WEEDS OF NATIONAL SIGNIFICANCE

Prickly acacia

(*Acacia nilotica subsp. indica* (Benth.) Brenan)

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An unpublished draft of the revised strategic plan has guided national coordination of this Weed of National Significance for the past two years.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

This strategy was compiled by Nathan March, Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry, in conjunction with the National Prickle Bush Management Group (NPBMG) and with full cooperation of the Australian, state and territory governments.

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The national distribution and management zone map was developed by Nathan March and Moya Calvert (Queensland Department of Agriculture, Fisheries and Forestry) based on the contributions of the NPBMG, lead state and territory agencies, and consultation with stakeholders.

Summary

Prickly acacia (*Acacia nilotica* ssp. *indica*) is one of Australia's worst weeds. It is a tree that aggressively invades grasslands and woodlands, replacing them with dense, thorny thickets, It is a particular threat to the 50 million hectares of Mitchell grasslands in northern Australia.

Prickly acacia is well established in parts of western Queensland, but also occurs in coastal and southern Queensland, the Northern Territory, Western Australia and South Australia. It was designated a Weed of National Significance in 1999, recognising the need for coordinated effort to reduce its detrimental impacts.

An initial strategic plan was published in 2001 and, despite the size of the problem, significant progress has been made towards reducing both the geographic range and impact of the weed. National reviews have since identified gaps associated with coordination, planning awareness and early detection, surveillance, economic and environmental data limitations, best-practice adoption, spread prevention and biological control research aspects that require strengthening.

Previous program achievements, identified coordination gaps and new aspirations have all been considered during the development of this strategic plan.

The strategy aims to deliver three goals and their associated objectives:

1 Protect clean areas and eradicate outlier infestations

- Minimise spread.
- Protect clean areas and promote early detection of new infestations.
- Eradicate isolated and scattered infestations.

2 Minimise impacts of prickly acacia on productivity and natural assets

- Facilitate community-based control.
- Increase adoption of best-practice management.
- Support biological control initiatives.

3 Maintain and enhance national commitment to manage prickly acacia

- Coordinate, monitor and evaluate implementation of the strategy.
- Improve resourcing and stakeholder support of the strategy.
- Inform and educate stakeholders about prickly acacia.
- Maintain legislative support for prickly acacia management.
- Develop and use national mapping tools.

All stakeholders share a responsibility for implementing and monitoring the strategic actions to ensure the effective management of prickly acacia continues.

Vision

Prickly acacia is eradicated outside the core infestations in Queensland, and national impacts are reduced to a minimum.

1 The challenge

Prickly acacia (*Acacia nilotica* ssp. *indica*), has serious impacts on the agricultural and environmental values of the Mitchell grasslands, and other natural grassland and woodland ecosystems.

Although prickly acacia has already invaded more than 6.6 million hectares, potential distribution mapping and climate change models suggest that the weed could spread well beyond its current range. In fact, it has invaded only 12% of the Mitchell grasslands and almost negligible areas of other ecosystems.

The impacts of prickly acacia on productive grazing systems are enormous, with high-density infestations eliminating perennial grass production. At high densities, direct economic impacts can exceed $100 000 each year per property, while it is estimated that landholders are spending at least $8 million each year to control and manage prickly acacia in the core infestation areas of western Queensland.

The environmental costs of prickly acacia have not been fully established. However, at moderate to high densities, prickly acacia severely alters the composition and habitat structure of flora and fauna species. The Mitchell Grass Downs Bioregion is known to be home to 25 rare and threatened animal species and 2 endangered plant communities, which could be affected by spread of prickly acacia.

Prickly acacia is readily dispersed by stock movement; consequently, seed-spread prevention practices are a key to managing this weed. Coupled with this is the need to address high seed-producing infestations growing in association with water. As with all weeds, prevention is a critical component of prickly acacia management to avoid future impacts.

Characteristic of prickly acacia invasion is the potential for mass establishment events to occur in response to a series of high rainfall years. Such events, as occurred in the mid-1970s, can cause a major expansion of both the range and density of infestations. Mass establishment events will require pre-emptive actions to minimise potential seed spread and coordinate the management of new infestations.

Control and management options are now available to help land managers address most infestation situations while investigations are continuing for effective biological control agents. The challenge will be to measurably reduce the geographic area affected by prickly acacia while maintaining economically feasible management practices for people containing the weed.

Effective implementation of this strategic plan will result in the eradication of infestations outside Queensland, the containment of core infestation areas within Queensland and the minimisation of impacts for all those affected by prickly acacia.

2 Background

Prickly acacia has been listed as a Weed of National Significance (WoNS) because of the impact it has on a major native ecosystem (the Mitchell Grass Downs) and its potential to spread over most of northern Australia. This weed forms dense thickets that have major impacts on both primary industry and biodiversity.

Prickly acacia is easily spread, shows a wide adaptability to climate and causes significant changes in ecosystem composition. While large infestations of prickly acacia are currently found only in Queensland, it poses a potential risk to 50 million hectares of Australia's native grassland ecosystems.

Prickly acacia is most often confused with *Acacia farnesiana* (a pre-European settlement introduction), *Prosopis* spp. (mesquites) and *Parkinsonia aculeata* (parkinsonia). The latter two species are also WoNS. It may also be confused with many native acacia species, such as *A. paradoxa* (kangaroo thorn). Unfortunately, its common name is also used for some of these species.

2.1 Biology

Prickly acacia is a thorny leguminous tree. It generally grows to approximately 5 m high, but can reach 10 m under favourable conditions. The pods and the umbrella shape of the tree are characteristic features. Mature trees are usually single stemmed, with spreading branches. Leaves are finely divided and fern-like, with 4–10 pairs of leaf branches and 10–20 pairs of narrow green leaflets on each branch. Pairs of stout thorns, usually 5–10 cm long, grow at the base of the leaves.

Golden-yellow, ball-shaped clusters of flowers, about 1 cm across, grow on the stems. Flowering generally begins in late February and continues through to June. Pods ripen and fall from late October through to January. Pods are usually 10–15 cm long, flattish, with narrow constrictions between the seeds, and turn grey when ripe. Most pods are produced by trees growing where there is adequate soil moisture, such as along bore drains, drainage lines, creeks and rivers, or around dams. Trees distant from water bodies, such as those growing in open downs country, usually produce low numbers of seeds, except in high rainfall years. Seeds can remain viable in the soil for many years (≥7 years), but most seeds germinate or are destroyed within 2 years (Figure 1).

Stock, particularly cattle, graze pods soon after they drop from trees, and are the main agents for dispersing prickly acacia seed. Cattle faeces also provide an environment that promotes germination and survival. Water may disperse pods containing seeds downstream during flooding and tides may also redistribute pods; however, these are usually only minor factors in spread.

Seed germination is affected by soil type and soil moisture. Prickly acacia prefers cracking clays and loam soils because of their high water-holding capacity.

