

Independent Review of the Yellow Crazy Ant Eradication Program

Executive summary, findings and
recommendations.

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The Wet Tropics Management Authority was contracted \$7.5 million by the Australian Government to carry out a National Landcare Program (NLP) – Emerging Priorities program to deliver “Control of yellow crazy ant infestations in and adjacent to the Wet Tropics World Heritage Area”.

1 Executive Summary

1.1 Review background

The Wet Tropics Management Authority (the Authority) is attempting to eradicate yellow crazy ants in and next to the Wet Tropics World Heritage Area (WTWHA) to protect the rich biodiversity of the region from one of the world's worst environmental pests. Eradication efforts have been funded by two overlapping projects. The first project (\$2 million) was funded by the Australian Government's Caring for Our Country Target Area Grant program (TAGEI14P2-0026) for the period 2013-2018. The second project (\$10.5 million) was funded by the Australian Government's National Landcare Program (\$7.5 million) and the Queensland Government (\$3 million) for the period 2016-2019. These two projects are hereafter referred to as the TAG project and NLP project, respectively, and are collectively referred to as the WTMA-managed Yellow Crazy Ant Eradication Project (YCAEP).

A review of the YCAEP was required under the TAG project. The review is primarily to evaluate the TAG project outcomes as outlined in the agreed Monitoring, Evaluation, Reporting and Improvement (MERI) plan and Project funding agreement. A second component of the review is to evaluate the ongoing contribution of the NLP project work for the period ending 30 June 2018.

The Authority commissioned The University of Melbourne to review the TAG and NLP projects. Assessment criteria considered in this review are listed in Appendix A. Particular attention is given to the projects' primary intended outcome of eradicating the YCA invasion in and near the WTWHA. An assessment is made of why this outcome was not achieved and whether progress has been made towards this outcome. In addition to assessing the two projects, this review also provides recommendations on future eradication strategies.

The Independent Review members were Dr Daniel Spring and Professor Tom Kompas, both of whom have worked extensively on tramp ant eradication program assessment and management. Dr Spring conducted analysis that informed the recent agreement on funding for the national fire ant eradication program and has over 10 years' experience in tramp ant assessment and analysis for Biosecurity Queensland and the Australian Government. He is a research fellow in the School of Ecosystem and Forest Sciences at The University of Melbourne. Professor Kompas conducted the first cost-benefit analysis of the fire ant eradication and has extensive experience in invasive species management and assessment. He is a Professor of Environmental Economics and Biosecurity in the School of Biosciences and the School of Ecosystem and Forest Sciences at the University of Melbourne. He is also one of three Chief Investigators in the Centre of Excellence for Biosecurity Risk Analysis (CEBRA), and the Foundation Director of the Australian Centre for Biosecurity and Environmental Economics at the Australian National University (ANU).

1.2 Brief summary of main findings

- Eradication of YCA in and next to the WTWHA remains feasible.
- The WTMA-YCAEP has protected the WTWHA from further spread of YCA, including spread that would potentially have made eradication infeasible, if YCA reached the main water catchment supplying the Cairns area.
- Progress towards eradication was slow between 2013 and 2017. This largely reflected factors outside The Authority's control, including the discovery of new infestations likely to have existed before the WTMA-YCAEP commenced, and initial regulatory restrictions that prevented the most effective treatment method being applied.
- Substantial progress has been made towards eradication since 2017.

1.3 Detailed findings

1.3.1 Feasibility of eradication

This review has assessed that eradication is feasible, based on the following evidence:

- A rapid reduction in YCA abundance in all areas where the current treatment method was applied. This includes a large contraction (160 ha) of the area in which YCA was found within the declared infestation area in the Bentley Park infestation. The significance of this rapid reduction in YCA abundance is twofold:
 - It provides confidence that eradication of known infestations is achievable if treatment effectiveness can be maintained at low densities of YCA.
 - It reduces the risk of new infestations becoming established through human-assisted spread of YCA. This is achieved when treatment rapidly reduces YCA numbers in known infestations and thereby reduces the risk of people coming into contact with YCA. Human assisted movement of YCA is one of the primary threats to eradication feasibility, as indicated by the spread modelling conducted for this analysis.
- Declared eradication of two infestations and the likely imminent eradication of another infestation if no further detections are made there.
- Slow natural spread of YCA over land:
 - Evidence from two infestations with known starting dates and founding points indicates that land spread rates via budding are approximately 50m/year. This was estimated based on an estimate of the maximum distances reached by YCA infestations before control efforts commenced there, and an assumption that infestation boundaries expand at a constant rate.
 - The rate of natural land spread is slow enough that infestations are likely to remain eradicable for an extended period before they are discovered. This implies that delays in detecting new infestations are unlikely to increase eradication costs prohibitively in the absence of human assisted spread and water-based spread.

