CASE STUDY: MYRTLE RUST

UPDATED: NOVEMBER 2017

Case study of a failure to prevent entry of and to eradicate a devastating new plant disease.

Species

Myrtle rust / Eucalyptus rust (*Puccinnia psidii*)

Origin

South America

Australian occurrence

First detected in April 2010 in NSW. Now established in Queensland (east of the Great Dividing Range as far north as the Wet Tropics), NSW and Victoria.

Potential ecological impacts[1]

Australia is in the early stages of invasion by myrtle rust, a fungus which causes disease in species in family Myrtaceae, Australia's dominant plant family. It has established in a wide variety of natural ecosystems – rainforests, heathlands, woodlands and wetlands – as well as in urban areas. The impacts so far indicate it will have very serious ecological impacts. There is no known method of controlling the disease in the wild except perhaps for application of fungicides in very small areas as a last resort for high priority assets. Myrtle rust has been listed as a key threatening process in NSW.

So far, more than 350 native species (more than 10% of native Myrtaceae species) have proven to be susceptible (in the laboratory or in the wild). This number is expected to increase. About 20% of the species susceptible in the wild are 'highly' or 'extremely' susceptible. In Queensland, 48 species have been rated as highly or extremely susceptible.

Myrtaceae species currently listed as 'threatened' (under state or Commonwealth legislation) that are susceptible include:

- Angle-stemmed myrtle (*Gossia gonoclada*), endangered (federal)
- Peach myrtle (*Uromyrtus australis*), endangered (federal, NSW)

Scrub myrtle (*Rhodamnia rubsecens*) has been so badly hit by myrtle rust since the disease reached Australia that it was nominated for listing as critically endangered. Photo: Tim Low

- Narrow-leaved malletwood (*Rhodamnia angustifolia*), endangered (Qld)
- *Backhousia oligantha*, endangered (Qld)
- Giant ironwood (*Choricarpia subargentea*) (NSW)
- Sweet myrtle (*Gossia fragrantissima*), endangered (federal, NSW)

Other species, hitherto not regarded as of conservation concern, such as scrub turpentine (*Rhodamnia rubescens*) and native guava (*Rhodomyrtus psidioides*) are already showing such high rates of dieback, reduced reproduction and mortality that they could be at risk of regional or total extinction.

Disease impacts on keystone species have broader ecological ramifications. Of 15 susceptible *Melaleuca* species in Queensland about half are 'highly or extremely susceptible'. Several – such as *Melaleuca quinquenervia*, *M. leucadendra* and *M. viridiflora* – are important sources of nectar for birds and flying-foxes, and the forests they form serve as habitat for many animals.

About 19 eucalypt species so far have proven susceptible in the wild but little is known about potential impacts. Dozens more have shown susceptibility in laboratory tests. Deaths have occurred in South American eucalypt plantations after repeated infection. Eucalypts are likely to be most vulnerable to the disease as seedlings and after fire. Infection causing shoot and stem dieback and death of coppice growth has been recorded on adult trees of *Eucalyptus curtisii*.

Potential economic impacts

Some susceptible species have economic importance, eg. medicinal tea tree (*Melaleuca alternifolia*), lemon myrtle (*Backhousia citriodora*) and Geraldton wax (*Chamelaucium uncinatum*). The nursery industry has suffered costs due to loss of stock and the need for disease management through plant selection and fungicide programs. The disease could also affect the timber industry, with commercially important plantation species such as *E. agglomerata*, *E. pilularis*, *E. cloeziana*, *E. grandis*, *Corymbia citriodora*, *C. henryi* and *C. torelliana* susceptible.[2]

Pathways

The way in which myrtle rust entered Australia is unknown. In 2006, seeds, nursery stock, bark crevices, lumber and wood packaging material, including dunnage with attached bark, were identified as potential pathways for the importation of spores.[3] Its spread within

Myrtle rust infecting a Western Australian peppermint. Photo: NSW Department of Industry & Innovation

Australia was initially mainly via infected nursery stock. It is also spread by humans, wind, rain and animals.

