Senate Inquiry:

Red Imported Fire Ants in Australia

Supporting evidence submission by the

Invasive Species Council

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About the Invasive Species Council

The Invasive Species Council was formed in 2002 to advocate for stronger laws, policies, and programs to keep Australian biodiversity safe from weeds, feral animals, exotic pathogens, and other invaders. It is a not-for-profit charitable organisation, funded predominantly by donations from supporters and philanthropic organisations.

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1. Executive summary

Australia's governments have underestimated fire ants (Solenopsis invicta) since they were first detected in 2001. Inadequate and often uncertain funding for fire ant eradication has hampered the response to this invasive species.

Despite this, fire ant eradication efforts have:

- Significantly slowed the spread of fire ants in Australia
- Responded effectively to 7 fire ant post border incursions
- Prevented billions of dollars of economic, industry, environmental and health impacts

Investments made in fire ant eradication have so far prevented their spread across much of eastern Australia. However, the stated goal of eradication has remained elusive for the remaining south-east Queensland outbreak.

Fire ants are a devastating threat to Australia's health, tourism, the environment, agriculture, infrastructure, and social amenity. Combined fire ant impacts are estimated to be up to $2 billion annually if they are allowed to spread across the continent. The annual costs of these impacts and managing fire ant inundation far exceed amounts spent on fire ant eradication since 2001.

The presence of the largest and last remaining fire ant stronghold on the Queensland-New South Wales Border poses an extreme risk to Australia. A single queen undetected in a new location could spark a new infestation. Recent detections and interceptions in Victoria and Tasmania show the risk of Queensland's fire ant population to the entirety of Australia. Eradication must remain the objective.

There is an urgent need for a new biosecurity response funding model that allows for more rapid decision-making for large-scale threats. The response to biosecurity threats like fire ants has historically been led by Agriculture Departments. However, given that the impacts of fire ants are dispersed across a range of sectors, it would be appropriate to consider response funding on a whole of government basis.

In 2017, $411 million was committed to eradication program work until 2027. These funds were already exhausted by 2023 - much faster than the planned 10 year timeframe. Slow government decision-making, a lack of thorough infestation area delimitation informing funding decisions and optimistic predictions about planned treatment work contributed to the failure of this plan. Despite this failure, the infestation had been contained to southern Queensland until November 2023 when fire ants breached containment into northern New South Wales.

In 2023 a new fire ant eradication response plan was agreed to by Federal, State and Territory ministers. Once every state and territory government commits funding the new eradication plan will have $593 million until 2027. This funding is not enough to achieve fire ant eradication, but is a significant step in the right direction.

The 2021 Independent Review determined that at least 10 years and up to $300 million per year would be required to eradicate fire ants. The availability and escalating costs of materials and workforce along with fire ant infestation growth over 2023 are reasonably expected to increase eradication costs above predicted levels. An ongoing transparent evaluation of resource availability for fire ant eradication work would provide community confidence that eradication efforts remain viable.

The commitment to full eradication agreed to by Agriculture Ministers at their July 2023 meeting necessitates a larger commitment over the next four years and beyond 2027 in line with that recommended in the 2021 independent review.

Eradicating red imported fire ants will be a major technical, scientific and governance challenge. Eradication is the only way to prevent the eventual spread of fire ants across Australia.

While eradication is still possible it must be a priority.

Australia cannot afford governments to fail on this.

2. Recommendations

Urgently needed actions to improve fire ant eradication

1. Eradication should remain the goal, the current national response plan should be endorsed and South Australia, Western Australia and Tasmania should commit their outstanding share of funds to this plan.
2. Urgently and rapidly review the funding for the national response plan.
3. Commit at least $10 million/year for public advertising, education and engagement.
4. Increase transparency and accountability in program delivery and review through:
    a. timely publication of key reports, minutes, priorities and data.
    b. formal stakeholder consultation and involvement in the steering committee.
5. Urgently increase resources for the Fire Ant Suppression Taskforce (FAST) to support self-treatment by residents in Brisbane City and Moreton Bay local government areas.
6. Ensure any additional outbreaks in NSW are detected and the risk of new outbreaks in NSW is limited by:
    a. Extending the Queensland fire ant biosecurity zones south to the Queensland-New South Wales border, including key cross border freight corridors.
    b. Auditing the movement of construction materials from south-east Queensland to NSW in 2022 and 2023 and systematically checking all high risk sites identified.
    c. Increasing ongoing biosecurity spot checks at Queensland border crossing points.

Longer term actions needed to achieve eradication and improve biosecurity preparedness

7. Extend ministerial responsibility for fire ant eradication to include environment and health ministers, in addition to agricultural ministers.
8. Ensure eradication funding decisions are made as part of a whole-of-government response, and not just as part of the biosecurity or agriculture budget.
9. Commence development on a funding package for fire ant eradication beyond 2027, led by the Commonwealth Government.
10. Consider establishing a stand alone fire ant response authority to run the eradication program.
11. Undertake a comprehensive study of the predicted biodiversity impacts of fire ants and develop key strategies to minimise their impact on Australia's environment if they spread beyond south-east Queensland.
12. Reform and increase national biosecurity funding to ensure that risk creators, like goods importers, pay their fair share so that we can fund the measures needed to prevent high risk invasive species from arriving and spreading in Australia.
13. Increase funding for research and development into technologies targeting invasive insects, such as eDNA marker surveillance.
14. Establish a permanent national body to coordinate national actions on invasive ants and provide dedicated funding for the National Invasive Ant Biosecurity Plan 2018-2028.
15. Undertake a comprehensive study of the health impacts of fire ants and their predicted cost impacts on Australia's health system.

3. Background

3.1 The Invasive Species Council

The Invasive Species Council advocates for stronger laws, policies, and programs to keep Australian biodiversity safe from weeds, feral animals, exotic pathogens, and other invaders. This is informed by considerable policy, community and on-ground knowledge and experience of the impacts associated with invasive species from across Australia.

An article from 2002 published in The Age on the creation of the Invasive Species Council outlined one of the threatening threats which had prompted the creation of the organisation:

> Of all the invasive species destroying Australia, the imported red fire ant will probably go down in history as one of the most devastating. It is a financial and environmental disaster expected to cost us $6.7 billion over 30 years. This alien invader is already calling Brisbane home.
>
> It raided the Queensland capital in February 2001 and has since crossed scores of suburbs, devouring thousands of hectares along the way. That year, it was detected in Victoria, in pot plants from Brisbane and in soil from a United States shipping container. Both infestations were terminated.
>
> Don't think that was the end of the rogue; like another introduced species, the cane toad, it is a monster on the move. It is why the states and territories have contributed to a $123 million eradication scheme, a small price to pay, considering Texas spends about $US580 million a year to merely control these ants.

Since it's formation in 2002 the Invasive Species Council has advocated for fire ant eradication in Australia. This position is based on an understanding of the evidence that eradication is still technically viable, cost-effective and preferable to the impacts of Australia-wide fire ant infestation.

This advocacy has included support for a new 10-year eradication program launched in 2017. Programs to combat fire ants have been pursued in partnership with concerned conservation, land restoration, agriculture, recreation and local government organisations. Through media and allied groups, this advocacy has included community education and engagement with direct approaches to government. While acknowledging shortcomings in government policy and fire ant eradication efforts – including in announcements made in late 2023 – eradication commitments and efforts to date are welcome.

Our advocacy for full fire ant eradication will continue if it remains technically possible – as will efforts to strengthen preventative biosecurity measures to prevent the next fire ant from entering Australia.

3.2 Senate inquiry

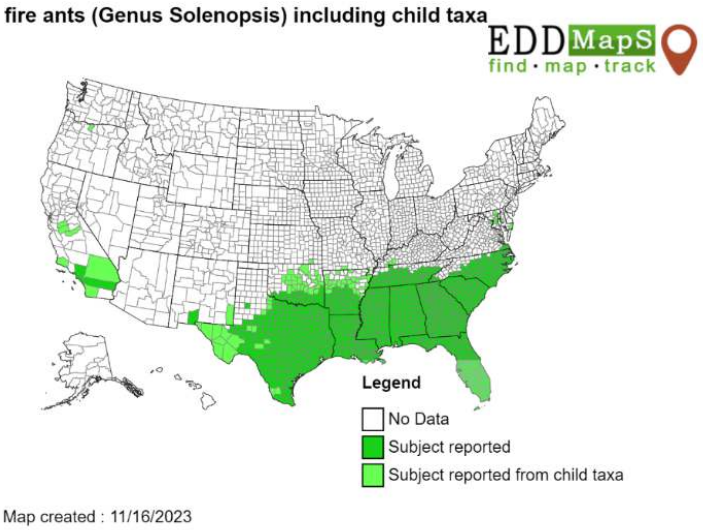
The Invasive Species Council welcomes the senate inquiry into fire ants announced on the 18th of October 2023. The universal parliamentary support for this inquiry demonstrates a broad understanding that the future approach to fire ants in Australia requires consideration and public discussion.

