BOTANIC GARDENS OF SYDNEY

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

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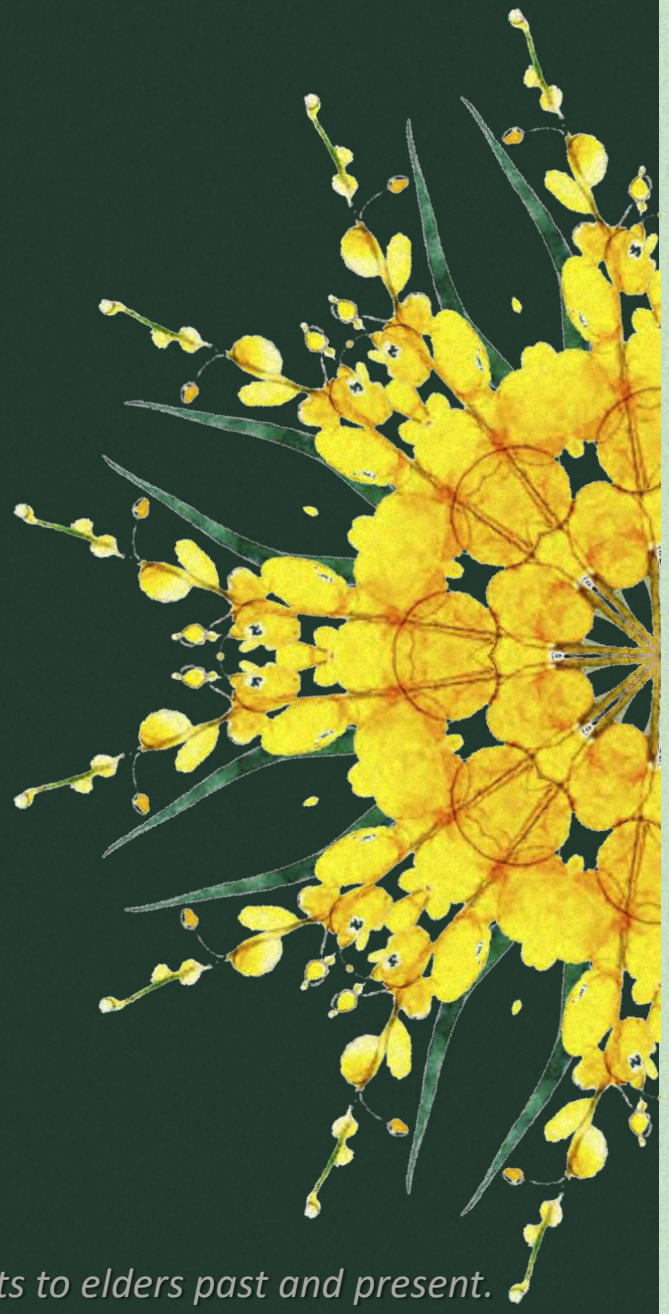
Research Centre for Ecosystem Resilience (ReCER)



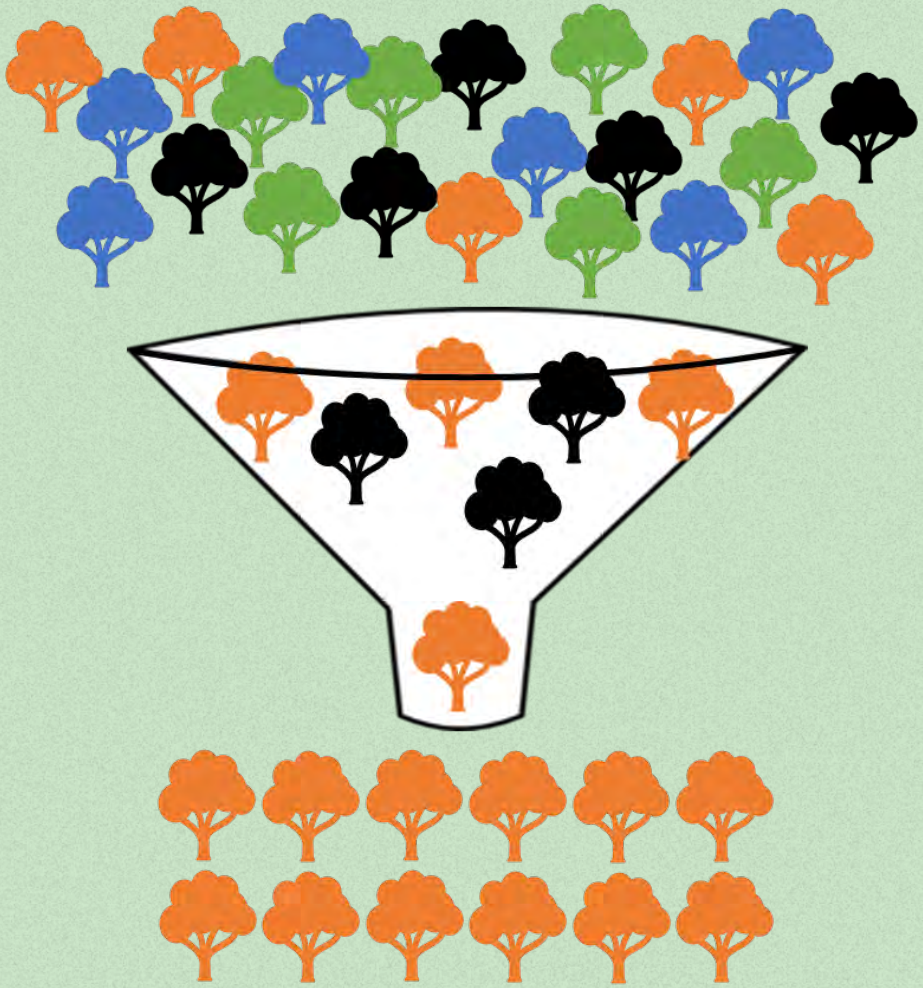
We acknowledge the Traditional Custodians of all the Lands we live and work on and pay respects to elders past and present.

