



**BOTANIC
GARDENS
OF SYDNEY**

Genomics in Conservation: the case of NSW's threatened rainforest species

Dr. Manuela Cascini

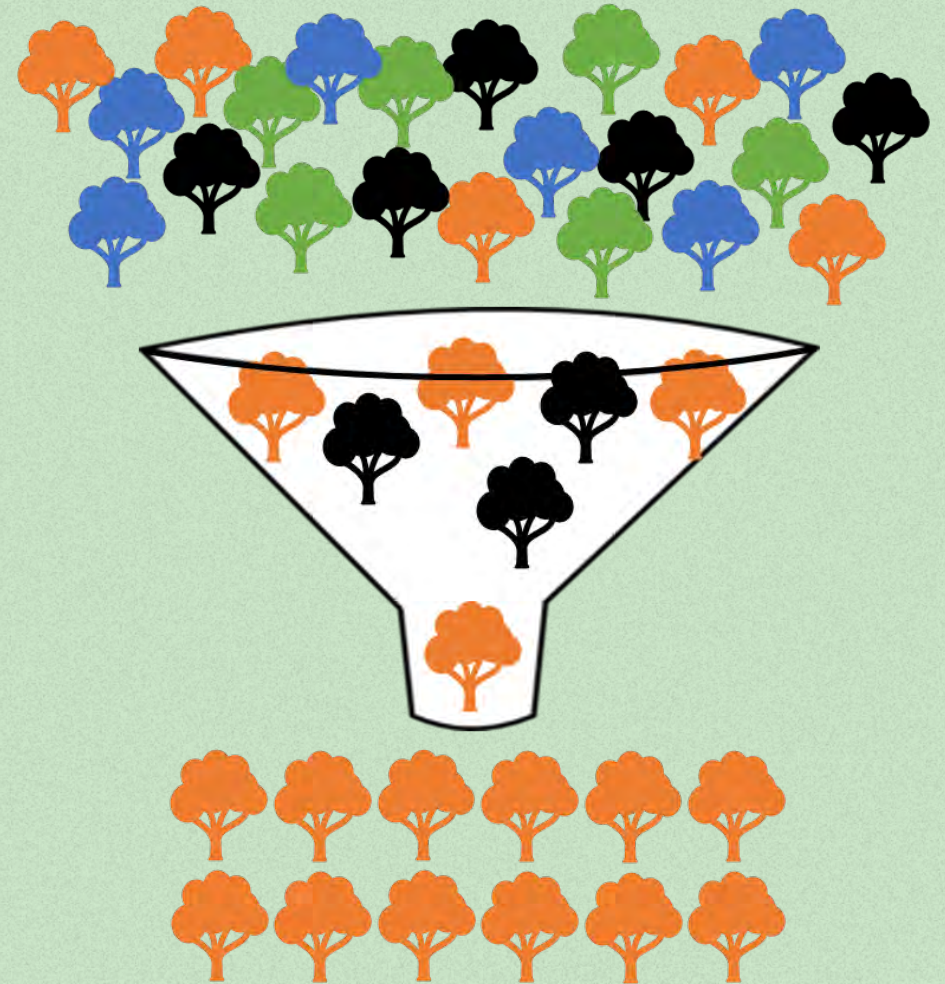
Scientific Officer (Biodiversity Research)
Research Centre for Ecosystem Resilience
(ReCER)



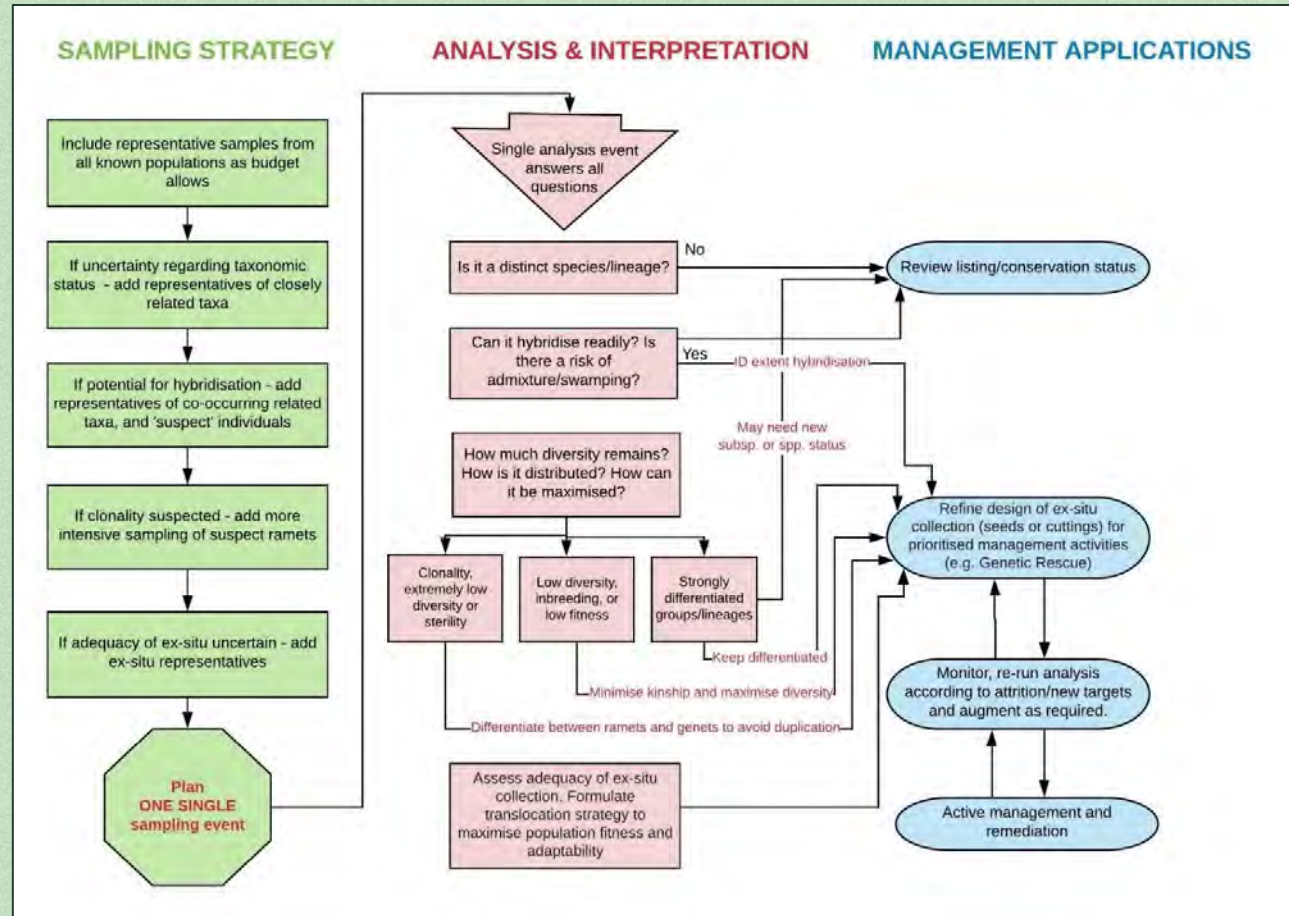
We acknowledge the Traditional Custodians of all the Lands we live and work on and pay respects to elders past and present.