3.3 Origins and global extent of invasive fire ants

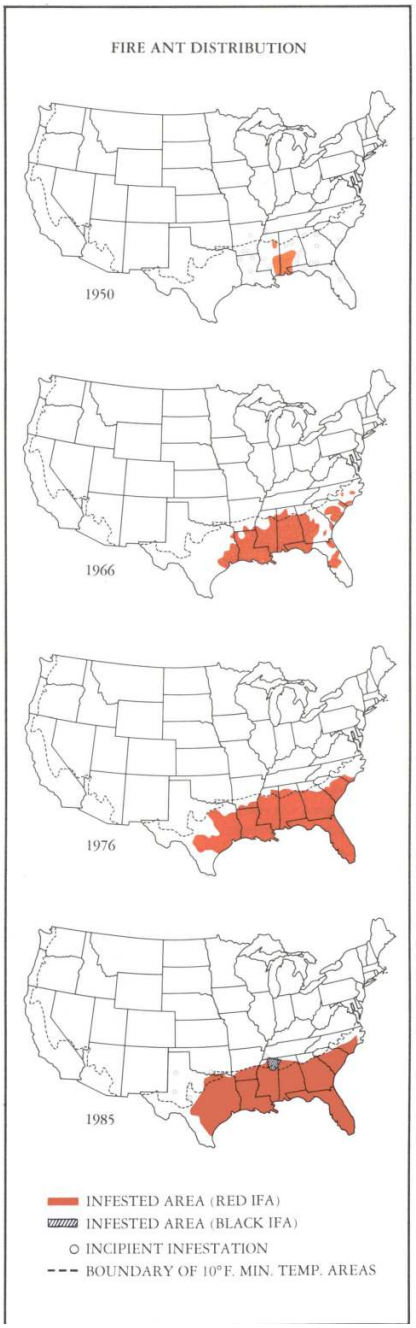
Fire ants are native to the Pantanal – a large wetland environment at the headwaters of the Paraguay river in Argentina, Paraguay and Brazil (Vinson, 1986). They spread to the United States in the 1930's and then to Australia in 2001. The fire ant's native environment makes them quite well adapted to infestation on the Australian mainland. The Pantanal is a large seasonal floodplain (Lytle AJ, 2020) making them naturally adapted to wet-dry cycles experienced across much of Australia.

In the United States, fire ants have spread beyond areas bounded by expected minimum temperatures (Map 1 and 2). Fire ants may be adapting tolerance to colder and hotter temperatures and increased elevation (Lytle AJ, 2020). It is also possible that changes in climatic conditions are increasing the range of suitable fire ant habitation (Morrison, 2005). Data on fire ant spread into habitable range indicates they are already entering climatically suitable zones expected to be viable from 2040 onwards. This indicates that perhaps some combination of adaptation and climate suitability shifts are increasing the potential range of fire ants in the United States. With the United States fire ant infestation currently exceeding 111 million hectares across at least nine states, there are now economic, regulatory and environmental obstacles to eradication in that country (Texas A&M Uni, 2023) (Williams, 1997). Fire ants are a US$7 billion economic impact (USDA, 2014).

Globally, fire ants have spread to many of Australia's key trading partners. This includes New Zealand, Japan, China, and South Korea with East and Southeast Asia, and Central Africa suitable areas for further spread (Chen S, 2020). In September 2023, 88 fire ant colonies were found in Syracuse, Sicily, significantly exposing Europe to fire ant infestation (Barkham, 2023). Half of mainland Europe is suitable for habitation and this is expected to expand as climate shifts alter the effective infestation range (Mattia Menchetti, 2023).



Map 1: Fire ant extent in southern United State, November 2023 (EDD Maps, 2023)



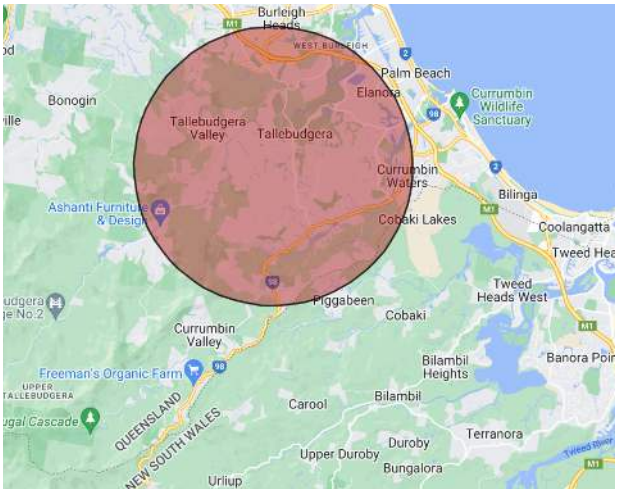
Map 2: spread of fire ants in United States since 1950 (Vinson 1986)

3.4 How fire ants spread

Fire ants are well adapted to territorial expansion through a few key methods:

Nuptial flights

Fire ant queens can fly considerable distances to create new colonies. The distances are variable and depend on the Queen ants size, wind and weather. Fire ant queen flights have been recorded at more than 30km although this is an outlier (Helms, 2018). Most flights provide for new nest establishment within a few hundred metres to a few kilometres. Five-kilometre buffer zones are used in fire ant eradication programs to help offset the risk of spread through Queen flights.



Map 3: 5km zone from Tallebudgera

In 2023, the discovery of fire ant nests at Tallebudgera on the Gold Coast was cause for alarm as it increased the risk of fire ants entering northern New South Wales. Map 3 shows a 5km zone around the Tallebudgera infestation.

Human-assisted movement (cargo & freight vectors)

The initial Australian fire ant incursion was from shipments of cargo. Fire ants reached Fremantle in 2019 in a similar way. A Queen was intercepted in Victoria in shipping.

Human freight is also a vector for local fire ant spread. Nests arrived at Kleinton, Tallebudgera, Minjerribah (North Stradbroke Island) and have expanded north to Morayfield in shipments of soil, hay and mulch. In November 2023, fire ants were detected at Murwillumbah in northern New South Wales 13 Km south of the Queensland border. In January 2024 a fire ant nest was found at Wardell south of Ballina. They are likely to have arrived at these locations in carrier material (soil or lawn).

Community surveillance and enforcement along with awareness and vigilance can help reduce human assisted spread of fire ants.

Rafting

During heavy rain events, fire ants can join together and form rafts, detach and float with floodwaters to reach new areas. These rafts form new colonies after floodwater recedes. This has been observed in Australia (see figure 1).

The possibility of fire ants breaching a river system like the Murray-Darling in time for the next major flood cycle is alarming. It would create the possibility of fire ants spreading very quickly to much of eastern Australia.

Figure 1: Fire ants rafting on floodwater at Rocky Point, Queensland, January 2023

3.5 The history of fire ants in Australia

3.5.1 Incursions in Australia since 2001

Since 2001, there have been many fire ant interceptions in Australia and post-quarantine eradications. A full list is available in Appendix 1 of the National Fire Ant Eradication Program Response Plan 2023-2027 Appendices (National Fire Ant Eradication Program, 2023).

Generally, the Invasive Species Council agrees with the terminology used by the National Fire Ant Eradication Program (NFAEP) concerning the status of current eradication responses. It should be noted that a 600,000-hectare figure has been in use by Departmental authorities for several years while the infestation zone has grown considerably in the Gold Coast and Moreton Bay regions.

