WEEDS OF NATIONAL SIGNIFICANCE

Bitou bush (*Chrysanthemoides monilifera* ssp. rotundata (DC) T. Norl.) and boneseed (*Chrysanthemoides monilifera* ssp. *monilifera* (L.) T. Norl.) strategic plan 2012–17

This publication is produced as part of the Weeds of National Significance initiative, a joint initiative between the Commonwealth of Australia and each of the Australian states and territories.

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An unpublished draft of the revised strategic plan has guided national coordination of this Weed of National Significance for the past two years. Before publishing this plan, the Australian Weeds Committee altered it because some actions had been completed, and then agreed to include a uniform monitoring, evaluation, reporting and improvement (MERI) template for all phase-3 Weeds of National Significance.

Supporting information about the Australian Weeds Strategy, Weeds of National Significance and progress to date may be found at www.weeds.org.au, where links and downloads provide contact details for all species, and copies of the strategy. Comments and constructive criticism are welcome as an aid to improving the process and future revisions of this strategy.

This publication (and any material sourced from it) should be attributed as:

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Inquiries should be addressed to:
Secretariat
Australian Weeds Committee
GPO Box 858
CANBERRA ACT 2601

Email: awc@daff.gov.au
Web: www.weeds.org.au

Copies of this publication are available from the Secretariat or at www.weeds.org.au/wons.

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Summary

Bitou bush (*Chrysanthemoides monilifera* subspecies *rotundata*) and boneseed (*Chrysanthemoides monilifera* subspecies *monilifera*) are Weeds of National Significance (WoNS) that threaten Australia's biodiversity and natural ecosystems. Bitou bush is primarily restricted to coastal regions of eastern Australia, whereas boneseed occurs in a larger variety of habitats across the southern states.

Despite the large scale of the problem, land managers and community groups throughout Australia have made significant progress in reducing the impact and preventing the spread of these weeds. The 2000 strategic plan set goals and objectives to ensure strategic national management. National coordination has facilitated significant progress towards achieving the plan's objectives.

Eradication programs are being implemented to control all bitou bush and boneseed outlier infestations, and containment lines are in place to prevent spread of the weeds outside of core (large and/or well-established) infestations. Extensive efforts by the community and land managers, and implementation of threat abatement actions, are protecting priority biodiversity assets. Community action is supported by a range of resources that provide advice on effective control of bitou bush and boneseed. Nationally coordinated awareness efforts have broadened the range of stakeholders engaged in bitou bush and boneseed management and have led to investment of additional resources in management and control.

Although a national management group will no longer facilitate implementation of the strategic plan after 2012, a legacy of national action remains. This plan outlines the means to continue that legacy. All stakeholders must now share responsibility for implementing and monitoring the strategic actions in this plan to ensure that national objectives continue to be achieved.

This plan provides guidance towards achieving the following key goals and objectives:

1 Prevent new infestations from establishing

- Develop and maintain early detection mechanisms to protect uninvaded areas.
- Record, map and analyse all infestations.
- Maintain and monitor eradication programs.
- Develop, maintain and implement containment programs.

2 Strategically manage existing infestations

- Introduce, assess and improve the effectiveness of biological control agents to reduce the impact of large and/or well-established infestations.
- Identify key assets for protection; prioritise these at state and/or regional level and undertake control in priority areas to reduce impacts of large and/or well-established infestations.
- Undertake monitoring post-control to ensure biodiversity conservation and, where necessary, undertake restoration to reduce impacts of core infestations.

3 Increase the capability and commitment to manage bitou bush and boneseed

- Refine and adopt best-practice management tools and techniques.
- Engage and support the community.
- Maintain the effectiveness and relevance of the national strategy.

Vision

Australia's native biodiversity is protected from the negative impacts of bitou bush and boneseed.

1 The challenge

Bitou bush (*Chrysanthemoides monilifera* subspecies *rotundata*) and boneseed (*Chrysanthemoides monilifera* subspecies *monilifera*) are Weeds of National Significance (WoNS) that have severe impacts on Australia's native biodiversity. A strategic plan was developed in 2000 to direct national management efforts for these weeds. Since 2005, the National Bitou Bush and Boneseed Management Group and a national coordinator have overseen implementation of the strategic plan. This national coordination has garnered commitment to strategic management and facilitated action nationally.

Containment and eradication programs are under way across Australia. All infestations of bitou bush in western New South Wales, Lord Howe Island, Western Australia, Victoria and Queensland are targets of eradication programs. Northern and southern containment lines in New South Wales prevent spread of bitou bush outside of core (large and/or well-established) infestations. Extensive efforts by the community and land managers, and implementation of a bitou bush threat abatement plan, ensure that priority biodiversity assets are protected from bitou bush within core infestations.

In Victoria, community management networks are being developed to support volunteer action on boneseed. The national western boneseed containment line and the Murray–Coorong containment zone in South Australia are in place to protect key assets and prevent spread. Containment and eradication zones are established throughout Tasmania to target outlier boneseed infestations and contain core infestations. Isolated infestations of boneseed in New South Wales and Western Australia are targeted for eradication. A hybrid bitou bush × boneseed population, at Davey's Bay near Frankston, Victoria, is being eradicated.

These collaborative initiatives are preventing spread and reducing the impact of bitou bush and boneseed across Australia. National coordination has facilitated these successes and helped to achieve significant progress towards strategic objectives. National coordination ended in 2012 and, despite the legacy of national action, there is still work to be done. This 2012–17 strategic plan builds on the original plan developed in 2000. The current plan provides information and guidance to assist land managers and the community in taking strategic action to reduce the impact of bitou bush and boneseed on Australia's native biodiversity.

The challenge now lies with all stakeholders to maintain their responsibility for implementing and monitoring the strategic actions in this plan, to ensure that goals and objectives are achieved. All stakeholders must work together to secure ongoing commitment to investment and management efforts. Governments must also continue to increase community capability to manage bitou bush and boneseed and provide support for the extensive community effort. Program partners must continue to progress strategic actions, so that the legacy of national effort continues.

2 Background

The biology, ecology, invasion history and impacts of bitou bush and boneseed, as well as control methods for these weeds, are extensively detailed in national best-practice manuals for bitou bush (Winkler et al. 2008) and boneseed (Brougham et al. 2006), and the *Chysanthemoides monilifera* Biology of Australian Weeds paper (Weiss et al. 2008). A brief overview is presented below.

2.1 Biology of bitou bush and boneseed

Bitou bush and boneseed are members of the daisy family (Asteraceae) and native to South Africa. Both subspecies are salt tolerant, and have fleshy leaves and fleshy, edible fruits that are dispersed by animals, humans and water. Figure 1 provides a guide to distinguishing between the two subspecies.

Individual bitou bush and boneseed plants can produce up to 48 000 seeds per year. Rapid germination and growth rates of bitou bush seedlings give them a competitive advantage over native plant seedlings (French et al. 2008).

Seeds may persist for up to 5 years for bitou bush and 10 years for boneseed; however, exact seed longevity is unknown. A 10-year seed persistence study began in 2008 (see Weiss et al. 2008), and results from this study will provide a greater understanding of the ability of these weeds to survive in the soil.

Bitou bush and boneseed are successful invaders because of their rapid growth, enormous seed production, efficient dispersal, lack of natural enemies and adaptability to different environments. These characteristics have allowed the weeds to invade and proliferate in a range of vegetation communities.

bitou bush (ssp. *rotundata*)			boneseed (ssp. *monilifera*)	
	sprawling shrub, 1–2 m high	**habit**	erect shrub, up to 3 m high	
	3–7 cm long, broader oval shape, smooth or only slightly toothed edges	**leaves**	3–9 cm long, elongated oval shape, irregularly toothed edges	
	11–13 'petals' flowers year round with a peak from April to June	**flowers**	4–8 'petals' flowers from late winter to spring (mainland), to early summer (Tas)	
	egg-shaped fruit	**fruit**	round fruit	
	egg-shaped, rough, dark brown to black	**seeds**	round, smooth, bone-coloured	
	leaves with smooth edges	**seedlings**	leaves with toothed edges	

Figure 1 Distinguishing between bitou bush and boneseed

2.2 History of spread

The earliest records of bitou bush are from the Newcastle area in 1908, where it was accidentally introduced in ballast. From 1946 to 1968, bitou bush was planted along the New South Wales and Queensland coasts to assist in post-mining rehabilitation. These plantings contributed significantly to spread, and bitou bush now affects up to 80 per cent of the New South Wales coast. Bitou bush is primarily restricted to coastal regions from south-east Queensland to the far south coast of New South Wales, but plants have been found as far as 50 kilometres inland at Stroud, New South Wales. Small, isolated infestations occur in Victoria, on Lord Howe Island and in western New South Wales. Potential distribution estimates (Figure 2) show that bitou bush could spread further north along the Queensland coast and further inland, especially along waterways. In July 2012, a single bitou bush infestation was found on coastal dunes south of Perth, Western Australia.

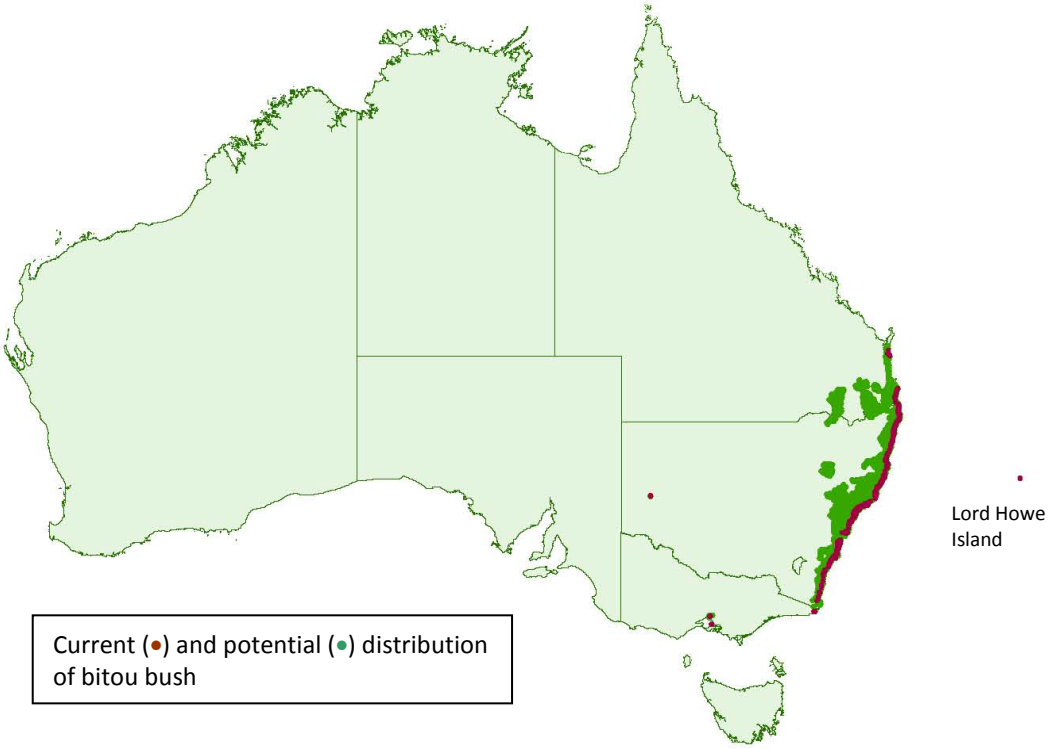


Figure 2 Current and potential bitou bush distribution in Australia (2010 data)

Boneseed was first recorded as a garden plant in Sydney in 1852. By 1948, it was present in all southern states. Infestations appear to have resulted from garden escapes. Boneseed occurs in a multitude of habitats. It is widespread in parts of Victoria (especially around Melbourne), and in Adelaide and the Mount Lofty Ranges of South Australia.

