

Threat abatement plans: strategic pest management for biodiversity conservation

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ABSTRACT

In Australia, invasive terrestrial pest species have been implicated in the decline of a number of threatened species. Under the NSW *Threatened Species Conservation Act 1995*, pest threats can be listed as Key Threatening Processes which require the preparation of Threat Abatement Plans to ameliorate the threats. This paper presents an overview of how the threat abatement planning process is being used to plan initiatives to reduce the biodiversity impacts of invasive species. The approach taken in four threat abatement plans (foxes *Vulpes vulpes*, feral cats *Felis catus*, bitou bush *Chrysanthemoides monilifera* and gambusia *Gambusia holbrooki*) is used to illustrate this process.

Key words: key threatening process, threat abatement plan, invasive pest species, foxes, feral cats, bitou bush, gambusia.

Introduction

Throughout the world, invasive terrestrial pest species are acknowledged as a major cause of biodiversity loss (IUCN 2000). In Australia, it has been suggested that introduced terrestrial pest species are second only to land clearing as the greatest threat to native biodiversity (Roush 2002; Martin 2003). The most recent estimate of the annual cost of weeds to Australian agriculture is \$4 billion (Martin 2003). This report suggests that weeds appear to be implicated in the extinction of at least four native plant species and are known to be adding pressure to a further 57 now under threat. As outlined later in this chapter, this is a gross underestimation of the species threatened by weeds.

Recently, the Cooperative Research Centre for Pest Animal Control has estimated that the national cost of invasive animal pests is conservatively, \$720 million per year (McLeod 2004). However, with the exception of foxes, feral cats and carp, this estimate does not include the cost of any impacts on biodiversity.

Threat abatement planning process

The development of threat abatement plans is a statutory requirement under the *Threatened Species Conservation Act 1995* (TSC Act). Although there has been a history in Australia of plans to control pest species, the focus has been primarily to protect agricultural enterprises e.g. wild dog control to protect the sheep industry (Fleming and Harden 2003). The threat abatement planning process is being used to plan and implement statewide, strategic pest control initiatives to protect biodiversity, independent of land tenure. This process has been recognised as the accepted model by the NSW Legislative Council Inquiry

into Feral Animals (New South Wales Legislative Council General Purpose Standing Committee No. 5. 2002) and by an independent review of the pest management programs being undertaken by the then NSW National Parks and Wildlife Service (English and Chapple 2002). The NSW National Parks and Wildlife Service, now part of the Department of Environment and Conservation, is required to prepare a threat abatement plan to abate or ameliorate the adverse effects on threatened biodiversity of any key threatening process listed under the TSC Act.

The threat abatement planning process provides a framework to minimise the impacts of key threatening processes on threatened biodiversity or on entities that may become threatened. This also allows for priorities to be established for the allocation of limited resources. The planning process is based on the assumption that the eradication of pests over large areas, is rarely if ever possible. The main objectives of threat abatement plans are to:

- target pest control across all land tenures at the species/sites where the impacts of pests are likely to be greatest;
- develop best practice guidelines that maximise the effectiveness of control programs while minimising non-target impacts;
- establish monitoring programs to demonstrate these impacts and to measure the effectiveness of the resultant control programs;
- identify knowledge gaps and develop research proposals where information is lacking; and
- increase community education and involvement.

A number of pest threats has been listed as key threatening processes under the TSC Act:

- Predation by the European red fox *Vulpes vulpes*.
- Competition by the feral European rabbit *Oryctolagus cuniculus*.
- Predation by the feral cat *Felis catus*.
- Predation, habitat degradation, competition and disease transmission by feral pigs *Sus scrofa*.
- Predation by the plague minnow *Gambusia holbrooki*.
- Predation by the ship rat *Rattus rattus* on Lord Howe Island.
- Competition from feral honeybees *Apis mellifera*.
- Importation of red imported fire ants *Solenopsis invicta*.
- Introduction of the large earth bumblebee *Bombus terrestris*.
- Invasion of native plant communities by bitou bush and boneseed *Chrysanthemoides monilifera*.
- Invasion of native plant communities by exotic perennial grasses.

Also, the Scientific Committee (the independent body that considers listings under the TSC Act) has made Preliminary Determinations to list the following pest threats as key threatening processes:

- Herbivory and environmental degradation by feral deer (various species)
- Competition and habitat degradation by feral goats *Capra hircus*.

Approach taken in current NSW threat abatement plans

The approach being taken in four approved, or near completed, threat abatement plans involving invasive pest species (foxes, feral cats, bitou bush and gambusia).

1. Foxes

A *Threat Abatement Plan for Predation by the Red Fox* (Fox TAP) was completed in 2001 and is now being implemented across New South Wales by the Department of Environment and Conservation, the Department of Primary Industries (State Forests) and the Department of Lands (NSW National Parks and Wildlife Service 2001). It was the first threat abatement plan to be completed under the TSC Act and it takes a new approach to fox management by identifying priorities for fox management across all land tenures. The threatened species considered most at risk from fox predation are identified along with 81 priority sites for fox control. Collaborative fox control programs have been established at most of these sites with the respective land managers.