- The small total area of known infestations:
 - At the time of writing this report, approximately 1,600 ha were within the declared treatment area. This includes a 100m buffer area comprising an area of approximately 745 ha and a substantial area where ants are no longer found (including 160 ha at Bentley Park).
 - This area is likely to be small enough for all infestations to immediately be managed without incurring a prohibitive cost, and thereby minimise the risk of human assisted spread.

1.3.2 Eradication progress

Yellow crazy ants have not been eradicated in the project region, nor is eradication likely to occur within the current funding period, which concludes on 30 June 2019. The invasion now occupies a larger area than when the project commenced. However, substantial progress has been made since 2017 in reducing the sizes of known infestations. There also have been two confirmed eradications of individual infestations. These successes are largely attributable to the adoption of an improved treatment protocol involving three broadcast applications of Antoff (active ingredient fipronil) per year for two years over each detected infestation, followed by targeted treatments of remaining YCA pockets within the initially treated land, before commencing two years of post-treatment validation to confirm eradication.

Progress towards eradication before 2017 was substantially slower than subsequent progress. This is primarily due to factors not attributable to YCAEP management. The view put to us by The Authority is that slow progress between 2013-2017 is attributable to four factors that were beyond its control: (i) the discovery of pre-existing infestations; (ii) regulatory restrictions that prevented the most effective treatment method being used; (iii) initial scientific advice supporting the treatment protocol initially applied in the projects, and (iv) a lack of trained staff, reflecting that WTMA had not previously developed a capacity for tramp ant eradication and was constrained by the available budget in hiring new staff. The assessment made here is in agreement with The Authority's view. Three of these factors are discussed in more detail below.

Discoveries of new infestations

Many of the new infestations discovered early in the WTMA YCAEP are likely to have existed before the project commenced in 2013, and therefore were not attributable to project management. This judgment is based on expert opinion that an infestation larger than 15 ha is likely to be at least two to three years old. With this rule of thumb, approximately 13 to 15 infestations were established before the TAG project commenced.

The discovery of new infestations increased eradication costs above the TAG project budget. This problem was mitigated by The Authority through reducing project costs and successfully applying for additional funding of \$10.5 million under the NLP project funding agreement. Costs were reduced through eliciting voluntary in-kind contributions from community organisations to augment control efforts and facilitate community engagement. These in-kind contributions were estimated to have a value in excess of \$3.3 million over the 5 years of the TAG program (Table 3). In addition, the YCAEP reduced program labour costs by utilising The Australian Government's Green Army Teams through a partnership with

Conservation Volunteers Australia to conduct much of the initial on-ground operational works.

Initial regulatory constraints on the control methods that could be applied

Restrictions initially existed on the pesticides that could be used to remove YCA infestations under permits available to The Authority that were issued by the Australian Pesticides and Veterinary Medicines Authority (APVMA) and a Referral under the Environment Protection and Biodiversity Conservation Act 1999 (the EPBC). One of the restrictions prevented the most effective available treatment method, Antoff, from being applied within 5m of waterways, which were known to be favourable habitat for YCA (Lach and Hoskin, 2015). These restrictions increased the risk that dry creeks and waterways would be a source of reinfestation of nearby areas. Restrictions on Antoff use also included a maximum of only two applications per year, and only between the months of May and December. This prevented The Authority from applying three treatments of Antoff per year, which was considered to be best practice.

These restrictions were addressed by The Authority through successfully presenting a case, in 2016, to the APVMA to vary the permit conditions for AntOff and for a reconsideration of the EPBC decision. A revised permit issued by the APVMA allowed for Antoff to be applied three times per year, all year round, in dry creeks and within 5m of waterways. This new treatment protocol was used from May 2017.

Effectiveness of treatment regimes

Application of the current treatment protocol (three applications of Antoff per year for two years) has resulted in substantial declines in infestation sizes in declared treatment areas since 2017. Prior to this, progress towards eradication between 2013- 2017 was slowed by the use of a relatively ineffective treatment protocol that included the use of the insect growth regulator (IGR) Engage P (active ingredient s-methoprene). This protocol proved to be less effective than anticipated and its application until early 2017 appears to have delayed eradication and increased costs.

