WEEDS OF
NATIONAL SIGNIFICANCE

Cat's Claw Creeper

(*Dolichandra unguis-cati*)

Strategic Plan
2012 to 2017

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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, their management committees and copies of the strategy.

This strategy was developed under the leadership of the National Madeira Vine and Cat's Claw Creeper Coordinator, Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry QLD, with full cooperation of all the States, Territories and Commonwealth of Australia.

Comments and constructive criticism are welcomed as an aid to improving the process and future revisions of this strategy.

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CONTENTS

EXECUTIVE SUMMARY 1

VISION / ASPIRATIONAL GOAL 2

1 THE CHALLENGE 2

2 INTRODUCTION 3

2.1 Principles underpinning the plan 3

2.2 The current situation 5

2.3 Strategic plan development 6

2.4 Relevance to other strategies and plans 6

3 STRATEGIC GOALS AND OBJECTIVES 7

GOAL 1: New infestations of cat's claw creeper are prevented from establishing 8

GOAL 2: Established infestations of cat's claw creeper are under strategic management 10

GOAL 3: Capability and willingness to manage cat's claw creeper is increased 11

4 STAKEHOLDER ROLES AND RESPONSIBILITIES 15

5 MONITORING EVALUATION REPORTING AND IMPROVEMENT 18

5.1 Targets and Measures 18

5.2 Program Logic Model 22

6 TECHNICAL BACKGROUND 23

6.1 Cat's claw creeper identification 23

6.2 Cat's claw creeper biology and ecology 24

6.3 Cat's claw creeper distribution and spread 25

6.4 Summary of impacts 27

6.5 Control options 28

6.5.1 Biological control 28

6.5.2 Physical control 29

6.5.3 Chemical control 29

6.6 Identified research gaps and priorities 31

6.7 Quarantine and legislation 33

7 APPENDICES 34

7.1 Weed control contacts 34

7.2 Other information sources 34

7.3 The WoNS Program and its phases 35

7.4 Glossary and Acronyms 36

7.5 References 37

EXECUTIVE SUMMARY

Cat's claw creeper (*Dolichandra unguis-cati*) is one of Australia's worst environmental weeds and in 2012 it was listed as a Weed of National Significance. It is one of a suite of weeds known as 'transformer' species because their invasion leads to major changes in ecosystem function.

Cat's claw creeper was introduced from Brazil and Argentina as a garden ornamental in the mid 1860s. It was first reported as naturalised in Queensland in the 1950s and in New South Wales in the mid 1960s. Currently, cat's claw creeper is widespread in coastal and sub-coastal areas of Queensland and New South Wales. Predictive modelling suggests it has the potential to extend its range significantly and may pose a threat to certain areas in all States and Territories.

Cat's claw creeper produces prolific numbers of winged seeds which are spread by wind and water; as well as large numbers of reproductive subterranean tubers that allow populations to persist during adverse conditions. It is a particular threat to remnant vine scrub, riparian and rainforest ecosystems as it can invade relatively intact environments. When growing under favourable conditions, it smothers and collapses native vegetation and forms dense above-ground mats that prevent growth and regeneration of understory vegetation.

This document provides a strategic framework to reduce the spread and impact of cat's claw creeper throughout Australia. Nationally coordinated implementation of this plan will ensure better protection of priority assets by providing tools and information, identifying management priorities, and fostering partnerships that lead to more strategic, collaborative management.

The strategic plan aspires to deliver the following Goals and Objectives:

Goal 1. New infestations of cat's claw creeper are prevented from establishing:

1. Invasion vectors, sources and pathways are identified and managed to prevent or reduce spread
2. Surveillance and response mechanisms are ensuring timely detection of infestations
3. Priority outlier infestations are contained or eradicated, and spread from core infestations is prevented

Goal 2. Existing infestations of cat's claw creeper are under strategic management:

1. Priority assets are benefitting from long term strategic weed control programs
2. Integrated weed management practices are improving natural resource condition

Goal 3. Capability and willingness to manage cat's claw creeper is increased

1. Infestations are mapped to national standards and to a level sufficient to inform decision making
2. Best practice management delivers efficient, effective and long-term control of cat's claw creeper
3. Capability and motivation to manage cat's claw creeper is enhanced by education and awareness
4. Research priorities are identified, promoted, addressed and informing management
5. Local to national planning incorporates strategic cat's claw creeper priorities
6. Appropriate policies, codes of practice, legislation and enforcement are supporting strategic management objectives
7. Stakeholders are committed to the implementation of the Strategic Plan
8. The National Strategic Plan is relevant and effective.

This plan complements the Australian Weeds Strategy. Both documents are aspirational and do not specifically address resource requirements. However, the plan fosters a shared approach, and identifies efficiencies and collaborative actions that will help ensure existing resources can be allocated to achieve improved, strategic management outcomes. The plan outlines measurable, targeted actions to allow progress towards the objectives over the next 5 years.

Vision / Aspirational Goal

The spread of cat's claw creeper is contained and Australia's valuable natural assets are protected from its impacts for the benefit of current and future generations.

1 THE CHALLENGE

Cat's claw creeper (*Dolichandra unguis-cati* – until recently classified as *Macfadyena unguis-cati*) is a vigorous, perennial vine native to central and South America, and the West Indies (Everett 1980; Howard 1989; Rafter et al. 2008a). In Australia it has been described as a 'transformer' species, because of its capacity to completely alter native plant communities. Cat's claw creeper can smother and kill mature trees, opening up the canopy for light-loving weeds (Sparks 1999). It also forms dense above-ground mats that prevent growth and seed germination of understory vegetation (Dhileepan et al. 2010).

Populations of cat's claw creeper are concentrated in southeast Queensland and north-east New South Wales, where they threaten a number of endangered ecological communities and pose a significant risk to biodiversity in riparian and dry rainforest communities (Csurhes & Edwards 1998; Batianoff & Butler 2003). Its east coast distribution extends from Cooktown to Sydney (Rafter et al. 2008b) and west along riparian systems. There are also isolated records from Victoria and the Northern Territory (Downey & Turnbull 2007) (Figure 1). Potential distribution mapping for this species is variable (see section 6.3) but suggests it could affect all States and Territories.

Canopy-dominant weeds (such as cat's claw creeper) are considered among the most serious environmental weeds because of their capacity to cause significant structural changes in Australian ecosystems (Swarbrick 1991). Based on an assessment of invasiveness and impact, cat's claw creeper was ranked 4th out of1060 naturalised south-east Queensland plant species (Batianoff & Butler 2002); and 11th out of 340 weeds in New South Wales based on impacts to biodiversity (Downey et al. 2010). It has also been included in the NSW exotic vines and scramblers key threatening process listing (NSW Environment and Heritage 2006).

Management of cat's claw creeper is challenging. It seeds prolifically and is spread by wind, water and people. Once established, it is difficult to control because of persistent subterranean tubers and the difficulties of managing a climbing vine among complex and sensitive natural environments that can include a range of native vine species. Public awareness is low and urban plantings provide an ongoing seed source.

Despite the barriers, there are good opportunities for strategic management. There are numerous community and local government groups working to control the spread and impact of this weed and significant industry interest where it threatens important forestry and water catchment areas.

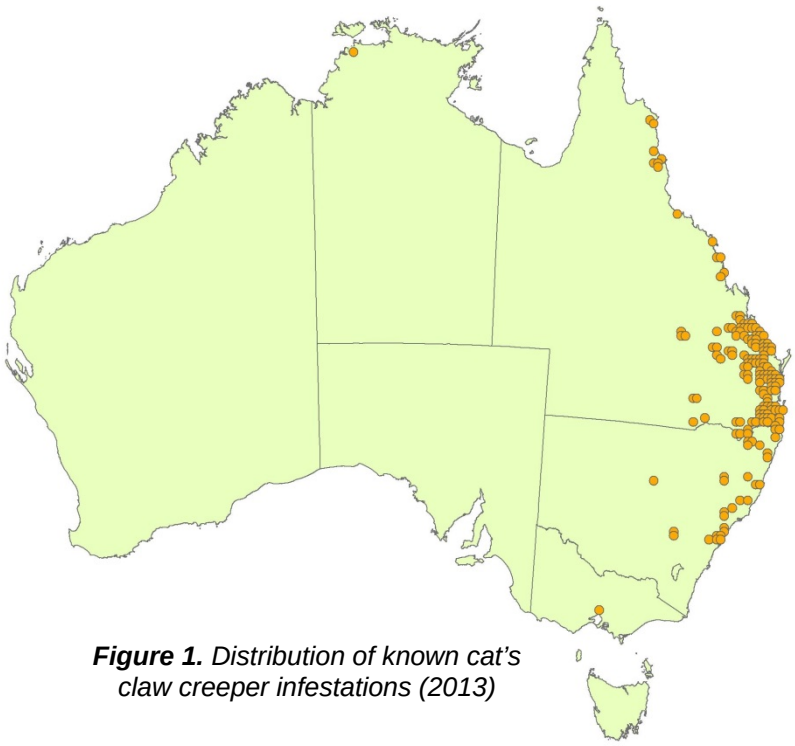


Figure 1. *Distribution of known cat's claw creeper infestations (2013)*

2 INTRODUCTION

This strategic plan is specific to cat's claw creeper; however, many of the actions and management needs are common to a range of invasive vines and scramblers. These species have similar impacts, invasion dynamics and research needs and there are efficiencies to be gained through a collaborative approach to strategic management. Consequently, the strategic plans for Madeira vine (*Anredera cordifolia*) and the *Asparagus* spp., which were also listed as WoNS in 2012, were developed in conjunction to achieve synergies across common actions. National coordination of these WoNS is expected to provide broader benefits for the management of other invasive vines and scramblers.

2.1 Principles underpinning the plan

This plan provides an overarching framework for the management of cat's claw creeper in Australia. Although it is considered to be an 'aspirational' strategy, all objectives and actions have been carefully vetted to ensure they are both reasonable and achievable given the five-year timeframe. However, this is a collaborative plan and the active involvement of all stakeholders, at all levels (national, state, regional and local) is necessary to ensure success.

While the plan is national in scale, regional benefits are expected through a range of outcomes including increased community awareness and knowledge, spread prevention or the protection of priority assets that are valuable to the national and local community. The fine detail of local and regional cat's claw creeper management cannot be captured here but this should not preclude or dissuade groups from planning and undertaking management actions at a more local scale for regional benefit.

In addition, this plan recognises that cat's claw creeper management alone will rarely, if ever, result in ecosystem recovery and it is important that site management plans are designed and delivered in an holistic manner, with the emphasis on site recovery rather than weed removal alone.

The WoNS Program

The Weeds of National Significance (WoNS) Strategic Plans provide a framework for the coordinated management of the 32 Weeds of National Significance. These plans represent the shared vision of all States/Territories and the Australian Government and form a critical component of the national weed management effort.

The WoNS program establishes national priorities and facilitates action where there is a significant national or cross-jurisdictional benefit to be gained. These 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.

The WoNS Strategic Plans are based on the recognition and acceptance of seven principles outlined in the Australian Weeds Strategy (Natural Resource Management Ministerial Council 2006):

1. 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.

2. Combating weed problems is a shared responsibility that requires all parties to have a clear understanding of their roles.

3. Good science underpins the effective development, monitoring and review of weed management strategies.

4. Prioritisation of and investment in weed management must be informed by a risk management approach.

5. Prevention and early intervention are the most cost-effective techniques for managing weeds.

6. Weed management requires coordination among all levels of government in partnership with industry, land and water managers and the community regardless of tenure.

7. Building capacity across government, industry, land and water managers and the community is fundamental to effective weed management.

In addition to the AWS, WoNS strategic plans are aligned to the 2012 Intergovernmental Agreement on Biosecurity (IGAB; COAG 2012), which outlines national invasive species management objectives. IGAB aims to enhance Australia's biosecurity system by fostering a collaborative approach to minimise the impact of pests, including 'a national management framework to ensure that nationally significant pests and diseases established in Australia are contained, suppressed or otherwise managed.' WoNS can contribute to this aim by facilitating coordinated, strategic management of nationally significant weeds.

