WEEDS OF NATIONAL SIGNIFICANCE

Bridal creeper

Asparagus asparagoides L. (Druce)

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An unpublished draft of the revised strategic plan has guided national coordination of this Weed of National Significance for the past two years.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 the revised 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.

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Summary

Bridal creeper (*Asparagus asparagoides*) is a highly invasive weed that poses a formidable threat to Australia's biodiversity. Bridal creeper is found predominantly throughout southern Australia, where it invades coastal and inland areas, including mallee shrublands, forests, woodlands and healthlands.

A national strategic plan to manage the threat posed by bridal creeper was produced in 2001. Since then, there has been considerable progress in preventing further spread and reducing the impacts of bridal creeper on natural ecosystems. In 2009, a review of the bridal creeper strategic plan evaluated progress made towards achieving its goals and objectives, and identified a number of priorities yet to be fully realised. These included:

- identifying and protecting assets at risk from bridal creeper
- improving integrated weed management
- incorporating monitoring and restoration activities into control programs
- enhancing management of other asparagus weeds.

In 2012, six other asparagus weeds (*Asparagus aethiopicus*, *A. africanus*, *A. asparagoides* Western Cape form, *A. declinatus*, *A. plumosus* and *A. scandens*) were listed as Weeds of National Significance. In response to this listing, a National Asparagus Weeds Strategic Plan was produced, which incorporates actions for the other asparagus weeds. The two plans are complementary and together set the direction for achieving coordinated, effective management of asparagus weeds in Australia.

This revised national strategic plan for bridal creeper provides guidance to all stakeholders involved in bridal creeper management. Managing the extensive problems caused by bridal creeper requires the engagement and commitment of community and government stakeholders at the local, regional, state, territory and national levels. This cooperation will ensure the goals and objectives within this strategy are realised.

This strategy has three goals and associated objectives:

1 Prevent the establishment of new infestations

- Collate weed distribution data and use it to inform decisions on strategic investment and management.
- Improve surveillance capability to improve the early detection of new infestations.
- Eradicate bridal creeper from identified priority regions.
- Prevent the spread of bridal creeper through containment programs
- Support bridal creeper management by adequate legislation and compliance activities.

2 Strategically manage existing infestations

- Protect priority assets through strategic weed management programs.
- Investigate and implement biological control options to effectively manage core infestations of bridal creeper.
- Improve biodiversity values through strategic management activities.

3 Increase the capability and willingness to manage bridal creeper

- Improve and adopt best-practice management methods.
- Increase awareness of the threat posed by bridal creeper and increase the ability to manage bridal creeper.
- Increase stakeholder support and ability to implement the objectives of the strategic plan.

Vision

Australia's biodiversity is protected from the negative impacts of bridal creeper

1 The challenge

Bridal creeper (*Asparagus asparagoides*) is a native of South Africa that was introduced to Australia for ornamental purposes in the 1800s. Since then it has spread extensively throughout southern Australia, and was listed as a Weed of National Significance in 2000 based on its impacts to biodiversity and potential for further spread. A nationally coordinated program began in 2005, seeking to engage stakeholders in efforts to reduce its impacts and prevent further spread. Much has been achieved since the program's inception; however, ongoing commitment is necessary to safeguard the investment made to conserve and enhance the natural values at risk from bridal creeper.

Bridal creeper is highly aggressive and persists in a variety of habitats, including coastal areas, mallee shrublands, sclerophyll forests, woodlands and heathlands. Infestations commonly occur in roadside vegetation corridors, where birds aid further spread into surrounding areas. Bridal creeper invades intact native vegetation, reducing the diversity of native ground covers and shrubs—in some case by up to 50% (Turner et al. 2008). Mature, dense infestations also influence ecosystem processes, such as nutrient cycling, and can affect seed bank dynamics of both native and weedy species resulting in sites with increased weed burdens and a reduced ability to recover naturally (Turner et al. 2008; Turner & Virtue 2009). Bridal creeper has also invaded citrus orchards, impacting on fruit production and increasing crop susceptibility to disease.

Although well controlled by grazing and cultivation in farming systems, bridal creeper is a particularly difficult weed to control in natural ecosystems. Herbicides must be applied with caution to minimise off-target damage to native plant species. Physical control (e.g. hand pulling) is only viable in small infestations and care must be taken to remove the rhizome to prevent regrowth. Biological control agents are a very effective management tool and two agents, the leafhopper and rust fungus, are widely distributed throughout bridal creeper's range. Rust fungus can reduce bridal creeper cover by up to 50% (Morin et al. 2009); however, the effectiveness of the fungus is reduced in drier, inland areas. This is a concern, given the recent spread of bridal creeper into lower rainfall areas in Western Australia and South Australia.

The successful management of bridal creeper using biological controls has highlighted issues regarding the long-term management and health of invaded sites. Where bridal creeper cover has been dramatically reduced by biocontrol agents, it is common for other weed species to dominate post-control. This, combined with other potential impacts such as increased soil fertility and an impoverished native seed bank, may mean that bridal creeper control alone does not lead to an improvement in biodiversity condition values (Turner et al. 2008). It is essential to manage sites holistically, including the control of all threats (such as secondary weeds, disturbance and modification), and to research and apply restoration methods in these areas to achieve biodiversity protection goals. Conversely, where bridal creeper is less entrenched, the challenge will be educating the community of the impending threat and motivating them to take early action to avoid such issues.

Although much is known about the impacts and management of common bridal creeper, the Western Cape form of bridal creeper was found in South Australia in 2004. It is known to occur in only three sites: the Adelaide Hills, and coastal areas in south-east South Australia and western Victoria. This form is similar in appearance to common bridal creeper but is not susceptible to biological controls and therefore has the potential to invade areas where control of common bridal creeper has been successful. It is critical that ongoing awareness-raising activities and strategic management are supported to aid early detection and to prevent further spread.

Of equal concern are the impacts of other asparagus weeds, which appear in sites post–bridal creeper control and are significant weeds in their own right. *Asparagus scandens* is a serious threat to biodiversity in south-west Western Australia, New South Wales, Victoria and northern Tasmania,

while *A. declinatus* is increasingly problematic in coastal areas of South Australia. *A. aethiopicus* is rampant along the east coast of Australia, and despite extensive efforts to manage it, there is evidence of increased spread throughout its potential range. *A. plumosus* and *A. africanus* form impenetrable thickets on the east coast of Australia, including in brigalow forest, which is a nationally threatened type of ecological community.

These five other species and the Western Cape form of bridal creeper were listed as Weeds of National Significance (WoNS) in 2012. A National Asparagus Weeds Strategic Plan has been developed that incorporates actions for their strategic national management. National coordination will oversee implementation of actions in the plan, which is complementary to the bridal creeper plan. Together these plans set the direction for achieving coordinated, effective management of asparagus weeds in Australia.

This Bridal Creeper Strategic Plan seeks to inform and motivate communities and governments to limit future spread of bridal creeper and to manage existing infestations to reduce their impacts. It provides ongoing strategic actions for tackling one of Australia's worst weeds.