WHY use genomics to assist with conservation management?

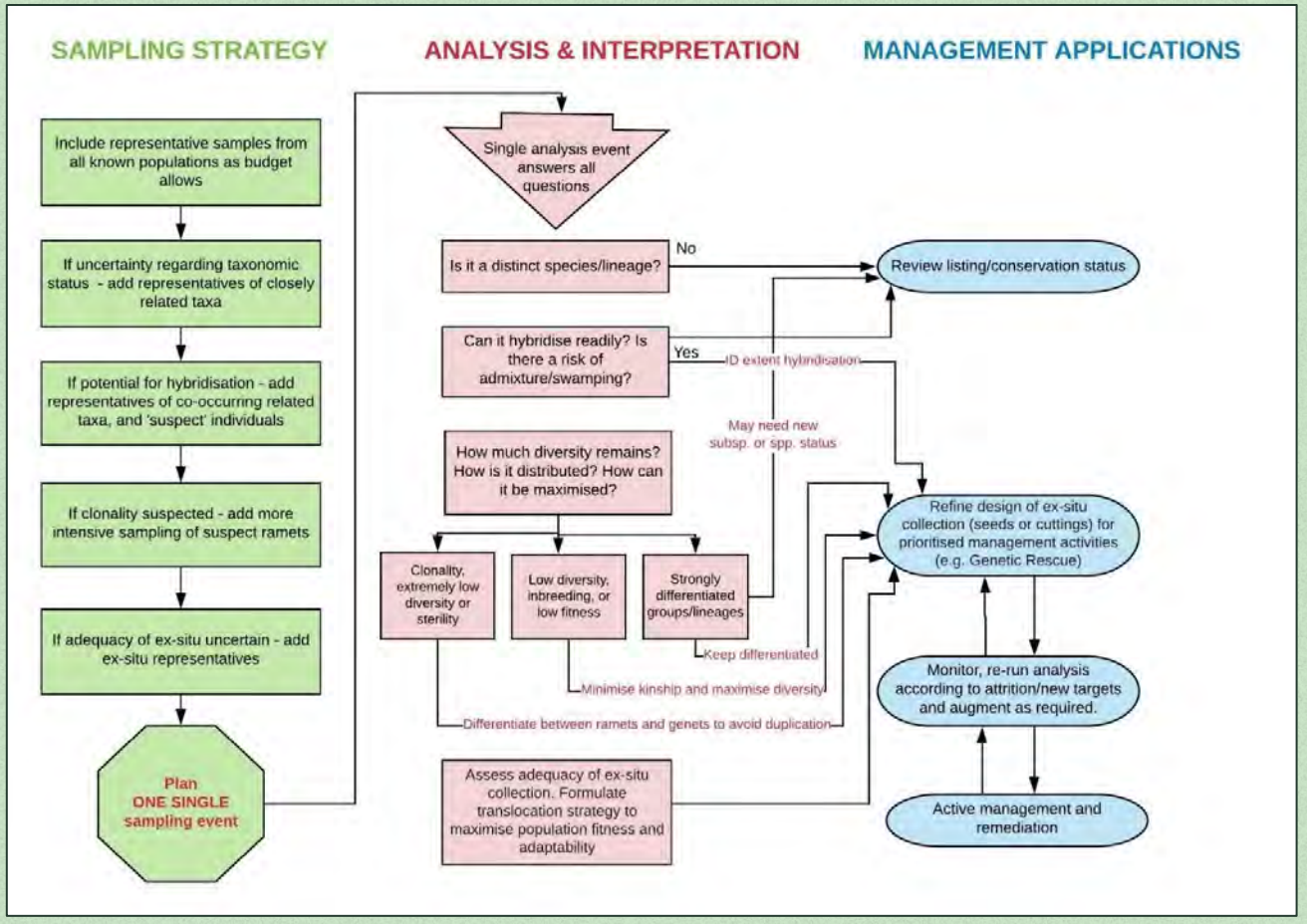
1. **Ensures costly, labour-intensive conservation actions are <u>worthwhile</u>**

2. **<u>Informs</u> about the species to reduce risk of failures of actions**

3. **<u>Enhances</u> effectiveness of an action, i.e., bolsters existing diversity, speeds up recovery, ensures survival**