IGAB principles highlight the importance of managing invasive species across the biosecurity continuum. The 'One Biosecurity' report (Beale et al. 2008) also recognises that weeds and other invasive species are most effectively managed in a collaborative manner across this continuum. This includes a 'spatial continuum' including pre-border, border and post-border work, as well as a 'management continuum' that spans prevention, eradication, containment and asset protection, depending on the scale of weed invasion. Figure 2 demonstrates appropriate strategic management approaches for weeds across this continuum.

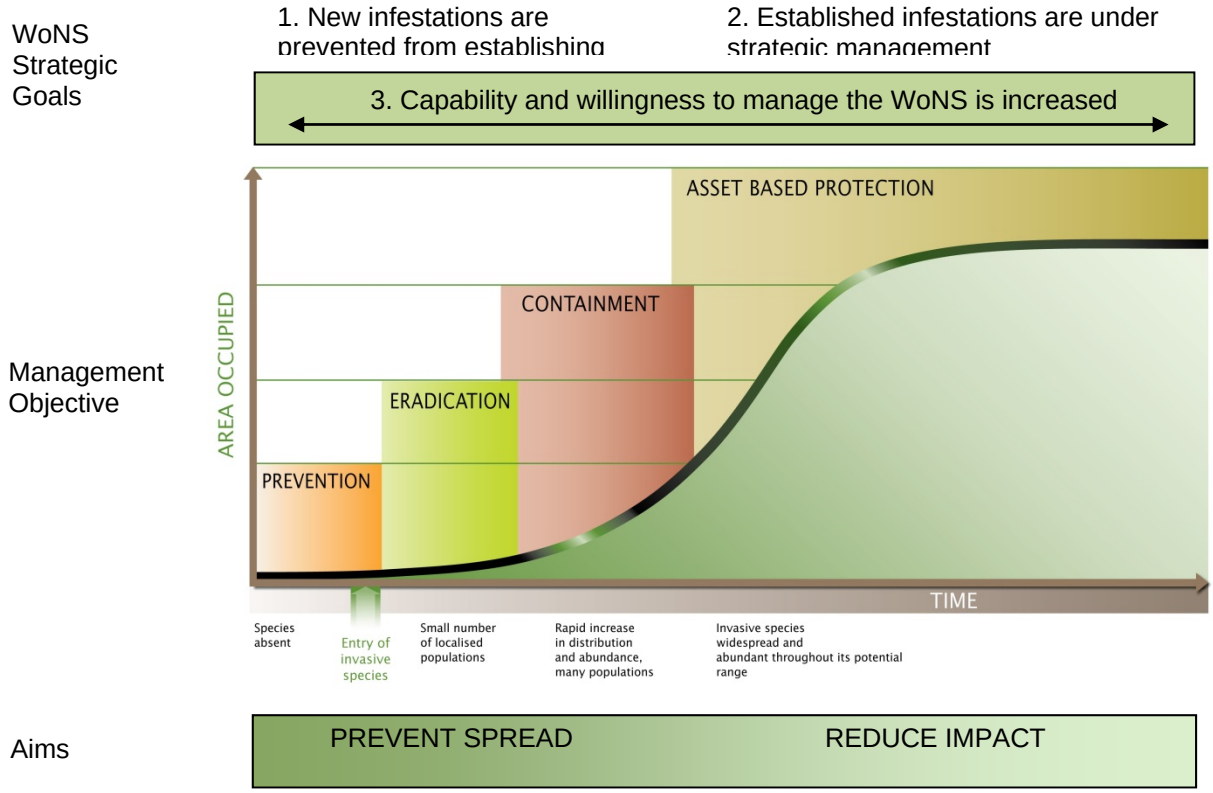


Figure 2. *Stages of weed invasion with corresponding goals, management objectives and actions at each stage. Modified from Hobbs and Humphries (1995) and Department of Primary Industries (2010).*

In most instances complete control (or eradication) of widespread weeds is unachievable. However, well researched, strategic and coordinated management can reduce current and potential impacts and provide a good return on investment. This includes spread prevention practices and eradication of outliers to protect environments where the weed is absent, establishment and defence of containment areas to halt or reduce the rate of spread, and the identification and protection of key environmental, social and economic assets in areas where the weeds are widespread. Underpinning all of this is the need for strong education, extension, capacity building and support mechanisms to ensure on-ground outcomes are achieved.

2.2 The current situation

Cat's claw creeper was introduced to Australia as a garden plant, particularly for screening trellises and walls (Batianoff & Butler 2003). The first record was in 1865 in a Melbourne nursery catalogue (Downey & Turnbull 2007) and the first naturalisations were recorded in south-east Queensland in the 1950s (Batianoff & Butler 2002) and north-east New South Wales in 1966 (Stockard 1991).

Today cat's claw creeper is prevalent in tropical and subtropical regions of Queensland and New South Wales where it has escaped from backyards into a range of natural ecosystems. Its distribution in other countries suggests that drier and cooler regions may also be at risk and management programs to protect Cape York, Victoria, Western Australia and the Northern Territory from invasion may play a critical role.

Currently cat's claw creeper is declared in Queensland and New South Wales and is prohibited entry to Western Australia (see section 6.7). In addition, the Invasion and Establishment of Exotic Vines and Scramblers has been listed as a key threatening process (NSW Environment and Heritage 2006) under the NSW *Threatened Species Conservation Act 1995*, with cat's claw creeper considered a species of special concern. Cat's claw creeper has also been included in the New South Wales Biodiversity Priorities for Widespread Weeds Statewide Framework (NSW DPI and OEH 2011).

Although declaration restricts trade and distribution, there are few requirements for active management. Some Local Governments are investing in more intensive management where the weed is considered to be new and emerging but there is currently no consistency across jurisdictions, with the result that local efforts toward containment or exclusion may be undermined. Consequently, there is significant room for

improvement through the identification (and where possible) legislative support of containment zones and the management of high-priority outliers.

Another key barrier to effective management is poor community awareness and/or commitment to the management of this weed. Cat's claw creeper is common in many urban and peri-urban areas, where it can cause considerable structural damage as the tendrils and aerial roots are capable of lifting roof tiles or cladding and its weight can crack walls (Downey & Turnbull 2007). Although it is sometimes considered a pest in backyard situations, community complacency is high and management only occurs when there is a personal impact i.e. when plants are mature and after several years of seed production. Communication and extension programs associated with the delivery of this plan will be challenged by the large number of stakeholders that need to be engaged and the fact that cat's claw creeper causes its greatest impacts in environmental systems away from public view.

Cat's claw creeper is no longer commonly sold by horticultural groups in Australia and the nursery industry may be an important ally in the delivery of educational information and programs such as the Grow Me Instead initiative. Replacement programs like these have benefits for both the industry and the environment. Other key stakeholders that need to be engaged are the Natural Resource Management Groups, State and Local Governments which have roles in education and the coordination of on-ground management programs and Biosecurity or Weed Authorities that are responsible for weed management legislation and the development of environmental management frameworks (see section 4 Stakeholder Roles and Responsibilities for further information).

Finally, although cat's claw creeper has been recognised as a weed in Australia since the 1960s, there are still significant gaps in our knowledge of the plant's biology and ecology and factors that could affect or improve management outcomes. There is some disagreement over the best approach to managing this vine and considering the sensitivity of the ecosystems it invades, research into alternate herbicides and the comparative costs/benefits with regard to ecosystem impact and recovery is warranted. There is also considerable scope for the development of restoration guidelines and integrated management tools that are applicable to the management of other weedy vines or scramblers and which take into account the natural successional processes of commonly invaded systems (also see section 6.6 Identified research gaps and priorities).

2.3 Strategic plan development

This document was prepared by the National Madeira Vine and Cat's Claw Creeper Coordinator. Its content is based on current literature, discussions with operations, scientific and policy staff from government agencies, representatives of other research groups, NRM organisations, community groups and individuals involved in the management of cat's claw creeper and other invasive vine and scrambler species.

Significant effort was made to contact stakeholders from across the country to ensure that the plan provides an accurate reflection of the requirements (and limitations) of land managers and administrators in all jurisdictions. More than 20 WoNS stakeholder meetings were held and Madeira vine and cat's claw strategic priorities were collected from all States and Territories where the vines grow. A feedback form was emailed to groups and individuals that the Coordinator was unable to meet with directly.

The Plan was submitted to the Australian Weeds Committee for comment by all jurisdictions in July 2012 and further public comment was sought via a 30-day public consultation period in September / October 2012. The final version will be submitted to the Standing Council on Primary Industries for endorsement in 2013.

2.4 Relevance to other strategies and plans

The Australian Weeds Strategy (AWS) provides national direction on weed management. WoNS are a significant component of the AWS and objectives and actions in the Cat's Claw Creeper Strategic Plan are aligned with AWS objectives. While this plan directs national action for one species, the objectives are common to all WoNS.

Other complementary linkages can be found in a range of existing resource management initiatives at all jurisdictional levels (Table 1). Successful implementation of this plan relies on alignment and support of actions in national to local level strategies and plans. As strategies and plans are developed or reviewed, relevant actions from this and other WoNS Strategic Plans should be considered, and where possible, incorporated.

Table 1: Policy and strategy linkages

Scale	Natural Resource Management	Weed Management
National	National Strategy for the Conservation of Australia's Biological Diversity 2010 Native Vegetation Policy 2001 National Strategy for Ecologically Sustainable Development 1992	Intergovernmental Agreement on Biosecurity (IGAB) Australian Weeds Strategy 2007 Weeds of National Significance Strategic Plans
State	State Biodiversity and Natural Resource Management Strategies Forest policies National Parks management plans	State agency pest management and invasive species plans and strategies Biosecurity strategies National Parks weed management plans
Regional or Catchment	Regional NRM and Catchment Management Plans Conservation corridor plans	Regional pest management strategies Regional weed management plans
Local	Landcare plans Sub-catchment and riparian vegetation management plans Bushcare and Coastcare plans	Local Government Pest Management Plans Local and community weed control plans
Property	Property Management Plans	Property Pest Management Plans

3 STRATEGIC GOALS AND OBJECTIVES

Uniform strategic goals have been established for all WoNS and include three primary outcomes: (1) prevent new infestations, (2) manage and reduce the impacts of existing infestations, and (3) engage the community to maximize assistance.

The objectives and strategic actions in this plan are generalized as it was considered premature to identify specific strategic management targets, research objectives and extension products. There is scope for refinement as our knowledge of this weed, its impacts and community-needs develop. To provide detail, a number of supporting documents are suggested:

1. A five year National Invasive Vines and Scramblers Research Framework, which outlines research needs and priorities, and provides an implementation framework for research

2. A National Invasive Vines and Scramblers Communications Plan (aligned to the WoNS Communications Plan)

3. Annual national priority management maps and spreadsheets (by NRM region), and

4. An annual monitoring, evaluation, reporting and improvement (MERI) plan.

Collaborative decision-making by responsible partners

The aspirational objectives in this plan are supported by strategic actions that identify how the objectives can be achieved. In most cases, further work will be needed to refine the actions and/or develop the best approach to implementation. This work should be done in a consultative manner with all responsible partners.

While national coordination can assist with strategic direction and collaboration, partners will need to ensure actions are relevant to them and determine how to implement those actions at an appropriate scale (e.g. local, regional, catchment, jurisdictional). Thus, it is important that the correct partners be identified and included in the decision making process and, where appropriate, that those partners identify an appropriate level of participation for implementing actions.

It is suggested that decision-making processes regarding national priority actions should be led by a national management group, in collaboration with responsible partners and other relevant stakeholders. Many of these decisions will rely on further collation of distribution data, risk assessment and due consideration of relevant legislation and policy. Final endorsement of priority actions will occur via the Australian Weeds Committee.

GOAL 1: New infestations of cat's claw creeper are prevented from establishing

Prevention and early detection are the most cost effective forms of weed management and this goal includes a number of actions to slow, or where possible, stop the spread of cat's claw creeper. This includes identifying and managing pathways of spread, determining risk of future invasion and implementing targeted hygiene and surveillance programs. Goal 1 includes actions to address new incursions and outlier infestations, as well as preventing spread from core infestations, through eradication or containment programs.

