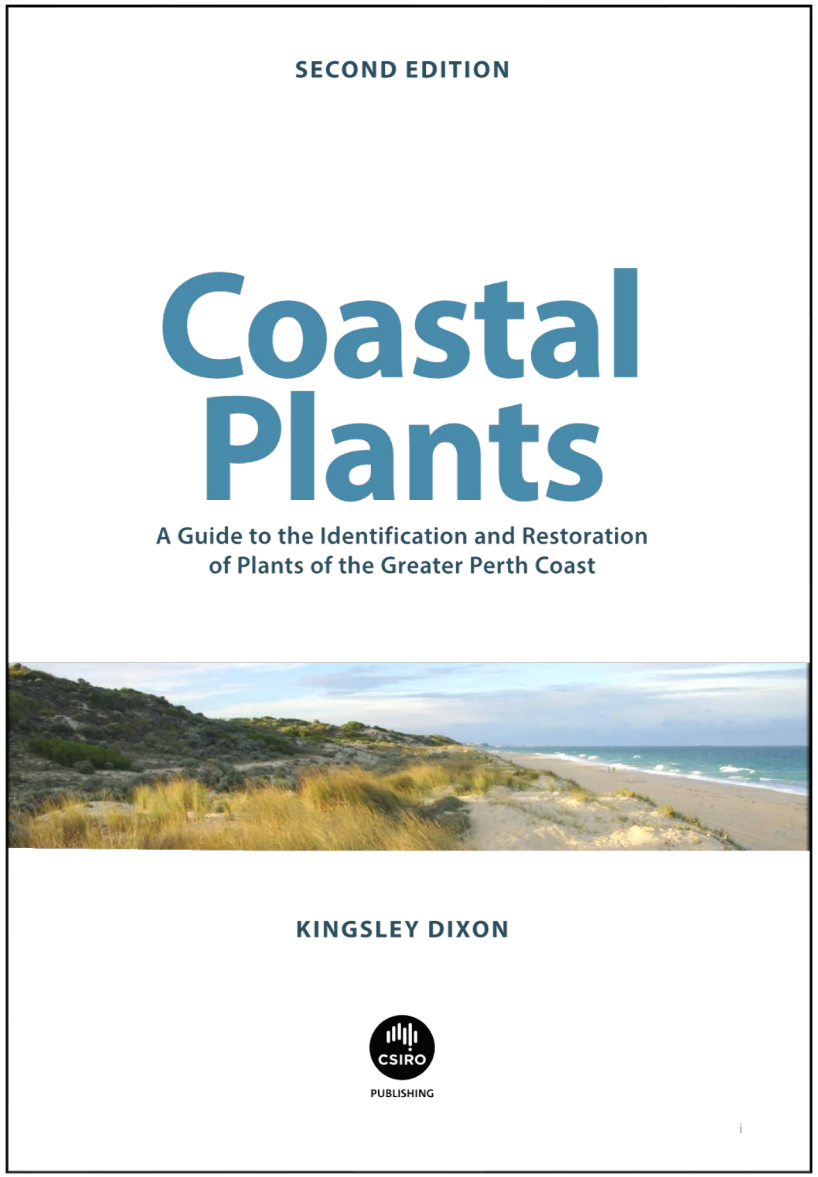
Conserve or restore?

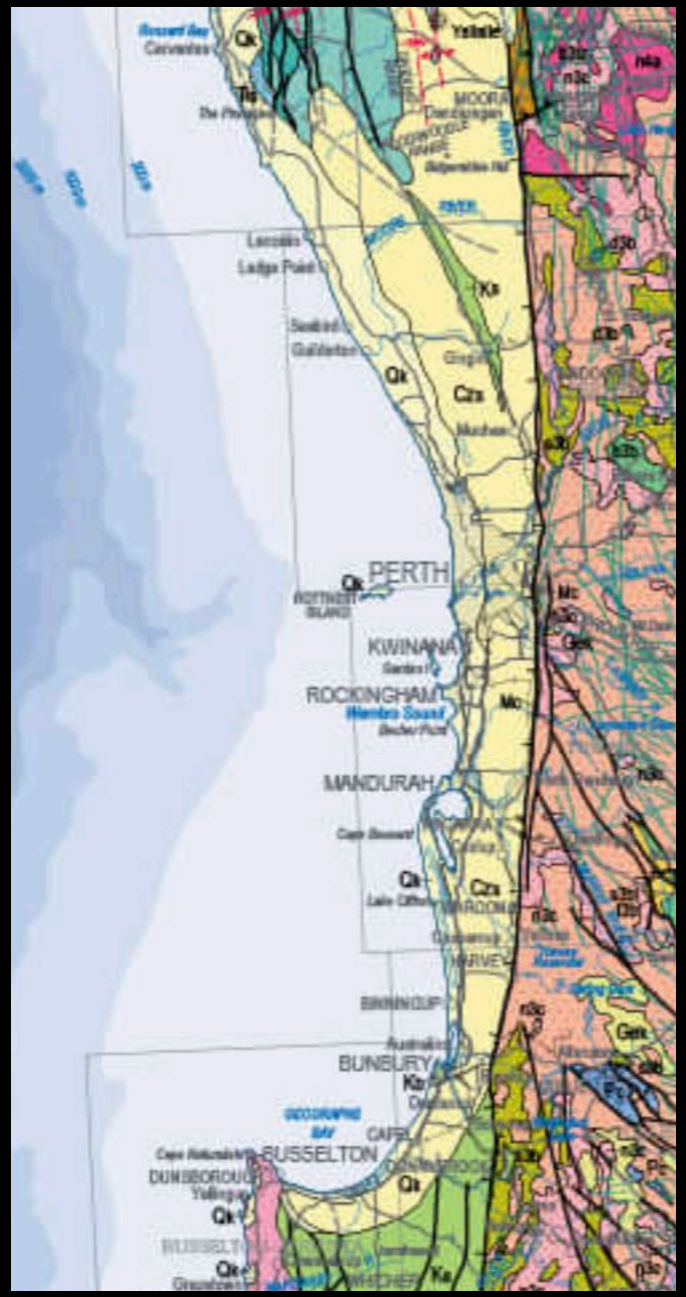


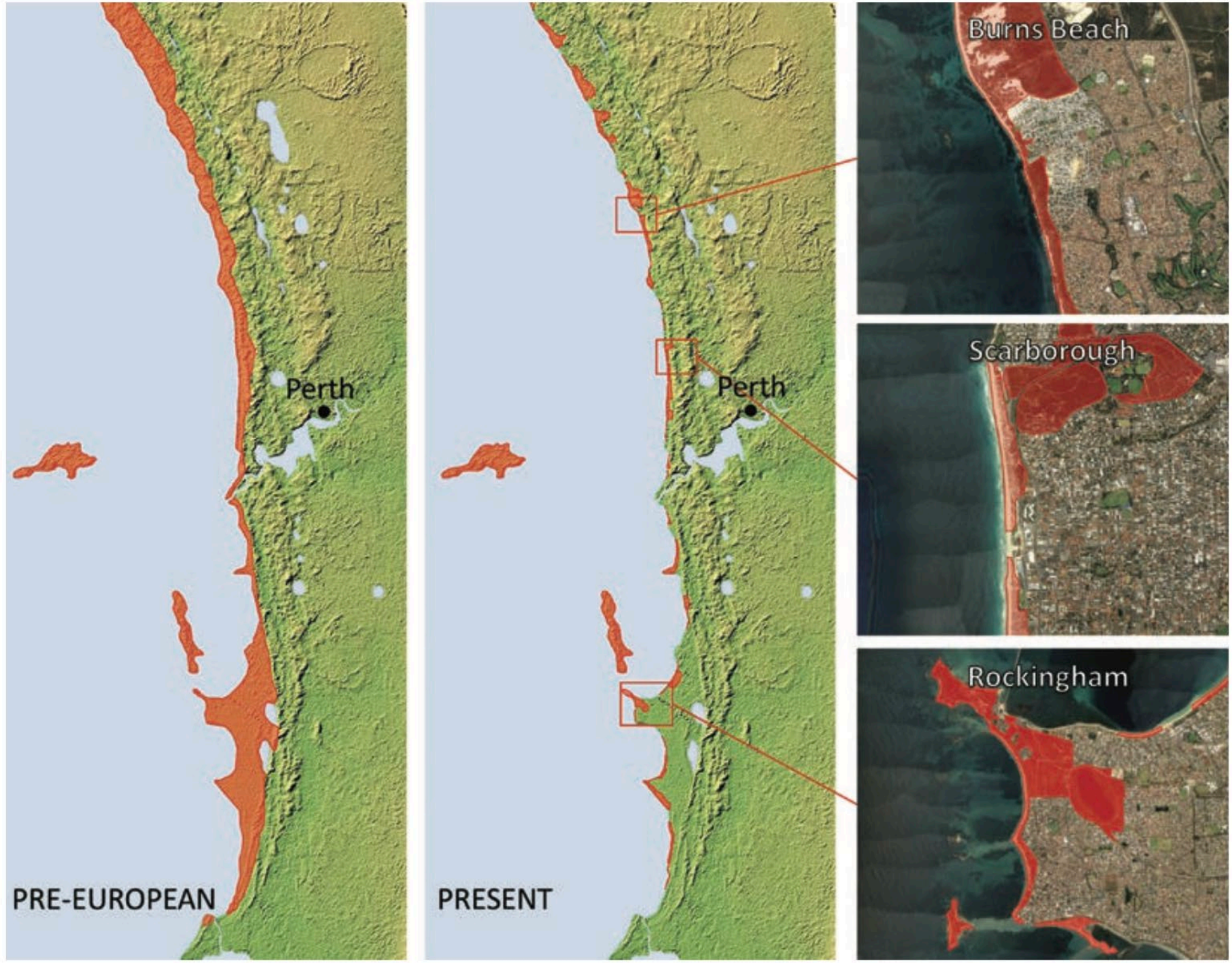
Michael Just &
Kingsley Dixon

Spectacle to Collapse

65 million years in the making – 200 years in the breaking
Shared with the world's oldest continuous culture

What is the rarest substrate in the SouthWest Biodiversity Hotspot?

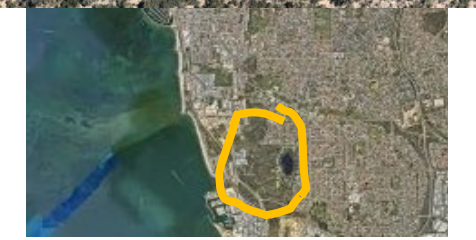


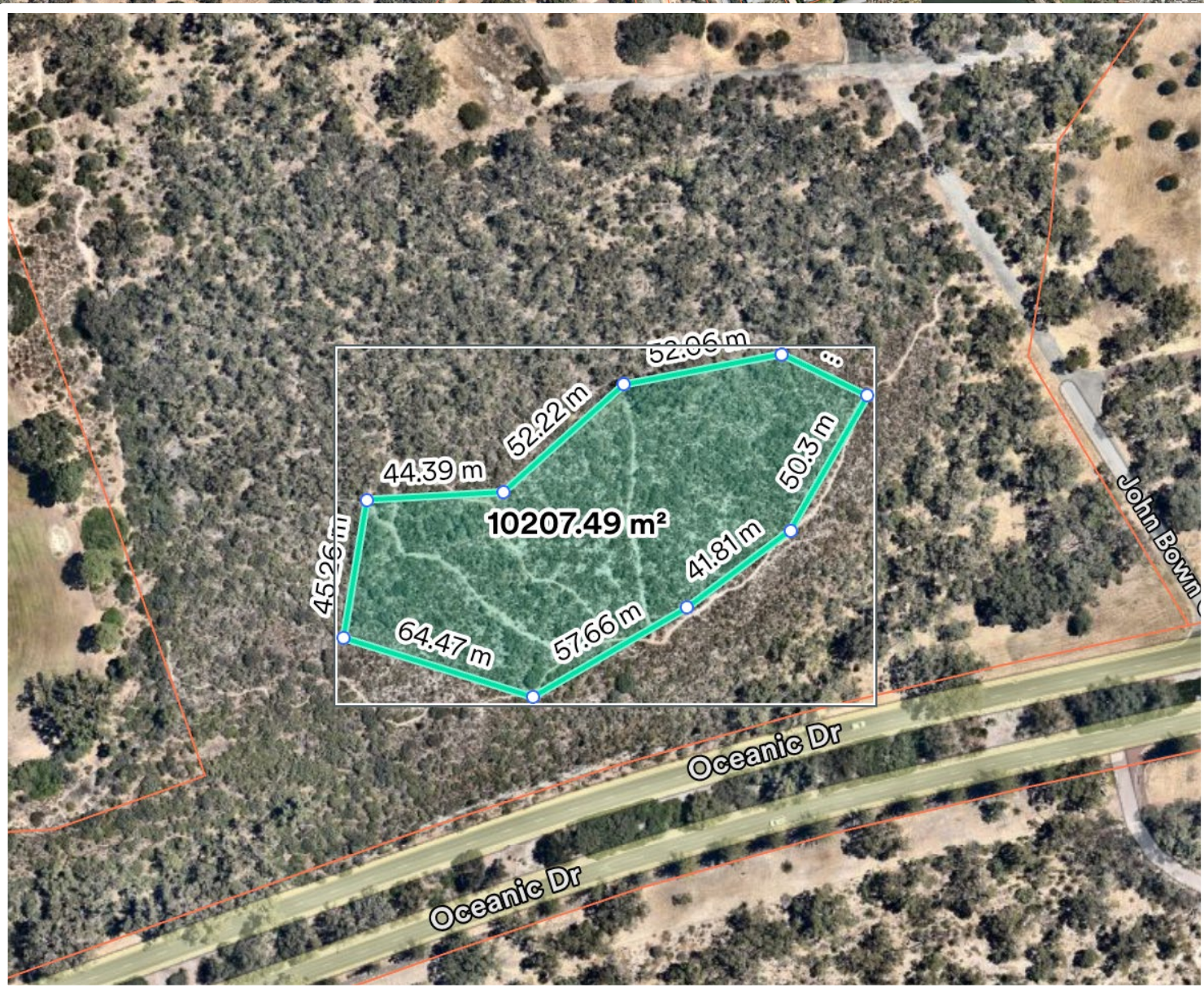

Perth
PRE-EUROPEAN
Perth
PRESENT
Burns Beach
Scarborough
Rockingham

What Remains of the Honeymyrtle Shrublands is equivalent to half the area of Kings Park

- Area of occupancy (AOO) <200 ha (2 km^2) = **very restricted**.
- Median patch size, of the 81 known occurrences is **1.3 ha**; with **96%** of patches <10 ha in size.


