

Reducing the threat of a nationally significant weed to biodiversity: four years of implementation of the NSW Bitou Bush Threat Abatement Plan

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Summary Widespread weed species are unlikely to be eradicated, thus control efforts need to focus on containment and asset-protection. In 2006, the NSW Bitou Bush Threat Abatement Plan (Bitou TAP) outlined an approach for the protection of environmental assets from a widespread weed species. Here we provide an overview of 4 years of implementation of the TAP, using five case studies. The implementation of the TAP across multiple land tenures at 107 sites is helping to protect nearly 90% of the high priority native species and ecological communities at risk from bitou invasion. Results to date show that this strategic approach has been effective in environmental asset-protection. For example, at Wamberal Lagoon Nature Reserve bitou bush density has been reduced to <10% from 70% and monitoring data show the cover and abundance of native plants increasing. Similarly, at Cape Byron bitou bush cover has decreased from >80% to <1% and the number of native species has increased including a new record of a high priority native species in 2009. These case studies showcase the implementation of the TAP and illustrate the success of this combination of strategic planning, control and monitoring dedicated to protecting and restoring biodiversity threatened by bitou bush invasion.

Keywords Case studies, conservation, native and threatened species, management priorities, weed impacts.

INTRODUCTION

Bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata* (DC.) Norl.) is an Australian Weed of National Significance that poses a major threat to coastal biodiversity in eastern Australia (DEC 2006). It is now widespread in coastal New South Wales (NSW), occurring over 80% of the coastline (Thomas and Leys 2002) and therefore complete eradication is unlikely. Bitou bush has been recognised as an invasive weed since the 1970s and while control has occurred since that time (Weiss *et al.* 2008), knowledge of the biodiversity at risk has been patchy and anecdotal, in part due to the incorrect assumption that control of weeds will automatically lead to conservation outcomes (Downey *et al.* 2010).

In 1999, bitou bush was recognised as a Key Threatening Process (KTP) under the NSW *Threatened Species Conservation Act 1995* (TSC Act). In response to this listing, a Threat Abatement Plan (TAP) was finalised in 2006, which identified 157 plant species, three endangered plant populations and 24 ecological communities as being threatened by bitou bush (DEC 2006, Hamilton *et al.* 2008). The Bitou TAP established a triage system for prioritising the biodiversity most at risk from bitou bush and sites for its protection based on the ability to deliver effective control and a biodiversity response (Burley *et al.* 2008, Downey *et al.* 2010).

BITOU TAP IMPLEMENTATION

The Bitou TAP is now being implemented across 107 sites and its implementation was recognised as a highly commendable ecological restoration project in Australasia by the Society for Ecological Restoration International in 2009. In addition, the TAP approach has been replicated nationally for lantana (*Lantana camara* L.) and for widespread weeds at a regional (Catchment Management Authority, CMA) scale in NSW (see Downey *et al.* 2009, Turner *et al.* 2010).

The implementation of the Bitou TAP across all land tenures has allowed management to occur in a coordinated manner for biodiversity conservation, rather than as a series of individual ad-hoc decisions and a series of unconnected short-term projects. This strategy has contributed to new funding for weed management with grants from both the Australian Government and NSW CMAs. In addition, a series of tools has been produced to help stakeholders with implementation (Burley *et al.* 2008). One of these tools is a monitoring manual for bitou bush control and native plant recovery (Hughes *et al.* 2009). The monitoring manual helps to address a key action in the TAP as well as assist stakeholder to evaluate their programs. Written in consultation with stakeholders and land managers, the monitoring manual uses a three tier approach to monitoring, where stakeholders can use techniques that best suit their resources and skills (Downey and Hughes 2010).

The control of bitou bush has occurred at all sites following the completion of 5 year site-specific management plans that tailor bitou bush control to the priority threatened species and ecological communities present. These control actions are now being supported by effective monitoring programs. Ninety percent of the high priority biodiversity identified in the TAP is now under active management to prevent further impacts from bitou bush. Below we present a brief summary from five priority sites to illustrate the effectiveness of the on-ground implementation of the Bitou TAP in NSW. Extended versions of each along with several other case studies are available on the Bitou TAP website: www.environment.nsw.gov.au/bitouTAP/casestudies.htm.

