THREAT ABATEMENT PLAN

To reduce the impacts of tramp ants on biodiversity in Australia and its territories

Australian Government
Department of the Environment and Heritage

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Front cover and sequential page photo: Red Imported Fire Ant (*Solenopsis invicta*) – Steve Wilson.

Contents

1. Introduction

'These ants will destroy our culture, our land, our life.'

Balupalu Yunupingu, Dhimurru ranger, Gumatj clan, Yolngu people, north-east Arnhem Land (2003)

Invasive alien tramp ants are a diverse group of species originating from many regions of the globe that can arrive at Australia's doorstep through a variety of transport pathways. They share genetic, behavioural, and ecological attributes that infl uence their probability of entry, establishment and spread, ecological dominance, and high impact in Australia and its territories.

While the impacts of all tramp ants on biodiversity in Australia have not been fully quantifi ed, some have the ability to signifi cantly affect Australia's native biodiversity. Their impacts may be felt directly through predation upon or competition with native animals, or indirectly by modifying habitat structure and altering ecosystem processes. Most tramp ants have multi-sectoral impacts, and can affect plant and animal health, social and cultural values, and human health. Thus, the effective and appropriate management of tramp ants poses a challenge to Australian institutions, testing the continuum of biosecurity and requiring coordination and cooperation among a broad group of stakeholders.

When the Minister for the Environment and Heritage listed the tramp ant species, the red imported fi re ant *(Solenopsis invicta)*, as a key threatening process under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) he also determined that a threat abatement plan was a feasible, effective, and effi cient way to mitigate the threats posed broadly by tramp ant species.

This plan establishes a national framework to guide and coordinate Australia's response to tramp ants, identifying the research, management, and other actions necessary to ensure the long-term survival of native species and ecological communities affected by tramp ants. It identifi es six national priority species as an initial, but fl exible, list on which to focus attention. They are the red imported fi re ant *(Solenopsis invicta)*, tropical fi re ant *(S. geminata)*, little fi re ant (*Wasmannia auropunctata*), African big-headed ant *(Pheidole megacephala)*, yellow crazy ant *(Anoplolepis gracilipes)*, and Argentine ant *(Linepithema humile)*.

Listed species known to be threatened or species and ecological communities that could be threatened by either red imported fi re ant or yellow crazy ant in Australia or its territories are at Appendix A. No other species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are currently considered at risk from other tramp ant species considered in the plan.

The goal of the threat abatement plan is to minimise the impact of invasive tramp ants on biodiversity in Australia and its territories by protecting threatened native species and ecological communities; and preventing further species and ecological communities from becoming threatened.

The plan contains six objectives, with supporting actions at all stages of the invasion sequence. The objectives are:

1. Increase science-based knowledge and expertise, incorporate Indigenous traditional ecological knowledge, quantify impacts, and improve access to information for priority tramp ant species
2. Prevent entry and spread of tramp ants by increasing diagnostic capacity, offshore surveillance, inspection, treatment, and national and state and territory surveillance
3. Prepare for rapid response to tramp ant incursions and spread through risk assessment of tramp ant species and pathways of introduction, and development of contingency plans
4. Enhance emergency response to tramp ant incursions by improving reporting and response rates, and by developing tools for response and follow-up
5. Build stewardship by engaging, educating, and informing the Australian community about the impacts of invasive tramp ants and effective means of response
6. Coordinate Australian Government, state and territory government, and local management activities in Australia and the region.

Detailed information supporting this plan, including tramp ant characteristics and biology, distribution, impacts on environmental, economic, social and cultural values, and current management practices and measures, is given in the *Background document for the threat abatement plan to reduce the impacts of invasive tramp ants on biodiversity in Australia and its territories* available at www.deh.gov.au/biodiversity/threatened/publications/tap/trampants.

2. Background

2.1 The threat

Ants are one of the most ecologically successful groups of animals across the globe. They occupy most terrestrial habitats and adaptive zones, fi ll a diversity of key functional roles, and act as ecosystem engineers to shape the structure of some ecosystems. Ants dominate many ecological communities, helping determine their structure, biodiversity and function.

Globalisation of trade and commerce has accelerated the spread of a subset of ants – the 'tramp' ants – widely beyond their areas of origin. Tramp ants share genetic, behavioural, and ecological attributes that affect their probability of entry, establishment and spread, ecological dominance, and high levels of impact. They routinely test Australian border defences. They are found in ships and planes and in a diverse range of cargoes. Many of these tramp ants have established and spread in Australia and its territories or have the potential to do so.

This plan identifi es six priority tramp ant species:

- red imported fi re ant *(Solenopsis invicta)*
- tropical fi re ant *(S. geminata)*
- little fi re ant *(Wasmannia auropunctata)*
- African big-headed ant *(Pheidole megacephala)*
- yellow crazy ant *(Anoplolepis gracilipes)*
- Argentine ant *(Linepithema humile).*

These species, fi ve of which are listed among the world's 100 worst invaders by the World Conservation Union, have a history of invasion and documented impact outside their native range, have been intercepted at, or breached, Australian borders and appear well adapted to Australian climatic conditions (see Chapter 9 of the Background document for the threat abatement plan).