Kalinda Dr
Opposite Kalari Dr
Kalinda Dr
Oceanic Dr
Scenic Dr
Oceanic Dr
After Kalinda Dr
Kalinda Dr
Mon Feb 5 2024
50 m




52.06 m
52.22 m
44.39 m
50.3 m
10207.49 m²
45.26 m
41.81 m
64.47 m
57.66 m
John Bown
Oceanic Dr
Oceanic Dr

Half of the plant diversity in Bold Park and Kings Park is associated with limestone based ecosystems

Kings Park:

- 415 native plant species
- 486 native fungi
- 712 native animal species

Bold Park:

- 202 native plant species)
- 364 native fungi
- 358 native animal species

An ecosystem that contains unique biodiversity – often unexpected

Myoporum insulare
Boobyella

City Beach restoration

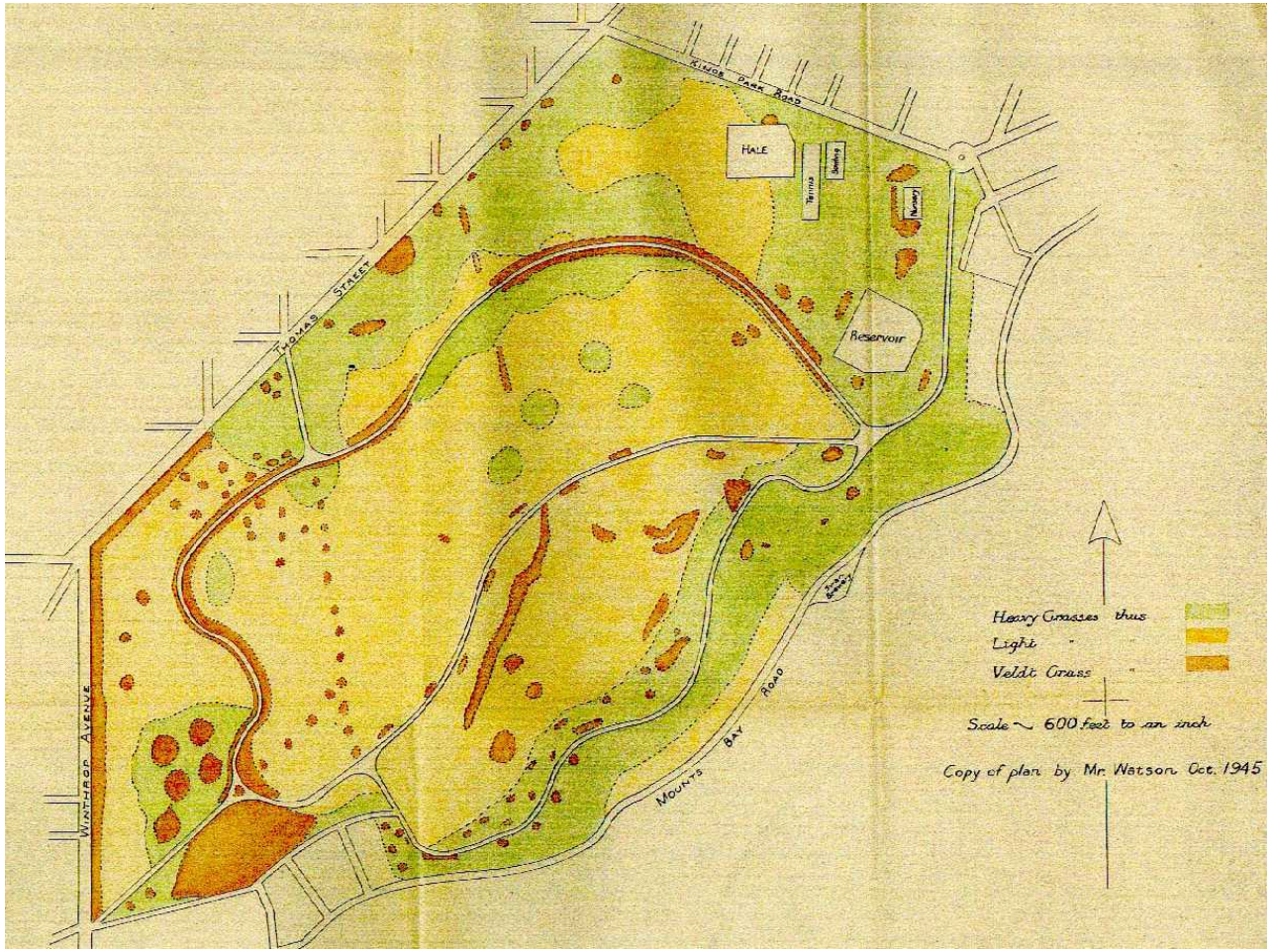
Cant wait for the lovely moths associated with myoporum to find it and be part of the ecology.

An ecology we are just learning about

Kings Park

Since 1996 tracks reduced from 40 km to 26km]

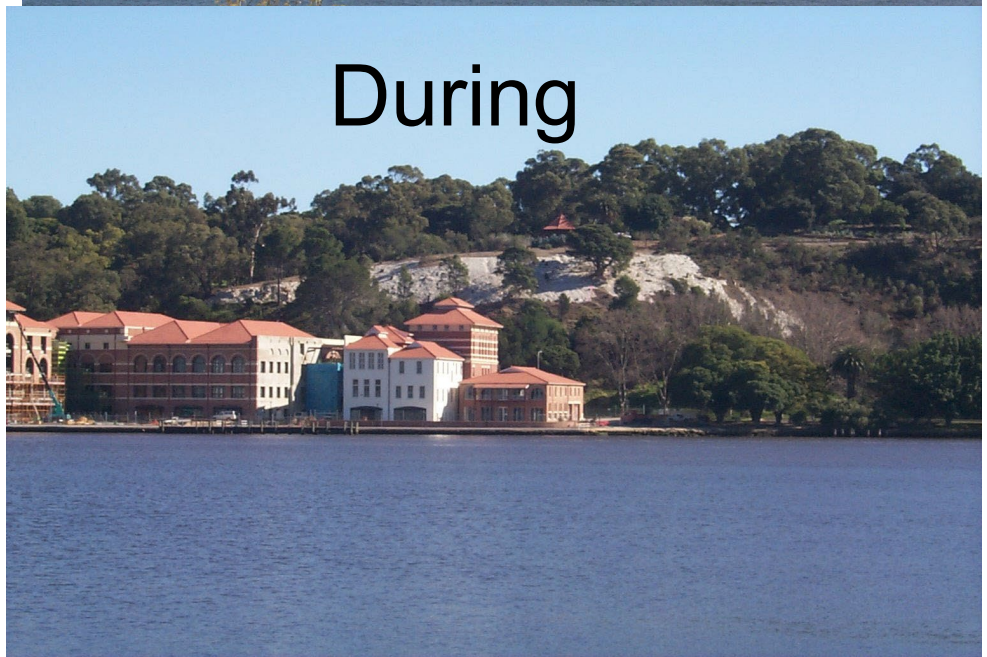
Trails and tracks are ’death by a 1000 cuts’



On bushland trail reduction. In relation to Kings Park there was a 1996 assessment that recommended up to 20% of the 40km network could be closed (Track Management and Site Restoration for Kings Park Bushland. Ecoscape (Australia) Pty Ltd et al. 1996. Tracks and paths are currently at 26 km with about 12.5km of bushland tracks closed since the 1996 Ecoscape review.

Manning Park Proposed Trail Area Coverage

Restoration needs to be a Nature NET GAIN



- Operations and monitoring 7y
- Key Activities:

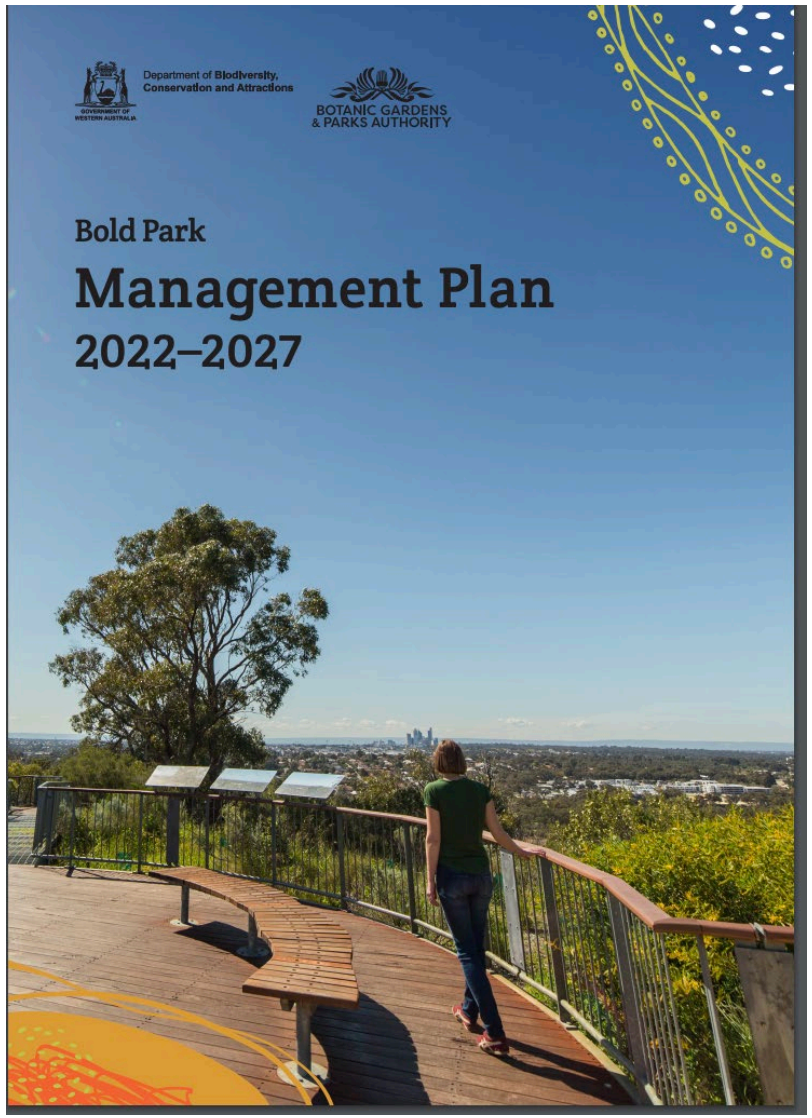
80% bridal creeper; 600m^3
Agave; 250k seedlings planted;

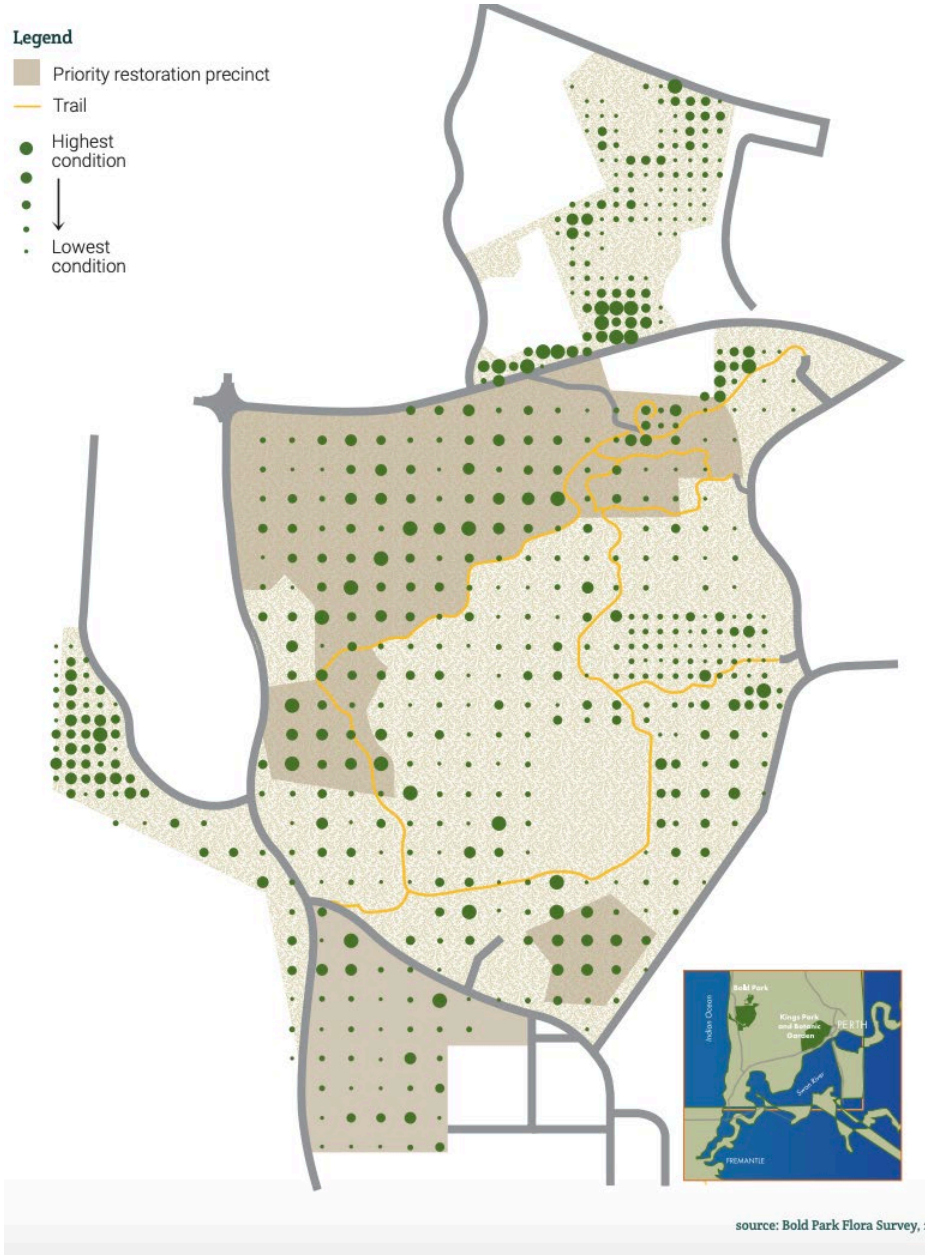
1300 full grown exotic trees removed

Lessons Learnt

- Adaptive management effective.
- Integrated, effective and focused science.
- Manage now: not delaying decisions.
- Values high quality bushland in terms of repair costs - $282,000/ha.

Respecting what we have; restore if we can….





Ecological communities now at levels below 30% of their original extent in regions should be fully retained.

Ecological communities and species should be fully protected and regenerated to sustainable levels.

Case Law: 2021 SAT Tredrea Tuarts (Shire of Harvey)

SER SOCIETY FOR ECOLOGICAL RESTORATION AUSTRALASIA

National standards for the practice of ecological restoration in Australia

Prepared by
Standards Reference Group,
Society for Ecological Restoration Australasia (SERA)
In consultation with key partners.

Edition 2.1
September 2018

Australian Government

Department of Climate Change, Energy, the Environment and Water

Approved Conservation Advice for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion

In effect under the *Environment Protection and Biodiversity Conservation Act 1999* from 15 November 2023.

To undertake priority actions to meet the conservation objective, the overarching principle is to maintain existing occurrences of this ecological community. Most species may not be easy to recover in practice, if lost from a site.

This principle is highlighted in the *National Standards for the Practice of Ecological Restoration in Australia* (Standards Reference Group SERA 2021).

