

Strategic widespread weed management: key outcomes and challenges from the Bitou Bush Threat Abatement Plan

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Summary Bitou bush (*Chrysanthemoides monilifera* (L.) Norl. subsp. *rotundata* (DC.) Norl.) is a coastal environmental weed in New South Wales (NSW) that is the subject of a long term asset protection program, the NSW Bitou Bush Threat Abatement Plan (TAP). The TAP aims to reduce, abate or ameliorate the impact of bitou bush by prioritising the biodiversity at risk and the sites for weed control. In 2006, the TAP was released and key stakeholders including the NSW National Parks and Wildlife Service (NPWS), Local Government, catchment management authorities (CMAs), community groups and Crown Lands came together to protect environmental assets at risk from bitou bush and to reduce its extent. In 2011, after five years of implementation the TAP was reviewed.

Some key findings of the TAP Review include: that strategic management of a widespread weed is achievable – with almost three quarters of the managed sites being the highest priority for conservation; bitou bush density and extent were reduced in national containment zones, as determined through mapping of bitou bush in NSW; and monitoring programs that were established at 76 sites needed strong support and assistance to determine the outcomes of weed management. Where data was sufficient and control programs had been implemented over a number of years, results indicate an increase in the abundance of native plant species.

This paper shows that with coordinated action, sufficient funding and support to land managers, management of a widespread weed to alleviate biodiversity impacts is achievable. We outline the lessons learnt during the TAP Review and the key challenges in the future.

Keywords Bitou bush, asset protection, threat abatement, weed monitoring, weed management.

INTRODUCTION

Bitou bush is an invasive shrub originating from South Africa. It has invaded coastal habitats of NSW; is a Weed of National Significance (WoNS); and is listed as a Key Threatening Process (KTP) under the NSW *Threatened Species Conservation Act 1995* (TSC

Act) and as Noxious under the NSW *Noxious Weeds Act 1993*.

Bitou bush is widespread in coastal NSW and as such the aim of control in the core distribution is asset protection as per the accepted prevention, eradication, containment and asset protection approaches (Environmental Weeds Working Group 2007).

In response to the KTP listing, a Threat Abatement Plan (TAP) was prepared in 2006 (DEC 2006). Coastal land managers and experts were consulted to identify plant species and ecological communities at risk and identify sites for control. Sites were prioritised through a two-step triage matrix that included the following two factors: urgency of control relative to the degree of threat posed to biodiversity; and the probability of achieving successful conservation outcomes as a result of weed control (Downey *et al.* 2010).

Since 2006, stakeholders including the NSW NPWS, Local Government, CMAs, community groups and Crown Lands came together to protect environmental assets at risk from bitou bush and to reduce its extent. In 2011, after five years of implementation, the TAP was reviewed (OEH 2013).

The Review evaluated implementation against the eight TAP objectives, in summary to ensure: the highest priority sites were managed in the first instance; the effectiveness of control programs were evaluated; coordination occurred and necessary stakeholders were involved; and research on the effect of bitou bush invasions and control on biota was carried out. We outline the key achievements, lessons learnt and the key challenges associated with implementing the Bitou TAP.

KEY OUTCOMES

Coordination The outcomes reported in the TAP Review were only achieved due to NPWS coordination of the TAP, with assistance from the bitou bush and boneseed WoNS coordinator. The TAP coordinator engaged the five coastal CMAs, the Crown Lands Division of the NSW Department of Primary Industries and over 40 land managers; attracted over \$2 million in Australian Government funds to implement the TAP; developed a raft of resources to assist stakeholders

to increase their capacity to implement the TAP; and assisted site managers in planning and monitoring.

Site management The fundamental objective of the TAP was to ensure bitou bush, and other weed, management occurred to protect key biological assets, such as threatened species. This was achieved, with 73% of all managed sites being in the highest priority management category (of a possible five), and 88% being in the top two categories. This shows that management was mostly consistent with the TAP site prioritisation.