Fire ant history of eradication in Australia			
Location	**Year**	**Extent**	**Status**
Port of Brisbane	2001	470 known colonies > 8,300 hectares – origin United States	Eradicated 2005
Richlands/South East Qld	2001	Spread to over 600,000 hectares from north of Brisbane to within 12km of NSW border – origin United States	Eradication underway
Yarwun, Gladstone	2006	Up to 100 colonies – origin Argentina	Eradicated 2007
Port of Gladstone	2013	80 colonies over 4,600 hectares origin United States	Eradicated 2016
Port Botany, Sydney	2014	1 colony – origin Argentina	Eradicated 2016
Brisbane Airport	2015	New infestation detected by genetic tracing – origin United States	Eradicated 2019
Port of Brisbane	2016	New infestation detected by genetic tracing – origin Argentina	Eradicated 2019
Fremantle WA	2019	3 colonies were detected in routine sweeps for other invasive ants – origin China	Eradicated 2023

Table 1: summary of fire ant incursions in Australia since 2001. Source: National Fire Ant Eradication Program Response Plan 2023-2027 Appendices

Reviews conducted into fire ants have found some success in Australia's fire ant response. Specifically, fire ant spread has been contained to southeast Queensland, expanding at a rate of 5km per year. This is a favourable comparison to the United States (48km per year spread) and China (80km per year spread) (Scott-Orr, 2021). Limited localised Incursions have also been successfully eradicated, most recently in Fremantle. The Invasive Species Council agrees with the verdict of past review and eradication experts that without Australia's fire ant response, the eastern states and much of Australia's interior would have endemic fire ants by now (Scott-Orr, 2021).

3.5.2 Previous Reviews and Government Responses

Australia's red imported fire ant (RIFA) eradication program has been subject to several rigorous reviews (Table 2). All reviews have found fire ants could be eradicated, all have made notable recommendations and the response to major reviews has been far too slow. For example: in 2016 a review was provided to the eradication program which was not fully implemented until 2018. In 2021 an urgent review was again provided which is still yet to be fully implemented.

Summary of reviews into Australia's fire ant eradication efforts		
Review	Year	Summary
First scientific review	2001	Excellent progress noted after one year
Second scientific review	2004	Ongoing progress noted
Third Scientific review	2006	Concludes programs work has delayed fire ant infestation by 10+ years
Stoush review	2010	Recommends program move to containment for 24 months. Resources moved from eradication to surveillance
Independent Review	2016	Finds eradication is still possible but requirement for significant resource commitment – this is implemented in late 2017
Wonder Review (efficiency and effectiveness)	2019	Recommendations received to improve the program.
CSIRO movement controls review	2020	Support for movement controls
Second Independent Review	2021	27 recommendations made – including ongoing eradication which remains technically feasible and cost beneficial
Qld Audit Office review of invasive species management	2023	Suggested stronger assessments and public reporting of progress on fire ant eradication

Table 2: summary of reviews conducted into fire ant eradication in Australia since 2001.

A notable statement from the 2016 review about the reasons for unsuccessful eradication follows:

> *The perception that RIFA were controlled; the shortfall between the budget required to achieve eradication and funds received; the reallocation of funds away from eradication to delimitation; the temporary removal of resources (e.g. odour detection dogs, staff) from the SEQ Program to other RIFA and tramp ant eradication campaigns; and the time taken to learn about RIFA and build a suite of management tools and resources required to eradicate RIFA* (Oi, 2016).

The 2021 review's key conclusion was that fire ant eradication was not possible without an increase in funding and resourcing along with a new plan.

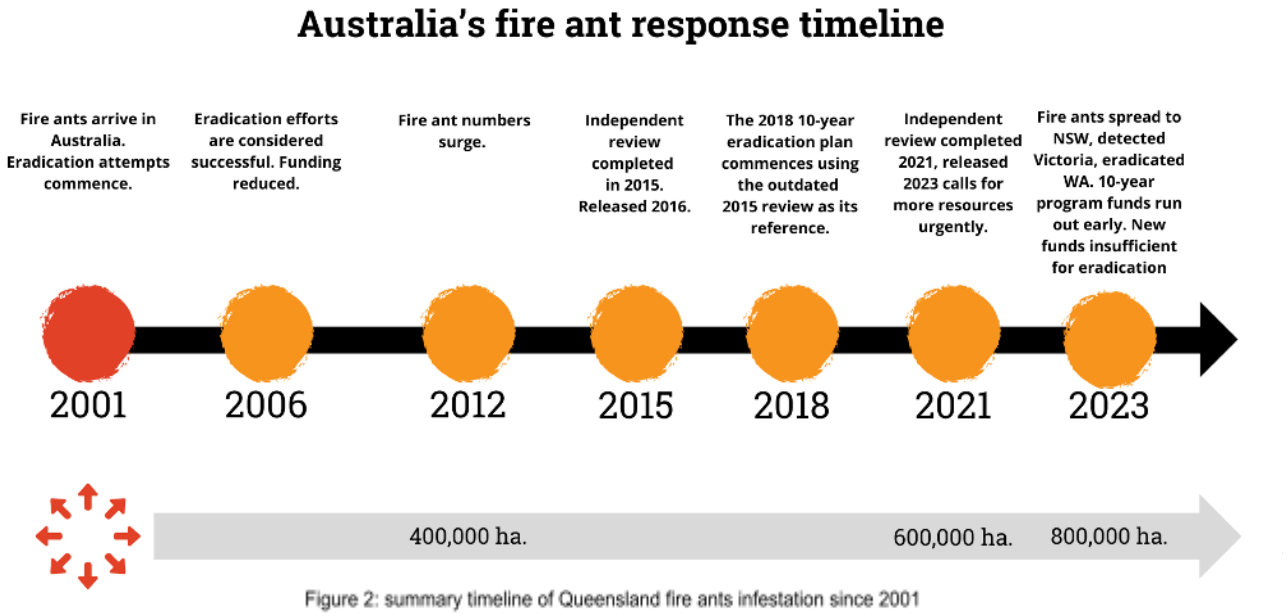


Figure 2: summary timeline of Queensland fire ants infestation since 2001

Year	Cost-shared funding expended	Supplementary QLD funding	Total expenditure
2001–02	27,878,000		27,878,000
2002–03	37,259,290		37,259,290
2003–04	41,905,680		41,905,680
2004–05	32,273,507		32,273,507
2005–06	23,270,729		23,270,729
2006–07	12,757,033		12,757,033
2007–08	12,609,660		12,609,660
2008–09	12,240,526		12,240,526
2009–10	14,465,546		14,465,546
2010–11	14,688,843	5,908,225	20,597,068
2011–12	15,628,117	5,944,249	21,572,366
2012–13	15,433,708	2,818,816	18,252,524
2013–14	14,923,492	3,000,000	17,923,492
2014–15	14,363,134	3,000,000	17,363,134
2015–16	15,567,000	3,000,000	18,567,000[1]
TOTAL	**$305,264,265**	**$23,671,290**	**$328,935,555**

Table 3: fire ant eradication expenditures by year leading up to the 10 year national eradication plan.

Fire ant eradication funding has fluctuated considerably over the past twenty years. In particular these fluctuations were noticeable between 2006 and 2015 following initial perceived fire ant eradication success. Supplemental funding allocations from the Queensland government were necessary to ensure continuity of operations. This ad hoc response was often determined year to year, preventing effective forward planning.

In 2017, a $411 million commitment was made for an eradication plan to run until 2027 (Department of Agriculture and Fisheries, 2023). An audit found that funds would actually be exhausted by 2023, five years earlier than anticipated (Queensland Audit Office, 2023). The table below outlines the planned budget and actual expenditure levels calculated from program annual reports,demonstrating the shortfall in funding from the second year of the 10 year plan. This shortfall in particular is related to the cost and resourcing requirements of treating the western part of the fire ant containment boundary.

Funding allocations approved in 2017 were clearly insufficient for the task. Factors contributing to the inadequacy of the allocation could relate to the delay between reviews and implementation, insufficient delimitation of infestation areas and intervening factors (for example: flooding events and COVID-19) that have impacted eradication efforts.

If a similar funding shortfall to that in 2017-2018 occurs in the current response, it would undermine future eradication efforts and likely lead to further fire ant spread in Australia.