Large infestations also occur around Launceston and Hobart in Tasmania, with outlier infestations along the north and east Tasmanian coasts. Isolated infestations of boneseed occur in New South Wales and Western Australia. A hybrid bitou bush × boneseed population occurs at Davey's Bay near Frankston, Victoria.

Boneseed has the potential to invade vast areas of southern Australia, including much of southern and central New South Wales, all areas of Victoria (except alpine regions), and more than 37 million hectares of south-west Western Australia (Figure 3).

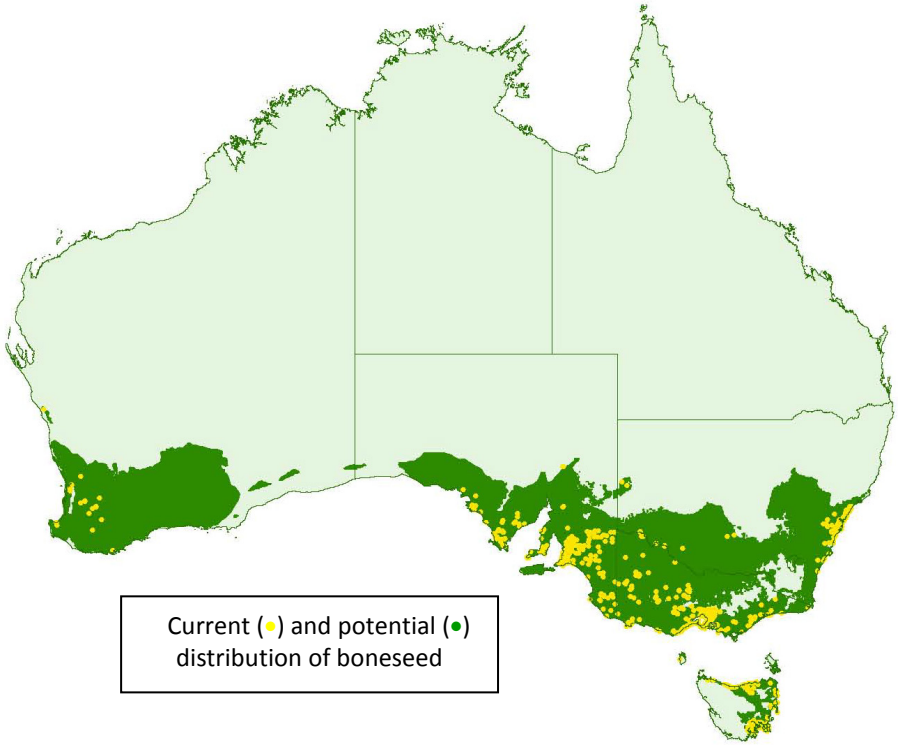


Figure 3 Current and potential boneseed distribution in Australia (2008 data)

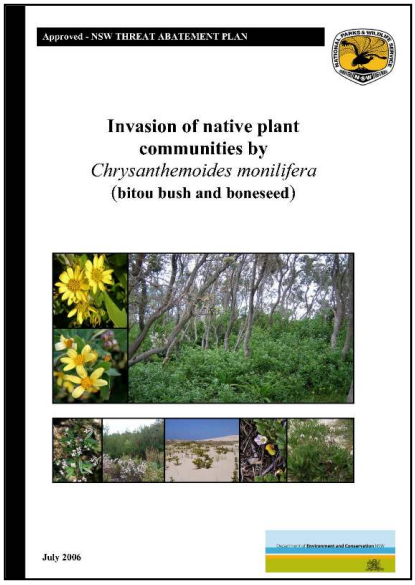
Both bitou bush and boneseed have the potential to become more abundant within their current range, as well as to spread into new areas. It is predicted that these weeds have the potential to invade more than 120 million hectares of Australia if effective control and containment programs are not implemented and maintained.

2.3 Summary of impacts

Bitou bush and boneseed pose a major threat to biodiversity because they reduce the abundance and diversity of native species, and adversely affect the structure and function of natural ecosystems. More than 200 native species, ecological communities and other biodiversity assets are known to be negatively impacted by bitou bush alone (DEC 2006). The impact of boneseed is also severe: native species richness can be reduced by up to 25 per cent following boneseed invasion (French & Watts 2010).

Extensive research indicates that bitou bush changes ecosystem properties and processes, negatively impacts fauna, reduces abundance and diversity of native plants, and exudes chemicals or changes soil processes that influence the growth of native plant seedlings (French et al. 2008)

Bitou bush can form monocultures in coastal ecosystems, including heath, grasslands, headlands, dunes, littoral rainforest and coastal sclerophyll forests. Boneseed invades all types of coastal ecosystems, including estuarine ecosystems, as well as numerous inland communities, such as mallee and eucalypt woodlands.



The Bitou bush Threat Abatement Plan (DEC 2006) prioritises sites for control based on biodiversity conservation.

2.4 Control methods

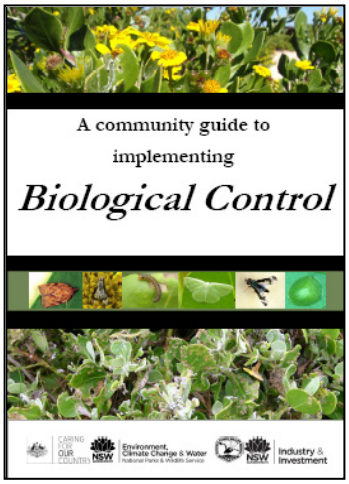
Bitou bush and boneseed can be effectively controlled using chemical and mechanical methods, and biological control options exist for bitou bush. A range of resources provide advice on effective management of bitou bush and boneseed.

2.4.1 Biological control

The bitou bush and boneseed biological control program has made significant progress since its inception in 1986 (see Adair et al. 2011; Downey et al. 2007). Three biological control agents are currently established on bitou bush: the bitou seed fly (*Mesoclanis polana*), the bitou tip moth (*Comostolopsis germana*) and the leaf-roller moth (*Tortrix* sp.). The seed fly and the tip moth are widespread throughout the range of bitou bush, contributing to a decline in seed production in some bitou bush infestations. Seed set is being reduced by as much as 80 per cent in some areas, and this success is expected to continue. Community groups and land managers have established biological control nurseries to assist with ongoing redistribution of the leaf-roller moth in core bitou bush infestations. The leaf-roller moth is also the subject of two education programs: Weeds Attack! and Weed Warriors, which teach school children about the impact of weeds and weed management (Schembri et al. 2008).

Biological control agents introduced for boneseed have had no significant impact to date. The boneseed leaf buckle mite (*Aceria* sp.) was released in 2008, but has yet to establish. Another potential agent, the boneseed rust fungus (*Endophyllum osteospermi*), is still in the research phase.

Biological control can play a significant role in the future by reducing seed production and plant vigour. Integrating redistribution of biological control agents into management programs and providing continued support for research are therefore critical.



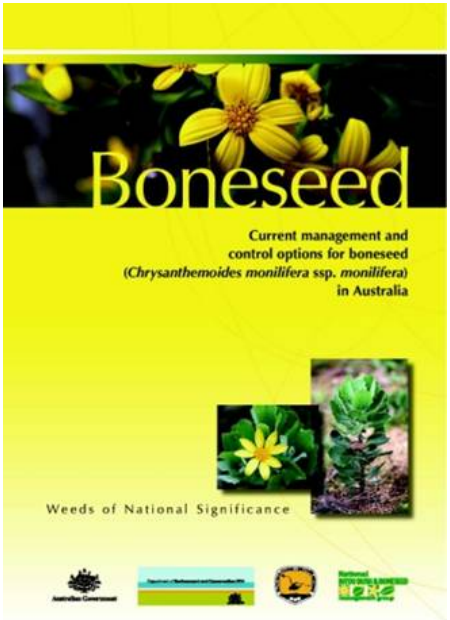
Tools are available to assist the community in redistributing bitou bush biological control agents (Jenner et al. 2010).

2.4.2 Manual, chemical and other control

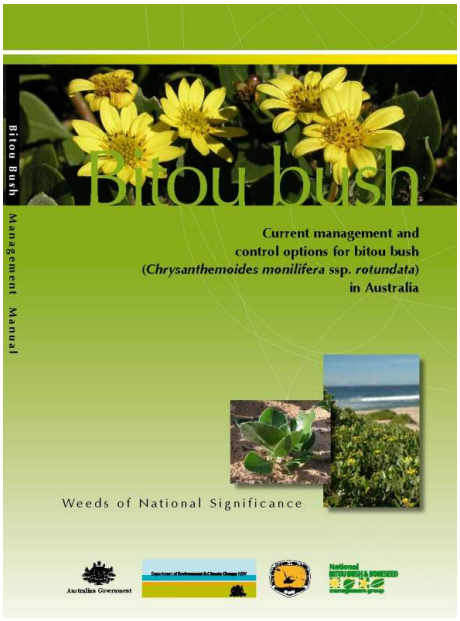
Bitou bush and boneseed can be controlled using manual and chemical methods. A range of herbicides and application methods are registered for use on both species.

Fire can also be integrated in management programs, where appropriate. Successful control requires an integrated management approach using various control options, with the final combination often being site specific.

Control programs must strive to protect native biodiversity, while preventing reinvasion by bitou bush or boneseed or their replacement by other weeds. Follow-up control is essential because of the large, persistent seed banks produced by bitou bush and boneseed.



Current management and control options for boneseed in Australia (Brougham et al. 2006)

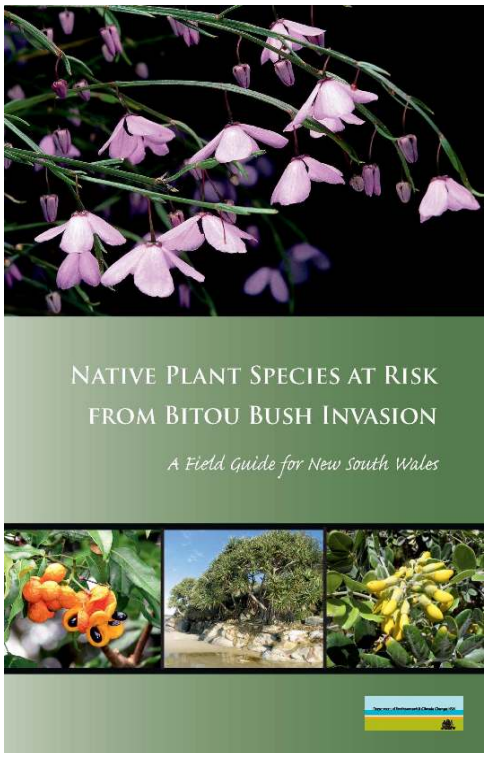


Current management and control options for bitou bush in Australia (Winkler et al. 2008)

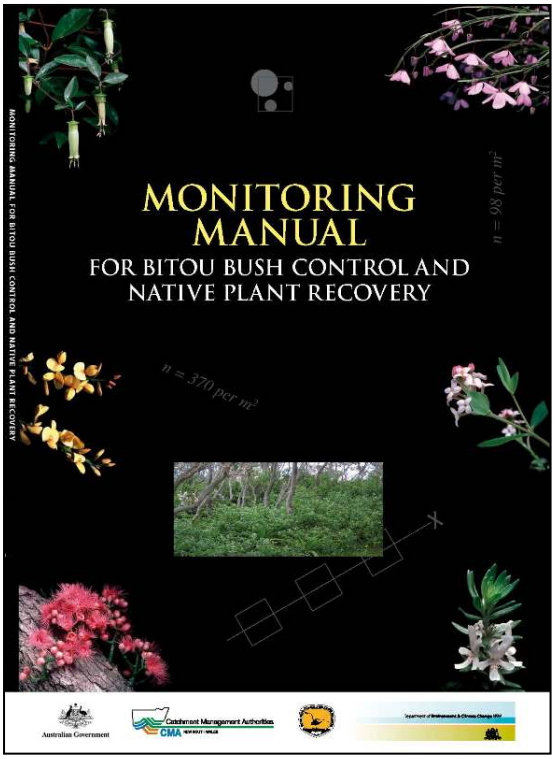
2.4.3 Monitoring and restoration

Dense infestations of bitou bush and boneseed can have long-term impacts on biodiversity. Monitoring the response of native biodiversity following control activities is essential for measuring the success of these activities in well-established infestations. Management strategies should also include restoration actions to ensure that resilience is restored to native habitats, since weed control alone does not always lead to an improvement in biodiversity.