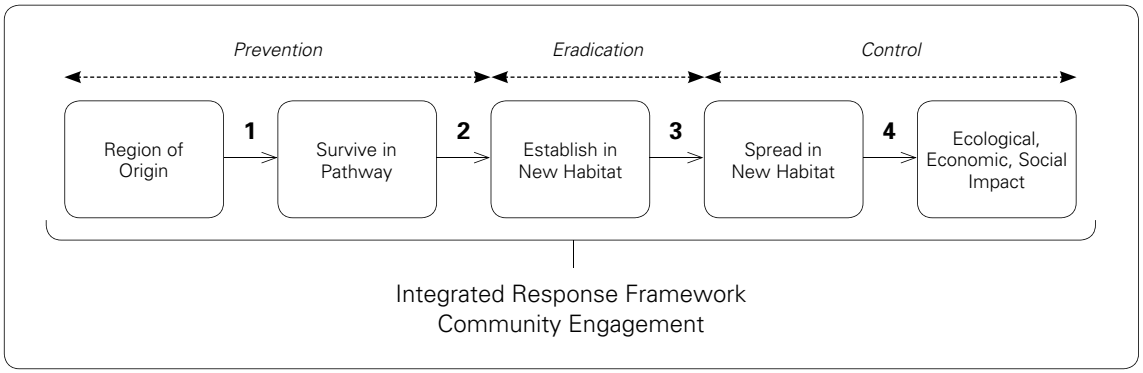
2.2 Impact

Tramp ant species share characteristics that help explain their invasiveness and impact. Some attributes (eg generalised nesting habits, many-queened nests, and association with disturbed habitats) increase the probability of movement along transport pathways, to reach and establish in new areas. Other attributes, including unicoloniality, low levels of within-species aggression, high levels of inter-species aggression, and omnivorous diets allow tramp ant populations to reach and sustain high densities. These ants can rapidly monopolise resources, increasing their population size at the expense of other species.

Invasiveness is also shaped by the attributes of the recipient community, including biotic factors (eg absence of enemies) and abiotic factors (eg good climatic and habitat matching, and disturbance) in the area of introduction.

The environmental impacts of the six priority tramp ant species have been investigated overseas. The impact of three species – the African big-headed ant, the Argentine ant, and the yellow crazy ant – have been documented in Australia or its territories. Impacts range from the displacement of native species to competition and predation resulting in disruption of ecosystem processes, including litter decomposition and changes in pollination and seed dispersal services.

■ Figure 1. Stages in the invasion sequence of a species



The severity and range of environmental impacts is vividly illustrated by the invasion of the yellow crazy ant on Christmas Island, in the Indian Ocean. Rapid formation of expansive supercolonies occurs on this Island, and this ant eliminates the red land crab *(Gecarcoidea natalis),* the dominant endemic consumer of leaf litter, seeds, and seedlings in the island rainforest. Without the red land crab, seedling recruitment is no longer regulated and litter decomposition slows. New associations between the crazy ant and honeydew-secreting scale insects lead to forest canopy dieback. These complex effects extend through the food web, rapidly change the forest community, and threaten listed species.

Most tramp ants also affect primary industry and social amenity, and some affect human health. While there are no overall estimates of the environmental, economic, and social costs of tramp ant invasions in Australia, economists estimate that the red imported fi re ant alone would cost Australia $8.9 billion over 30 years if left uncontrolled.

2.3 Managing the threat

To effectively manage tramp ants, actions must be integrated at all stages of the invasion sequence (Figure 1). Management aims to prevent the ants reaching the next stage of invasion.

Each solid arrow represents a transition to the next stage (with an associated probability) and a decision point (**1-4**) for managers. Management responses are in *italics*. Some responses, such as community engagement, are important at all stages.

Actions can be divided into (i) measures to **prevent** entry and to **prepare** in advance for incursions; and (ii) **responses** to eradicate or control incursions and limit their spread so as to mitigate tramp ant impacts.

Prevention, including surveillance, inspection, and treatment of tramp ants, can occur offshore in high-risk source areas, and onshore at potential entry points or in high-value conservation areas at risk. Prevention depends on effective surveillance and monitoring systems for early detection, rapid and accurate diagnostics, and effi cient data retrieval.

Preparedness involves advance work and readiness for response to tramp ants, including risk assessment for species and pathways, development of contingency plans, development of new or improved control and delivery technologies, and public awareness and engagement.

Response to incursions can be divided into three phases:

(i) The trigger phase begins with detection of the ant species and is followed by notifi cation of stakeholders, then interim management (eg containment and movement controls).

(ii) In the scoping phase the scale and intensity of the problem are assessed and decisions are made on the nature, costs, and timeframe of the response. This includes rapid assessment of how big an area the ants have invaded, ascertaining the availability and delivery of treatment, and an environmental assessment of the response, including the full range of potential environmental impacts.

(iii) The operational phase is where action is taken and evaluated. Eradication is the ideal goal of any management response, but it is only feasible when specifi c criteria are met. Otherwise, tramp ant populations must be contained and controlled to mitigate impacts. Irrespective of eradication or control, progress must be monitored to ensure that objectives are met. Evaluations of treatment effectiveness can be used to adapt management to changing circumstances, including follow-up surveillance and treatment, or a decision to stand down.

3. Threat abatement

3.1 Goal

The goal of this threat abatement plan is to minimise the impact of invasive tramp ants on biodiversity in Australia and its territories by:

- protecting threatened native species and ecological communities; and
- preventing further species and ecological communities from becoming threatened.

At a national level, these goals can only be achieved by managing tramp ants through all stages in the invasion sequence (Figure 1). This requires a coordinated policy and management framework that minimises the impacts of invasive alien tramp ant species on biodiversity and the environment by preventing, detecting, responding to, and managing the species. Achievment of the goal will require cooperation between all sectors and levels of government, adoption of a science-based strategy that uses the best available knowledge, and engagement of the public and key stakeholders so as to generate broad participation. The success of the plan will in part be measured by (i) a decreased rate of tramp ant incursions into Australia and its territories; and (ii) a reduction in the incidence and magnitude of impacts arising from established tramp ants on Australian native species and ecological communities.

3.2 Objectives

The plan's six objectives are:

1. Increase science-based knowledge and expertise, incorporate Indigenous traditional ecological knowledge, quantify impacts, and improve access to information for priority tramp ant species
2. Prevent entry and spread of tramp ants by increasing diagnostic capacity, offshore surveillance, inspection, treatment, and national and state and territory surveillance
3. Prepare for rapid response to tramp ant incursions and spread through risk assessment of tramp ant species and pathways of introduction, and development of contingency plans
4. Enhance emergency response to tramp ant incursions by improving reporting and response rates, and by developing tools for response and follow-up
5. Build stewardship by engaging, educating, and informing the Australian community about the impacts of invasive tramp ants and effective means of response
6. Coordinate Australian Government, state and territory government, and local management activities in Australia and the region.