WHY use genomics to assist with conservation management?

1. Ensures costly, labour-intensive conservation actions are worthwhile
2. Informs about the species to reduce risk of failures of actions
3. Enhances effectiveness of an action, i.e., bolsters existing diversity, speeds up recovery, ensures survival



From genomic data to management actions: our workflow



APPLIED TO OVER 80 NSW
THREATENED PLANTS

Rossetto, M., Yap, J. Y. S., Lemmon, J., Bain, D., Bragg, J., Hogbin, P., ... & Wilson, T. C. (2021). A conservation genomics workflow to guide practical management actions. *Global ecology and conservation*, 26, e01492.

From genomic data to management actions: **our workflow**

OVER 30 evolutionary based practical management reports completed

Review conservation status
(3 species, 1%)

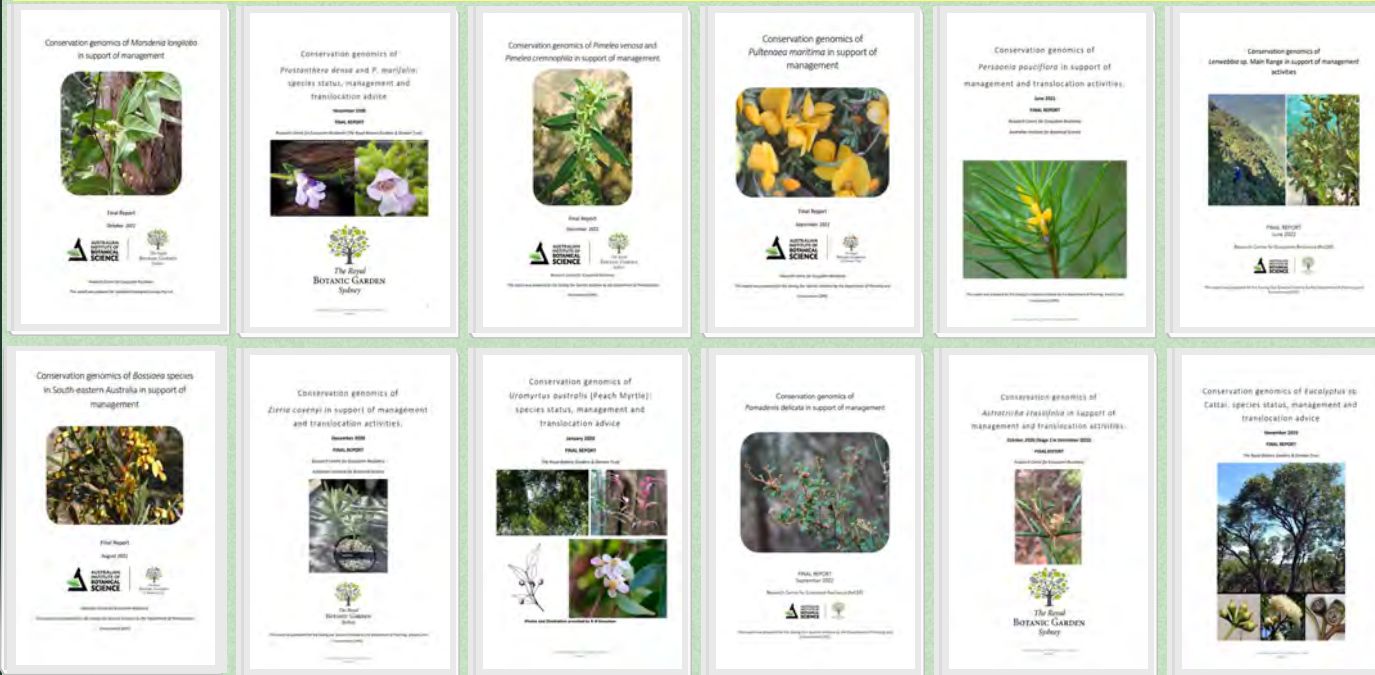
Guide conservation actions

In-situ (All 35 species)

Ex-situ (16 species, 46%)

Translocation (9 species, 26%)

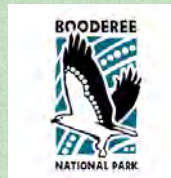
Long-term monitoring (5 species, 14%)



From genomic data to management actions: **our workflow**



Saving our Species program



Rhodamnia maideniana – Smooth scrub turpentine (Myrtaceae)

Existing information:

1. Highly impacted by Myrtle Rust
2. Small population

EMERGENCY priority

Five species undergoing extremely strong decline are recommended for emergency-level action to secure germplasm:

- *Lenwebbia* sp. 'Blackall Range' (P.R.Sharpe+ 5387)
- *Lenwebbia* sp. 'Main Range' (P.R.Sharpe+ 4877)
- *Rhodamnia maideniana* ★★★★★
- *Rhodamnia rubescens*
- *Rhodomyrtus psidioides*