> ***"Ecological restoration is not a substitute for sustainably managing and protecting ecosystems in the first instance.***
>
> *The promise of restoration cannot be invoked as a justification for destroying or damaging existing ecosystems because functional natural ecosystems are not transportable or easily rebuilt once damaged and the success of ecological restoration cannot be assured."*
>
> *Standards Reference Group SERA (2021) – Appendix 2.*

Eight Principles Underpinning Ecological Restoration

1 ENGAGES **STAKEHOLDERS**

2 DRAWS ON **MANY TYPES OF KNOWLEDGE**

3 IS INFORMED BY **NATIVE REFERENCE ECOSYSTEMS,** WHILE CONSIDERING ENVIRONMENTAL CHANGE

4 SUPPORTS **ECOSYSTEM RECOVERY PROCESSES**

5 IS ASSESSED AGAINST **CLEAR GOALS AND OBJECTIVES** USING MEASURABLE INDICATORS

6 SEEKS THE **HIGHEST LEVEL OF RECOVERY** POSSIBLE

7 **GAINS CUMULATIVE VALUE** WHEN APPLIED AT LARGE SCALES

8 IS PART OF A **CONTINUUM** OF **RESTORATIVE ACTIVITIES**

SER SOCIETY FOR ECOLOGICAL RESTORATION

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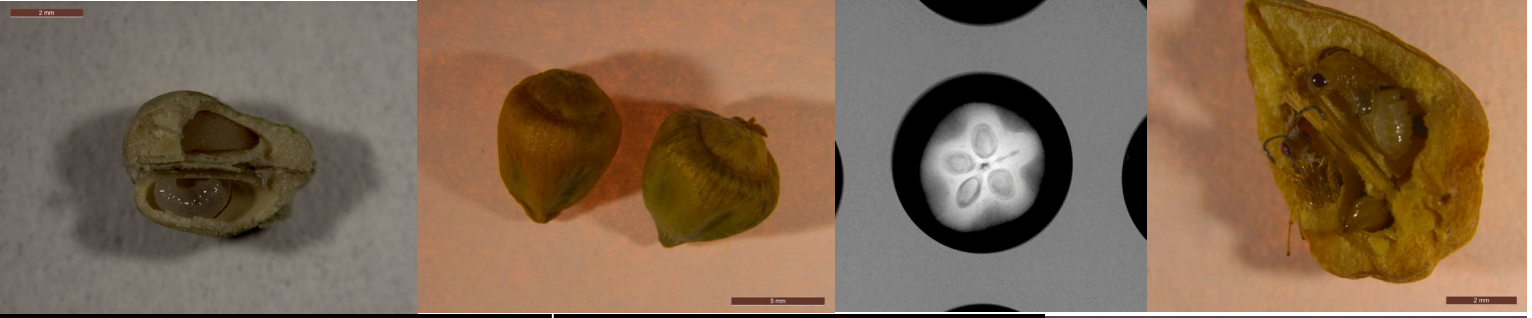
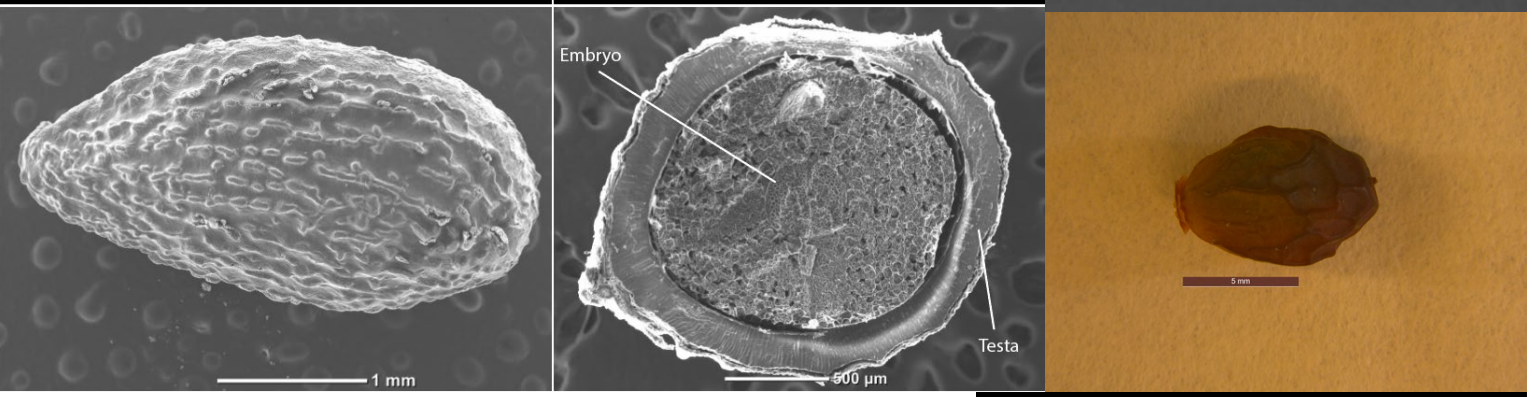
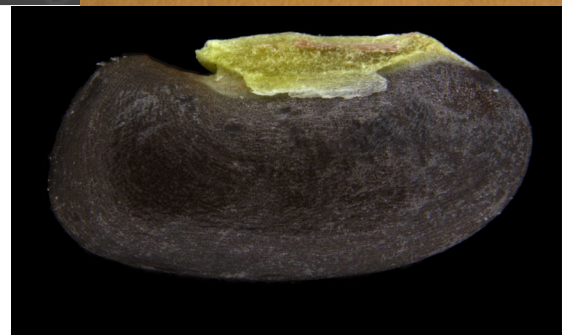
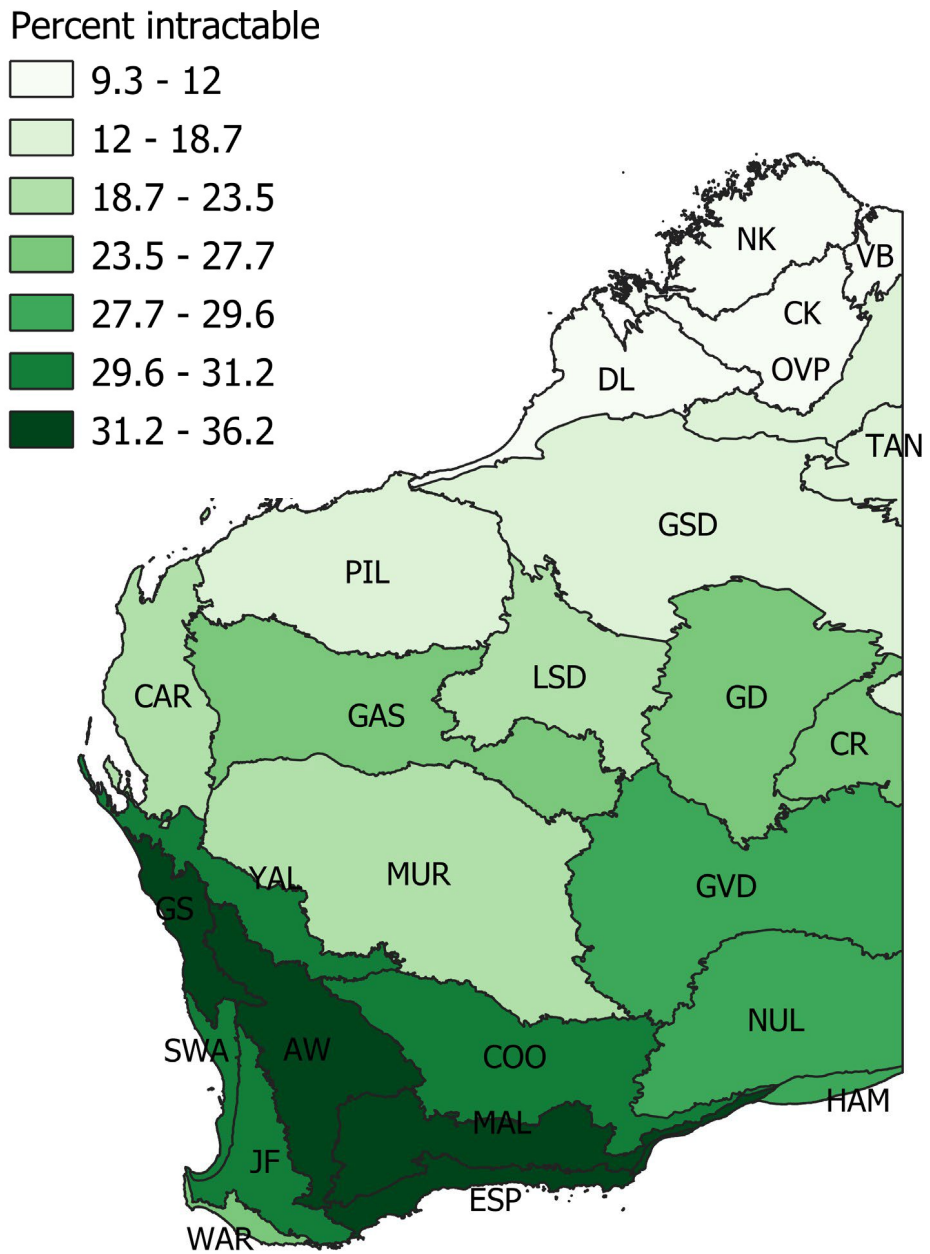
SER SOCIETY FOR ECOLOGICAL RESTORATION

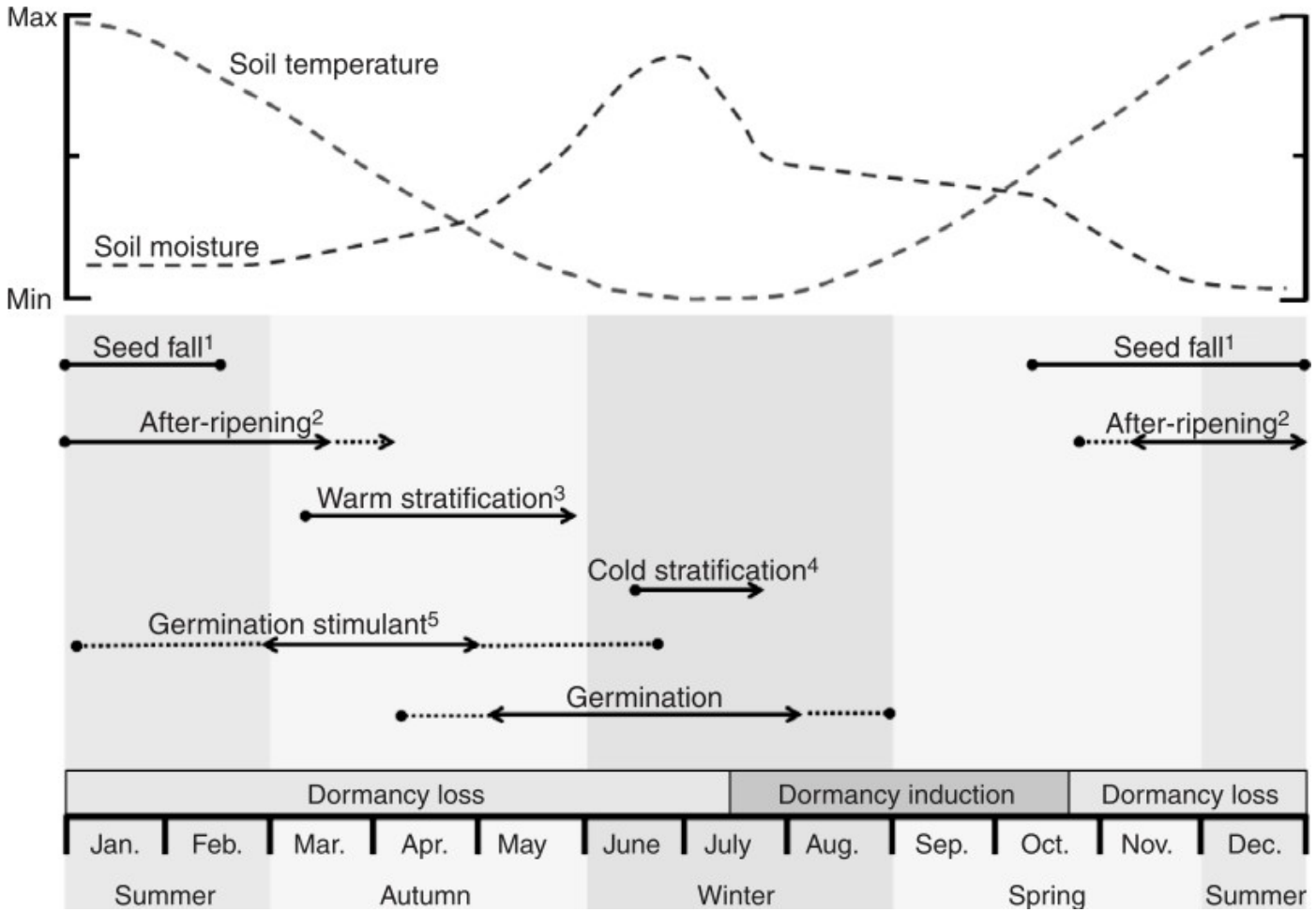






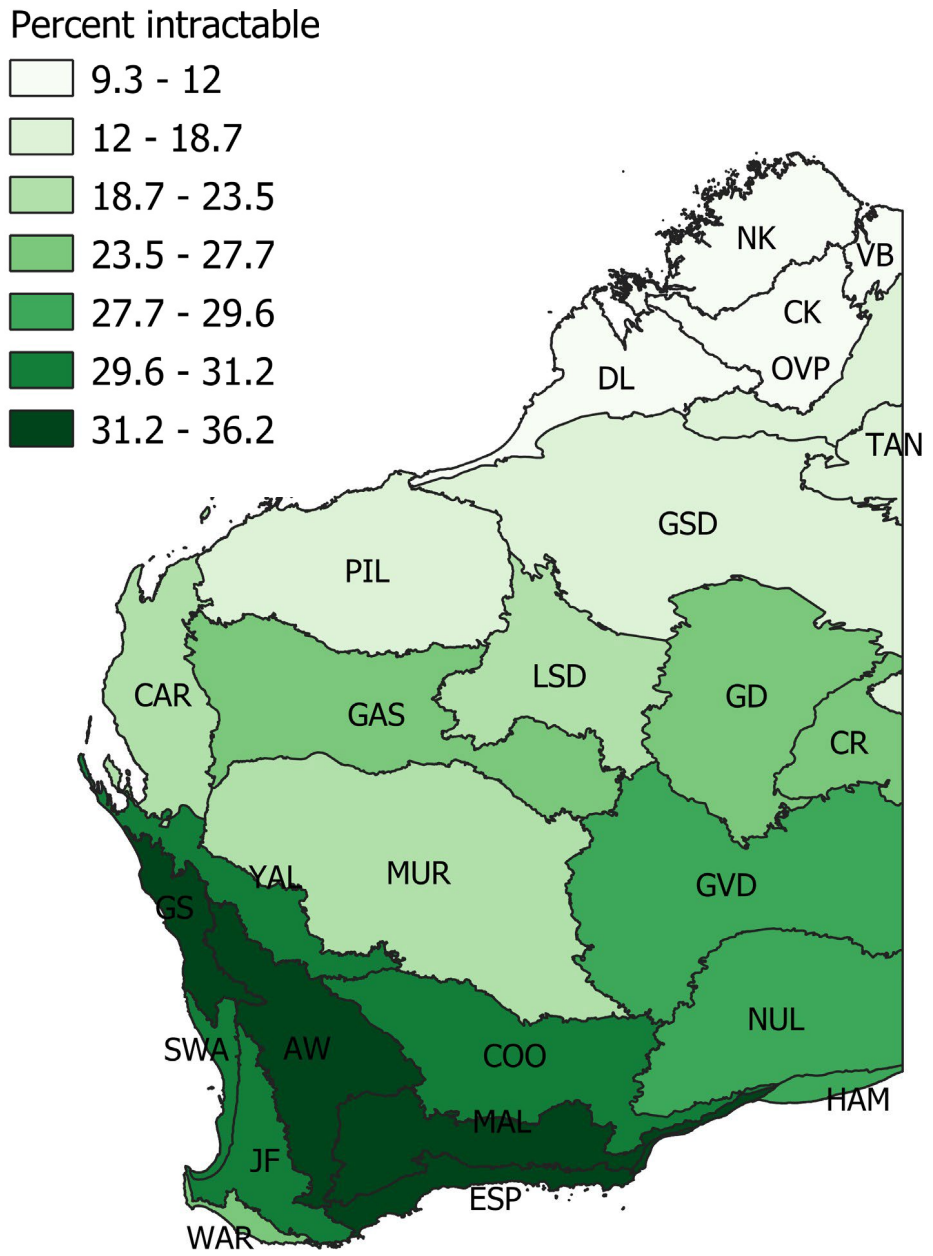


Just, *et al.*, in prep
40 indicative species in conservation advice
12 would fall into this category which is 30%