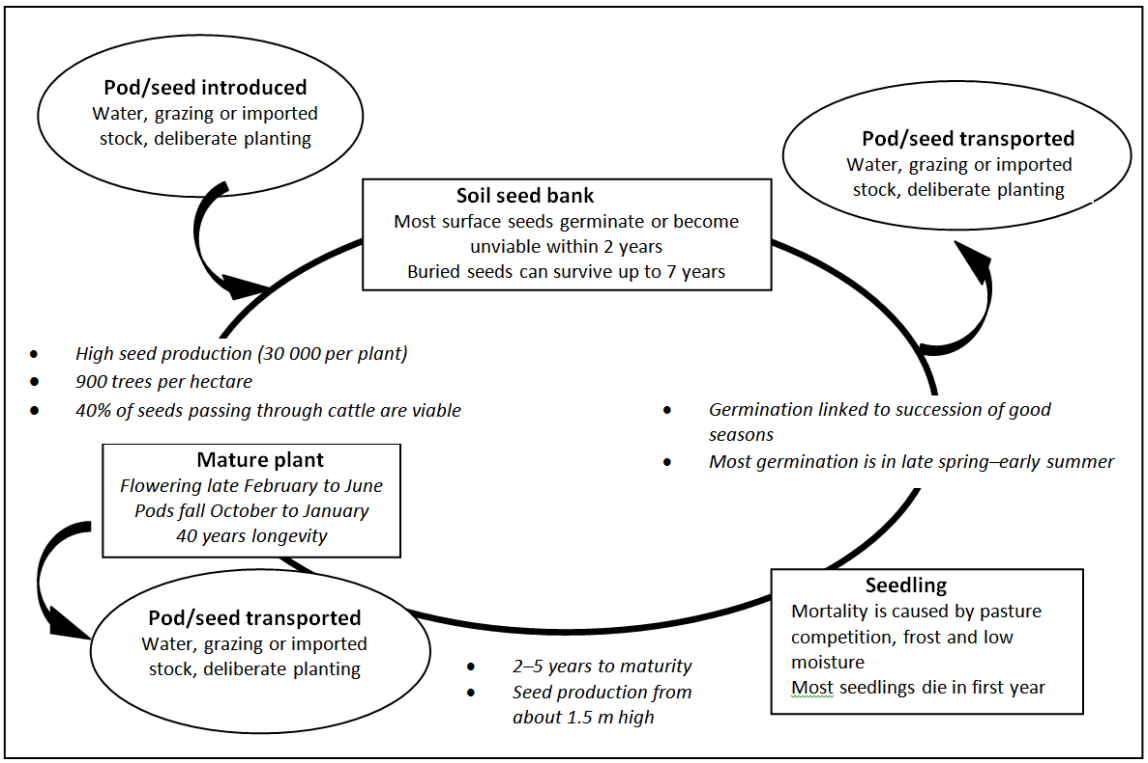


Figure 1 Life cycle of prickly acacia

2.2 History of spread

Prickly acacia was first recorded in Australia in 1803 in New South Wales. It did not become widespread until after 1900, when it was grown extensively as a shade and ornamental tree in the Bowen and Rockhampton districts of Queensland. Initial spread was by broadcasting seeds from horseback and by deliberate planting of seedlings. In 1926, the Queensland Department of Agriculture and Stock recommended it as a shade tree for sheep production in western Queensland. It was subsequently widely planted around homesteads, bore drains and dams during the 1920s to the 1940s, not only for shade but also for fodder, because of the protein-rich pods and leaves.

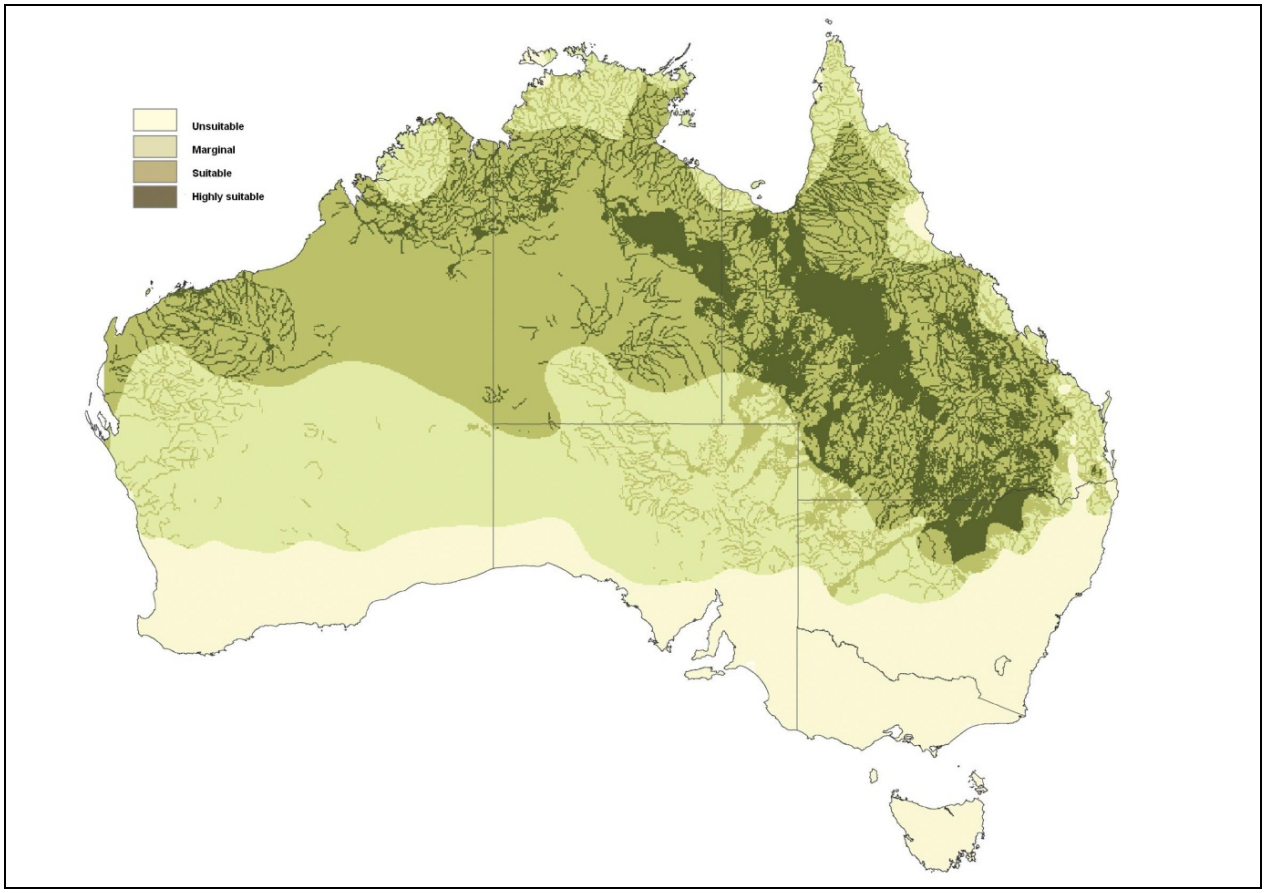
The wool crash of the 1970s saw a change from stocking sheep to cattle in Queensland. The slump in cattle prices during the 1970s in turn led to high stocking rates, which may have been significant in providing large numbers of cattle as dispersal agents. This, and the series of wet years during the 1950s and again in the 1970s promoted massive invasion of prickly acacia throughout the northern Mitchell Grass Downs and the establishment of dense thorn veldts, particularly along bore drains.