P Woodard



Craig Stehn

Conservation Status

AUS Critically Endangered

NSW Critically Endangered

QLD Critically Endangered

***Rhodamnia maideniana* – Smooth scrub turpentine (Myrtaceae)**
Is it a distinct species?

R. maideniana



R. whiteana



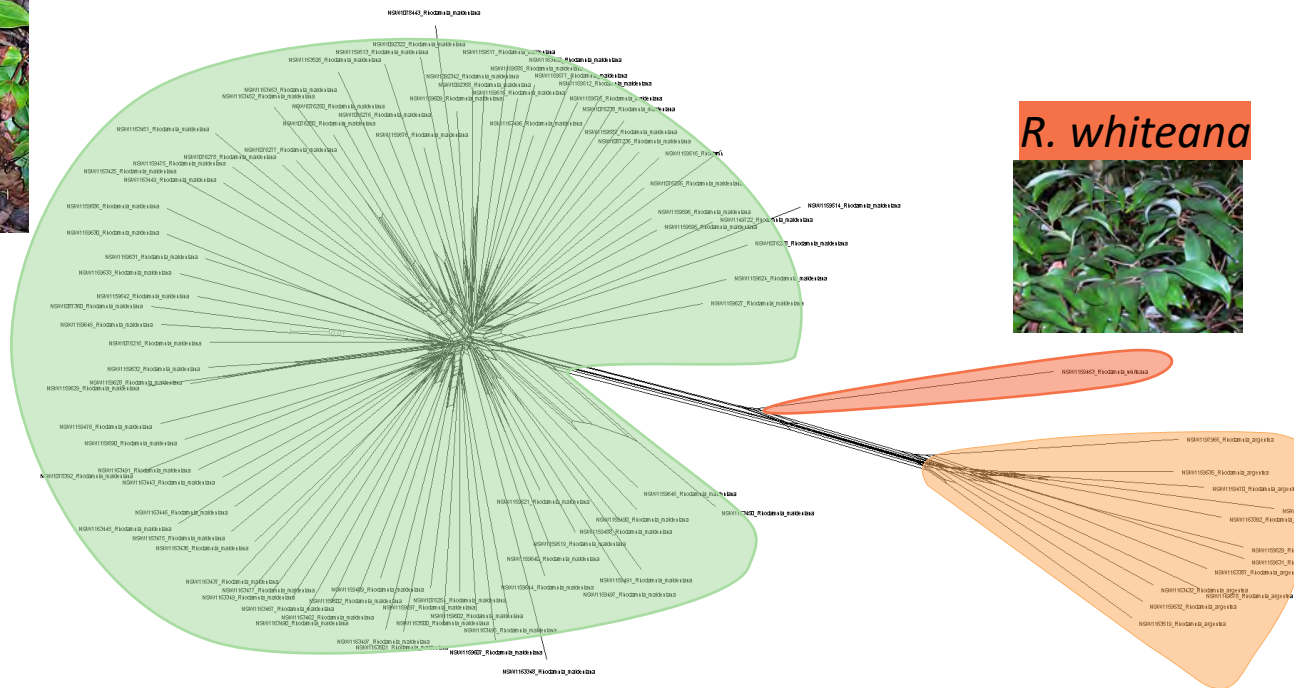
R. argentea



Rhodamnia maideniana – Smooth scrub turpentine (Myrtaceae)

Is it a distinct species?