To ensure site management was consistent with the TAP objectives, a standardised site management plan template was developed. This included the list of biodiversity at risk from bitou bush; other weeds threatening this biodiversity; the stakeholders involved; a site map and control plan; actions to reduce potential off-target impacts; and monitoring details. Each plan was approved by the TAP coordinator. In total, 115 of the 157 known managed TAP sites had approved site plans. Site plans were prepared by the NPWS (53%) and Local Government and Crown Lands (39%).

Bitou bush distribution and density As part of the TAP Review, the distribution and density of bitou bush was remapped in NSW in collaboration with land managers (see Hamilton *et al.* 2012). In 2008, bitou bush infestations covered 43,588 ha in NSW, and the density of infestations decreased markedly since previous mapping in 2001.

Specific analyses were performed to ascertain changes in bitou bush in national containment zones and on NPWS estate. Between 2001 and 2008, the area and density of bitou bush at both the northern and southern containment zones was reduced markedly and the zones receded. As of 2008, in the northern and southern containment zone the area of bitou bush decreased by 8% and 34% respectively, coupled with large reductions in infestation density. These reductions appear to have greatly increased since 2008, with unpublished data collected in the Tweed Shire Council in 2011 and 2013 suggesting much greater reductions in the northern containment zone.

The area of bitou bush on NPWS estate decreased by 21% (between 2001 and 2008), including a 56% decrease in infestations with greater than 40% cover. For further detail on mapping results see Hamilton *et al.* (2012).

Biological monitoring Monitoring programs were established at 76 sites across coastal NSW. After excluding sites with solely baseline data, pre- and post-control data were available for 64 sites. The

extent and duration of monitoring and data quality varied markedly. Monitoring programs that were well replicated and occurred over periods greater than two to three years were established at relatively few sites.

Figure 1 illustrates the response of native biodiversity across the 64 monitored sites. A positive native biodiversity response occurred at 17 of 64 (27%) sites, being a measure of total native species cover or native richness, and included sites where positive biodiversity changes occurred prior to the TAP but monitoring data collected thereafter confirmed these trends. Thirty-eight of 64 (59%) sites had insufficient data to detect a response at the time of analysis, mostly due to poor plot replication and/or a short duration of monitoring.

Notwithstanding, in general, where data was sufficient and control programs were implemented over a number of years, results indicated an increase in the abundance of native plant species. However, strong support and assistance to field staff was needed to measure this weed management outcome.

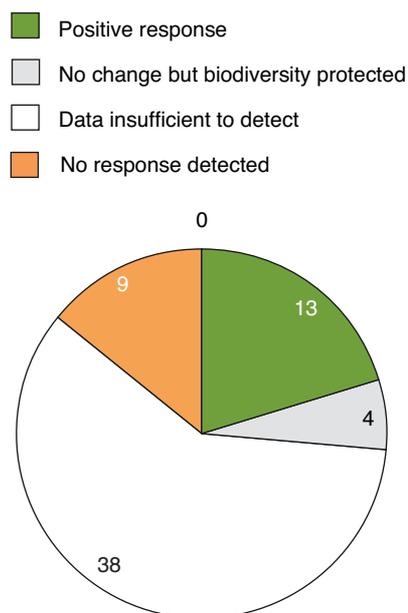


Figure 1. The response of native biodiversity at TAP sites, as determined by analysis of native species abundance and/or richness. For definitions of response categories see OEH (2013). Note: no sites recorded a negative response of biodiversity.

KEY CHALLENGES

Poor knowledge of threatened entities Each TAP site was prioritised on the basis of an impact to a plant species, population or ecological community. Poor knowledge of the location of threatened species at sites limits the effectiveness of asset protection planning and monitoring efforts. This challenge may have been helped somewhat through publication of the identification guide to the plants at risk from bitou bush invasion (Hamilton *et al.* 2008), but is unlikely to be resolved without expert flora surveys of sites and improved threatened species and ecological community spatial data.

Monitoring Though monitoring details were required in the site management plan, the Monitoring Manual for Bitou Bush Control and Native Plant Recovery (Hughes *et al.* 2009), and the standardised techniques and datasheets therein, the manual was not released until after management and monitoring programs had commenced at many sites. Subsequently monitoring was often not established, poorly planned, performed intermittently, and/or not standardised.