BITOU TAP CASE STUDIES

Cape Byron State Conservation Area (North Coast NSW) Bitou bush was widely planted in the region to stabilise the sand dune complex following mining in the 1950s. It became widespread throughout the 10 ha site and was damaging a suite of native threatened plant species and two ecological communities, including Littoral Rainforest. The site is important to the local Arakwal Aboriginal people and they are actively involved in its management, with the NSW National Parks and Wildlife Service (within the DECCW), Byron Shire Council, and the community under the Cape Byron Trust. Bitou bush control targeted at saving native species started in 2008. A combination of spot spraying using a knapsack sprayer and over-spraying using a vehicle-mounted spray rig achieved initial control over the whole site.

A thorough annual monitoring program consisting of transects and quadrats have been used to monitor the control of bitou bush and recovery of native species. This site is now a demonstration site for 'Advanced Monitoring' techniques of the Bitou TAP Monitoring Manual (Hughes *et al.* 2009). Bitou bush cover has decreased from >80% to <1% and the number of native species has increased by several species per m², including a new record in 2009 of a high priority native species (as recorded in the Bitou TAP).

Bundjalung National Park (North Coast NSW) Surveys in 2001 revealed that approximately 28 km of the frontal dune system was moderately to heavily infested with bitou bush, along with the hind dune system and other vegetation communities. Several high priority species and ecological communities, including Themeda Grassland on Seacliffs and Coastal Headlands endangered ecological community (EEC), Coastal Banksia Woodlands, Littoral Rainforest ECC and Frontal Dune Vegetation Complex, which were

identified in the Bitou TAP occurred on the site. In addition, an assessment of the site as part of the TAP revealed a high likelihood of native species recovery following bitou bush control.

Bundjalung National Park site is managed jointly by the NSW National Parks and Wildlife Service, in consultation with the local indigenous people, and the Department of Defence, which manages a weapons range within the park. In addition, the local community Dune Care group works regularly on the site to control bitou bush and restore the native vegetation communities. General bitou bush control started before the TAP, but has been focused on the high priority species and communities since the TAP development. The control program has included aerial and ground spraying as well as bush regeneration. In addition, wildfires have occurred on site in the last 10 years. A rigorous monitoring program has been in place since 2002 (Thomas *et al.* 2006). Bitou bush control has resulted in a 90% decline in the cover of the weed, with a corresponding increase in the cover of many native species at risk.

Wamberal Lagoon Nature Reserve (Central Coast NSW) Bitou bush has invaded the fore- and hind-dunes as well as the headlands, replacing native vegetation across the 5 ha site. The site also contains three threatened species and Littoral Rainforest EEC. Implementation of the Bitou TAP began on site in 2007 along the dunes to protect the native species at risk, with the assistance of professional bush regenerators and an active community group. Regenerators cut tracks through the bitou bush and sprayed it with splatter guns using small volumes of high concentration glyphosate. Bitou bush was also controlled at the site with cut and paint and hand removal techniques and the assistance of NSW National Parks and Wildlife Service staff who sprayed along the dunes. Secondary and maintenance control has occurred since the initial control efforts.

Monitoring using nested quadrats has been established at the site to assess the bitou bush control program and native species recovery. Bitou bush density has been reduced from 70% to <10% while the cover abundance of most native plants has increased to 25%. While these results show a positive outcome, long lasting change has not occurred and the site will require ongoing maintenance and restoration until the native canopy and ground cover have re-established.

Bass Point Reserve (South Coast NSW) Surveys and aerial inspections in 1998 revealed that the majority of the 71 ha reserve was heavily infested and bitou bush was a serious threat to its conservation value and ecological diversity. The Reserve encompasses at

least ten vegetation communities including the Littoral Rainforest EEC and three threatened plant species. The Reserve is managed by Shellharbour City Council, in consultation with the local Aboriginal community for whom the site is of significance. Bitou bush control has occurred since 1999 as a collaborative partnership between Council, the Illawarra District Noxious Weeds Authority, the Illawarra Aboriginal Lands Council and the Southern Rivers CMA. In addition, local residents have assisted since 2004, the Department of Corrective Services has been integral in providing labour to aid on-ground control, and the NSW National Parks and Wildlife Service has helped to coordinate bitou control within the most sensitive areas since 2007.