R. maideniana



R. whiteana



R. argentea

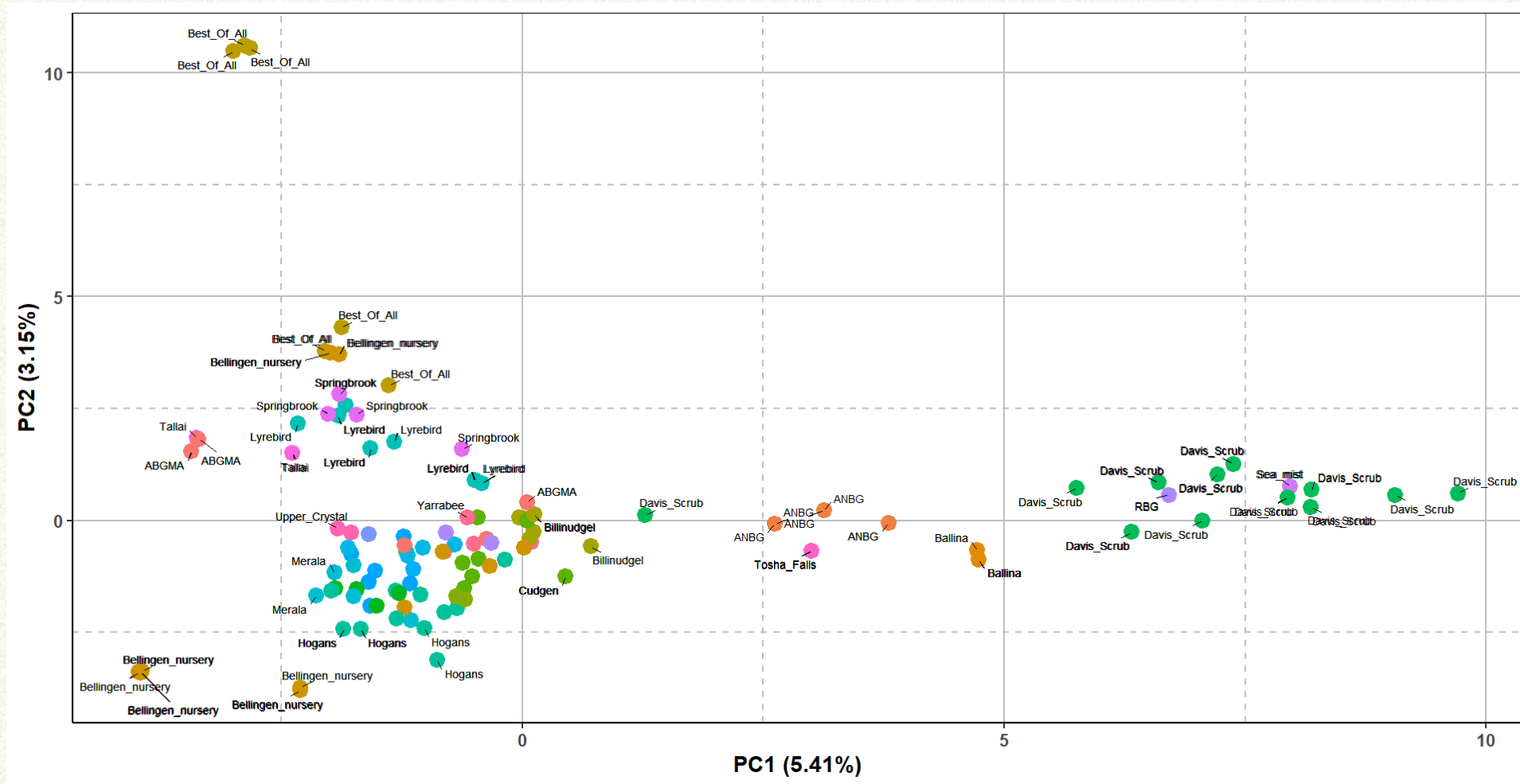


***Rhodamnia maideniana* – Smooth scrub turpentine (Myrtaceae)**
What is its genetic health?

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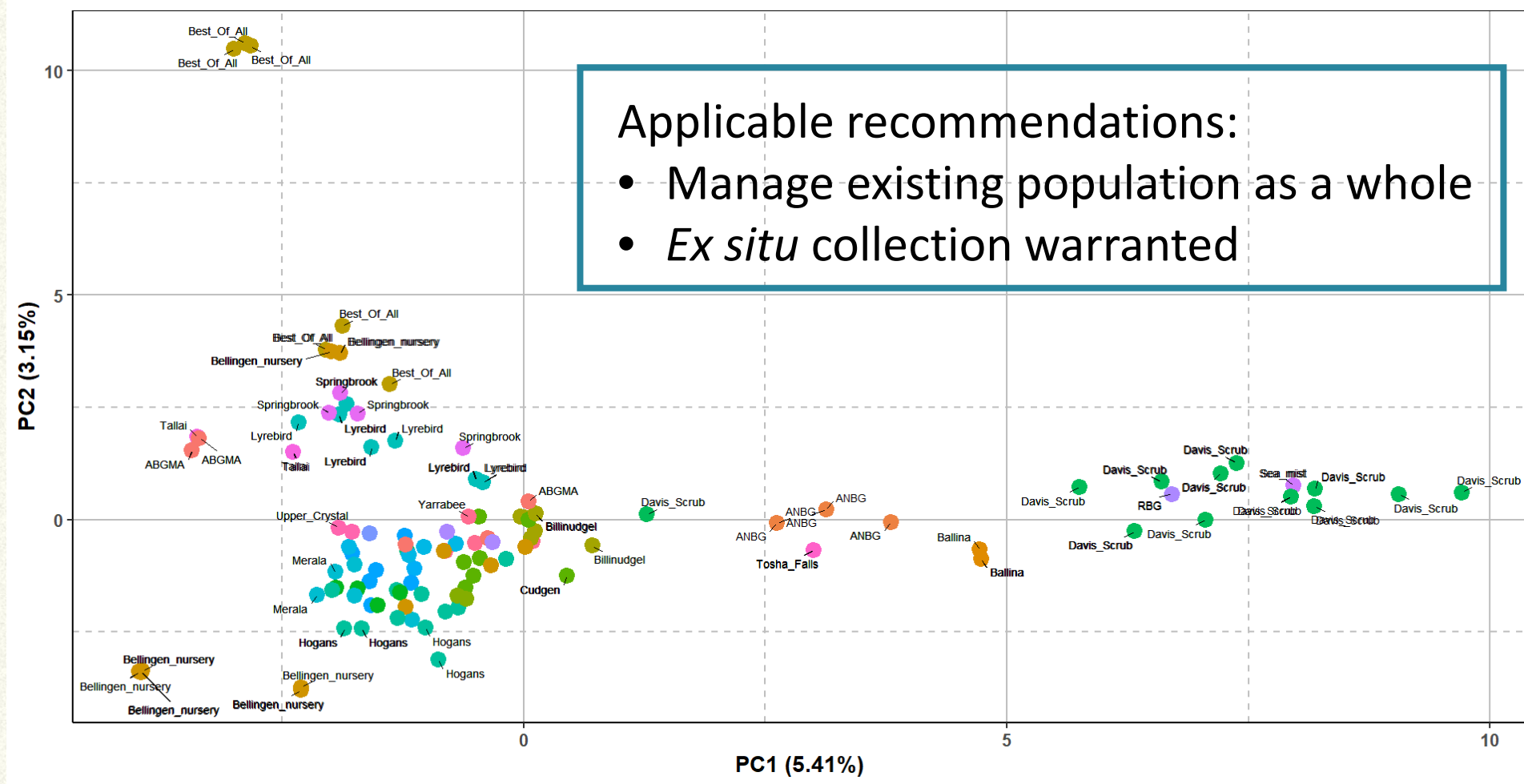
- Low levels of genetic variation detected



Rhodamnia maideniana – Smooth scrub turpentine (Myrtaceae)

What is its genetic health?

