



The Science Underpinning Western Australian Restoration Programs... and Beyond

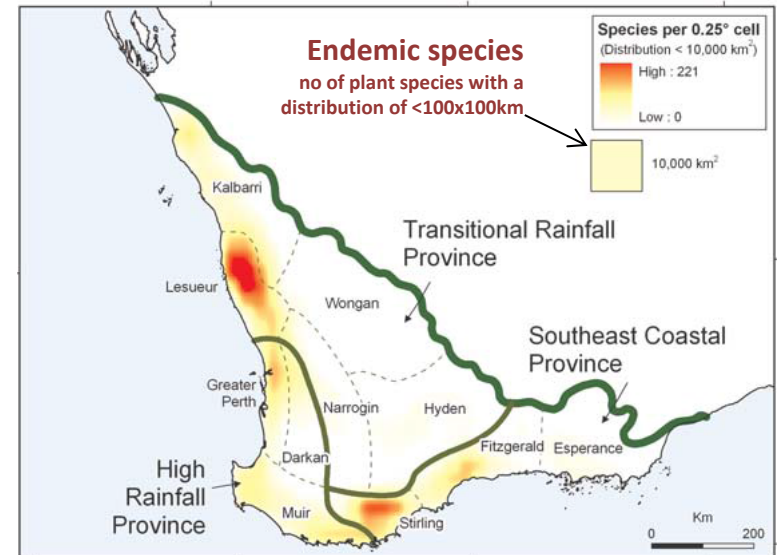


Dr Jason Stevens



Our Business case (1) - unique biodiversity and ecology need unique approaches in restoration

Biodiversity Hotspots of the World



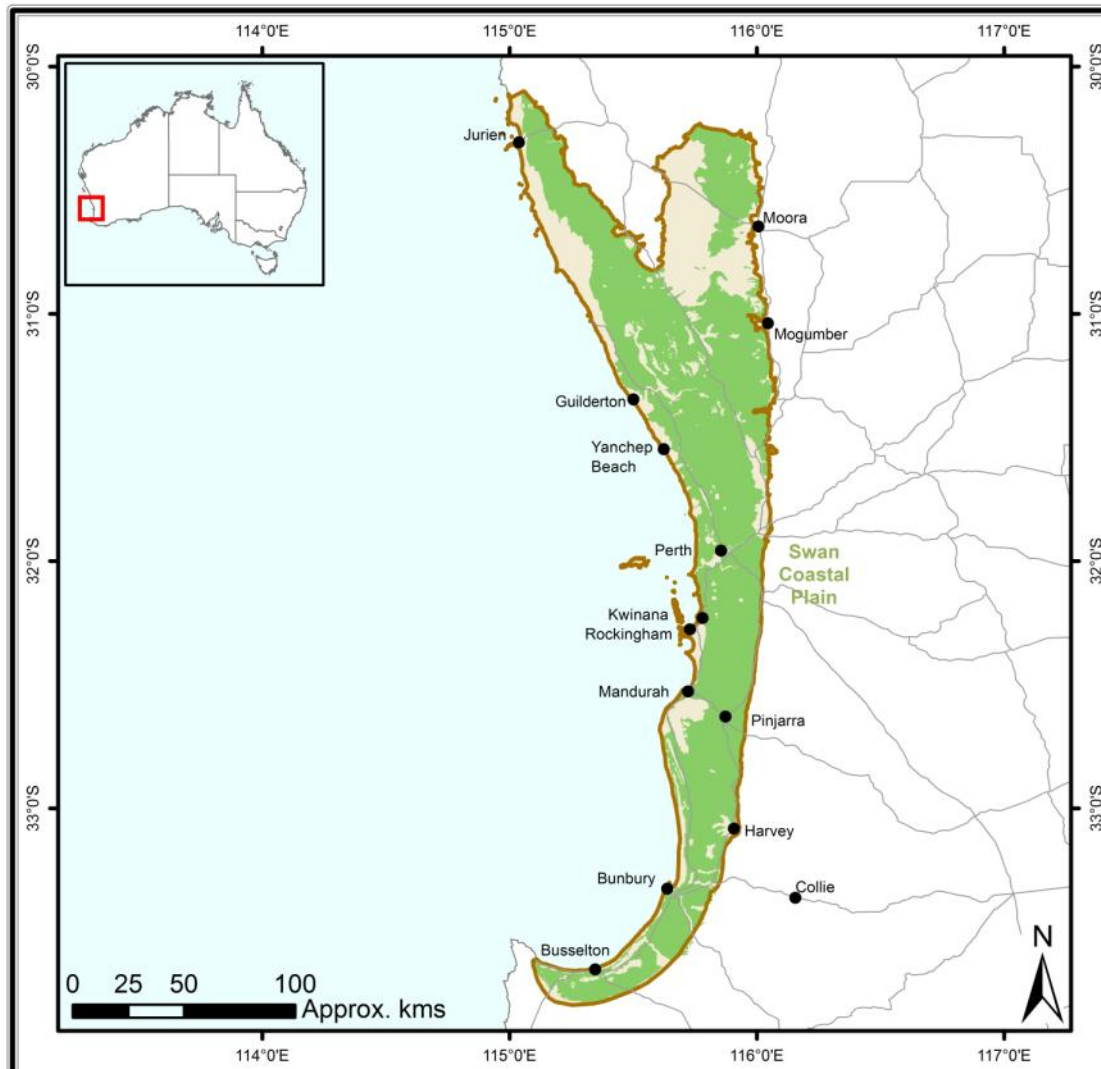
Hopper SD and Gioia P (2004). *Annual Review of Ecology and Systematics* 35: 623-650