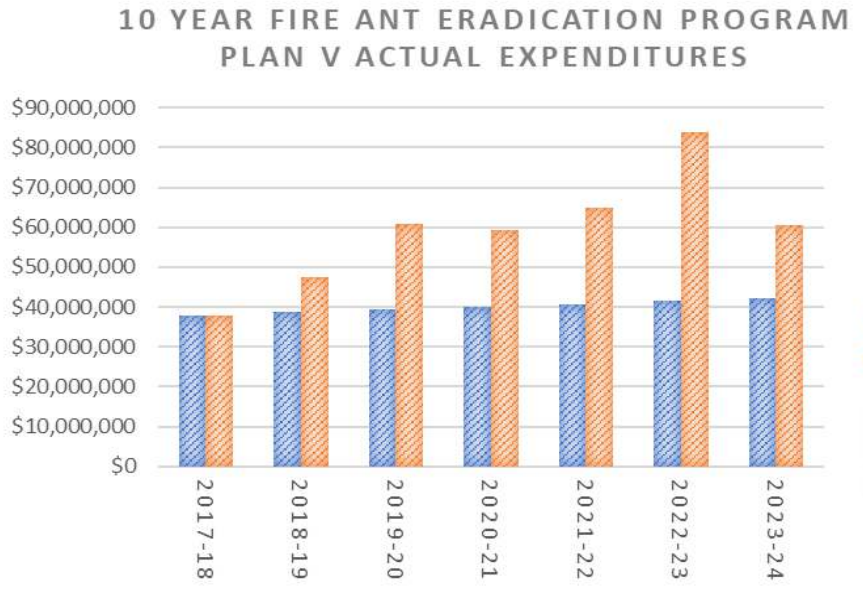


Figure 3: fire ant eradication expenditure by year compared to planned ten year eradication program expenditure.

Source: Fire Ant Eradicaiton Program annual reports, Wonder, B, 2019, NFAEP Response Plan 2023-2027 Appendices.

The infestation risks of fire ants in Australia are severe. Modelling sourced from the NFAEP shows fire ants will spread across most of Australia if containment is removed and eradication work ends; see figure 4 below for CLIMATCH modelling and impacted population projections from 2017 (National Fire Ant Eradication Plan, 2023).

	Total population	Percentage of affected area state/territory	Potentially affected population
NSW	7,704,300	99.31%	7,651,140
Vic	6,039,100	99.46%	6,006,489
Qld	4,827,000	99.83%	4,818,794
SA	1,706,500	100.00%	1,706,500
WA	2,613,700	99.83%	2,609,257
Tas	518,500	53.31%	276,412
NT	244,000	100.00%	244,000
ACT	395,200	94.87%	374,926
		Total potentially affected population of Australia	**23,687,518**

Note population data is the most recent available from the Australian Bureau of Statistics **http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0**

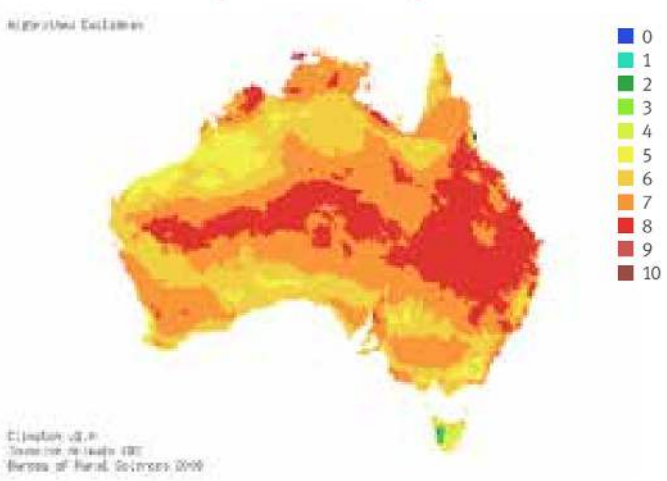


Figure 4: potential population by state impacted by fire ants and Climatch map of potential distribution of red imported fire ants based on the 'worldclim data'. Sourced from *National Red Imported Fire Ant Eradication Program 10 Year Eradication Plan*

3.5.3 Fire ants in 2023

In 2023, there were several significant fire ant detections:

- The detection of fire ants on Minjerribah (North Stradbroke Island) for the first time. Initially, several dozen nests were located on the island. Later in the year, further nests were located on the site of a former sand mine.
- A subsequent offshore island detection on Macleay Island.
- The interception of a solitary fire ant Queen in a shipment to Victoria.
- A fire ant incursion at Kleinton north of Toowoomba marking the first time the Brisbane fire ant infestation had breached the Great Dividing Range.
- Detection of a fire ant nest at an equestrian centre in Tallebudgera approximately 5 km from the NSW border.
- Significant nest clusters found north of Brisbane in the suburbs of Morayfield and Burpengary.
- Notable fire ant nests found at a school in Miami, the Gold Coast spit and sporting fields.
- Detection of 6 fire ant nests in Murwillumbah, northern New South Wales

Map 4: Illustration of fire ant containment breaches in 2023.

The Queensland Audit Office report noted increasing fire ant nest reports since 2007 and attributed this not just to the spread of fire ants but also to greater public reporting and deployment of new technology (Queensland Audit Office, 2023). Fire ant infestations on Minjerribah had likely been there for some years, given the numbers of nests detected on the island. The Victorian fire ant interception is evidence of the interstate biosecurity system working, but is also a warning of future potential incursions. Infestations at Murwillumbah, Kleinton and Tallebudgera were acted on relatively decisively. The slow initial response to the Kleinton infestation received criticism from public and media (Long, 2023). Following this, the program conducted surveillance on 1,500 properties near the Kleinton nests along with compliance checks, community awareness and outreach (National Fire Ant Eradication Program, 2023).

The surge in fire ant numbers and nest reports along with the risks to New South Wales prompted announcements from the governments of Queensland on the 25th of July (Hon. Mark Furner MP, 2023) New South Wales on the 29th of June (Minister for Agriculture, 2023) and 16th of August (Minister for Agriculture, 2023) and the Australian Government on the 22nd of October (Government of Australia, 2023). Other governments have followed suit. These commitments are substantial and provide the bulk of a significant new fire ant investment. Some jurisdictions have not yet contributed their portion of the response funding (see table 4).

Fire ant eradication funding breakdown (in millions)				
	% of total	2023/24 (million)	Total until 2027	Status
Commonwealth	50.00%	$66.55	$296.42	FUNDED
New South Wales	16.02%	$21.32	$94.94	FUNDED
Victoria	12.92%	$17.20	$76.60	FUNDED
Queensland	10.28%	$13.68	$60.95	FUNDED
Western Australia	5.31%	$7.07	$31.48	2 YEARS ONLY
South Australia	3.56%	$4.74	$21.11	UNFUNDED
Australia Capital Territory	0.86%	$1.15	$5.10	FUNDED
Tasmania	0.59%	$0.79	$3.50	UNFUNDED
Northern Territory	0.46%	$0.61	$2.73	FUNDED
Total	100%	$133.00	$592.85	
Shortfall			$40.35	

Table 4: fire ant eradication response funding commitments by jurisdiction.

The new resources resulting from 2023 funding announcements aided the response to the detection of fire ants in New South Wales originating for the first time from Queensland. Despite this disturbing detection, there is also cause for optimism:

1. The small cluster of nests were directly genetically linked to locations in Queensland making direct spread from the Queensland infestation more likely than from an unknown New South Wales location.
2. Terrain around Murwillumbah is open and well suited to efficient aerial baiting and surveillance. The national program and NSW Department of Primary Industries reacted rapidly and decisively to the reported nests.
3. The community appears to have engaged with fire ant surveillance allowing for rapid checking and clearance of potential infestation sites.

The Murwillumbah response was informed by lessons learned during the Kleinton response and it is encouraging to see the program working as intended. Repeated fire ant detections outside the infestation zone should prompt a review of available funding to ensure resourcing matches the demands of the fire ant eradication mission.