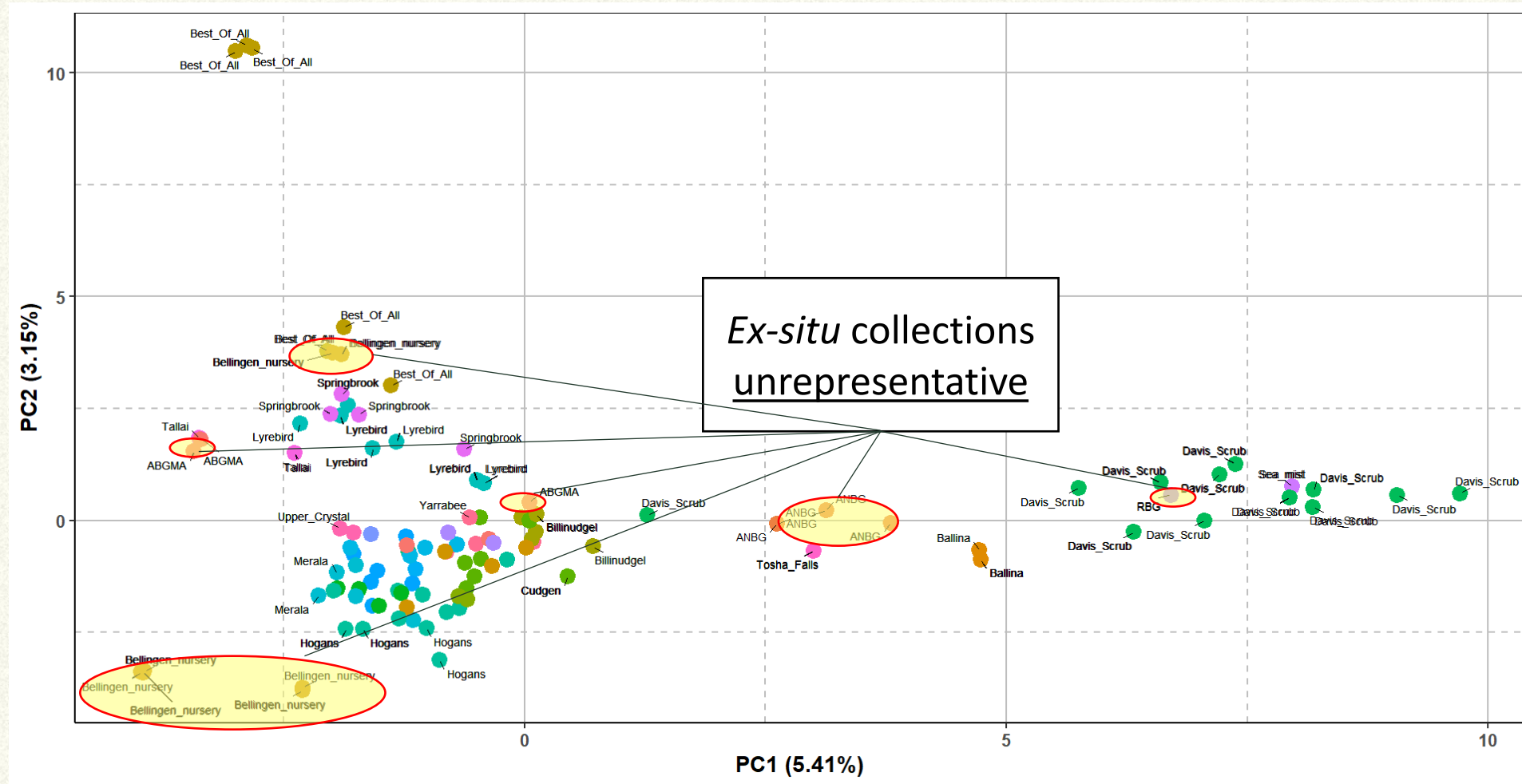
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***Rhodamnia maideniana* – Smooth scrub turpentine (Myrtaceae)**
Are current *ex-situ* collections representative?

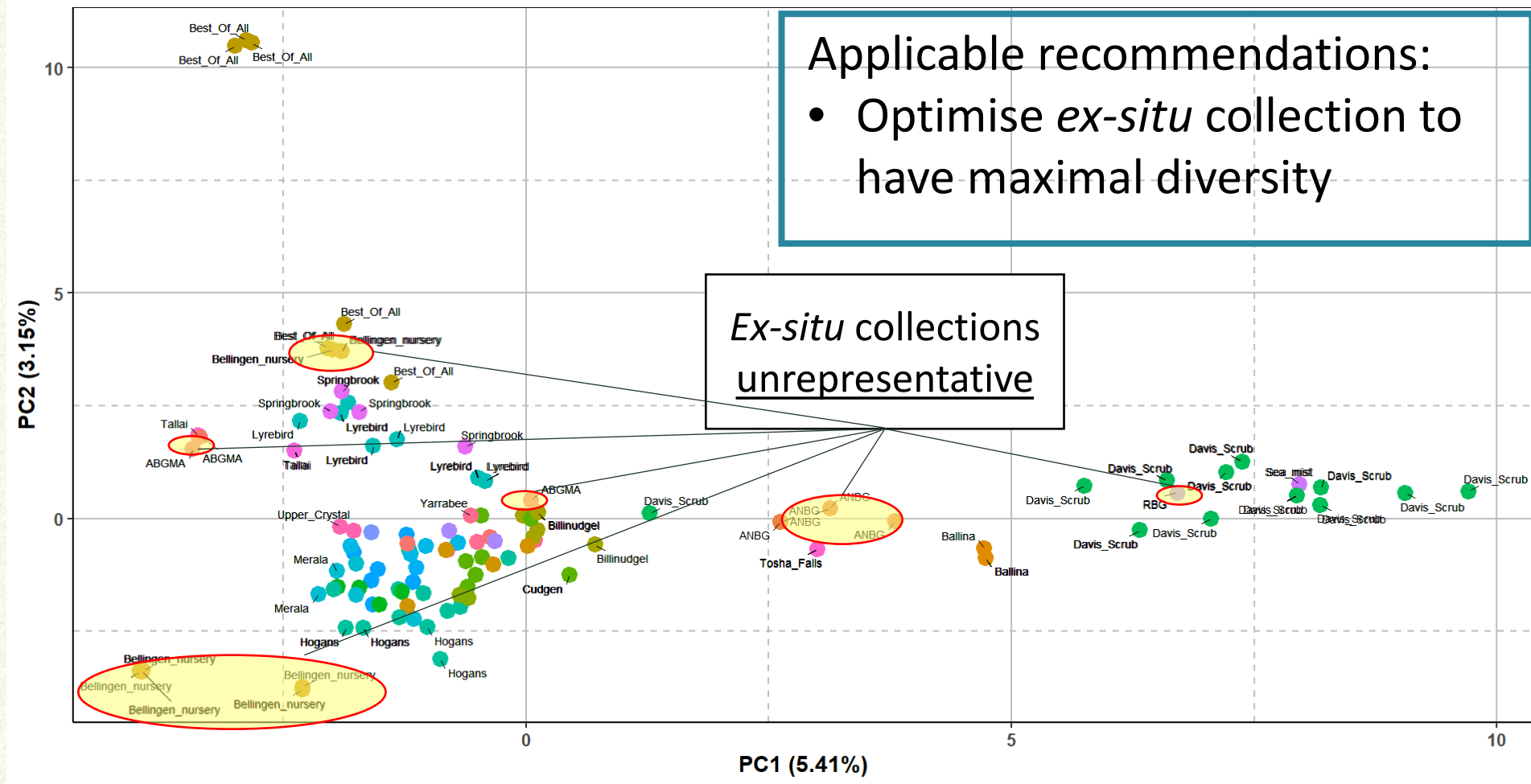
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Rhodamnia maideniana – Smooth scrub turpentine (Myrtaceae)

Are current *ex-situ* collections representative?