Cat's claw creeper spreads via wind, water and human-assisted dispersal of its seeds and tubers. Improved knowledge of its reproduction and dispersal is needed to support strategic management and support compliance activity associated with weed-spread legislation and protocols i.e. linkages to Goal 3.

Table 2. Goal 1 objectives and strategic actions

Objectives	Strategic Actions	Priority[1]	Responsible Partners[2]
1.1 Invasion vectors, sources and pathways are identified and managed to prevent or reduce spread	1.1.1 Undertake analysis of invasion vectors and pathways using available tools to inform and guide surveillance activities	2	National coordinator/s, State/Territory agencies, Research groups
	1.1.2 Improve catchment (or sub-catchment) management planning for better spread prevention	1	National coordinator/s, NRM groups, Industry groups, Local gov., Community members
	1.1.3 Ensure cat's claw creeper is incorporate into hygiene protocols and other spread prevention guidelines (develop protocols where necessary)	3	
1.2 Surveillance and response mechanisms are ensuring timely detection of infestations:	1.2.1 Utilise and/or refine predictive models of cat's claw creeper spread examining flood and wind impacts and under current and climate change conditions	2	National coordinator/s, National mgt group, State/Territory agencies, Research groups

[1] Priority

1 = critical to the success of the strategic plan

2 = highly beneficial and will contribute significantly to success of the strategy

3 = desirable, still beneficial, but not critical to success of the strategy

[2] Responsible partners (also see section 4)

NIVaST = National Invasive Vines and Scramblers Taskforce (includes Madeira Vine Strategic Plan Committee)

NRM Groups = Natural Resource Management Groups (incl. Catchment Management Authorities)

Biosecurity / Weed authorities = statutory agencies/groups responsible for weed management. These vary across jurisdictions (e.g. at state gov level in QLD, local gov. level in NSW and regional NRM level in SA, etc.)

	1.2.2 Identify priority regions/landscapes (including niche environments in areas with a lower risk of invasion) to inform surveillance activities – link to 1.1.1	1	National coordinator/s, National mgt group, State/Territory agencies, Research groups
	1.2.3 Establish and/or promote early detection and reporting mechanisms outside containment zones	1	National coordinator/s, National mgt group, State/Territory agencies, Local gov., Conservation and NRM groups
	1.2.4 Develop and/or make use of enhanced technology for early detection e.g. aerial, satellite or lidar imagery, integration of GPS, smart phone capability and mapping; as well as citizen science initiatives to assist with surveillance and early detection	2	National coordinator/s, State/Territory agencies, Research groups
1.3 Priority outlier infestations are contained or eradicated and spread from core infestations is minimised	1.3.1 Identify, delimit and prioritise outlying infestations based on risk of further spread, potential impact and feasibility of control	1	National coordinator/s, National mgt group, State/Territory agencies
	1.3.2 Develop and/or coordinate cooperative programs to defend containment zones	1	National coordinator/s, National mgt group, Biosecurity/Weed authorities, Local gov., Conservation and NRM groups, Land managers.
	1.3.3 Develop and/or adopt standardised processes for determining feasibility of eradication or containment, and for prioritisation of sites for control, at appropriate scales	2	National mgt group, National coordinator/s, research organisations
	1.3.4 Undertake or coordinate priority management (and eradication where feasible) of new and outlying infestations	1	State/Territory agencies, Biosecurity/Weed Authorities, Local gov., Conservation and NRM groups, Land managers

GOAL 2: Existing infestations of cat's claw creeper are under strategic management

Cat's claw creeper causes significant impacts within its core distribution. Unfortunately, broad scale control is not feasible or practical, due to the highly resilient nature of the population and its sheer size. A more realistic objective is to apply existing resources in a strategic manner to reduce impacts, increase the efficiencies of management and protect priority assets.

Currently there is limited information on the holistic management of vine species and the ecosystems they invade. The achievement of this goal will require support for research and the development of more cost-effective management approaches; as well as community capacity-building, i.e. linkages to Goal 3.

Table 3. Goal 2 objectives and strategic actions

Objectives	Strategic Actions	Priority	Responsible Partners
2.1 Priority assets are benefiting from long-term strategic weed control programs	2.1.1 Identify and document priority assets (environmental, economic and social) and high priority sites at risk from cat's claw creeper to guide investment within core infestations	1	All stakeholders
	2.1.2 Collate information on priority assets, assess level of risk posed by cat's claw creeper and identify national management priorities	1	National coordinator/s, National mgt group, State/Territory agencies
	2.1.3 Engage and support stakeholders to develop and implement management plans to protect high priority assets from cat's claw creeper	1	National coordinator/s, State/Territory agencies, Industry, Local gov., Conservation and NRM groups
2.2 Integrated weed management practices are improving natural resource condition	2.2.1 Build the capability of land managers to implement landscape restoration in areas impacted by vines and scramblers, including through the provision of best practice tools and advice	1	National coordinator/s, State/Territory agencies, Local gov., Conservation and NRM groups
	2.2.2 Establish baseline data and undertake or coordinate monitoring activities to determine the long-term effectiveness of containment, outlier management and asset protection programs	1	State/Territory agencies, Local gov., Conservation and NRM groups, Land managers
	2.2.3 Support, coordinate and/or implement collaborative, tenure-free management of cat's claw creeper and associated weeds in line with agreed national strategic priorities	1	National coordinator/s, National mgt group, State/Territory agencies, Research groups
	2.2.4 Support the adoption of best practice and integrated management of cat's claw creeper, including rearing and distribution of biological control agents, (sub) catchment planning, monitoring and restoration	1	All land managers

GOAL 3: Capability and willingness to manage cat's claw creeper is increased

Cat's claw creeper is a serious environmental weed which continues to spread from urban areas. However, within the broader community there is very little awareness of its impacts or motivation to actively participate in its control. Consequently, significant effort needs to be invested in building capacity and commitment to reduce the impacts of this weed.

The actions identified below provide the background information and support systems required to deliver the Strategic Plan. This includes the development and maintenance of adequate mapping resources; investment in priority research; development of strategic planning tools and more effective management approaches; development and delivery of best practice extension information and communication plans; and effective legislative, policy and governance frameworks.

Table 4. Goal 3 objectives and strategic actions

Objectives	Strategic Actions	Priority	Responsible Partners
3.1 Infestations are mapped to national standards and to a level that is sufficient to inform decision making	3.1.1 Establish and/or maintain centralised state and national databases for storing mapping information	1	Australian gov., State/Territory agencies
	3.1.2 Collate and contribute mapping information to centralised state and national spatial databases	1	National coordinator/s, National mgt group, State/Territory agencies, Local gov., Conservation and NRM groups, Land managers
	3.1.3 Identify and record / map national strategic management zones and priority assets	1	National coordinator/s, State/Territory agencies
	3.1.4 Strengthen existing distribution data sets - priority placed on the delimitation of outliers, definition of containment lines and mapping of cat's claw creeper infestations which threaten priority assets	1	State/Territory agencies, Local gov., Conservation and NRM groups, Land managers
	3.1.5 Support development and promote use of national weed information and mapping systems. Provide training where necessary	2	National coordinator/s, National mgt group, all stakeholders
3.2 Best practice management delivers efficient, effective and long-term control of cat's claw creeper *(Actions included here are specific to the development of best practice resources – dissemination and training is included under 3.3)*	3.2.1 Collate and refine information on existing cat's claw creeper control options	1	National coordinator/s, National mgt group, State/Territory agencies, Industry bodies, Research groups
	3.2.2 Facilitate and/or contribute to the development of best practice extension information relevant to invasive vine weeds (including a best practice management resources)	1	National coordinator/s, National mgt group, State/Territory agencies, Australian gov.
	3.2.3 Maintain/support development of off-label permits and/or registrations for effective herbicides as identified through best practice	1	State agencies, Industry bodies

	trials		
	3.2.4 Support the establishment of rearing and release facilities for cat's claw creeper biological control agents	1	National coordinator/s, State agencies, Industry bodies, Community groups
	3.2.5 Facilitate and/or contribute to development of support tools including: ~ restoration guidelines for riparian systems affected by invasive vines and scramblers ~ biological control rearing and release information ~ monitoring and reporting tools to assess the success of a control program ~ surveillance and containment program guidelines ~ site management protocols and management plan templates	2	National coordinator/s, National mgt group, State/Territory agencies, Industry bodies, Research groups
	3.2.6 Assess adoption of best practice tools and techniques and identify barriers to uptake	2	National mgt group, research organisations, NRM groups, State/Territory agencies
	3.2.7 Identify and promote novel control techniques which have proven effectiveness	3	National coordinator/s, National mgt group, State/Territory agencies, Industry bodies, Local gov., Conservation and NRM groups
3.3 Capability and motivation to manage cat's claw creeper is enhanced by education and awareness	3.3.1 Develop and/or implement a National Vines and Scramblers Communications Plan (aligned with the WoNS Communications Plan)	1	National coordinator/s, State/Territory agencies, Local gov., Industry groups, Conservation and NRM sector
	3.3.2 Facilitate development and delivery of education and awareness resources for cat's claw creeper including: ~ information on the impacts of cat's claw creeper ~ identification tools to increase capacity for early detection (priority – areas outside the defined containment zones & delimitation of full extent of hairy cat's claw creeper range)	1	National coordinator/s, National mgt group, State/Territory agencies, Local govt, NRM groups
	3.3.3 Build community capacity through delivery of best practice management information and training	1	National coordinator/s, State/Territory agencies, local gov., Conservation and NRM groups

	3.3.4 Annually update and publish the Priority Management Action spreadsheet identifying national strategic priorities by NRM region	1	National coordinator/s, National mgt group
	3.3.5 Identify and promote community use of existing support systems e.g. Weed Spotters and spatial data/mapping systems – link to 3.1.2	2	National coordinator/s, State/Territory agencies
	3.3.6 Encourage better management of urban cat's claw creeper plantings through the promotion of non-weedy replacements (Grow Me Instead campaigns) and improved garden waste disposal protocols.	2	National mgt group, Nursery Industry, State/Territory agencies, Local gov., gardening interest groups
	3.3.7 Provide advice to community groups on strategic alignment of funding applications	3	National coordinator/s, NRM groups
	3.3.8 Maintain cat's claw creeper management networks for communication of updated information and strategy developments	2	National coordinator/s, National mgt group
3.4 Research priorities for cat's claw creeper are identified, promoted, addressed and outcomes are informing management *(Also see section 6.6)*	3.4.1 Identify knowledge gaps and opportunities for improved weed management	1	National coordinator/s, National mgt group, State/Territory agencies, Research groups, weed managers
	3.4.2 Develop, prioritise and maintain a 5-year National Invasive Vines and Scramblers Research Framework	1	
	3.4.3 Develop and maintain partnerships with research organisations (including international groups) and promote research needs	2	National coordinator/s, National mgt group, State/Territory agencies, Research groups
	3.4.4 Coordinate and/or undertake research to address critical information gaps and management barriers for invasive vines and scramblers	1	
	3.4.5 Facilitate a two-way flow of information on vine management and research needs/solutions between researchers and land managers	1	National coordinator/s, National mgt group, Researchers, Weed managers
3.5 Local to national planning incorporates strategic cat's claw creeper priorities	3.5.1 Identify local to national plans relevant to vine/scrambler management	1	National mgt group, National coordinator/s
	3.5.2 Integrate cat's claw creeper strategic priorities into State, regional, catchment and local level management plans; and/or encourage other stakeholders to do so during weed mgt planning processes	1	National coordinator/s, National mgt group, Australian gov., State/Territory agencies, Biosecurity/Weed authorities; Local gov., Conservation and NRM groups
3.6 Appropriate policies, codes of practice, legislation and enforcement are supporting	3.6.1 Enforce national importation restrictions on *Dolichandra unguis-cati*	1	Australian gov. (DAFF Biosecurity)
	3.6.2 Introduce and/or enforce appropriate state and territory legislation with a minimum requirement to ban the sale and distribution of	1	Biosecurity/Weed authorities

strategic management objectives	*Dolichandra unguis-cati*		
	3.6.3 Provide legislative and/or policy support for agreed containment and asset protection objectives	2	Biosecurity/Weed authorities
	3.6.4 Encourage and promote nursery, garden and landscaping industry codes of practice that support cat's claw creeper / WoNS objectives	3	National coordinator/s, National mgt group, Industry groups
3.7 Stakeholders are committed to effective delivery of the Strategic Plan	3.7.1 Establish a national committee to provide advice and oversee implementation of the national plan	1	National coordinator/s, Host Agency (Qld DAFF)
	3.7.2 Communicate Cat's Claw Creeper National Strategic Plan (2012-17) goals, objectives and actions to all stakeholder groups and their members	1	National coordinator/s, National mgt group, State/Territory agencies, Local gov., Conservation and NRM groups
	3.7.3 Provide information and advice to encourage action to address priority management and surveillance activities	1	National coordinator/s, State/Territory agencies, Local gov., NRM groups
	3.7.4 Recognise and promote local weed management successes; and the groups and individuals that drive them	3	National coordinator/s, Weeds Societies, NRM groups, Landcare groups
3.8 The National Strategic Plan is relevant and effective	3.8.1 Develop and implement a Monitoring, Evaluation, Reporting and Improvement (MERI) strategy for the Cat's Claw Creeper National Strategic Plan (2012-17)	2	National coordinator/s, National mgt group
	3.8.2 Coordinate, monitor, review and implement the Strategic Plan annually	1	National coordinator/s, National mgt group, States & Territories (phase 3)
	3.8.3 Collate information (with contributions from all partners) and communicate progress and evaluation outcomes to the Australian Weeds Committee and other key stakeholders	1	National coordinator/s, National mgt group, States & Territories (phase 3)
	3.8.4 Undertake a comprehensive review of progress toward Strategic Plan objectives in 2017	2	Australian Weeds Committee
	3.8.5 Identify sources of funding and allocate resources to high priority management and research projects	1	All stakeholders

