Identifying, prioritising and managing for weeds in connectivity and conservation areas

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Figure 1. Box Gum Woodland connectivity link through a typical open grazing landscape in the project region, and on right, a diverse high conservation value groundlayer dominated by native buttercups (*Ranunculus lappaceus and R. sessiliflorus*)

What were the objectives of this project?

In Australia, large landscape-scale conservation initiatives that focus on connecting habitat and restoring ecosystem processes are a major focus for restoration efforts. However there has been relatively little research on invasive weeds in these environments. This research investigated the major weeds that are found in these areas, whether they pose a threat to broad-scale conservation objectives, and the factors that make their management difficult.

How was the work undertaken and where?

We focused on three main corridor regions in south-eastern NSW: the Kosciuszko to Coast Partnership (K2C), the Slopes to Summit Partnership (S2S) and the Kanangra-Boyd to Wyangala Link (K2W). These regions, which collectively exceed 40,000 km^2 in area, are part of the broader Great Eastern Ranges Initiative (GER), which aims to restore connectivity along a 3,600 km corridor stretching from western Victoria to northern Queensland. These are predominately agricultural regions that contain significant remnant vegetation, including woodlands, riverine forests and floodplains, native grassland and dry and wet sclerophyll forests.

Surveys were undertaken with property and other land managers in these regions to identify which invasive weed species were considered the worst at the whole property or regional level and in areas managed for biodiversity and connectivity. In particular we wanted to know which weeds became worse, required most management, how they were controlled and how successful were the different control methods.

What were the main weeds found through this research?

62 weed taxa were reported across all properties with 56 of those in conservation management areas. The following table ranks, in order of their abundance and severity, the most abundant and common weeds in areas managed for conservation.

Abundant (>30% sites)	Common (>10-30% sites)
African lovegrass (*Eragrostis curvula*)	Capeweed (*Arctotheca calendula*)
St. John's wort (*Hypericum perforatum*)	Phalaris (*Phalaris aquatica*)
Blackberry (*Rubus fruticosus spp. agg*)	Willow (*Salix* spp.)
Serrated tussock (*Nassella trichotoma*)	Flatweed (*Hypochoeris glabra/radicata*)
Paterson's curse & vipers bugloss (*Echium* spp.)	Exotic annual grasses (eg. *Bromus, Avena, Lolium* spp.)
Paterson's curse (*Echium plantagineum*)	Aaron's rod (*Verbascum* spp., esp. *V. thapsus*)
Thistles (all spp. eg. saffron, nodding, black)	Fleabane (*Conyza* spp.)
	Sweet briar (*Rosa rubiginosa*)
	Saffron thistle (*Carthamus lanatus*)

Table 1. The most common or abundant weeds found in areas managed for conservation ranked by their abundance and severity (requires the most management and have potential to severely impact land use objectives).

In addition to the weeds in Table 1, a further 42 weed taxa were recorded only occasionally and on less than 10% of properties. This was a diverse group dominated by annual and biennial forbs and annual and perennial grasses. The most important species were Chilean needle grass (*Nassella neesiana*), a Weed of National Significance, storks-bill (*Erodium* spp.) and wild oats (especially *A. barbata*). The extremely invasive Coolatai grass (*Hyparrhenia hirta*), and silver nightshade (*Solanum elaegnifolium*) are also present and spreading in the region.

Figure 2. Phalaris dominating in a revegetation site (left) and blackberry, willow, thistles and Chilean needle grass (right) in an area fenced off for riparian management.

Where do the weeds come from?

We found that weeds that *already* exist on properties will typically pose the most immediate problem in newly established conservation areas. Landholders will therefore already be familiar with the majority of severe weed species that they are likely to encounter and how to control them while undertaking conservation work, at least in the short to medium term.

There is however a significant exception - exotic perennial grasses such as African lovegrass, Coolatai grass and Chilean needle grass. These are highly invasive weeds that are extremely difficult to control and can come to dominate conservation, agricultural and mixed land use types. African Lovegrass is already widespread in the K2C corridor, but Coolatai grass and Chilean needle grass are still in only early stages of invasion across the region. It will be critical for all land managers, as well as connectivity initiatives, to recognise their highly invasive potential and to undertake coordinated awareness, control and management programs specifically targeting these species.

Landholder concerns and weed management issues

Key issues facing land managers were the high costs associated with weed management, including herbicides, weed control equipment, labour, and time. The lack of adequate, cost-effective control measures for exotic perennial grasses was another major concern for landholders, which was compounded by the inability of many neighbouring landholders to identify important species such as African lovegrass. Technological and simple practical constraints such as inadequate equipment and the inaccessibility of weed infestations in rugged sites were also frequently cited problems. Small holdings, absentee landholders, a lack of clarity as to 'who manages the weeds', a perceived lack of willingness to undertake control, and weed invasion from neighbouring lands also major concerns.

The good and the bad news

The results of our study provide both good news and bad news for land managers contemplating biodiversity conservation work on their properties. The good news is that the majority of weeds that tend to increase rapidly in conservation management areas, usually in response to grazing removal and disturbance associated with revegetation, often decline as vegetation cover increases and both bare ground and soil fertility decline. The best examples include annual and biennial species such as annual exotic grasses, most thistle species and annual broadleafs such as capeweed and Paterson's curse.

Unfortunately, some species do seem to be favoured in conservation management areas. For example, many land managers had become aware of the potential for 'woody weeds' such as blackberry and sweet briar to invade these areas. These species are spread by birds, foxes and other animals as they move along fencelines and use resources and cover provided by shelterbelts and revegetation areas. An additional problem is that herbicides used to control these species can affect native trees and shrubs used in revegetation projects. Fortunately, it was clear that if targeted early, and if revegetation areas were planned to allow adequate future access, these species could be controlled quite effectively.

Another group of weeds, which includes St. John's wort and Phalaris, also often increase in response to the removal of grazing pressure, but then tend to form more persistent swards that can out-compete native vegetation. These species typically require control before revegetation tubestock is planted, and then in an on-going way until their presence is significantly reduced. Fortunately this can often be achieved using planned grazing and other low-cost strategies.

Most weed control effort is expended on a relatively small group of high impact species such as blackberry, serrated tussock, St. John's wort, Phalaris and African lovegrass. Controlling these species as early as possible early is therefore clearly the most effective way to target property-scale weed control efforts.

What is the greatest invasive weed threat in these regions?

Our study shows that a relatively small, predictable subset of pre-existing weed species increases in abundance and severity in areas that have been converted to conservation land use. These can usually be managed effectively using existing control techniques, albeit at considerable cost in time and resources.

A greater threat is posed by a few species, like African lovegrass, Coolatai grass and Chilean needle grass, which have the potential to fundamentally transform the management of entire landscapes. For economic, ecological and social reasons the control of these species is at present often difficult or impossible. A combination of early identification and triage, targeted management of priority areas, establishment of new initiatives in areas where they are not yet present, and funding for cross-initiative experiments into prevention and control will likely be necessary to stop their spread.

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