80% of Australian species are found nowhere else
Australia is more biodiverse than 98% of other countries



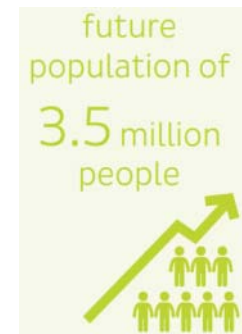
Our Business case (2) - Biodiversity loss and risk

Banksia woodland ecosystems 1780 to now

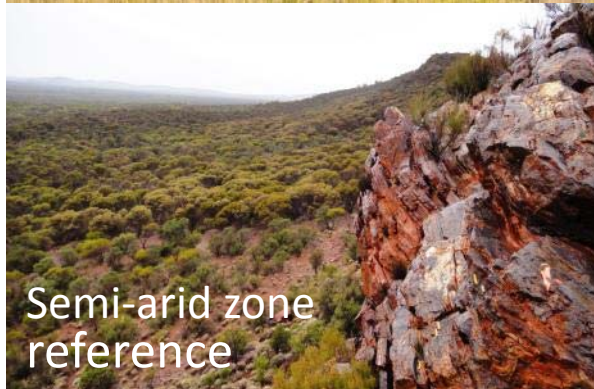
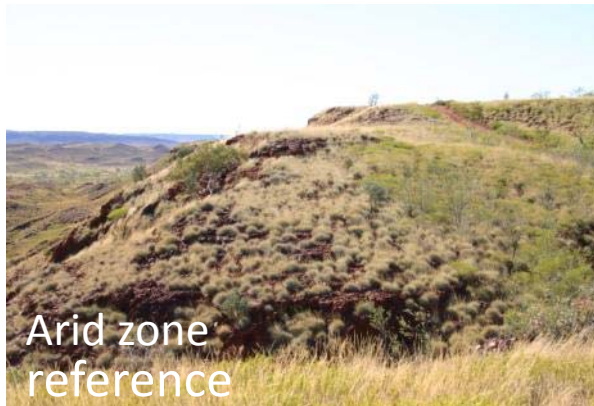