3.3 Objectives and actions

This plan includes actions at all stages of the invasion sequence to reach the goal and objectives outlined above. There are 15 action groups under the six objectives. Action groups include specifi c actions and performance indicators.

It is a complex task to set priorities objectively among short- and long-term actions that take place across different stages in the invasion sequence. Nevertheless, priorities for actions to achieve each objective are coarsely assigned as very high (essential) or high (important) with performance indicators achievable in the short term (before three to five-years) or medium term (beyond three to five-years).

■ **Objective 1**

Increase science-based knowledge and expertise, incorporate Indigenous traditional ecological knowledge, quantify impacts, and improve access to information for priority tramp ant species.

Action groups 1.1 to 1.4 build capacity to manage tramp ants through research and development, education and training, and production of tools and infrastructure for dissemination to managers and policy makers.

Key actions include support for applied research that assists managers in understanding the basic attributes associated with invasion and spread, innovative research that increases the capacity to forecast invasions and rates of spread, and support for research and management training to increase expertise in Australia. Most of the actions in 1.1 and 1.3 are science based. A coordinated, proactive science strategy, supported by stakeholders, would be very valuable. Research must move from a reactive to a predictive discipline to develop technological innovations to reduce risks and impacts of invasive tramp ants. Because management responses to tramp ants are justifi ed by their actual or potential impacts, quantitative analysis of the effects of invasive tramp ants on biodiversity, the environment, the economy, and social and cultural values (1.3) is a high priority. Other information sources, especially the traditional ecological knowledge of Indigenous peoples (1.2), can increase management capacity and is an important priority on Indigenous-owned or managed lands. Support for research and management training, through the universities and relevant cooperative research centres, will also be important to increasing capacity and innovation. Specifi c actions in 1.4 develop infrastructure and consolidate information on tramp ants and their management in easily accessible forms in a single place or network.

These actions should be implemented upon adoption of the threat abatement plan and performance indicators could be signifi cantly progressed within the fi rst fi ve years. Action groups 1.1, 1.3, and 1.4 could be accelerated through consultation and collaboration with Biosecurity New Zealand. Cost-effective funding of many of the specifi c tasks in 1.1 and 1.3 could be pursued through the Linkage Grant Program of the Australian Research Council.

Action group	Actions	Performance indicators (the extent to which the following are in place)
1.1 Increase science-based knowledge, innovation, and expertise for management of tramp ants in Australia and its territories (Very high priority, Short term)	1.1.1 Produce syntheses of existing information for priority tramp ants of management concern.	Peer-reviewed syntheses summarising current knowledge of priority tramp ants established in, or of potential consequence for, Australia and its territories.
	1.1.2 Identify genetic, physiological, behavioural, and ecological attributes of priority tramp ants.	Peer-reviewed publications that increase basic knowledge about attributes of priority tramp ants relevant to their management.
	1.1.3 Determine key factors for establishment, patterns of dispersal, and mating requirements of priority tramp ants.	Peer-reviewed publications that increase knowledge about factors important in establishment, dispersal, and reproduction relevant to management.
	1.1.4 Increase predictive capabilities for invasion of priority tramp ants and regions/ habitats susceptible to invasion.	Peer-reviewed publications or reports on invasion success of priority tramp ants and susceptibility of regions/ habitats to invasion.
	1.1.5 Enhance the capacity to forecast the potential distribution and rate of spread of priority tramp ants.	Spatially explicit models predicting the potential distribution and spread of priority tramp ants.
	1.1.6 Increase the capacity for research and management training relevant to tramp ant management.	Increased research training and research degrees relevant to management of tramp ants.

Action group	Actions	Performance indicators (the extent to which the following are in place)
1.2. Incorporate Indigenous traditional ecological knowledge into tramp ant management (High priority, Short term)	1.2.1 Consult Indigenous landholders and include traditional ecological knowledge in management of tramp ants.	Improved surveillance and management of tramp ants on Indigenous-owned lands and in other areas.
1.3 Assess tramp ant impacts in Australia and its territories (High priority, Short term)	1.3.1 Quantify direct and indirect impacts (and mechanisms of impact) of priority tramp ants, focusing on biodiversity but where appropriate including other environmental, economic, health and cultural impacts.	Peer-reviewed publications and reports documenting impacts for priority tramp ants established in Australia or its territories as a basis for risk assessment and establishing priorities for management response.
	1.3.2 Review known impacts of all tramp ant species of concern, especially those species emerging as threats.	Reports on potential impacts for species of concern that are not yet established in Australia or its territories as a basis for risk assessment and establishing priorities for management response.
	1.3.3 Commission an economic assessment of environmental /human health/social costs of priority tramp ants.	An economic assessment of the broad direct and indirect costs of tramp ants to Australian society.
1.4 Create a central repository or linked network for knowledge relevant to the management of tramp ants (Very high priority, Medium term)	1.4.1 Identify an agency or organisation to act as a clearing-house for information relevant to a national response to tramp ants.	A clearing-house for information on tramp ant species relevant to their management in Australia, its territories, and the region.
	1.4.2 Harmonise data collection, storage, retrieval, and exchange among the Australian Government, states and territories, and within the Asia Pacifi c region.	Consistent methods of data management increase the value, ease of use, and application of the database.
	1.4.3 Compile a list of technical experts on tramp ants and their specialities.	Technical experts easily identifi ed, and consulted more rapidly and frequently by key stakeholders; list of experts incorporated into contingency plans.
	1.4.4 Incorporate existing data on distributions, existing action plans, knowledge summaries, contingency plans, expert lists, and links to other sites.	High levels of usage and 'one-stop shopping' by key stakeholders.
	1.4.5 Make database freely available and easily accessible to all.	High level of usage of database by researchers, managers, key stakeholders, policymakers, and the public.