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

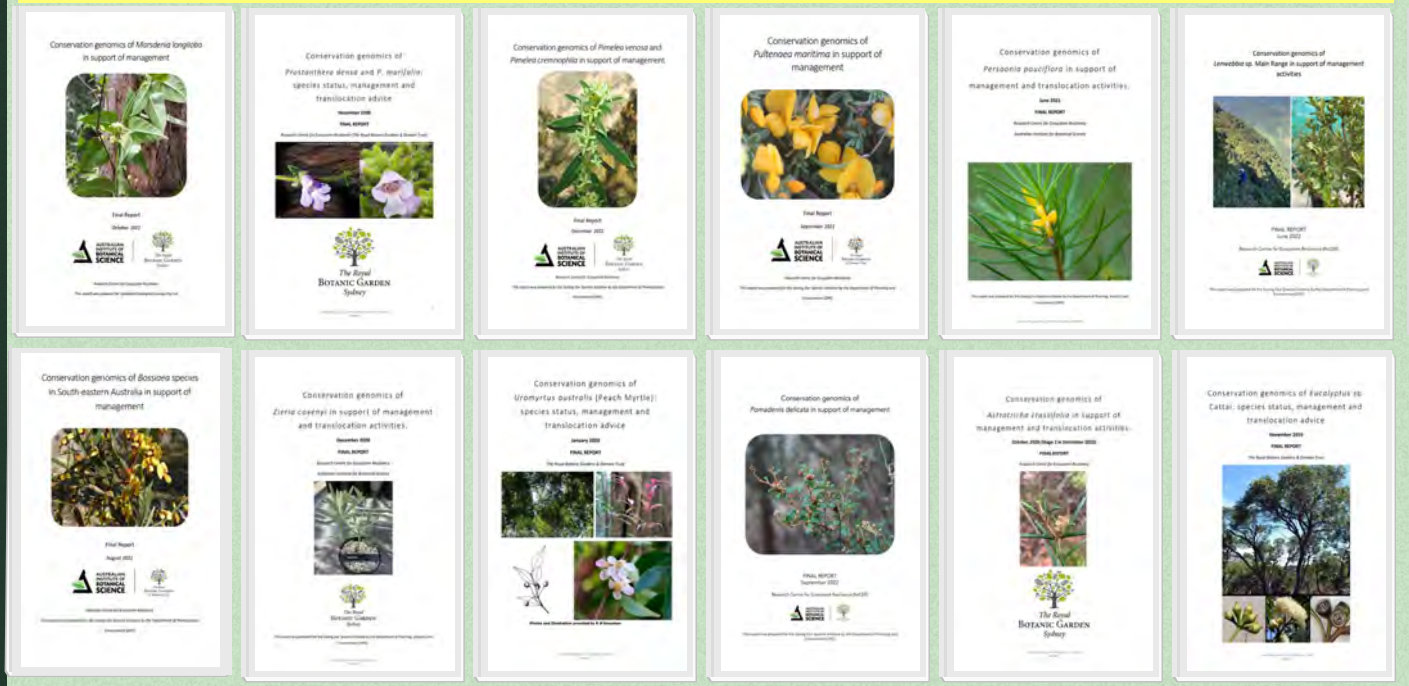


APPLIED TO OVER **80** NSW THREATENED PLANTS

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*

Conservation Status

AUS	Critically Endangered
NSW	Critically Endangered
QLD	Critically Endangered

M Fagg

C Stehn

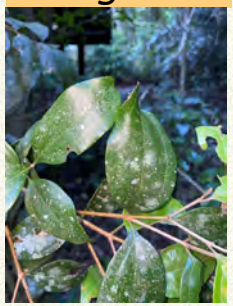
Rhodamnia maideniana – Smooth scrub turpentine (Myrtaceae)

Is it a distinct species?

R. maideniana

R. whiteana

R. argentea



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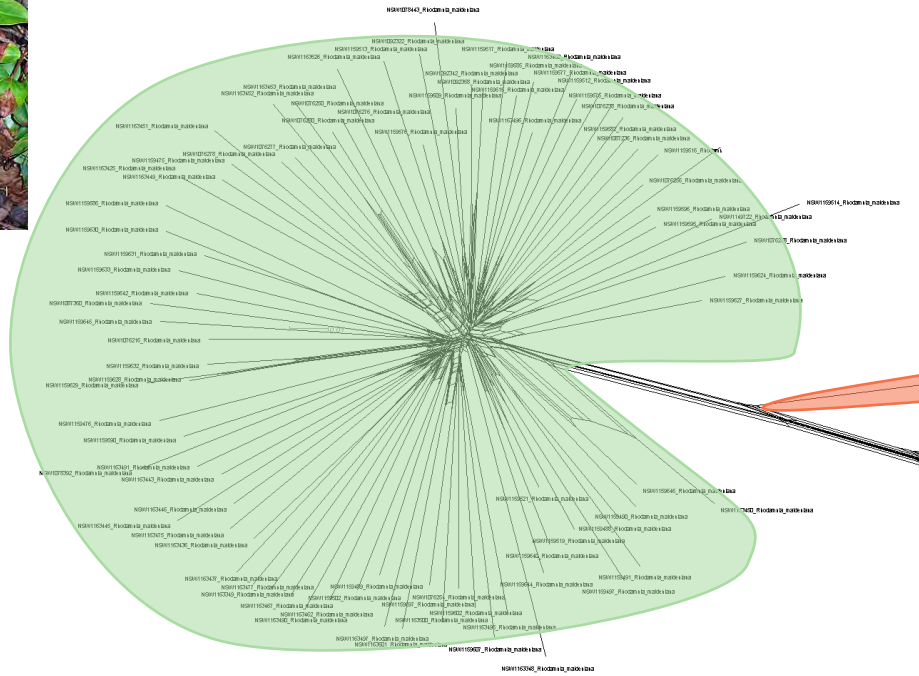
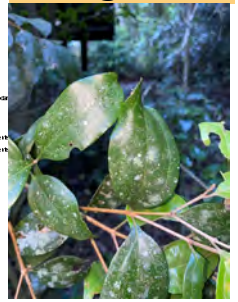


R. whiteana

R. argentea



Rhodamnia maideniana – Smooth scrub turpentine (Myrtaceae)

What is its genetic health?