Several tools are available to assist with monitoring and restoration. These include; the monitoring manual for bitou bush (Hughes et al. 2009), which can also be used for boneseed and other weeds; an identification guide to the native plants at risk from bitou bush (Hamilton et al. 2008); and restoration guidelines for bitou bush in southern New South Wales (French 2010), which can be used as a template to produce similar guidelines for other regions.



Guide to the native plant species at risk from bitou bush invasion (Hamilton et al. 2008)



Monitoring manual for bitou bush control and native plant recovery (Hughes et al. 2009)

2.5 Socioeconomic factors affecting management decisions

Bitou bush and boneseed are predominantly, but not exclusively, weeds of public land. As a result, many of the resources to manage these weeds come from public sources, and opportunities to obtain industry funding are limited. Fortunately, there is considerable community interest in, and awareness of, the adverse impacts of bitou bush and boneseed among the hundreds of volunteer groups who work towards managing and controlling these weeds. However, the magnitude of the problem, coupled with limited recruitment of new volunteers and the requirement for a long-term commitment, can lead to volunteer disillusionment and burnout. Public funding agencies need to continue supporting community volunteers with resources to ensure that this important community effort is promoted and maintained.

2.6 Management status: achievements to date

In 2000, relevant ministerial councils approved the Bitou Bush and Boneseed Strategic Plan (ARMCANZ et al. 2000). The plan directed resources to the most critical issues, through a range of agreed actions involving all stakeholders. The focus of the plan was on improving control techniques, refining and adopting integrated management strategies, and coordinating actions at national, state, regional and local levels. Priority was given to increasing community involvement, with specific recognition of the important role of volunteers.

In 2005, a national coordinator was appointed, and the National Bitou Bush and Boneseed Management Group (NBBBMG) was formed to oversee implementation of the strategic plan. The NBBBMG comprises government and community representatives from all states that are affected by bitou bush and boneseed. The national coordinator and the NBBBMG have worked to develop lasting partnerships between state and local governments, natural resource management (NRM) regional bodies and community stakeholders, to ensure continued support for the strategic plan. The Australian Government, state agencies, regional NRM bodies, local governments, research organisations and community groups have made significant progress in implementing the strategic plan. A national review in 2009 found that approximately 80 per cent of actions from the 2000 strategic plan were successfully completed. A summary of the key management achievements against each strategic goal for the 2000 strategic plan is presented below.

2.6.1 Preventing the spread of bitou bush and boneseed

The national program has reduced the invasion potential of bitou bush and boneseed by stopping new introductions, and eradicating and containing infestations. Achievements include the following:

- All jurisdictions have enacted legislation that prevents entry and sale of bitou bush and boneseed, and all *Chysanthemoides monilifera* subspecies are prohibited entry into Australia, ensuring no further deliberate, legal introductions.
- Northern and southern containment lines are in place for bitou bush, to restrict further spread (see Figure 5). Regional bodies and the community are actively monitoring areas outside the containment lines to find and destroy all plants. The northern containment line just south of the New South Wales – Queensland border, and the Queensland bitou bush eradication program, are protecting Queensland from the threat. The southern

bitou bush containment line at Jervis Bay has advanced more than 100 km north since 2002 and protects Victoria and southern New South Wales.

- Boneseed is the target of a statewide eradication program in Western Australia (see Figure 6), and all outlier populations in Tasmania (Figure 7) and New South Wales are prioritised for control or eradication. The western boneseed containment line (Figure 6), west of Adelaide, and the Western Australia boneseed eradication program protect more than 40 million hectares potentially at risk from boneseed invasion.
- Effective mapping has provided knowledge on where to direct efforts to control outlier infestations and set containment boundaries, improving the capacity for strategic national management.

2.6.2 Minimising adverse impacts of bitou bush and boneseed on biodiversity

The use of best-practice management by stakeholders, including more than 1000 community groups, continues to reduce the area and impact of bitou bush and boneseed. Key achievements include the following:

- Land managers and the community are dispersing biological control agents for bitou bush. Three agents are having negative impacts on bitou bush throughout core infestations.
- There is increased social engagement in biodiversity protection and greater awareness of the impact of bitou bush and boneseed on biodiversity, including a strong focus on using holistic management to protect key assets within core infestations.
- Priority biodiversity is being protected at more than 130 sites, including World Heritage sites, through implementation of the New South Wales Bitou Bush Threat Abatement Plan (Bitou TAP; DEC 2006). The Bitou TAP integrates regional, local and community plans to protect biodiversity.

2.6.3 Maintaining national commitment to coordination and management of bitou bush and boneseed

Community action is being supported by best-practice advice for both weeds, including consistent information on identification and impact:

- Best-practice publications provide knowledge and increase the capability of the community and others to manage bitou bush and boneseed. Resources include restoration guidelines for bitou bush, aerial spraying guidelines, monitoring and management manuals, identification guides and awareness materials.
- Increased support and resourcing have led to greater participation and a behavioural and institutional shift to better management of bitou bush and boneseed, as well as an increase in voluntary contribution by the community to bitou bush and boneseed management.
- NRM regions and state agencies have an increased commitment to managing bitou bush and boneseed. National coordination has led to improved stakeholder capability and a greater commitment to management at all levels. There is an increased cross-community and cross-generational awareness, including among school students, land managers and community groups.

- Nationally coordinated awareness efforts have broadened the range of stakeholders engaged in bitou bush and boneseed management and led to additional resources being invested in management and control.

Continuation of the strategic activities described above will ensure that community and government investment is maintained. However, this will require long-term commitment of resources and ongoing community support. Resources must largely be provided by government agencies and community volunteers, since bitou bush and boneseed primarily affect environmental assets on public land. This document is intended to provide guidance on future actions for bitou bush and boneseed.

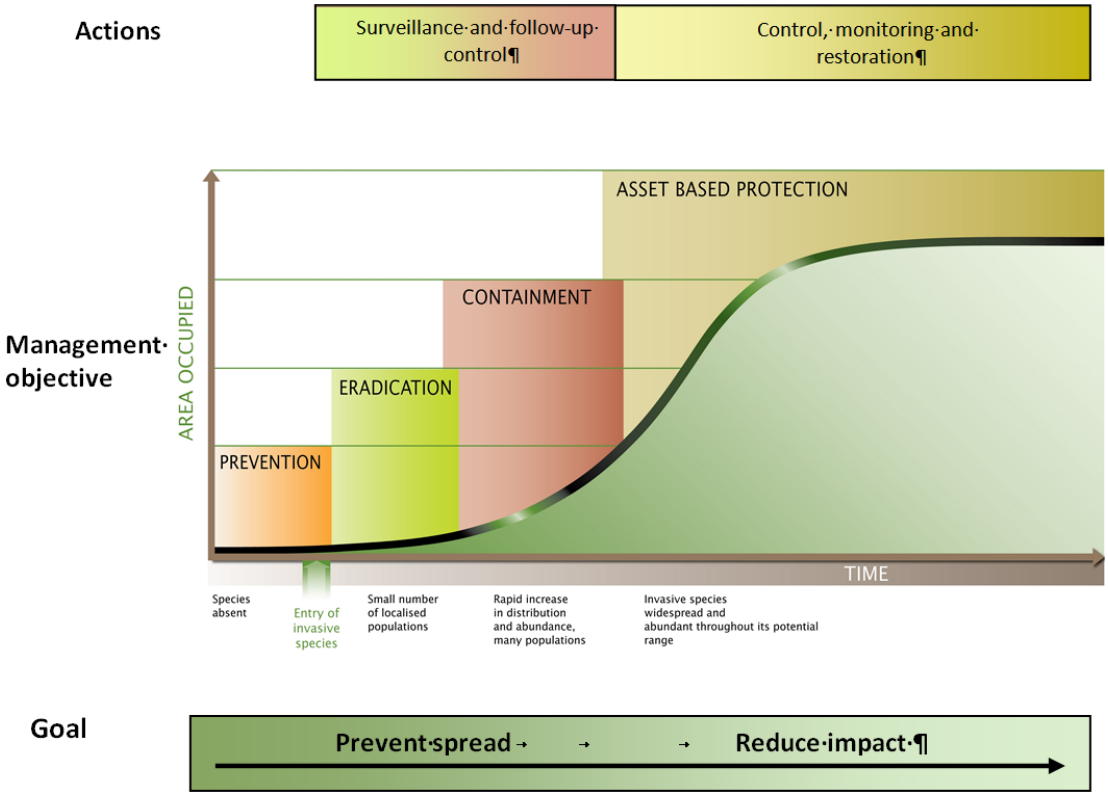
2.7 Principles underpinning the plan

This strategic plan is based on the seven key principles of the Australian Weeds Strategy (NRMMC 2007):

- Weed management is an essential and integral part of the sustainable management of natural resources for the benefit of the economy, the environment, human health and amenity.
- Combating weed problems is a shared responsibility that requires all parties to have a clear understanding of their roles.
- Good science underpins the effective development, monitoring and review of weed management strategies.
- Prioritisation of, and investment in, weed management must be informed by a risk management approach.
- Prevention and early intervention are the most cost-effective techniques for managing weeds.
- Weed management requires coordination among all levels of government, in partnership with industry, land and water managers, and the community, regardless of tenure.
- Building capacity across government, industry, land and water managers, and the community is fundamental to effective weed management.

The WoNS initiative establishes national priorities and facilitates action where there is a significant national or cross-jurisdictional benefit to be gained. WoNS strategic plans do not specifically address resourcing; however, they aim to identify efficiencies and ensure existing resources can be allocated to achieve the most strategic management outcomes.

Effective broadscale management of WoNS and other weeds requires an integrated approach that includes prevention and eradication programs, establishment and implementation of management zones, and the protection of key environmental, social and economic assets in areas where the weeds are already widespread (Figure 4).



Source: Modified from Hobbs & Humphries (1995) and (DPI 2010).