2 Background

2.1 The biology of bridal creeper

Bridal creeper is a deciduous climbing vine that shoots each autumn from a perennial root system consisting of a mat of branching rhizomes and numerous fleshy tubers. The root system accounts for up to 85% of the plant's biomass. The tubers persist in a wide range of soil types and climatic conditions, and provide water, energy and nutrient reserves to enable the plant to survive over summer.

a) **b)**

c)

Bridal creeper invasion in native woodland (a), fruits (b), and rhizome and roots (c)

Seeds germinate in autumn and winter, with seedlings producing at least one tuber in their first year. Plants take at least three years to reach sexual maturity. Flowers appear in later winter to early spring. Green berries ripen to red in late spring to early summer, making them an attractive food source for birds and other animals that disperse the seed over long distances. Fruit production is greatest on climbing shoots and reduced in plants that are heavily shaded, water stressed or form part of old, dense infestations where competition is high. Compared to other weeds, bridal creeper has a relatively short-lived seed bank, with only 5% of seed remaining viable after 12 months (Raymond 1999).

In late spring to early summer the leaves turn yellow and fall, and stems die back, so that a severe bridal creeper infestation may go unnoticed during summer. In areas that receive reliable summer rainfall, some shoots may remain or new shoots may emerge.

The Western Cape form of bridal creeper is similar to the common form in general appearance and it is often difficult to tell the forms apart at seedling stage or when shoots are first emerging for the season. The leaves and vines of the Western Cape form are often larger, thicker and a duller dark green than the common form, although these differences vary based on growing conditions. The most reliable identification feature is the root system. The Western Cape form produces much larger, rosette-shaped tubers that grow very close to the soil surface. The above ground biomass of the Western Cape form may also survive longer in the growing season because of its thicker leaves and larger root system.

Bridal creeper's ability to establish in undisturbed native vegetation, coupled with the storage capacity of its root system, ensure its success as a rapid invader that dominates the understorey of native plant communities. The extent and nature of its impacts are discussed in Section 2.3.

2.2 History of spread

Bridal creeper was first reported in Australia in 1857 in a nursery catalogue. By the 1870s it was a common garden plant, and its foliage was used in floral arrangements, particularly wedding bouquets. By the early twentieth century, bridal creeper had naturalised across much of southern Australia, and is now predominantly found in temperate zones that receive winter rainfall.

Bridal creeper is now widely distributed throughout south-west Western Australia, southern South Australia, central and western Victoria, the central and southern coasts of New South Wales, and Lord Howe Island (Figure 1). In these core infestations, management efforts are focused on protecting key natural assets. Limited infestations occur near Toowoomba in south-east Queensland, and on the north and east coasts of Tasmania. Eradication programs are in place for these areas.

Bridal creeper has the potential for further spread into new areas, such as the wheat belt and northern agricultural regions of Western Australia, the northern agricultural regions of South Australia, north-eastern and south-western regions of Victoria, central and northern New South Wales, and south-east Queensland. In these areas, infestations are being managed to prevent further spread and minimise the potential for long-term impacts to biodiversity. There is also potential for an increase in abundance within bridal creeper's current range. Strategic management of outlier infestations, containment planning and suppression of core areas using biocontrols will be essential to prevent increases in the current abundance and distribution.

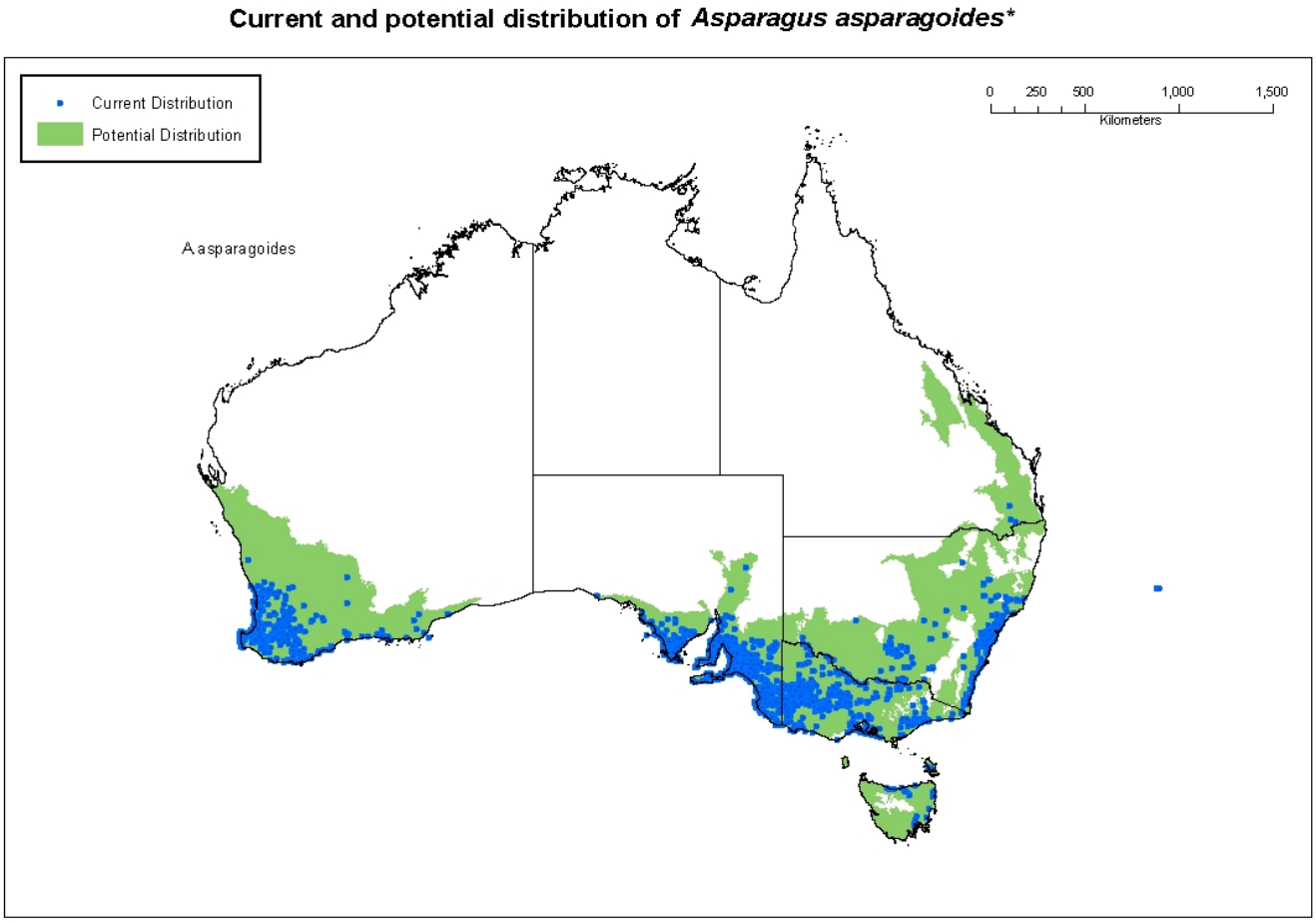


Figure 1 Current and potential distribution of bridal creeper (*Asparagus asparagoides*), 2011

2.3 Summary of impacts

Bridal creeper poses a major threat to the biodiversity value of Australia's temperate natural ecosystems by altering the structure and function of native plant communities. Bridal creeper can invade intact native vegetation, where it may reduce native plant diversity (particularly that of understorey shrubs and trees) by up to 50% (Turner et al. 2008).