Objective 2

Prevent entry and spread of tramp ants by increasing diagnostic capacity, offshore surveillance, inspection, treatment, and national, state and territory surveillance.

Action groups 2.1 to 2.3 aim to develop a preventative strategy. Accurate and rapid diagnostics (2.1) are critical to surveillance strategies. Capacity can be enhanced through targeted support for ant bioinformatics and training eg by the Australian National Insect Collection, the Australian Quarantine and Inspection Service (AQIS), state and territory museums, universities, and through the annual delivery of a short course on tramp ant identifi cation and biology. Enhanced capacity for offshore surveillance, inspection and treatment (2.2) can decrease the probability of tramp ants reaching the Australian border just as improved surveillance in high-risk regions and at high-value sites in Australia (2.3) can lead to early detection of incipient populations of priority tramp ant species.

Improving diagnostic capacity is a very important action and could be initiated in the near term. Arrangements to enhance offshore surveillance are a critical priority, but depend on negotiation of bilateral or regional agreements so are likely to be medium-term. Developing nationally consistent surveillance protocols is a very high priority and could be achieved in the near term. A national survey to produce an up-to-date status of tramp ants in Australia is a very high priority longer-term action that could be initiated in the near term.

Action group 2.2 could be accelerated through integrating tramp ant surveillance into existing surveillance activities, bilateral arrangements with countries in Australia's region, and active participation in regional cooperative programs (eg the Pacifi c Ant Prevention Plan).

Action group	Actions	Performance indicators (the extent to which the following are in place)
2.1 Improve diagnostic capacity and service (Very high priority, Short term)	2.1.1 Boost national diagnostic capacity through increased taxonomic support, training, and expertise.	Larger pool of trained experts for tramp ant diagnostics and improved ant identifi cations.
	2.1.2 Produce training course for tramp ant identifi cation and biology.	Short course on ants produced by AQIS, CSIRO, CRCs and universities that increases the quantity and quality of identifi cations by a trained workforce.
	2.1.3 Develop easy-to-use, accessible on-line keys for both professionals and lay people.	Improved rates and accuracy of identifi cation of tramp ants by professionals and the public.
	2.1.4 Identify genetic/biochemical signatures for rapid and simple identifi cation of priority tramp ants.	Capacity to identify invasive tramp ants without taxonomic expertise.
	2.1.5 Provide voucher specimens to high-risk ports and high-value conservation sites.	Improved confi dence, ease, and accuracy in identifi cation of tramp ants.
	2.1.6 Investigate cost-effective diagnostic services and removal of disincentives to report tramp ants in all states and territories.	Increased rates of reporting by stakeholders and the public.

Action group	Actions	Performance indicators (the extent to which the following are in place)
2.2 Improve offshore surveillance, inspection, and treatment (Very high priority, Medium term)	2.2.1 Build offshore surveillance capacity, especially in South-east Asia and the Pacific.	Fewer introductions of priority and other tramp ants into Australia.
	2.2.2 Support regional training and workshops.	Improved offshore capacity for surveillance, inspection and treatment.
	2.2.3 Support the development of regional plans to prevent tramp ant invasions.	Effective and relevant regional initiatives on tramp ant management.
	2.2.4 Investigate development of hygiene policy for overseas ports identifi ed as high risk.	Improved risk mitigation for tramp ants offshore.
	2.2.5 Expand and enhance pre-border and border surveillance for priority tramp ant species.	Establishment or extension of surveillance programs such as AQIS's Northern Australia Quarantine Strategy (NAQS) to include high-risk regions such as Australia's eastern seaboard.
	2.2.6 Increase environmental context of surveillance, especially in high-risk areas.	Improved detection and response to tramp ants that threaten biodiversity and ecological communities.
	2.2.7 Investigate further collaboration between border control agencies in the region (port reviews, coordination of aid programs in region).	Harmonisation of border inspection, surveillance, and treatment for tramp ants in the region.
2.3 Enhance national and state/territory surveillance (Very high priority, Medium term)	2.3.1 Review current world data on surveillance methodologies for priority tramp ant species.	Synthesis of knowledge of available methodologies for effective surveillance.
	2.3.2 Develop and validate protocols for surveillance in different contexts (ie ports, environment, agriculture, and urban).	Effective protocols for surveillance in different habitats and contexts.
	2.3.3 Design and conduct a national survey for priority tramp ant species. Include conservation, agricultural and urban contexts, especially in high-risk regions.	Up-to-date status of tramp ants in Australia.
	2.3.4 Analyse known barrier breaches and incursions to assess pathways for tramp ant species detected at the border.	Objective basis to identify pre-border and border prevention measures.

Objective 3

Prepare for rapid response to tramp ant incursions and spread through risk assessment of tramp ant species and pathways of introduction, and development of contingency plans.

Action groups 3.1 and 3.2 plan and prepare in advance for response to tramp ants at all stages in the invasion sequence. The production of risk assessments to develop a national priority list of tramp ant species and risk analyses of introduction pathways, vectors and commodities (3.1) is a very high priority action. Similar risk analyses to identify high-value sites and habitats that are highly susceptible to tramp ant invasion and impacts, particularly in a conservation context, are also very high priority actions. Risk assessment activities could be accelerated through a bilateral arrangement with the Ministry of Agriculture and Forestry New Zealand which has already produced detailed risk assessments for tramp ant species for Biosecurity New Zealand. These actions should be implemented upon adoption of the threat abatement plan.

Development of contingency plans (3.2), based on up-to-date knowledge and operational experience, is essential to effective and rapid response to invasive tramp ants. This is a very high priority and should be implemented upon adoption of the threat abatement plan.