Pittosporum kororoense – Big banana pittosporum (Pittosporaceae)

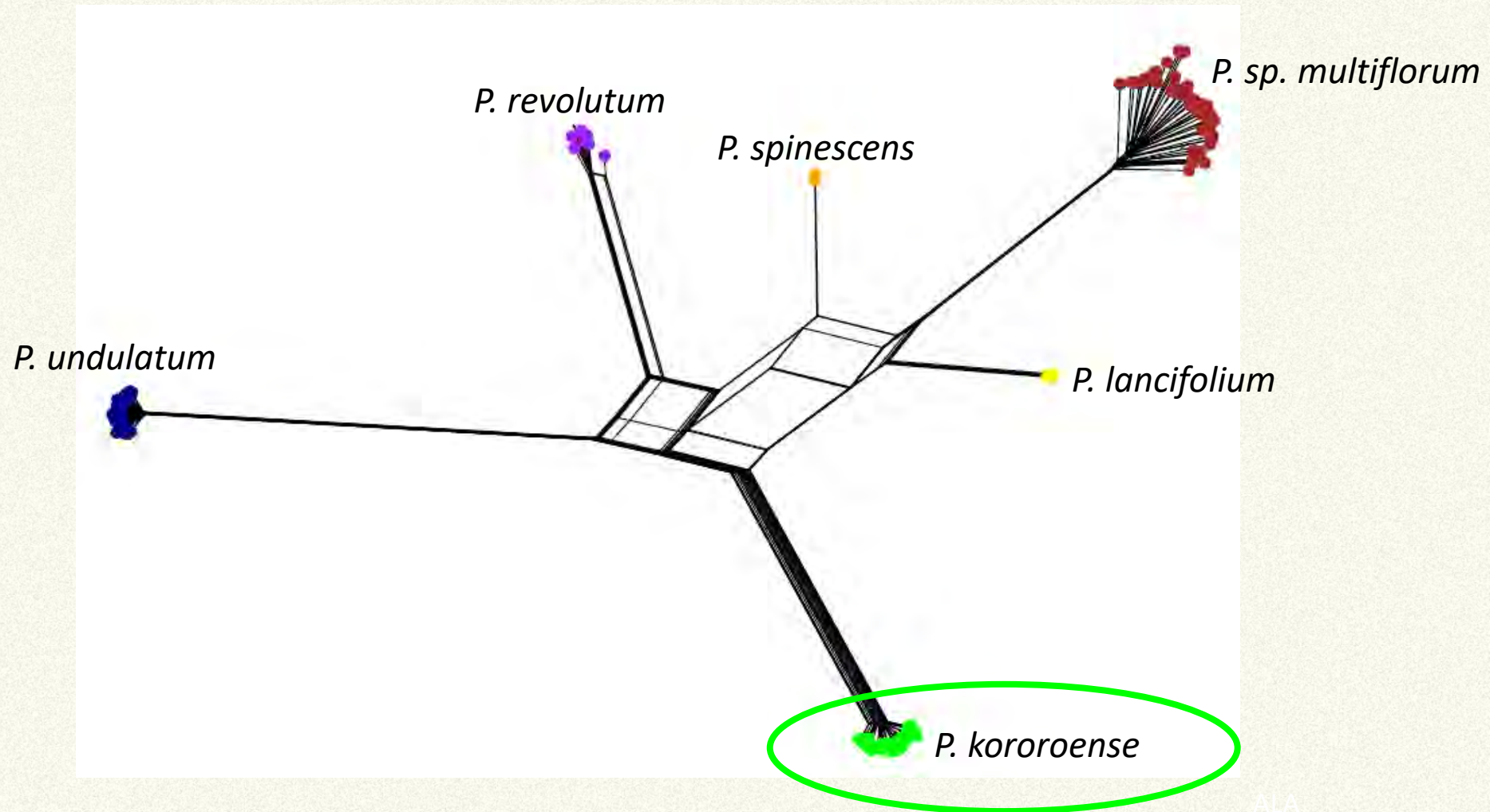
Existing information: - none



ALA

***Pittosporum kororoense* – *Big banana pittosporum* (Pittosporaceae)**
A new species?

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A new species?



ALA

***Pittosporum kororoense* – Big banana pittosporum (Pittosporaceae)**

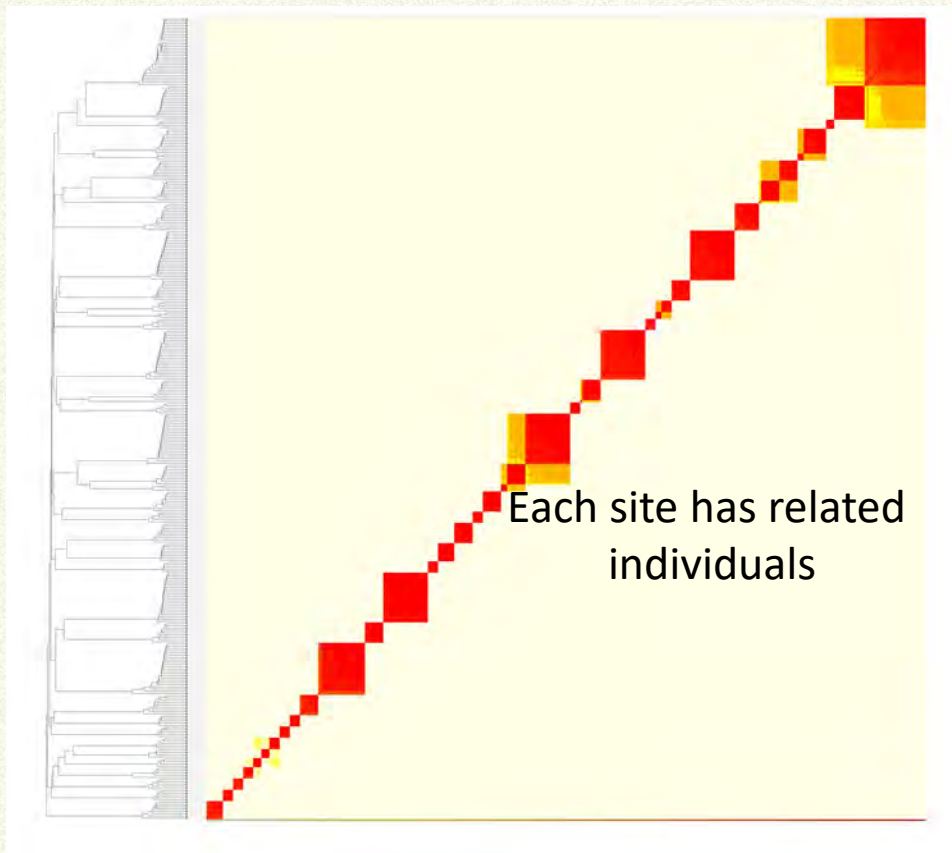
What is its genetic health?