Figure 4 Stages of weed invasion with corresponding goals, management objectives and actions at each stage

2.7.1 Process followed

Since 2005, the NBBBMG has monitored and reviewed annual progress towards each of the actions in the strategic plan. In addition, a national bitou bush and boneseed forum was held in Geelong, Victoria, in August 2007. Key stakeholders attended from Queensland, New South Wales, Victoria, Tasmania, South Australia and New Zealand, including representatives from state agencies, local government, conservation agencies, non-government agencies, regional NRM bodies, scientists and community groups. Forum participants reviewed and revised the strategic plan's priority actions, based on achievements to date (see Downey et al. 2008). The NBBBMG used annual reviews and forum results to inform development of this current plan.

In 2009, the Natural Resource Management Ministerial Council (Resolution 15.7, 21 May 2009) endorsed a three-phased approach to national management of WoNS species (Appendix 1). An independent review in September 2009 recommended revision of the 2000 strategic plan to set future direction. The NBBBMG, in conjunction with stakeholders, developed a draft strategic plan for 2012–17 that was placed on public display for 30 days in February 2011. All submissions received were considered, and the plan was revised to address issues raised during the consultation period. A final draft of the plan was prepared and submitted to the Australian Weeds Committee in May 2011.

2.8 Relevance to other strategies

The Bitou Bush and Boneseed Strategic Plan 2-12–17provides a framework for coordinated management of these weeds across Australia. This plan is linked to many national, state, regional and local plans (Table 1) that aim to protect biodiversity from the threat of weeds.

Table 1 Strategies and plans for the management of bitou bush and boneseed

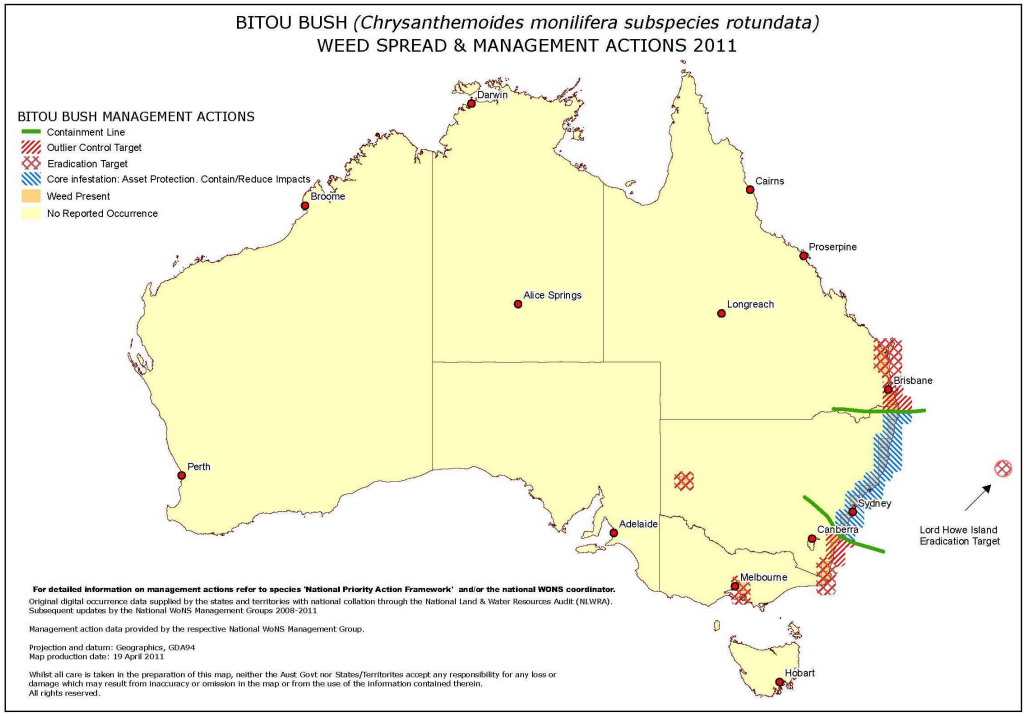
Scale	Strategies and plans
National	Australian Weeds Strategy; policies, strategies and plans applied to Commonwealth lands (e.g. under the *Environment Protection and Biodiversity Conservation Act 1999*)
State/territory	State and territory weed management strategies and plans (e.g. NSW Invasive Species Plan, state and territory biodiversity and conservation strategies)
Regional	NRM regional plans and strategies, including vegetation and biodiversity management plans; regional weed management strategies; corridor management plans (e.g. rail, road and utility)
Local	Local government and community weed/pest management and conservation plans, community action strategies (e.g. Landcare, Bush for Life), property management plans

3 Strategic goals

This 2012–17 Bitou Bush and Boneseed Strategic Plan aims to maintain current strategic actions and progress new initiatives to prevent the spread and reduce the impact of bitou bush and boneseed. Strategic actions in this plan follow the principles shown in Figure 4.

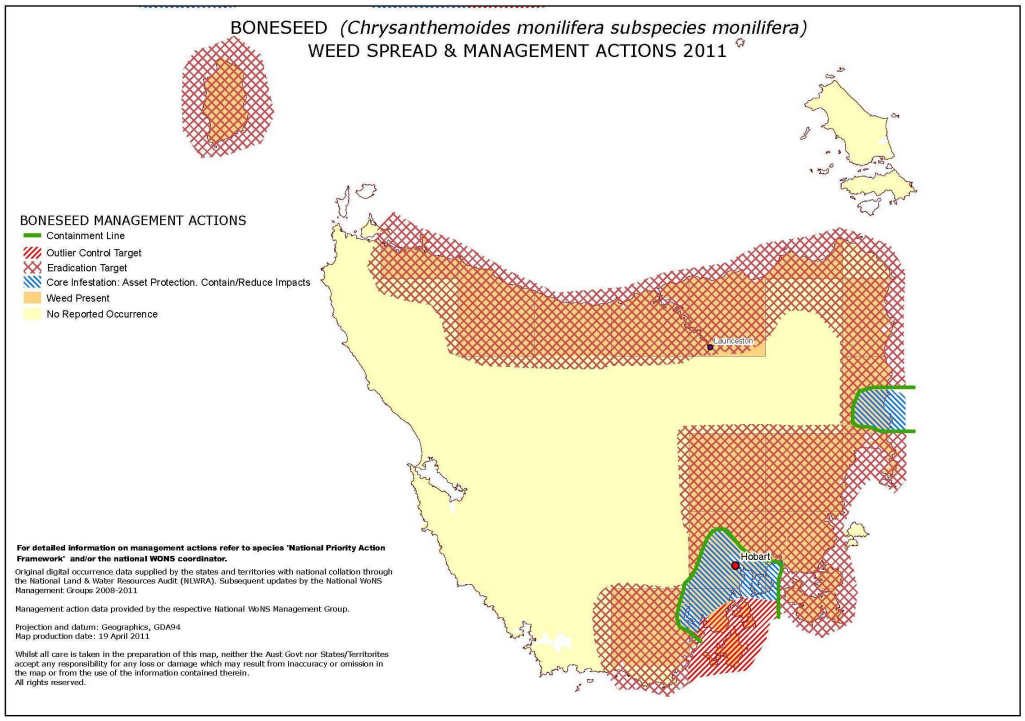
Bitou bush and boneseed are widespread in southern Australia, and management is undertaken at all scales, from national to local. To ensure strategic and cost-effective use of resources, invasions at each scale must be managed with objectives and actions appropriate to the level of infestation. Management objectives can be broadly categorised as prevention, eradication, containment and asset protection (Figure 4). These four categories correlate with the spatial distribution of a weed over time. At early stages of invasion, the goal is to prevent spread, which aligns with goal 1 of this plan: prevent new incursions of bitou bush and boneseed, and ensure that current infestations do not spread to create new problems. When infestations are widespread, the goal is to reduce impact, which aligns with goal 2 of this plan: existing infestations are under strategic management.

Eradication and containment zones are established throughout Australia to prevent spread of bitou bush and boneseed. In Western Australia and New South Wales, where only very small numbers of boneseed plants exist, eradication is the objective (Figure 6). Eradication is also the objective for bitou bush in western New South Wales, Lord Howe Island, Western Australia, Victoria and Queensland (Figure 5). Once infestations increase in area and eradication is no longer feasible, the focus should be on containing spread to protect uninvaded areas. Thus, national containment lines are established for boneseed in South Australia (Figure 6), and for bitou bush in southern and northern New South Wales (Figure 5). In Tasmania, eradication and containment zones exist at the regional level (Figure 7). Appendix 2 provides details of priority management actions in each NRM region.



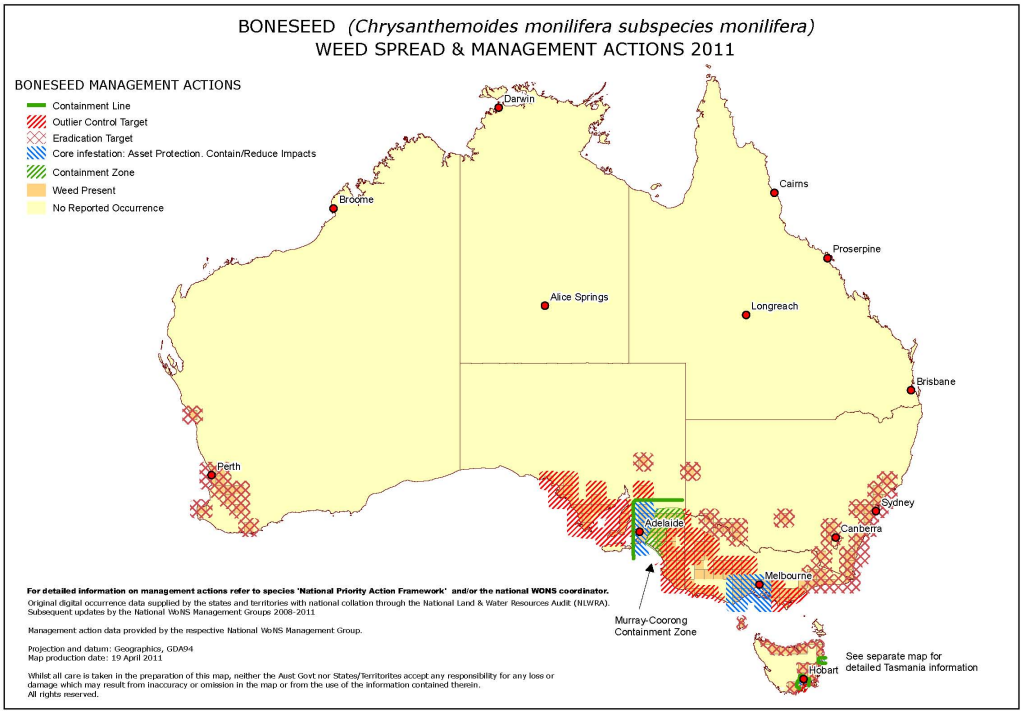
Source: <www.weeds.org.au/wons/bitoubush>

Figure 5 2011 bitou bush national management action map



Source: <www.weeds.org.au/wons/bitoubush>

Figure 6 2011 boneseed Tasmanian management action map



Source: <www.weeds.org.au/wons/bitoubush>

Figure 7 2011 boneseed national management action map

Where bitou bush and boneseed are widespread (core infestations), management actions are directed towards reducing their impact. The New South Wales Bitou TAP (DEC 2006) prioritises sites for control within the core infestation of bitou bush based on biodiversity conservation. Although there is no similar plan for boneseed, a key action in this plan is for

states or regional groups to develop such plans for core boneseed infestations. Resource investment within core infestations should be primarily directed to asset protection, but opportunities may also arise, at regional or local scales, to expand core infestation control efforts to contain local spread within the core area. These localised efforts support asset protection initiatives by preventing reinvasion.