BIOSECURITY ISSUES

Summary

As Geoff Pegg, plant pathologist with the Queensland government, said, 'This has been the pinnacle of pathogens we wanted to keep out of Australia.'[4] Its establishment in Australia in 2010 represents a very serious failure of biosecurity for it had been recognised as a high risk disease for several years and response/contingency plans had been developed.[5] However, there was no surveillance program in place (as far as we are aware) and the emergency response to the incursion was seriously flawed, with a premature decision made not to eradicate (revised four months later to suppression with a goal of long-term eradication). By not proceeding rapidly with a comprehensive eradication (as was specified in the contingency plan) Australia may have missed a small window of opportunity (of about 6 months) to eradicate the rust before the weather became conducive to spread of the rust's spores. A very high priority biosecurity focus should be to prevent introductions of new variants of the rust, which could exacerbate its threat, as well as other pathogens that cause disease in Myrtaceae species.

Risk assessment and quarantine

For more than a decade before it arrived, myrtle rust was regarded by plant pathologists as a serious biosecurity risk for Australia.[6] Concern was heightened when the rust reached Hawaii in 2005.[7] In 2006 the Primary Industries Ministerial Council stated that it was 'one of the most serious threats to Australian production forests and natural ecosystems'.[8] There have been quarantine restrictions for several years to reduce the risk of infected Myrtaceae material from countries known to host the rust. In 2004, AQIS detected viable spores on shipments of timber from Brazil (including on the surface of the shipping container) which led to a suspension in trade of eucalypt timber from countries with eucalyptus rust.[9] We do not know how adequate the import restrictions were (and are) and how well they were (and are) enforced.

Contingency planning

The Office of the Chief Plant Protection Officer released a national response plan in 2007 and Plant Health Australia published a contingency plan for the nursery and garden industry in 2009.[10] The latter plan identified *Puccinia psidii* as a 'high-extreme' risk for the nursery

OUR MISSION

To protect the environment from harmful new invasive species through prevention and early action.

Stronger biosecurity is vital to protect the highly endemic wildlife of Australia and its many special wild places. This is Lord Howe Island, where invasive species have already caused several extinctions. Photo: Robert Whyte

industry. (Oddly and unjustifiably, the plan gave a lower risk rating for the environment – 'high' – which has been contradicted by current impacts.) The response plans recommended pathway risk analysis, early detection systems and raising awareness with businesses using Myrtaceae. We are uncertain how many of the recommendations were implemented.

Surveillance

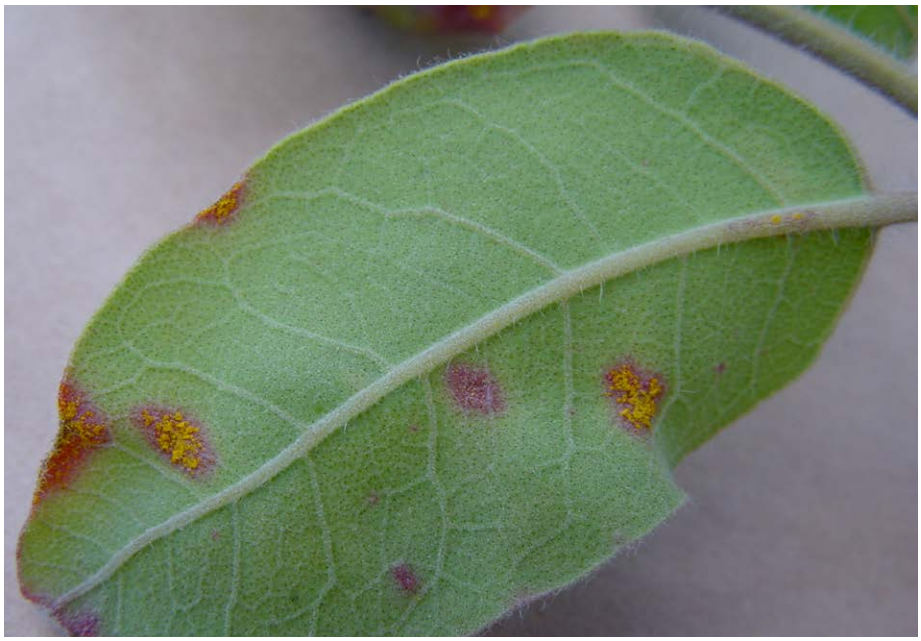
Although it is not known how rust spores entered Australia (whether on imported plant material, attached to other imported goods or via a traveller), it is thought that the rust had been in Australia for several months prior to detection, suggesting surveillance was inadequate.[11] Australian biosecurity agencies were highly aware of the risk of the rust entering Australia, particularly after it arrived in Hawaii in 2005.[12] In 2006, the Primary Industries Ministerial Council said the best defence to Eucalyptus rust was 'early detection through the use of hazard site surveillance using sentinel crops in Australia, the South West Pacific and South East Asia.'[13] The Office of the Chief Plant Protection Officer was said to be investigating costs and options for early detection. As far as we are aware, five years after it was reported in Hawaii, no early detection systems or specific surveillance programs had been established.