Australian cities as biodiversity disaster zones

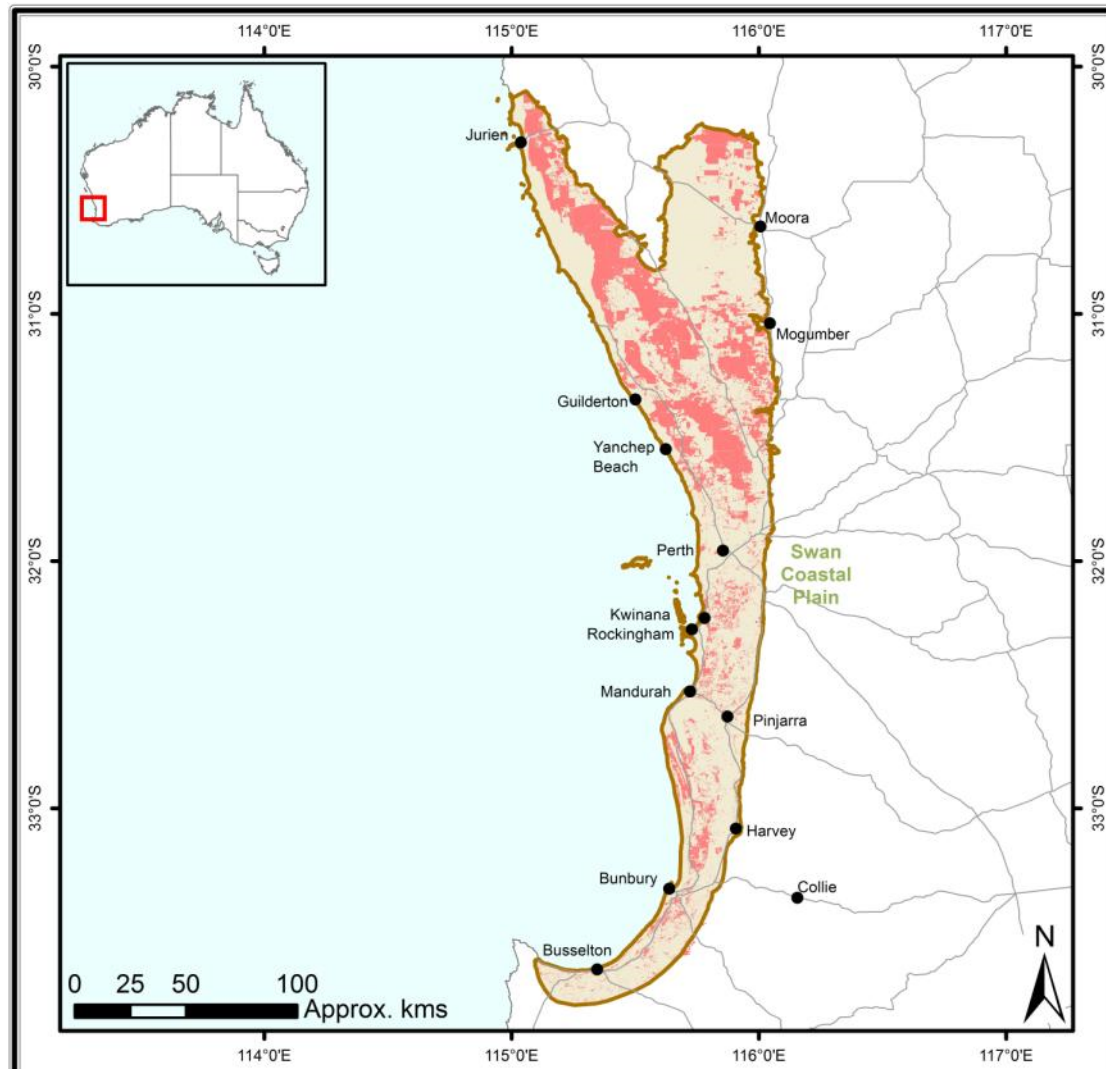
| Plant parameter | State Tally |
|-----------------------------------|-------------|
| Threatened Species | 15% |
| Conservation Priority Species | 11% |
| Threatened Ecological Communities | 30% |
| Priority Ecological Communities | 9% |



Our Business case (3) - Leave it alone and what happens...