Over time, large, tuberous root mats form and compete with native plants for root space and nutrients. These root mats can persist for many years, even after successful bridal creeper control, limiting the ability of native plants to regenerate and contribute to the seedbank. As a result, seedbanks at sites long invaded by bridal creeper often feature disproportionally high levels of weed seed and low levels of native seed (Turner et al. 2008).

Bridal creeper also transforms native communities through changes to nutrient cycling (Turner et al. 2008, 2011). Bridal creeper's annual leaf shed results in increased levels of nutrients, such as phosphorus and iron, within the soil profile. Changes to nutrient levels will remain for some time, contributing to secondary weed growth and associated increases in competition, leading to reduced diversity. Early intervention activities, as prescribed in Section 3 (goal 1), are critical to prevent future impacts.

2.4 Control methods

There are a range of methods for the management of bridal creeper, including biological, chemical, manual and other techniques. A best-practice management manual for bridal creeper and other

asparagus weeds is available, which also includes background information on weed management planning, identification, and monitoring and evaluation.[1] It is important to consider these factors in the broader management context, as long-term commitment and resourcing is required for a successful control program that leads to improved biodiversity outcomes.

2.4.1 Biological control

The biological control program for bridal creeper has been extremely successful in reducing the extent and density of many bridal creeper infestations in southern Australia. Three agents have been released: a leaf beetle, a leafhopper and a rust fungus. Exceptional results have been obtained with the rust fungus and leafhopper agents, which have been released at over 3000 sites. Rust fungus can decrease bridal creeper density by 10–50% (Morin et al. 2009) by reducing vegetative growth (foliage, shoot and seedlings) and fruit production. Community groups and weed officers actively spread rust fungus using the 'sporewater' method, where spores are suspended in water for quick and easy redistribution by spraying along roadsides and other large areas of native vegetation.

Leafhoppers feed on leaves and young stems, with heavy attacks resulting in early defoliation of the plant (Morin et al. 2009). Leafhoppers are complementary to the use of rust fungus and together they can reduce the relative growth rate of bridal creeper (Turner et al. 2010). Schools participating in the Weed Warriors program are instrumental in leafhopper rearing and release; some releases have resulted in a near disappearance of bridal creeper at localised sites.

The effectiveness of biocontrol is influenced by climatic conditions, and the rust fungus has marginal value in reducing bridal creeper infestations in low rainfall areas, where moisture levels are insufficient to produce heavy rust fungus infection. Conversely, where conditions are favourable to early season bridal creeper growth (e.g. early autumn rains) the plant can produce flowers and berries before heavy rust infection occurs, and the fungus will have a reduced impact on the plant's growth and reproductive ability. In this instance, managing any new outliers that emerge from seed should be a high priority.

Although the use of biocontrol agents remains the most effective method for reducing core infestations of bridal creeper, there may be a need to apply integrated weed management practices, such as the secondary use of herbicides, to achieve effective and lasting results. Core infestations that are being managed with biocontrols can still produce seed, which spreads to form outlier or satellite infestations. A different management approach should be applied to control these small, outlier infestations before they become established. Additional intervention in the form of vegetation restoration will also be required to restore biodiversity value at heavily invaded sites.

Although some minor feeding damage from leafhoppers has been observed on the Western Cape form of bridal creeper, both the rust and leafhopper are ineffectual on this form of bridal creeper.

[1] www.weeds.org.au/WoNS/bridalcreeper

2.4.2 Chemical, manual and other control

Bridal creeper can be controlled with two herbicides that, with correct use, can be applied safely and with low environmental impact. Registration of the two herbicides, metsulfuron methyl (e.g. Brush-off®) and glyphosate (e.g. Roundup®), varies from state to state, which may limit control options available to weed managers. Careful application of herbicides is required to prevent off-target damage to native plant species. This may necessitate the time-consuming use of hand spraying or wiping techniques.

Reductions in foliage growth of 90–95% in the year after applying herbicide are common, but re-treatment will be required for complete control as non-flowering shoots will often appear in following years. It may be a more efficient use of time and resources to control plants every 2–3 years (the time taken until first flowering and fruiting) and when more leaf area exists for chemical uptake.

Physical removal of bridal creeper is not effective unless all of the rhizomes are dug up and destroyed. This approach can create significant site disturbance, which can contribute to secondary weed invasion, and this method is generally applied only to small-scale infestations (e.g. in the case of eradication programs). Fire may retard or kill bridal creeper plants and can be integrated with herbicide control to improve site access and stimulate native seed germination, although this requires a site-specific approach.

All site factors, such as secondary weeds, other disturbance vectors and necessary restoration activities, should be considered to effectively protect or restore biodiversity values.

2.4.3 Monitoring and restoration

Pre-control site evaluations will be helpful in determining site conditions and the rate or likelihood of achieving restoration goals. Factors such as the presence of threatened species, the level of weed invasion and the time since invasion may influence the priority given to sites to increase recovery potential.

Monitoring the effectiveness of control actions to inform and improve control programs is important; however, it is also critical to monitor the response of native plant communities to weed control. The legacy of impacts associated with long-term bridal creeper invasion indicate that control measures alone will not bring about lasting improvements in biodiversity.

Efforts should be directed at managing re-invasion by secondary weeds, a common occurrence at sites where bridal creeper has been effectively controlled with biological control or herbicides. Additional restoration, such as revegetation, may be required to reach long-term goals.

2.5 Socioeconomic factors affecting management decisions

Bridal creeper invades natural ecosystems, and it is difficult to quantify the economic benefit of control, as the monetary value of natural assets remains undefined. This has not hindered the extensive efforts of land managers, weed officers and community groups to reduce the spread and impact of bridal creeper; however, the widespread nature of this weed necessitates an intensive and lasting investment of resources.

In citrus orchards, control of bridal creeper can be a significant financial burden, particularly where low commodity prices result in minimised farm input costs. Bridal creeper invasion impacts the viability of affected orchards through increased labour and herbicide costs (of up to $2000 per hectare per year (Kwong & Holland-Clift 2004)), damage to crops and reduced production.

Short-term funding cycles, conflicting investment priorities at the local, regional and national levels and volunteer burnout all influence the success of control programs. Funding availability should be matched to seasonal growing conditions for bridal creeper, given the limited window for control due to leaf shed over summer. It is also important to acknowledge that landholders generally do not receive direct benefits from bridal creeper control and, consequently, the investment of time and cost of control can act as disincentives.

Governments must continue to provide weed managers with access to appropriate tools and resources, including technical advances in control options, networks, funding, leadership in strategic planning and support for volunteers working on public land.

2.6 Quarantine and legislative controls

Table 1 summarises the current state and territory declarations for bridal creeper.

