatfield Dodds, CSIRO, pers. comm.). We believe the same will be true for buffel grass.

REFERENCES


Groves, R.H., (Convenor) and 13 others. (2003). ‘Weed categories for natural and agricultural ecosystem management’. (Bureau of Rural Sciences, Canberra).