Banksia woodland ecosystems now

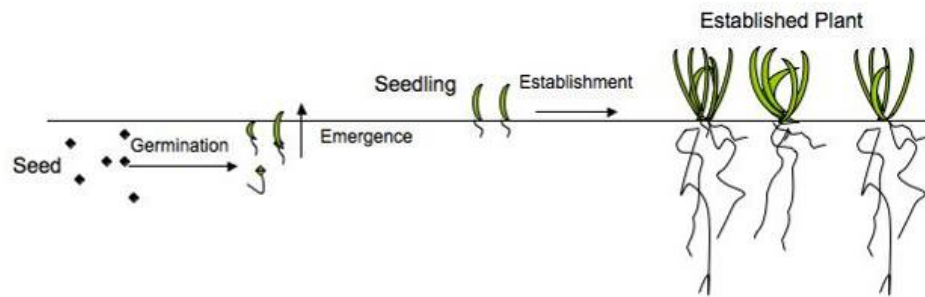
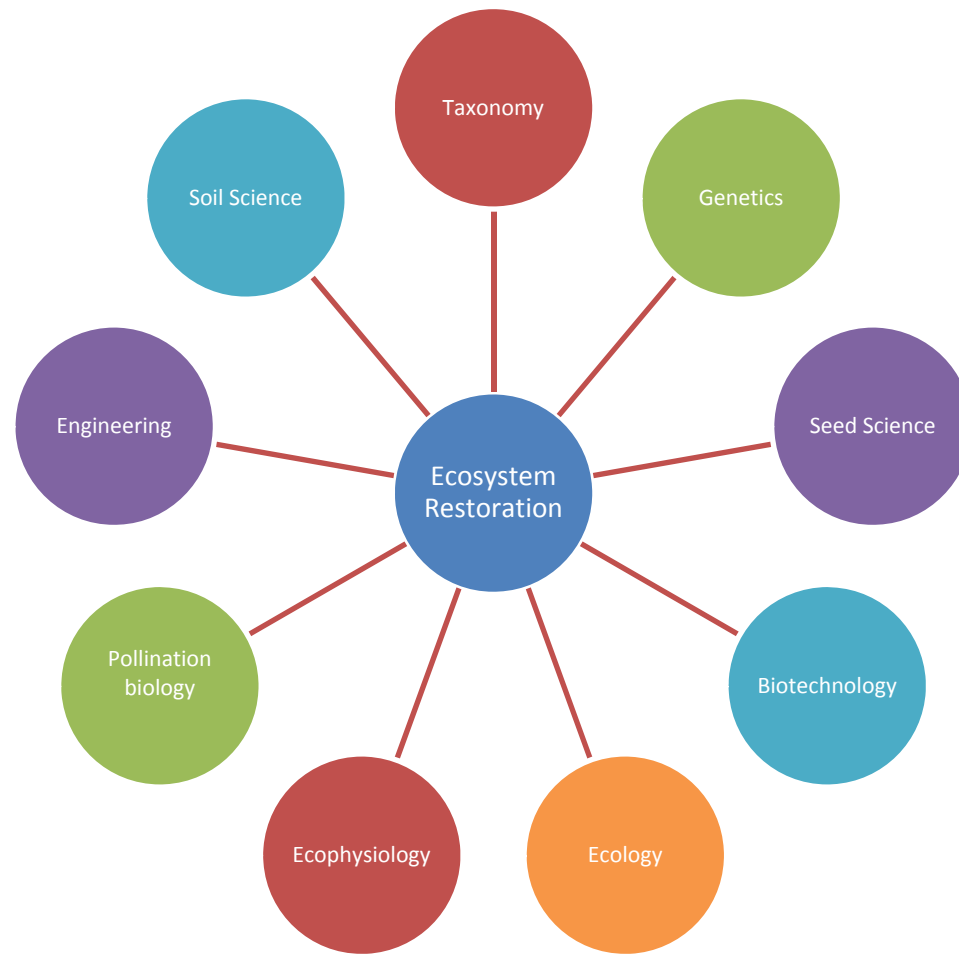


Opportunities to restore biodiversity



AIM – to restore the community back to pre-disturbance levels

A 21 year journey.....



In partnership



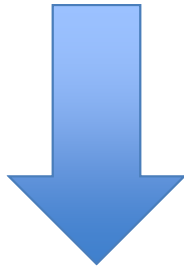
Solutions

- Proven**
- Cost-effective**
- Scalable**
- Transferable**

Biodiversity outcomes



| SCORECARD | | | | | | |
|-------------------------------|-----------------|-----|--|--|--|----------|
| | Pre involvement | | | | | |
| | Poor | | | | | Resolved |
| Species richness | Red | | | | | |
| Plant density | | Red | | | | |
| Plant survival | | Red | | | | |
| Ecosystem function | Red | | | | | |
| Scalability and applicability | Red | | | | | |



Practitioner outcomes

Recognition



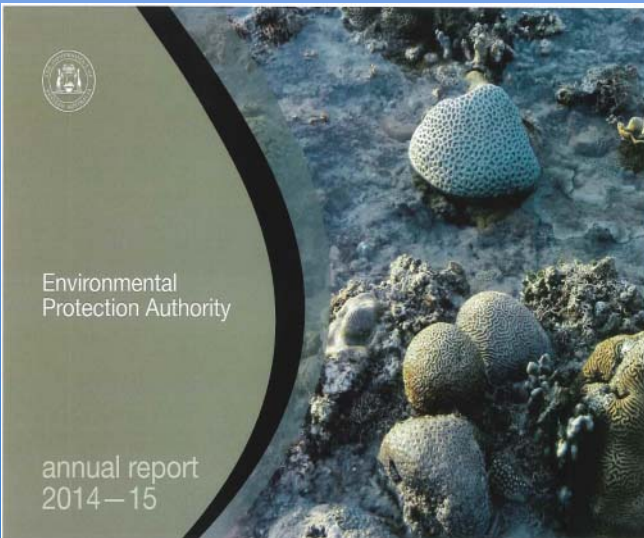
2008 State Environmental Excellence Award