n18 – 3 genets

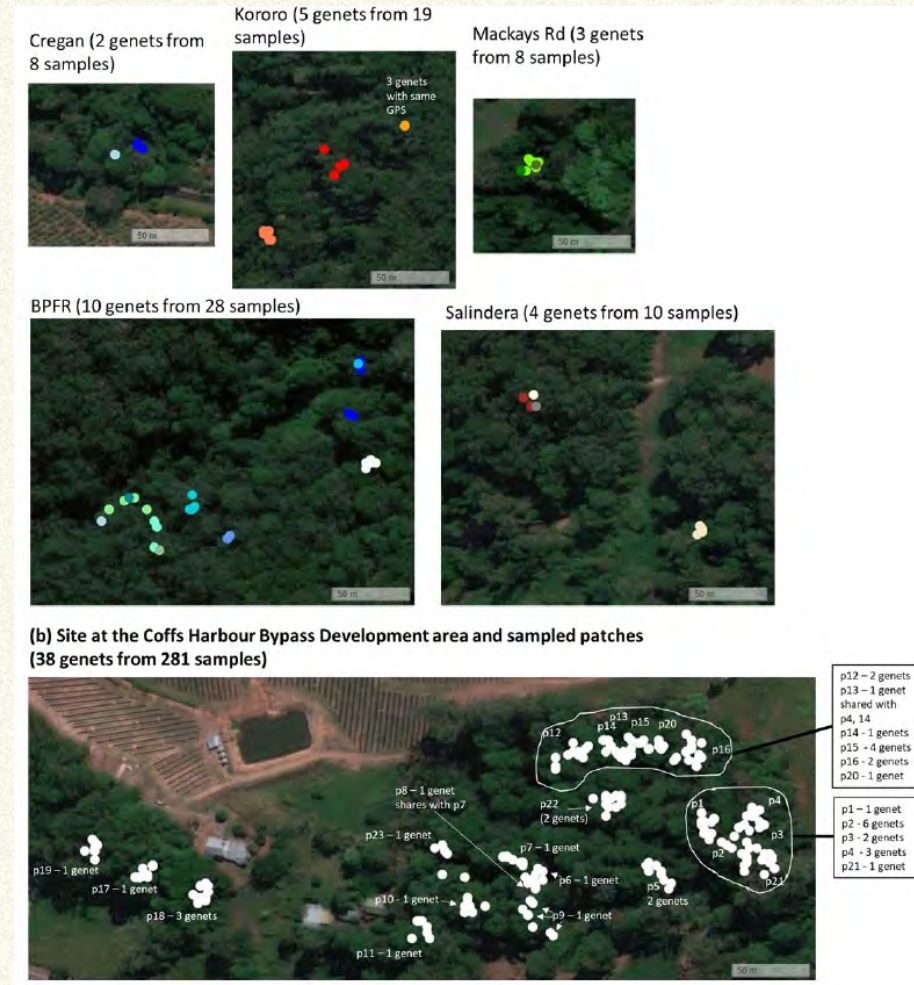
Pittosporum kororoense – Big banana pittosporum (Pittosporaceae)

What is its genetic health?

- Clonality and high levels of inbreeding detected at each site



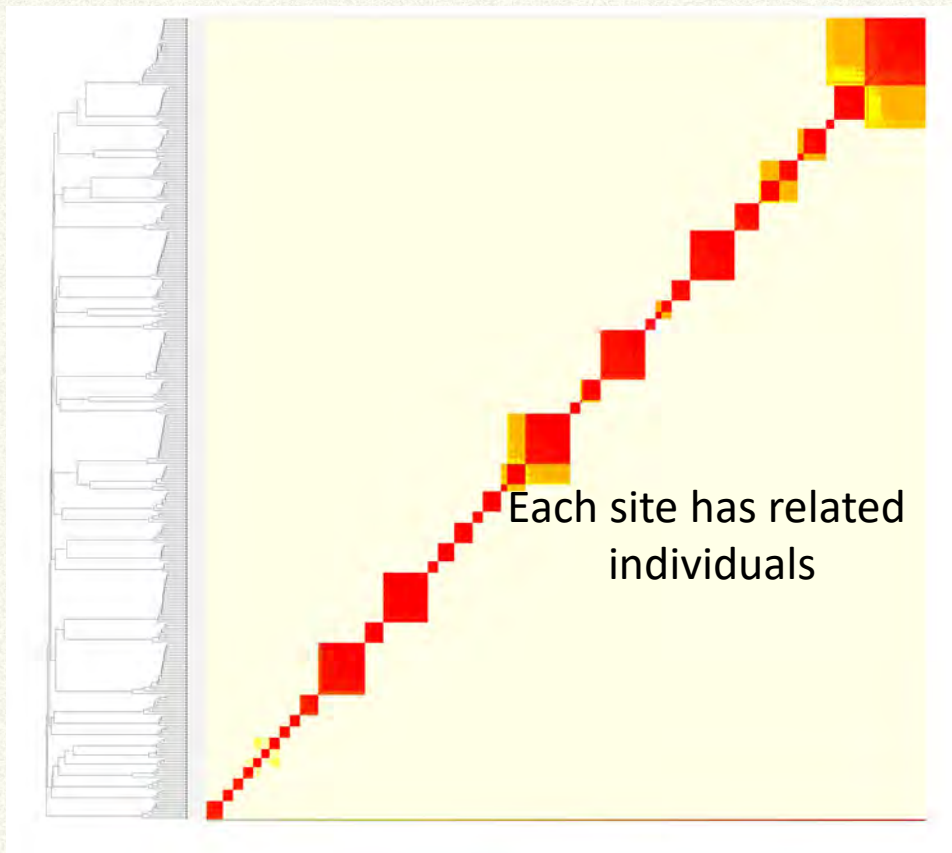
p18 – 3 genets



Pittosporum kororoense – Big banana pittosporum (Pittosporaceae)

What is its genetic health?