4. The costs of fire ants to Australia

4.1 Environment

A survey of potential impacts of fire ants on Australian wildlife	
Ants	Species abundance loss of up to 90% (Moloney, 2002)
Arthropods	Species richness declines up to 40% (Moloney, 2002)
Snails	Florida endangered tree snail species mortality rates at 86% (Moloney, 2002) Local extinction of a snail species in Florida (Forys E. A., 2001).
Amphibians	Predicted population declines in 95% of species (Lach, 2013)
Turtles	In clutches of turtle hatchlings exposed to fire ants, survival rates were 55% or lower when compared to non-exposed clutches (Allen, 2001). Complete mortality has been observed in turtle hatchling nests exposed to fire ants (Moloney, 2002)
Reptiles	Crocodiles and skinks for example vulnerable to attack – 20% of North American Alligator nests exposed to fire ants, 50% of hatchlings showed evidence of attacks (Moloney, 2002) Predicted population declines in 69% of species (Lach, 2013)
Birds	Ground nesting birds vulnerable in particular to hatchling mortality. Identified species include: Ground parrot (*Pezoporus wallicus*), the Black-breasted Button-quail (*Turnix melanogaster*), the Buff-breasted Button-quail (*Turnix olivii*), the Eastern Bristlebird (*Dasyornis brachypterus*), the Night Parrot (*Pezoporus occidentalis*), the Little Tern (*Sterna albifrons*), the Golden-shouldered Parrot (*Psephotus chrysopterygius*), the Plains Wanderer (*Pedionomus torquatus*) and the Bush Stone-curlew (*Burhinus grallarius*). (Moloney, 2002) Predicted population declines in 45% of species (Lach, 2013)
Mammals	Predicted population declines in 38% of species (Lach, 2013)

Table 5: fire ant impacts on biodiversity from several evaluations.

Fire ants prefer open floodplain environments with an abundance of direct sunlight and canopy cover. They have been reported to forage up to 40m into canopy-covered forest areas (Moloney, 2002). In national park and other protected area environments, broadscale baiting projects will be hampered by foliage making protective baiting less viable.

The *Environmental Protection and Biodiversity Conservation* (EPBC) *Act 1999* lists fire ants as a key threatening process and lists 32 bird species "potentially at risk from the direct impacts of fire ants and occur in potential fire ant habitat" (Department of Climate Change, Energy and Water, 2003). This listing pre-dates some of the research summarised above. This further information on environmental impacts could now be included in this EPBC listing to update it.

4.3 Agriculture

Significant impacts on agriculture are expected in Australia including (Wylie, 2016):

- Grain: 20% output reductions
- Sunflowers: 40% - 50% crop loss
- Potatoes: 30% yield loss
- Soya beans: 20% to 30% yield loss
- Eggplants: 50% yield reduction
- Grain crops: 20% reduction
- Cattle: industry costs approximated at $308 million
- Equine: not calculated although horses were 8.5% of reported fire ant stings to animals in Texas in a 1993 study
- Poultry: not calculated - 94% of producers in Texas reported operations problems resulting from fire ants
- Citrus: production issues were also noted.
- Beekeeping: impacting stored honey, larvae, pupae and pollen and act as competitors to local bee populations.

4.4 Tourism, recreation, sporting, social amenity

In 2023, fire ants were responsible for the closure of parks, school playgrounds, sporting fields, and other public amenities on the Gold Coast and greater Brisbane areas. Some of these closures were to allow for treatment and baiting activities to occur but longer-term fire ants would impact access and visitation. Reputational damage can also be assumed. It is unclear what impact fire ants might have on the Brisbane Olympics planned for 2032, however it is noted that current eradication timeframes seek to have fire ants largely eradicated by the time of the Olympics. This is only achievable if additional funding is forthcoming now and beyond 2027.

4.5 Human Health & Workforce

In 2023, fire ants were directly linked to at least one publicised fatality in the United States – Cathy Weed – who stepped on an ant mound, had an allergic reaction and died before she could obtain medical attention (White, 2023). 30% to 60% of the population will be stung each year with 8% requiring use of an EpiPen and 2% resulting in medical appointments and 1% in fatalities (Star, 2021). There are workforce health and safety implications for outdoor workers; for example, personnel in construction, agriculture, garden, maintenance and tourism.

In 2001 fire ants were predicted to cause at least 3,000 anaphylactic reactions each year and 140,000 to 651,623 medical appointments if they became prevalent across Australia (Solley, 2002, National Allergy Centre of Excellence, 2023). This will place additional pressure and costs on the medical system in particular general practice, emergency departments a remote, rural and regional health servies. Fire ants and similar invasive species have been addressed as an agricultural policy response, however the health and social impacts from fire ants could outweigh their agriculture and industry impacts.

4.6 Household & infrastructure

Under conditions comparable to those in the United States, household costs from fire ants could be approximately $536.8 million per year and $82 million for infrastructure (Star, 2021). Fire ants can occupy and undermine infrastructure presenting additional costs to local and state authorities, telecommunication and utility companies and households.

In US based studies, fire ants will have a wide range of negative effects across households, urban infrastructure, and commercial businesses. Such broad impacts are difficult to accurately quantify, however we know they are significant, and will cost millions annually for households, power supply infrastructure, golf courses, schools, and even paths and roads (Gutrich et al 2007).

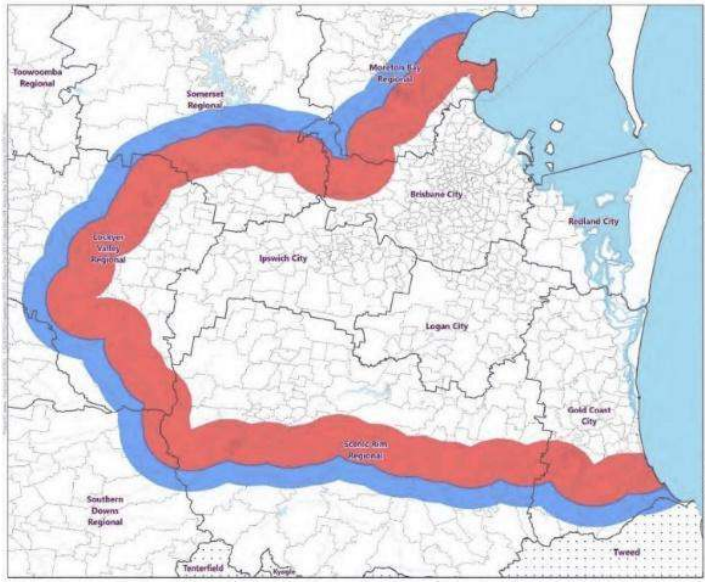
5. The National Fire Ant Eradication Program Response Plan 2023-2027

5.1 Overview of the current response plan

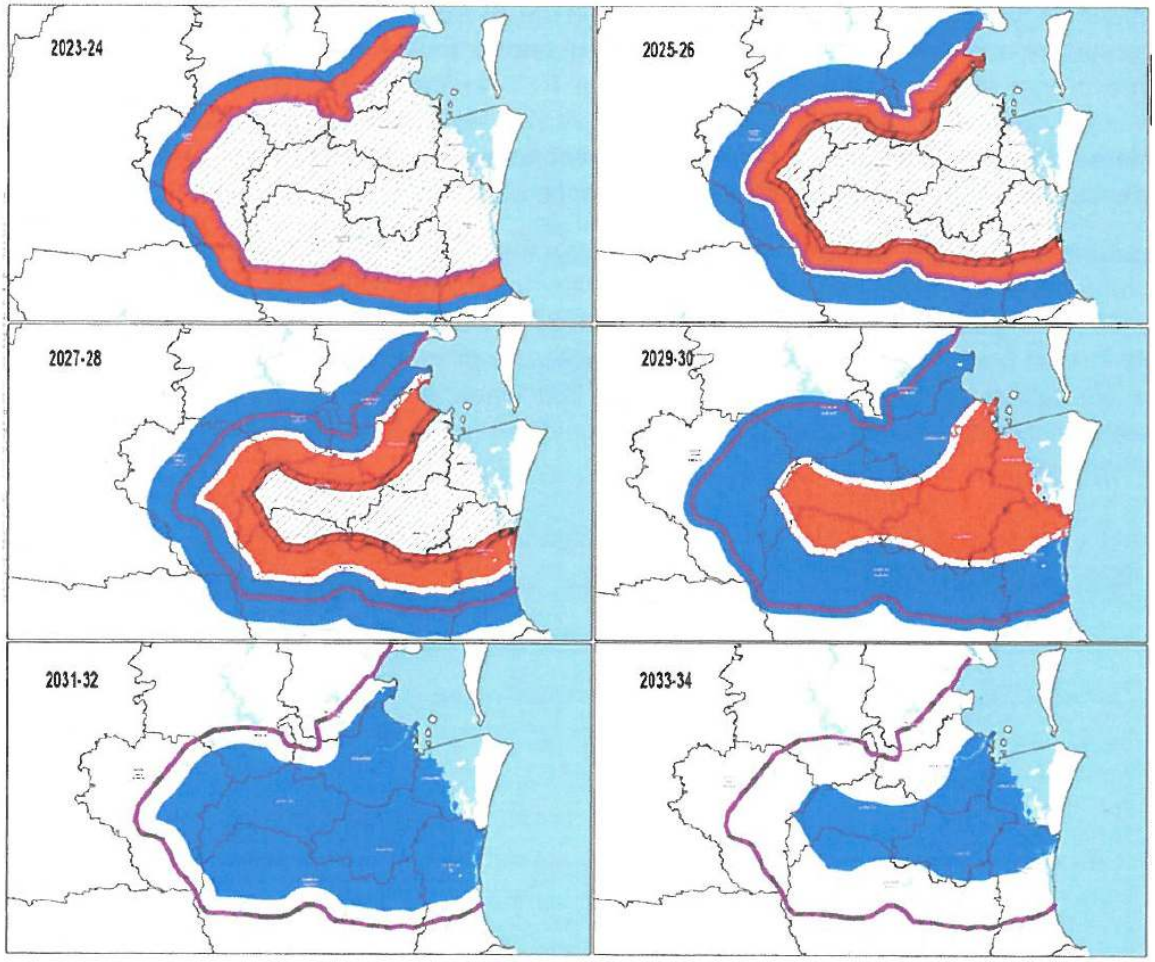
A new response plan approach was first announced publicly on the 25th of July 2023 (NFAEP Response Plan 2023-2027)