Table 1 Legislation related to bridal creeper as at July 2011

Jurisdiction	Legislation	Goals or actions
Australian Capital Territory	*Pest Plants and Animals Act 2005*	Propagation and supply is prohibited
New South Wales	*Noxious Weeds Act 1993*	May not be sold, propagated or knowingly distributed (statewide)
Northern Territory	*Weeds Management Act 2001*	To be eradicated (throughout the Territory), and not to be introduced into the Territory
Queensland	*Land Protection (Pest and Stock Route Management) Act 2002*	May not be sold, introduced, kept or supplied. Subject to eradication. Landowners required to control
South Australia	*Natural Resource Management Act 2004*	Movement and sale prohibited. Landholders required to control
Tasmania	*Weed Management Act 1999*	Importation, movement and sale prohibited. Landholders may be required to control. Zone A municipalities required to eradicate
Victoria	*Catchment and Land Protection Act 1994*	Must not be sold, bought or knowingly distributed
Western Australia	The legislative arrangements are currently in a transition from the *Agriculture and Related Resources Protection Act 1976* to the *Biosecurity and Agriculture Management Act 2007* (BAM Act). *Plant Diseases Act 1914*	Trade, sale or movement into the state prevented

2.7 The national program—progress to date

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). In 2009, the bridal creeper strategic plan was reviewed to assess progress against goals and objectives.

Tables 2–4 summarise the achievements against the goals of the 2001 strategic plan. The listing of six other asparagus weeds as WoNS in 2012 will ensure that management of these species is improved through implementation of the Asparagus Weeds Strategic Plan.

Table 2 Key achievements and outcomes for goal 1 of the 2001 Bridal Creeper Strategic Plan

Goal 1: Commit and coordinate—the community recognises bridal creeper as a major environmental threat and is committed to its management
Outcome: Awareness, capacity and commitment to manage bridal creeper have been improved through the provision of extension material and support for strategic management programs.
Key achievements: • Appointment of the NAWMC and NC has increased cooperation and coordination between stakeholders at multiple scales, including supporting local/regional working groups in the development of plans and programs. • Promotion of consistent messages about the threats posed by bridal creeper and other asparagus weeds and opportunities for strategic management. • Distribution of a best-practice management manual and supporting extension material, including identification brochures, an Asparagus WEEDeck and a newsletter, which has led to a high level of awareness of asparagus weeds across Australia. • Development of an asparagus weeds network for dissemination of best-practice methods, funding opportunities and project updates. • Convening of a national asparagus weeds management workshop, which collated and presented (via publication) available knowledge on research and management practices • Increased reporting of new infestations in areas where common bridal creeper is relatively unknown, including community identification of Western Cape bridal creeper infestations.

Table 3 Key achievements and outcomes for goal 2 of the 2001 Bridal Creeper Strategic Plan

Goal 2: Eradicate and prevent spread—high-value natural assets are protected from invasion by bridal creeper
Outcome: Eradication programs are in place, significant outlier infestations are being controlled and asset protection has been enhanced through the successful use of biocontrols. Support for the management of other asparagus weeds has also been improved through their inclusion in the bridal creeper program.
Key achievements: • Legislation now prevents the sale and distribution of bridal creeper throughout Australia, with some strengthening of declarations for other asparagus weeds. • A national dataset for bridal creeper and other asparagus weed distribution has been established, and use of national standards for data collection by weed managers has been promoted. • Active eradication programs for bridal creeper are in place in Tasmania, Queensland and Lord Howe Island. • A national management plan that directs eradication and containment actions for the Western Cape form of bridal creeper in South Australia and Victoria has been developed. • National mapping of occurrence and management actions has been undertaken (Appendix 2). • National outlier infestations have been identified and progress towards targeted control and containment planning is being made in Western Australia, South Australia and New South Wales. • Other asparagus weeds have been included in extension material, training workshops and other communication activities, which has increased awareness of the significant threats these species pose and encouraged a more holistic approach to weed management and biodiversity conservation.

Table 4 Key achievements and outcomes for goal 3 of the 2001 Bridal Creeper Strategic Plan

Goal 3:
Reduce existing impacts—bridal creeper is managed to reduce its density and occurrence
Outcome:
Bridal creeper vigour and density has been reduced in core infestations through the application of biological control agents and best-practice management.
Key achievements:
• The introduction of 3 biological control agents and the successful national establishment of 2 of these agents is contributing to the reduction of bridal creeper cover by up to 50% and also reducing the plant's ability to reproduce. • Enormous community uptake of biocontrol redistribution through the use of sporewater (for rust fungus) and the WeedWarriors school program (for leafhoppers). • Development and extensive circulation of best-practice management information has empowered weed managers to plan and implement control programs at multiple scales. • Strategic approaches to bridal creeper management are being integrated into natural resource management plans and policies. In some instances, management targets have been set to prevent or reduce long-term impacts associated with bridal creeper invasion.

2.8 Principles underpinning the plan

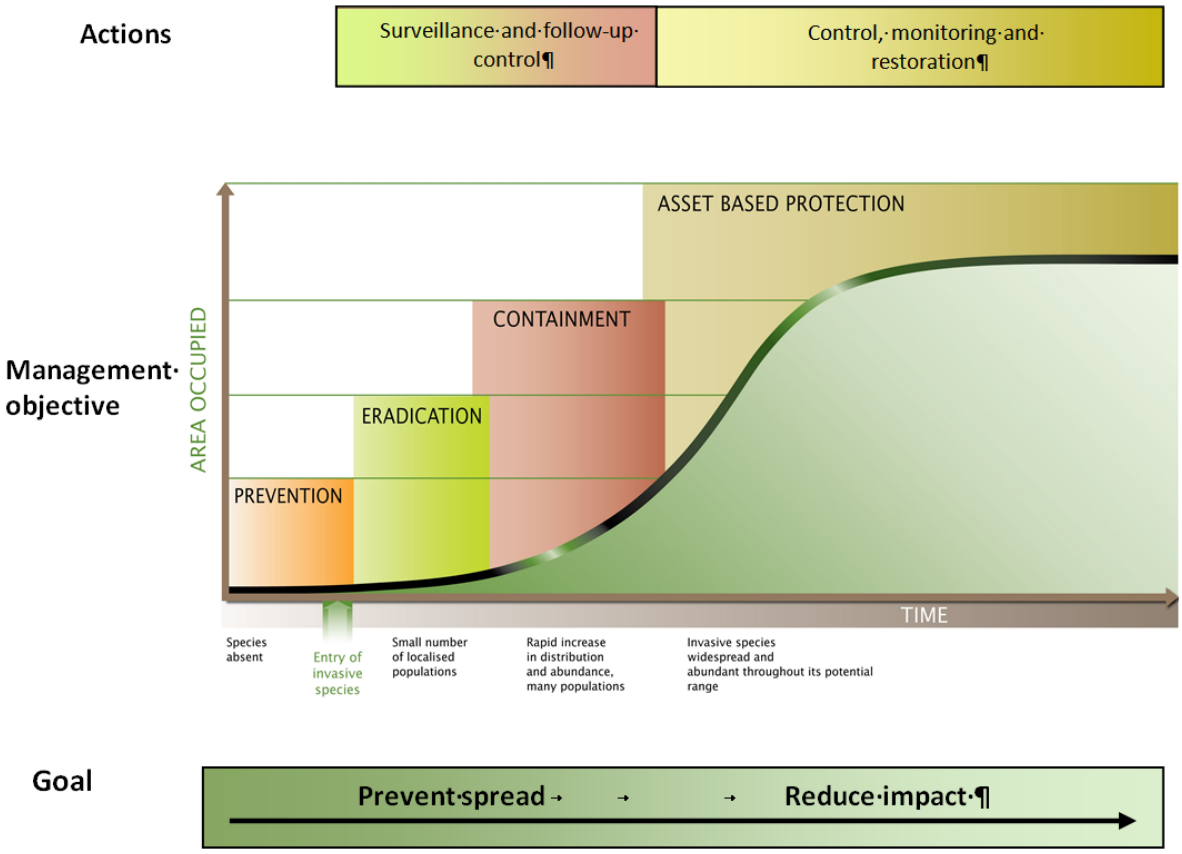
This strategic plan based on the seven key principles of the Australian Weed Strategy (NRMMC 2007):

- 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. These 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 widespread weed management, requires an approach that spans the biosecurity continuum. Bridal creeper is widespread in parts of 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 2). 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 bridal creeper, 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.