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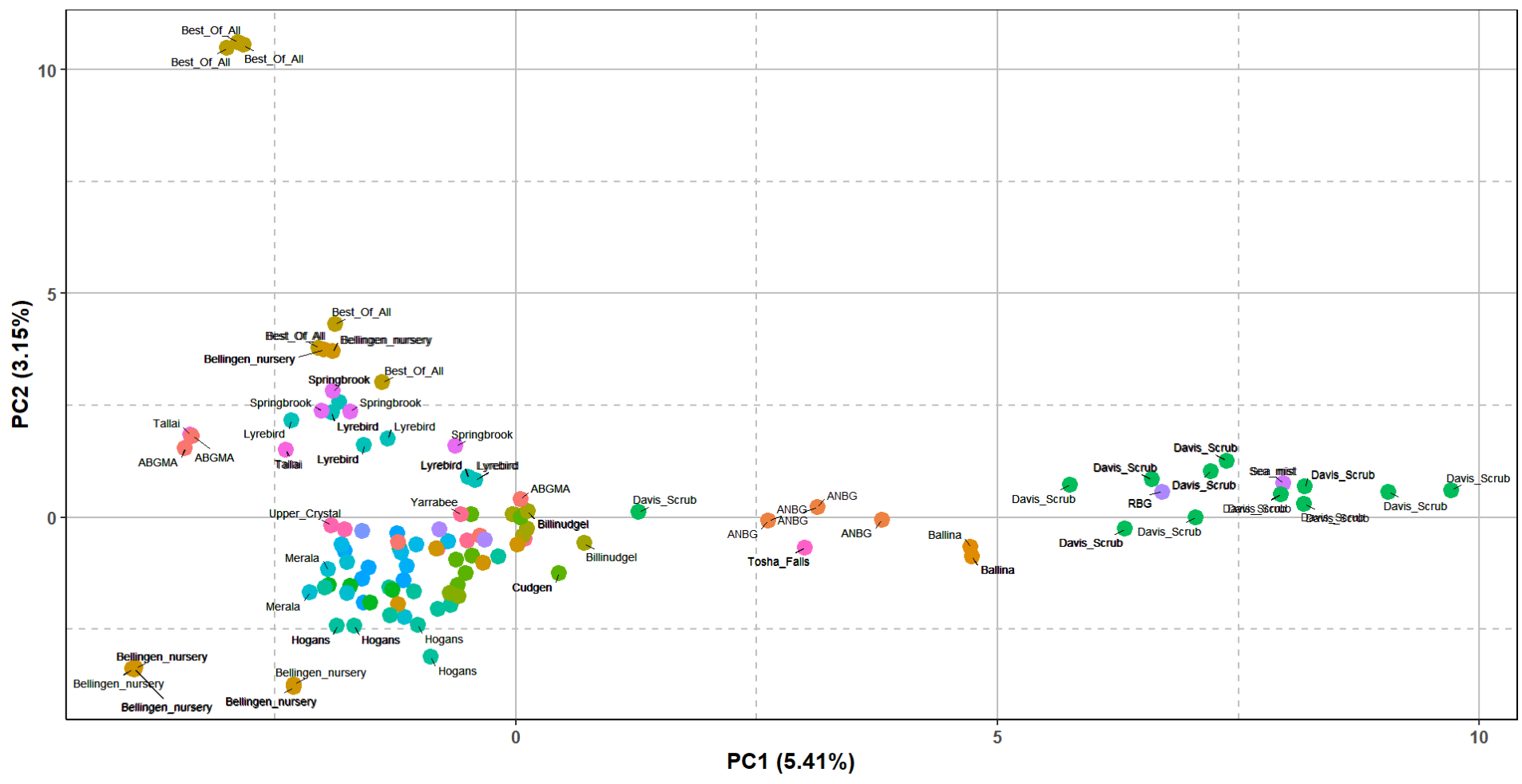
- Low levels of genetic variation detected



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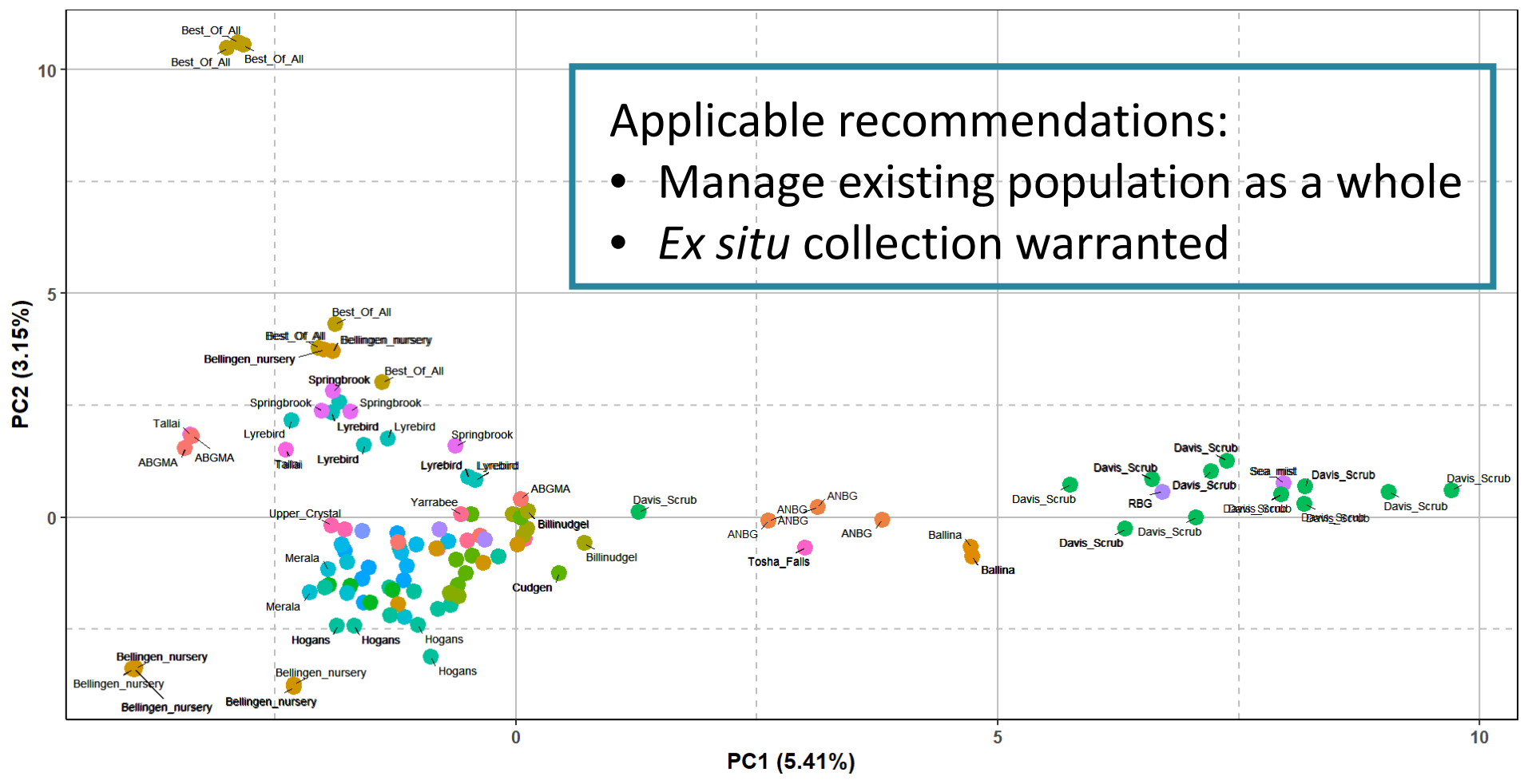