This response plan approach rests on three key pillars:

1. A complete eradication ring around the fire ant containment area implemented by the NFAEP.
2. Extended surveillance and spot fire ant responses outside the infestation area implemented by the NFAEP.
3. Ongoing suppression based on self-treatment and community engagement within the fire ant containment zone implemented by the Queensland-funded Fire Ant Suppression Taskforce (FAST).



Map 5: 2023-2024 eradication and surveillance target areas sourced from *National Fire Ant Eradication Program.*

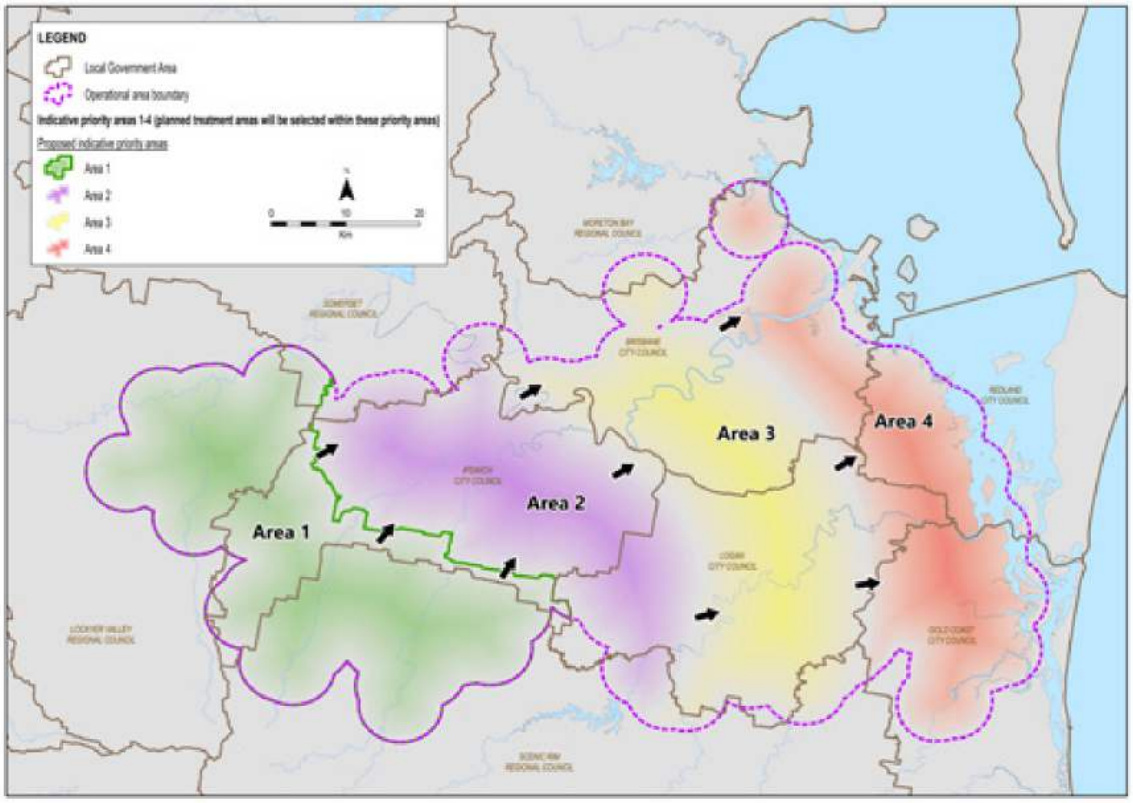


Map 6: Planned but as yet unfunded progression of fire ant treatment through to 2034. Red is area under active eradication, blue is surveillance response area.

Fire ant treatment boundary (in red on map 5 and 6) is to be a 10km band for the first two years with a surveillance boundary extending a further 5km beyond the eradication zone.

The treatment boundary will be brought inwards with a 3km overlap zone between each year's treatment zones. This will reduce the area of FAST activities and establish progressive fire ant eradication. Each two year treatment cycle consists of three treatments in the first and three treatments in the second year. This is demonstrated in Map 6.

This response plan differs substantially from the 2017 eradication plan which commenced treatment in the western extent of the fire ant biosecurity zone aiming to eradicate in an eastward direction (NRIFAEP, 2017). This approach created considerable eradication and response gaps to the north and south of the biosecurity zone. Transport and housing development corridors exist north and south of Brisbane which have become primary directions of fire ant expansion. The 2017 plan also required treatment of densely populated urban areas to the later years of eradication. These factors were built into the plan and are likely to have contributed to cost miscalculations which have exhausted the 10-year funding allocation early. The 2021 independent review identified some of these factors in suggesting a new response..



Map 7: previous 10 year response plan which focussed on an eastward eradication effort.

The new response plan will tackle a mix of treatment area types across the life of the plan (urban, agricultural, etc.). It can be expected that although the treatment area will diminish, costs are unlikely to, as land use densities increase closer to eradication completion. Pre and post treatment surveillance and proof of freedom activities will also become resource intensive and require a commitment beyond the later years of the response plan.

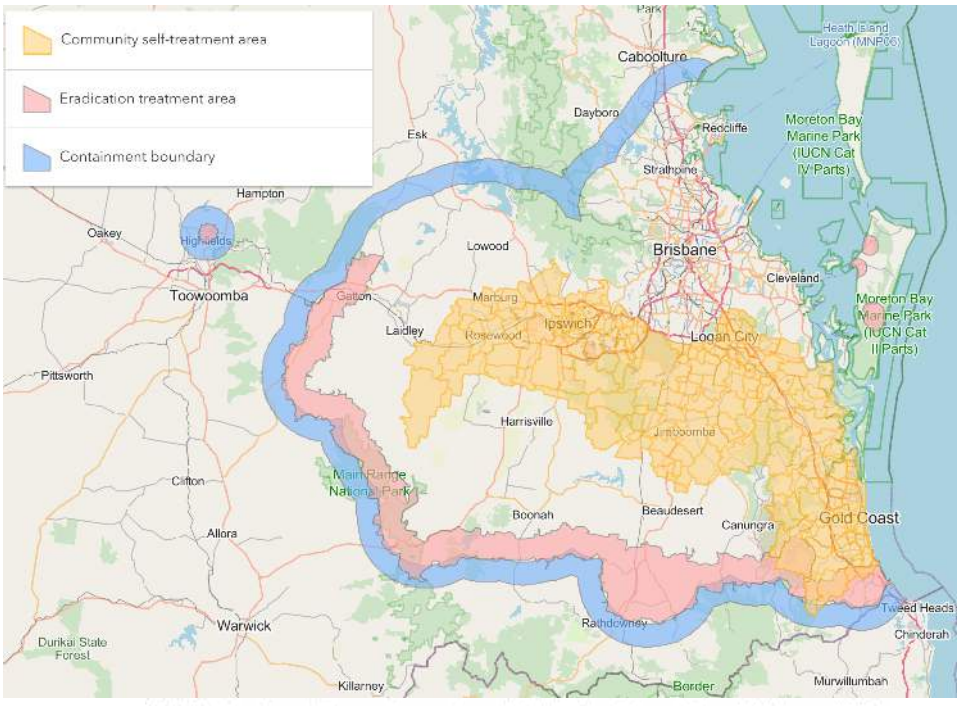
An increase of self-treatment and expansion of activities being delivered by the FAST would support this urban eradication effort. 40,000 households have participated in self-treatment in the three months it has been available in 2023 (Jeffries, 2023). This shows a willingness of residents to engage with and support eradication efforts. Currently, self-treatment is available to Gold Coast, Ipswich and Logan residents and not to Brisbane City or Moreton Bay local governments areas. Further funds provided to the FAST work would support local councils who are taking an increasing role in fire ant suppression work.