Risk reduction measures

According to biosecurity officers, biosecurity practices in many wholesale plant breeding facilities and nurseries are poor. Many are sited next to bushland, with no buffer, which means that any pests or diseases introduced on nursery stock have a high risk of spreading into the natural environment. The origins of myrtle rust in Australia are unknown but for many weeks the only infestations found were in nurseries, and the pathogen was spread through the nursery trade even after it was identified in April 2010.

Emergency response[14]

The rust was confirmed on 23 April 2010 in a NSW central coast nursery on willow myrtle plants (*Agonis* species). The grower said the disease has been present since



Myrtle rust infecting turpentine, a common Australian Myrtaceae species. Photo: NSW Department of Industry & Innovation

mid-March 2010. It was also found at low levels on turpentine trees (in a windbreak) and bottlebrush plants up to 500 metres away but not in bushland.[15] On 30 April 2010, although the rust had been found only on two properties and not in bushland, the National Management Group deemed it ineradicable. This was based on advice from the Consultative Committee on Emergency Plant Pests (CCEPP) that there was a 'high likelihood that its spores may have spread to other areas'.[16] This position was maintained for the next four months. In July, the CCEPP advised that it had 'become clear that the host range of [myrtle rust] in Australia is more limited than anticipated' (contrary to the eventual outcome).

After considerable criticism[17] and more surveys showing there had been only limited spread (only four infected properties had been identified by mid-August), the earlier decision not to eradicate was revised. On 2 July 2010, the National Management Group agreed to an attempt to suppress the rust with a long-term goal of eradication. It activated the Emergency Plant Pest Response Deed, which triggered 100% cost-sharing by the federal and state/territory governments (no industry funding).

The rust was first detected in bushland in late October 2010, 6 months after its first detection in Australia. By 7 December there were 127 infected premises, 1034 premises. In December the rust was found in Queensland. The emergency response was stood down on 22 December after technical advice that eradication was no longer feasible because the rust was spreading naturally in bushland.[18]

ISC considers the emergency response was inadequate in the following ways:

- The 30 April 2010 decision that myrtle rust was ineradicable was far too premature, given it had been detected only in two nurseries and not in bushland. It was also inconsistent with the process outlined in the contingency plan.[19]
- Given the recognised extreme risks of the disease, and the lack of information about the extent of establishment and likely impacts, the precautionary principle should have been applied.[20] It seems that short-term budgetary considerations prevail over environmental and longer-term economic considerations in many emergency response decisions. One state (or industry in some cases) reluctant to contribute funds can veto an eradication.
- The decision-making lacked transparency and did not appear to

consistently involve experts in ecology or plant pathology. It did not involve environment NGO stakeholders.[21] A Scientific Advisory Panel was appointed only in July but it is not clear that it had ecological/conservation expertise.[22]

- Environmental risks were not given sufficient weighting in the decision-making process. We very much doubt that the same decision would have been made if it had been an incursion of foot and mouth disease or equine influenza.

Carnegie and Cooper (2011) report that until November-December (when weather conditions conducive for spread and infection occurred) the rust was spreading only due to movement of infected plants and people. This leaves open the real possibility that had more resources (flowing from national cost-sharing arrangements) been dedicated to surveys and eradication in the initial stages after detection, the rust's spread into bushland could have been prevented. Carnegie and Cooper (2011) say that the conditions in the few months after detection (until late spring) 'provided an ideal situation to attempt to eradicate the rust'. ISC is of the opinion that the very high risks of myrtle rust warranted an early full-scale eradication attempt, which would have been consistent with the contingency plan.

