Buffel grass in South Australia: Progress and future directions

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Summary Buffel grass is arguably the greatest invasive species threat to biodiversity across the Australian arid zone. It transforms ecosystems, forming dense monocultures, displacing native plants, altering habitat structure and diminishing resources that support arid zone fauna. Buffel grass invasion negatively impacts upon aboriginal culture and increases the frequency and intensity of bushfires.

In South Australia scattered populations are widely distributed across the north, with extensive infestations in the far north. The South Australian buffel grass strategic plan 2012–2017 provided a roadmap for buffel grass management and its successful implementation has seen some significant advances. Key challenges for the future are increased stakeholder engagement, improving distribution knowledge, maintaining funding and managing extensive, remote infestations.

Keywords Conflict species, stakeholder engagement, zoned management.

BACKGROUND

Buffel grass (*Cenchrus ciliaris* L.) is a perennial tussock grass native to Africa, India and Asia. Since its introduction into central and northern Australia for pasture improvement and dust control, buffel grass has spread widely across many landscapes. It is an ecosystem transformer (Bastin *et al.* 2008) capable of radically altering the species composition richness of Australian rangelands following invasion.

Buffel grass is considered one of Australia's worst environmental weeds (Humphries *et al.* 1991). It has been shown to increase the intensity and frequency of fires in native plant communities (Butler and Fairfax 2003). It is able to rapidly regenerate after fire and suppress regeneration of native species, generating positive fire invasion feedbacks (Miller *et al.* 2010). Numerous studies have shown that the cover of buffel grass is negatively associated with species richness (e.g. Clarke *et al.* 2005). High buffel grass densities are thought to lead to ongoing declines in species richness as the seed banks of native forbs and grasses are gradually depleted (Clarke *et al.* 2005).

Some specialist seed eating birds, such as finches and some parrots, do not include buffel seed in their diet and are relatively rare in buffel dominated landscapes (Franks *et al.* 2000). Endangered fauna species in northern South Australia threatened by buffel grass include black-footed rock-wallabies, great desert skinks, and mallee fowl as well as a suite of other birds such as chestnut quail thrush, dusk grass wren, and striated grass wren (Paltridge *et al.* 2009).

Buffel grass is recognised as a major threat to Country, negatively impacting Aboriginal cultural values and practices, including hunting and gathering through its impacts on key species as well as significant sites.

Buffel grass has a wide climatic tolerance and establishes on a range of soil types under various disturbance regimes, quickly forming self-sustaining populations (Franks 2002). The highly varied morphological and physiological characteristics of buffel grass across Australia contribute to this adaptability. Pasture introduction programs have brought in approximately 580 accessions, with many informal and formal releases in central, tropical and sub-tropical Australia (Hall 2000). Modelling suggests that the vast majority of South Australia is likely to be suitable for establishment of buffel grass (Marshall and Hobbs 2010), and more broadly 60% of mainland Australia may be suitable for buffel grass establishment (Lawson *et al.* 1994).

The difficulties and problems posed by buffel grass are compounded by its perceived benefits and widespread use as a pasture species. Buffel grass pasture is well regarded by many central and northern Australian cattle producers because of its palatability, responsiveness to limited rainfall, ability to colonise

and its tolerance to drought, fire and heavy grazing (Fairfax and Fensham 2000). As with other 'conflict species', many of the same attributes contribute to the significance of buffel grass as both a pasture species and an environmental weed. These include ease of establishment, rapid growth rate, fast maturation, prolonged flowering periods, prolific seed production and high seed dispersal ability, coupled with relatively long seed dormancy (Franks 2002).

However, as well as evaluating the perceived value of buffel grass for livestock production with reference to its serious environmental and social impacts, there is a need to critically examine beliefs regarding its benefits. There is growing evidence that it may be nutritionally inadequate as the main dry feed for adult stock (Reseigh *et al.* 2014, NR SAAL 2017). Furthermore, it can lead to pasture degradation in the long term. While it responds to out of season rain when native species remain dormant (Hall 2000), it also displaces a large range of short-lived native grasses and forbs that are important in fattening cattle (Puckey and Albrecht 2004). Lack of diversity in pastures can limit the nutritive value available to stock during dry periods. Once buffel grass reaches high densities and displaces valuable native forage, reversing this process is extremely challenging. Buffel grass also has a high demand for available soil nitrogen and phosphorus. Over time, depletion of these nutrients leads to pasture 'run-down', with an associated decline in cattle live-weight gain (Puckey and Albrecht 2004). Buffel grass also contains oxalates and can cause acute oxalate poisoning in ruminants, most often in young and hungry sheep (Thomas 2004).