4 STAKEHOLDER ROLES AND RESPONSIBILITIES

The effective implementation of this plan requires the involvement of all landowners and managers affected by cat's claw creeper. Stakeholder responsibilities may vary between jurisdictions: some actions may be optional while others are prescribed by legislation. The successful achievement of strategic objectives relies on the development and maintenance of partnerships between community, industry and government, and recognition of the roles of each stakeholder. Suggested responsibilities to assist in achieving these are:

Australian Weeds Committee

- Provide a mechanism for identifying and resolving weed issues at a national level
- Provide advice to the National Biosecurity Committee on weeds issues
- Provide planning, coordination and monitoring of the implementation of the Australian Weeds Strategy
- Facilitate coordination between the Australian Government and State and Territory governments on weed management policy and programs
- Provide governance processes for the effective delivery of the WoNS initiative
- Oversee the implementation of the activities described in the WoNS strategies
- Promote the importance and benefits of the WoNS program to all levels of government

Australian Government

- Ensure quarantine controls to prevent importation (DAFF Biosecurity)
- Promote the status of cat's claw creeper as a WoNS, its impacts and the importance of management
- Undertake strategic cat's claw creeper control on all Australian government managed lands

State and territory agencies

- Maintain appropriate legislation and policies to achieve state and territory based objectives for managing cat's claw creeper e.g. national ban on sale
- Administer and enforce legislation where applicable
- Coordinate cat's claw creeper control and management at a jurisdictional level to complement the management and delivery of the Cat's Claw Creeper National Strategic Plan
- Undertake cat's claw creeper management on state lands in line with agreed national priorities
- Work with NRM groups, local governments, communities and other stakeholders to prevent and minimise cat's claw creeper impacts
- Identify strategic management areas and associated objectives
- Promote consistency with this Strategy in jurisdictional pest management plans
- Facilitate the inclusion of strategic cat's claw creeper management in pest management planning processes
- Contribute to priority weed research initiatives
- Source funding for strategic management programs and research
- Implement monitoring and reporting protocols in line with the MERI plan and provide relevant information to the Australian Weeds Committee as required
- Develop and implement communication and extension tools, where appropriate
- Undertake any necessary planning and mapping and contribute to national mapping initiatives

- Ensure, where appropriate, participation on the National Management Group or similar national WoNS taskforce
- Improve knowledge of the identification, impacts and best practice management of cat's claw creeper
- Identify cat's claw creeper and other weeds threatening public lands
- Implement weed hygiene and other best practice management to minimise spread of cat's claw creeper

National management group – National Invasive Vines and Scramblers Taskforce (NIVaST), including the Cat's Claw Creeper Strategic Plan Committee

- Ensure a diversity of community and agency views are represented and contribute to effective Strategic Plan implementation
- Provide guidance, direction and policy advice for cat's claw creeper management through the delivery of the Strategic Plan
- Monitor, evaluate, report and improve Strategic Plan implementation
- Assist in the development and implementation of programs and initiatives that support strategic actions
- Maintain and build partnerships with key stakeholders to improve strategic cat's claw creeper management
- Support and recognise achievements in cat's claw creeper management
- Identify funding sources and provide independent advice on development of projects that support WoNS strategic actions

Research institutions (e.g. CSIRO, Universities, government agencies)

- Undertake appropriate research to address priority national strategic requirements
- Identify research gaps and seek innovative solutions for the management of cat's claw creeper
- Seek new and on-going funding and support for research requirements

Local governments

- Incorporate Cat's Claw Creeper Strategic Plan objectives in relevant pest management plans and monitor implementation
- Administer and enforce legislation where applicable
- Undertake surveying and mapping particularly in relation to outlying cat's claw creeper infestations
- Establish local management policies to contribute to strategic control, containment and/or asset protection objectives
- Improve community awareness of impacts and identification; and promote early detection
- Strategically control cat's claw creeper on local government managed or owned land
- Facilitate the removal of urban plantings of cat's claw creeper in strategically important areas
- Source funding and/or contribute to strategic control programs

Natural resource management groups (catchment management authorities),

- Administer and enforce legislation where applicable (e.g. in South Australia)
- Source funding and/or contribute to strategic control programs
- Improve regional awareness of impacts and identification and promote early detection
- Contribute local and regional perspectives to cat's claw creeper management

- Contribute to the development, implementation and/or review of local and regional pest management plans
- Incorporate cat's claw creeper actions in relevant pest management plans and monitor implementation
- Promote and contribute to local and regional containment and/or management programs in partnership with relevant stakeholders
- Support and/or develop cat's claw creeper projects consistent with national priorities and seek funding to implement projects
- 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

Community, conservation and other interest groups

- Contribute local and regional perspectives to cat's claw creeper management, including community perspectives
- Contribute to the development, implementation and/or review of local and regional pest management plans
- Support and/or develop cat's claw creeper projects consistent with national priorities and seek funding to implement projects
- Participate in local and regional mapping initiatives and contribute to state, territory and national map production

Industry

- Promote and adopt best practice management of cat's claw creeper
- Contribute to research and development of management practices to support industry members
- Ensure awareness of sale and movement restrictions (this may differ between states) of cat's claw creeper within industry members
- Improve community awareness of impacts and identification; and promote early detection, hygiene protocols and discourage use of cat's claw creeper

Private land owners

- Manage and control cat's claw creeper on private lands in accordance with State/Territory or local government legislation and policy
- Improve knowledge of the identification, impacts and best practice impacts of cat's claw creeper
- Identify cat's claw creeper and other weeds threatening the property
- Undertake any necessary planning and mapping
- Implement best practice management
- Implement weed hygiene and other management practices to minimise spread of cat's claw creeper

5 MONITORING EVALUATION REPORTING AND IMPROVEMENT

This monitoring, evaluation, reporting and improvement (MERI) framework lists the **minimum** reporting information that should be collected for the life of the Strategic Plan – including during phase 3 delivery (see section 7.3). 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. Additional annual MERI plans should be developed to follow individual activities in more detail.

5.1 Targets and Measures

Table 5. MERI progress assessment

Strategic Plan Goals	Key Evaluation Questions	Data/Evidence Required	Consider
1. New infestations are prevented from establishing.	To what extent have new infestations been prevented from establishing?	<u>1.1 National distribution data</u> • 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/info stored? • Do they capture national priorities?
		<u>1.2 New infestations</u> • Number of new outlier infestations[1] recorded. • Percentage of known infestations actively controlled. [1] New infestations should be an outlier, outside existing cat's claw creeper distribution	• Are any new outlier infestations occurring in areas identified as a high priority in the national strategy / annual work plan? • How infestations were detected (passive or active surveillance, community reporting etc)? • Have high risk pathways been adequately identified? And threats minimised?
		<u>1.3 Eradication & containment programs</u> • Percentage of eradication and/or containment programs being maintained	• What percentage of the programs identified in the national strategy / annual work plan are being actively managed? • Is there a plan in place for ongoing management? • How is progress being monitored and reported to stakeholders? • Can include examples using case studies.

		1.4 Legislation • Has a need for legislative change been identified by stakeholders? • Have there been any legislation or policy changes for this species?	• 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?
		Overall progress rating	
2. Existing infestations are under strategic management.	To what extent is integrated weed management effectively managing core infestations?	2.1 Integrated Weed Management • How effective are IWM programs?	• Are existing tools providing adequate control of cat's claw creeper? • Have new advances/technologies been developed and are they incorporated into BPM information? • Are there barriers to adoption of best practice management? • Are research programs addressing any observed gaps (e.g. herbicide trials, biological control, restoration requirements post control)?
	To what extent are assets being protected through strategic management?	2.2 Asset protection • Have prioritisation processes been implemented in all jurisdictions to identify assets 'at risk' from cat's claw creeper? • Percentage of priority assets being protected (e.g. assessed against relevant Threat Abatement Plans)? • Percentage of state/regional invasive species plans that identify priority assets at risk from cat's claw creeper?	• Response should include status report on progress towards asset protection programs. • 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?
		Overall progress rating	
3. Greater capability and commitment to manage cat's	To what extent has the capability and commitment to manage cat's claw creeper	3.1 Community engagement & awareness • What is the status of best practice information? • Are partnerships being maintained to	• Is best practice information up-to-date and readily available? • Is this information and/or advice being targeted to priority regions?

claw creeper	increased?	ensure collaboration on cat's claw creeper projects? • Number and type of media activities.	• Is training being delivered to meet the needs of weed managers (including the community)? • Are networks/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 Commonwealth, jurisdictions, industry, etc
		3.3 Policy & Planning • Are the objectives of the strategy being integrated into Commonwealth/State/ regional plans, policies and programs? • Has cross border collaboration occurred?	• How are priorities being reflected in planning and policy approaches? E.g. weed risk assessment/management, 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 & awareness raising, research projects.
		Overall progress rating	
Continuous improvement	Are there any unexpected outcomes that have been identified through implementation of strategy?	4.1 Barriers • Have any other management issues or impediments been identified?	