Map 8: in 2023 a partial plan was put in place while funding decisions were being resolved to provide resourcing for the full eradication plan.

Immediate implementation of the NFAEP Response Plan 2023-2027 had been assumed. This has not been realised due to funding and resourcing for the first year of the response not being immediately available. A modified work plan was deployed for 2023 (National Fire Ant Eradication Program, 2023).

Under the work plan, a 5km treatment boundary was planned on the southern Gold Coast and Scenic Rim local government areas instead of a 10km treatment boundary across the full containment border.

The work plan also provided for a reduced surveillance area coverage (8% compared to 17% under the full response). Further, instead of three treatments in the first year across the full border treatment zone, two treatment rounds were to occur on the Gold Coast, three in Scenic Rim and nil in other border treatment zone areas.



Map 9: Treatment, surveillance and suppression work within the fire ant biosecurity zone at 29 January 2024.

This work plan was based off the $84 million that was available of the full $133 million that was required to implement the full first year of the NFAEP Response Plan. Commentary in the NFAEP

Response Plan Appendices outlines that the National Biosecurity Committee (NBC) requested the work plan was required as funding decisions were not in place for 1 July 2023.

NFAEP officials have stated that funding decisions and favourable weather conditions have allowed southern area treatments to be concluded in the Scenic Rim ahead of schedule. As a result, Gold Coast treatments have been brought forward and Lockyer Valley treatments have commenced early. This accelerated schedule suggests that it is still possible to achieve most of the full response first-year treatments.

This delay to the commencement of the full NFAEP Response Plan should be factored into future deliberations on timelines and results, particularly in 2024 and 2025.

5.1.1 Barriers to current response plan success

Resourcing uncertainty

Supply of bait, treatment chemicals, spreaders, vehicles, drones, and remote sensing equipment to an eradication effort the size of the fire ant eradication underway in Australia will be a logistical challenge. Global supply chain disruptions have been a reality following the pandemic and are ongoing with international unrest. This is coupled with disrupted manufacturing, supply stress and shipping delays. NFAEP have advised they are conducting ongoing procurement to ensure ongoing supply of these items. Maximisation of onshore sources manufactured locally where possible would minimise supply chain shock risks and comply with Queensland's public service procurement policies.

Lack of community support & social licence

As identified in the most recent independent review, successful fire ant eradication in heavily populated urban areas depends on community engagement (Scott-Orr, 2021). Reporting of suspected fire ant nests, providing access to NFAEP officers for treatments, complying with movement restrictions and now extending to signing up for and completing fire ant self-treatment are features of community support. Through 2023, the Invasive Species Council observed increasing goodwill and support for fire ant eradication as awareness and clarity about the potential impacts of fire ants to Australia grew.

Community support exists for the NFAEP but it is conditional and finite. We are encouraged by the stakeholder engagement sessions conducted by the NFAEP, the outreach from NFAEP officers at all levels and the proactive engagement from the FAST. A standing stakeholder organisations reference group to assist facilitation of broader engagement and to structure timely engagement and feedback could sustain non-government institutional support. The Invasive Species Council has participated in a similar reference group as a part of the Yellow Crazy Ant eradication underway by the Wet Tropics Management Authority.

As a final note – we are concerned about the report of treatment refusals from community members (Beaudesert Times, 2023). Informal advice received by the Invasive Species Council indicates that treatment or surveillance refusals are a growing barrier to NFAEP and FAST activities. A successful response requires that every property is treated and checked, and gaps undermine the chances of successful eradication. While the power provided to biosecurity officers to enforce compliance are acknowledged, an owner cooperation approach is preferred. At present the extent of this problem is not known beyond media reports and anecdotal evidence.

Government prioritisation

The 2021 independent review identified that fire ant eradication would require $200-$300 million per year for at least ten years. The current funding committed for fire ant eradication is $537 million, leaving a shortfall of $56 million. The Invasive Species Council does not have clarity

about the material differences in funding estimates generated by the independent review in 2021 and the request put forward in the NFAEP Response Plan 2023-2027.

As of January 2023, every jurisdiction except Tasmania, South Australia and Western Australia has confirmed funding support for the new response plan. Further funding will be required beyond 2027, and potentially sooner given the recommendations of the 2021 review.

Previous post-border and post-containment fire ant incursions have caused a diversion of resources from the main eradication effort.

A contingency for short-term surges in fire ant eradication funding when future post containment or post border incursions are detected would help support responses outside the planned containment program. Development should also commence now on the post-2027 fire ant eradication funding package in anticipation of future decision-making.

Finally, funding for fire ant eradication at Commonwealth, state and territory levels is delivered from the budgets of Agriculture, Environment and Biosecurity. The significant society wide impacts of fire ants mean a new consolidated funding approach should be considered.

6 Future funding certainty for post quarantine responses

Australia's biosecurity system contributes more than $314 billion to the national economy and is critical to safeguarding our way of life and natural environment, yet is struggling to keep up with the growing number of people and goods coming into the country.

This is a global trend. In September 2023, the United Nations Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services released a landmark report, finding that invasive species cost the global economy over $423 billion every year, with costs having at least quadrupled every decade since 1970. Among its findings, the report found that governments do not invest a proportionate amount of money into biosecurity, particularly for environmental biosecurity. The report found that invasive species played a role in 60% of global plant and animal extinctions and that prevention measures are underfunded and not prioritised, particularly for environmental risks. Over 80% of Australia's mammal extinctions were caused by invasive species, and invasive species are likely to be a primary driver of 85% of the next round of predicted vertebrate extinctions over the next 20 years.

The reactive nature of funding for biosecurity emergencies and preparedness remains an issue. The history of funding uncertainty for the eradication of fire ants is a prime example of the need for a systemic reform of funding biosecurity and highlights the urgency and importance of sustainable funding. For future eradication programs to operate more effectively, they must not be tied to budget negotiations, or funded ad-hoc.

While investment from the federal budget provides a crucial foundation, we know that long-term funding security requires new and innovative approaches. It is positive to see sustainable and increased funding as a core objective of the National Biosecurity Strategy.

Analysis prepared by Frontier Economics last year presents clear and workable solutions that would strengthen the funding of our biosecurity system such as reforming the self-assessed clearance, implementing a container levy and enhancing inter-agency cost-recovery (Frontier Economics 2023). In delivering its election commitment for sustainable biosecurity funding, all available funding pathways should be considered to resource the biosecurity system, with urgent focus needed on properly resourcing environmental biosecurity.

Without a significant increase in biosecurity funding, from sustainable and equitable sources, Australia will find itself once again grappling with the same setbacks and funding challenges as experienced with fire ants.The Commonwealth government made an election commitment to deliver long term sustainable biosecurity funding at the last federal election. In the 2023/24 Budget, DAFF announced a range of measures aimed at addressing this commitment. While a good first step, the job has not been completed. There is dissatisfaction widely expressed by affected export industries, and in regards to environmental biosecurity funding, there has been no increase in funding, and the perpetuation of outdated and broadly criticised funding models continues to put environmental biosecurity in a tenuous position. Funding for the Chief Environmental Biosecurity Officer and staff continues to rely on internal DAFF budget decisions which can change at any time, and cannot compete with the agriculture and industry focus of the department.

National Environmental Biosecurity Response Agreement (NEBRA)

When fire ants were discovered in Australia, the National Program for eradication was set up as it pre-dated the development of the National Environmental Biosecurity Response Agreement (NEBRA). The National Program operated in a similar arrangement to the NEBRA, meeting criteria of being in the national interest to prevent the impacts seen from fire ant outbreaks in other countries. Subsequent outbreaks since 2012 have been managed under the NEBRA framework.