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

Figure 2 Stages of weed invasion with corresponding goals, management objectives and actions at each stage

2.8.1 Process followed

The National Asparagus Weeds Management Committee (NAWMC) has been responsible for overseeing implementation of the Bridal Creeper Strategic Plan (2001) since 2005. The committee meet each year to assess progress against the strategy's goals and objectives, which are documented in publically available annual reports.

In 2009, a review of the national asparagus weed management program acknowledged that the majority of the actions in the 2001 bridal creeper strategy had been achieved and recommended a revision of the strategy to capture new information, issues and approaches to ensure that the most up-to-date information was made available.

This revised strategy was developed by the NAWMC, with the support of key stakeholders. Comment was sought through targeted and public consultation stages via the Weeds Australia website[2] in February 2011. All submissions were considered before a final version was presented to the Australian and state governments for approval.

2 www.weeds.org.au

2.9 Relevance to other strategies

This bridal creeper strategic plan provides weed managers with a clear management direction that will help to prevent further spread and reduce impacts on Australia's natural assets. Many of the objectives and strategic actions will align with local, regional and state plans, policies and strategies for natural resource management. Some of these links are outlined in Table 5.

Table 5 Strategies and plans for the management of bridal creeper

Scale	Strategy and plans	Policy and legislation
National	Australian Weeds Strategy Australia's Biodiversity Conservation Strategy (draft) Other Weeds of National Significance strategic plans	*Environment Protection and Biodiversity Conservation Act 1999*
State	State and territory biodiversity conservation strategies Invasive species strategies Biosecurity strategies	State pest plant and biodiversity conservation policies and associated legislation
Regional	Natural resource and catchment management plans Invasive species plans	Guided by state and Commonwealth legislation and policies
Local	Weed control plans Property management plans Local government weed strategies and plans	Guided by state and Commonwealth legislation and policies

3 Strategic goals

This national strategy outlines five-year strategic actions to be undertaken by key stakeholders to protect Australia's natural values from the impacts of bridal creeper. In the long term, strategic actions seek to achieve two important outcomes: maintaining areas free from bridal creeper and reducing the adverse impacts of bridal creeper on natural assets.

These outcomes acknowledge the need to manage bridal creeper from both ends of the weed invasion spectrum: preventing new infestations through early detection and eradication where it is not yet established, and protecting and improving assets where bridal creeper is widespread. The strategy also identifies the critical need for committed and capable partners to realise its long-term vision.

Existing bridal creeper programs and activities will require a continued focus to sustain and improve on the achievements made so far. A number of key activities were identified to assist in this process that, if implemented, will result in a lasting improvement to biodiversity in Australia. The program logic model (Appendix 3) indicates how these activities will contribute to the desired outcomes, and outlines the activities necessary to maintain a successful bridal creeper program with measureable results.

In 2012, six other asparagus weeds (*Asparagus aethiopicus*, *A. africanus*, *A. asparagoides* Western Cape form, *A. declinatus*, *A. plumosus* and *A. scandens*) were listed as WoNS. Goals and objectives related to these species are in the National Asparagus Weeds Strategic Plan.

Table 6 Goals and objectives of the Bridal Creeper Strategic Plan 2012–17

Goals		Objectives	
1	Prevent infestations from establishing	1.1	Collate weed distribution data and use it to inform decisions on strategic investment and management
		1.2	Increase surveillance capability to improve the early detection of new infestations
		1.3	Eradicate bridal creeper from identified priority regions
		1.4	Prevent the spread of bridal creeper through containment programs
		1.5	Support bridal creeper management by adequate legislation and compliance activities
2	Strategically manage existing infestations	2.1	Protect priority assets through strategic weed management programs
		2.2	Investigate and implement biological control options to effectively manage core infestations of bridal creeper
		2.3	Improve biodiversity values through strategic management activities (control and other restoration actions)
3	Increase capability and willingness to manage bridal creeper	3.1	Improve and adopt best-practice methods
		3.2	Increase awareness and ability to manage bridal creeper
		3.3	Increase stakeholder support and implementation of the goals of the national strategy

Significant achievement has been made towards the goals of the 2001 bridal creeper strategic plan. There is also recognition that some key areas, such as restoration following bridal creeper control, and best-practice solutions for other asparagus weeds, require further effort. For actions related to asparagus weeds other than bridal creeper, please refer to the Asparagus Weeds Plan.

Strategic, coordinated actions will be essential to the continued success of the bridal creeper national strategic goals. A number of stakeholders are identified as key partners that can assist in achieving these goals. Responsible partners are identified in Tables 7–9.

3.1 Goal 1: Prevent new infestations of bridal creeper from establishing

Although bridal creeper is widespread throughout much of Australia, there are still opportunities to prevent further spread into many regions (Table 7). Early detection and management of new infestations is the most cost-effective method of preventing the long-term impacts associated with bridal creeper invasion. This will require an effective mapping and surveillance system, continued support of eradication and containment programs and ensuring the legislative capability is in place to support such efforts. Underpinning these goals is the need to communicate the impacts associated with bridal creeper, and to provide identification and best-practice management information and training, which are included in goal 3 of the strategy.

Table 7 shows the strategic actions for each objective under goal 1, and the action level and responsible partners for each action.