How to score progress rating

1- Insufficient evidence to score

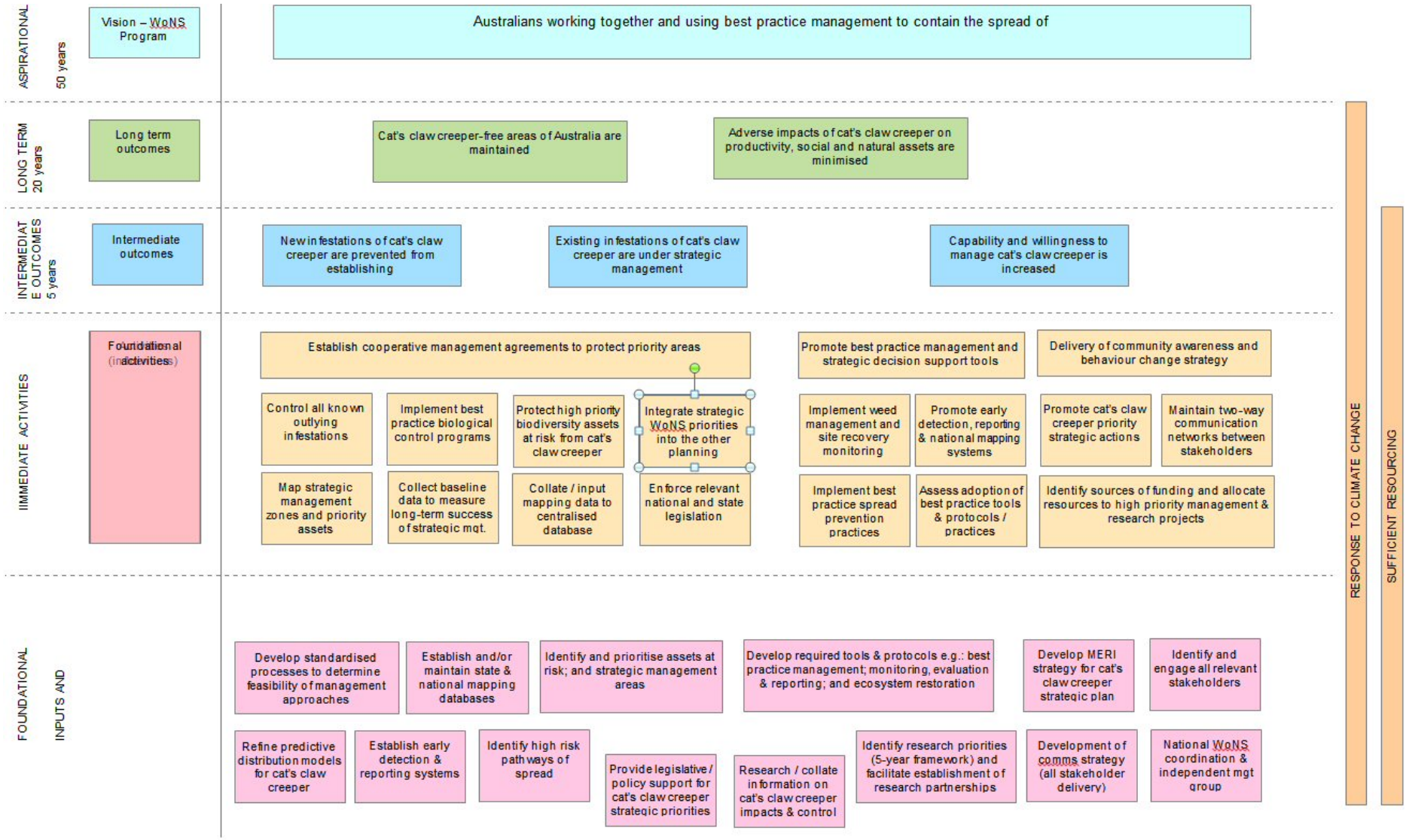
2- No progress against goal

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

Program Logic Model



6 Technical Background

6.1 Cat's claw creeper identification

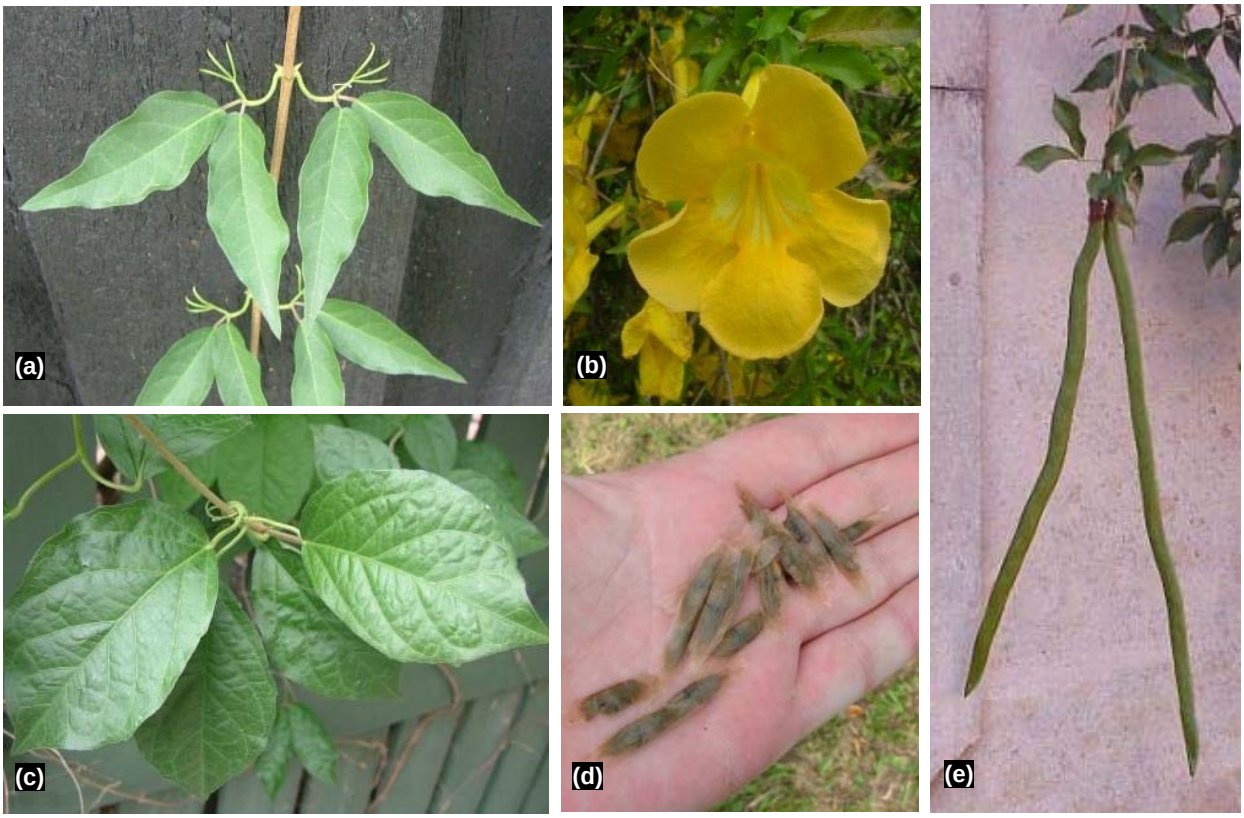


Figure 3. (a) Lance-shaped leaflets and cat's claw-like tendrils of the standard cat's claw creeper; **(b)** Large yellow trumpet flowers (standard form); **(c)** Larger, broader leaflets of hairy cat's claw creeper;

Cat's claw creeper is a perennial woody vine with numerous stems, generally up to 15 cm thick. The leaves are opposite and compound, with a 1–2 cm long stalk (petiole). Each leaf has a basal pair of lance-shaped leaflets 2–7 cm long x 1–3 cm wide (Figure 3(a)) (Downey & Turnbull 2007). Hairy cat's claw creeper (a less common variety found in south east Queensland) has larger and broader leaflets (Figure 3(c)), often with toothed margins and a fine covering of hair on the stems, leaf stalks and leaf undersides (Technigro 2010).

The plant's name refers to a modification to the third leaflet, forming a three-pronged tendril with stiff tips that form hooks (visible in Figure 3(a)). Tendrils are 10–35 mm long and aid in climbing.

The standard form has large yellow trumpet flowers (Figure 3(b)) (Downey & Turnbull 2007), while the flowers of the hairy form are usually pale orange to pale orange-yellow (Technigro 2010). The flowers of both varieties are borne in the leaf axils in clusters or as single flowers. They are 4–8 cm long with lobes to 2 cm long (Downey & Turnbull 2007).

Cat's claw creeper fruit develops as a long narrow capsule, 30-60 cm long and 8–12 mm wide in the standard form (Figure 3(e)) and 60-100 cm long in the hairy variety. Capsules contain numerous two-winged seeds that are 2–4 cm long (Figure 3(d)) (Downey & Turnbull 2007).

Cat's claw creeper has an extensive root system which produces a tuber at approximately 50 cm intervals along the lateral roots. Each tuber can be up to 40 cm long (although the majority are 0.5-10 cm (Osunkoya et al. 2009)) and develops climbing runners that either colonise the surrounding vegetation or grow as ground cover (McClymont 1996). Entwined roots and tubers form a dense underground mat in mature infestations.

Under low-light conditions, cat's claw creeper vines can be difficult to differentiate from native species however the vine stems tend to 'hug' the host tree or fence. When they are mature and woody, the bark

becomes fissured and flaky and tends to be covered in adventitious roots (S. Lymburner *pers. comm 2012*).

Several other introduced plants from the Bignoniaceae family have become naturalised in eastern Australia. The three vine species which most closely resemble cat's claw creeper are:

- Flame vine, orange trumpet or golden shower (*Pyrostegia venusta*). This vine has ribbed branchlets, three-pronged tendrils, and orange flowers.

- White trumpet vine or monkey's comb (*Pithecoctenium cynanchoides* and *P. crucigerum*). This vine has ribbed branches, tendrils (lacking the three prongs), heart-shaped leaflets and yellow to creamy white flowers that are paler inside.

Native vines are common in the habitats invaded by cat's claw creeper but do not have the distinctive three-pronged tendrils. Native species that can be confused with cat's claw creeper, particularly in the seedling stage include Australian Teak (*Flindersia australis*), Pastel Flower (*Pseuderanthemum variabile*), Monkey rope (*Parsonsia straminea*) and the endangered Isoglossa (*Isoglossa eranthemoides*).

6.2 Cat's claw creeper biology and ecology

Cat's claw creeper, a member of the Bignoniaceae family, is native to Central and South America and the West Indies where it has a distribution that covers several climatic zones including wet tropics, temperate and tropical savannah (Rafter et al. 2008b). Consequently it has the potential to invade a range of environments and regions of Australia. Little is known about the weed's ecology in either its native or introduced ranges (Vivian-Smith & Panetta 2004) and it is likely that some biological and ecological research may be needed to improve our understanding of which environments are at risk and to support the development of best practice management guidelines.

Cat's claw creeper seedlings have the capacity to tolerate competitive stresses in relation to light, moisture and nutrients and its climbing woody stems (lianas) cling to tree trunks, enabling it to grow into the forest canopy. Young climbing stems produce aerial roots that can attach strongly to bark. Plants grow best in open, sunny situations, but as young plants are tolerant of shade, the vine is able to invade intact environments including rainforests.

In recent years, a second variety of cat's claw creeper, known as 'long pod cat's claw creeper', 'hairy cat's claw creeper' or 'bat's claw creeper' has been identified in south east Queensland. Among other morphological differences, this variant displays large hairy leaves and very long seed pods containing significantly more seeds than the standard variety (Shortus & Dhileepan 2011). It has a very limited distribution (currently identified at 12 sites); but can invade ecosystems away from waterways and has even been found in estuarine wetlands (J. Ford *pers comm.* 2012). As a consequence, there is some concern that this variety could have a wider potential distribution and become an even more serious threat (Technigro 2010). This is difficult to confirm without further information on its origins and the period of time this variety has been naturalised. Recent research into comparative below and above-ground allocation of biomass have found some differences between the two varieties but no explanation for the disparity in distribution (Taylor & Dhileepan 2012).

Cat's claw creeper has a well defined growing season, extending from spring through to autumn. Roots start to develop tubers in their second year and plants may be well established before they start to flower. Flowering occurs in spring and seed capsules mature in late summer to autumn, approximately 8–10 months after flowering. The fruits of hairy cat's claw creeper mature in late winter to early spring (Shortus & Dhileepan 2011). Seed begins to drop in late May, with peaks in July and August.

Cat's claw creeper produces prolific numbers of double-winged seeds, which provide the primary means of long-distance dispersal (Osunkoya et al 2009). In addition, cat's claw creeper yields numerous underground reproductive tubers (records of ~1000 per m^2) and can reproduce vegetatively, producing roots from nodes in the stems (Osunkoya et al 2009). Tubers also act as carbohydrate reserves that enable the plant to persist even if above ground vegetation dies back (Downey & Turnbull 2007; Osunkoya et al 2009).

The major method of dispersal was traditionally thought to be by wind (Gentry 1983); however, riparian corridor spread patterns suggest water may be a significant dispersal agent (Muyt 2001). This is supported by seed buoyancy research which indicates cat's claw creeper seeds float for an average of >35 days (Vivian-Smith and Panetta 2002) suggesting water could be the main means of long-distance dispersal.

Cat's claw creeper grows in a range of soil types, but does not tolerate poorly drained soils. Plants are capable of surviving heavy frost but germination is reduced at low temperatures and its general distribution seems to be limited by cold and dry stress (Rafter et al 2008b)

6.3 Cat's claw creeper distribution and spread

Cat's claw creeper is native to Central and South America and the West Indies (Everett 1980; Howard 1989; Rafter et al 2008a) but is a popular horticultural plant and is widely naturalised around the world, occurring in southern Africa, south-eastern USA, Hawaii, Asia, the Pacific Islands, Republic of Cape Verde, Mascarene and recently in Europe (Rafter et al 2008b).