The process of changing the treatment method from the initial protocol to the current protocol involved three stages:

- (i) an initial assessment of the protocol to inform the decision on whether to seek a permit variation to support a changed treatment method;
- (ii) an application to vary the permit; and
- (iii) a delay before the application was approved by the relevant regulatory authorities.

The initial application to vary the permit was submitted in 2014. A further 18-19 months elapsed before the next application was made for a revised permit in early 2016. Further delays occurred while awaiting EPBC Act approval and APVMA conducting a review on all Fipronil-related products for Australian use. These factors contributed to the delayed commencement of the new triple treatment/year of Antoff until May 2017. This extended delay highlights the need to consider a modified regulatory approval process that weighs the environmental consequences of failing to eradicate pests against the non-target

environmental impacts of eradication methods. A modified regulatory approval process would potentially allow for rapid approvals to be made where:

- robust scientific evidence is provided that the environmental consequences of a failure to eradicate are much larger than the environmental consequences of a specific treatment method, and
- currently approved treatment methods are failing.

For any eradication program, evidence to support the application for a revised permit would need to be obtained as soon as possible to minimise the period over which an inefficient treatment method is applied.

1.3.3 Protecting the World Heritage Area

Project efforts to eradicate YCA infestations in and near the WHA are likely to have prevented those infestations from expanding. Some of those infestations (e.g. Bentley Park) are in residential areas where there is a significant risk of human assisted spread of YCA. Other infestations are in locations where land use practices, such as sugar cane harvesting and associated transportation, have a substantial risk of moving YCA further than would occur naturally. These risks of human assisted spread of YCA are likely to have been substantially lessened by the reduction in YCA numbers achieved by control efforts, the eradication of two infestations and the early detection of other infestations facilitated by community engagement. In turn, the likely reduction in human assisted spread of YCA, and the apparent prevention of existing infestations expanding through natural spread, are likely to have prevented further encroachment of YCA into the WHA and resulting harm to the Area's unique ecological, cultural, social and economic values.

1.3.4 Community engagement

One of the aims of the YCAEP was to increase “engagement and participation of the community, including farmers and Indigenous people, in the management of YCA in and next to the Wet Tropics World Heritage Area”. In this context, The Authority has reached agreements with several industries that are potential sources of human assisted spread of YCA. These include agreements with residential development and associated earth moving industries that were achieved principally under the TAG project, and newer agreements established during the NLP project with a turf farm, two quarries and the sugar cane industry (through MSF Mulgrave Mill).

The Authority has successfully elicited large in-kind contributions from community and industry organisations to facilitate community and industry engagement. These contributions exceeded the total value of funding provided by the TAG project and supported community monitoring efforts such as the Russett Park Community Taskforce (run by Kuranda Envirocare) and Conservation Volunteer Teams (both Better Earth and Green Army programs) that provided support for passive surveillance efforts. These resulted in the discovery of several infestations that are likely to have existed before the TAG and NLP projects and that had not been detected by previous agencies responsible for YCA management. The community and industry engagement activities have assisted in raising awareness of household and industry practices that could potentially transport YCA and therefore accelerate invasion spread through human assisted “jumps”.

2 Recommendations

2.1 Continuation of eradication efforts

Eradication efforts should continue based on:

- Promising indications that eradication is technically feasible;
- An assessment that the cost of eradication is likely to be substantially less than the cost of protecting the WTWHA from ongoing incursions of YCA. The importance of this rationale for continuing the YCAEP reflects that protection of the WHA is of paramount importance, as implied by the TAG and NLP assessment criteria, and given the species' potential to cause large ecological damages; and
- The demonstrated capacity of The Authority to effectively manage the eradication program.

2.2 Primary focus of eradication efforts

The future eradication strategy should have a primary focus on:

- Treating known infestations with the best available methods.
- Detecting new infestations, if they exist, by continuing to support community monitoring and expanding regional delimitation efforts, informed by trace-back and trace-forward assessments:
 - Trace-back assessment involves identifying potential sources of known infestations; and
 - Trace-forward assessment extrapolates from the best available information on human assisted movement risks to identify potential locations of unknown infestations that may have resulted from such movements.
- Confirming treatment success with the most cost-effective available monitoring methods.

2.3 Managing the risks of project failure

The future eradication strategy should manage the two main risks of project failure identified in this review: (i) human-assisted spread of YCA and (ii) the potential failure of treatment methods to remove all individuals from a known infestation.

The risk of human assisted spread is best managed by:

- continuing to support community and industry monitoring of YCA to detect new infestations;
- minimising delays in treating newly discovered infestations to reduce YCA abundance and thereby reduce the risk of contact with people; and
- applying for regulatory changes that would allow The Authority to gain enforceable access to private land known or suspected to contain YCA.

