# Weeds as 'Key Threatening Processes': implications for managing environmental weeds

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**Summary** Alien species are acknowledged as a major cause of biodiversity loss across the globe. Yet, the way these species are managed does not always address biodiversity loss; this is especially the case for weeds. One reason is that control actions do not focus on specific biodiversity outcomes. Historically, weed management and plant conservation have been approached independently. In order to achieve conservation outcomes, weed management must establish specific conservation objectives and then tailor weed control to meet these objectives. In this way resources are directed to protect the species/localities where the biodiversity benefits will be greatest. One solution is to list weeds as key threatening processes (KTPs) and to develop threat abatement plans (TAPs) for these weed KTPs listed under the threatened species legislation (e.g. NSW *Threatened Species Conservation Act 1995*). This paper presents an overview of KTPs and TAPs. It outlines this new approach to weed management and highlights its role in managing major weed problems. In addition, this paper then outlines future directions and approaches to dealing with weeds as KTPs. It is anticipated that this paper will raise awareness of KTPs and TAPs in the field of weed management.
**Keywords** Threat abatement plan, key threatening process, biodiversity, weed management, threatened species, *Chrysanthemoides monilifera*.

## INTRODUCTION

Alien invasive species are recognised as a major threat to biodiversity (IUCN 2000). Managing the threat of alien invasive species to biodiversity, however, requires a better understanding of the biodiversity at risk (see Downey 2004 this volume). Understanding the biodiversity at risk is not an easy task as (i) thorough investigation of the species at risk is rarely undertaken, (ii) strategies to manage the major threats to biodiversity are typically broad overviews, and (iii) historically, invasive species management and biodiversity conservation were viewed as two distinct entities, despite a cause and effect relationship (see Downey 2003a).

For one group of alien invasive species – the introduced environmental weeds – managing the threat they pose to biodiversity has been limited, due in part to the paucity of data on their impacts which contributes to the three problems outlined above. In addition, environmental weed control alone does not always lead to conservation outcomes. Often, other weed species invade following control, or the initial weed species re-infests (especially if follow-up control is not undertaken). Alternatively weed control is undertaken in areas of low conservation value, or the presence of the weed/s has decreased the ability of the native vegetation to regenerate naturally. The assumption that weed removal will result in beneficial conservation outcomes does not consider the reasons for the weed problem in the first instance (which is why re-invasion occurs); how the weed may have altered ecosystem structure or functions (e.g. shading); the conservation value of the site to be controlled; or the ability of the site to 'recover' following control.

Plant conservation and weed management have merged in part with the advent of control methods like bush regeneration (see Buchanan 1989). There is no disagreement that bush regeneration can allow conservation outcomes to be achieved at individual sites. However, it is not a strategy for merging weed control and conservation at a policy level or for delivering large scale initiatives aimed at reducing the impacts of weeds to biodiversity, or for setting priorities to focus weed control to areas of high conservation value or for understanding the impacts to biodiversity. This is apparent when the focus of weed control is shifted from a localised area or infestation to dealing with widespread weeds across their range. An emerging approach that links weed management and plant conservation at such a level, is to list weeds as key threatening processes under threatened species legislation and then to develop threat abatement plans (see Downey 2003a,b), a process which is discussed in this paper.

## KEY THREATENING PROCESSES (KTPS)

Anything that threatens biodiversity can be listed as a key threatening process (KTP – e.g. clearing of native vegetation; alien invasive species) under the NSW *Threatened Species Conservation Act 1995* (TSC Act) or the Australian Government *Environment Protection* *and Biodiversity Conservation Act 1999* (EPBC Act) (the discussion presented hereafter is limited to the TSC Act only). Environmental weeds threaten biodiversity in a number of ways, for example, habitat modification, competition and alteration of disturbance regimes (see Mack and D'Antonio 1998) and therefore can be considered for listing as KTPs.

The process for listing a KTP (i.e. under Schedule 3 of the TSC Act) is outlined in the Act. Any person or organisation can submit a nomination to the NSW Scientific Committee (the independent body that adjudicates on listings) for consideration. Each nomination must meet the criteria established under the TSC Act – a KTP must threaten two or more species, populations, or endangered ecological communities listed under Schedules 1 and 2 of the Act, or cause species, populations or ecological communities to become threatened. The Scientific Committee assesses all nominations. A preliminary determination is then made to either list or reject a nomination. All preliminary determinations made by the Scientific Committee are placed on public exhibition. Submissions received during this period are considered and a final determination is made: if the KTP is accepted it is listed under Schedule 3 of the TSC Act.