In Australia cat's claw creeper is now widespread within coastal and sub-coastal areas of Queensland and northern New South Wales, its distribution stretching from Cooktown to Sydney. The worst infestations occur along the Clarence River, northern New South Wales and span approximately 150 km (T. Moody pers. comm. *in* Downey & Turnbull 2007).

Although normally considered a tropical and sub-tropical species, cat's claw creeper has also established in temperate regions like the New England Tablelands and the Clarence, Namoi and Gwydir River catchments (Downey & Turnbull 2007; S. Johnson *pers. comm*. 2012); and has recently expanded into adjacent dry sclerophyll forests (e.g. forest dominated by spotted gum, *Eucalyptus maculata* Hook.) (T. Moody pers. comm. *in* Downey & Turnbull 2007). Naturalised plants have been collected from Darwin and Melbourne (Downey & Turnbull 2007). Overseas cat's claw has invaded savannahs, secondary forests and remnant high forests (Downey & Turnbull 2007), suggesting potential for spread into drier environments.

Hairy cat's claw creeper appears to tolerate drier conditions and has invaded open and closed forests away from waterways (Technigro 2010). It has been found growing around estuarine wetlands (J. Ford*, pers. comm.* 2012), suggesting a higher tolerance for salt than the common variety.

Climatic tolerance modelling of cat's claw creeper's potential distribution indicates that highly suitable habitat occurs in the coastal regions from southern New South Wales north, to include the tropical rainforests in Far North Queensland and large areas of Cape York. Coastal zones of Western Australia, the Northern Territory and South Australia are also suitable. There is some disagreement over the suitability of Victoria and Tasmania; however recent modelling by Macquarie University (Figure 6) indicates these areas are also prone to invasion (Wilson et al 2010). Cold and dry inland conditions limit cat's claw creeper distribution, but riparian microclimates that provide increased soil moisture and protect from frost are likely to enable inland invasion along waterways (Rafter et al 2008b). There is also potential for cat's claw creeper to become significantly more abundant within its current range.

It should be noted that current modelling work has been undertaken for the standard form of cat's claw creeper and predicted potential distribution ranges may increase if hairy cat's claw creeper is allowed to expand its range. Little is known about the origins of this form; however recent field-surveys in Brazil have confirmed the co-occurrence of the 'long-pod' (hairy cat's claw) and 'short-pod' (standard form) haplotypes (Rafter et al 2008b).

A number of climatic models have been produced for cat's claw creeper (e.g. Figures 4 and 5) and it will be important to determine which is most accurate or whether there is a need for further refinement of the models.

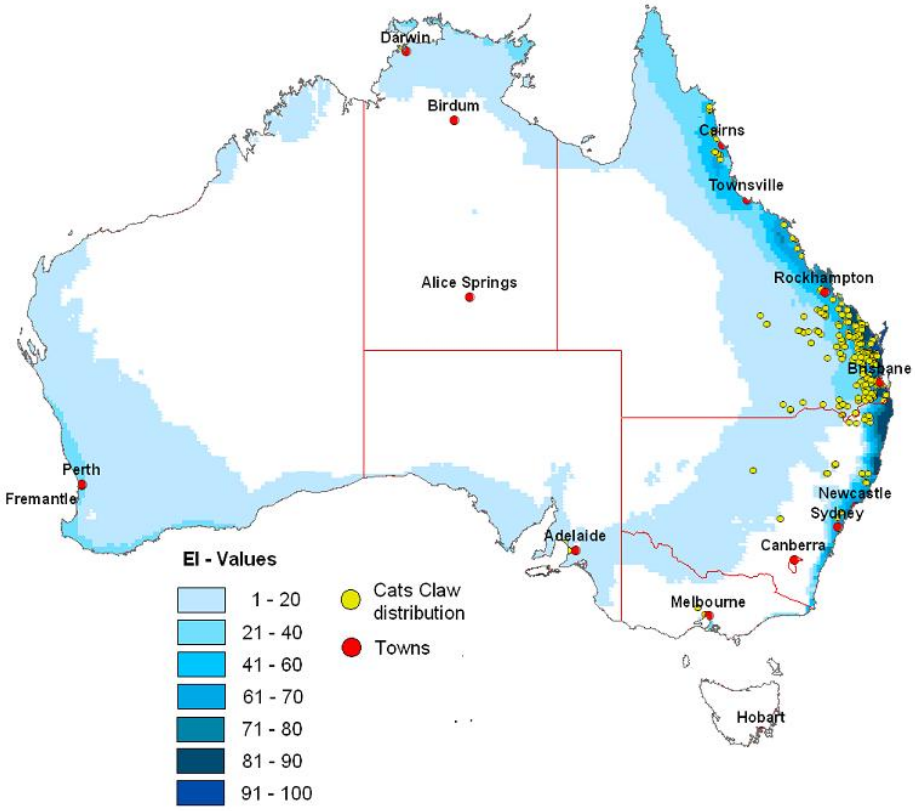


Figure 4. *Current and potential distribution of cat's claw creeper in Qld and NSW (Biosecurity QLD – CLIMEX 2008)*

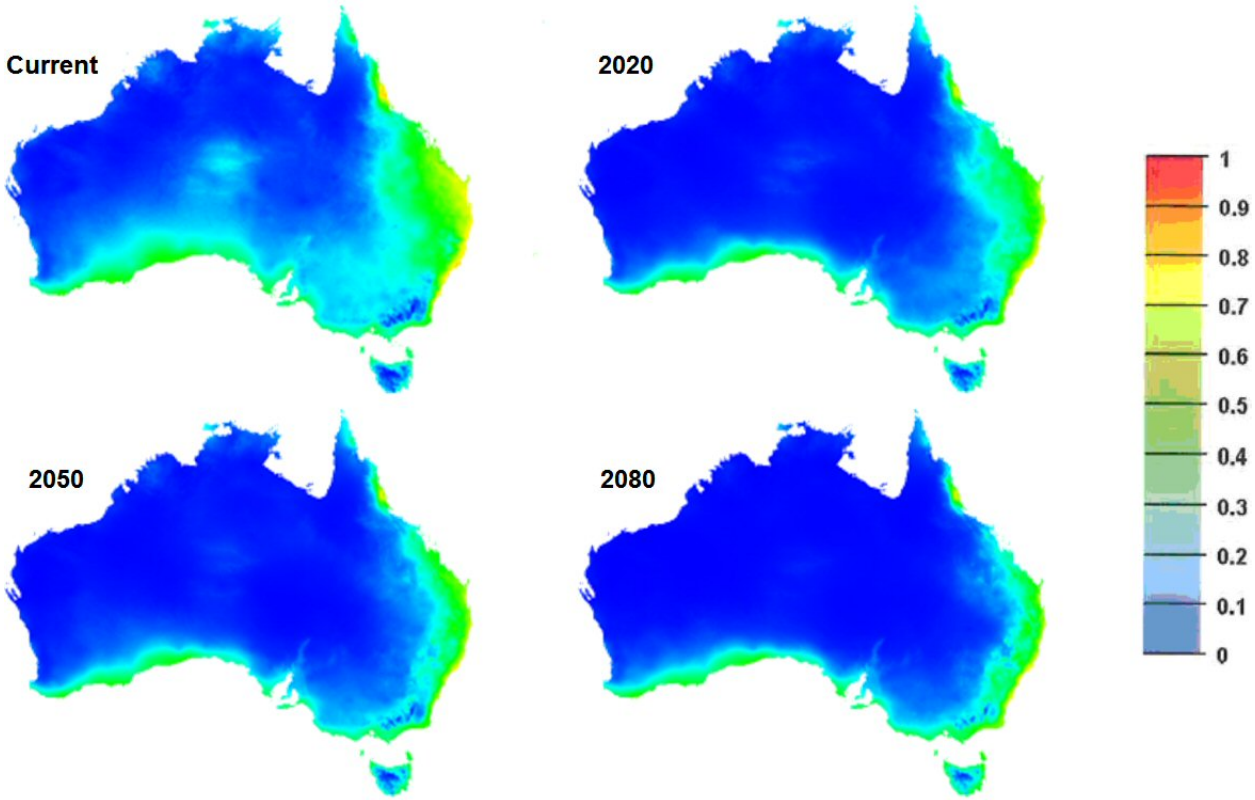


Figure 5. *Potential distribution of cat's claw creeper under climate change scenarios – MaxEnt Modelling Software* (Wilson et al 2010)

Summary of impacts

Certain exotic vines and scramblers have been described as “transformer species” (Swarbrick 1991; Ernst & Cappuccino 2005, Blood 2001), because they alter the nature of the environment where they are dominant. They smother canopy and ground-level vegetation, reducing light access and suppressing regeneration of native species. Exotic vines and scramblers may also affect the abundance and diversity of plant-dwelling invertebrates (Stockard 1991), restrict the movement and water access of some native fauna and/or favour other species (including pest animals) by providing protective shelter (NSW Environment and Heritage 2006).

Cat’s claw creeper is a particular threat because it is able to invade intact, heavily shaded environments, opening them up to invasion by other weedy species. This can lead to further degradation in the structure and composition of the native plant community. In areas where there are no standing structures, cat’s claw creeper forms dense above-ground mats that prevent growth and seed germination of understory vegetation (Muyt 2001; Dhileepan et al 2010).

The plant communities in Australia most commonly invaded by cat’s claw creeper are those in riparian zones, and subtropical and tropical rainforests. These include critically endangered subtropical lowland rainforest systems (I. Last pers comm. 2012), littoral rainforest and riverflat eucalypt forest on coastal floodplains, listed as endangered ecological communities in NSW (Coutts-Smith & Downey 2006). Most surviving remnants of these communities are small and particularly prone to weed invasion and degradation. It is also spreading further west along riparian corridors and is considered a potential threat to the upper reaches of the Murray Darling System (J. Conroy pers. comm. 2012).

The ecosystems invaded by cat’s claw creeper are some of Australia’s most biodiverse regions and its spread poses immense risks to the continued function of these environments. It is likely that further research will be required to identify the full suite of species and ecosystems impacted or at risk from cat’s claw creeper, but it has already been included in the NSW exotic vines and scramblers key threatening process listing (NSW Environment and Heritage 2006) and is known to threaten a number of critically endangered and endangered species and ecological communities listed under the NSW *Threatened Species Conservation Act 1995,* the Queensland *Nature Conservation Act 1992* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Coutts-Smith & Downey 2006).

Threatened fauna that may be impacted by cat’s claw creeper infestations include the Coxen’s fig parrot (*Cyclopsitta diophthalma coxeni*) which is listed as critically endangered in NSW and endangered in Queensland (Coutts-Smith & Downey 2006), several species of flying foxes – as a result of the combined effect of infestation and mortality of trees on the availability of habitat and food, and the endangered eastern freshwater cod due to the loss and modification of riparian vegetation and stream banks and the effects on water quality, food and shelter (Downey & Turnbull 2007).

Cat’s claw creeper is also a pest of forestry, urban areas and infrastructure corridors; although it is not generally considered a threat to pasture or agricultural areas as young stems and leaves close to the ground can be grazed. The major hoop pine plantations of Queensland’s largest forest plantation grower (HQPlantations) lie within the western Mary Valley near Gympie – an area heavily infested by cat’s claw creeper. These forests exist within a matrix of retained native forest, including critically endangered subtropical lowland rainforest ecosystems. Economic impacts to hoop pine plantations result from the need for more frequent and ongoing weed control treatments in young plantations; an increased safety risk when harvesting densely-infested mature plantations (vines can pull the top sections out of adjacent trees when felled); processing and timber recovery issues when milling due to attached vines; and the inability to supply hoop pine bark to the landscape market due to the risk of contamination (I. Last pers. Comm. 2012)

Because cat’s claw can cause the death of adult trees, it also has the potential to cause infrastructure damage (trees washed down stream by floods) and water quality problems due to erosion. This is considered a serious problem in the water catchment area for Gladstone, one of Queensland’s major industrial centres (B. Nicholls pers. comm. 2012).