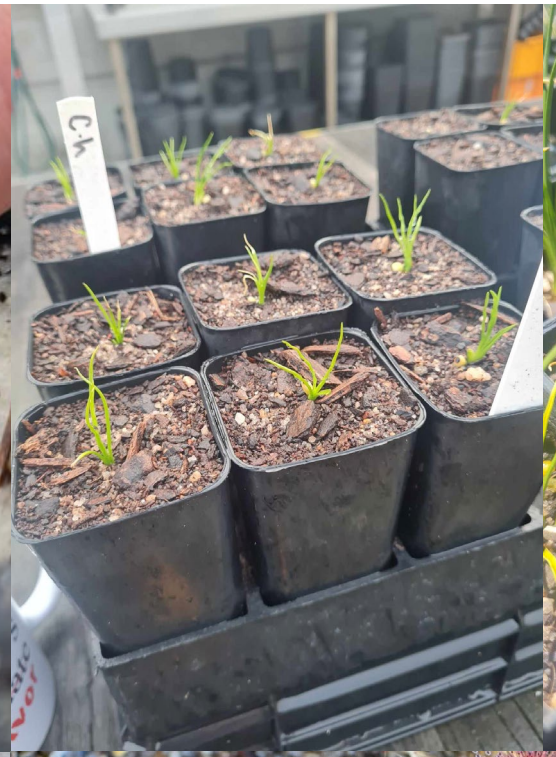
Dormancy responds to environmental signals of temperature and moisture

Merritt, D., *et al.* (2007). Australian Journal of Botany **55(3): 336-344.**



Just, *et al.*, in prep

Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain (TEC SCP3a)



Drosera image cred: Thilo Krueger

Public Transport Authority

OMTID Office of Major Transport Infrastructure Delivery

METRONET

Curtin University

Data driven restoration targets

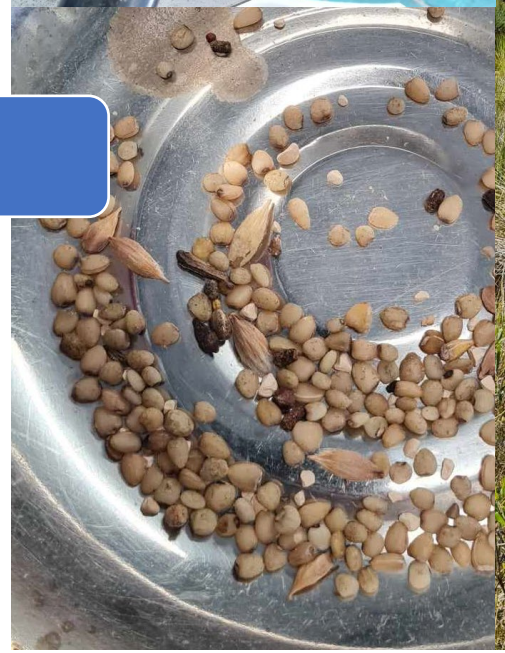
- Reference community surveys
- Planting regimes and monitoring methodology

Establishment of plant production systems

- Seed collection
- Seed banks
- *in vitro* culture lines

Optimisation of restoration methodology

- Seed processing and delivery
- Dormancy and germination
- Weed management



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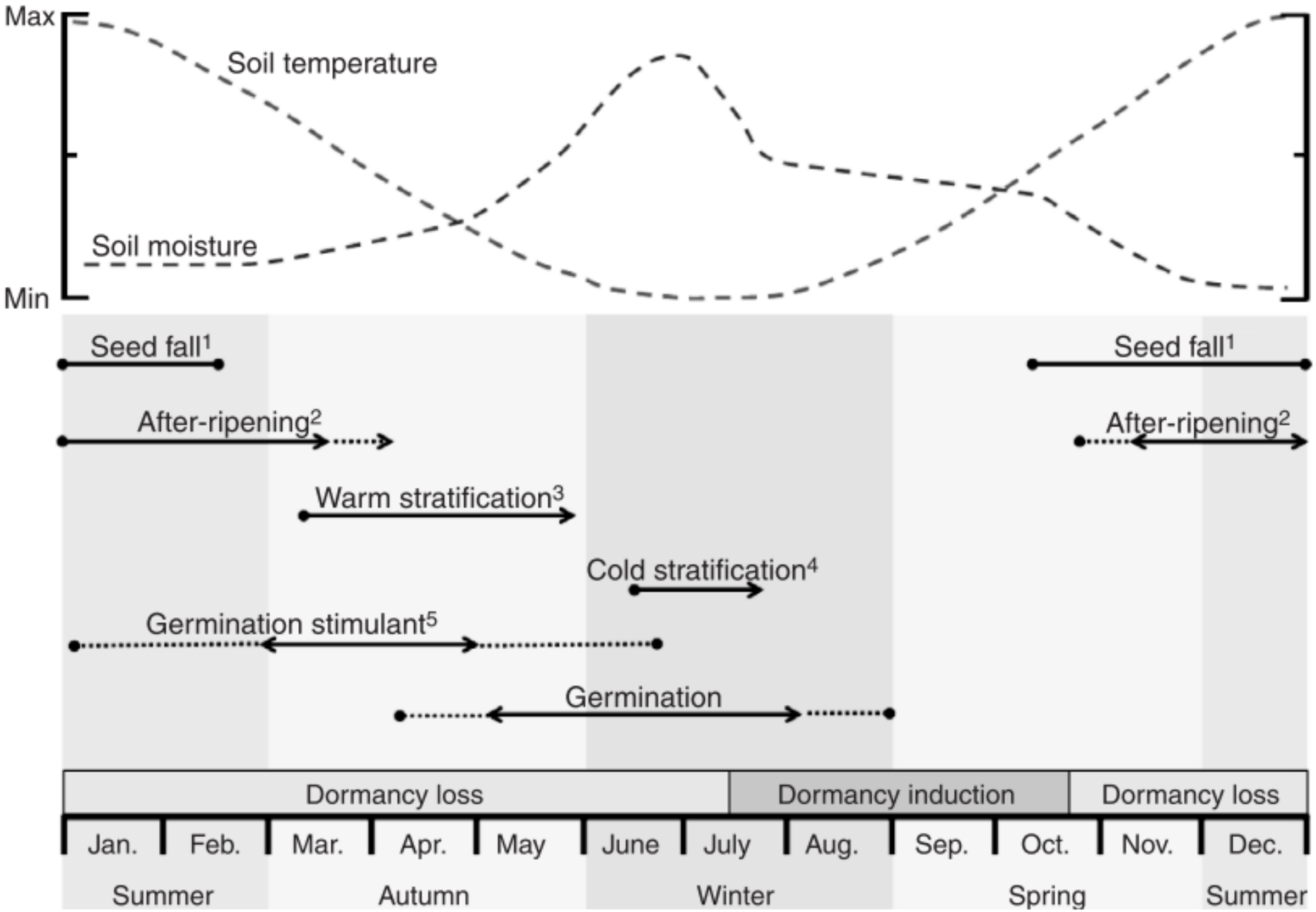
Thanks for listening!



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RESEARCH PAPER
https://doi.org/10.1071/BT22076

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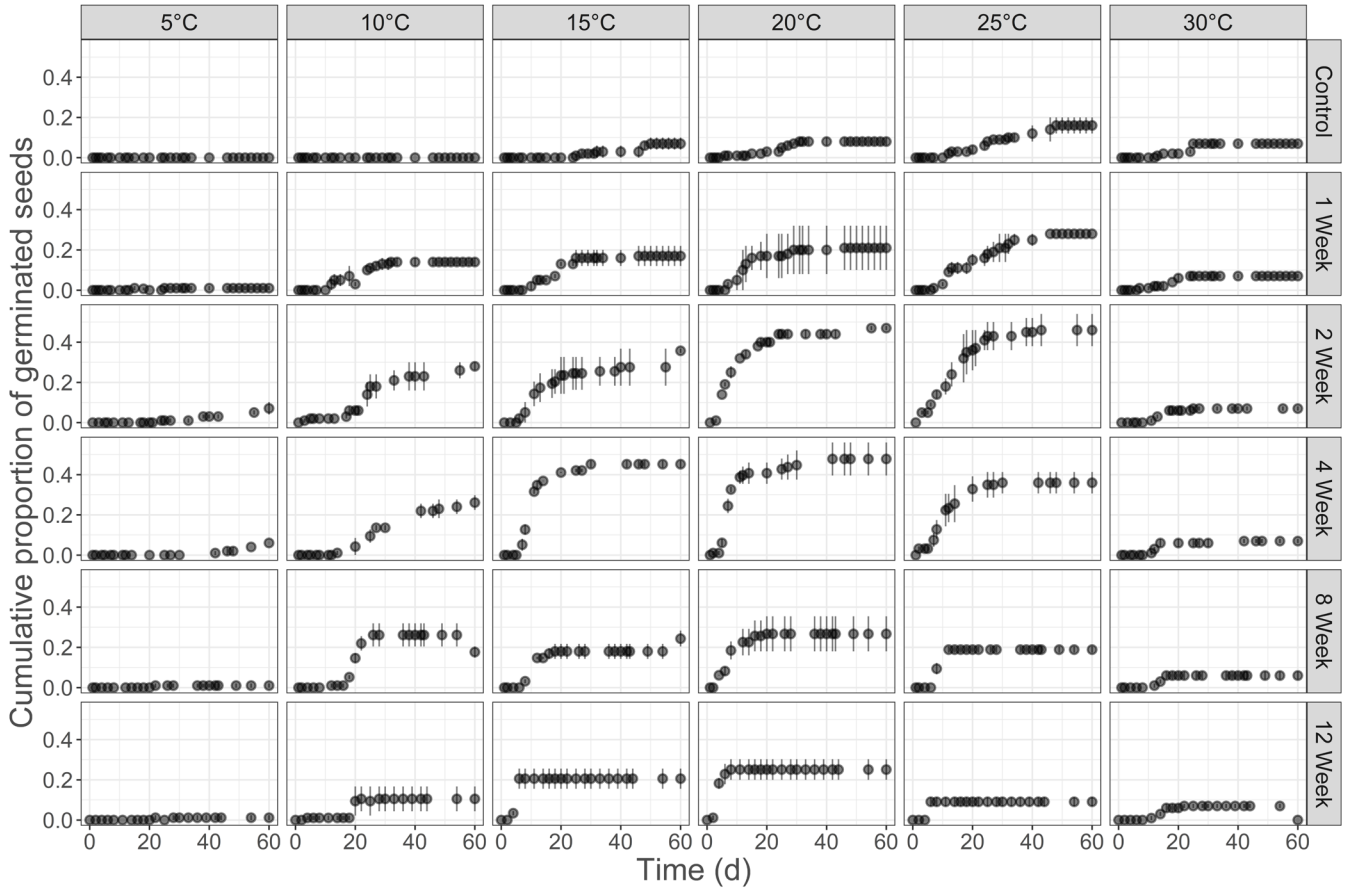
Michael Just[A,*], Adam T. Cross[A,B], Wolfgang Lewandrowski[C,D], Shane R. Turner[A], David J. Merritt[C,D] and Kingsley Dixon[A]



1 - 12 weeks warm stratification (30°C)

60 days incubation at 5 – 30°C

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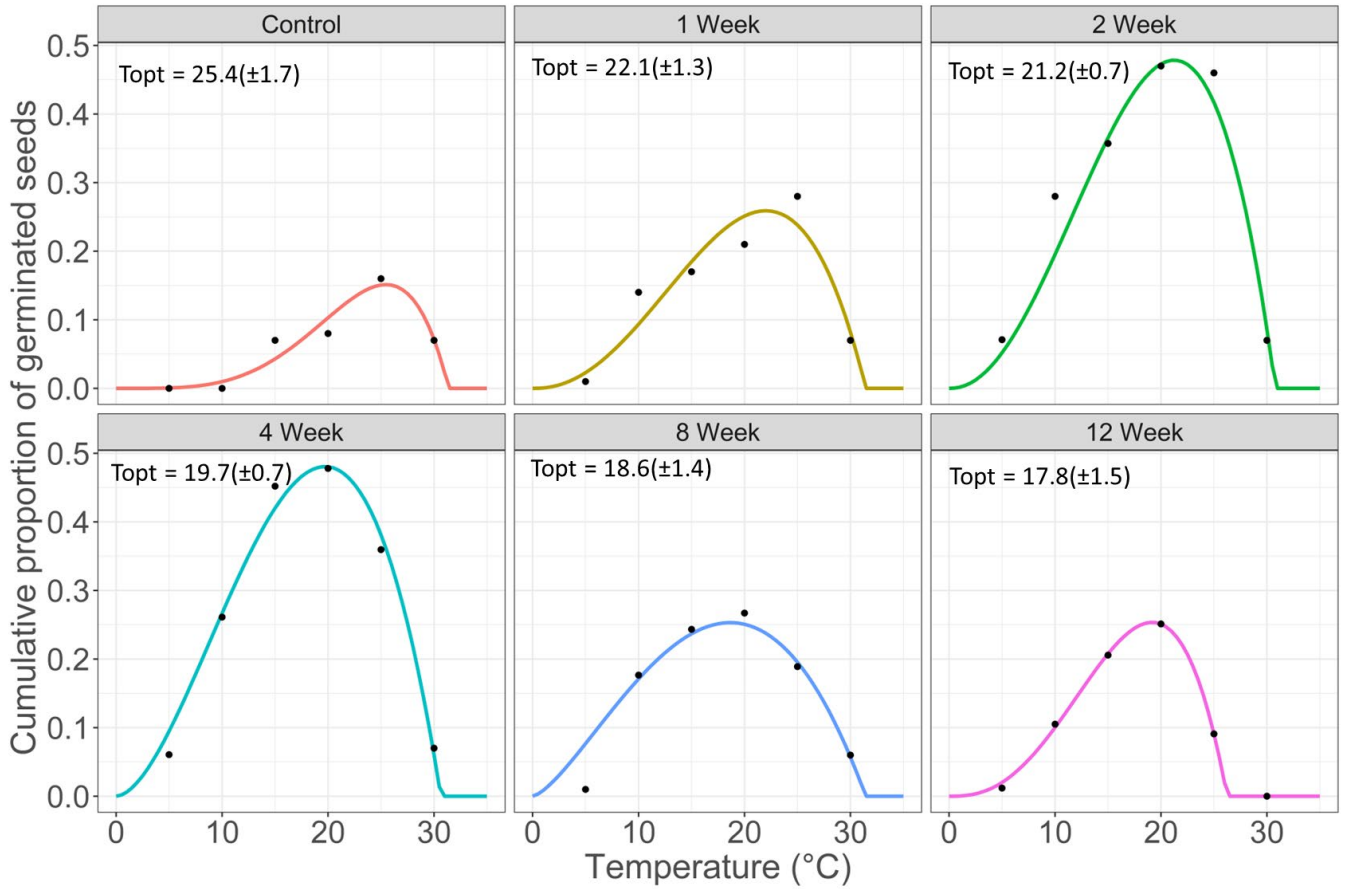