Leveraging opportunities

5 Linkage programs *ca* \$12M funding
Co-funded dedicated research scientist

Promotional opportunities

5 International Scientific conferences

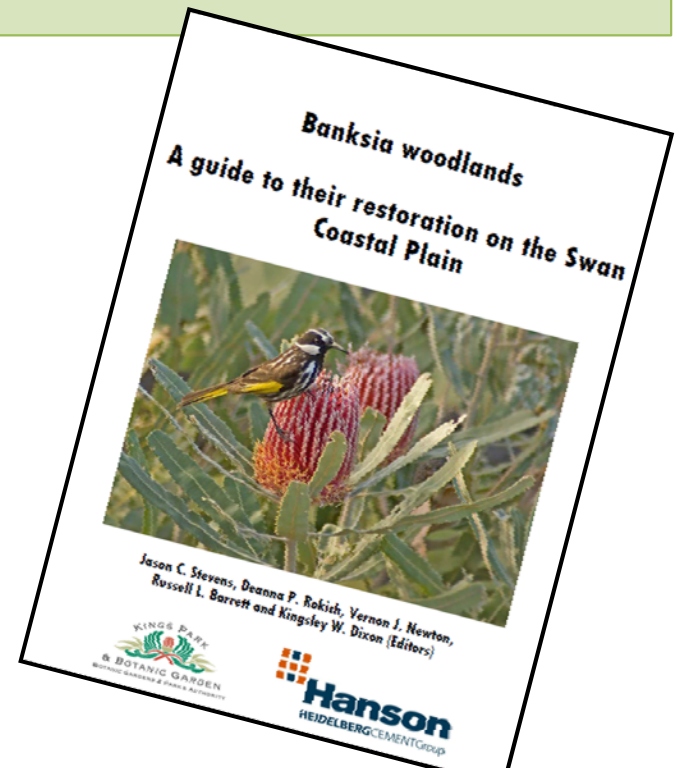


Case studies in post-mining rehabilitation

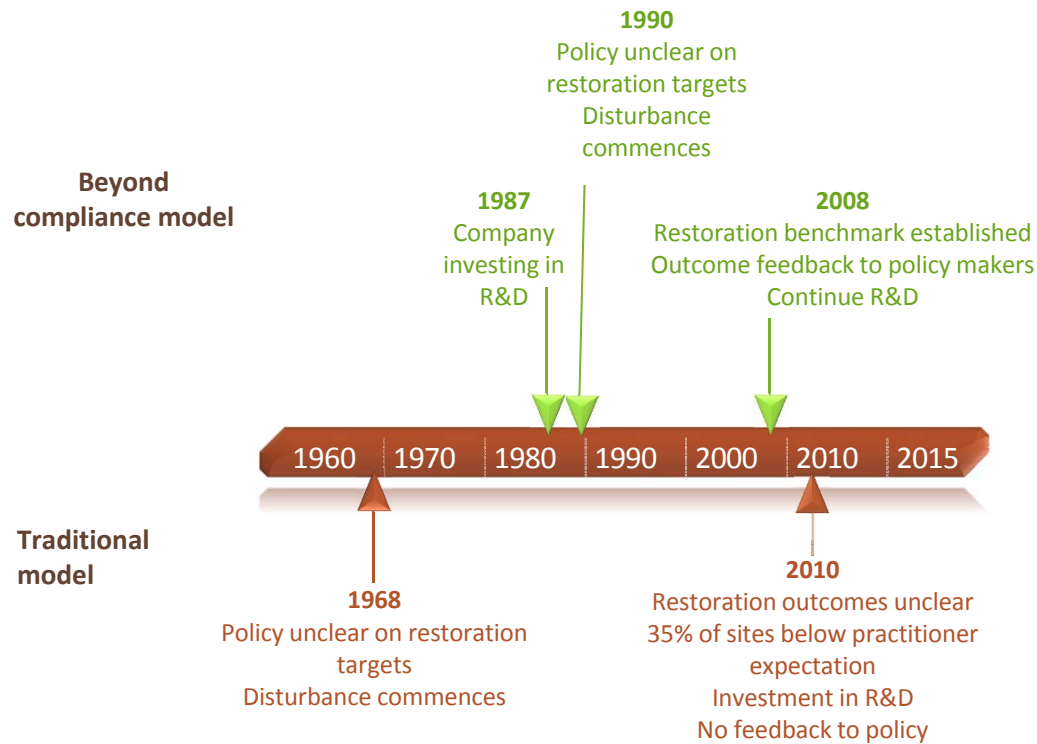
Experience has shown the EPA that the challenges of rehabilitating disturbed landscapes can be successfully met with good, ecologically sustainable outcomes, when adequate attention is paid to forward planning and a genuine commitment to rehabilitation extends throughout the life of the mine.