Eradication and containment programs typically require initial control followed by long-term surveillance and follow-up control. Asset protection programs also require long-term control and follow-up, and must also include monitoring programs to determine the response of native biodiversity to weed control and restoration programs.

3.1 Goals and objectives

The strategic goals and objectives in this plan (Table 2) build on those of the first strategic plan. The objectives include actions to maintain ongoing strategic programs and address critical management and research needs.

Table 2 Goals and objectives of this strategic plan

Goal	Objectives
1. Prevent new infestations from establishing	1.1 Early detection mechanisms to protect uninvaded areas are improved and/or maintained
	1.2 All infestations are recorded, mapped and analysed
	1.3 Eradication programs are maintained and monitored
	1.4 Containment programs are developed, maintained and progressed
2. Strategically manage existing infestations	2.1 Biological control agents are introduced; agent effectiveness is monitored; and delivery of biological control programs is improved to reduce the impact of large and/or well-established infestations (core infestations)
	2.2 Key assets are identified for protection and prioritised at state and/or regional levels; control is undertaken in priority areas to reduce the impact of large and/or well-established infestations (core infestations)
	2.3 Monitoring is undertaken post-control to ensure biodiversity conservation and, where necessary, restoration is undertaken to reduce impacts of core infestations
3. Increase the capability and commitment to manage bitou bush and boneseed	3.1 Best-practice management tools and techniques are refined and adopted
	3.2 The community and volunteers are engaged and supported
	3.3 The effectiveness and relevance of the national strategy are maintained

3.2 Monitoring and reporting on this plan

To ensure that the goals and objectives of this plan are achieved, it is important to monitor and evaluate the effort and resources invested. At the national level, the Australian Weeds Committee is responsible, under the Australian Weeds Strategy (NRMMC 2007), for monitoring and evaluating management of national priority weeds, including WoNS. In

addition, state agencies responsible for weed management and conservation will benefit from strategic actions that reduce the impact and prevent the spread of bitou bush and boneseed. Where possible, these agencies should coordinate actions required to implement the plan, and monitor and evaluate progress towards the plan's objectives, in conjunction with existing state, regional or local plans in their jurisdictions. Thus, partners to the plan should develop performance indicators for each of the plan's specific actions (Tables 4–6) that align with their existing state, regional or local objectives.

Although individual actions in the plan should be monitored at the jurisdictional or regional level, critical evaluation questions should be addressed annually at the national level to ensure that progress continues towards key actions. Table 3 contains suggested annual evaluation questions that should be answered by the Australian Weeds Committee. All partners in the bitou bush and boneseed program should provide data to the Australian Weeds Committee to assist with monitoring and evaluating progress.

Table 3 Suggested monitoring and evaluation questions to measure progress under the phase 3 WoNS Bitou Bush and Boneseed Strategic Plan 2012–17

WoNS:	Jurisdiction:		Date:
Goal	**Key evaluation questions**	**Data or evidence required**	**Consider**
1 Prevent new infestations from establishing	To what extent have new infestations been prevented from establishing?	1.1 National distribution data: • Has the national distribution map been reviewed and/or updated? • Has the Priority Management Action spreadsheet been updated?	• Are these documents publicly available? • Have stakeholders been advised of any changes? • Where is this data or information stored? • Does this information capture national priorities?
		1.2 New infestations: • Number of new infestations recorded • Percentage of known infestations actively controlled	• Are any new infestations occurring in areas identified as a high priority in the national strategy? • How were infestations detected (passive or active surveillance, community reporting etc.)? • Have high-risk pathways been adequately identified? • Have threats been minimised?
		1.3 Eradication and containment programs: • Percentage of eradication and/or containment programs being maintained	• What percentage of programs identified in the national strategy are being actively managed? • Is there a plan in place for ongoing management? • How is progress being monitored and reported to stakeholders? (Examples using case studies can be included)
		1.4 Legislation: • Legislation or policy changes for this species • Legislative change has been identified by stakeholders	• What legislative changes have been made? • Are minimum requirements being maintained (e.g. ban on sale, trade, movement? • Is control required throughout or in part of the jurisdiction? • Is compliance actively enforced?
			Score:

Table 3 ***continued***

WoNS:	**Jurisdiction:**	**Date:**

Goal	**Key evaluation questions**	**Data or evidence required**	**Consider**
2 Strategically manage existing infestations	To what extent is integrated weed management effectively managing core infestations?	2.1 Integrated weed management: • Effectiveness of integrated weed management programs	• Are existing tools providing adequate control of WoNS? • Have new advances or technologies been developed and are they incorporated into best-practice management information? • Are there barriers to adoption of best-practice management? • Are research programs addressing any observed gaps (e.g. herbicide trials, biocontrol, restoration requirements post-control)?
	To what extent are assets being protected through strategic management?	2.2 Asset protection: • Number of priority assets identified as 'at risk' from WoNS • Percentage of priority assets being protected (e.g. assessed against relevant threat abatement plans) • Percentage of state and regional invasive species plans that identify priority assets at risk from WoNS	• Methods by which assets are being protected (e.g. targeted annual spray programs, high-risk pathway surveillance, strategic plans) • Are long-term monitoring programs in place to detect change? • To what extent is management leading to an improvement in asset condition? (Response should include status report on progress towards asset-protection programs)
			Score:
3 Increase the capability and commitment to manage WoNS	To what extent has the capability and commitment to manage WoNS increased?	3.1 Community engagement and awareness: • What is the status of best-practice information? • Are partnerships being maintained to ensure collaboration on WoNS? • Number and type of media activities	• Is best-practice information up to date and readily available? • Is this information and/or advice being targeted to priority regions? • Is training being delivered to meet the needs of weed managers (including the community)? • Are networks and groups being supported (e.g. through dissemination of research outcomes,

Table 3 ***continued***

WoNS:	Jurisdiction:		Date:
Goal	**Key evaluation questions**	**Data or evidence required**	**Consider**
			funding opportunities, control options etc.)? • Has awareness and engagement in WoNS management been raised effectively?
		3.2 Resourcing: • From what sources are programs being funded?	• Number of projects funded by Australian Government, jurisdictions, industry, etc.
		3.3 Policy and planning: • Are the objectives of the strategy being integrated into Australian Government/state/regional plans, policies and programs? • Has cross-border collaboration occurred?	• How are priorities reflected in planning and policy approaches (e.g. weed risk assessments, invasive species plans, asset-protection plans, district plans, weed spread prevention activities, management programs, incentive programs, state working groups)? • How are national priorities being maintained (e.g. containment lines, eradication targets, training and awareness raising, research projects)?
			Score:
Continuous improvement	Are there any unexpected outcomes that have been identified through implementation of strategy?	Barriers: • Have any other management issues or impediments been identified?	

WoNS = Weeds of National Significance
Scoring:
1: Insufficient evidence to score
2: No progress has been made against this goal
3: Limited progress is being made against this goal
4: Reasonable progress is being made against this goal
5: Excellent progress is being made against this goal

3.3 Responsible partners

Between 2005 and 2010, national coordination of the Bitou Bush and Boneseed Strategic Plan facilitated significant progress towards its objectives. The national program assisted stakeholders with strategic planning, monitoring and reporting, to allow ensure consistent and effective management. National coordination will cease by 2013, and this plan outlines the means to continue the legacy of national action. All program partners share a significant, continued commitment to strategic bitou bush and boneseed management. They must now continue to ensure that resources are most effectively invested and strategic action continues to achieve the objectives outlined in this plan.

National and state agencies, regional NRM bodies, local governments, non-government and research organisations, land owners and managers, and community members share responsibility for implementing the actions in this plan. Tables 4–6 show the plan's strategic actions and the partners responsible for implementing them. In addition, national priority action maps (Figures 5–7) and a list of priority actions by NRM region (Appendix 2) provide a clear picture of necessary action at the regional level. Although some actions will be the responsibility of specific agencies or groups, many actions will require a coordinated approach. Responsible partners within each jurisdiction should coordinate efforts, where possible, and work together to achieve the greatest return on investment. Many of the actions will enable progress towards multiple objectives. Thus, all activities should be undertaken in light of the overall program and should address all relevant goals, when possible.

A program logic (Appendix 3) was developed by the NBBBMG to show the relationship between strategic actions and the objectives and goals they achieve. 'Immediate activities' from the program logic are included as 'themes' in Tables 4–6 to provide a greater understanding of where each strategic action fits within the logic framework.

3.4 Goal 1: Prevent new infestations from establishing

The objectives of goal 1 include preventing new incursions of bitou bush and boneseed, and ensuring that current infestations do not spread to create new problems. Early detection, eradication and containment strategies will prevent bitou bush and boneseed from expanding within their current range and spreading to new areas. Embedding these strategies and programs into state legislation, regional and local weed strategies, and community plans will ensure that they are carried out in the future.

Table 4 shows the strategic actions for each objective under goal 1, and the action level and responsible partners for each action.

Table 4 Objectives and strategic actions to achieve goal 1 of the Bitou Bush and Boneseed Strategic Plan 2012–17

Objective and theme[a]		Strategic action	Action level[b]	Responsibility
1.1 Early detection mechanisms to protect uninvaded areas are improved and/or maintained Theme: Surveillance and mapping	1	Collate and share geospatial data or maps of containment and eradication areas. Distribute identification and awareness materials where early detection is needed (i.e. adjacent to eradication and containment zones)	1	State agencies, regional NRM bodies, local government
	2	Develop and implement plans to address new infestations	1	State agencies responsible for weed management, in conjunction with land managers/owners
	3	Encourage stakeholders in 'early detection' areas and encourage reporting. Potential mechanisms include encouraging 'citizen science' reporting of infestations through national database	2	State agencies, regional NRM bodies, local government, in conjunction with land managers/owners
	4	Update identification tools and information (where necessary) for awareness raising	3	State agencies, regional NRM bodies, local government
	5	Update and distribute maps of potential bitou bush and boneseed distribution under future climate change scenarios	3	State agencies, regional NRM bodies, local government, research organisations
1.2 All infestations are recorded, mapped and analysed Theme: Surveillance and mapping	1	Collate updated distribution data to enable production of revised national maps. Provide data and maps to national repository	1	State agencies, local government, NRM bodies
	2	Ensure that distribution data and management action maps are available on national platform	1	State agencies, Australian Government
	3	Encourage use of national WoNS mapping guidelines (McNaught et al. 2008)	3	State agencies, regional NRM bodies, local government
1.3 Eradication programs are maintained and monitored Theme: Integrated control in priority areas	1	Maintain and monitor the Western Australian Boneseed Eradication Program, as required by Western Australian weed legislation; monitor eradication according to the Western Australian Boneseed Eradication Strategy and Western Australian weed legislation until 1 July 2013	1	Western Australian Government; regional NRM bodies, local government, in conjunction with land owners/managers
	2	Maintain and monitor boneseed eradication in Cradle Coast NRM region and all Zone A municipalities in Tasmania	1	Relevant municipalities, Cradle Coast NRM, NRM North and NRM South, Tamar NRM, Tasmanian