SOUTH AUSTRALIAN RESPONSE

To provide a coordinated response to buffel grass, in 2012, South Australia developed the State Buffel Grass Strategic Plan 2012–2017 (Biosecurity SA 2012), and formed the Buffel Grass Taskforce. The Taskforce comprises representatives with experience in weed policy and management from regional Natural Resource Management (NRM) authorities, Biosecurity SA, other state government agencies, conservation organisations, as well as ecologists and researchers. The Taskforce oversees and coordinates the plan, which aims to contain and effectively manage buffel grass to minimise its impact in South Australia.

To achieve this vision the plan took a zoned approach to guide state-wide planning and management (Figure 1). The use of a zoned approach recognises that while management of an invasive plant depends on local needs and priorities, these will be much more effective and efficient when they are part of a broader scale strategic approach (e.g. Grice *et al*. 2011). The zones were informed by a risk assessment in combination with expert knowledge and distribution data. The 2012 assessment determined a high weed risk in grazing rangelands and native vegetation, but also suggested a high feasibility of containment in the former and very high in the latter.

Based on this, the four goals of the plan were:

1. exclude the entry of buffel grass into South Australia and prevent its movement within the State;
2. manage impacts of buffel grass in Zone 1;
3. contain spread of buffel grass in Zone 2, and destroy infestations in Zone 3; and
4. build capacity to manage buffel grass.

In 2013, the Taskforce was successful in obtaining funding for the three-year Buffel Grass Control in Arid Rangelands Project. The Project included delivery of a number of strategic surveillance, control and capacity building activities, herbicide trials and development and dissemination of best practice buffel grass management tools. Specific outcomes include:

- strategic control of over 300 ha of buffel grass outlier infestations;
- herbicide research and a report identifying best practice options for control;
- five best practice management fact sheets (identification, hygiene, herbicides, integrated control, management planning) http://www.pir.sa.gov.au/biosecurity/weeds_and_pest_animals/weeds_in_sa/weed_id/plant_id_notes/buffel_grass
- over 4600 km of roadsides surveyed, documenting distribution and spread of buffel grass;
- a GIS database and control prioritisation tool; and
- community engagement activities involving over 270 stakeholders and media.

A major factor in the success of the Project was engagement of a dedicated Buffel Grass Coordinator, tasked with implementing the strategic plan and coordinating efforts of NRM regions, with support from the Taskforce.

Another success has been the declaration of buffel grass under South Australia's *Natural Resources Management Act 2004*. This prohibits sale and transport of buffel grass, and allows NRM regions to enforce control or destruction of infestations. At present no other Australian states or territories have regulated buffel grass under their legislation. This is likely to be in large part due to the different perceptions of buffel grass in those jurisdictions and overwhelmingly favourable views of it, particularly in summer rainfall production areas.