Thermal performance modelling

- Maximum germination
- Ceiling Temperature
- Base temperature
- Optimum temperature

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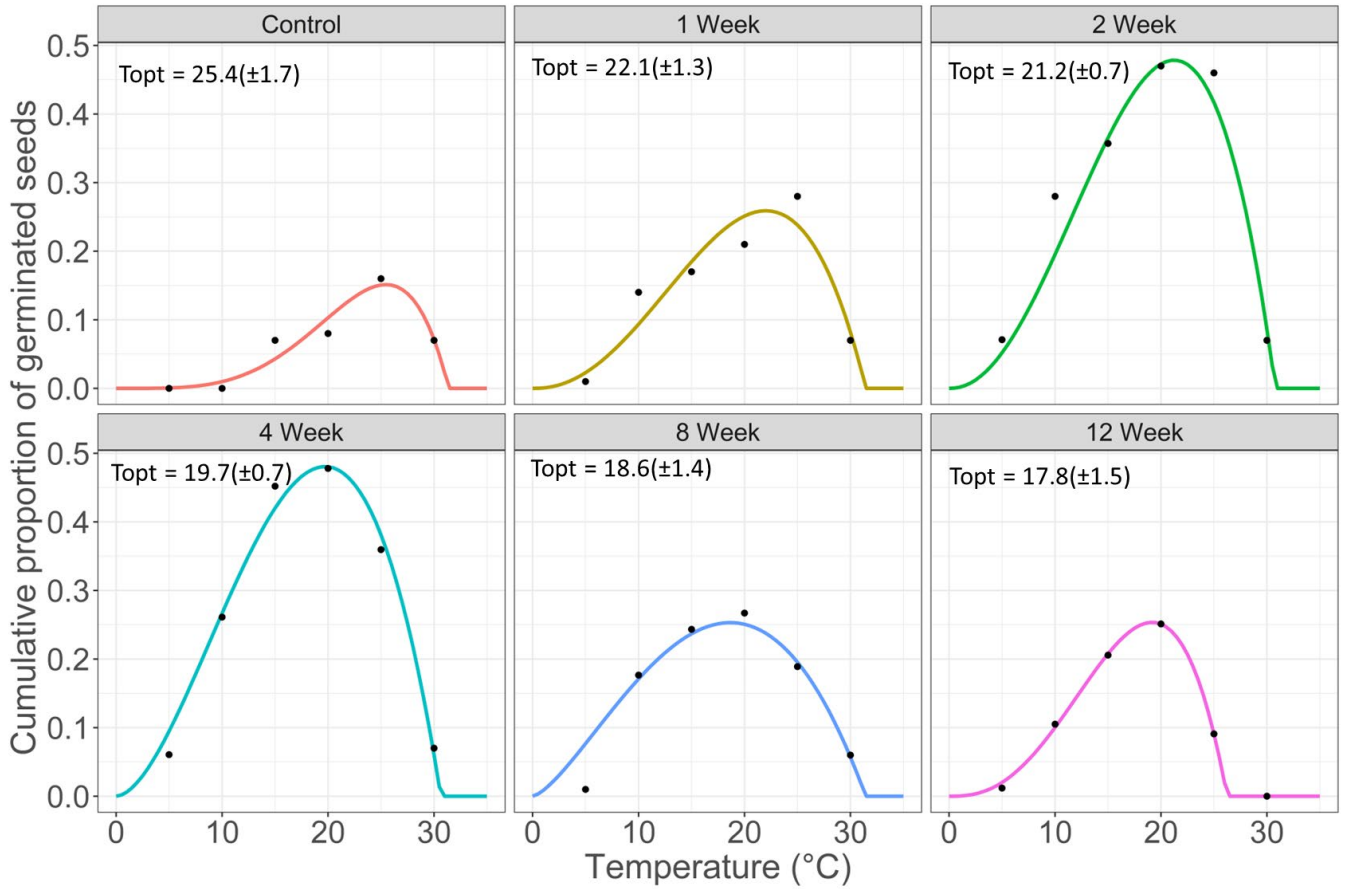

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	Stratification duration (weeks)					
	0	1	2	4	8	12
Germination proportion (± se)	0.15 ± 0.05	0.25 ± 0.04	0.48 ± 0.03	0.48 ± 0.03	0.25 ± 0.03	0.20 ± 0.03
Optimum temperature (°C ± se)	25.46 ± 1.71	22.01 ± 1.35	21.24 ± 0.76	19.72 ± 0.7	18.65 ± 1.44	19.56 ± 1.59

Optimum temperature decreases with increasing duration of warm stratification

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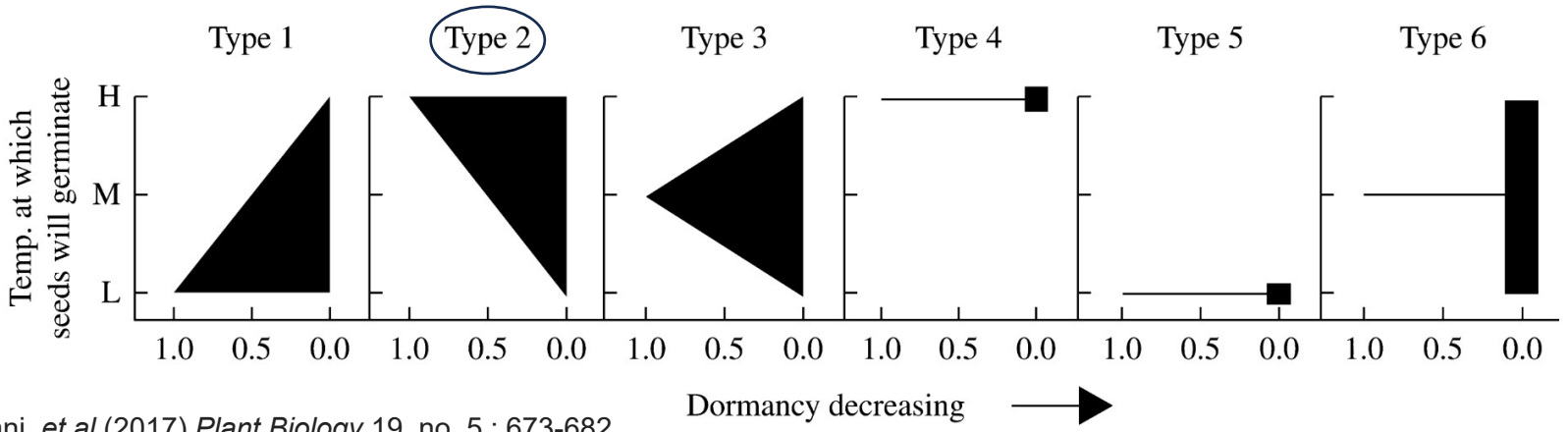
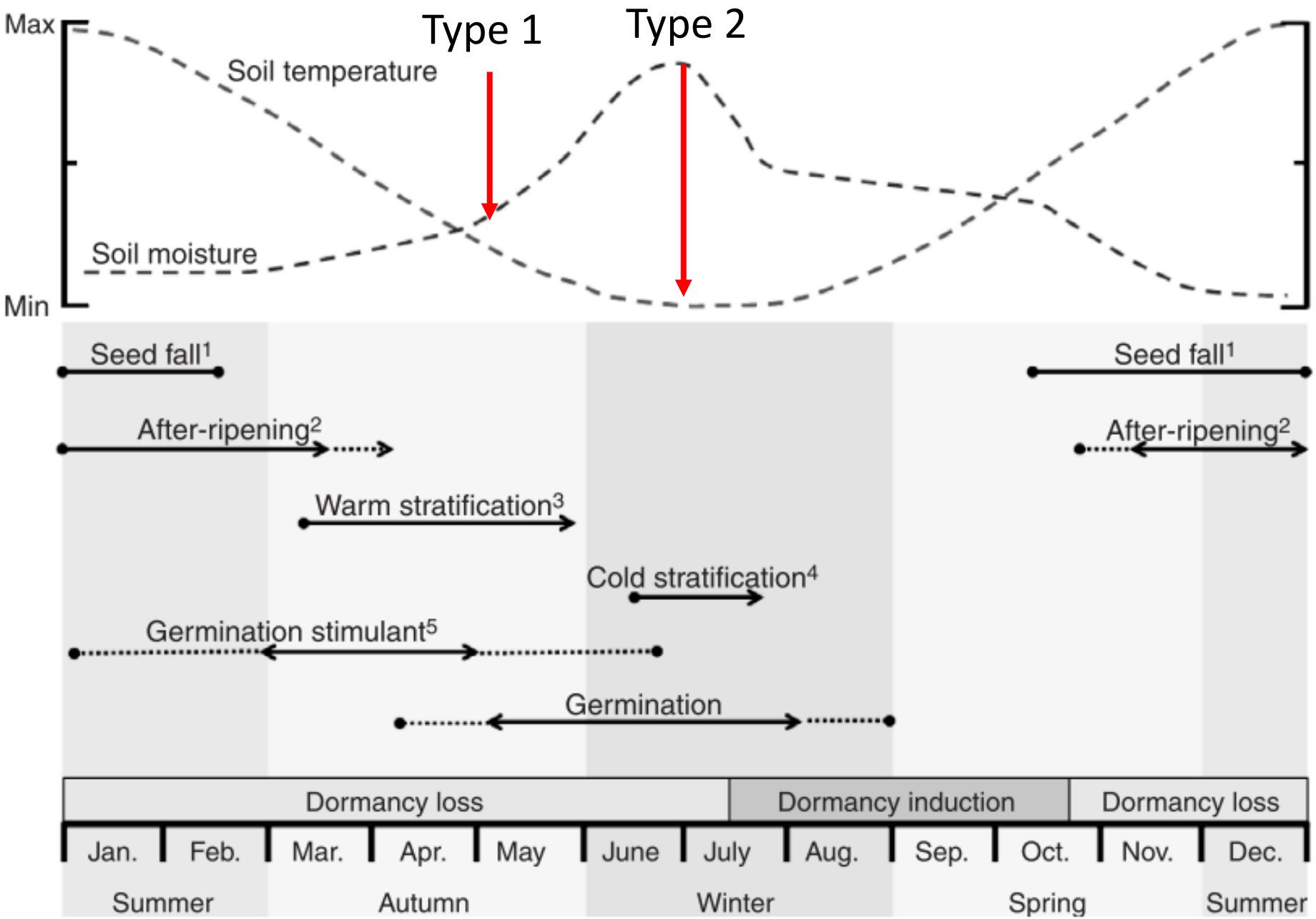


Suggests a type 2 response

Soltani, *et al* (2017) *Plant Biology* 19, no. 5 : 673-682.



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Conservation Physiology
Volume 11 • 2023
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Research article

Germination physiology of *Cochlospermum fraseri* (Bixaceae), a deciduous tree from Northern Australia with physical seed dormancy

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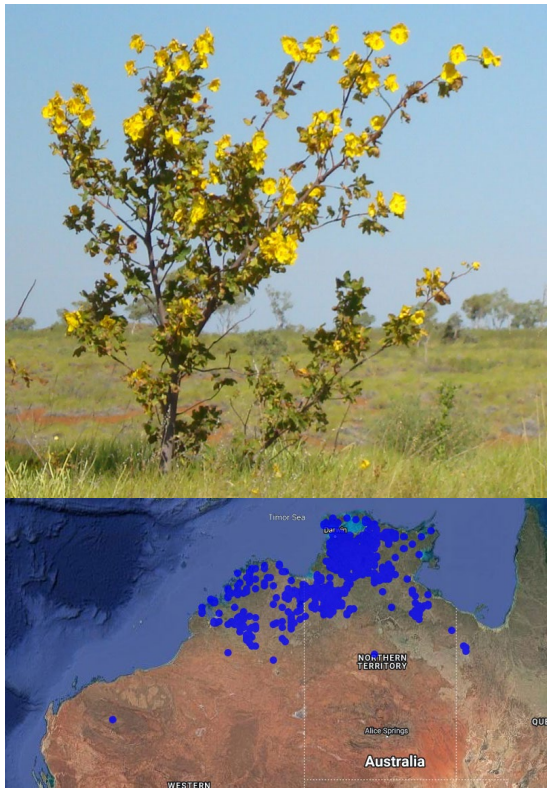