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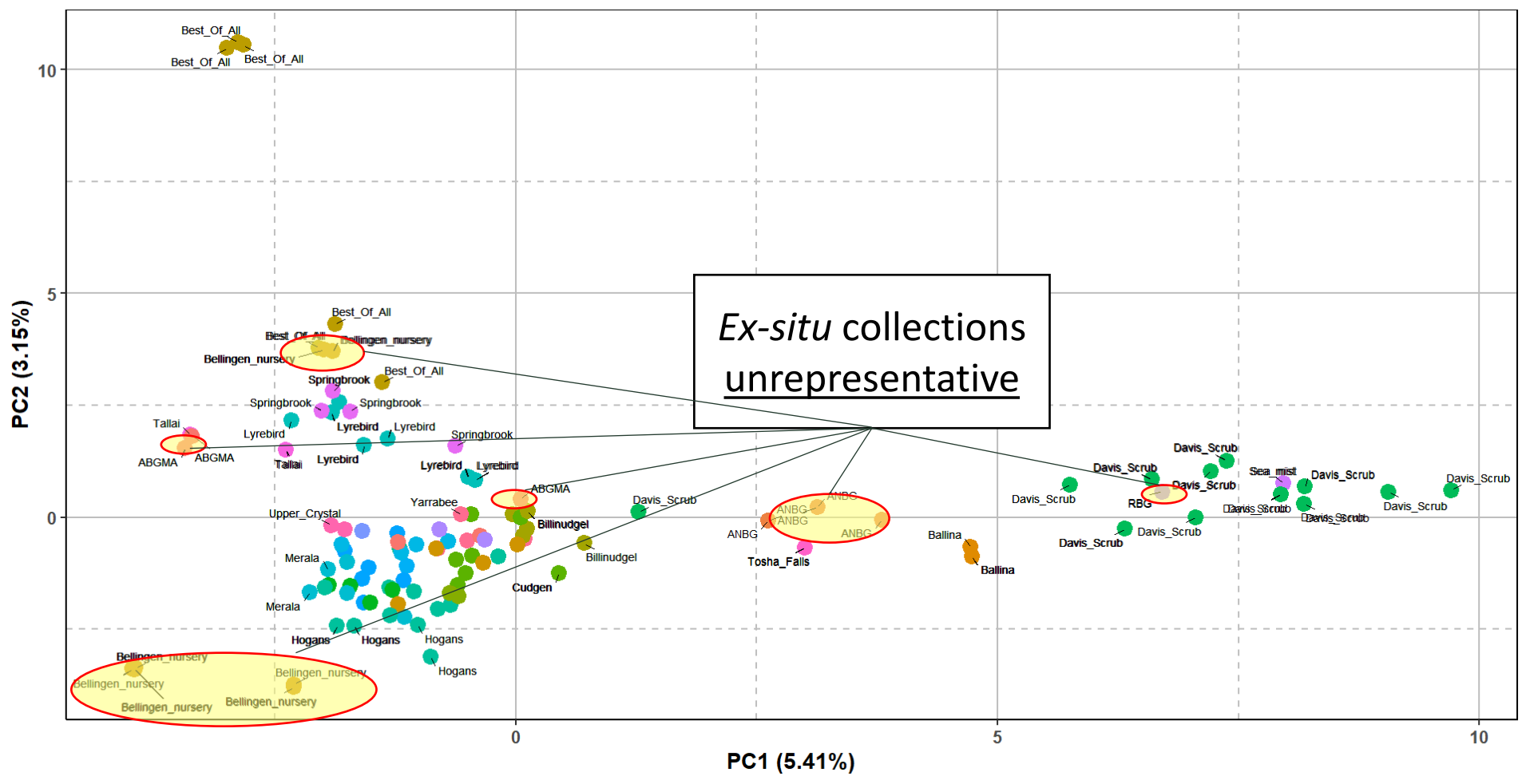