Recent research also indicates that cat’s claw creeper may improve soil fertility and influence nutrient cycling. Soil invasion effects include increased air dry-moisture content, higher organic carbon, total carbon, total nitrogen, calcium, magnesium and sulfur; and lower levels of exchangeable

sodium and iron within infested areas (Perrett et al 2012).This may have a negative impact on native species adapted to low nutrient soils.

6.4 Control options

Dense infestations of cat's claw creeper are very difficult to control due to its numerous lianas, abundant seed and ability to resprout from the tubers, sometimes for years. In selecting the most suitable control techniques it is essential to minimise adverse impacts on native vegetation and to encourage its subsequent recovery.

Catchment and sub-catchment planning is considered an important component of strategic management of cat's claw creeper. Good mapping of its distribution and an awareness of high risk spread pathways enable the identification of high priority management zones to more effectively manage existing infestations and reduce the risk of further spread.

1. Prevent cat's claw creeper spread:

Identify locations where cat's claw creeper occurs as isolated plants or sparse populations. Remove seedlings and treat isolated plants or clumps first. Cat's claw creeper can spread along rivers, particularly from seeds dispersed by floodwaters. Where possible, keep uninfested areas free of cat's claw creeper.

2. Reduce established infestations:

In regions where cat's claw creeper is widespread, sites with the greatest biodiversity significance should be the highest priority for weed removal. Liberating mature native trees from vine weeds to enable recovery of the canopy is a key first step in restoring ecosystems.

Develop and implement a long-term weed management plan for each site. It is important to identify all plant species (weeds and natives) and map their distribution and density so that you can establish the most strategic management approach to the site.

Mature infestations of cat's claw creeper are most readily identified during flowering season (spring). Where possible, infestations should be managed prior to seeding (late summer – autumn) to reduce the incidence of spread.

Weed strategically, protecting the better quality native vegetation first (treat cat's claw creeper infesting trees that are still living) and where possible, control infestations which threaten to spread downstream.

The size of the area targeted at each stage should be manageable enough to enable thorough follow-up control 2-3 times a year, usually in late spring/early summer, late summer/early autumn and just before winter. Regrowth should be treated before it reaches the foliage of the host tree.

Follow-up work in the first year is particularly delicate as care must be taken to treat the cat's claw creeper seedlings amongst the native seedlings.

Ensure that activities do not spread the seed and tubers or disturb ground cover.

Monitor and evaluate outcomes and adapt the plan accordingly:

Include monitoring of native plant regeneration, as well as weed response. In weed management programs there is often a tendency to focus on the removal of weeds as a goal, but at the site level the ultimate goal is restoration of native vegetation.

6.4.1 Biological control

Several biological control agents have been identified and are at various stages of testing and introduction. Australian releases of the leaf-sucking lace bug (*Carvalhotingis visenda*) and leaf-tying pyralid moth (*Hypocosmia pyrochroma*) were approved in 2007 and a new agent, the leaf-mining buprestid beetle (*Hylaeogena jurecki*) is due for release in 2012-13.

If successful, these agents should reduce the rate of shoot growth to limit the weed's ability to smother native plants; and through suppression of photosynthetic processes, reduce the tuber biomass.

Recent research indicating that recruitment is primarily from seeds, not vegetative as previously thought (Osunkoya et al 2009), suggests future biological control research might be best focussed on seed and pod feeding insects to reduce the potential for spread.

6.4.2 Physical control

The physical removal of large numbers of tubers cannot be achieved without excessive soil disturbance. However, in new infestations, hand removal of seedlings is feasible and some practitioners recommend grubbing out larger tubers where repeated herbicide treatments have failed to prevent reshooting. Tubers must be composted on-site or double bagged and disposed of in landfill waste, as they will regrow in moist conditions in contact with soil.

It may be impractical and dangerous to attempt to pull lianas out of the tree canopy and the upper vines are generally cut and left to die in situ. This can be a valuable control technique – even when herbicide is not applied to the basal section because it can halt seeding and further spread of the infestation.

6.4.3 Chemical control

Herbicides can be effective, providing they are carefully chosen and selectively applied when plants are actively growing. The main herbicide application methods for cat's claw creeper are described below. Stem injection and basal bark application are less commonly used. Basal barking in particular poses the risk of off-target damage because cat's claw creeper stems are usually firmly attached to the stem of the host tree.

Remember to always follow label and permit directions when using herbicides.

Table 6. Cat's claw creeper management summary

Growth form	Most effective treatment approach
Seedlings and ground runners	Foliar application of herbicide[†].
Small to medium sized vines that have begun to attach/climb host	Pull juvenile vines away from host if possible, curl and spray with herbicide[†]. If the vine can't be removed from host – scrape and paint with concentrated herbicide (more time consuming).
Well established vines growing into canopy	Cut stump herbicide application; or cut and foliar spray ground-level regrowth if detrimental affects to host tree can be avoided.

[†] Some residual herbicides may not be suitable where there is the potential for run-off into waterways or where there could be a long-term impact on native species recruitment. Non-residual and waterway compatible herbicides are available.

Cut stump and cut, scrape and paint application (suitable for all basal stem sizes)

Cut all climbing stems well above the ground (1–2 m high) and leave the aerial parts to die. Peel the stems back from the trunk of the host plant (leaving a clear area that can be monitored for regrowth) and cut all the basal stems again horizontally approximately 20 cm from the ground. Treat the cut surface immediately (within 15 seconds) with concentrated herbicide, using a handheld spray bottle or a brush. To increase the likelihood of herbicide penetration into the root and tuber system, it may also be beneficial to scrape the bark from one side of the remaining stem and the surface of any visible tubers and treat the exposed area with herbicide. For large plants, a team of two or more people need to work together to treat each stem as it is cut.

For larger vines this technique may not be suitable as the dense cellular structure results in poor translocation and not enough herbicide reaches the underground tubers. In this instance, some

practitioners suggest it is most effective to: (1) cut the vine relatively low to the ground, drill a hole down the middle and fill the well with glyphosate at the rate of 1 part herbicide to 1.5 parts water – this can be re-filled when all the herbicide is absorbed or (2) leave the vine intact and drill several holes into the stem and fill each with herbicide (R. Joseph pers. comm. 2012).

Foliar spray

Stems of cat's claw creeper are strongly attached to the trunk of the host, so in-situ foliar spray can cause off-target damage. However, handheld equipment (handgun and hose or knapsack) can be used to spot spray prostrate stems, seedlings and regrowth less than 2 m tall. Pull any regrowth off the native vegetation, coil or tie it into a knot and spray the vines at ground level to minimise spray drift and off target damage. The leaves and stems must be sprayed to the point of run-off. The best time for foliar spray is when new growth is present.

Some managers find it most cost effective to cut the stems (allowing aerial sections to die) and foliar spray any regrowth, without dedicating time to cut, scrape and paint application of herbicides.

Registered herbicides for cat's claw creeper

The most commonly used herbicides are described here, however further research is needed to determine the comparative effectiveness and off-target impacts of many of these herbicides and care must be taken to ensure conditions are suitable for their use.

The only herbicide that has Australia-wide registration for cat's claw creeper (under the definition of 'rhizomatous plant') is picloram gel (45 g/kg). However, there are a number of minor use permits current for Queensland and New South Wales for herbicides including glyphosate, dicamba, fluroxypyr and triclopyr + picloram (± aminopyralid). Permits are also available for mesulfuron-methyl; however trials indicate that cat's claw creeper is particularly resistant to this herbicide. These permits are either issued specifically for cat's claw creeper or under the definition of environmental weeds. For more details on the current status of pesticide permits go to www.apvma.gov.au.

For cut stump or cut, scrape and paint techniques, glyphosate (360 g/L) is generally applied at a ratio of 1:1.5 mixed with water. Alternately picloram gel (e.g. Vigilant®) can be applied 'neat' to the cut surface. The latter is more expensive, but some research and anecdotal reports indicates it may have more impact on the subterranean tubers.

A range of selective, non-selective; residual and non-residual herbicides are available for spot spraying cat's claw regrowth and seedlings. There are pros and cons associated with each of these (described below) that must be considered on a site by site basis.

For spot spraying of regrowth and seedlings, glyphosate (360 g/L) mixed with water at a ratio of 1:100 is commonly used. However, as glyphosate is not residual, it will not provide ongoing control of tuber and seed germination. A site may therefore require additional follow-up herbicide applications (compared to residual herbicides) to exhaust the soil tuber bank. Glyphosate is a non-selective herbicide and in-discriminate spraying will open up bare ground for opportunistic weed invasion. Therefore extreme care must be taken to avoid contact with desirable species.

More selective and residual herbicides achieve good control of regrowth, juveniles and tubers but can remain active in the soil for long periods of time. The favoured treatment is triclopyr (300 g/L) + picloram (100 g/L) at mix rates of 200 – 400 mL/100 L of water because it works relatively rapidly and provides the lowest levels of immediate off-target damage to competitive native species. At these rates grasses, ferns, rushes and sedges should be unaffected; but this herbicide will have an impact on other woody plants and vines, particularly in the immature stages. Therefore, until further trials can be conducted to assess the long-term impacts on the germination of native species, the use these residual herbicides should be avoided in more sensitive sites. In degraded and heavily infested sites where native species recolonisation from adjacent areas or active revegetation will be required regardless, these selective and residual herbicides may provide a better control option.

Dicamba (500 g/L) applied as a foliar spray at a mix rate of 4 mL /1 L of water is also recommended by some groups as an effective control for cat's claw creeper where the vine is growing over the ground or up to 1 m into small trees and shrubs. Dicamba is a selective broadleaf herbicide with a half life of about 14 days. For this reason it won't provide the same long-term residual tuber control that triclopyr + picloram herbicides provide; however it may be more suitable in environments where native seedling

regeneration is critical. Despite this, care should still be taken, particularly where it is used around shallow rooted native plants and in sandy soils where there is a risk of soil leaching.

Application of both selective and non-selective herbicides must be done with extreme care, following label or permit instructions and by an experienced operator. The use of a dye is recommended to enable managers to identify which areas have been treated. Off-target spraying has the potential to affect desirable species and significantly deplete the native seed bank, jeopardising the long-term recovery of the site.

6.5 Identified research gaps and priorities

Potential research requirements were compiled from stakeholder feedback (Table 7). These have been categorised and linked to existing actions in the Plan, but are not prioritised. The development of a National Invasive Vines and Scramblers Research Framework (Action 3.4.2) is recommended in association with relevant research groups (local and international) and land managers. This framework should identify priorities and establish a cohesive structure, sequence and time frame within which to address research and management requirements. It should also establish communication networks (linkages with the Vines and Scramblers Communications Plan) to promote an ongoing dialogue between researchers and land managers.