The history of response to fire ants in Australia is a good case study on the weaknesses and problems within the NEBRA framework. It shows that there is still a need for a greater level of

custodianship of the NEBRA, which will require more adequate and ongoing resourcing in order to support responses, an increase in transparency of decision making, greater support for on-ground activities and extension, and better coordination of stakeholder activities. A recommendation of the NEBRA five year review also highlighted the benefits of institutionalising the NEBRA Administrative Group as an ongoing body enabling jurisdictions to support and engage as required. It would also facilitate long term oversight and facilitate feedback from users and parties back to the Australian Government managing the agreement.

Options to provide funding security to post quarantine responses	
Funding mechanism	**Description**
Increased budget appropriation	Additional funds set aside for biosecurity from the Commonwealth budget
Expanded or reformed industry cost-recovery (pre-border and at border)	Expansion or reforms to DAFF's fees to recover the cost of biosecurity services to specific individuals or business organisations. While there are numerous examples for this mechanism, we have focussed on expansion of cost-recovery for self-assessed clearances (SAC).
Air and sea-freight conveyance or container levies	Charges imposed when biosecurity services are provided to a group of individuals or organisations (rather than to a specific individual or organisation)
Enhanced cost-recovery from other government agencies	Enhancements to cost recovery for biosecurity services provided to other government agencies, for example the Department of Defence and the Department of Health, noting that some already contribute to biosecurity-related activities.
Increased passenger movement charge (PMC)	An increase to the current PMC of $60 for the departure of a person from Australia for another country, whether or not the person returns to Australia. The increase would be specifically used to fund biosecurity activities
Payments by beneficiaries of the biosecurity system	Levies or charges levelled on groups that are vulnerable to biosecurity hazards and benefit from biosecurity control. For example, industry funding deeds for sectors not currently covered by industry deeds such as the Emergency Response Deeds already established between Animal Health Australia and Plant Health Australia.
Risk insurance	A forward-looking risk-based charge where biosecurity risk creators are charged the actuarial price of risk – higher premiums/charges for higher risk activities

The establishment of a short-term emergency response fund for funding immediate and short-term emergency responses for potentially nationally significant outbreaks, the maintenance of an expert panel to serve this funds application, and enhanced custodianship of the NEBRA are all relevant to the need for sustainable funding. In line with the new Australian Biosecurity Strategy 2022-2032, the governance and decision making frameworks under the NEBRA require more transparency around how decisions are made. Environmental perspectives continue to be a gap in decision making under existing arrangements.

Another key area that should be considered for future improvements to the NEBRA framework is to allow for cost-sharing of containment, and transition to management stages of incursions, rather than only applying to eradication. There are many potential scenarios where the feasibility of eradication is low, but the benefits of a national and rapid response (e.g. for containment) have benefits. This would require significantly more resourcing to develop and operate.

Finally, the fact that the continuation of successful eradication of fire ants was so reliant on federal commitment of funding, serves as another example of the limited funding available for

DAFF to support the custodianship of the NEBRA and national responses. A solution to this lack of funding is the creation of a similar independent body as that of Plant Health Australia, and Animal Health Australia. The recommendations from reviews and submissions agree to the need for a greater custodian role to enhance and develop the NEBRA into the future. If DAFF continues in this role, significantly greater commitment of ongoing maintenance funding will be required, to finally break from the reactive, and uncertain nature of funding expensive eradications such as fire ants.

7. Conclusion

Fire ants are a challenge that has spread to many parts of the world, but Australia is particularly climatically suitable to fire ant incursions. Since first arriving in Australia in 2001, fire ant eradication efforts have not achieved the stated goal of eradication. However, the eradication program has been worthwhile because the program has::

1. Slowed the spread of fire ants in Australia
2. Responded effectively to new incursions
3. Prevented billions of dollars of economic, industry, environmental and health impacts

Eradicating fire ants in Australia is still viable – however it is reliant on an appropriate investment of funding over the next decade to address the scale of the threat. New technologies and practices currently being implemented could accelerate eradication efforts and support responses to other invasive species (animal, insect and pathogen). Eradication will require continued political determination and support across political parties and over multiple governments.It is encouraging that there remains a high level of political and community support for eradication despite the length of the response program. Community awareness and engagement is vital to the effectiveness of eradication efforts and will ensure understanding of the long term nature of this project. There have been setbacks and lessons, and this must be acknowledged. A successful fire ant eradication program in Australia can be a model response to other invasive incursions in Australia and overseas.

Unlike a hospital or road project, fire ant eradication success cannot be measured by what is seen and does not have a finite end point. Successful eradication will mean that over time we hear and see less of fire ants in Australia and there will be a long twilight of post eradication surveillance. This post eradication surveillance will be crucial to avoid the reinfestation experienced after 2006. It will be resource intensive but the costs of not investing the required resources will be far higher

Understanding fire ants as a society wide impact beyond agriculture and the environment will provide context for Treasury department funding evaluations. Full fire ant eradication will take up to a decade so a new funding package will be required to support eradication beyond 2027. It is likely to require increased investment over the coming four years beyond amounts already announced. Fire ant eradication will require a government and community wide effort. It is likely to take time to develop the ongoing package beyond 2027 so work must commence on this as soon as possible.

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Appendix 1: Historic and current barriers to fire ant eradication

Summary of barriers to successful fire ant eradication		
Barrier	**Example**	**Mitigation**
Premature incorrect evaluations of success	Early predictions of program success incorrectly informed government policy and budget decisions.	Post eradication surveillance period of at least two years with zero fire ant detections.
Underfunding/resource limitations	Between 2006 and 2016 underfunding and resource limitations contributed to fire ant spread. Limited resources led to a lack of containment, surveillance and eradication work. Incomplete delimitation is likely to have also contributed to underfunding in 2017.	Responsive resource allocation from government decision makers to emerging fire ant detections outside the scope of the current eradication response. Changing cost of personnel and materials should also be considered.
Inadequate eradication strategy	The 10 year eradication plan 2017-2027 relied on a west to east eradication direction. This resulted in fire ant spread south to NSW border and north into Moreton Bay region.	'Horseshoe' or ring containment strategy with progressive eradication band around entire fire ant infestation zone.
Delayed decision making	Independent reviews in 2015 and 2021 have taken multiple years to fully implement. Inadequate responsiveness at funder level to changing infestation circumstances with required resourcing.	Future fire ant funding reviews should commence immediately to ensure program continuity beyond 2027.
Community engagement and support	Citizen science assets in agriculture and environment sectors not fully utilised for much of the life of eradication efforts.	Additional resourcing for communications and increased community engagement freedom for NFAEP. Formalise engagement with stakeholders at peak and community level to NFAEP, steering committee and funding decision-makers.

Appendix 2: Innovation and the Response Plan

A key assumption in the NFAEP Response Plan 2023-2027 is the availability of new technologies.

The following is a summary of some of the key innovations that would support and accelerate fire ant eradication in Australia:

Key innovations in fire ant eradication		
	Description	**Impact**
Environmental DNA (eDNA)	Using gene markers to identify potential fire ant sites through screening samples from a given environment (eg testing of soil and water).	Currently, fire ants can be obscured underground for long periods. This can leave limited surface traces, reduce the efficacy of dog detection and negate detection by visual inspection and remote sensing technology.
New bait delivery systems	Utilisation of drones (unmanned aerial vehicles) to deliver fire ant treatments. Drones could be an extremely cost-efficient way to deliver bait more precisely to targeted treatment areas.	Aerial treatments currently depend on the availability of helicopters. Weather is a constraint (wind/storm/lightning). High cost to deliver treatment payloads. Treatment clearances from residential buildings and flight path restrictions are further limitations on bait delivery.
Weather resistant bait	Deployment of fire ant baits that are resistant to degradation by wet weather.	Currently, fire ant baiting is reliant on reliable dry weather limiting the opportunity for summer fire ant treatments.
Surveillance methods	Examples include drones with remote sensing technology that detects fire ant colony heat signatures, and deployment of predictive AI as a guide to likely fire ant locations and movement corridors.	Remote sensing relies on helicopter availability and has the same limitation as bait delivery. Fire ant identification does use human pattern recognition, AI has the potential to automate processing of community reports and historical trends.

Development and deployment of these technologies has the potential to create new national assets and contribute meaningfully to eradication of other invasive species.

Appendix 3: List of figures, maps and tables

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