Infestations now cover about 6.6 million hectares, with large established infestations roughly bordered by Hughenden, Julia Creek, Winton, Barcaldine and Aramac in western Queensland. The heaviest infestations occur along bore drains, watercourses and drainage lines. Infestations spread from here onto the extensive rangelands.

Infestations also occur in coastal and southern Queensland, the Barkly and Victoria River districts of the Northern Territory, the Kimberley region of Western Australia and the north-east of South Australia.

The predicted distribution of prickly acacia in Australia has considered climate (CLIMEX modelling[1]), soil suitability, accessibility to water drainage, proximity to major stock transport routes and stock routes in the existing infestation area (Figure 2). All areas north of latitude 32°S (except for South Australia, coastal New South Wales and south-east Queensland) appear to be climatically suitable for prickly acacia and must be considered potentially under threat from this weed. This potential distribution includes more than 50 million hectares of Australia's native grassland ecosystems.

Climate change modelling suggests that increased temperatures and possibly less severe or fewer frost episodes will favour the southern establishment of prickly acacia, particularly into New South Wales.



Source: March & Calvert (2004)

Figure 2 Predicted distribution of prickly acacia

2.3 Summary of impacts

At low densities, prickly acacia may benefit primary production through provision of shade and fodder. However, most landholders view it as undesirable due to its invasive potential and substantial impacts as densities increase. Medium to high-density infestations reduce pasture production, change pasture composition to favour less desirable annual species,

1 Simulation modelling system developed by CSIRO based on climate

increase mustering costs, impede stock access to water, increase water loss from bore drains and cause vehicle tyre damage.

In areas with a prickly acacia canopy cover of 25–30%, pasture loss is estimated to be 50%. Pasture growth is virtually eliminated by a 50% canopy cover (J Carter, DPI, 1997, pers. comm., Mackey). In 2009, landholders spent approximately $6 million to control prickly acacia in four of the five shires affected by core infestations (March 2010).

With the potential to convert open grasslands to thorn veldt, the environmental impacts of prickly acacia are equally significant. Prickly acacia causes a structural change to native grassland ecosystems characterised by loss of grass cover, increased bare ground and development of an intermittent tree canopy. These structural changes can favour some species over others (e.g. increased availability of perch sites may favour butcher birds to the detriment of their prey) but few studies have examined whether prickly acacia causes a decline in biodiversity. Ecosystem changes threaten rare and vulnerable animals including the Julia Creek Dunnart (*Sminthopsis douglasi*), a form of the long-tailed planigale (*Planigale ingrami*) and two skink species.

The Mitchell Grass Downs are one of the world's unique grass landscapes. With the value of the outback tourism industry increasing markedly, there are concerns that infestations of prickly acacia may reduce the natural values and attraction of the outback and the unique downs landscape.

2.4 Control history

Prickly acacia was declared as a noxious plant in Queensland in 1957, but debate regarding the benefits versus costs of prickly acacia continued until the early 1990s. As a result of varying community attitudes and a lack of management tools, control was generally ad hoc. Some landholders undertook modest control activities and others invested significant resources in attempts to eradicate it from their properties. Many control efforts initially focused on minimising property management impacts (e.g. mustering, stock access to water points).

It was only in the mid-1990s that major coordinated control programs began through the former Queensland-based Strategic Weed Eradication and Education Program. Between 1998 and 2010, regional natural resource management (NRM) groups, in combination with state and territory lead agencies, capitalised on various Australian, state and territory funding initiatives. All initiatives have been strongly supported at property, local government and regional levels.

Within the past 10 years, a concerted effort has been made to eradicate prickly acacia from Western Australia, the Northern Territory and South Australia. While new occurrences have occasionally been found, a systematic approach has progressively reduced the number and area of infestations in most jurisdictions. Eradication will require ongoing monitoring and follow-up for an extended period.

In Queensland, various strategic control projects have continued outside a core area of the Mitchell Grass Downs, while within the core area control activities are focused on reducing the impacts of prickly acacia on primary productivity. Control activity levels in the core infestation areas are now very high and all landholders recognise the detrimental impacts of this weed.

2.5 Control methods

Spread prevention practices are the most effective and efficient means of minimising future establishment and impacts of prickly acacia. As stock is the major vector for seed movement, stock hygiene should be considered when moving any stock that have had access to mature pods. This may entail the yarding or use of holding paddocks for stock before and after transport, and the monitoring and subsequent control of any outbreaks of prickly acacia at these sites.

Maintaining a healthy pasture is also considered a preventive strategy for many woody weeds such as prickly acacia. Deep-rooted perennial grasses will actively compete with young prickly acacia plants for resources, and in doing so can negatively affect their survival, growth and development.

Chemical and mechanical methods, pasture management and in some situations fire can be used in an integrated control program for prickly acacia. All methods may be effective in particular situations depending on the infestation density, landform, resources, area covered and the management objectives (Mackey 1997). Timing is also very important for control as some low-rainfall seasons may lead to natural mortality, while other seasons result in major seedling recruitment.

A range of effective chemical control options are available, such as foliar spraying, basal barking, cut stumping, and soil application of residual herbicides. For example, the use of Diuron-based products has been highly successful for controlling the densest infestations along bore drains. Infestations in creek lines and along natural water bodies have been more difficult to control, and some herbicides have restrictions that prevent them from being used in these areas.

Mechanical control is being used more widely by land managers who are trying a range of equipment to minimise costs but still achieve high kill rates. Equipment includes grubber attachments on tractors, front-end loaders, and bulldozers fitted with standard blades, stick rakes, cutter bars or blade ploughs. Chain pulling for control of medium to dense infestations has been very cost-effective, particularly during drier years when soil seed reserves are generally low and subsequent seedling regrowth is less than during times of high rainfall. Mechanical control can provide a supplementary source of fodder but needs to be timed to minimise the risk of spread.

Fire is not generally considered a control option for prickly acacia because fire does not affect plants past the seedling stage. However, in years of large-scale seedling regrowth it could be considered, provided fires can be implemented before seedlings become too large.

Biological control is considered to be potentially the most cost-effective management method for dense areas of many weeds. Several agents have been released in Australia on prickly acacia, including a seed-feeding insect (*Bruchidius sahlbergi*), a leaf-feeding beetle (*Homicloda barkeri*) and three leaf-feeding caterpillars (*Chiasmia inconspicua*, *Chiasmia assimilis* and *Cometaster pyrula*). None of these have had significant impacts on prickly acacia in the major infestations, although *Chiasmia assimilis* appears to cause substantial periodic defoliation of prickly acacia plants in some coastal infestations in northern Queensland. Recent biological control research in Indian populations of prickly acacia has identified additional agents which are being tested and may be released in the future.

Sporadic dieback episodes have been observed in prickly acacia infestations but the causal factors (possibly pathogens, insects and climate) have not been determined and are being investigated.

2.6 Socioeconomic factors affecting management decisions

Prickly acacia is principally a rangeland weed—an invader of mainly pastoral properties in generally low population areas of northern Australia. Within the western Queensland core infestation area (predominantly the Mitchell Grass Downs), properties are usually moderate-sized family enterprises. However, properties with geographically strategic (non-core) infestations in other parts of Australia tend to be much larger properties managed by pastoral companies or owned by traditional owners.