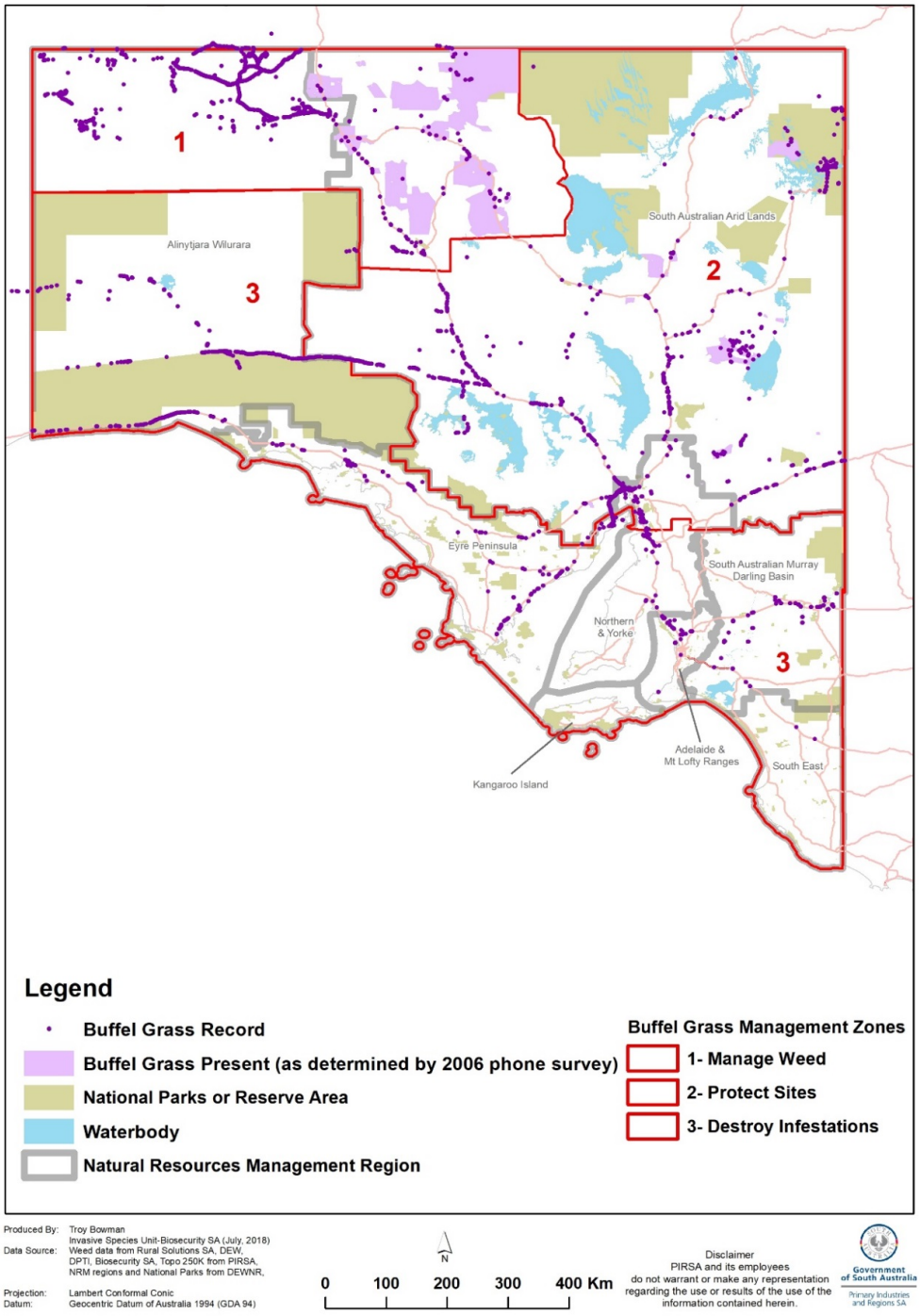

Figure 1. Buffel grass management zones and known distribution in South Australia in 2018.

CHALLENGES AND FUTURE DIRECTIONS

Despite these successes, much remains to be done and buffel grass distribution in South Australia continues to increase. As a result of this expansion and improved ecological and biological knowledge gained over the past six years, a revised risk assessment was undertaken in April 2018. This assessment upgraded the weed risk to very high, and reduced the feasibility of containment to low in native vegetation, and negligible in grazing rangelands.

This risk assessment formed part of a revised and updated strategic plan, designed to guide management through to 2023, sustaining and leveraging the outcomes of the 2012–2017 plan. At the time of writing the updated plan is yet to be finalised, but the focus will be to reduce the overall economic, environmental and social impacts of buffel grass, and to prevent spread of the weed to uninfested assets. In a state-wide context, with buffel grass primarily established in the north, this means protecting key environmental assets and preventing range expansion southwards into uninfested areas.

With best practice materials developed and a range of control options to suit most situations, future activities will be refocussed to fill gaps identified during the process of updating the plan. Key challenges include improved and expanded stakeholder engagement, maintaining funding and momentum for on-ground action and containment, better mapping and knowledge of distribution, and developing strategies and tools for managing buffel grass in remote areas with widespread, extensive infestations.

Further engagement of a range of stakeholders including the mining industry, road and rail corridor managers, and pastoralists is critical. Their engagement and active involvement will be essential to realising the aims of the strategic plan. This is likely to be particularly challenging with regards to pastoralists, but the information available on the deficiencies of buffel grass as a pasture species in arid areas will be a valuable tool in this respect.

Without a dedicated coordinator to drive state-wide management there is a risk that the gains made to date may be difficult to maintain. A coordinated approach among NRM regions will be required. Furthermore, on-ground control works above and beyond those undertaken by NRM regions are likely to be necessary to prevent expansion southwards and into conservation assets such as the Flinders Ranges. As such securing a funding base for this will be a major focus of the Taskforce.

The remoteness of much of the country where buffel grass occurs also presents major challenges. Our knowledge of its current distribution is largely restricted to the sparse road network in northern South Australia. Better distribution data will be critical, both to accurately understand the current situation and risks and to plan management strategies. However, we do know there are large extensive infestations in the state's northwest. Managing these is extremely challenging. One possible option could be biological control, but without broad national support this is unlikely to be pursued.

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