Table 7 Objectives and strategic actions to achieve goal 1 of the Bridal Creeper Strategic Plan 2012–17

Objectives	Strategic actions	Action level[a]	Responsibility
1.1 Collate weed distribution data and use it to inform decisions on strategic investment and management	Maintain and update national distribution and density maps	2	Australian, state, territory and local governments; NRM regions
1.2 Increase surveillance capability to improve the early detection of new infestations	Incorporate bridal creeper into passive/active surveillance activities in high-risk jurisdictions/regions (as determined by national maps)	1	State, territory and local governments; NRM regions; landholders
	Encourage and promote community reporting of new infestations to support targeted surveillance activities (e.g. weed spotters)	2	State, territory and local governments, NRM regions
1.3 Eradicate bridal creepr from identified priority regions	Encourage and support bridal creeper eradication in Tasmania	1	Tasmanian and local governments, NRM regions, landholders
	Encourage and support the New South Wales bridal creeper eradication program in the following NRM regions: • Northern Rivers Catchment Management Authority • Lord Howe Island	2	New South Wales and local governments, NRM regions, Lord Howe Island Board, landholders

Objectives	Strategic actions	Action level[a]	Responsibility
	Encourage and support the Queensland bridal creeper eradication program	2	Queensland and local governments, NRM regions, landholders
1.4 Prevent the spread of bridal creeper through containment programs	Encourage and support bridal creeper containment zones in northern and central New South Wales, as appropriate	1	New South Wales and local governments, NRM regions, landholders
	Encourage and support bridal creeper containment zones and/or outlier control targets in Western Australia, including the following NRM regions: • South West • Avon • Northern Agricultural	1	Western Australian and local governments, NRM regions, landholders
	Investigate control feasibility for bridal creeper outliers (distinct from core infestations) and action appropriate response in the following Victorian NRM regions: • Corangamite • North East • West and East Gippsland	2	Victorian and local governments, NRM regions, landholders
	Investigate control feasibility for bridal creeper outliers (distinct from core infestations) and action appropriate response in the following South Australian NRM regions: • Eyre Peninsula • Northern and Yorke • Kangaroo Island	2	South Australian and local governments, NRM regions, landholders
1.5 Support bridal creeper management by adequate legislation and compliance activities	Enforce relevant legislation and declarations that prohibit sale and distribution of bridal creeper and, where applicable, enforce control requirements and regionally specific regulations to support bridal creeper strategic management objectives	1	State, territory and local governments; NRM regions

NRM = natural resource management

a 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.

3.2 Goal 2: Strategically manage existing infestations

Where bridal creeper is widespread, efforts must be directed at protecting and increasing high-value natural assets at risk from invasion (Table 8). This may include areas that either contain significant biodiversity value or will respond well to management due to a relatively low level of weed incursion. Research indicates that weed management alone may not always be sufficient to enable sites to recover from dense bridal creeper infestations. In these instances, it will be necessary to identify priority assets and establish programs to ensure appropriate management of all threats, including those from bridal creeper. Some sites may also require additional intervention, such as manipulation of soil nutrients or the use of fire to trigger native seed germination. Research into such restoration techniques and the publication of restoration guidelines will enable land mangers to better plan and resource bridal creeper management programs.

Table 8 Objectives and strategic actions to achieve goal 2 of the Bridal Creeper Strategic Plan 2012–17

Objectives	Strategic actions	Action level[a]	Responsibility
2.1 Protect priority assets through strategic weed management programs	Support and encourage programs to protect high-priority assets at risk from bridal creeper at the regional, state and national level	1	State and territory governments, NRM regions in consultation with local government. and community groups
2.2 Investigate and implement biological control options to effectively manage core infestations of bridal creeper	Investigate the efficacy of existing bridal creeper biocontrol agents in low rainfall regions (and other hard-to-establish sites) to inform management options	2	State and territory governments, research organisations, NRM regions
	Continue to supply and redistribute biocontrol agents for bridal creeper (rust fungus and leafhoppers) and support community redistribution, including Weed Warriors and other education programs	2	State, territory and local governments, NRM regions, community groups, educators
2.3 Improve biodiversity values through strategic management activities (control and restoration actions)	Monitor sites post-control to determine ecosystem response and need for additional restoration, including the management of secondary weeds and other threats	2	State, territory and local governments, researchers, NRM regions
	Promote restoration tools and knowledge, where available, to assist in restoration of biodiversity in invaded sites post-bridal creeper and other weed control; support development of additional tools	2	

NRM = natural resource management

a 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.

3.3 Goal 3: Increase the capability and willingness to manage bridal creeper

Providing key stakeholders with the most effective weed control solutions and improving their capability to implement them is critical to achieve lasting management programs that contribute to the prevention of bridal creeper spread and impact the reduction premise of goals 1 and 2 (Table 9). In regions where there is still potential for bridal creeper spread, it will be important to increase awareness of invasion impacts to ensure quick response to new incursions. Long-term commitment from key stakeholders will be essential as the level of national coordination for bridal creeper reduces over time. The maintenance of communication networks, integration of strategy actions into general natural resource management planning, and a coordinated approach to strategic bridal creeper management will all contribute to achieving long-term goals.

Table 9 Objectives and strategic actions to achieve goal 3 of the Bridal Creeper Strategic Plan 2012–17

Objectives	Strategic actions	Action level[a]	Responsibility
3.1 Improve and adopt best-practice methods are	Evaluate existing control techniques for bridal creeper (e.g. herbicide rates, application methods), and promote further research or improvement as necessary	2	State, territory and local governments, researchers, NRM regions
	Scope the need for further research on the role of fire in management and restoration programs for bridal creeper	2	Research organisations
3.2 Increase awareness and ability to manage bridal creeper	Include bridal creeper tools and information in the delivery of training workshops, presentations and field days	1	State, territory and local governments, NRM regions, research organisations
	Provide support to land managers, community groups and individuals through dissemination of research results and best-practice management information, including a best-practice manual, flyers, website, newsletters, maps		
3.3 Increase stakeholder support and implementation of the goals of the national strategy	Include bridal creeper in the asparagus weed network and other relevant weed networks from the local to the national level, to encourage information and knowledge sharing	2	State, territory and local governments, NRM regions, National Asparagus Weeds Management Committee
	Encourage integration of national strategy objectives into regional and state policy and planning approaches	1	State and territory governments, NRM regions
	Monitor and review progress towards strategic plan goals against the monitoring, evaluation, reporting and improvement (MERI) plan	1	Australian, state and territory governments, Australian Weed Committee

NRM = natural resource management

a 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.

4 Monitoring, evaluation, reporting and improvement framework

The Australian Weeds Strategy (NRMMC 2007) gives the Australian Weeds Committee (AWC) responsibility for monitoring and evaluating the management of national priority weeds, including WoNS. The AWC is therefore responsible for monitoring and reporting on progress under this strategic plan.

This strategic plan is subject to a five-year review; however, mechanisms must also be put in place to allow the goals and actions to be evaluated throughout this period. This enables ongoing assessment of progress towards intermediate and long-term, and, ultimately, helps to determine the effectiveness and efficiency of individual actions. It also helps to identify program improvements, and provides evidence to stakeholders and funding bodies that they are getting value from their investment.

Individual jurisdictions and/or organisations responsible for weed management and conservation will need to develop their own monitoring strategies. They should, where possible, coordinate actions to implement this plan, and monitor and evaluate progress towards its goals in conjunction with existing state, regional or local plans. While individual actions should be monitored at the jurisdictional level, data or evidence collected as a part of state, regional and local activities or plans should be provided to the AWC and collated so that it can be assessed each year within the national context. This will help to build a comprehensive overview of the plan's delivery. Table 10 lists key evaluation questions that should be assessed by the AWC each year at the national level to ensure progress against strategy goals, and which should be used to provide the basis for an annual report to the AWC.

This monitoring, evaluation, reporting and improvement (MERI) framework lists the basic reporting information that should be collected for the life of the strategic plan—including during phase 3 delivery (see Appendix 1). This will ensure that sufficient data is collected to identify successes and failures, and provide the opportunity for improvement where outcomes are not being achieved. Annual MERI plans may be developed to follow activities in more detail.

Although performance indicators or other ways of measuring progress are not provided in this strategic plan, a scoring system could be appropriate.