Rehabilitation success is noticeably linked to the existence of clear objectives and agreed strategies, implemented with the support of management and with the benefit of a strong relationship between research and operations.

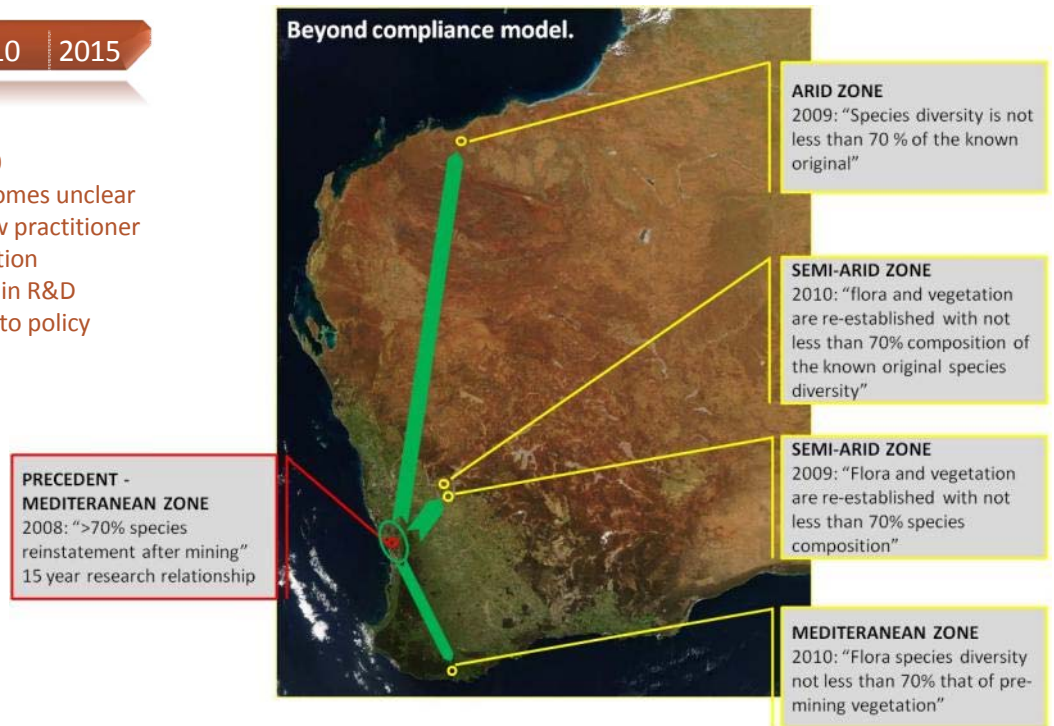
Case study 1: Banksia woodland rehabilitation by Rocla Quarry Products



Policy outcomes



Stevens and Dixon, *Environmental Science and Policy*. Submitted



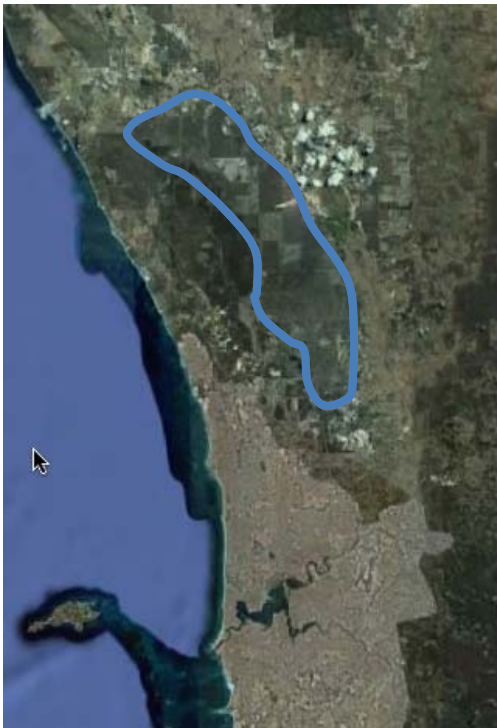
current restoration efforts only achieve an estimated 15% of pre-disturbed biodiversity.