The ability of properties to effectively and consistently address prickly acacia and other weeds in the rangelands is driven by key elements such as cattle prices, property viability, climate, resourcing and the knowledge, attitudes, skills and aspirations of the land managers. Although all of these factors impact on prickly acacia management, this strategy can only address some of them.

Poor stock prices (including fluctuations to the live cattle export trade) and extended drought conditions both have an adverse impact on the capacity of land managers to expend finances for weed management. Conversely, very high rainfall over two or more years may result in mass establishment of prickly acacia that is beyond the capacity of land managers to contain within the short term. A convergence of poor stock prices (and subsequent high stocking rates providing high capacity for seed spread) and high rainfall from 1974 to 1976 resulted in the mass establishment of prickly acacia in parts of western Queensland.

Although the level of prickly acacia control is moderate to high in many infestation areas, external resourcing is a catalyst for group-based aspirations and subsequently drives landscape-level coordinated control programs. Because active landcare groups are scarce in the rangelands, program drivers such as agencies, local government and regional natural resource management groups have often harnessed this individual effort into ‘property syndicates’ and ‘subcatchment groups’ to achieve broadscale objectives.

Changing the attitudes and aspirations of land managers relies on effective extension delivery. Although direct extension services by agencies in some rangeland regions have declined, this has been partly balanced by indirect services (internet) and an increasing role and capacity of regional natural resource management groups (e.g. catchment management authorities). Effective extension services are critical to awareness, early detection and best-practice adoption, and should be considered necessary complementary actions to on-ground control.

Additionally, due to resourcing restrictions, extension methodology increasingly targets group-based situations, which only occur irregularly in the rangelands. The necessity of one-on-one property-based extension needs to be a reconsidered, particularly where eradication is the desired outcome.

2.7 Legislative controls

The Australian Quarantine and Inspection Service (now Biosecurity Australia), through the Quarantine Proclamation 1998, prohibits the introduction of prickly acacia as nursery stock, plant parts or seed into Australia.

The management of prickly acacia within Australia is supported by legislation at a state and territory level (Table 1). In addition, several jurisdictions have developed policies, guidelines and strategic frameworks to assist the implementation of legislation.

Table 1 Legislative related to prickly acacia in Australia

Jurisdiction	Legislation	Declaration	Action
Australian Capital Territory	*Pest Plants and Animals Act 2005*	C4	Propagation and supply is prohibited
New South Wales	*Noxious Weeds Act 1993*	C2	Must be notified to local control authority Must be eradicated and the land kept free of the plant Cannot sell or move the plant or plant material
Northern Territory	*Weeds Management Act 2001*	Class A and Class C	Class A—to be eradicated Class C—not to be introduced
Queensland	*Land Protection (Pest and Stock Route Management) Act 2002*	Class 2	Must not introduce, keep, release, supply or transport Landowner is required to take reasonable steps to keep land free of, or to control, prickly acacia
South Australia	*Natural Resource Management Act 2004*	Class 1C(i) Category 1 whole of state	Must not sell plant or material carrying (whole of state) Owner to take action to destroy or control (South Australian Arid Lands, natural resource management region)
Tasmania	*Weed Management Act 1999*	Nil	Not declared in Tasmania
Victoria	*Catchment and Land Protection Act 1994*	Restricted weed	Must not buy, sell, possess for sale, display, plant, propagate, deposit on land, bring into or transport around Victoria
Western Australia	*Agricultural and Related Resources Protection Act 1976* *Plant Diseases Act 1914* *Biosecurity and Agriculture Management Act 2007*	P1 (whole state) P2 (whole state) 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).	P1—sale, trade and movement is prohibited P2—eradicate existing and new infestations

2.8 Principles underpinning the plan

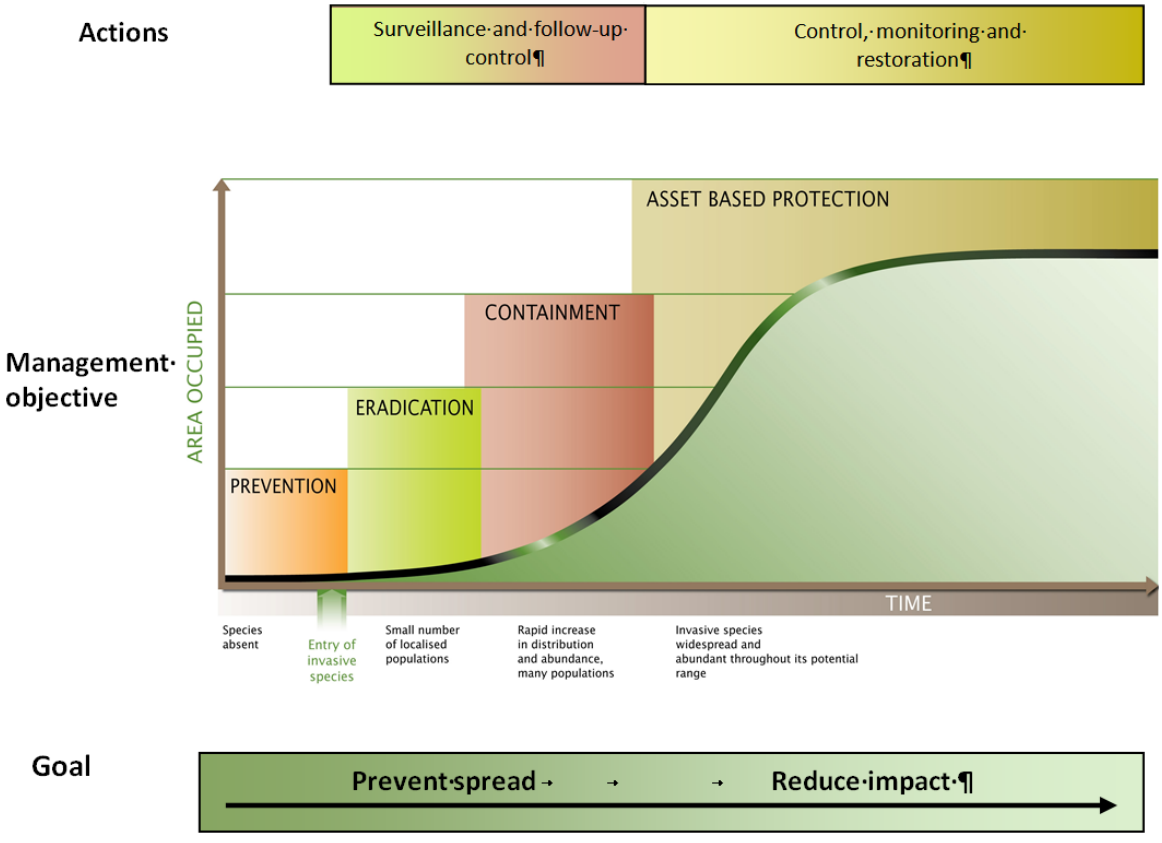
This strategic plan is based on the seven key principles of the Australian Weeds Strategy (NRMMC 2007):

- 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. 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 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 3).



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

Figure 3 Stages of weed invasion with corresponding goals, management objectives and actions at each stage

2.8.1 The national program—progress to date

The original prickly acacia strategy was published in 2001 and was quickly followed by formation of the National Prickle Bush Management Group (December 2001) and appointment of a National Coordinator (April 2002). The management group has overseen implementation of the original national strategy since December 2001. The group met annually to assess progress against the strategy's goals and objectives and participated in major reviews of the strategy during 2006–10.