A generic program logic model (Appendix 3) was developed by WoNS coordinators in 2010. This shows the relationship between strategic actions and the objectives and goals they achieve. The program logic is one way to communicate the links between activities, their intermediate and long-term outcomes, and the vision of the strategic plan.

Table 10 Suggested monitoring and evaluation questions to measure progress under the phase 3 WoNS Bridal Creeper 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 10 ***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 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, 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.

Table 10 ***continued***

WoNS:	**Jurisdiction:**		**Date:**
Goal	**Key evaluation questions**	**Data or evidence required**	**Consider**
		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

5 Stakeholder responsibilities

Although landowners and managers have primary responsibility for the control of bridal creeper on their land, relevant agencies share responsibility for the actions listed in Sections 3 and 4. The effective implementation of this strategy requires the involvement of a range of stakeholders. Stakeholders' responsibilities may vary between jurisdictions: some actions may be optional while others are prescribed by legislation. The successful achievement of strategic actions relies on the development and maintenance of partnerships between community, industry and government, and recognition of the roles of each stakeholder. In particular, while the National Asparagus Weeds Management Committee provided oversight for the original strategy, future coordination arrangements will evolve to maintain and build on past achievements. The Australian Weeds Committee, at a national level, and various agencies at the state and territory level will continue to provide a leadership role. Suggested responsibilities for each group are listed below.

Commonwealth and state/territory governments have a significant part to play in supporting and/or resourcing the priority actions identified in the plan, and should provide a leadership role in the development, coordination and support of programs, policies and other projects. Importantly, in many instances a coordinated, partnership approach will be required, including providing support to community group. This approach will assist governments to report on progress against the strategic actions (see Section 4).

Natural Resource Management (NRM) regions (or Catchment Management Authorities (CMAs) are crucial in the successful delivery of regional programs, and form a strategic link between national and state agencies and local-level groups.

Local government and associated weed officers, in varying capacity, are a major resource in delivering weed management programs and providing technical advice and support to local groups. In some jurisdictions, local government also has legislative responsibilities for weed management.

Community groups, so often 'at the coal face' of weed management can, with adequate support and resourcing, help governments and landholders deliver on their broader responsibilities.

Landholders also have a duty to protect natural assets from weed threats. Although legal requirements for the control of bridal creeper vary throughout Australia, control at the property level can contribute to broader weed management programs.

Appendix 1 The Weeds of National Significance initiative and its phases[3]

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 3). This 'phased approach' aims to provide the most cost-effective use of limited 'national coordination' resources.

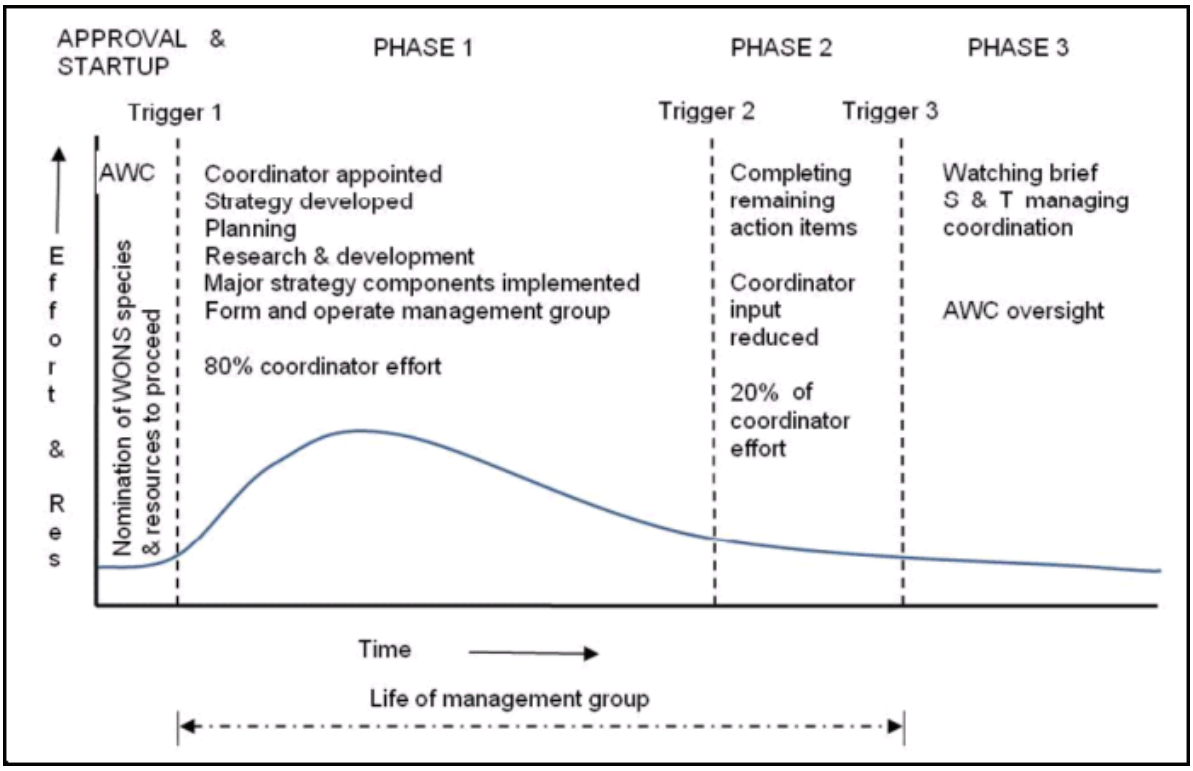


Figure 3 Australian Weed Committee diagrammatic representation of coordinator effort and resource use when implementing a Weeds of National Significance strategy

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 removed from the WoNS list. The AWC is