Seed Science

- 33 species/ha **sown**
- 11 species/ha **established**

* preliminary data analysis 2013

Data courtesy David Freudenberger ANU



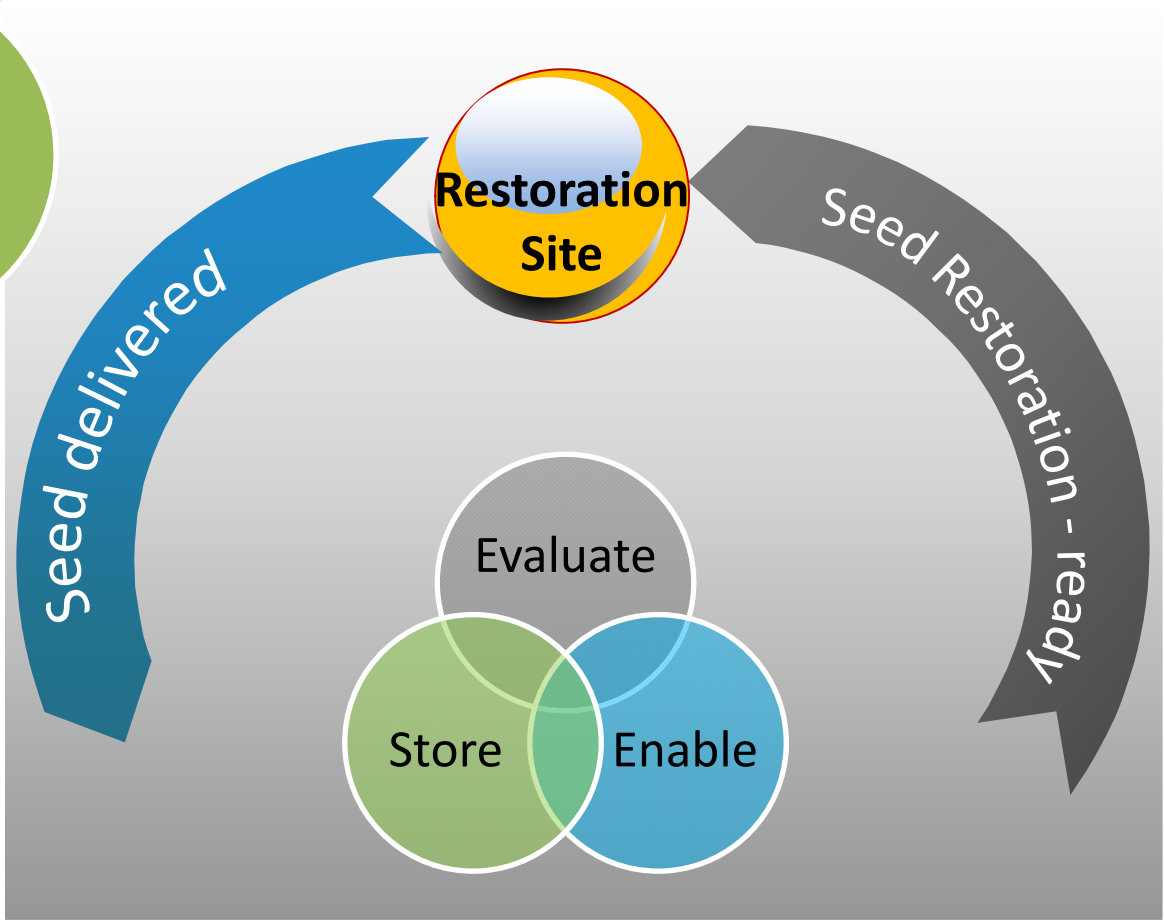
Just add seed ?

But is there enough for biodiverse restoration?

The restoration project

- 17,000 ha disturbed land.
- 10-15 kg/ha for low to moderate reinstatement of diversity.
- 170 – 255 tonnes of seed required.
- **Current collection capability: 1 tonne pa.**
- **US\$260 million for seed**

Seed Science



- Evaluate**
- Purity assessment
 - Viability assessment
 - Germination testing
 - Post-harvest handling

- Store**
- Short-term storage
 - Long-term storage
 - Germination testing
 - Viability monitoring