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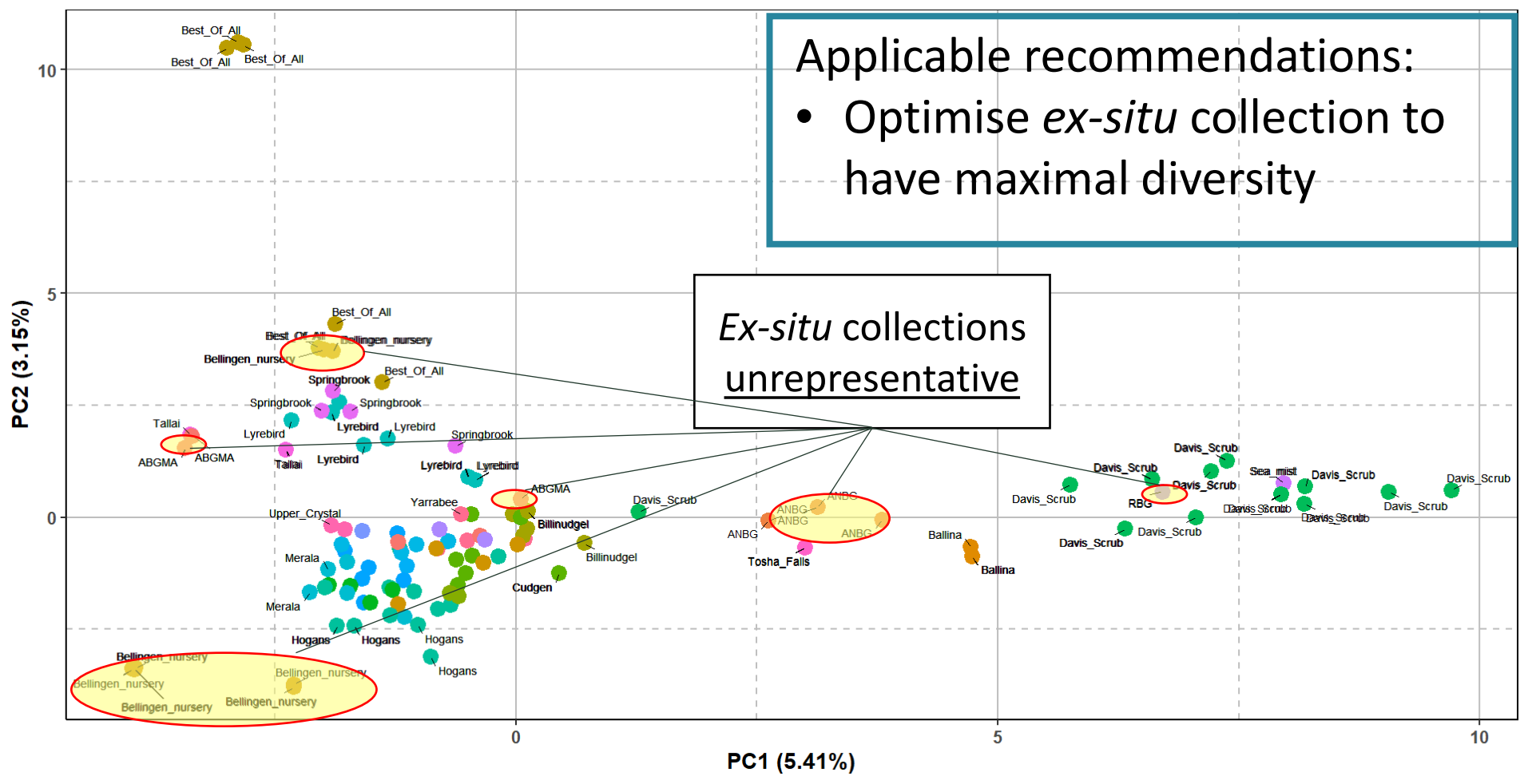

Pittosporum kororoense – Big banana pittosporum (Pittosporaceae)

Existing information: - none

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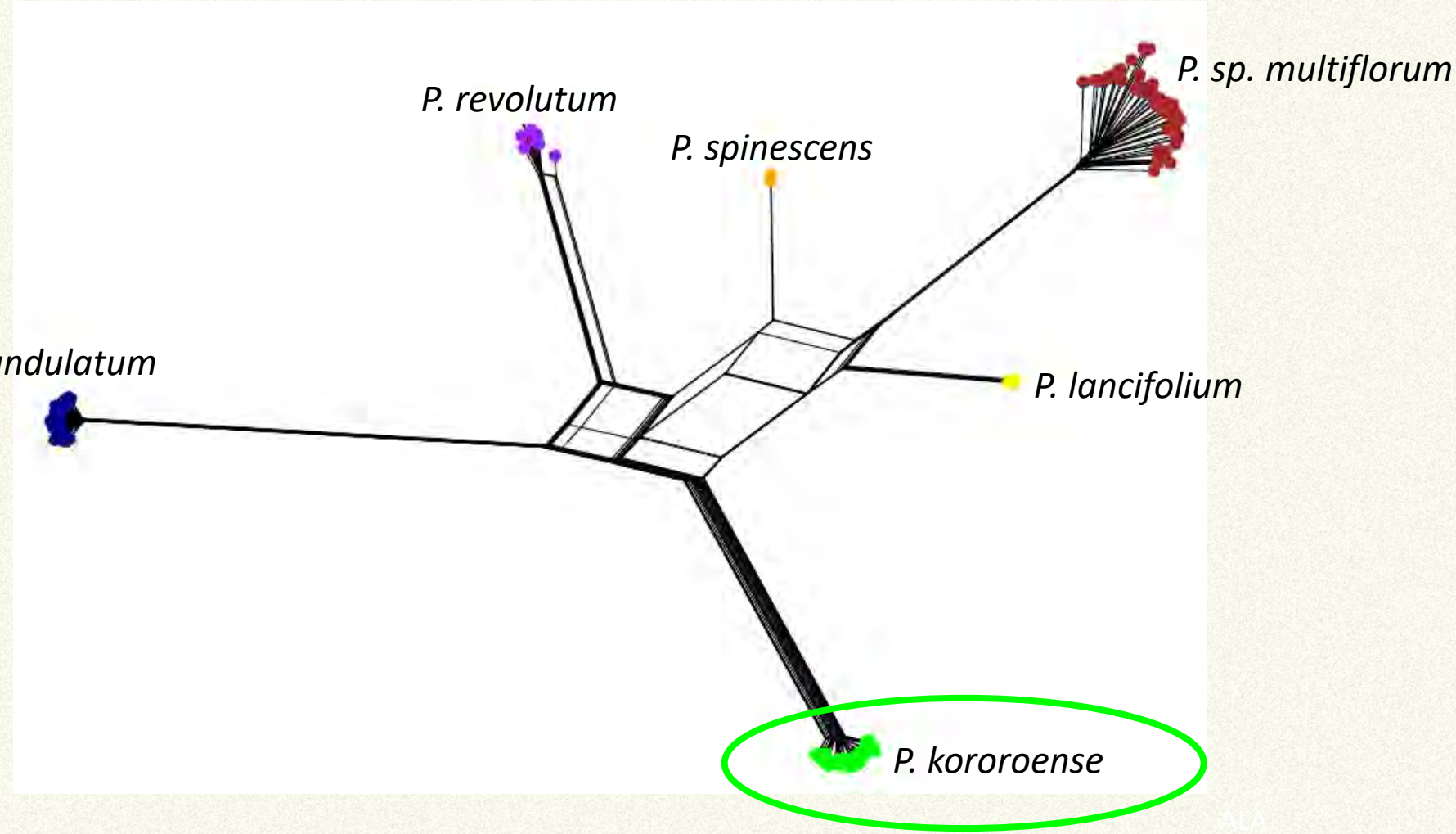

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What is its genetic health?