Measuring a response from the specific biota at risk was difficult and often not, or poorly, attempted. This could be due to: inherent target species' rarity and sporadic occurrence; steep and rocky habitats or transient dunes vulnerable to coastal erosion; fragile species' habit and habitat; species identification difficulties; and species' life history traits that may reduce the likelihood of a species' response to solely weed control. Further, where monitoring did occur, in many instances it was unable to detect a biodiversity response, especially due to low replication or insufficient time to detect such a response. It also became evident during the TAP Review that weeds were often threatening but not currently impacting biodiversity and any effort to monitor changes in the abundance of such species was superfluous. The TAP Review concluded that monitoring of rare or difficult-to-monitor species may not be feasible unless substantial time and expertise is committed.

A key monitoring challenge is to have clear management objectives and monitoring questions, and then to ensure outcomes are measurable. For example, it may not be feasible to expect an increase in threatened species abundance once a weed impact or threat is abated. Indeed, measuring such a change is likely beyond the skills and resources of most land managers. Instead, the expected outcome to be measured could be the continued presence of the threatened entity at the site or other surrogates such as native species richness or the abundance of key species in an Endangered Ecological Community.

A substantial amount of Bitou TAP monitoring was undertaken, but guidance and direction is required to ensure efficient, targeted and meaningful data is collected. NPWS efforts are underway to assist managers with sites under the Biodiversity Priorities for Widespread Weeds (BPWW, DPI and OEH 2011) (a threat abatement strategy for all widespread weeds) to ensure monitoring is standardised, well replicated and evaluates the effectiveness of weed management.

Continued site management As part of the TAP Review, a survey of site managers found that the need for consistency in long-term funding to maintain momentum at sites was a high priority (OEH 2013). There is a need for consistency in long-term management to ensure gains made at sites are not lost to weed reinvasion. Therefore, site managers have attempted to secure funding from a variety of sources to allow for follow up or secondary weed control.

Often the weeds that invade after bitou bush management are more costly to control. Common weeds that invade or re-invade at bitou bush managed sites include: glory lily (*Gloriosa superba* L.), ground asparagus (*Asparagus aethiopicus* L.), climbing nightshade (*Solanum seaforthianum* Andrews), and coastal morning glory (*Ipomoea cairica* (L.) Sweet) (Winkler *et al.* 2008). Therefore, continued management and early management of secondary weed invasion are vital.

DISCUSSION

This threat abatement case study outlines an experience prioritising and managing one widespread weed (though all weeds impacting biodiversity were managed at the site level). Clearly such prioritisation effort cannot be invested individually for each widespread weed. The BPWW (DPI and OEH 2011) seeks to overcome this issue by prioritising widespread weed management by taking into account the risk of all widespread environmental weeds. This tool is now used to prioritise widespread weed management for biodiversity conservation on NPWS estate. BPWW site priorities were incorporated into the 14 Regional Pest Management Strategies (for example, the strategy for North Coast Region, OEH 2012) that NPWS uses to guide its pest and weed management.

This paper shows that with coordinated action, sufficient funding and support to land managers, management of widespread weeds to alleviate biodiversity impacts and contain further spread is achievable. Undoubtedly, it makes sense to invest scarce resources on prevention and eradication approaches, as these are the most cost effective to prevent future weed impacts. However, this investment should not be at the expense

of strategically managing the greater impacts of widespread weeds, the environmental and social costs of which are not well accounted for. Further, under the TSC Act, Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, Intergovernmental Agreement on Biosecurity, and NSW Biosecurity Strategy 2013–2021, there are obligations to manage widespread weeds to reduce impact. Any effort or policy movement away from funding widespread weed management is in conflict with these statutes and strategies and ignores the continuing and current impacts of widespread weeds.

In conclusion, the above outcomes were achieved and the future challenges listed above will only be acted upon through strong coordination and investment. Implementation of the Bitou TAP was also assisted by national coordination of the bitou bush WoNS program and good relationships with CMAs that acted as regional coordinators, administrators and funding bodies. The final challenge now is to ensure weed management gains at TAP sites are not lost and momentum on environmental widespread weed management continues.

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