To date, only one weed species (*Chrysanthemoides monilifera* (L.) T.Norl. (see Scientific Committee 1999)) and one group of weeds (exotic perennial grasses (see Scientific Committee 2003)) have been listed as KTPs under the TSC Act. Listing a threatening process as a KTP results in the development of a threat abatement plan (see below).

**Future directions for listing weeds as KTPs** There are about 2800 naturalised plant species in Australia. Not all of these presently pose serious threats to biodiversity, especially those recent naturalisations or sleeper weeds. However, a small number (maybe as many as 15%) pose serious threats to biodiversity, either on a localised scale or over large areas of their distribution. Many of these species meet the criteria for listing as KTPs either under the TSC Act or the EPBC Act (see above), for example, Scotch broom (*Cytisus scoparius* (L.) – see Heinrich and Dowling 2000), bridal creeper (*Asparagus asparagoides* L.W.Wight – see Willis *et al*. 2003) and lantana (*Lantana camara* L. – see NPWS 2002). However, for a large number of weed species additional information is required to satisfy the criteria for listing.

Given the potential number of weed species that could be listed as KTPs and the pending release of the first weed threat abatement plan (further discussion presented below), the Department of Environment and Conservation (NSW) held a workshop on listing weeds as KTPs under the TSC Act. Participants at this workshop represented all relevant NSW State Agencies, the NSW Scientific Committee, the Commonwealth Department of Environment and Heritage, the CRC for Australian Weed Management and local government. The main outcome was that the listing of weeds as KTPs should be undertaken through the listing of individual species, and wherever possible meaningful groups of weed species (e.g. exotic perennial grasses). The concept of a generic listing of environmental weeds as occurs under the Victoria *Flora and Fauna Guarantee Act 1988* is not possible under the TSC Act. In addition, the workshop participants considered such a generic listing as an unacceptable outcome, for it removed the emphasis from the worst species or groups to all weeds. The other main outcome of the workshop was to establish a small working group to prioritise the weed species that impact upon biodiversity, especially to threatened species or ecological communities in NSW. The working group had not made any recommendations when this paper was prepared. The recommendations of this working group will be used to develop nominations for listing weeds as KTPs under the TSC Act either by DEC or other stakeholders.

## THREAT ABATEMENT PLAN (TAP)

A threat abatement plan (TAP) is a strategic plan to reduce the impacts of a KTP on threatened biodiversity (i.e. native species, populations and or ecological communities) which is independent of land tenure in NSW. TAPs are prepared in accordance with specific criteria established under the TSC Act. The development of a TAP for those KTPs that threaten two or more species, populations or ecological communities listed under Schedule 1 or 2 of the Act must be completed within three years of the listing of a KTP. However, there is no timeframe for the development of a TAP for those KTPs that cause species or ecological communities that are not listed to become threatened. The Department of Environment and Conservation (which includes the former National Parks and Wildlife Service) is responsible for preparing TAPs under the TSC Act. Once prepared, a draft TAP must be placed on public exhibition. The public's comments are then incorporated and a final version of the TAP is presented to the NSW Minister for the Environment for approval in accordance with the TSC Act. Approval from any government department (Minister), or authority identified in actions must be obtained before a draft or final plan can be released. The release of the first weed TAP, albeit a draft, will provide weed managers, stakeholders and the community with an understanding of the process and will allow them to gain an appreciation of how a TAP may deliver conservation benefits.

**The first weed TAP in Australia** *Chrysanthemoides monilifera* is listed as a KTP under the TSC Act. A draft TAP (hereafter referred to as the Bitou TAP – see DEC in prep.) has now been prepared in accordance with the Act (see above). At the time of writing, the draft Bitou TAP has not undergone public exhibition. The Bitou TAP is the first such plan for a weed in Australia, and arguably the most comprehensive plan ever prepared for any weed species in Australia. The Bitou TAP encompasses five principles, which aim to:

- develop a strategic framework for delivering control of *C. monilifera* to areas of high conservation value (in terms of threatened biodiversity);
- develop and promote best practice management;
- monitor the effectiveness of control programs in terms of the recovery of threatened biodiversity;
- foster community education, involvement and awareness; and
- identify and fill knowledge gaps where possible.