Strategy implementation initially focused on community-based strategic control programs, best-practice adoption, national mapping, and education and awareness activities. New initiatives in eradication projects, biological control and remote sensing have occurred more recently.

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). In 2009, a review of the strategy assessed progress against goals and objectives, and identified gaps and new actions for future management. Key achievements identified from the review included:

- effective control of all known infestations outside Queensland (i.e. in Western Australia, South Australia, Northern Territory), with each progressing towards eradication
- best-practice information readily available to landholders
- national and regional maps developed to inform planning and monitoring
- demonstrated increase in landholder adoption of best-practice management
- control works for western and southern extremities of prickly acacia in Queensland
- national mapping of occurrence and management actions (Appendix 2).

The review recognised that there were several barriers and challenges to achieving effective management of prickly acacia, including:

- challenges of logistics, coordination and resourcing because of the large number of properties and range of stakeholders
- challenge of achieving hygiene in cattle movement from infested to clean areas.
- lower identification and early detection capability outside of Queensland
- low level of compliance for weed seed spread prevention and control
- lack of long-term funding for eradication programs
- restricted control on organic-accredited properties, especially in South Australia and south-west Queensland
- limited economic and environmental impact data
- reduced capacity to direct funds to nationally strategic sites
- difficulties of monitoring across broad rangeland areas.

The review also recognised the need for ongoing national coordination of prickly acacia management, with a particular focus on:

- achieving effective, long-term local/regional containment/eradication through a mix of sustained compliance and incentives

- a robust and informative monitoring system for on-ground activities
- quantifying prickle bush impacts and the benefits of control
- improved processes for assessing the nationally strategic value of resourcing decisions
- enhanced surveillance in New South Wales and Western Australia
- development and distribution of new biocontrol agents
- revision of the national containment line
- ensuring sustained follow-up control at nationally strategic sites.

In August 2010, the National Prickle Bush Management Group held a national workshop to identify new actions required to maintain the benefits derived from national coordination and to limit the impacts of prickly acacia in Australia. A draft strategy, linking strategic actions with intermediate to long-term program objectives, was produced.

To finalise this document, comments were sought from targeted agency, industry and community stakeholders. The draft strategy was also available for public comment via the Weeds Australia website.[2]

[2] www.weeds.org.au

2.9 Relevance to other strategies

The WoNS Prickly Acacia Strategic Plan 2012–17 has been developed to provide a framework for coordinated management of prickly acacia across the country. Complementary links can be found in a range of existing resource management initiatives at all jurisdictional levels, as shown in Table 2.

Table 2 Strategies and plans for the management of prickly acacia

Scale	Natural resource management	Pest management	Weed species management
National	*Environment Protection and Biodiversity Conservation Act 1999* National Strategy for the Conservation of Australia's Biological Diversity 2010 Native Vegetation Policy 2001 National Strategy for Ecologically Sustainable Development 1992	The Australian Weeds Strategy 2007 Weeds of National Significance *Biological Control Act 1984* Caring for our Country Business Plan	Weeds of National Significance strategic plan
State	State biodiversity and natural resource management strategies	State and territory agency pest management plans	New South Wales Prickle Bush Strategy Northern Territory Prickly Acacia Guideline Queensland Prickly Acacia Guideline
Regional	Regional natural resource management plans	Regional pest management strategies	Specific weed control plans
Catchment	Regional or catchment management strategies	Regional pest management strategies	Regional species plans
Local	Landcare plans	Local government pest management plans (Qld.)	Local weed control plans
Property	Property management plans National parks management plans	Property pest management plans National park weed management strategies	Property weed management plans

3 Strategic goals

The strategic goals and objectives in this revised plan build on those of the original plan. These objectives include actions to maintain ongoing strategic programs and address critical management and research needs for the future.

Appropriate actions to achieve these goals and objectives are outlined in Sections 3.1–3.3. 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.

3.1 Goal 1: Protect clean areas and eradicate outlier infestations

Objectives are to:

- minimise spread
- protect clean areas and promote early detection of new infestations
- eradicate isolated and scattered infestations.

The actions to achieve this goal, and the action level and responsible partners for each action, are shown in Table 3.

Table 3 Actions to achieve goal 1 of the Prickly Acacia Strategic Plan 2012–17

Strategic actions	Actions	Action level[a]	Responsibility
1.1 Facilitate the control of high seed sources	Increase awareness of the high seed production threat of prickly acacia growing near water sources (e.g. dams, bore drains, watercourses) and encourage control	1	Queensland lead agency, regional groups, local government, landholders
	Facilitate removal of historical plantings associated with rural townships and property infrastructure (e.g. around yards and other facilities)	3	Local government, landholders, state & territory agencies
1.2 Minimise long and short-distance movement of seed by stock	Review studies associated with seed passage through livestock, and re-examine recommendations for livestock hygiene protocols	2	Queensland lead agency
	Enhance awareness of livestock hygiene protocols and practices for minimising the dispersal of prickly acacia seed through livestock movement and transport	1	State and territory agencies, local government, South Australian Arid Lands
	Maintain and enhance the wash-down facility network, particularly within and next to core infestations and strategic locations along high-risk transport corridors	1	Queensland lead agency, local government
	Promote the use of vehicle wash-down facilities and/or livestock holding paddocks	2	State and territory agencies, local government, South Australian Arid Lands
	Maintain border (cross-jurisdictional) quarantine requirements between the Northern Territory and Western Australia	2	Western Australian lead agency

Strategic actions		Actions	Action level[a]	Responsibility
		Evaluate the adoption and use of vendor declaration forms by properties within and external to the core infestation area	3	Queensland lead agency
		Research seed longevity and review implications for control programs and monitoring	2	Queensland lead agency
1.3	Develop and maintain early detection and eradication mechanisms	Use risk assessment (pathway analysis) to determine how and where prickly acacia is most likely to spread based on its potential for long-distance movement by livestock	2	Research organisations, state and territory agencies
		Implement education and awareness activities specific to the pastoral industry, community groups, regional natural resource management groups and government staff to improve identification skills, threat awareness, control methods, resourcing and to implement timely control of new outbreaks, especially within eradication zones	1	State and territory agencies local government, South Australian Arid Lands
		Encourage reporting of suspected outbreaks and ensure processes are in place for identification, rapid response, delimitation and control planning	1	State and territory agencies, local government
		Implement targeted and systematic surveys and/or monitoring of high-risk areas, including areas associated with confirmed outbreaks	2	State and territory agencies, local government, regional groups
		Maintain prickly acacia–free areas through awareness, identification training and early detection capability	1	State and territory agencies, local government, regional groups
1.4	Progress eradication objectives	Encourage the development and use of databases, registers or similar systems for maintaining consistent site records for eradication zones at a state and territory level	2	State and territory agencies, local government, regional groups
		Continue eradication objectives for the whole of the Northern Territory, Western Australia and South Australia, and within the eradication zone in Queensland	2	State and territory agencies, South Australian Arid Lands, local government, regional groups
		Evaluate progress of eradication objectives at a site, regional, state and territory level and review zoning	2	State and territory agencies, South Australian Arid Lands, local government, regional groups

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 Goal2: Minimise impacts of prickly acacia on productivity and natural assets

Objectives are to:

- facilitate community-based control
- increase adoption of best-practice management
- support biological control initiatives.