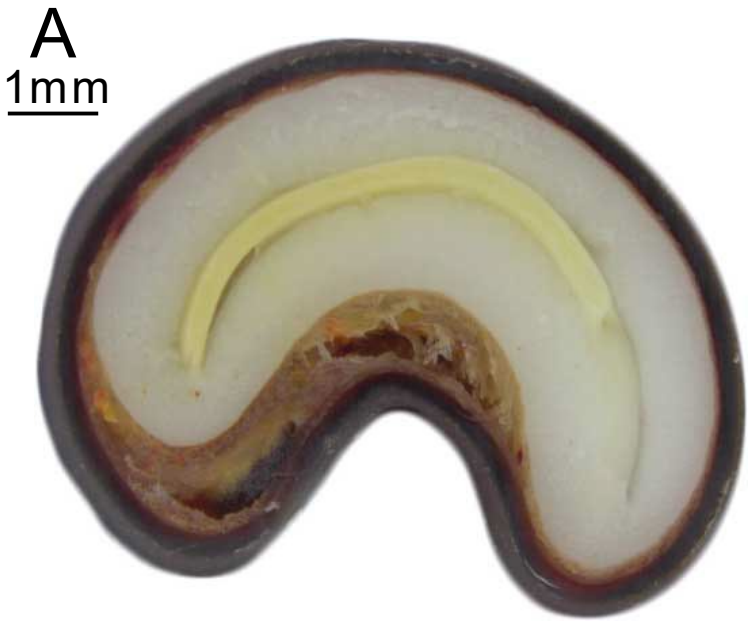

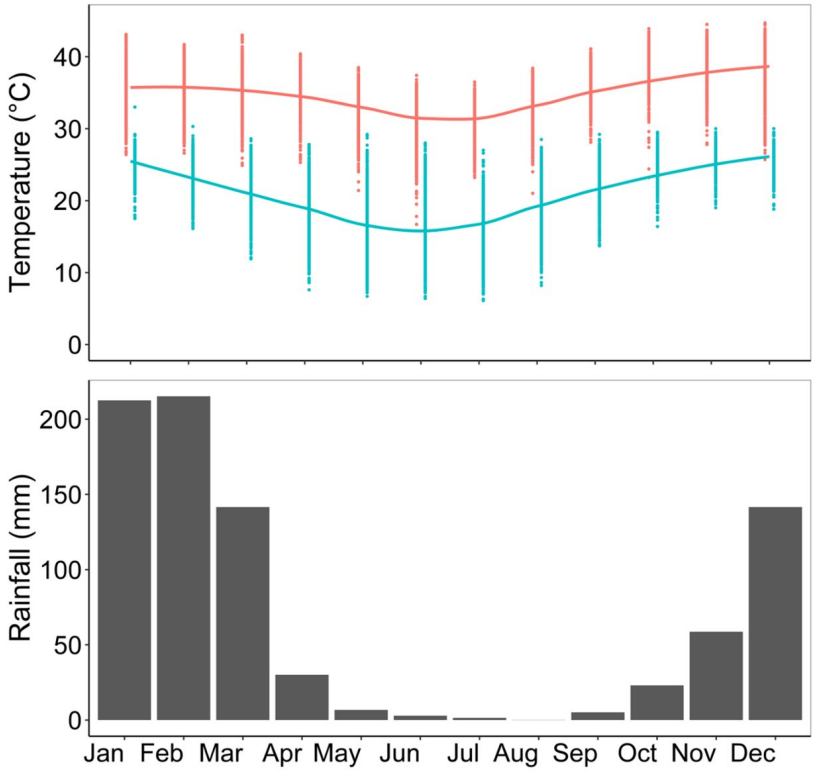

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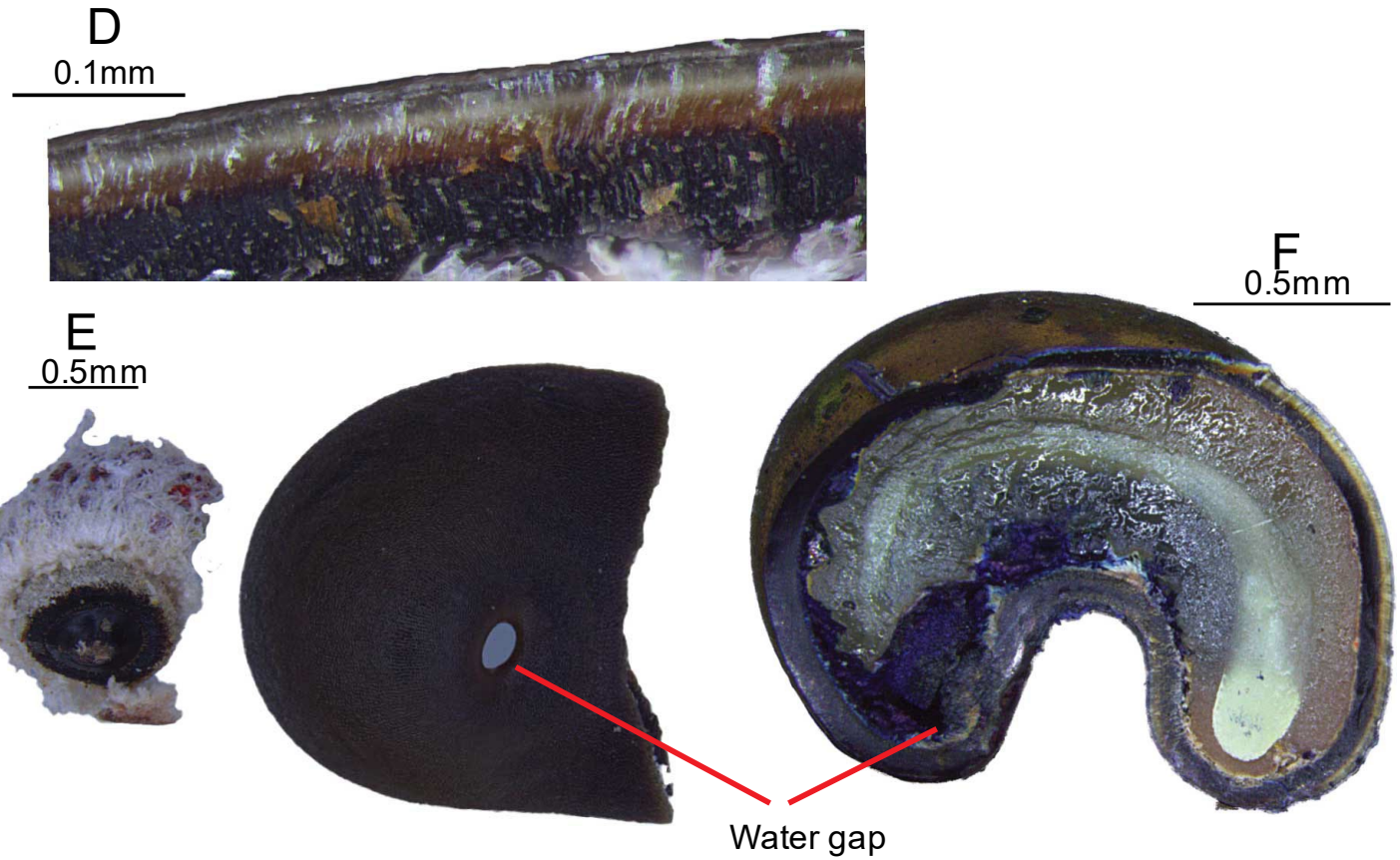

- Physical seed dormancy
- Pneumatic scarification, hot water and dry heat treatments ineffective
- Anecdotal reports of sporadic germination years after seeding

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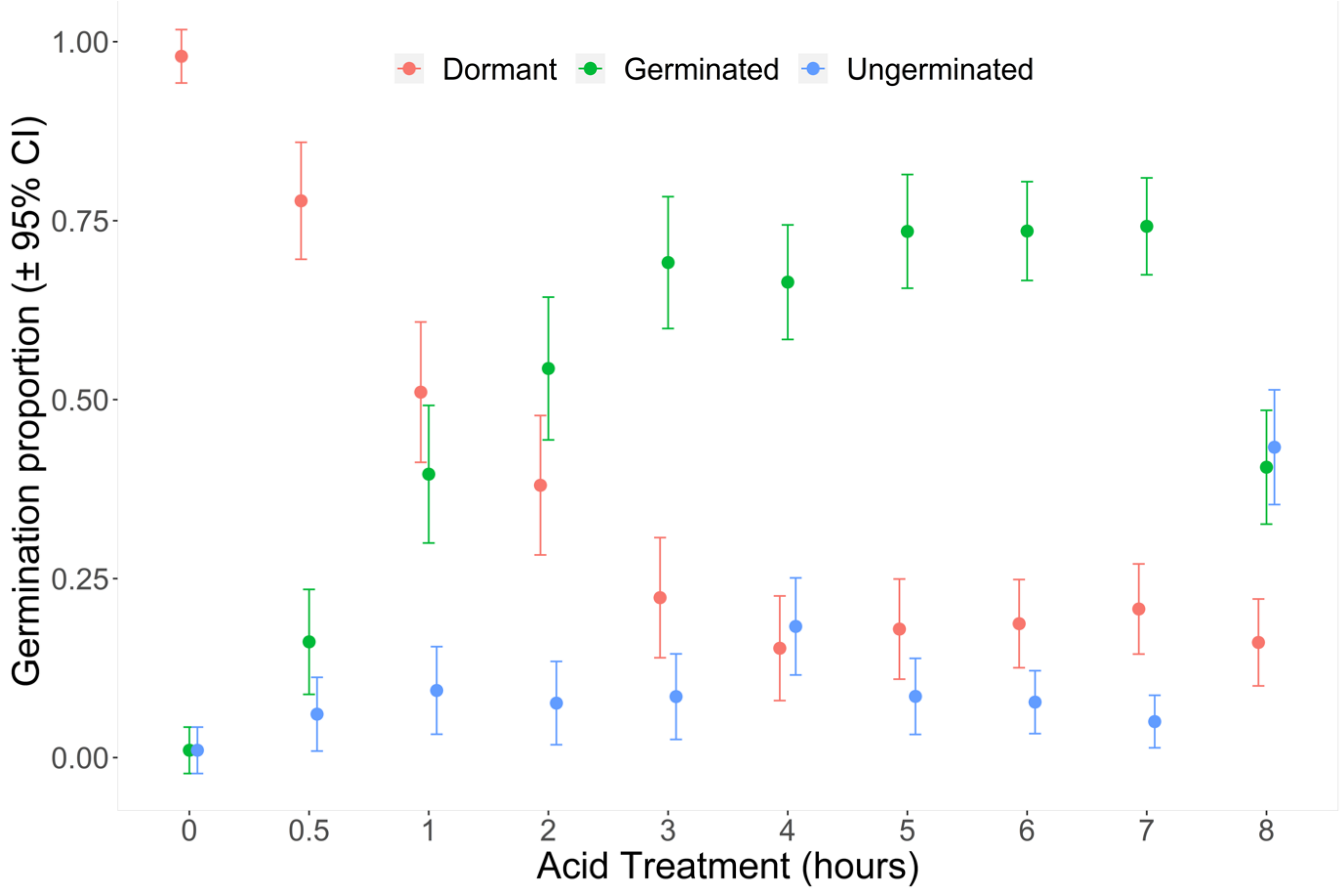

- **98% sulfuric acid for 3 hours**
- **High dormancy loss and germination**
- **Seeds begin to perish after 7 hours**
- Acts on the water gap
- Leaves seed coats intact

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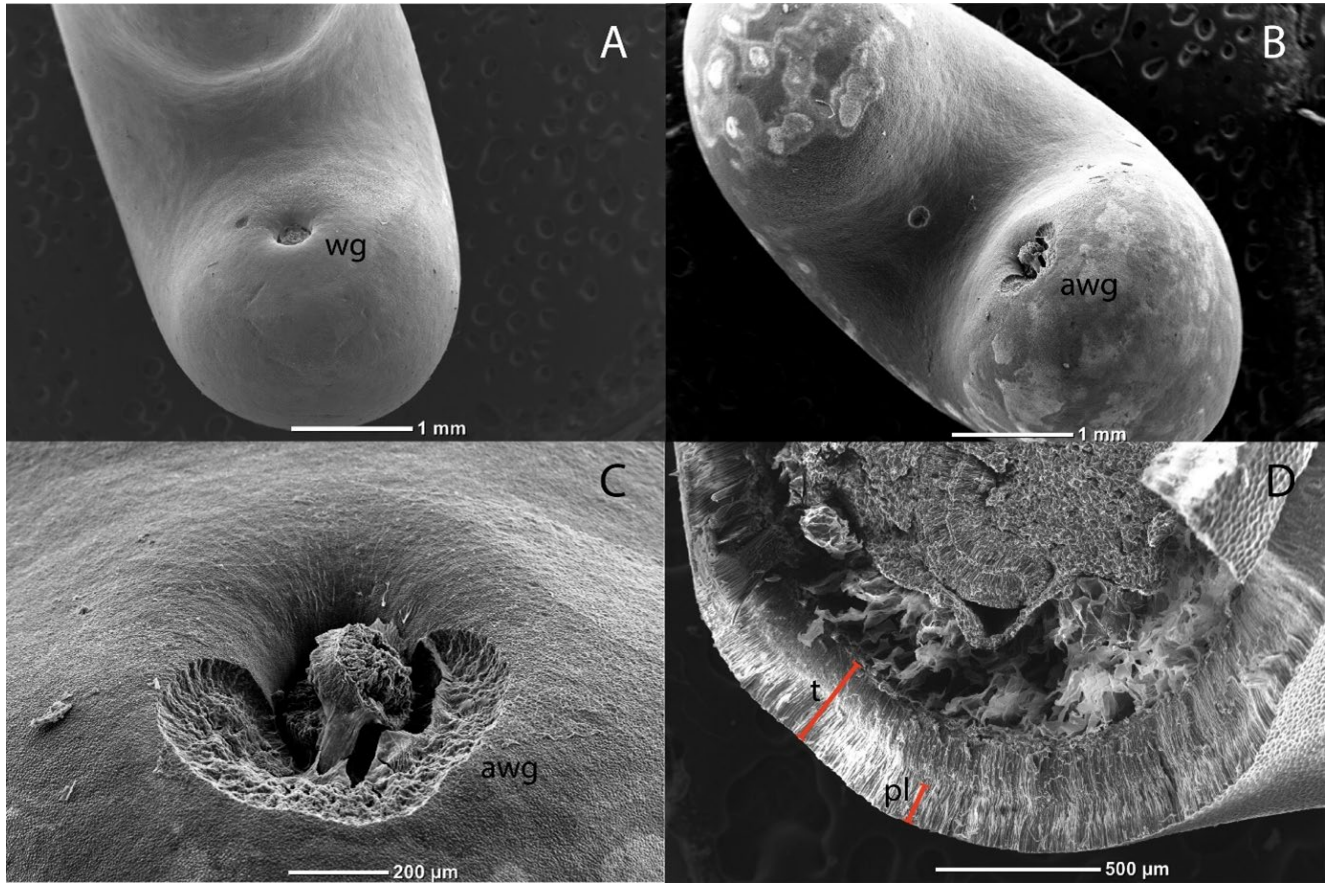