Bitou bush control programs have primarily involved aerial spraying of all heavy and inaccessible infestations, complemented by hand removal and/or spot spraying in more accessible and sensitive locations. Annual monitoring using photo points (which includes observational monitoring – see Hughes *et al.* (2009) has been used to determine the success of bitou bush control and native species recovery.

Control works have resulted in a >90% decline in the presence of bitou bush across all treated areas with a noticeable increase in the number of individuals or seedlings of two threatened species. For example, at least 27 *Zieria granulata* (F.Muell.) C.Moore ex Benth. seedlings were recorded within 5 m of mature trees following protection works. Funding received under the Bitou TAP has done much to mitigate and ameliorate the impact of bitou bush on the threatened species and Littoral Rainforest EEC that are most at risk. It has also complimented existing programs within the reserve that began in 1999.

Warrain/Currarong Beach (South Coast NSW)

Bitou bush has invaded a 9 km stretch of coastline near Warriar beach, which provides a land barrier between the waters of the nationally significant Lake Wollumboola and the Tasman Sea. The site also has a high ecological significance due to the suite of EECs that form the diverse mosaic of native vegetation. The site is managed by the Shoalhaven City Council and the NSW National Parks and Wildlife Service. Community volunteers and some of the surrounding private landholders also participate in on-ground works where practicable. Bitou bush control has occurred at the site using a range of methods aimed at protecting priority biodiversity.

A program of monitoring photopoints and quadrats has been established to assess the threatened species, along with bitou bush density mapping prior to and following control. Following intensive bitou bush control in 2007, the number of individuals of the high

priority threatened species *Chamaesyce psammogeton* (P.S.Green) P.I.Forster & R.J.F.Henderson has increased from one to seven in 2009. Monitoring results have also revealed that bitou bush is being contained and eliminated from the EECs present. The Bitou TAP has helped shift the weed management focus at this site from generalised bitou bush control to protection and restoration of the priority species and EECs present.

CONCLUSIONS

The implementation of the Bitou TAP has been a combined effort involving many different stakeholders including five CMAs, DECCW (including the NSW National Parks and Wildlife Service) and other government agencies, local councils, contractors, local Aboriginal communities and community groups/volunteers (Burley *et al.* 2008, Strehling *et al.* 2008). The above case studies illustrate the value of the TAP in focusing the control of bitou bush on the protection of the biodiversity at risk rather than for broad control. These results have been dependent on sound planning and prioritisation of sites where control of bitou bush is likely to have the greatest conservation outcomes. In addition these successes are dependent on coordination and more recently the development of adequate guidance and commitment to monitoring that is consistent with the TAP aims (being the recovery of the native biodiversity most at risk). The continual rollout of the monitoring manual in the coming year will help land managers to measure the effectiveness of their bitou bush control and the recovery of native species.

The TAP has also provided a valuable tool to guide investment in weed control, in an environment where needs far exceed the limited resources available (Williams *et al.* 2009). The Bitou TAP has also established a model for strategic management of other widespread weeds to protect biodiversity. The asset-based approach used in the Bitou TAP model has been adapted for lantana nationally through the national plan to protect environmental assets from lantana (Biosecurity Queensland 2010). In addition, with assistance from Industry and Investment (I&I) NSW and the 13 CMAs in NSW, the bitou bush and lantana approaches have been adapted to encompass multiple widespread weed species at a regional or CMA scale in NSW (DECCW and I&I NSW 2010).

In 2011 the Bitou TAP will be formally reviewed in accordance with the TSC Act. This will see a full examination of the sites and the response of the native species at risk. The interim results presented here suggest that the TAP approach has been successful in focusing weed control on native species recovery and highlight the value of effective coordination and monitoring.

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