Objective and theme[a]		Strategic action	Action level[b]	Responsibility
				Government, in conjunction with land owners/managers
	3	Maintain and monitor eradication of boneseed as a Regionally Prohibited Weed in North Central CMA, North East CMA and East Gippsland CMA in Victoria	2	Victorian Government, with assistance from local government, relevant CMA regions and land owners/managers
	4	Eradicate bitou bush × boneseed hybrids (at Davey's Bay site) and all bitou bush from Victoria, as per eradication strategy	1	Victorian Government, with assistance from local government, relevant CMA regions and land owners/managers
	5	Eradicate and monitor all boneseed in New South Wales, as per New South Wales legislation	1	New South Wales Government, local government, land owners/managers
	6	Eradicate and monitor boneseed infestation in Parachilna Gorge, South Australia, as outlined in the Ten Year Boneseed Management Plan (NY&EP NRM Boards 2008)	2	South Australian Government, SA Arid Lands NRM region, land owners/managers
	7	Maintain and monitor bitou bush eradication in Queensland as required for Class 1 declared status under the *Land Protection (Pest and Stock Route Management) Act 2002*	1	Queensland Government, with assistance from regional NRM bodies and local government
	8	Eradicate and monitor bitou bush infestation in western New South Wales near Menindee/Kinchega and all bitou bush plants on Lord Howe Island	1	New South Wales Government, Lower Murray Darling CMA (Menindee), Northern Rivers CMA (Lord Howe), local government, land managers
1.4 Containment programs are developed, maintained and progressed Theme: Integrated control in priority areas	1	Support the northern and southern national bitou bush containment lines in New South Wales (see Figure 5). Develop buffer zones, where appropriate, to support movement of containment lines	2	New South Wales Government, local government, in conjunction with land owners/managers; Australian Government (Booderee National Park); Northern and Southern Rivers NRM regions
	2	Support and implement Murray–Coorong boneseed containment zone (see Figure 6). Incorporate containment priorities into regional NRM plans	2	South Australian Government; SA Murray–Darling Basin and South East NRM regions, in conjunction with land owners/managers
	3	Maintain national western boneseed containment zone on Eyre and Yorke peninsulas, South	1	South Australian Government; Eyre Peninsula and Northern

Objective and theme[a]	Strategic action		Action level[b]	Responsibility
		Australia (see Figure 6), as outlined in the Ten Year Boneseed Management Plan (NY&EP NRM Boards 2008)		and Yorke NRM regions, in conjunction with land owners/managers
	4	Maintain boneseed containment zones in Tasmania (see Figure 7)	2	Tasmanian Government, NRM North and NRM South, local government, land owners/managers
	5	Investigate development of a northern national boneseed containment zone around New South Wales – Victoria border to prevent spread to New South Wales and to boneseed-free areas in Victoria	2	New South Wales and Victorian governments, local government, in conjunction with land owners/managers

CMA = catchment management authority; NRM = natural resource management; WoNS = Weeds of National Significance

a Theme links to program logic (Appendix 3)

b The Australian Weeds Committee (AWC) applied three action levels that reflect jurisdictional commitment to implementing actions:
Level 1 = Highly beneficial as a national action that is critical to success of the WoNS revised strategic plan and all relevant AWC jurisdictions have committed resources to implementing this action.
OR
Highly beneficial to a particular jurisdiction and the responsible party/ies have committed resources to implement this action.
Level 2 = Highly beneficial at national and/or jurisdictional level, but implementation will be subject to resource availability and investment priorities.
Level 3 = Desirable and still beneficial to improving uptake and efficiency of on-ground action, but not critical to success.

3.5 Goal 2: Strategically manage existing infestations

Goal 2 aims to reduce the impact of bitou bush and boneseed in dense or well-established (core) infestations. In areas where weeds are widespread, a biodiversity protection (or asset protection) approach is most appropriate. This differs from the 'weed species' approach that is used in containment and eradication programs, where the weed is not yet widespread and may not yet have caused any impacts (see Figure 4). The asset protection approach includes holistic weed control, and long-term monitoring and restoration of areas where the weeds have impacted priority assets in core infestations. In addition to strategic control to protect biodiversity, it is critical to monitor and communicate the successes of asset protection programs encourage further support for this approach.

Table 5 shows the strategic actions for each objective under goal 2, and the action level and responsible partners for each action.

Table 5 Objectives and strategic actions to achieve goal 2 of the Bitou Bush and Boneseed Strategic Plan 2012–17

Objective and theme[a]		Strategic action	Action level[b]	Responsibility
2.1 Biological control agents are introduced; agent effectiveness is monitored; and delivery of biological control programs is improved to reduce the impact of large and/or well-established infestations (core infestations) Theme: Integrated control in priority areas	1	Redistribute *Tortrix* (bitou leaf roller moth) across range of bitou bush and monitor its progress and impact. Support schools implementing Weed Warriors programs for *Tortrix*	2	New South Wales Government, local government, with assistance from community groups
	2	Establish boneseed leaf buckle mite and monitor its progress and impact	2	Victorian, Tasmanian and South Australian governments, local government, with assistance from community groups
	3	Continue research and complete importation of boneseed rust fungus	2	CSIRO, with support from Australian and state governments
	4	Facilitate further research on the lesser seed fly, *Mesoclanis dubia*	3	Australian and state governments, with support from local government
	5	Reattempt to introduce lacy-winged seed fly for bitou bush	2	New South Wales and Australian governments, with support from local government
	6	Investigate need for further genetics research to inform boneseed biological control program	3	CSIRO and/or relevant research organisations, with support from Australian and state governments
	7	Continue to investigate source of bitou bush 'die-back' on New South Wales coast. Identify pathogen and undertake further research, if warranted	3	CSIRO and other agencies, with support from New South Wales Government
2.2 Key assets are identified for protection and prioritised at state and/or regional levels; control is undertaken in priority areas to reduce the impact of large and/or well-established infestations (core infestations) Theme: Integrated control in priority areas	1	States, regions or local government areas develop, adopt and resource plans to protect assets from threat of boneseed in key areas, including establishment of weed exclusion zones around key assets	2	State agencies and regional NRM bodies, with support from local government, the community and land owners/managers
	2	Support implementation and resourcing of the New South Wales Bitou TAP and other identified asset priorities for bitou bush, including the Biodiversity Priorities for Widespread Weeds project	1	New South Wales Government, local government, land owners/managers, New South Wales coastal NRM regions, with assistance from community groups

Objective and theme[a]	Strategic action		Action level[b]	Responsibility
	3	In 2012, review and/or revise New South Wales Bitou TAP, including enhanced mapping and data collection, to ensure that key assets are identified and prioritised in core infestations	1	New South Wales Government, with input from New South Wales coastal NRM regions, relevant land managers and community groups
	4	States, regions or local government areas continue to develop, adopt and resource plans aimed at expanding strategic control of bitou bush or boneseed in core areas, to support asset protection initiatives by reducing reinvasion from surrounding areas	3	State agencies, regional NRM bodies, with support from local government, land owners/managers and the community
2.3 Monitoring is undertaken post-control to ensure biodiversity conservation and, where necessary, restoration is undertaken to reduce impacts of core infestations Theme: Asset restoration	1	Monitor native species recovery following bitou bush control, and undertake restoration where impacts have occurred to ensure biodiversity conservation	1	State and local governments, regional NRM bodies, with support from the community and land owners/managers
	2	Monitor native species recovery following boneseed control, and undertake restoration where impacts have occurred to ensure biodiversity conservation	2	State and local governments, regional NRM bodies, with support from the community and land owners/managers
	3	Disseminate bitou bush monitoring manual (Hughes et. al. 2009) and encourage its use and training	2	State and local governments, NRM regional bodies
	4	Disseminate example restoration guidelines (French 2010) and support NRM regions to develop guidelines for each region	2	State and local governments, NRM regional bodies
	5	Promote further research and improvement of post-control restoration techniques, including encouraging nursery industry to propagate rare native species and incorporating restoration into NRM policy and planning	3	State and local governments, researchers, NRM regional bodies, in conjunction with the nursery industry and community

Bitou TAP = Bitou Bush Threat Abatement Plan; CSIRO = Commonwealth Scientific and Industrial Research Organisation; NRM = natural resource management

a Theme links to program logic (Appendix 3)

b The Australian Weeds Committee (AWC) applied three action levels that reflect jurisdictional commitment to implementing actions:
Level 1 = Highly beneficial as a national action that is critical to success of the WoNS revised strategic plan and all relevant AWC jurisdictions have committed resources to implementing this action.
OR
Highly beneficial to a particular jurisdiction and the responsible party/ies have committed resources to implement this action.
Level 2 = Highly beneficial at national and/or jurisdictional level, but implementation will be subject to resource availability and investment priorities.
Level 3 = Desirable and still beneficial to improving uptake and efficiency of on-ground action, but not critical to success.

3.6 Goal 3: Increase the capability and commitment to manage bitou bush and boneseed

Providing support to the extensive community effort is critical, because there is no economic incentive to control bitou bush and boneseed. Government agencies must ensure that community effort and knowledge are recognised, provide volunteer groups with assistance for funding opportunities, provide direction on priority asset sites, and help to increase participation of new members. Provision of best-practice materials and training also increases community capability and commitment. In addition, program successes must be widely promoted to encourage further investment. Effective awareness campaigns will show the value of investment in preventing the spread of bitou bush and boneseed and protecting Australia's biodiversity. Teaching school children about the threat of weeds will ensure future commitment to weed management.

Table 6 shows the strategic actions for each objective under goal 3, and the action level (see footnote) and responsible partners for each action.

Table 6 Objectives and strategic actions to achieve goal 3 of the Bitou Bush and Boneseed Strategic Plan 2012–17

Objective and theme[a]		Strategic action	Action level[b]	Responsibility
3.1 Best-practice management tools and techniques are refined and adopted Theme: Education and training	1	Continue seed dynamics research (long-term burial studies) and disseminate results to community	2	University researchers, state and local governments
	2	Evaluate existing control applications and promote further research and improvement, including impacts on native flora and fauna; update best-practice guidelines as appropriate	2	State and local governments, NRM regions, researchers
	3	Scope the need for further research on impacts of fire on boneseed	3	State and local governments, researchers
	4	Scope boneseed aerial spraying possibilities (outside New South Wales)	3	State and local governments
3.2 The community and volunteers are engaged and supported Theme: Awareness raising; collaboration, coordination and partnerships	1	Assist community groups, including Indigenous groups, with funding applications, promotion, recruitment of new volunteers and other operational needs	2	State and local governments, NGOs, NRM regions
	2	Build community capability through delivery of best-practice management training and provision of materials	1	State and local governments, NRM regions
	3	Involve the community, including Indigenous groups, in the development and implementation of management strategies at all levels	1	State and local governments, NRM regions

Objective and theme[a]	Strategic action		Action level[b]	Responsibility
	4	Expand school education tools (e.g. Weeds Attack!) nationally, and facilitate adoption	3	State and local governments, NRM regions
3.3 The effectiveness and relevance of the national strategy are maintained Theme: collaboration, coordination and partnerships	1	Monitor and evaluate implementation of this strategic plan against a phase 3 monitoring, evaluation, reporting and improvement plan; report progress to National Biosecurity Committee and stakeholders	2	Australian Weeds Committee
	2	Collate data to enable bitou bush and boneseed WoNS management priorities and management action maps to be updated, made available on the web and widely distributed	1	State and local governments, NRM regions

NGO = non-government organisation; NRM = natural resource management; WoNS = Weed of National Significance

a Theme links to program logic (Appendix 3)

b The Australian Weeds Committee (AWC) applied three action levels that reflect jurisdictional commitment to implementing actions:
Level 1 = Highly beneficial as a national action that is critical to success of the WoNS revised strategic plan and all relevant AWC jurisdictions have committed resources to implementing this action.
OR
Highly beneficial to a particular jurisdiction and the responsible party/ies have committed resources to implement this action.
Level 2 = Highly beneficial at national and/or jurisdictional level, but implementation will be subject to resource availability and investment priorities.
Level 3 = Desirable and still beneficial to improving uptake and efficiency of on-ground action, but not critical to success.