A series of specific objectives and actions for each principle is outlined within the TAP. To achieve the main objective (the focusing of control to biodiversity outcomes) a system was required to prioritise the species, populations and ecological communities at risk from invasion. Models were developed to rank these entities and then rank the sites at which they occur. Thus, this matrix of entities (high, medium and low priority) by sites (high, medium and low priority) provides an on-ground framework for delivering control of *C. monilifera* at sites where the biodiversity benefits will be greatest (see Downey 2003b, 2004 – this volume; DEC in prep. for more information).

The draft Bitou TAP identifies 63 species, two populations and nine ecological communities which are at risk from *C. monilifera* invasion, of which 11 species, two populations and four ecological communities are considered to be at greatest risk (see DEC in prep.). The TAP also identifies over 600 sites at which threatened entities occur in NSW. This number is reduced to about 60 when the highest priority sites for the entities at greatest risk are considered (i.e. the high priority entities at the high priority sites). The remaining cells in the matrix can be used as a framework for the delivery of broader conservation outcomes. A more in depth discussion on the Bitou TAP is presented elsewhere in the volume (see Downey 2004).

The draft Bitou TAP, being the first such plan for a weed, provides a model upon which to develop future weed TAPs. However, the species selection models may require modification especially for weeds with other life-forms (i.e. trees, vines or herbs). In addition, multiple weed species TAPs (i.e. exotic perennial grasses) will require a system to prioritise the weed species based on their impacts to biodiversity. For example, the nomination for exotic perennial grasses identifies five exotic grasses that threaten biodiversity and at least 14 other species that could threaten biodiversity. One option could be to prepare individual TAPs for each of the weed species within these broad groupings. Irrespective of which option is finally adopted, a system to prioritise these weeds will still be needed to determine the order for preparing the TAPs. The exotic perennial grasses KTP also presents other issues that will need to be considered when preparing a TAP which were not major issues in the development of the Bitou TAP. For example, a strategy to resolve any conflict that may arise among stakeholders i.e. those that use introduced perennial grasses for beneficial purposes and those that seek their prohibition (see Grice in press).

**The role of TAPs in weed management** The management of any weed species needs to take a holistic approach. While TAPs can establish a comprehensive approach to managing weeds, specifically with respect to conservation, other priorities still need to be addressed. These priorities include, weed control that meets (i) actions outlined in other strategies, for example, the northern and southern containment zones outlined in the *C. monilifera* national strategy (see ARMCANZ *et al*. 2000), (ii) requirements under the NSW *Noxious Weed Act 1993*, and (iii) other objectives, for example, around high visitation areas within national parks. Thus, TAPs need to form part of a broader approach to weed management which utilises a range of control strategies (Downey 2003a). In New Zealand, the Department of Conservation uses the terms 'weed-led' and 'site-led' to separate control priorities (Timmins and Popay 2003) thus establishing a formal framework for weed management encompassing two approaches.

It must be noted that while it is economically more cost effective to control new infestations of weeds – either for new introductions or new locations for existing weeds – such infestations tend to have limited short-term impacts on biodiversity in comparison with large infestations. Such an approach may provide conservation outcomes by reducing or preventing future infestations. However, it does little to reduce the immediate impact of widespread weeds to threatened biodiversity; weeds that are more likely to be listed as KTPs than new introductions. In addition, this approach may do little to address the aim of a TAP (i.e. to reduce the impact to biodiversity) when there is an immediate impact, which in most cases is the main justification for listing a weed as a KTP. Thus, a TAP for widespread weeds must target the current impacts over the potential impacts, irrespective of the cost. While there continues to be no acceptable dollar value for the extinction of a species, any approach to weed management that targets threatened biodiversity will remain without an acceptable economic assessment. However, prioritisation systems – given limited resources – can help to fill the void as they can aid decision making. Therefore, the prioritisation system outlined in the Bitou TAP, in which control is focused to areas of high conservation value, provides a pragmatic alternative, in that control is limited in areas of little or no conservation value.

## CONCLUSION

Listing weeds as KTPs and developing TAPs is a new approach to managing weeds. Weed TAPs have the ability to deliver strategic weed control to areas of high conservation value, thereby merging weed management and conservation. The release of the first weed TAP in Australia is likely to generate interest in the KTP and TAP process for dealing with weeds. The success of this TAP will be determined through its implementation and acceptance by the wider community.

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