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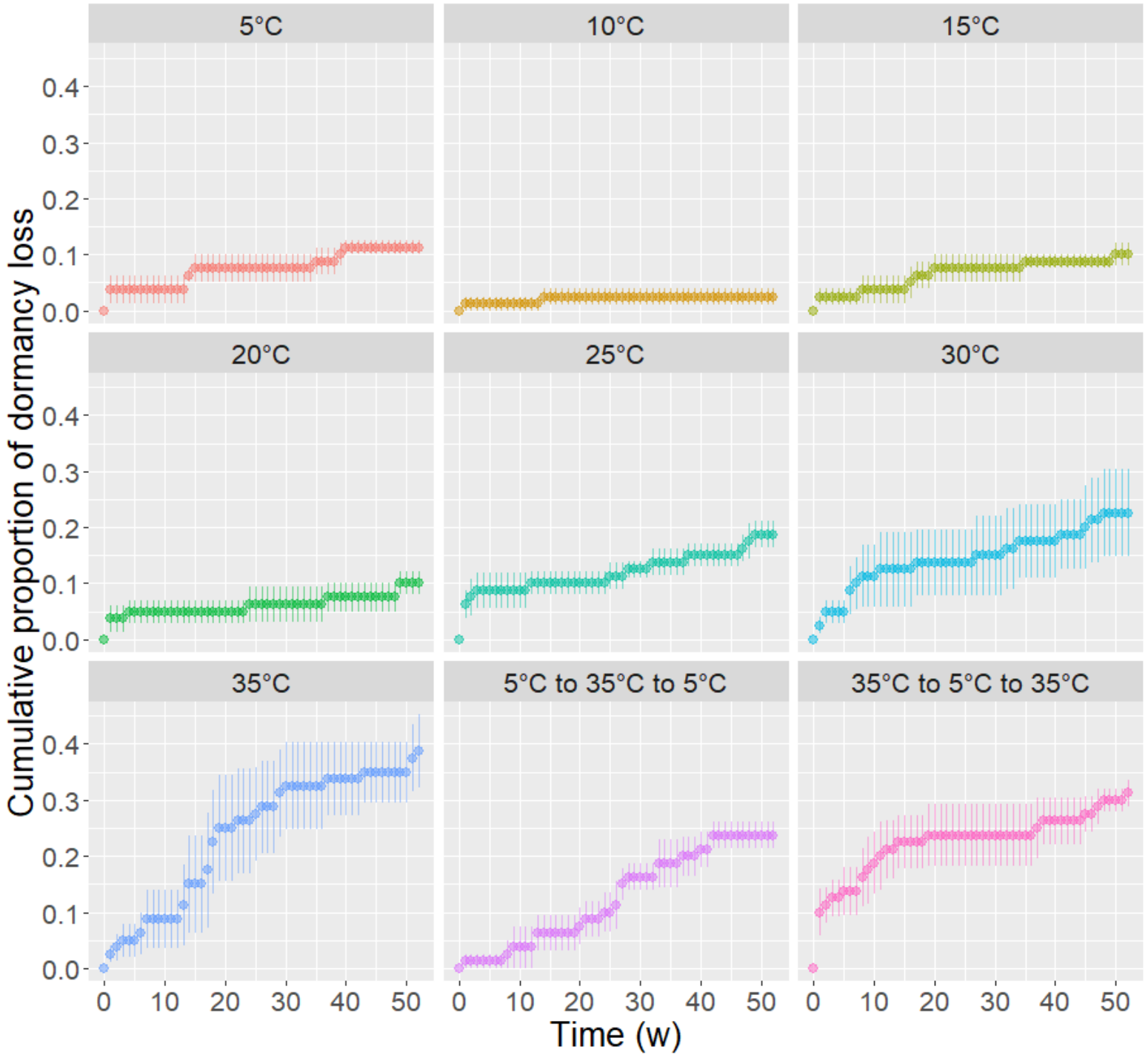
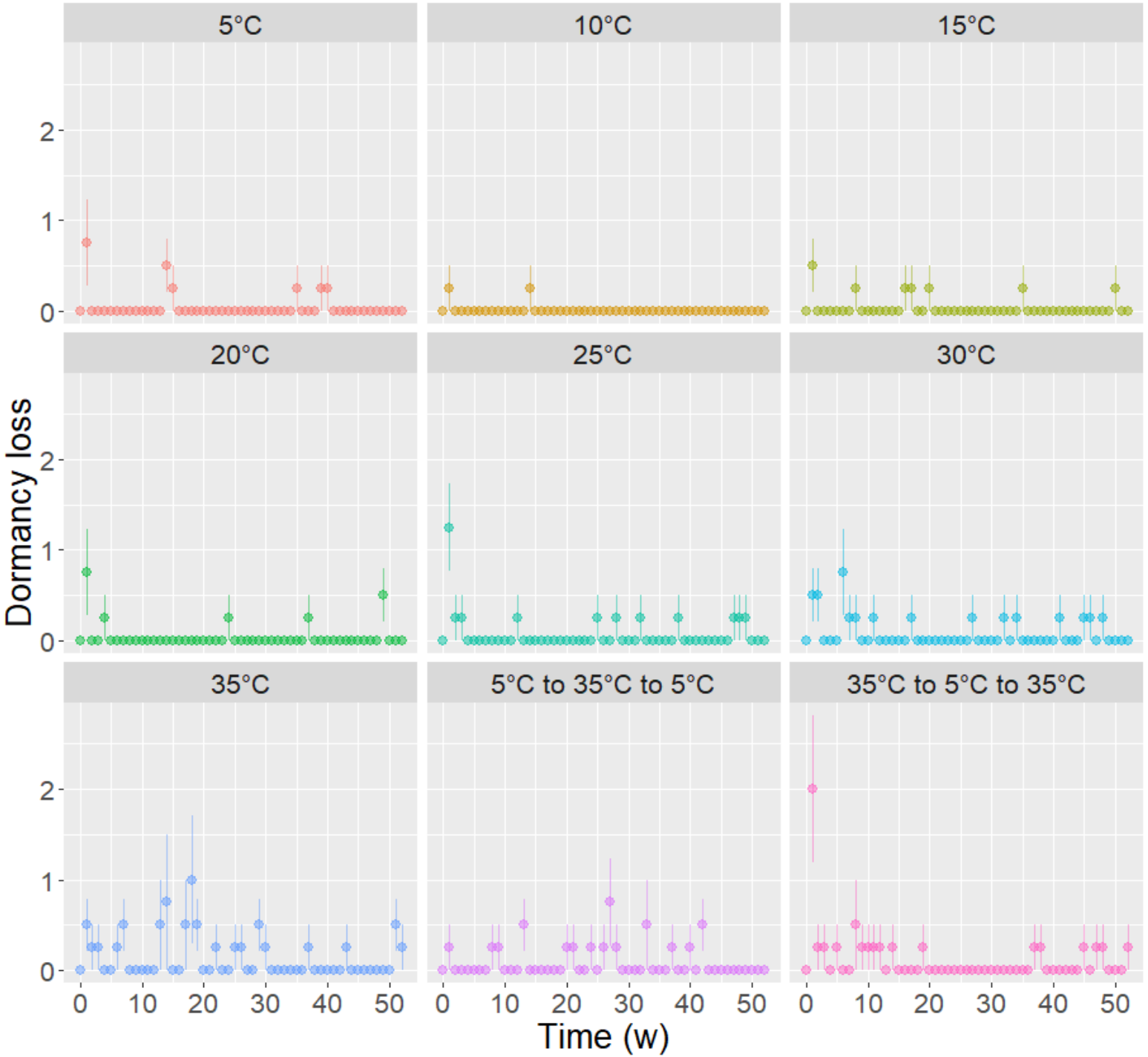


- **Warm stratification 25-35°C**
- **Alleviated dormancy in 40% of seeds over 52 weeks**
- Move along treatments ever 4 weeks
- Dormancy loss restricted to temperatures > 25°C



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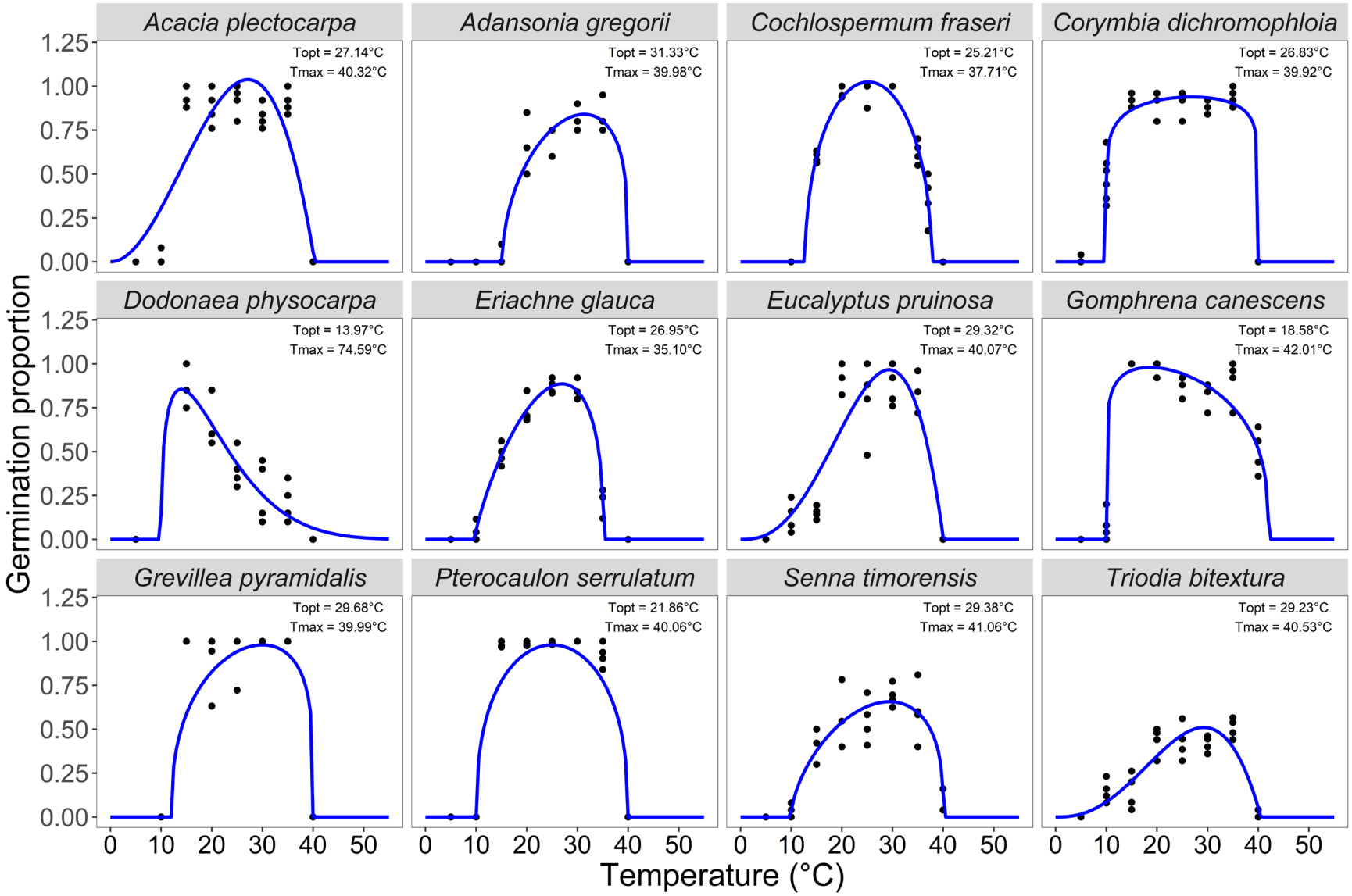
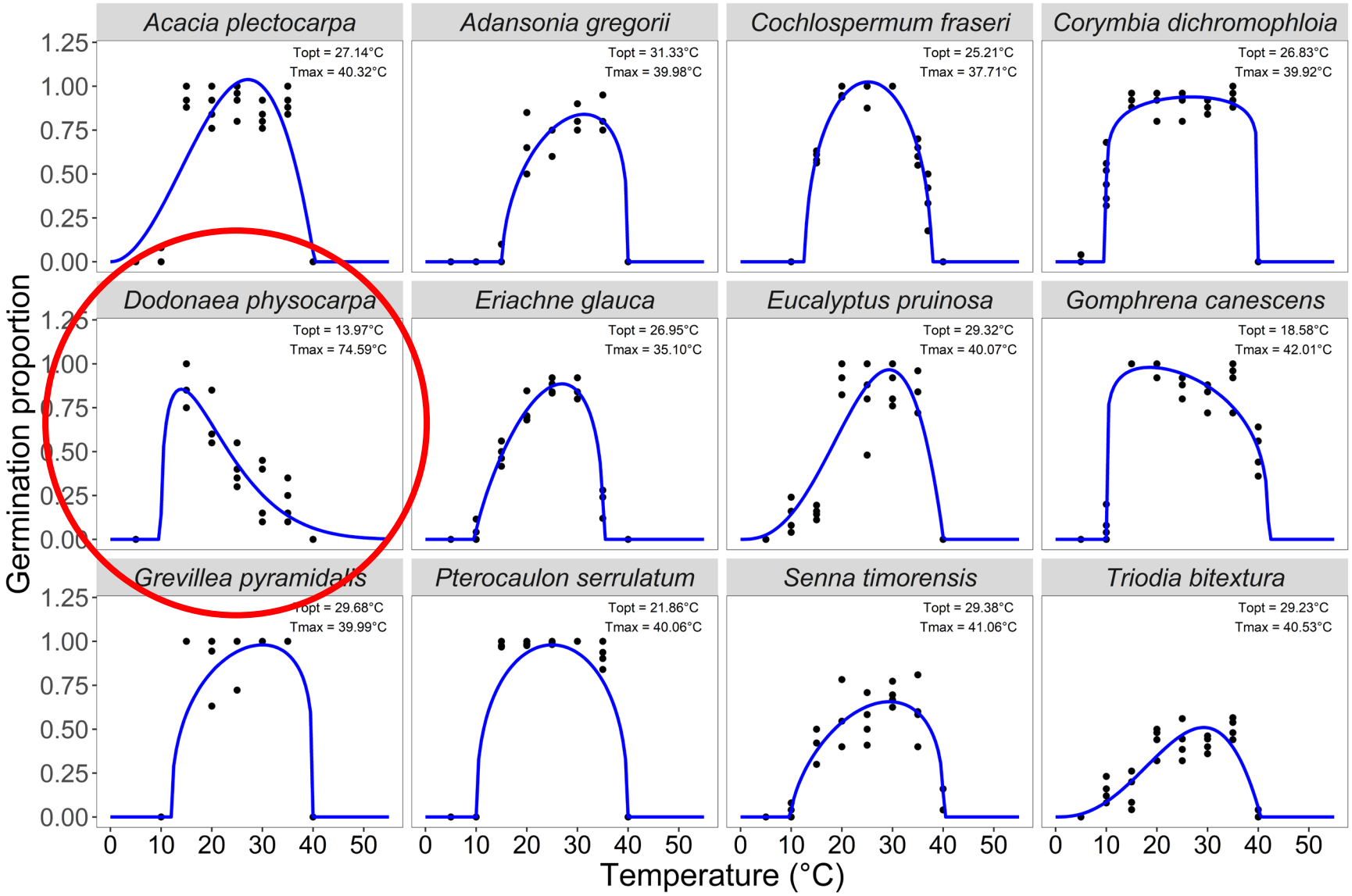
Once dormancy is broken…



- 11 of 12 species germinate well across wide thermal windows 15 – 35°C
- Average optimum 25.79 ± 1.77°C
- T10 2.14 ± 0.32 days