p18 – 3 genets

Pittosporum kororoense – Big banana pittosporum (Pittosporaceae)

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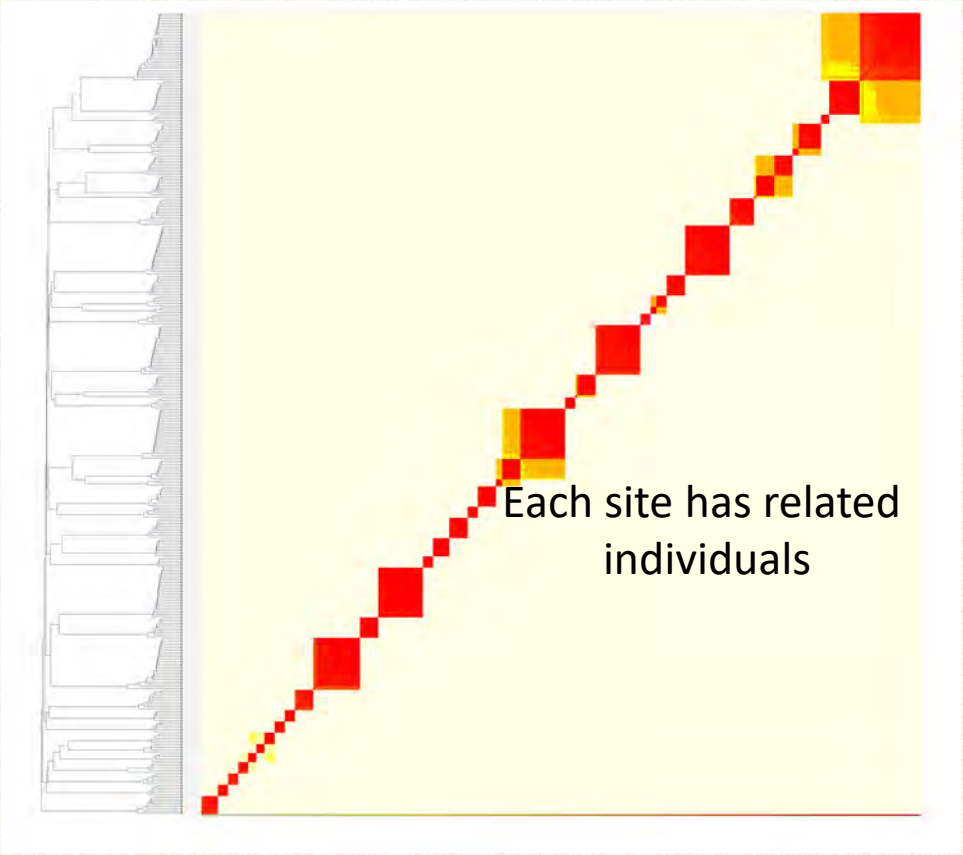
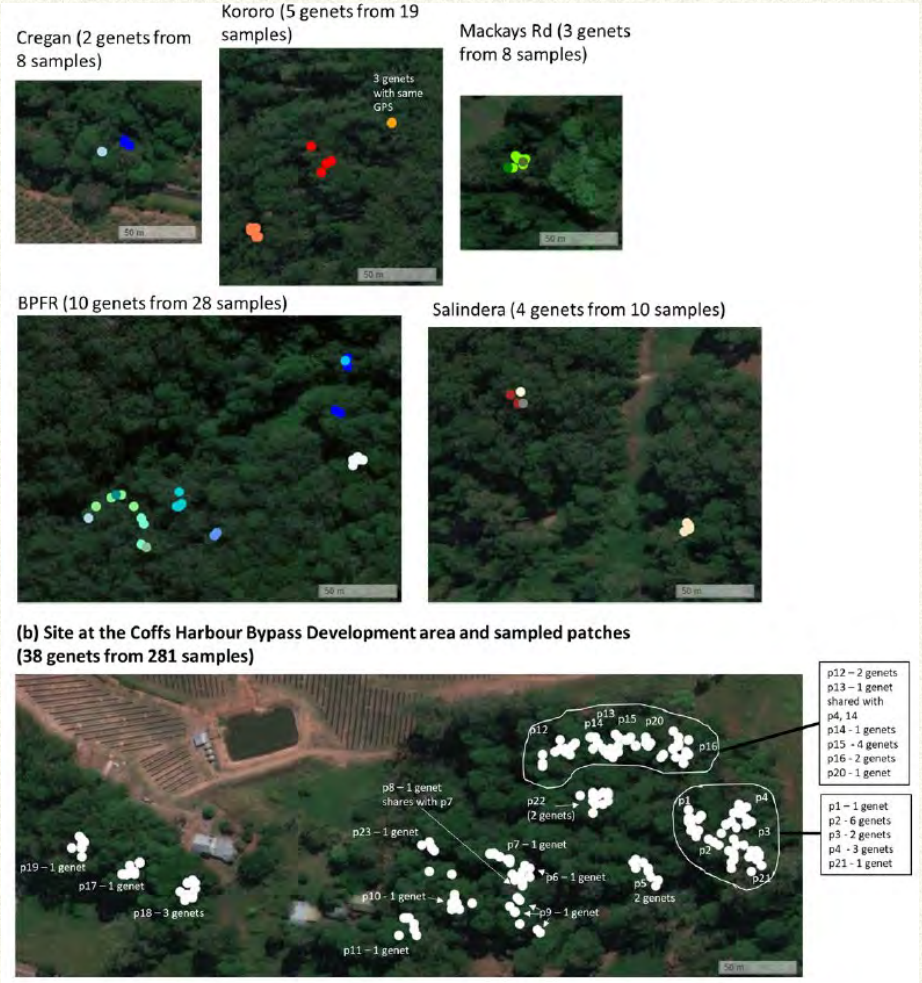
- Clonality and high levels of inbreeding detected at each site