Action group	Actions	Performance indicators (the extent to which the following are in place)
3.1 Produce risk assessments for tramp ants, pathways, and regions and habitats susceptible to invasion and impact (Very high priority, Short term)	3.1.1 Develop risk profi les for tramp ants. Identify, list, and set priorities for national priority invasive ant species.	A national priority list of tramp ant species.
	3.1.2 Develop risk profi les for regions and habitats in relation to tramp ant invasion and impact.	Identified high-risk regions and habitats in Australia and its territories.
	3.1.3 Produce risk analysis for introduction pathways for tramp ants using the Pest and Disease Information Database and the AQIS Quarantine Incidents Reporting System. Establish origin, nodes, commodities, vectors, and numbers per intercept to identify high-risk source areas, vectors, and commodities.	Objective risk assessments, based on best available data, for source ports, pathways of introduction, vectors, and specifi c commodities.
	3.1.4 Profi le pathways, vectors, and commodities for movement of tramp ants within Australia (eg between states/territories and bioregions).	Identified high-risk pathways, vectors, and commodities for spread of tramp ants within Australia to produce movement controls that minimise spread.
3.2 Develop generic, specifi c, and context-dependent contingency plans (Very high priority, Short term)	3.2.1 Identify resources, treatment options, technical expert list, etc prior to actual detection of incursion.	A set of contingency plans for priority tramp ant species, available and accessible.
	3.2.2 Develop and incorporate emergency response procedures in a variety of contexts, including premises, enterprises, and conservation reserves.	Ability to respond rapidly to tramp ant detections in a variety of contexts to contain, prevent spread, and treat.
	3.2.3 Incorporate existing action plans for tramp ant management into contingency plans.	Realistic contingency plans based on previous operational experiences.
	3.2.4 Establish agreed roles, responsibilities and resource arrangements in advance. Develop strategy to rapidly identify lead agency for rapid response.	Rapid and effective response with clear lines of authority. Suffi cient resources to complete the response.
	3.2.5 Simulate incursion responses to identify gaps, test response effectiveness, and revise contingency plans.	Responses evaluated and improved; contingency plans updated regularly.

■ **Objective 4**

Enhance emergency response to tramp ant incursions by improving reporting and response rates, and by developing tools for response and follow-up.

Action groups 4.1 to 4.3 will improve emergency response to detections of invasive tramp ants. Measures to improve reporting procedures (4.1), including a national, uniform notifi cation system, are crucial to rapid emergency response to incursions. Rapid response to detections (4.2) is based on an effective information system, rapid notifi cation of stakeholders, effective interim management procedures, and effective decision-making tools to arrive at a management response. Response also depends on the availability of technologies, tools, and approaches to eradicate or control specifi c tramp ant incursions in different management contexts, and tools to evaluate the effectiveness of the response and adapt management if necessary (4.3).

These actions groups are all critical for an effective operational response to a tramp ant incursion and should be implemented upon adoption of the plan. Progress of actions 4.2 and 4.3 could be accelerated through cooperation with the Ministry of Agriculture and Forestry New Zealand and its National Invasive Ant Program, which is currently addressing these issues.

Action group	Actions	Performance indicators (the extent to which the following are in place)
4.1 Improve reporting of new detections of tramp ants (High priority, Short term)	4.1.1 Develop a simple, uniform reporting system with an offi cial notifi cation process, integrated with existing or proposed reporting systems (eg those envisaged in industry biosecurity plans).	Uniform reporting standards and notifi cation procedures across the States and Territories in all contexts (eg environmental, agricultural, urban).
	4.1.2 Develop effective mechanisms for data capture, eg a call centre with public access.	Ease of reporting and effective data storage.
	4.1.3 Investigate cost-effective diagnostic services and removal of disincentives to report tramp ants in all states and territories.	Increased rates of reporting by stakeholders and the public.
4.2 Accelerate response to new detections of tramp ants (High priority, Short term)	4.2.1 Establish immediate response process with suffi cient emergency capacity and, where necessary, legislative authority.	Ability to draw on existing response frameworks (eg weeds, animal health; VET response database).
	4.2.2 Develop lists of key contacts, stakeholder expert list (environmental, and as relevant, agricultural, health and cultural contexts).	Ability to rapidly notify key stakeholders and affected sectors of society.
	4.2.3 Develop interim management responses (ie containment strategies including quarantine and movement controls).	Interim management responses incorporated into contingency plans.
	4.2.4 Produce decision-making tools to decide on the nature of the management response (ie eradicate, contain or control).	Objective basis for decision on nature of the management response.
	4.2.5 Produce and distribute a generic information system for tramp ant management. This could be based on the Fire Ant Information System or other systems –such as the BIOSIRT information management system for data management and documentation of incursion responses).	Tried, tested, and adaptable information system for data management, documentation and evaluation of management responses.

Action group	Actions	Performance indicators (the extent to which the following are in place)
4.3 Develop effective control/delivery technologies and effi cient monitoring/ surveillance protocols (High priority, Medium term)	4.3.1 Conduct fi eld research trials of control techniques.	'Best practice' control measures available for use.
	4.3.2 Support research for new attractants and chemicals; develop effective delivery systems.	Range of effective products available for control and delivery systems.
	4.3.3 Pre-register chemical control products for sets of tramp ants and a variety of contexts (eg conservation, urban, agriculture).	Most effective and appropriate control products available for different contexts of management response.
	4.3.4 Ensure that control techniques and delivery systems minimise non-target impacts on biodiversity, social values, and human health.	Control technologies and delivery systems minimise risks to an acceptable level.
	4.3.5 Explore other control technologies, including biological control.	Alternative methods to chemical control available.
	4.3.6 Develop monitoring protocols for follow-up, including milestones.	Effective and validated monitoring protocols for objective evaluation of treatments.
	4.3.7 Develop monitoring protocols for assessing non-target impacts on biodiversity, social and cultural values, and human health.	Effective and validated monitoring protocols evaluating non-target impacts.
	4.3.8 Develop protocols to assess failure/ success of the response.	Objective basis to stand down or alter and adapt management response.