Appendix 1 The Weeds of National Significance initiative and its phases[1]

In 2007, an independent review of the WoNS initiative concluded that the nationally strategic approach of WoNS was highly successful in leveraging consistent multijurisdictional activity on high-priority weed species. This initial review was followed by a detailed review of the inaugural WoNS species by the Australian Weeds Committee (AWC) in 2009–10. The AWC reviewed the implementation of the 20 WoNS national strategies and, in light of achievements for these 20 species, considered the capacity for national coordination of additional WoNS species.

Following the reviews, the Natural Resource Management Ministerial Council (Resolution 15.7, 21 May 2009) endorsed a three-phased approach to national management of WoNS species (Figure 8). This 'phased approach' aims to provide the most cost-effective use of limited 'national coordination' resources.

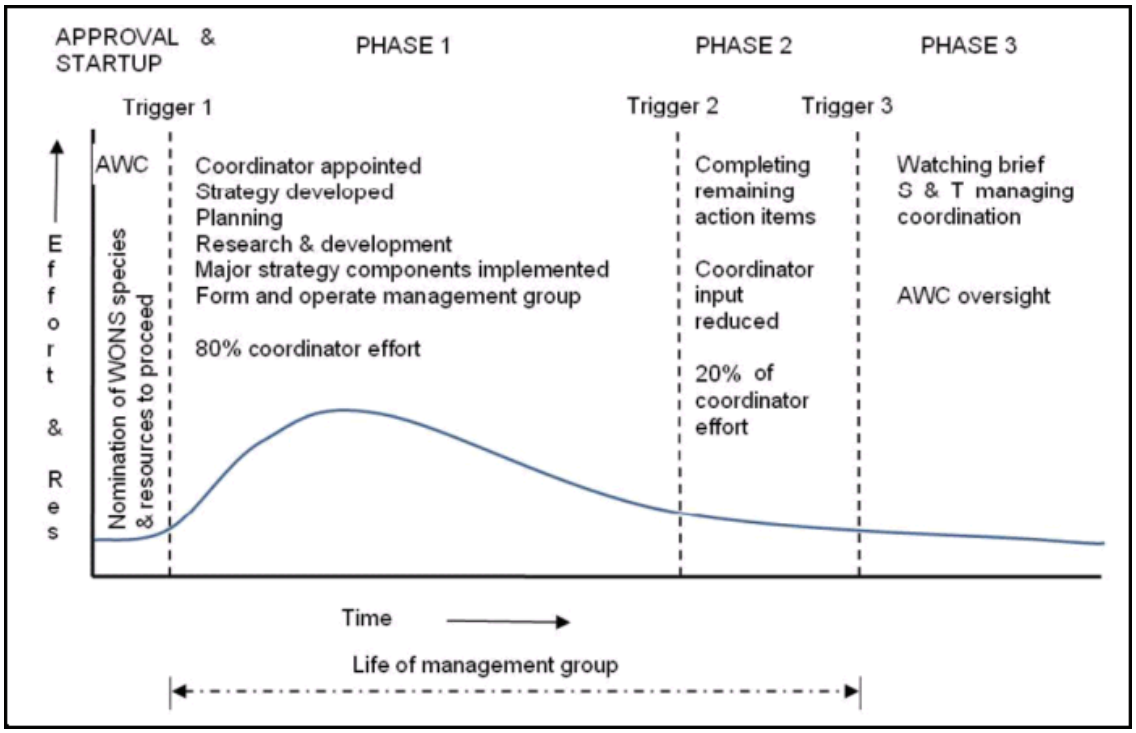


Figure 8 Australian Weed Committee diagrammatic representation of coordinator effort and resource use when implementing a Weeds of National Significance strategy

The phased approach recognises the need for reduced national coordination ('phasing down') of WoNS species that are under effective national management, and allows for further weed species to be nominated for consideration as additional WoNS. The AWC is implementing these reforms, and national coordination of the inaugural 20 WoNS species has already transitioned to phase 2 or 3, depending on the species. No species have yet been

[1] Adapted from Thorp 2012, *Additional list of Weeds of National Significance*, <www.org.au/WoNS>.

removed from the WoNS list. The AWC is developing a protocol to guide future decisions about when this should occur on a case-by-case basis.

In 2010, jurisdictions nominated additional candidate WoNS species. These species were independently assessed, and the AWC endorsed 12 additional 'species' to be listed as WoNS. The AWC Chairman, Dr Jim Thompson, announced these additional plant species as WoNS on 20 April 2012. Additional information on the selection of these species and the phased approach is available on www.weeds.org.au/WONS.

Appendix 2 Bitou bush and boneseed priority management actions by NRM region

Table 7 provides clear direction on priority national actions that should be continued and progressed for bitou bush and boneseed by all partners in each NRM region. The highest priority actions are in bold text, and the highest priority regions are highlighted in pink. These actions are displayed graphically on the national management action maps (Figures 5–7) in the body of this document. Priority action tables and maps are available on <www.weeds.org.au/wons> for all WoNS.

Table 7 Bitou bush and boneseed priority management actions by NRM region

NRM region	Bitou bush priorities 2012–17 (not including research)	Boneseed priorities 2012–17 (not including research)
National (overarching priorities)	Eradication in Qld and Vic; support containment zones in NSW. Undertake control to protect high-priority assets, as outlined in Bitou TAP. Provide support for volunteers and expand the volunteer effort. Involve the community in release and monitoring of biological control agents. Develop and implement education and awareness programs aimed at all stakeholders, with emphasis on school resources. Record new infestations and maintain updated maps.	Eradication in WA, Tas. and NSW, including surveillance and mapping; support containment zones in SA and Tas., and outlier control in Vic. and SA. Protect high-priority assets from threat of boneseed. Investigate and implement, if practical, containment zones in Vic. Support Class 1 (or 2) listing (eradication) in NSW. Provide support for volunteers and expand the volunteer effort. Raise awareness of threat to inland areas. Involve the community in release and monitoring of biological control agents. Develop and implement education and awareness programs aimed at all stakeholders.
Highest priorities are in bold text. High-priority regions are highlighted in pink.		
ACT	Bitou bush does not occur in this region. Education and awareness.	Boneseed is not known to occur, but is a threat to this region. Early detection and awareness raising. Support Class 1 (or 2) listing (eradication) in NSW.
New South Wales		
Border Rivers – Gwydir	Bitou bush does not occur in this region. Education and awareness.	Boneseed does not occur in this region. Education and awareness. Support Class 1 (or 2) listing (eradication) in NSW.
Central West	Bitou bush does not occur in this region. Education and awareness.	Boneseed is not known to occur, but is a threat to this region. Early detection and awareness raising. Support Class 1 (or 2) listing (eradication) in NSW.
Hawkesbury–Nepean	**Asset protection through implementation of the Bitou TAP via strategic control at TAP sites**. Provide support for volunteers and expand the volunteer effort. Education and awareness, including community redistribution of biological control agents and primary/secondary school	**Eradication of boneseed; surveillance and mapping.** Raise awareness of differences between bitou bush and boneseed. Support boneseed eradication in NSW. Develop and implement strategically targeted education and awareness programs.

NRM region	Bitou bush priorities 2012–17 (not including research)	Boneseed priorities 2012–17 (not including research)
	education (e.g. Weeds Attack!, Weed Warriors).	
Hunter – Central Rivers	**Asset protection through implementation of the Bitou TAP via strategic control at TAP sites**. Provide support for volunteers and expand the volunteer effort. Education and awareness, including community redistribution of biological control agents and primary/secondary school education (e.g. Weeds Attack!, Weed Warriors).	**Eradication of boneseed; surveillance and mapping.** Raise awareness of differences between bitou bush and boneseed. Develop and implement strategically targeted education and awareness programs.
Lachlan	Bitou bush does not occur in this region. Education and awareness.	Boneseed is not known to occur, but is a threat to this region. Eradication, early detection and awareness raising.
Lower Murray Darling	**Eradication of bitou bush.** Raise awareness of threat to inland areas.	**Eradication of boneseed; surveillance and mapping.**. Raise awareness of threat to inland areas.
Murray	Bitou bush does not occur in this region. Education and awareness.	**Eradication of boneseed; surveillance and mapping.** Raise awareness of threat to inland areas.
Murrumbidgee	Bitou bush does not occur in this region. Education and awareness.	**Eradication of boneseed; surveillance and mapping.** Raise awareness of threat to inland areas.
Namoi	Bitou bush does not occur in this region. Education and awareness.	Boneseed is not known to occur, but is a threat to this region. Eradication, early detection and awareness raising. .
Northern Rivers (including Lord Howe Island)	**Maintain and progress national northern bitou bush containment zone. Maintain eradication of bitou bush on Lord Howe Island. Continue asset protection through implementation of the Bitou TAP via strategic control at TAP sites.** Provide support for volunteers and expand the volunteer effort. Education and awareness, including community redistribution of biological control agents and primary/secondary school education (e.g. Weeds Attack!, Weed Warriors).	Boneseed is not known to occur, but is a threat to this region. Eradication, early detection and awareness raising.
Southern Rivers	**Maintain and progress southern bitou bush containment line from Sussex Inlet and eradicate all plants south of Sussex Inlet. Asset protection through implementation of the Bitou TAP via strategic control at TAP sites.** Provide support for volunteers and expand the volunteer effort. Education and awareness, including community redistribution of biological control agents and primary/secondary school education (e.g. Weeds Attack!, Weed Warriors).	**Eradication of boneseed; surveillance and mapping.** Raise awareness of differences between bitou bush and boneseed. Develop and implement strategically targeted education and awareness programs.

NRM region	Bitou bush priorities 2012–17 (not including research)	Boneseed priorities 2012–17 (not including research)
Sydney Metro	**Asset protection through implementation of the Bitou TAP via strategic control at TAP sites.** Provide support for volunteers and expand the volunteer effort. Education and awareness, including community redistribution of biological control agents and primary/secondary school education (e.g. Weeds Attack!, Weed Warriors).	**Eradication of boneseed; surveillance and mapping.** Raise awareness of differences between bitou bush and boneseed. Develop and implement strategically targeted education and awareness programs.
Western	**Eradication of bitou bush.** Education and awareness.	**Eradication of boneseed.** Raise awareness of threat to inland areas.
Northern Territory		
Northern Territory	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Queensland		
Queensland Murray–Darling Committee	Bitou bush does not occur in this region. Education and awareness.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
North Queensland Dry Tropics	Bitou bush does not occur in this region. Education and awareness.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Burnett Mary	**Eradication of bitou bush.** Education and awareness.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Cape York	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Condamine Alliance	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Desert Channels	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Fitzroy	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Reef Catchments	Bitou bush does not occur in this region. Education and awareness.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Northern Gulf	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
South East Queensland	**Continue eradication of bitou bush**. Support northern bitou bush containment line efforts in NSW. Education and awareness.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
South West Queensland	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.