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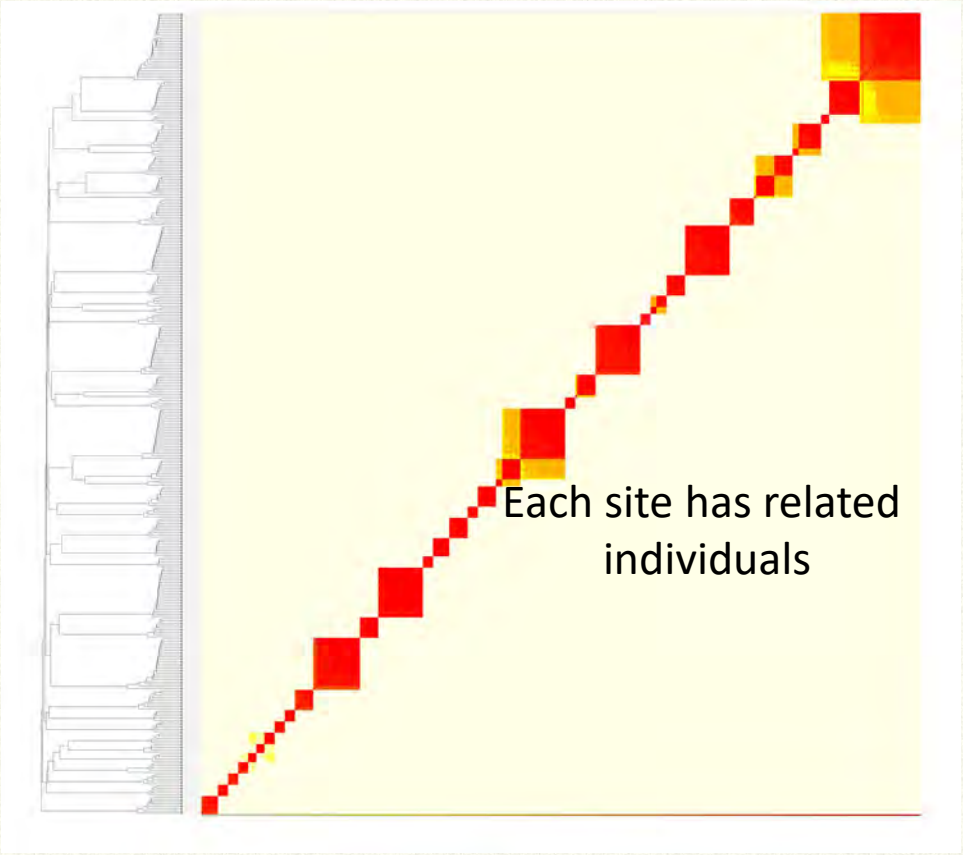

Applicable recommendations:

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

Pittosporum kororoense – Big banana pittosporum (Pittosporaceae)

OptGenMix for genetically optimised collections

Jason Bragg

Received: 19 August 2020 | Accepted: 14 December 2020
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ORIGINAL ARTICLE

Evolutionary Applications WILEY

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

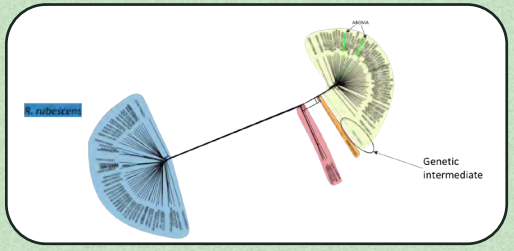
Jason G. Bragg[1,2] | Jia-Yee S. Yap[1,3] | Trevor Wilson[1] | Enhua Lee[4] | Maurizio Rossetto[1,3]

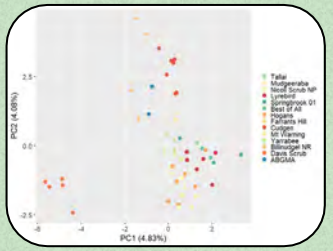
https://github.com/jasongbragg/OptGenMix

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

Monitor in-situ

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

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

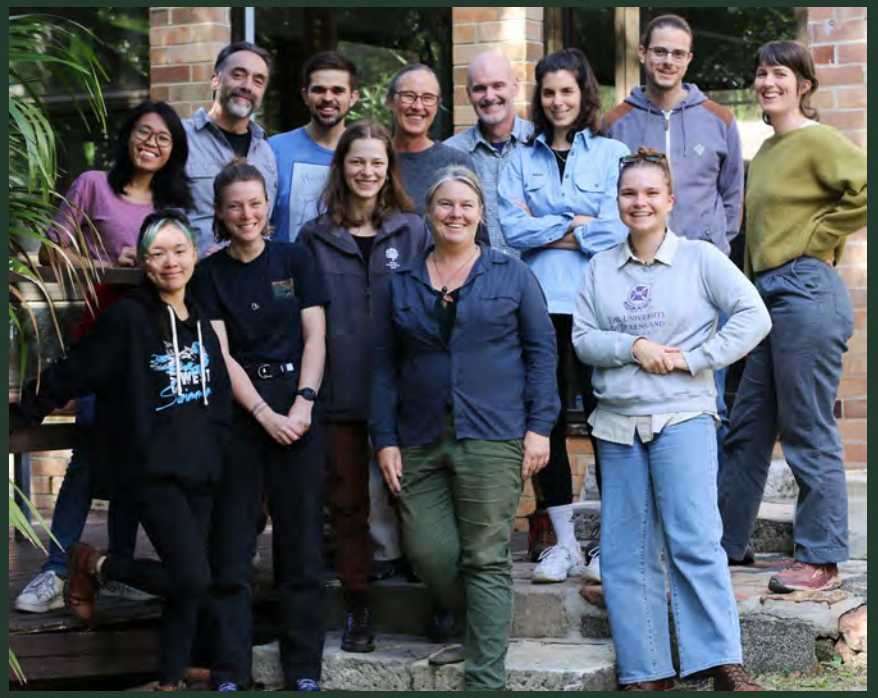
Track and ensure success – risks and supplementation

Species recovery

BOTANIC GARDENS OF SYDNEY

Research Centre for Ecosystem Resilience

Thank You



For further questions, contact me:
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