The risk of treatment failure is best managed by:

- Applying a rapid assessment method for adaptively determining the most cost-effective treatment protocol:
 - In the initial stages of applying a new treatment method, testing for treatment failure is likely to support earlier change in the treatment method than testing for treatment success. We therefore recommend that monitoring be conducted to determine whether new treatment methods are failing.
 - In the later stages of treatment, after the method has passed the initial failure test, careful monitoring is required to confirm treatment success. Confirmation of success should be based on a rigorous and transparent method for estimating the level of confidence that YCA would be detected within the two-year post-treatment monitoring protocol if the species were still present. The method should consider YCA detectability and rates of YCA population increase.
- Ensuring that any research conducted to support eradication efforts has a realistic prospect of improving management of the program. The principles of Value of Information analysis (Runge et al. 2017) could assist in determining what forms of research to support with limited eradication program funds.

These recommended risk management actions are discussed in more detail below.

2.3.1 Human assisted spread

There are multiple known examples of human assisted spread in the project region. These are illustrated by the existence of isolated infestations. Based on this evidence and consultation with The Authority and YCAEP stakeholders, a preliminary spread model was developed to facilitate predictions of YCA spread under alternative scenarios. These included scenarios in which eradication efforts cease. Analyses conducted with this model indicate that human assisted spread will have a much larger effect on the area infested by YCA than natural land spread (“budding”). Consequently, it is assessed here that human assisted spread has substantial potential to make eradication infeasible, and consequently, it is important to manage this form of spread.

This can be accomplished directly, by placing restrictions on human activities that could spread YCA, or indirectly, by reducing YCA numbers to reduce risks of human contact with YCA. An advantage of the indirect approach is that regulatory approaches that restrict human activities can erode cooperation between YCAEP management staff and stakeholders. However, we recommend that regulatory changes be introduced to ensure YCAEP staff have enforceable access to infested properties, or properties likely to be infested, to ensure the program’s best efforts are not undermined by a small number of non-compliant landowners. In this regard, The Authority indicated that it is currently investigating with Cairns Regional Council and other local government organisations (LGOs) to declare a “Control and Prevention” program whereby YCAEP might have delegated powers that would allow enforceable access to properties to monitor and treat YCA. These powers may also support the imposition of movement controls equivalent to previous Emergency Quarantine notices.

2.3.2 Treatment failure

If individual infestations cannot reliably be removed with available treatment methods, eradication is unlikely to be feasible unless new treatment methods can be developed in the near future, which may not be possible. There is a degree of uncertainty about the efficacy of available treatment methods, which highlights the need for ongoing monitoring and evaluation of treatment effectiveness. This uncertainty about treatment efficacy arises for different reasons, including a lack of prior successes in eradicating large infestations (>100 ha) and uncertainty about the capacity to eradicate YCA from complex environments.

Uncertainty about treatment effectiveness can be addressed by monitoring treatment outcomes to determine whether treatment methods are performing as well as needed to achieve eradication. Information provided by post-treatment monitoring can potentially be used to determine whether to conduct further research to understand why a treatment method is performing less effectively than expected. Alternatively, observations made with post-treatment monitoring could be used to justify the use of an alternative treatment method, if it is available. An advantage of the latter approach is that it can potentially reduce delays before an effective treatment method is identified and applied. Discussions with a leading YCA expert who has advised the WTMA YCAEP (Dr. Ben Hoffmann, CSIRO) indicated that substantial challenges usually exist in determining causes of treatment failure. Even if a cause is identified, it may not influence the decision on which treatment method to apply if further research would be required to determine how best to address the cause of failure. For these reasons, it is recommended that the risk of treatment failure be addressed by rapidly evaluating alternative treatment methods based on observations made during post-treatment monitoring, rather than conducting time consuming and potentially costly research projects to attempt to understand the causes of treatment failure. Based on discussions with The Authority, the risk of treatment failure is effectively being managed by the WTMA YCAEP.

2.4 Delimitation efforts should be expanded

The Authority has had success in progressing towards full delimitation of the YCA invasion in the project region. Passive surveillance has been encouraged through supporting community monitoring (including through funding a Russett Park Community Taskforce Coordinator position under the NLP), which has assisted in detecting new infestations. Active monitoring by The Authority has also been conducted, and these efforts have been complemented by efforts to trace-back outlier infestations to probable sources. These trace-back efforts are still in their early stages, and continuation of these efforts may reveal new infestations.