■ **Objective 5**

Build stewardship by engaging, educating, and informing the Australian community about the impacts of invasive tramp ants and effective means of response.

Action group 5.1 builds shared stewardship through increased community and stakeholder awareness of tramp ants and participation in tramp ant management.

These actions are important to the success of the threat abatement plan. Although these actions are ongoing, key performance indicators can be achieved within the initial fi ve years of the plan.

These actions can be accelerated by building on the community and stakeholder awareness campaigns of the National Eradication Program for the Red Imported Fire Ant and other effective awareness campaigns for invasive alien species (eg AQIS's Quarantine Matters!).

Action group	Actions	Performance indicators (the extent to which the following are in place)
5.1 Build stewardship by engaging, educating, and informing all sectors of the Australian community about tramp ants and their impacts (High priority, Medium term)	5.1.1 Build on the awareness campaign for the red imported fi re ant by extending it to other priority tramp ant species.	Increased rates of reporting of tramp ants, increased coordination and participation among stakeholders, increased political will to establish and guarantee funding for key actions.
	5.1.2 Develop educational curricula on tramp ants for primary and secondary schools including Australian case studies. Incorporate both science-based and traditional Indigenous ecological knowledge.	Increased public understanding and awareness of tramp ants and their impacts.
	5.1.3 Initiate national awareness campaigns for best practices in key industries associated with high-risk pathways, vectors and commodities for tramp ants, both into and within Australia.	Increased awareness and use of best practices among stakeholders to reduce incidence of tramp ants in commodities, vectors, and pathways, both into and within Australia.
	5.1.4 Develop community outreach programs to encourage participation in management projects.	Demonstration-through-management projects with community engagement and participation.

Objective 6

Coordinate Australian Government, state and territory government, and local management activities in Australia and the region.

Action groups 6.1 and 6.2 coordinate all other activities outlined in the plan to enhance tramp ant management across jurisdictions and tiers of government, and among stakeholders. These actions to develop mechanisms for arrangements and agreements among stakeholders are a very high priority and should commence upon adoption of the plan.

Action to coordinate such a complex issue in invasive species management is a major challenge (6.1). The Department of the Environment and Heritage will facilitate the establishment of a National Implementation Team that will include key stakeholders and experts. It is critical that the National Implementation Team for the plan has the ability to implement the plan effectively. Furthermore, as national biosecurity arrangements evolve, the plan should be integrated into broader policy and management of invasive species in Australia. It is important that the threat abatement plan be considered in regional management plans, especially those for high-risk regions with high-value sites that adopt a whole-ecosystem approach to management.

Cooperative bilateral and regional arrangements (6.2) provide important opportunities to reducing the threat to Australia.

Action group	Actions	Performance indicators (the extent to which the following are in place)
6.1 Coordinate Australian Government, state, territory, and local management activities for tramp ants in Australia (Very high priority, Short term)	6.1.1 The Department of the Environment and Heritage facilitates the establishment of a National Implementation Team that will include key stakeholders and experts.	Coordination in national tramp ant management.
	6.1.2 National Implementation Team to establish clear links with State and Territory-based management groups and with local and regional bodies with responsibilities for management of tramp ants.	Links established with State/Territory threat abatement teams (or equivalents) and agencies, and with interagency committees, including Indigenous management groups, involved in management of tramp ants in Australia.
	6.1.3 National Implementation Team to develop a mechanism to defi ne roles and responsibilities of stakeholders in advancing the objectives of the plan.	Agreed roles and responsibilities for response to invasive tramp ants.
	6.1.4 National Implementation Team to establish links with groups developing national policy frameworks for invasive species.	Integration of tramp ant management in broader policy and management initiatives for invasive species.
	6.1.5 National Implementation Team to develop mechanisms to ensure that objectives of the plan are considered in regional management plans that incorporate a wide range of management issues.	Integration of tramp ant management with other high-level management objectives in ecosystem-level management plans.
	6.1.6 National Implementation Team to identify and establish a communication network of key stakeholders.	Communication network established and used between stakeholders.
	6.1.7 National Implementation Team to develop a mechanism to establish an agreed priority list for actions in the plan.	An agreed list of priority actions to be funded for management of tramp ants.
	6.1.8 National Implementation Team will regularly review and evaluate the implementation of the plan.	Recommendations to vary the plans are made to the Minister as required.

Action group	Actions	Performance indicators (the extent to which the following are in place)
6.2 Cooperation through bilateral agreements and partnerships within Australia's region (High priority, Medium term)	6.2.1 Support international collaboration and exchange of experts, especially within Australia's region.	Increased number of exchanges and research/management collaborations within the region; increased information sharing and expertise in tramp ant management in the region.
	6.2.2 Increase participation in and links to regional initiatives to manage tramp ants offshore.	Participation in regional initiatives, eg the Pacifi c Ant Prevention Plan; more effective offshore management of tramp ants.
	6.2.3 Develop bilateral cooperation in tramp ant management activities of common interest in the region (eg with Biosecurity New Zealand).	Minimisation of duplication, maximisation of use of expertise, and economies of scale in the management of tramp ants.

3.4 Other ecological matters affected by the plan

Implementation of this plan could affect other ecological matters. For example, operational responses involving chemical treatment to control target tramp ants could also have non-target impacts on some native animals, affecting native biodiversity, ecological communities, and ecological processes. Implementation of all proposed actions will have regard to their broader ecological impacts.

4. Duration and evaluation of the plan

4.1 Duration and cost of the plan

The plan has been written to refl ect that the threat abatement process is likely to be ongoing, as there is no likelihood of nationally eradicating all tramp ant species in the foreseeable future.

The costs of many of the actions will be determined by the level of resources that stakeholders commit to management of the problem. Therefore, the total cost of the plan's implementation cannot be quantifi ed at the time of making this plan.

The making of this plan does not necessarily indicate individual stakeholders' commitment to undertaking any specifi c actions. Achieving the objectives of this plan and provision of funds may be subject to budgetary and other constraints. With changes in knowledge, proposed actions may be modifi ed over the life of the plan.