NRM region	Bitou bush priorities 2012–17 (not including research)	Boneseed priorities 2012–17 (not including research)
Southern Gulf	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Torres Strait	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
Terrain (Wet Tropics)	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region and falls outside the modelled potential distribution.
South Australia		
Adelaide and Mount Lofty Ranges	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Prioritise areas for control based on biodiversity conservation; undertake control for asset protection. Involve the community in release and monitoring of biological control agents. Develop and implement education and awareness programs aimed at all stakeholders, with emphasis on school resources. Provide support for volunteers and expand the volunteer effort.
Alinytjara Wilurara	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed is not known to occur, but is a threat to this region. Early detection, awareness raising and education.
Eyre Peninsula	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Maintain western boneseed containment line west of Adelaide** (as per Ten Year Boneseed Management Plan [NY&EP NRM Boards 2008]). **All boneseed in region is considered outlier and targeted for eradication.** Develop and implement strategically targeted education and awareness programs. Raise awareness of threat to inland areas.
Kangaroo Island	Bitou bush does not occur in this region. Education and awareness.	Boneseed is not known to occur, but is a threat to this region. Early detection, awareness raising and education.
Northern and Yorke	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Maintain western boneseed containment line west of Adelaide** (as per Ten Year Boneseed Management Plan [NY&EP NRM Boards 2008]). **All boneseed in region is considered outlier and targeted for control**. Develop and implement strategically targeted education and awareness programs. Raise awareness of threat to inland areas.
South Australian Arid Lands	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**All boneseed in region is considered outlier and is high priority for eradication**. Support western boneseed containment line west of Adelaide (as per Ten Year Boneseed Management Plan [NY&EP NRM Boards 2008]). Develop and implement strategically targeted education and awareness programs. Raise awareness of threat to inland areas.
South Australian Murray–Darling Basin	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Implement Murray–Coorong Boneseed Containment Plan to protect key assets and prevent spread. Mapping and surveillance.** Raise awareness of threat to inland areas. Develop and implement strategically targeted education and awareness programs.
South East	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Implement Murray–Coorong Boneseed Containment Plan to protect key assets and prevent spread. Mapping and surveillance.** Continue control at previously funded high-priority conservation sites in Green Triangle. Raise

NRM region	Bitou bush priorities 2012–17 (not including research)	Boneseed priorities 2012–17 (not including research)
		awareness of threat to inland areas. Develop and implement education and awareness programs aimed at all stakeholders. Provide support for volunteers and expand the volunteer effort.
NRM North	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Support containment and eradication zones around Launceston; eradicate all outlier populations.** Develop and implement strategically targeted education and awareness programs. Provide support for volunteers and expand the volunteer effort.
Tasmania		
Cradle Coast NRM	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Eradication; ensure cross-tenure follow-up control to add value to previous investment. Surveillance and updated mapping.** Continue education and awareness to engage landowners. Provide ongoing support for eradication to volunteer and community groups.
NRM South	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Support and contract containment zones around greater Hobart and Bicheno; continue eradication of outlier populations.** Involve the community in release and monitoring of biological control agents. Develop and implement education and awareness programs aimed at all stakeholders. Provide support for volunteers and expand the volunteer effort.
Victoria		
Corangamite	Bitou bush does not occur in this region. Education and awareness.	**Provide support for volunteers and expand the volunteer effort. Prioritise areas for control based on biodiversity conservation; undertake control for asset protection.** Involve the community in release and monitoring of biological control agents. Develop and implement strategically targeted education and awareness programs.
East Gippsland	**Eradication of bitou bush.** Education and awareness.	**All boneseed in region is considered outlier and targeted for eradication. Investigate feasibility of establishing containment line at NSW–Vic. border (supporting NSW eradication efforts), and implement if practical.** Develop and implement strategically targeted education and awareness programs.
Glenelg Hopkins	Bitou bush does not occur in this region. Education and awareness.	**Establish containment zones (e.g. from east at Corangamite border or into high-priority areas in the region) and control outlier populations.** Prioritise areas for control based on biodiversity conservation; undertake control for asset protection. Continue control at high-priority conservation sites in Green Triangle. Raise awareness of threat to inland areas. Develop and implement strategically targeted education and awareness programs. Provide support for volunteers and expand the volunteer effort.
Goulburn Broken	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed is not known to occur, but is a threat to this region. Early detection, awareness raising and education.

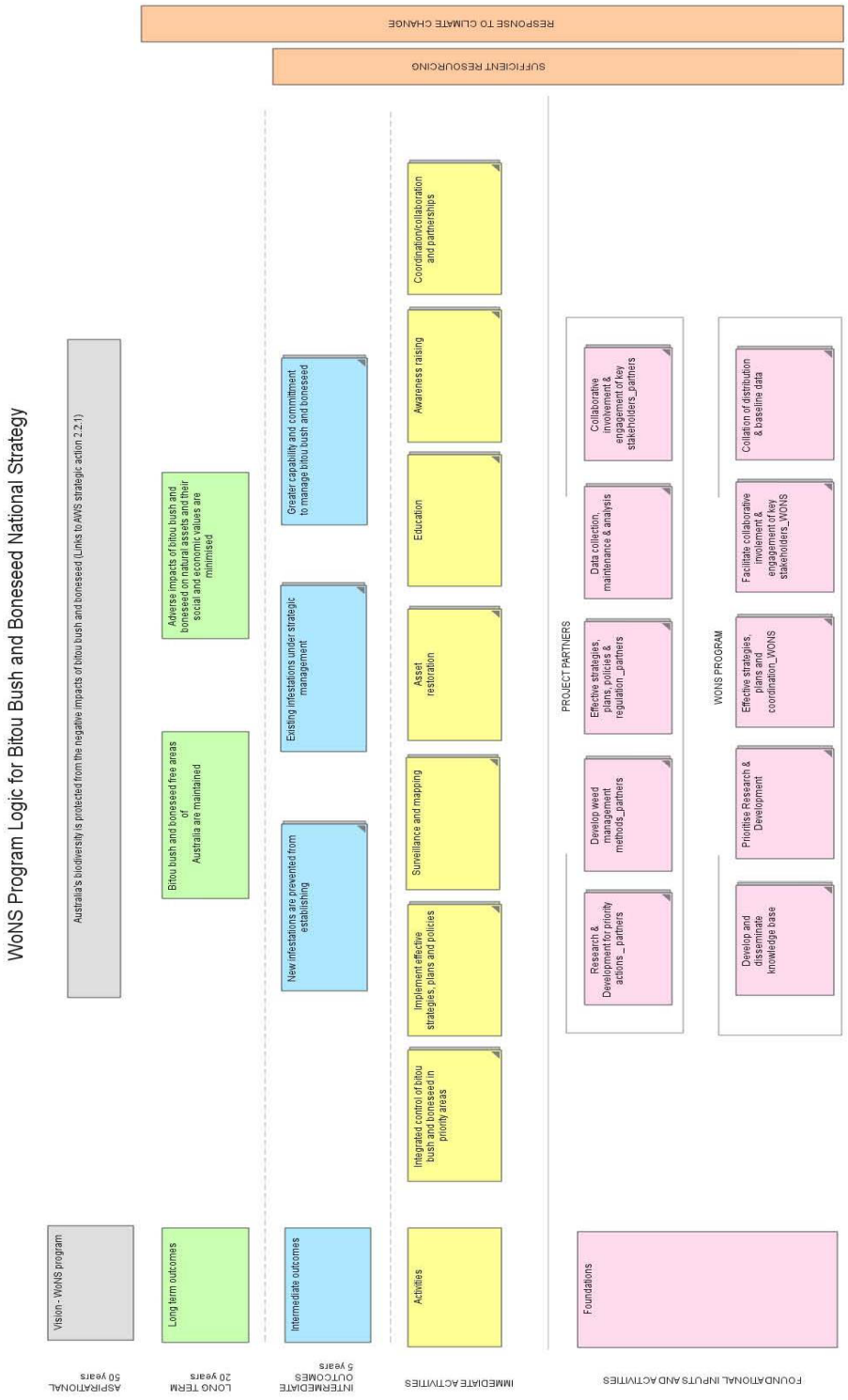
NRM region	Bitou bush priorities 2012–17 (not including research)	Boneseed priorities 2012–17 (not including research)
Mallee	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**All boneseed in region is considered outlier and targeted for control. Investigate feasibility of establishing containment line at NSW–Vic.–SA border (supporting NSW eradication efforts), and implement if practical. Mapping and surveillance are high priority.** Raise awareness of threat to inland areas. Develop and implement strategically targeted education and awareness programs.
North Central	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**All boneseed in region is considered outlier and targeted for eradication. Investigate feasibility of establishing containment line at NSW–Vic. border (supporting NSW eradication efforts), and implement if practical. Mapping and surveillance are high priority.** Raise awareness of threat to inland areas. Develop and implement strategically targeted education and awareness programs.
North East	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed is not known to occur, but is a threat to this region. Early detection, awareness raising and education.
Port Phillip and Westernport	**Eradication of bitou bush and hybrid population.** Education and awareness.	**Eradicate hybrid bitou bush × boneseed population near Frankston.** Involve the community in release and monitoring of biological control agents. Prioritise areas for control based on biodiversity conservation; undertake control for asset protection. **Provide support for volunteers and expand the volunteer effort.** Develop and implement strategically targeted education and awareness programs.
West Gippsland	Bitou bush does not occur in this region. Education and awareness.	**Establish containment zones to prevent further spread. Surveillance, mapping and outlier control.** Provide support for volunteers and expand the volunteer effort. Prioritise areas for control based on biodiversity conservation; undertake control for asset protection. Develop and implement strategically targeted education and awareness programs.
Wimmera	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**All boneseed in region is considered outlier and targeted for control. Investigate feasibility of establishing containment line at Vic.–SA border, and implement if practical. Mapping and surveillance are high priority.** Raise awareness of threat to inland areas. Develop and implement strategically targeted education and awareness programs.
Western Australia		
Northern Agricultural Region	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Eradication of boneseed. Surveillance and mapping. Education and awareness, especially to assist with identification and early detection.**
Perth	.Eradication of bitou bush, Surveillance and early detection of new infestations; education and awareness raising of bitou bush threat.	**Eradication of boneseed. Surveillance and mapping. Education and awareness, especially to assist with identification and early detection.**
Rangelands	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	Boneseed does not occur in this region. Education and awareness.

NRM region	Bitou bush priorities 2012–17 (not including research)	Boneseed priorities 2012–17 (not including research)
South Coast	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Eradication of boneseed. Surveillance and mapping. Education and awareness, especially to assist with identification and early detection.**
Avon (Wheatbelt)	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Eradication of boneseed. Surveillance and mapping. Education and awareness, especially to assist with identification and early detection.**
South West	Bitou bush does not occur in this region and falls outside the modelled potential distribution.	**Eradication of boneseed. Surveillance and mapping. Education and awareness, especially to assist with identification and early detection.**

ACT = Australian Capital Territory; Bitou TAP = Bitou Bush Threat Abatement Plan; NSW = New South Wales; Qld = Queensland; SA = South Australia; Tas. = Tasmania; Vic. = Victoria; WA = Western Australia

Appendix 3 Program logic model for the bitou bush and boneseed strategic plan

Note: 'Immediate activities' are included in Tables 4–6 (Section 3) as 'themes' to show links between strategic actions and the program logic.



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