Resources

Compared to the potential impacts of this disease – both economic and environmental – extremely modest sums were invested in the emergency response. On 9 April 2011, it was reported (in The Australian) that the NSW government had spent $5 million detecting, controlling and attempting to eradicate the rust (to December 2010), Queensland had spent $970,000, and the federal government $1.4 million.[23]

Preventing future incursions

It is vital to try to prevent further incursions of eucalyptus/myrtle rust because any new genetic material could exacerbate the disease threat by:

- expanding the pathogen's host or geographical range
- Increasing the aggressiveness or persistence of the disease
- increasing the pathogen's capacity for genetic change and adaptive evolution.

The evidence from South America indicates that strains present there are more harmful to eucalypts than the strain currently in Australia. With the rust already in Australia it will be very difficult to detect new incursions, so there needs to be a rigorous focus on preventing entry. Australia needs an independent risk analysis and review of current import, quarantine and surveillance arrangements.

In 2013 import conditions for Myrtaceous timber were changed: the prohibition on imports from countries hosting Eucalyptus rust were lifted, and the same treatment requirements apply to all Myrtaceous timber.[25] This increases the risks of further incursions of the rust, including new strains.

Australia should be considering the risks of other exotic diseases of native plants as well. Plantations of Australian native species overseas greatly increase the risks of host jumps by pathogens in these export locations and then invasion of the pathogen into Australia (as has occurred with myrtle rust). See ISC's case study on eucalypt and wattle pathogens.

Preventing spread from Australia

Australia should also be concerned about the risks of this disease spreading to other countries with Myrtaceae such as Papua New Guinea, and assist their biosecurity services to implement surveillance and rapid response. Myrtle rust was detected in New Caledonia in 2013[28] and New Zealand and Norfolk Island in 2016.[29]

Disease management

The federal government invested a very modest sum of about $1.5 million for management of myrtle rust as part of the Transition to Management Plan but little of this was dedicated to environmental issues. None of the recommended environmental monitoring projects were funded. ISC is concerned that the level of funding and the proposed activities are far from sufficient for such a nationally significant disease. (Compare this to the $12 million recently granted for Hendra virus research.) There should be a national research and management plan to identify priority research questions and management options relevant to the environment. Issues that need research include:

- Which susceptible species are a priority for conservation management and how can they be assisted?
- What are the impacts on eucalypts post-fire?
- What is the potential for biocontrol?
- Are there strategies such as removal of highly susceptible species (eg. *Syzygium jambos*) from street plantings, bush regeneration and from sale that could assist in disease management (by removing prolific sources of spores)?

Community engagement

Myrtle rust is one of the most threatening invaders of the natural environment, yet there has been minimal engagement of the environment sector (in government and the community) in preparing for and responding to the incursion. As far as we are aware, there was no consultation with environment NGOs in the development of contingency plans and no involvement in decision-making by the National Management Group. In contrast, the nursery and garden industry sector (but not the forestry industry) was involved in both – as a party to deed arrangements between industry and governments for emergency responses and due to the existence of the industry-government body Plant Health Australia. There is no environmental equivalent for Plant Health Australia and Animal Health Australia. The National Management Group consists mainly of agricultural agencies and industry bodies, although the federal environment department was also included in the NMG for myrtle rust. There are no community environmental representatives because none are party to the Emergency Plant Pest Response Deed. Although agricultural agencies are meant to bring a whole of government perspective to the NMG, this does not ensure a strong environmental perspective in decision-making. If environmental NGOs (and state environmental agencies) had been involved in the myrtle rust NMG, the

initial decision would almost certainly have been more precautionary and favoured a stronger eradication response. This has mostly not occurred.

CHANGES NEEDED

Quarantine

- Quarantine conditions and processes need review to ensure sufficient strength and rigor to prevent future incursions of environmental plant diseases including new strains of myrtle rust.
- Other eucalypt pathogens, and those that harm wattles, should be listed as quarantine targets.

Prevention

- Contingency planning, surveillance and preparation for responding to future such incursions must be strengthened to avoid further failures. This much include building awareness and preparedness in the nursery industry.
- Policies are needed to reduce the risks of disease spreading from nurseries and plant breeding sites into bushland. This could include a requirement for buffer zones.