Australian Government funds may be available to implement key national environmental priorities, such as relevant actions listed in this plan and actions identifi ed in regional natural resource management plans.

4.2 Implementing the plan

The Australian Government Department of the Environment and Heritage, jointly with other Australian Government departments, will draw on appropriate State/Territory, national, and regional expertise to form a National Implementation Team to facilitate the plan's implementation. The Team will establish clear links with State and Territory agencies and with local and regional bodies that are responsible for the management of invasive tramp ants.

The Department of the Environment and Heritage will facilitate the implementation of the plan, encouraging involvement of key stakeholders and experts in the research and management of tramp ants. The Australian Government will implement the plan as it applies to Commonwealth land and will act in accordance with the provisions of the plan.

4.3 Reviewing the plan

Section 279 of the EPBC Act provides for the review of this plan at any time and requires that it be reviewed at intervals of no longer than fi ve years. If evidence is found that the practices recommended in the plan need to be updated or modifi ed to prevent species becoming threatened, recommendations can be made to the Minister that the plan be revised sooner.

5. Glossary and abbreviations

AQIS	Australian Quarantine and Inspection Service
Barrier breach	Escape of an alien species beyond barrier controls but prior to its establishment.
Commodity	A type of organism, product, or other article being moved for trade or other purpose that could harbour tramp ants.
Containment	Application of measures in and around an infested area to prevent spread of an invasive tramp ant beyond a defi ned area.
Contingency plan	A carefully considered outline of the action that should be taken upon the suspected detection of an incursion of an unwanted alien species. Contingency plans are prescriptive in relation to matters such as communication, management, diagnosis, survey, and quarantine.
Control	Suppression of population of the invasive species below an acceptable threshold of environmental or economic impact.
CRC	Cooperative research centre
CSIRO	Commonwealth Scientifi c and Industrial Research Organisation
Ecological community	As defi ned in and listed under the EPBC Act, an assemblage of native species that (a) inhabits a particular area in nature; and (b) meets the additional criteria specifi ed in the Regulations (if any) made for the purposes of this defi nition.
Endangered species	As defi ned in and listed under the EPBC Act, a native species is eligible to be included in the endangered category at a particular time if, at that time, (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth legislation)
Eradication	Application of measures to eliminate an invasive alien species from a defi ned area.
High-value sites	Areas of high biodiversity value such as those reserved for conservation, habitats of threatened species, and areas that are free of invasive tramp ant species.
Incursion stage	Period following the arrival of an alien species in a new environment but prior to the point when it becomes established.
Introduction pressure	The intensity (number of individuals) and frequency (number of introductions per unit time) of introduction of a species.
Invasive alien species	A species transported outside its area of origin that threatens species, habitats or ecosystems or proliferates and spreads in ways that are destructive to the environment, the economy, and society.

Movement controls	Regulations or activities to prevent human-assisted movement of high-risk materials associated with tramp ants from inside a containment area to outside the area.
NAQS	AQIS's Northern Australia Quarantine Strategy
Pathway	The routes by which species move from one locale to another, either within a country or between countries.
Quarantine	Offi cial confi nement of regulated articles for observation and research or for further inspection, testing and/or treatment.
Region (Australia's)	Countries and states closely associated with Australia in the South Pacifi c, South-east Asia, and Eastern Indian Ocean.
Risk analysis	A systematic approach to decision-making regarding alien species through risk identifi cation, assessment, management, and communication.
Risk assessment	The evaluation of the probability of the introduction and spread of a pest and of its associated potential impacts.
Stakeholder	Any person or organisation who will be affected, or thinks they will be affected, positively or negatively by a given management response. This may include landowners, local communities, government agencies with jurisdiction over the managed area, the public, relevant non-government agencies, and special interest groups. The latter two groups may represent a range of interests such as environmental and biodiversity protection, heritage conservation, or a particular industry.
Supercolony	Extended areas, spreading over tens of square metres to thousands of square kilometres, of interconnected populations of unicolonial tramp ants.
TAP	Threat abatement plan
The Department	Australian Government Department of the Environment and Heritage
Threatened ecological communities	Refers to the Australian Government list of threatened ecological communities divided into the following categories as per the EPBC Act: critically endangered; endangered; vulnerable.
Threatened species	Refers to the Australian Government list of threatened native species divided into the following categories as per the EPBC Act: critically endangered; endangered; vulnerable; conservation dependent.
Tramp ants	A diverse group of ant species originating from many regions that are readily moved across the world through a variety of transport pathways. They share genetic, behavioural, and ecological attributes that increase their probability of entry, establishment and spread, ecological dominance, and high impact in areas of introduction.
Transition probabilities	The probability of a species successfully moving from one stage to another in the invasion sequence.
Unicoloniality	The free movement of ants of the same species between nests that is highlighted by a lack of intra-species aggression and low genetic diversity.
Vulnerable species	As defi ned in and listed under the EPBC Act, a native species is eligible to be included in the vulnerable category at a particular time if, at that time, (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

6. Acknowledgements

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Appendix A. Threatened species affected by tramp ants

The following species are listed under the *Environment Protection and Biodiversity Conservation Act 1999*. It is considered that they may be adversely affected by the red imported fi re ant*(Solenopsis invicta)* or the yellow crazy ant *(Anoplolepis gracilipes)*. No other species listed under the EPBC Act are currently considered at risk from other tramp ant species considered in the plan.

E = Endangered, V = vulnerable, U = unlisted.