At many of these sites, monitoring programs have been incorporated to assess the effectiveness of the fox control programs and the recovery of the target threatened species. In most cases the control programs have not been running for sufficient time for a measurable increase in the recovery of the threatened species. However,

some preliminary results are encouraging. For example, a program to protect the yellow-footed rock wallaby *Petrogale xanthopus* in the Mutawintji Nature Reserve and the Mutawintji National Park, has resulted in a significant increase in the wallaby population since fox control began in 1995 (DEC 2004a). Positive responses to fox control have also been reported for shore birds such as little terns and pied oystercatchers (DEC 2004a).

In addition, the Fox TAP identifies *Best Practice Guidelines for Fox Control* which seek to maximise the effectiveness of control programs while minimising the potential non-target impacts.

2. Feral cats

In some areas of New South Wales, feral cats have significant impacts on ground birds and small native mammals and have caused the failure of attempts to re-introduce some threatened species (Dickman 1996). Hence, *Predation by the Feral Cat* is listed as a key threatening process under the TSC Act. A draft threat abatement plan has been prepared and should be available for public comment in late 2004 or early 2005.

Feral cats are difficult to study because they are wary of traps, shy and elusive. Little is known about their impacts on threatened species and the best ways to reduce these impacts. The draft *Threat Abatement Plan for the Feral Cat* (Feral Cat TAP) will address this lack of information by using a modelling approach, similar to that used in the Fox TAP to identify the threatened species most at risk from feral cat predation. Currently, available control options (mainly trapping) are ineffective for broad-scale cat control and there are no poison baits registered for control of feral cats in NSW. Hence, the Feral Cat TAP does not propose implementing these measures on a significant scale although they may be used in localised areas to protect threatened species. Best-practice guidelines for trapping will be developed to improve and evaluate its effectiveness as a control technique.

Research is being conducted in other states to develop a toxin and baiting system which is humane and cat-specific (Fisher *et al.* 2001). The Feral Cat TAP will focus on trials to evaluate this control method when it becomes available. In the meantime, the Feral Cat TAP will identify priority species most at risk of cat predation and the locations for priority control. Also, the Feral Cat TAP will list actions to educate and inform the community about the impacts of feral cats on wildlife and to gain community support for implementing feral cat management programs once effective control options become available.

3. Bitou bush

Bitou bush is a highly invasive coastal shrub which now occurs on more than 80% of the New South Wales coastline (Thomas and Leys 2000). In September 2004, a draft *Threat Abatement Plan for Invasion of Native Plant Communities by Bitou Bush* (Bitou TAP) was released for public comment (DEC 2004b). The approach taken with this plan is similar to that which was adopted in the Fox TAP in that it focuses on:

- developing a strategic framework for delivering control of bitou bush to areas of high conservation value (in terms of threatened biodiversity);
- monitoring the effectiveness of control programs in terms of recovery of threatened biodiversity;
- developing and promoting best practice management;
- fostering community education, involvement and awareness; and
- identifying and filling knowledge gaps.

The Bitou TAP identifies 63 plant species, two endangered plant populations and nine endangered ecological communities (EECs) as being at greatest risk from bitou bush (DEC 2004b). Of these, 11 plant species, 2 endangered plant populations and 4 EECs are at serious risk of extinction if action is not undertaken to combat the problem. The plan also identifies the sites at which these threatened species occur and ranks them for control. From a list of over 600 sites along the coast, 60 priority sites have been identified at which control action is essential for the conservation of the species at greatest risk (DEC 2004b).

4. Gambusia

Gambusia is a contributing factor to the decline of frogs (threatened or otherwise) as well as other aquatic life such as native fish and macro-invertebrates (NSW National Parks and Wildlife Service 2003). An approved *Threat Abatement Plan for Predation by Gambusia – The Plague Minnow* (Gambusia TAP) was published in 2003 (NSW National Parks and Wildlife Service 2003). Management options for this pest are limited to localised control through pond draining and re-stocking. In the long-term, genetic research such as that being undertaken for carp, may be applicable to gambusia. The concept of this technology is to target genes that control sexual development of fish to exclusively produce males. The aim is to release these modified fish to mate with carp in the wild. Carp populations would become biased towards males and gradually decline over many generations. The work is currently in the very early stages.

The Gambusia TAP focuses on the following actions:

- research to determine the impacts of gambusia on threatened frogs species;
- research to develop more effective control options;
- a survey of the distribution of gambusia in areas occupied by key frog species in order to determine priority sites which can be maintained free of gambusia; and
- public education and awareness programs aimed at minimising human dispersal of gambusia to water bodies that are not already infested.