Emergency response

- It is crucial that future decisions about responses to incursions are based on evidence, are transparent and give sufficient, precautionary consideration to the potential impacts on the natural environment. Consideration should be given to establishing an independent scientific advisory panel to inform future decision-making.

Management

- Sufficient resources must be committed to monitoring and managing myrtle rust in the natural environment and to protecting susceptible species and ecosystems.

Community engagement

- The environment sector (both government and non-government) should be involved in preparing for and responding to incursions such as that of myrtle rust.

ABOUT OUR CASE STUDIES

Our case studies illustrate the need for changes in how Australia prevents the establishment of new invasive species. They were compiled using publicly available information at the time of the last update. We would welcome new information or updates to biosecurity response for inclusion in future updates.

CONTACT US

- Visit invasives.org.au for more information about the Invasive Species Council and to get in touch.

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1 Tommerup et al. (2003), NSW Scientific Committee (2011), Carnegie & Lidbetter (2012), NSW Department of Primary Industries (2012), Pegg et al. (2013), Makinson (2014), Pegg et al. (2014), Queensland Government (2014), Bob Makinson, personal communication.

2 Pegg et al. (2013)

3 Primary Industries Ministerial Council (2006)

4 Deighton and Higgins (2011)

5 Glen et al. (2007), Plant Health Australia (2009)

6 Coutinho et al. (1998)

7 Uchida et al. (2006)

8 Primary Industries Ministerial Council (2006)

9 Grgurinovic et al. (2006)

10 Office of the Chief Plant Protection Officer (2007), Plant Health Australia (2009)

11 Trace studies indicated that it had been present since October 2009. Many nursery detections were traced to a supplier in north western Sydney (National Management Group 2010b).

12 Uchida et al. (2006)

13 Primary Industries Ministerial Council (2006)

14 Carnegie and Cooper (2011) outline the sequence of events and the on-ground surveillance and eradication program in NSW.

15 Consultative Committee on Emergency Plant Pests (2010)

16 National Management Group (2010a)

17 On 6 May Plant Health Australia requested that the CCEPP reconsider the decision that it was not technically feasible to eradicate the rust, and also requested that NSW be supported in suppressing the rust and delimitating the infected area (Carnegie & Cooper 2011). For example, the Institute of Foresters of Australia wrote in June 2010 to the agricultural minister expressing 'extreme' concern that the incursion not been 'met with an adequate and speedy response to eradicate this most serious plant pathogen'. John McDonald, the industry development manager of the Nursery and Garden Industry Association said: 'The jurisdictions are quick to define the pest as established so that they can walk away from it without having to commit any funds . . . at the first stage of that incursion, all jurisdictions washed their hands and ran away.'

18 See Carnegie and Cooper (2011) for an outline of the response.

19 The contingency plan for Eucalyptus rust by Plant Health Australia (2009) stated: 'If the initial detection is contained within an area small enough and/or isolated enough that eradication is considered feasible, eradication procedures should also be implemented immediately, without waiting for the results of delimiting surveys, as any delay will allow further spore production and dissemination, reducing the likelihood of successful eradication.'

20 The decision by the National Management Group was the opposite of what is required by the precautionary principle. It justified the decision to not proceed with eradication by saying that 'based on information currently available, the CCEPP can not assure the NMG that eradication is technically feasible'. (National Management Group 2010c). FOI material, National Management Group Out of Session Paper No. 1, 13 May 2010.

21 One example of a lack of environmental expertise on the CCEPP was this suggestion that long-term management of myrtle rust may be achieved with chemical treatment: 'In the natural environment the use of defoliants in combination with fungicides to assist canopy penetration might be a useful approach to control.' (Consultative Committee on Emergency Plant Pests 2010).

22 According to NMG notes, the members were 'drawn from the three technical committees that prepared the projects for the response plan and have expertise in forest health, diagnostics, plant pathology, myrtle/guava rust taxonomy and science, economics and risk analysis.'

23 Deighton and Higgins (2011)

24 Minister for Agriculture, Fisheries and Forestry (2013)

25 International Plant Protection Convention (2013)

26 Summarised in Booth (2011)

27 Wingfield et al. (2011)

28 Giblin (2013)

29 New Zealand Department of Conservation