It is recommended that these trace-back activities be continued and expanded, given the importance of delimiting the invasion and identifying human spread vectors to reduce risks of long distance movements of YCA. Delimitation efforts should include all locations where eradication was declared by the previous program manager, Biosecurity Queensland, to manage the risk that one or more of those locations still contain remnant YCA individuals.

2.5 Eradication progress should be monitored

Given uncertainty about the effectiveness of treatment, the risk of human assisted spread and uncertainty about whether undetected infestations exist, it is essential to carefully

monitor eradication progress to ensure the program remains on track to achieve its objectives. This should include monitoring of changes in the invasions' size over time, including the number of infestations, the geographic extent of the invasion and the proportion of the delimited area occupied by YCA. This can be accomplished by expanding delimitation and trace-back activities and carefully recording information produced by these activities. The data produced by these activities could then in turn be used in statistical analyses to estimate whether the invasion is declining in terms of those attributes (number of infestations, the geographic extent of the invasion and the proportion of the delimited area occupied by YCA). The invasion may be declining in these attributes even if occasional new infestations occur, however, quantitative analysis is needed to determine whether new infestations occur infrequently enough that eradication can still be achieved. Appropriate methods for evaluating whether declines are occurring in one or more of these invasion size attributes should take account of the fact that observations of the invasion are incomplete (some areas that may have YCA may not have been surveyed) and imperfect (the failure to detect YCA at a surveyed location does not guarantee that YCA was absent there).

2.6 Budgetary and resourcing considerations

Two budgetary considerations are the size of the total budget and its allocation for program activities over time.

Experience with the Red Imported Fire Ant (RIFA) eradication program indicates that there is substantial value in allowing flexibility in how the budget is allocated over time. The RIFA program discovered substantial new areas of infestation in the early stages of the current program funding round and this has led to future budget allocations being accessed earlier than expected to immediately treat newly discovered infestations.

The YCA invasion in the project region is small enough that all known infestations can be treated within a short period. However, challenges may arise in using labour intensive control methods, such as targeted ground treatment and post-treatment monitoring (in contrast to less labour-intensive activities such as aerial treatment). Intensive control activities may require the use of large numbers of staff that can be employed over a large area when needed to conduct treatment and monitoring. The intermittent nature of this form of work may create challenges in obtaining and maintaining access to a skilled and trained workforce. The use of sniffer dogs, if they can be trained soon enough, would assist mitigation of the problem of relying heavily on casual staff. This reflects that sniffer dogs could potentially reduce labour requirements. Although this monitoring method is yet to be applied in a YCA eradication program, preliminary trials of the method in Lismore, NSW, indicate that one sniffer dog could potentially cover the same area as 4-5 people (Dr Ben Hoffmann, personal communication). Access to state or Federal biosecurity agency staff may further assist in gaining access to adequately trained staff to conduct monitoring and treatment, particularly if the YCA control zones overlap with areas concurrently being managed by other agencies.

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Appendix A: Project assessment criteria

Caring for Our Country (CFOC) - Targeted Area Grants (TAG) Project

- To what extent and in what ways has the project contributed to reducing 400ha YCA (critical threat) in and adjacent to the Wet Tropics World Heritage Area? Are we progressing towards our goal of eradication or not?
- To what extent has the project contributed to the improvement, restoration, enhancement and presentation of the outstanding universal value of the Wet Tropics World Heritage Area?
- To what extent has the project contributed towards a coordinated effort aimed at identifying and addressing key threatening processes to the World Heritage Area and invasive tramp ant management at a range of scales?
- How will any new infestations be addressed?
- How has the project contributed towards building Indigenous community capacity in the management of YCA in and next to the Wet Tropics World Heritage Area?

National Landcare Program (ad-hoc funding) assessment criteria

- To what extent has the project contributed to the restoration and rehabilitation of the natural environment and in particular, the protection and conservation of the Wet Tropics World Heritage Area?
- To what extent has the project contributed towards a coordinated effort aimed at identifying and addressing key threatening processes to the World Heritage Area and invasive tramp ant management?
- To what extent and in what ways has the project contributed to reducing YCA (critical threat) in and adjacent to the Wet Tropics World Heritage Area?
- How will any new infestations be detected and addressed?
- To what extent has the project increased engagement and participation of the community, including farmers and Indigenous people, in the management of YCA in and next to the Wet Tropics World Heritage Area?
- To what extent has the project contributed to improving landholder enjoyment and use of their land?
- How efficient, cost effective and sustainable were the activities? Are any improvements to the effectiveness possible?