- Enable**
- Dormancy release
 - Germination enhancement
 - Seed delivery

- Supply**
- Seed farming

Some of our science locations

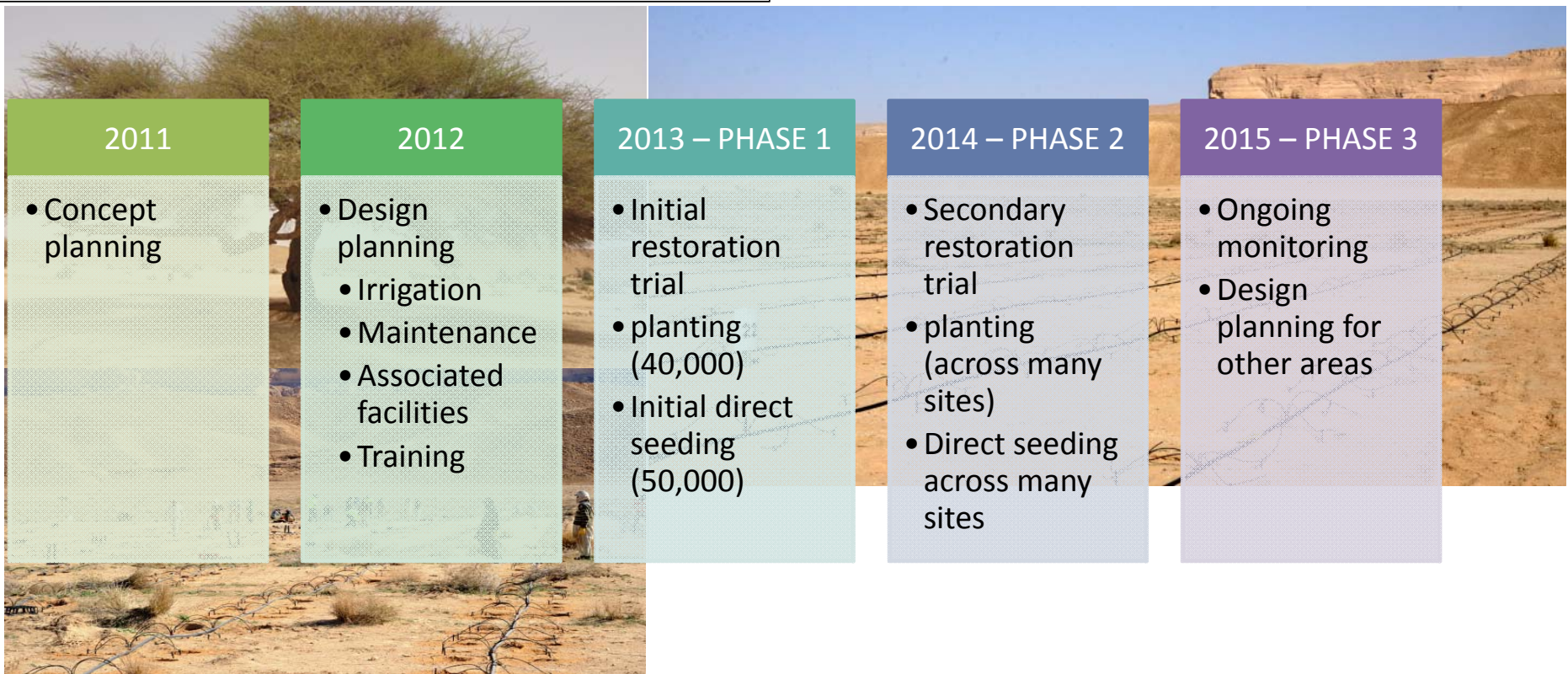


ONE COMPANY ALONE
1,200 square kilometres
impact over the next 50
years



الهَيئَة العُلْمِيَّة
للتطوِير مَدِينَة الرِّيَاض

KINGS PARK
& BOTANIC GARDEN
BOTANIC GARDENS & PARKS AUTHORITY

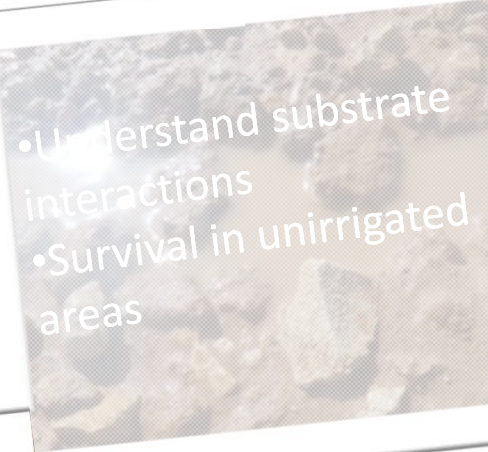


- 
- Seed collectors trained
 - Seed storage facilities
 - Key taxa collected

- 
- Germination resolved for 6 key taxa

- 
- Restoration nursery designed at scale
 - Propagation training

- 
- Improved water-use efficiency
 - Improved irrigation

- 
- Understand substrate interactions
 - Survival in unirrigated areas

High Commission for the
Development of Arriyadh

Preservation, rehabilitation and
development of native plant
cover in Arriyadh Province



Phase 2: Strategy Plan

Copyright © 2016 Arriyadh Development Authority

Take home

- Fast-track science on demand
- Finding and engaging with the practitioner champions
- Unless we have the grassroots support and the scientific integration we wont see a change in biodiversity restoration outcomes.