Table 7. Preliminary identification of cat's claw creeper research gaps

Category	Possible research areas	Background / benefit	Strategic Plan linkages
Biology / ecology	Refine taxonomic knowledge of Australian cat's claw creeper	Taxonomic identification is important for biological control research and establishment. There is some speculation that hairy cat's claw creeper should be defined as a subspecies.	1.1.1 2.2.4
	Relative invasiveness and threat of hairy cat's claw creeper	A second variety of cat's claw creeper (hairy cat's claw) was recently identified in Southeast Queensland. Known distribution is limited, but it appears to have greater environmental tolerances and may have the potential for greater spread and impact.	1.1.1 1.2.1 1.3.4
	Limiting / promoting factors for spread and establishment	Potential for better identification of ecosystems at risk of invasion and better information to contribute to predictive modelling	1.1.2
	Predictive modelling – high risk invasion pathways	Identification of priority surveillance zones. Focus for cat's claw is on wind and water distribution.	1.1.2 1.2.2 1.2.3
	Develop local / site-specific protocols for estimating abundance and links to biomass	This information is required to quantitatively gauge the efficacy of management methods e.g. biological control impacts	2.2.2 2.2.4 3.4.4
Ecosystem restoration	Guidelines for ecosystem restoration following vine management	Compilation of existing knowledge and identification information gaps – lead to development of restoration guidelines	2.2.1 3.2.3
	Better integration of vine and other weed species management	Information required on other typical weed invaders, successional and regeneration processes, management / promotion of native species	2.2.1 3.2.3
Improved herbicide control	Costs/benefits of residual and selective herbicides and other additives such as Fulvic acid	Recent research suggests residual herbicides are more effective in the management of cat's claw creeper and its tubers. What are the potential impacts of residual herbicides on sensitive ecosystems and does the cost of an uncontrollable cat's	3.2.1

		claw creeper infestation outweigh the costs of using residual herbicides? Are there other additives that may provide a better long-term outcome? Are recommended concentrations appropriate (some research suggests lower concentrations effective with fewer off-target impacts (T. Scanlon pers. comm.)	
	Mechanisms, including physiology, of herbicide uptake, sequestration and/or long-term effects on aerial and subterranean tubers	Tuber persistence is seen as the major barrier to successful control of cat's claw creeper. Understanding herbicide translocation and sequestration mechanisms may provide management solutions	3.2.1
Eradication/ containment feasibility	Identify key factors that determine eradication and containment feasibility of cat's claw creeper	This information is valuable for the identification of strategic management priorities	1.3.2 1.3.3 1.3.4
Biological control	Maintain efforts to research and distribute biological control agents	Three biological control agents have been approved for release in Australia. Depending on the success, further biological control research may be required to support the program.	2.2.4 3.4.1
	Monitoring of biological control impacts	Standardised biological impact monitoring protocols should be established and promoted	2.2.2 2.2.4
Impacts / costs	Accurate accounting of the environmental, economic and social cost of cat's claw creeper (more specific detail below)	A good knowledge of the impacts of cat's claw creeper is required to ensure priority assets are protected and as a motivational tool to encourage broader community involvement in management.	3.3.2
	Potential long-term environmental and economic impacts of cat's claw creeper on water supply systems	Cat's claw creeper is causing significant impacts to riverine systems feeding important water catchments in central and SE Qld and northern and central NSW. The loss of riparian vegetation (and particularly adult trees) risk severe erosion and water quality issues in the long term.	2.1.1 2.1.1
	Quantify control costs and benefits of different management approaches	Costs and benefits of control form a valuable component of the decision making process	3.3.2
Social research & extension technologies	Community weed management perceptions and drivers	Social / behavioural research to provide a foundational understanding of public perceptions and better target education, awareness and best practice application	3.3.1
	Communication / extension technologies that encourage community involvement in weed surveillance and management	Peri-urban and urban communities are difficult to engage with. New, exciting and easy to use reporting and information-access technologies could provide an important impetus for involvement	3.3.1

6.6 Quarantine and legislation

The import of *Dolichandra unguis-cati* (synonyms: *Macfadyena unguis-cati; Bignonia tweediana, Doxantha unguis-cati*) into Australia (including their seeds or reproductive bodies) is prohibited by legislation administered by DAFF Biosecurity (formerly the Australian Quarantine and Inspection Service). Table 8 provides a list of the relevant State and Territory Legislation and the declaration status of cat's claw creeper current at the time of writing.

Table 8. State/Territory declaration status for Dolichandra unguis-cati

	Legislation		
Qld	*Land Protection (Pest and Stock Route Management) Act 2002*	Class 3 (Environmental Weed) State-wide	The plant and its reproductive bodies cannot be sold or distributed. Control may be required for the protection of environmentally significant areas.
NSW	*Noxious Weeds Act 1993*	Class 4 noxious weed in selected Local Control Areas (see NSW DPI website for details)	In these areas the growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed.
NT	*Weeds Management Act 2001*	Not currently declared	
WA	*Biosecurity and Agriculture Management Act 2007* *Plant Diseases Act 1914*	Not currently declared Prohibited entry to WA	
SA	*Natural Resource Management Act 2004*	Not currently declared	
Vic	*Catchment and Land Protection Act 1994*	Not currently declared	
Tas	*Weed Management Act 1999*	Not currently declared	
ACT	*Pest Plants and Animal Act 2005*	Not currently declared	The ACT Weeds Strategy 2009-2019 states: "Included in the declaration schedule are those pest plants that have been determined to be WoNS and that are either established in the ACT or have the potential to establish".

7 Appendices

7.1 Weed control contacts

State	Department	Phone	Email	Website
ACT	Environment and Sustainable Development Directorate	132281	environment@act.gov.au	www.environment.act.gov.au/environment
NSW	Biosecurity NSW, NSW Dept of Primary Industries	1800 680 244	weeds@industry.nsw.gov.au	www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds
NT	Dept of Natural Resources, Environment, The Arts and Sport	08 8999 4567	weedinfo.nretas@nt.gov.au	www.nt.gov.au/weeds
QLD	Biosecurity Queensland, Dept of Agriculture, Fisheries and Forestry	132523	callweb@dpi.qld.gov.au	www.biosecurity.qld.gov.au
SA	Biosecurity SA, Dept of Primary Industries and Regions SA	08 8303 9620	nrmbiosecurity@sa.gov.au	www.pir.sa.gov.au/biosecuritysa/nrm_biosecurity/weeds
TAS	Dept of Primary Industries, Parks, Water and Environment	1300 368 550	www.dpipwe.tas.gov.au/weeds scroll to the bottom of the page and click on “weeds enquiries”	www.dpipwe.tas.gov.au/weeds
VIC	Dept of Primary Industries	136186	customer.service@dpi.vic.gov.au	http://new.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds
WA	Dept of Agriculture and Food	08 9368 3333	enquiries@agric.wa.gov.au	www.agric.wa.gov.au
Australia wide	Australian Pesticides and Veterinary Medicines Authority	02 6210 4701	contact@apvma.gov.au	www.apvma.gov.au

7.2 Other information sources

Information on all the WoNS species, as well as contact details for the Coordinators is available on the Weeds Australia website at www.weeds.org.au/WoNS. This site acts as a hub for published strategic plans, extension resources, mapping information, priority action tables (annual priorities mapped to regional scale); and monitoring, evaluation and reporting information. The Strategic Plan support documents (see Section 3) will be published here.

7.3 The WoNS Program and its phases[3]

In 2007, an independent review of the WoNS program concluded that the nationally strategic approach of WoNS was highly successful in leveraging consistent multi-jurisdictional 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 6). This 'phased approach' aims to provide the most cost-effective use of limited 'national coordination' resources.

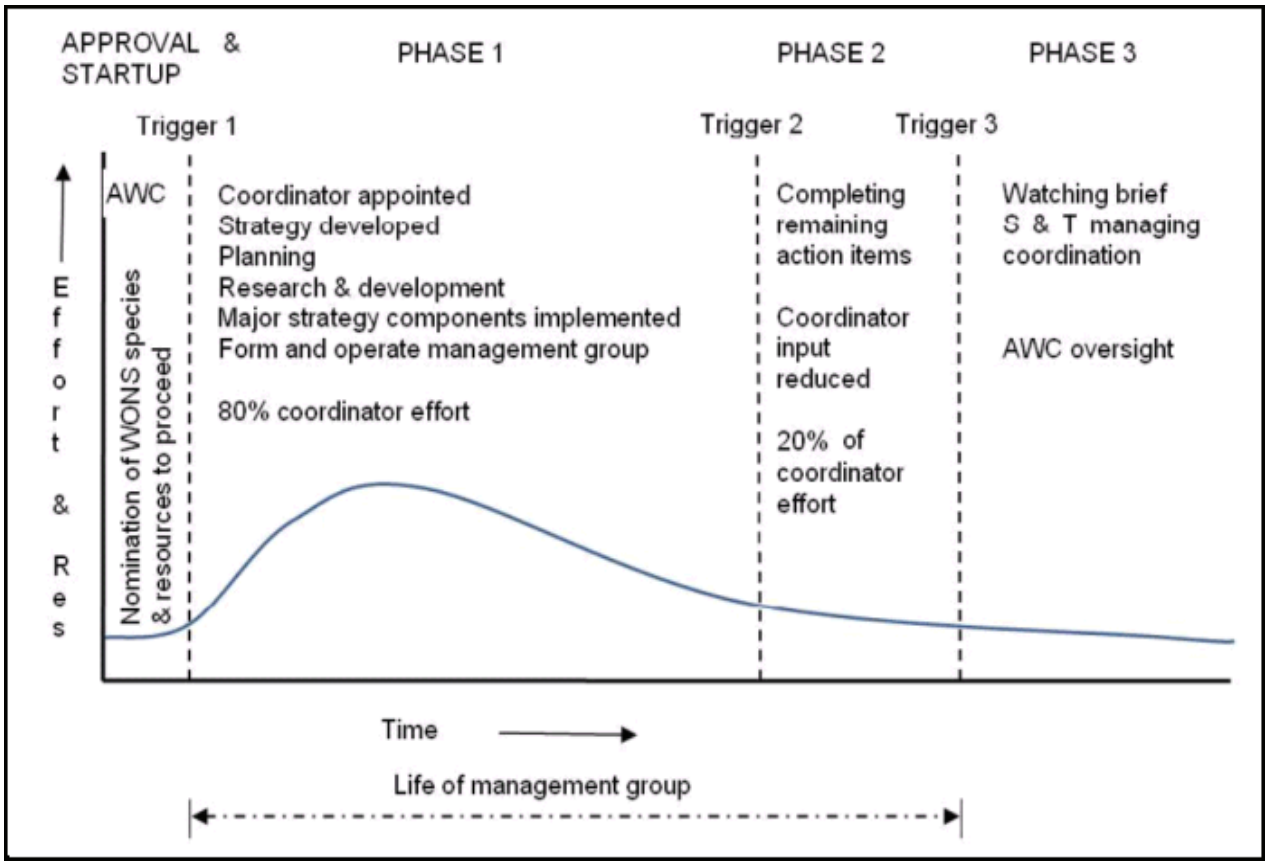


Figure 6. *Australian Weed Committee diagrammatic representation of coordinator effort and resource use when implementing a Weeds of National Significance strategy*

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 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. Theses species were independently assessed and the AWC endorsed twelve 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.

[3] Adapted from Thorp 2012 "Additional List of Weeds of National Significance – April 2012" www.weeds.org.au/WoNS.

7.4 Glossary and Acronyms

Asset protection – A weed management approach to reduce impact or threat to a high value asset (environmental, economic or social) e.g. at a national scale this may include the protection of EPBC listed species or ecosystems.

AWC – Australian Weeds Committee.

AWS – Australian Weeds Strategy 2007.

Biosecurity / Weed Authorities - Statutory agencies/groups responsible for weed management. These vary across jurisdictions (e.g. at state government level in QLD, local government level in NSW and regional NRM level in SA, etc.).

Citizen science – Scientific research conducted by amateur or non-professional scientists. This typically includes detection and mapping of weeds and monitoring of management outcomes.

Containment – A weed management approach that aims to prevent an increase in the current distribution of a weed, by using weed control procedures to reduce the density of existing infestations and limit the dispersal of propagules through the establishment of management or enforcement regions e.g. containment lines and zones. Highly effective containment programs can actually result in a decrease in the current distribution of a weed.

Coordinated control – A strategic weed management program that enables joint, cross-tenure action to ensure the application of weed control procedures towards a specific end (e.g., eradication or containment).

Core infestation – Weed infestation which are relatively abundant and widespread or in difficult to access areas where management is not feasible.

Eradication -The elimination of every single individual of a species from an area to which recolonisation is unlikely to occur, including propagules (Myers *et al*. 1998).

IGAB – Intergovernmental Agreement on Biosecurity.

NIVaST – National Invasive Vines and Scramblers Taskforce (includes Cat's Claw Creeper Strategic Plan Committee).

NRM Groups – Natural Resource Management groups (including Catchment Management Authorities).

Outlier – A satellite weed infestation separate from the core. This could be managed through a localised containment or eradication program.

Partner – Person, group or organisation actively supporting/participating/investing in weed management/ WoNS strategy implementation / responsibility / contribution.

Priority assets – High value (environmental, primary production, cultural and social) assets determined to be at risk – can be applied at varying scales.

Priority outliers – Outliers which are feasible to eradicate, contain or reduce / prevent spread.

Stakeholder – Person, group or organisation interested in or concerned about weeds and or their management.

WoNS – Weeds of National Significance.

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