- Clonality and high levels of inbreeding detected at each site



Applicable recommendations:

- Optimise *ex-situ* collection to have maximal diversity and minimise inbreeding

p18 = 3 genets

Pittosporum kororoense – Big banana pittosporum (Pittosporaceae)

OptGenMix for genetically optimised collections



Jason Bragg

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ORIGINAL ARTICLE

Evolutionary Applications WILEY

Conserving the genetic diversity of condemned populations: Optimizing collections and translocation

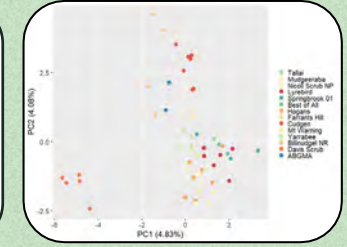
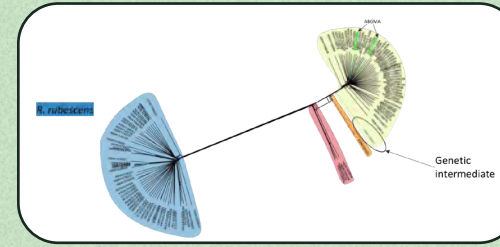
Jason G. Bragg^{1,2} | Jia-Yee S. Yap^{1,3} | Trevor Wilson¹ | Enhua Lee⁴ |
Maurizio Rossetto^{1,3}

<https://github.com/jasongbragg/OptGenMix>

NSW sample	Site	Individual	(a) To capture diversity within impacted sites	(b) To capture maximum species diversity				
			N cuttings to obtain from 17 genets	N cuttings to obtain from 10 genets	N cuttings to obtain from 20 genets	N cuttings to obtain from 30 genets	N cuttings to obtain from 40 genets	N cuttings to obtain from 50 genets
NSW1154164	BPFR	indiv no. 250		60	30	20	15	12
NSW1154160	BPFR	indiv no. 256		60	30	20	15	12
NSW1154161	BPFR	indiv no. 257		0	0	0	0	12
NSW1154154	BPFR	indiv no. 260		0	30	20	15	12
NSW1154150	BPFR	indiv no. 266		0	0	20	15	12
NSW1154305	BPFR	indiv no. 277		0	30	20	15	12
NSW1154303	BPFR	indiv no. 275		0	0	0	0	0
NSW1154309	BPFR	indiv no. 271		0	0	0	15	12
NSW1154298	BPFR	indiv no. 280		60	30	20	15	12
NSW1154306	BPFR	indiv no. 278		0	0	20	15	12
NSW1154225	Cregan	indiv no. 191		0	0	0	0	12
NSW1154220	Cregan	indiv no. 196		0	30	20	15	12
NSW1087627	Kororo	indiv no. 75		0	0	0	0	12
NSW1087622	Kororo	indiv no. 77		0	0	20	15	12
NSW1087602	Kororo	indiv no. 78		60	30	20	15	12
NSW1154174	Kororo	indiv no. 240		0	30	20	15	12
NSW1154170	Kororo	indiv no. 246		0	0	20	15	12
NSW1150492	MackaysRd	indiv no. 5		0	0	0	0	12
NSW1150491	MackaysRd	indiv no. 4		60	30	20	15	12
NSW1150495	MackaysRd	indiv no. 8		0	0	20	15	12
NSW1154213	Salindera	indiv no. 199		0	0	0	15	12
NSW1154208	Salindera	indiv no. 203		0	0	0	15	12

Genomics to the rescue

addressing conservation needs every step along the way!



Threatened species

What is the species? – concept, hybridisation potential, genetic health

Monitor in-situ

Implement ex-situ collection

Selection of source material –
remove hybrids, maximise diversity,
minimise inbreeding



Translocation
planning

Design planting - size, spatial design,
self-sustainability

Implement translocation



Long-term monitoring

Track and ensure success –
risks and supplementation

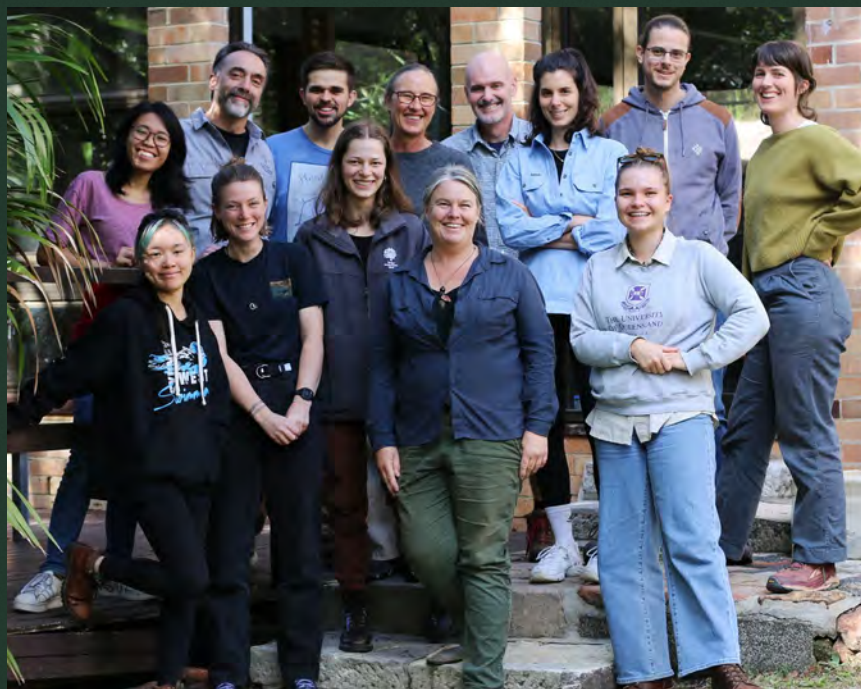
Species recovery



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Research Centre for Ecosystem Resilience

Thank You



For further questions, contact me:
Manuela.Cascini@botanicgardens.nsw.gov.au