B. Albert *et al.*, in preparation

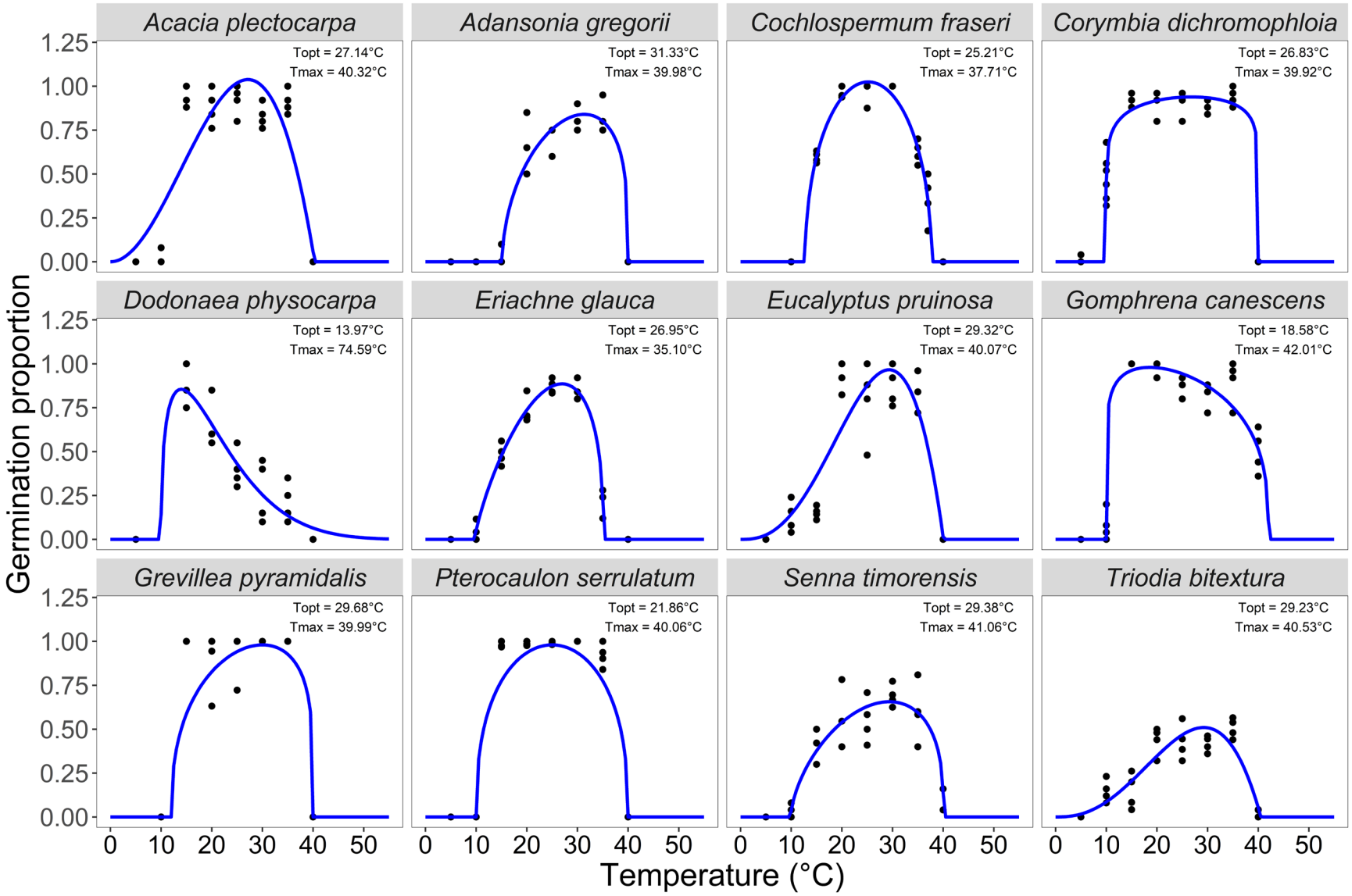
Once dormancy is broken…



- *Dodonaea physocarpa* germinates ~12°C lower than the average across the other 11 species
- Suggesting some species in the region are seeking to germinate on the peripheral of the typical germination window

B. Albert *et al.*, in preparation

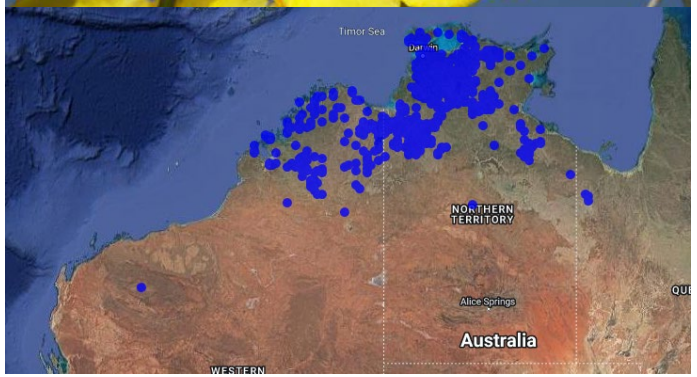
Once dormancy is broken…

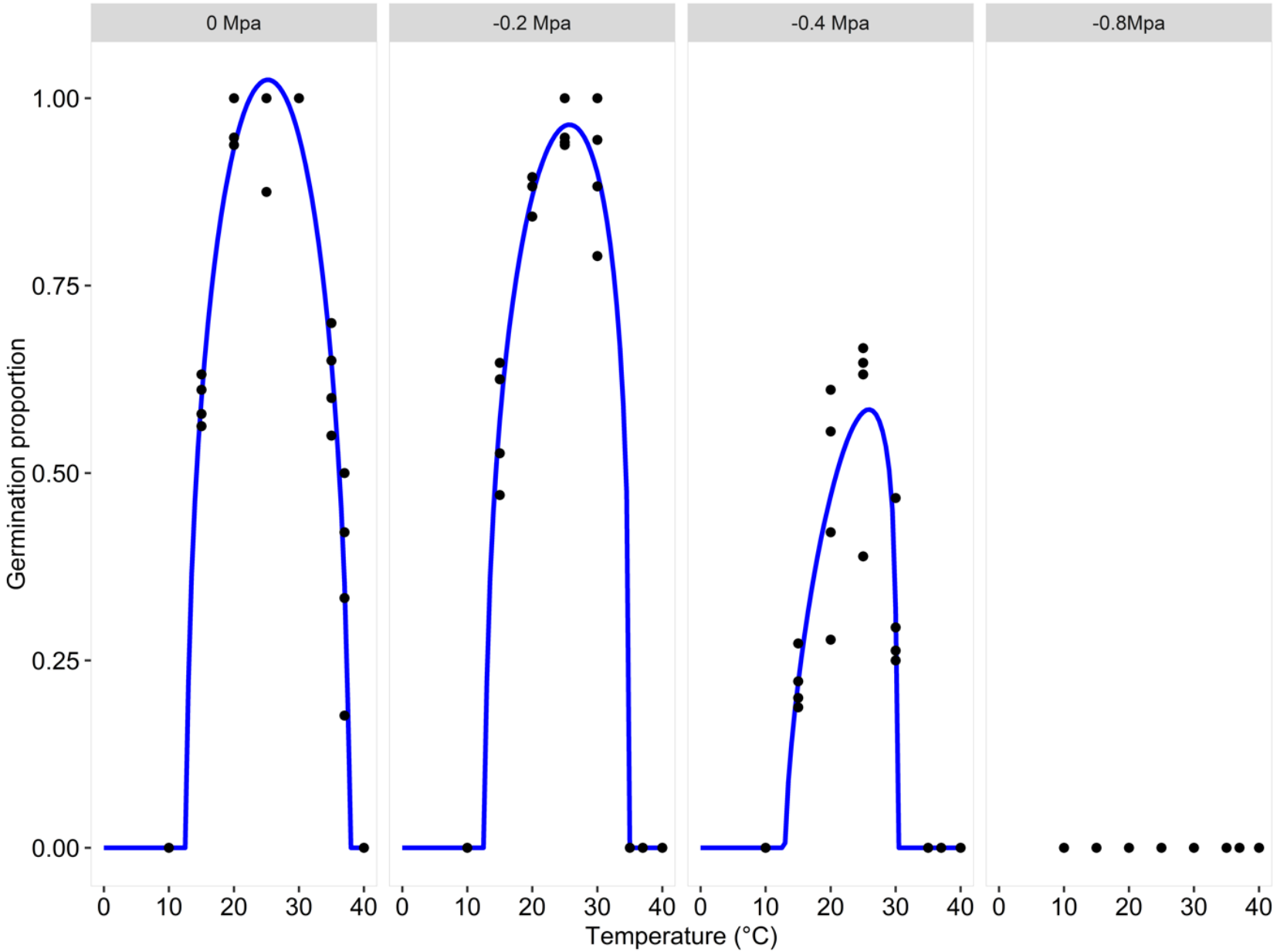


- But for the majority temperature appears to play a lesser roll in defining germination windows
- Rainfall and soil moisture are likely a much greater driver of germination timing

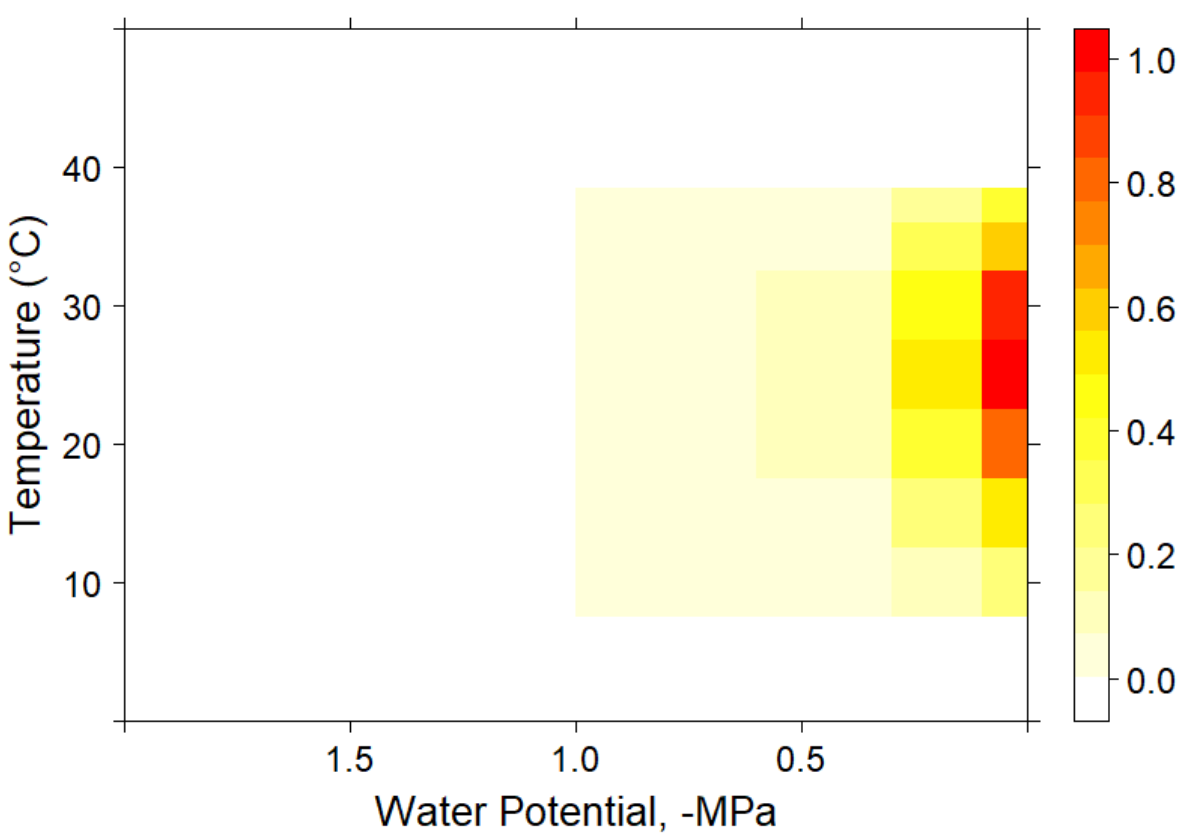
B. Albert *et al.*, in preparation

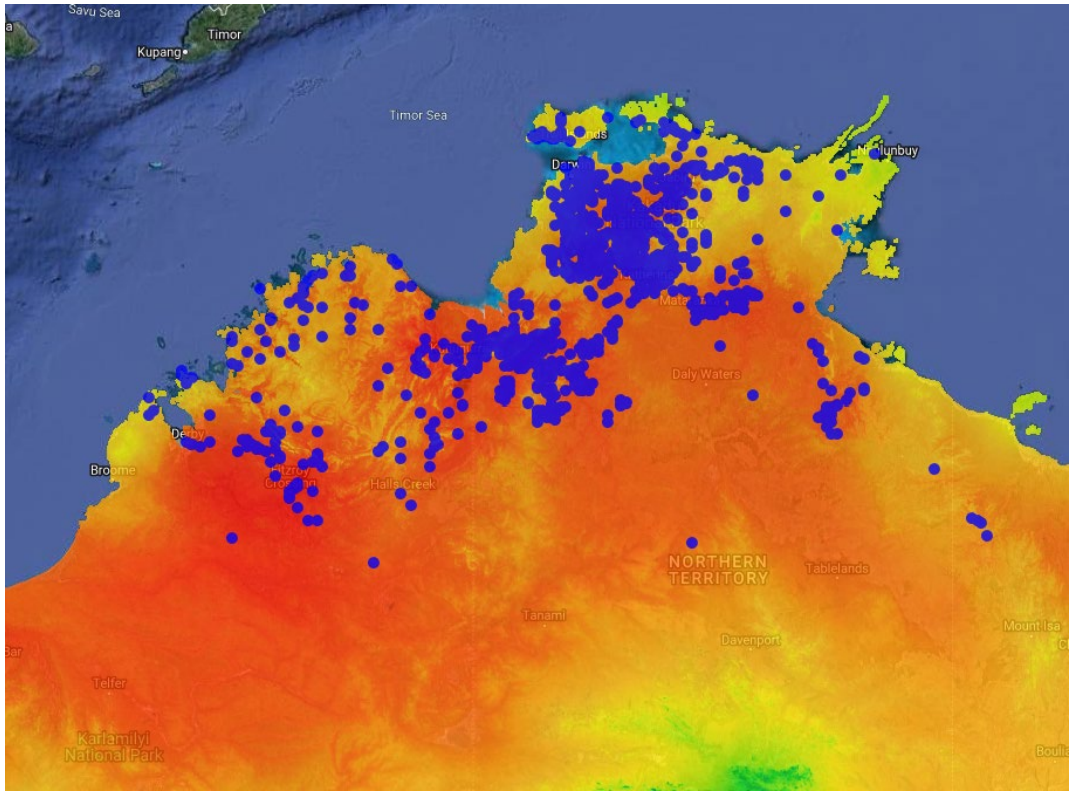
Cochlospermum fraseri





It's about predicting where and when seeding will make the biggest impact





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Thanks for listening!

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Recruiting!!!

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