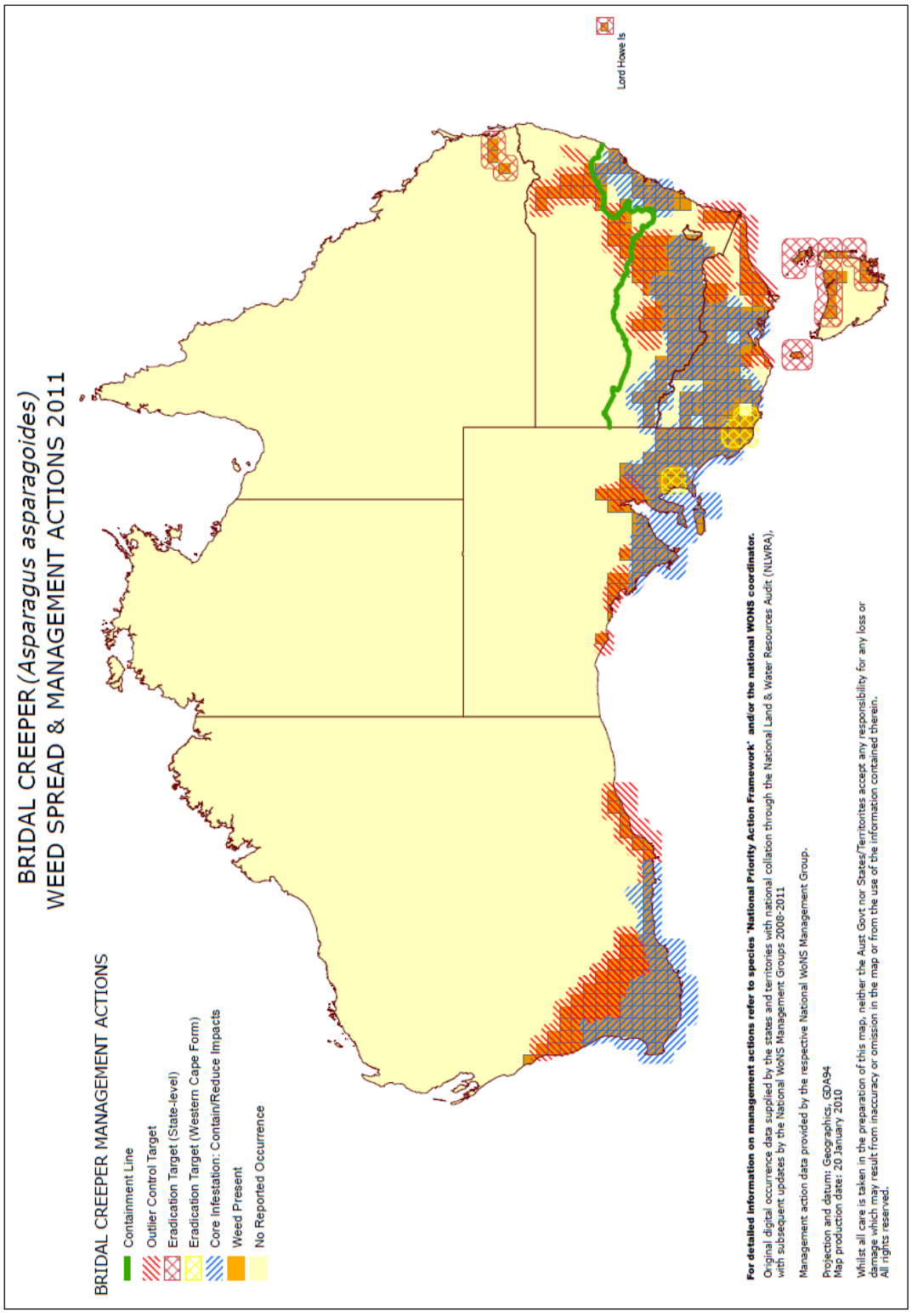
[3] Adapted from Thorp 2012, *Additional list of Weeds of National Significance*, <www.org.au/WoNS>.

developing a protocol to guide future decisions about when this should occur on a case-by-case basis.

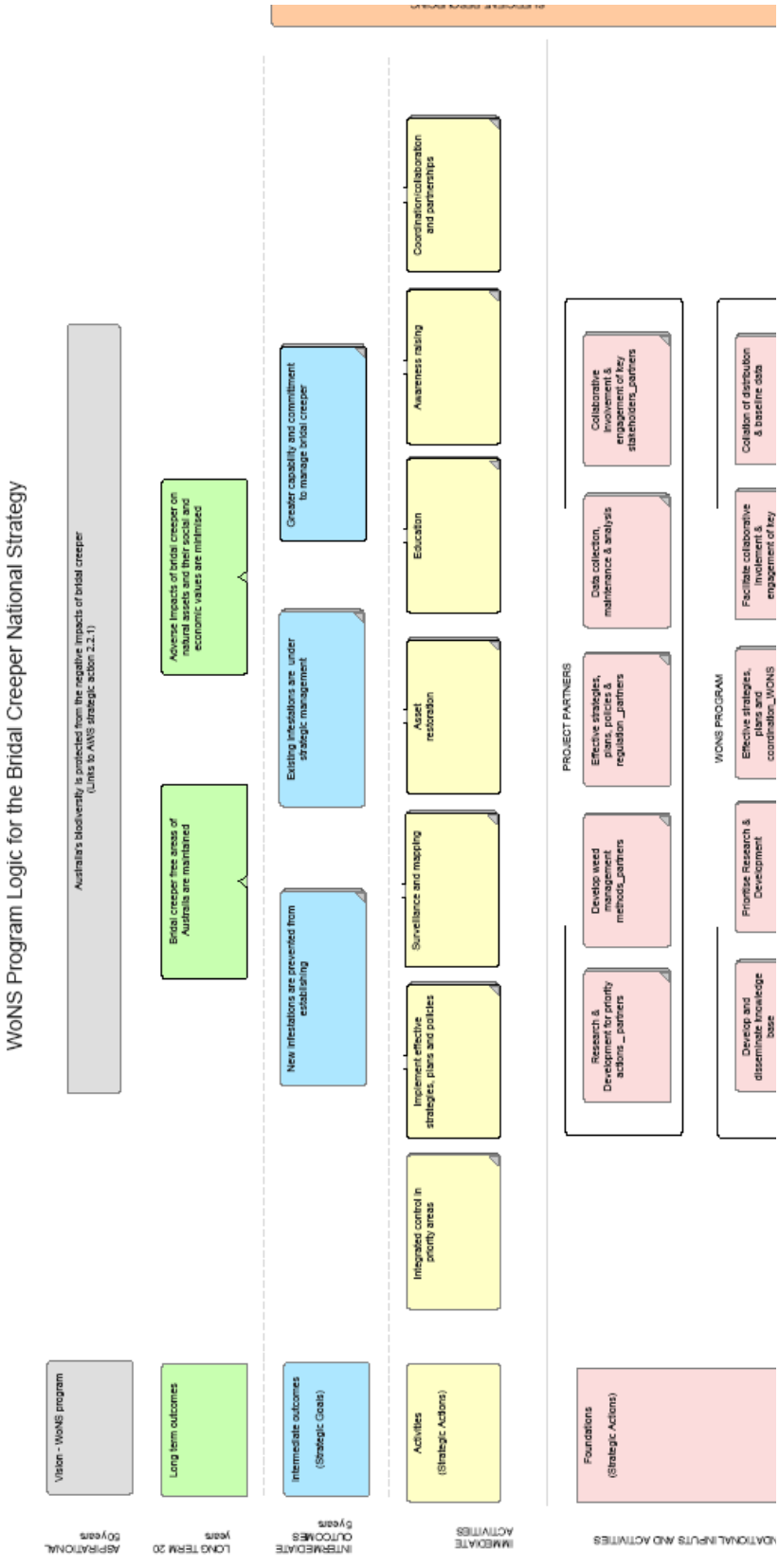
In 2010, jurisdictions nominated additional candidate WoNS species. These species were independently assessed, and the AWC endorsed 12 additional 'species' to be listed as WoNS. The AWC Chairman, Dr Jim Thompson, announced these additional plant species as WoNS on 20 April 2012. Additional information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

Appendix 2 National bridal creeper distribution and management zone map, 2011

The priority management actions for bridal creeper outlined in goals 1–3 of the strategic plan are reflected in the national weed spread and management map below. The map identifies eradication zones for common and Western Cape bridal creeper, containment lines and outlier infestations for targeted control. The map also indicates the core infestations of bridal creeper, where an asset-protection approach should be applied.



Appendix 3 Program logic model for the bridal creeper strategic plan



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