Red imported fi re ant*(Solenopsis invicta)*
http://www.deh.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pl

Common names	Species	Current status	Distribution
Listed threatened species that may be adversely affected and could become listed at a higher threatened category			
Southern cassowary	*Casuarius casuarius johnsonii*	E	N Qld
Eastern bristlebird	*Dasyornis brachypterus*	E	SE Qld, NSW, Vic.
Star fi nch (eastern)	*Neochmia rufi cauda rufi cauda*	E	Qld, NT, WA
Night parrot	*Pezoporus occidentalis*	E	SW Qld, SA
Buff-breasted button-quail	*Turnex olivei*	E	N Qld
Golden-shouldered parrot	*Psephotus chrysopterygius*	E	N Qld
Gouldian fi nch	*Erythrura trichroa*	E	N Qld, NT, WA
Western whipbird (western heath)	*Psophodes nigrogularis nigrogularis*	E	WA
Western ground parrot	*Pezoporus wallicus fl aviventris*	E	WA
Southern emu-wren (Fleurieu Peninsula), Mount Lofty southern emu-wren	*Stipiturus malachurus intermedius*	E	SA
Bathurst copper butterfl y	*Paralucia spinifera*	V	S. NSW
Squatter pigeon (southern)	*Geophaps scripta scripta*	V	Qld, NSW
Plains-wanderer	*Pedionomus torquatus*	V	SA, Qld, NSW, Vic
Black-breasted button-quail	*Turnix melanogaster*	V	Qld, NSW
Slender-billed thornbill (western)	*Acanthiza iredalei iredalei*	V	WA
Thick-billed grasswren (eastern)	*Amytornis textilis modestus*	V	NSW, SA, NT

Common names	Species	Current status	Distribution
Listed threatened species that may be adversely affected and could become listed at a higher threatened category *continued...*			
Thick-billed grasswren (Gawler Ranges)	*Amytornis textilis myall*	V	SA
Thick-billed grasswren (western)	*Amytornis textilis textiles*	V	WA
Noisy scrub-bird	*Atrichornis clamosus*	V	WA
Partridge pigeon (western)	*Geophaps smithii blaauwi*	V	WA
Partridge pigeon (eastern)	*Geophaps smithii smithii*	V	NT
Malleefowl	*Lipoid ocelot*	V	WA, SA, NSW, Vic
Western whipbird	*Psophodes nigrogularis*	V	WA, SA, Vic
Southern emu-wren (Eyre Peninsula)	*Stipiturus malachurus parimeda*	V	SA
Mallee emu-wren	*Stipiturus mallee*	V	SA, NSW, Vic
Unlisted species or taxa that could be adversely affected			
Ants	Subfamily Formicidae	U	Widely distributed
Butterfl ies and moths	Order Lepidoptera	U	Widely distributed
Flightless carabid beetles	Family Carabidae	U	Widely distributed
Land snails	–	U	Widely distributed
Earthworms	–	U	Widely distributed
Trap-door spiders	Family Mygalolomorpha	U	Widely distributed
Quails	Subfamily Phasianinae	U	Widely distributed
Button-quails	Family Turnicidae	U	Widely distributed
Australian brush-turkey, orange-footed scrubfowl	Family Megapodiidae	U	N. Australia and Qld, NSW
Bustards	Family Otididae	U	Widely distributed
Wetland birds (eg grebes; herons, egrets and bitterns; geese, swans and ducks)	Families Podicipedidae, Ardeidae, Anatidae	U	Widely distributed
Waders	Families Jacanidae, Burhinidae, Rostratulidae, Haematopodidae, Charadriidae, Recurvirostridae, Scolopacidae, Phalaropodidae, Glareolidae	U	Widely distributed
Pigeons, doves	Family Columbidae	U	Widely distributed
Ground-nesting seabirds (eg gulls and terns)	Family Laridae	U	Coastal regions

Yellow crazy ant (Anoplolepis gracilipes)

http://www.deh.gov.au/biodiversity/threatened/ktp/christmas-island-crazy-ants.html;
http://www.deh.gov.au/biodiversity/threatened/species/e-a-enastri.html

Common names	Species	Current status	Distribution
Listed species that are adversely affected and could become listed at a higher threatened category			
Christmas Island pipistrelle	*Pipistrellus murrayi*	E	Christmas Island
Christmas Island shrew	*Crocidura attenuate trichura*	E	Christmas Island
Christmas Island gecko	*Lepidodactylus listeri*	V	Christmas Island
Gove crow butterfl y	*Euploea alchathoe enastri*	E	NE Arnhemland
Listed species that are adversely affected but for which there is no evidence that their listing status should change			
Abbott's booby	*Papasula abbotti*	E	Christmas Island
Christmas Island goshawk	*Accipter fasciatus natalis*	E	Christmas Island
Christmas Island frigatebird	*Fregata andrewsi*	V	Christmas Island
Christmas Island hawk-owl	*Ninox natalis*	V	Christmas Island
Unlisted species that are adversely affected and could become eligible to be listed as Vulnerable			
Tahitian chestnut	*Inocarpus fagifer*	U	Christmas Island
Christmas Island fl ying fox	*Pteropus melanotus natalis*	U	Christmas Island
Emerald dove	*Chalcophaps indica natalis*	U	Christmas Island
Christmas Island thrush	*Turdus poliocephalus erythropleurus*	U	Christmas Island
Red land crab	*Gecarcoidea natalis*	U	Christmas Island
Unlisted ecological communities that are adversely affected and could become eligible to be listed as Vulnerable			
Terrace rainforest		U	Christmas Island
Shallow soil rainforest		U	Christmas Island
Limestone scree slopes and terraces		U	Christmas Island
Deeper plateau and terrace soils evergreen forest		U	Christmas Island
Unlisted species or taxa that are adversely affected but for which there is no evidence that they would become listed			
Christmas Island giant gecko	*Cyrtodactylus sadlieri*	U	Christmas Island
Blue-tailed skink	*C. egeriae*	U	Christmas Island
Forest skink	*Emoia nativitatis*	U	Christmas Island
Robber crab	*Birgus latro*	U	Christmas Island
Blue crab	*Cardisoma hirtipes*	U	Christmas Island
Little nipper	*Geograpsus grayi*	U	Christmas Island
Endemic litter invertebrates		U	Christmas Island