Discussion

The threat abatement planning process is a science-based mechanism for delivering strategic initiatives which tailor pest management programs to specific biodiversity outcomes e.g. recovery of specific threatened species, endangered

populations of ecological communities. A key objective is the setting of performance measures to assess the effectiveness of each threat abatement plan. This is considered to be an essential part of effective pest management (Braysher 1993; Braysher and Saunders 2003).

In this chapter, I have outlined the approach being taken with four species-specific threat abatement plans with very different objectives. Threat abatement plans for foxes and bitou bush have identified priority threatened species, populations and ecological communities and the locations where protection of these species is most critical. In this way, resources can be allocated to protect threatened biodiversity at the localities where the benefits of control will be greatest.

For feral cats and gambusia, where effective options are not available for broad-scale control, or where information on the impacts on threatened biodiversity is lacking, research and other actions are identified in the threat abatement plans. For the Feral Cat TAP, a reference group was formed to allow key stakeholders to have input into the plan. Because there are sections of the community opposed to any cat control, this is an important step in gaining community support.

Where critical populations of a threatened species have been determined to be at risk on private lands, the Department of Environment and Conservation discusses with landowners what options they may wish to consider to protect the species. The threat abatement planning process does not use coercive measures on privately owned lands to protect threatened species at priority sites identified in the TAPs. Instead, a cooperative approach is fostered where the landowner/manager is encouraged to work with the Department of Environment and Conservation and other government agencies to control the pest in a way that will protect the threatened species. For example, support has been provided to private landowners for fox control to protect Malleefowl *Leipoa ocellata*, Plains-wanderer *Pedionomus torquatus* and Bush Stone-curlew *Burhinus grallarius* in western New South Wales. Also, in developing the draft Bitou TAP, the Department of Environment and Conservation has been encouraged by the positive response shown by private landowners when they were approached to discuss the protection of priority sites on their lands e.g. Telstra, St. Michael's Golf Club.

The draft Bitou TAP is the first threat abatement plan for any weed species in Australia. It has taken considerable time to prepare, partly because of the need to develop an effective model to rank plant species threatened by bitou bush that can be followed in the future. Unfortunately, information on the impact of invasive weed species on biodiversity is lacking and the use of a modelling approach is essential. Grice *et al.* (2004) have recently reviewed all available information published on this subject and they found that the ecological impacts of very few invasive plant species have been quantified (16 species). This is in marked contrast to the large number of exotic species that has naturalised in Australia (2,732 species according to Groves *et al.* 2003).

Because there are more than 200 environmental weeds that impact on natural ecosystems, there is potentially a large number that could be listed as key threatening processes, each of which would require the preparation of a threat abatement plan. To examine solutions to this problem, the Department of Environment and Conservation held a workshop on listing weeds as Key Threatening Processes (KTPs) under the TSC Act. Participants at this workshop represented all relevant NSW government agencies, the NSW Scientific Committee, the Commonwealth Department of Environment and Heritage, the Cooperative Research Centre 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) (Downey and Leys 2004). 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 (Downey and Leys 2004). 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 recommendations of this working group will be used to develop nominations for listing weeds as KTPs under the TSC Act, either by DEC or by other stakeholders (Downey and Leys 2004).

Threat abatement plans utilise an adaptive management approach. Pest control at priority sites identified in threat abatement plans has to be effective in reducing the pest threat to levels where the recovery of threatened biodiversity can occur. Hence, the monitoring component of threat abatement plans is essential to measure the reduction in pest density from pest control and, more importantly, the resultant recovery of threatened biodiversity.

Experience gained during the first four years of implementing the Fox TAP has shown that field staff depend on support from the Fox TAP Coordinator (Dr Paul Mahon) to implement the plan. This has been particularly important for the monitoring process where many field staff have not had the necessary skills to undertake wildlife monitoring programs or the expertise to design and conduct appropriate experiments. In addition, a uniform approach to monitoring is required to allow collation and analysis of the data. Hence, sufficient support for the coordination of threat abatement plans is essential for the threat abatement planning process to be able to deliver effective outcomes.

In 2003, the NSW Government announced major changes to the way natural resource management will be delivered. A key component of the changes is the establishment of Catchment Management Authorities (CMAs) which have replaced the 19 Catchment Management Boards and 20 Regional Vegetation Committees that existed previously. The CMAs are responsible for managing natural resource matters including responsibility for developing catchment action plans which will integrate existing regional vegetation management plans, catchment blueprints and investment strategies. It is anticipated that CMAs will recognise the impacts of invasive species on natural resources and that relevant actions identified in national and NSW threat abatement plans will be included in catchment action plans.

Invasive pest species are having significant adverse impacts on national and state biodiversity values. The threat abatement planning process is a framework that enables priorities to be established for the allocation of limited resources to reduce the adverse impacts of listed key threatening processes. The Fox TAP is a good example of how this is being implemented in the field. The listing of invasive pest species as key threatening processes and the preparation and implementation of threat abatement plans is a task that will require considerable input in the future. To be successful, this process will need the support and involvement of government agencies, CMAs and the community.

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