The actions to achieve this goal, and the action level and responsible partners for each action, are shown in Table 4.

Table 4 Actions to achieve goal 2 of the Prickly Acacia Strategic Plan 2012–17

Strategic actions	Actions	Action level[a]	Responsibility
2.1 Protect and restore high value environmental and cultural sites	Implement on-ground control projects to protect and restore high-value conservation sites (e.g. riparian wetlands, mound springs) and culturally significant areas threatened and/or impacted by prickly acacia	2	Landholders, traditional owners, regional groups, state and territory agencies
2.2 Promote local and regional-scale control within active management zones	Implement coordinated control programs to suppress and/or reduce infestations within active management zones	2	Local government, regional groups, state and territory agencies
2.3 Develop regional and local containment plans	Incorporate prickly acacia management in all relevant plans including – property and subcatchment plans – local government and agency pest management plans – NRM and catchment strategies – biodiversity strategies – state and territory plans	1	Landholders, local government, regional groups, state and territory agencies
	Promote and maintain the establishment of clean areas within the containment zone	3	Landholders, local government, regional groups, Queensland lead agency
2.4 Promote the integration of prickly acacia management	Promote property planning and integrated weed management to maximise benefits of prickly acacia control	2	State and territory agencies, regional groups, universities
	Promote sustainable pasture management practices where prickly acacia threatens grassy ecosystems (e.g. Mitchell grasslands)	3	State and territory agencies, regional groups
2.5 Identify economic impacts, incentives and disincentives	Determine the benefits and costs of prickly acacia control for best-practice management	3	Queensland lead agency, regional groups, industry groups, universities

Strategic actions		Actions	Action level[a]	Responsibility
		Update data on the national economic impact of prickly acacia	3	Queensland lead agency, regional groups, industry groups, universities
2.6	Adopt best-practice management	Continue to promote best-practice options for prickly acacia management	1	Local government., regional groups, industry groups, state and territory agencies
		Include prickly acacia management in pest management field days, workshops and demonstration sites to facilitate best-practice adoption	2	Local govt., regional groups, state and territory agencies
		Incorporate prickly acacia control and management techniques in relevant pest management training	2	Local government, regional groups, state and territory agencies
2.7	Improve integrated management practices	Continue the development of new control methods to support integrated management	2	Queensland lead agency, agrochemical companies, regional groups, industry.
		Use landscape modelling to predict impacts of prickly acacia in different regions, and to facilitate planning and prioritisation	3	CSIRO, regional groups
2.8	Introduce and improve the impact of biocontrol agents	Search overseas for biological control agents based on subspecies matching, climate considerations and potential effectiveness of the agents	1	Queensland lead agency
		Maximise introduction and assessment of potential biological control agents	1	Queensland lead agency
		Determine impacts of introduced biological agents in differing climatic regions and interrelationships between them and other control options	3	Queensland lead agency
		Investigate the cause and scope of naturally occurring dieback and assess the potential for complementing other control options	2	University of Queensland, Queensland lead agency

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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.
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Level 3 = Desirable and still beneficial to improving uptake and efficiency of on-ground action, but not critical to success.

3.3 Goal 3: Maintain and enhance national commitment to manage prickly acacia

Objectives are to:

- coordinate, monitor and evaluate implementation of the strategy
- improve resourcing and stakeholder support of the strategy
- inform and educate stakeholders about prickly acacia
- maintain legislative support for prickly acacia management
- develop and use national mapping tools.

The actions to achieve this goal, and the action level and responsible partners for each action, are shown in Table 5.

Table 5 Actions to achieve goal 1 of the Prickly Acacia Strategic Plan 2012–17

Objectives	Strategic actions	Action level[a]	Responsibility
3.1 Manage implementation of the plan	Maintain effective national strategy coordination and implementation arrangements including inter-jurisdictional collaboration	1	State and territory lead agencies, national coordinator (until 30 June 2013)
3.2 Monitor and evaluate implementation of the strategy	Collate strategy milestones and report on progress annually to the Australian Weeds Committee and other key stakeholders against a phase 3 monitoring, evaluation, reporting and improvement (MERI) plan	1	State and territory agencies
3.3 Coordinate communication about the strategy	Conduct targeted communication activities relevant to protecting clean areas and eradicating outliers to ensure awareness of the plan, priority actions and achievements	1	State and territory agencies, national coordinator (until 30 June 2013)
	Ensure links with other relevant WoNS strategies and other plans to maximise awareness	1	State and territory agencies, national coordinator (until 30 June 2013)
3.4 Seek support and resources for strategy delivery	Facilitate and support regional, state, territory and national initiatives to address nationally strategic infestation areas and asset protection	2	State and territory agencies
	Encourage collaborative partnerships to improve prickly acacia coordination and control outcomes	1	State and territory agencies, community groups, local government
3.5 Increase education and awareness of the prickly acacia situation in Australia	Promote awareness of the threat and impacts of prickly acacia	1	State and territory agencies, regional groups, local government
	Direct awareness campaigns to target groups in high-risk regions	1	State and territory agencies, regional groups, local government
	Produce and distribute identification materials for prickly acacia and joint products with mesquite, parkinsonia and	2	State and territory agencies, regional groups

Objectives		Strategic actions	Action level[a]	Responsibility
		other WoNS		
3.6	Maintain an appropriate legislative framework for prickly acacia management	Maintain declaration of prickly acacia to prevent trade and distribution in all states and territories	1	State and territory agencies
		Enhance policy support for nationally strategic actions	2	Australian government, state and territory agencies
		Promote landholder awareness of their responsibilities under legislation	2	Local government, state and territory agencies
		Review the use of lease conditions to facilitate prickly acacia control	3	Queensland agencies
3.7	Develop maps of prickly acacia distribution and management zones	Maintain and update national distribution and density maps	1	State and territory agencies
		Develop distribution and density maps at appropriate scales for project management, planning, resource prioritisation and reporting	1	Regional groups, local government, state and territory agencies
		Develop, delineate and publish national management zones incorporating eradication, active management and containment by July 2013	1	State and territory agencies, national coordinator (until 30 June 2013)
		Review national management zones including community, industry and government submissions to amend zoning by July 2013	2	State and territory agencies
		Apply national data attributes for evaluation of prickly acacia management progress in each zone	2	State and territory agencies
		Investigate and assess new techniques for prickly acacia mapping, including remote sensing and unmanned aerial vehicles	3	Queensland agencies, universities, industry organisations

WoNS = Weeds of National Significance

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.
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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 outcomes and, ultimately, helps to determine the effectiveness 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 build a comprehensive overview of the plan's delivery. Table 6 lists key evaluation questions that must 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 are 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 6 Suggested monitoring and evaluation questions to measure progress under the phase 3 WoNS Prickly Acacia 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 6 ***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,

Table 6 ***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

5 Stakeholder responsibilities

Although landowners have primary responsibility for the control of prickly acacia 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 Prickle Bush Management Group 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.

Private land owners

- Manage and control prickly acacia consistent with legislative requirements for their state or territory.
- Implement best-practice management.
- Undertake any necessary planning and mapping.
- Identify prickly acacia and other weeds threatening their property.
- Implement stock hygiene and other management practices to minimise prickly acacia spread.

Local governments

- Incorporate prickly acacia objectives in relevant pest management plans and monitor implementation.
- Administer and enforce legislation where applicable.
- Undertake surveying and mapping, particularly in relation to outlying prickly acacia infestations.
- Establish local management policies to contribute to strategic control, containment and/or asset protection objectives.
- Control prickly acacia on local government–managed or owned land.
- Facilitate the removal of urban plantings of prickly acacia.
- Source funding and/or contribute to strategic control programs.
- Develop and implement extension strategies to increase awareness of prickly acacia.

Natural resource management groups (catchment management authorities), community, conservation and other interest groups

- Contribute local and regional perspectives to prickly acacia management.
- Contribute to the development, implementation and/or review of local and regional pest management plans.

- Promote and contribute to local and regional containment and/or management programs in partnership with relevant stakeholders.
- Support and/or develop prickly acacia funding submissions.
- Participate in local and regional mapping initiatives and contribute to state, territory and national map production.
- Promote awareness and best-practice management through event coordination and product distribution.

Primary industries (including producers and industry bodies associated with the grazing sector and relevant agricultural and herbicide industries)

- Promote and adopt best-practice management of prickly acacia.
- Identify gaps and issues associated with implementing the prickly acacia strategic plan.
- Contribute to research and development of management practices to support industry members.

State and territory agencies

- Maintain appropriate legislation and policies to achieve state and territory-based objectives for managing prickly acacia.
- Coordinate prickly acacia control and management at a jurisdictional level to complement the management and delivery of the Prickly Acacia Strategic Plan.
- Work closely with local governments, communities and other stakeholders to prevent and minimise prickly acacia impacts.
- Identify strategic management areas and associated objectives.
- Include the strategic control of prickly acacia on state lands in agency pest management plans and on-ground implementation and outcomes.
- Facilitate the inclusion of strategic prickly acacia management in pest management planning processes with secondary stakeholders.
- Source funding for strategic management programs and research.
- Implement monitoring and reporting protocols in line with the monitoring, evaluation, reporting and improvement plan and provide relevant information to the national taskforce and/or the Australian Weeds Committee.
- Develop and implement communication and extension plans where appropriate.
- Facilitate state and territory-level mapping and contribute to national mapping initiatives.

Research institutions

- Initiate applied research to address priority national strategic requirements.
- Identify research gaps and seek innovative solutions for the management of prickly acacia.
- Seek new and ongoing funding and support for research.

Australian Government

- Ensure quarantine controls to prevent importation.
- Ensure access is available for appropriate and potential resources through funding initiatives such as Caring for our Country.
- Provide research support through CSIRO and the Commonwealth Weeds Research Group.
- Undertake strategic prickly acacia control on all Australian Government–managed lands.

Australian Weeds Committee

- Provide a mechanism for identifying and resolving weed issues at a national level.
- Facilitate coordination between the Australian Government, the states and territories and other agencies.
- Provide advice to the Natural Resource Management Ministerial Council on weeds issues.
- Plan, coordinate and monitor the implementation of the Australian Weeds Strategy; build links between key stakeholders; identify potential and emerging weed problems; implement consistent approaches to weed management; and develop a communications strategy for increasing the profile of weed issues.
- Oversee the implementation of the activities described in the WoNS strategies.

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

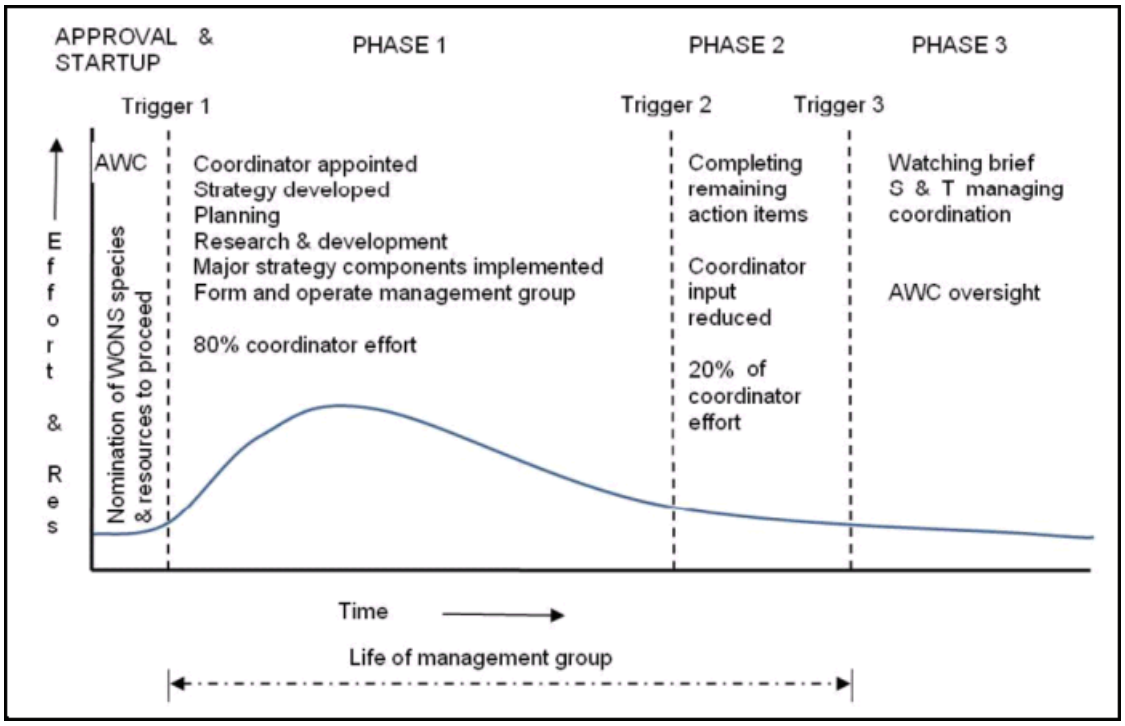


Figure 4 Australian Weed Committee diagrammatic representation of coordinator effort and resource use when implementing a Weeds of National Significance strategy

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

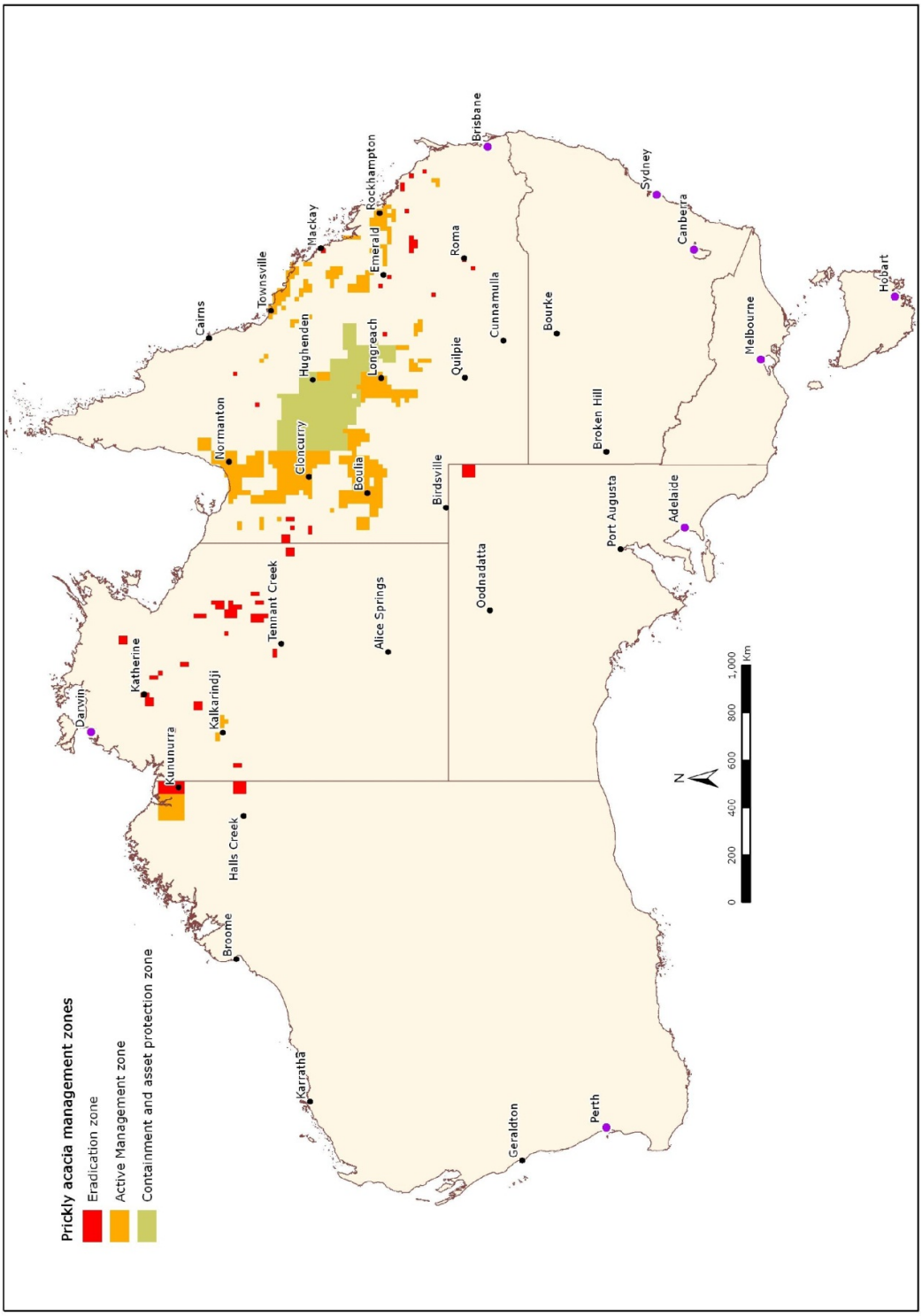
[3] Adapted from Thorp 2012, *Additional list of Weeds of National Significance*, <www.org.au/WoNS>.

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.

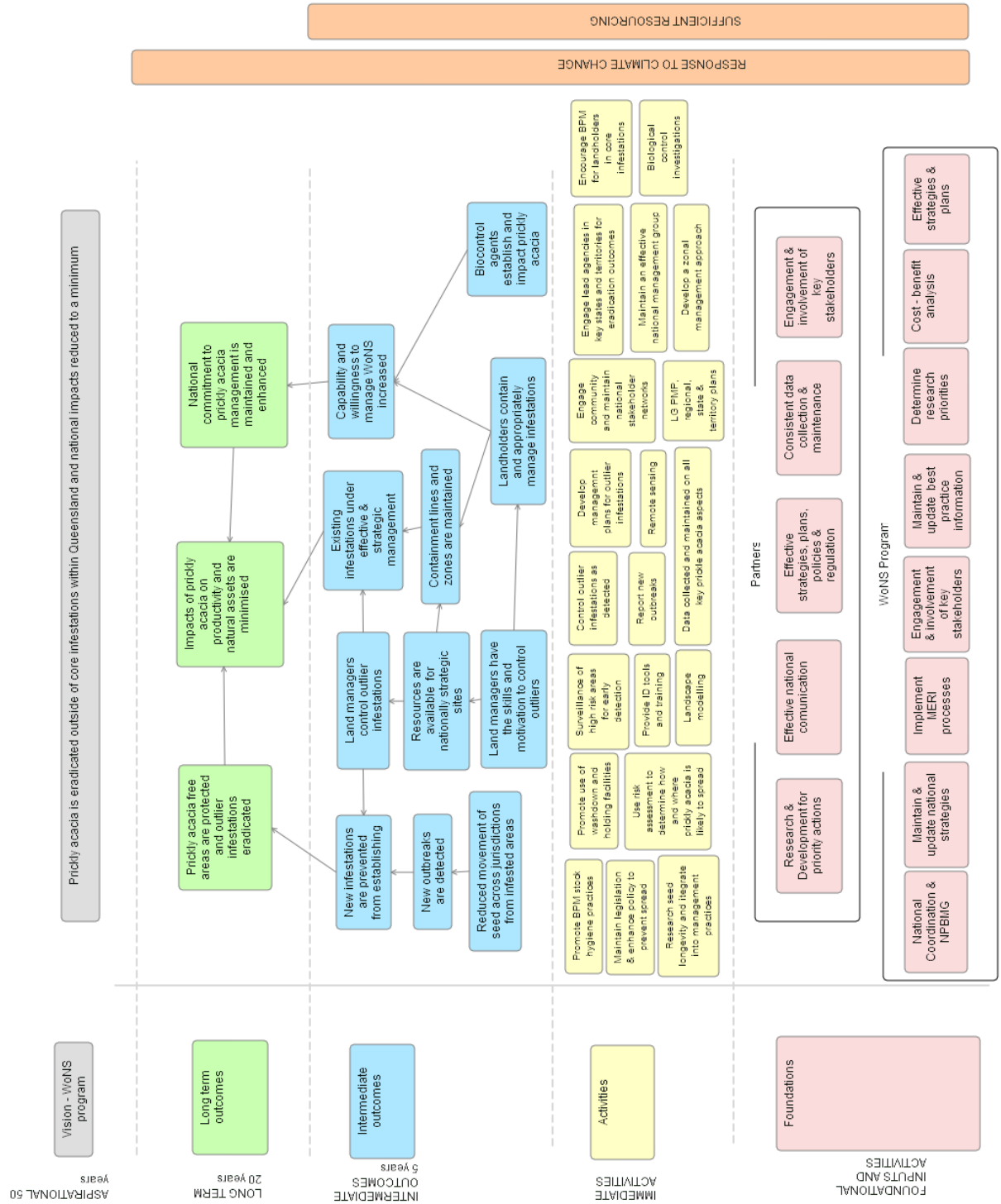
In 2010, jurisdictions nominated additional candidate WoNS species. These species were independently assessed, and the AWC endorsed 12 additional 'species' to be listed as WoNS. The AWC Chairman, Dr Jim Thompson, announced these additional plant species as WoNS on 20 April 2012. Additional information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

Appendix 2 National prickly acacia distribution and management zone map

The priority management actions for prickly acacia outlined in goals 1–3 of the strategic plan are reflected in the national weed spread and management map below.



Appendix 3 Program logic model for the prickly acacia strategic plan



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