





National Seed Bank: We don't just store seeds!

Caroline Chong APCC12 13 November 2018





Outline

Ex situ conservation of rare and threatened plants

National Seed Bank Seed biology research 3 case studies





How to regenerate rare and threatened plants?



AUSTRALIAN NATIONAL BOTANIC GARDENS

How to regenerate rare and threatened plants?

Seed biology research

- Seed dormancy, viability, longevity Germination and establishment
- Physiological thresholds
- Population variation





How to regenerate rare and threatened plants?

Predict responses and resilience to threats

- Develop optimal conservation techniques
- Restoration-ready seeds, plants, biological data
- National Seed Bank 7588 accessions of 3411 taxa Databased, accessible information





Data deficiencies for significant taxa





Case studies





ACT ENDANGERED

Herb of Natural Temperate Grassland 2 populations

Threats

Habitat loss and fragmentation Inappropriate disturbance

Competition, Grazing

How to restore populations?Germination, seed production requirements unknown





Key partners

ACT Government

Australian National Botanic Gardens

Greening Australia

Australian Government Caring for our Country grant

Centre for Australian National Biodiversity Research

NSW National Parks & Wildlife Service

NSW Office of Environment and Heritage





Searching for the key:

How to restore and ensure survival of natural populations?

Seed production area at Australian National Botanic Gardens

200,000 seeds at National Seed Bank

Germination thresholds and fire response identified

- 100% germination at 15°C in 48h
- Heat sensitive seed





Next steps

How to restore and ensure survival of natural populations?

Seed production techniques established for *Lepidium ginninderrense*

Seedling establishment?

Apply genus-level knowledge: *Lepidium hyssopifolium* production and trial plantings at McCleods Creek Nature Reserve





Case studies





Northern Territory VULNERABLE

14 individuals in Uluru-Kata Tjuta NP

Significant value to Anangu custodians

Threats

Introduced grazers, wildfire

Difficult to germinate and cultivate

Seed dormancy

Hemiparasite: needs a host to survive

Reduced genotype pool







Recommended actions

Fence from camel and rabbit damage

Protect from inappropriate fire

Translocate seedlings









Key partners

Anangu traditional custodians

Uluru-Kata Tjuta National Park

Parks Australia, Australian Government Department of the Environment and Energy

Australian National Botanic Gardens National Seed Bank, Living Collections







ONAL

KAT



Australian Government Parks Australia





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Australian Government Parks Australia







Nut-cracking suite of techniques

Physiological dormancy

After-ripening, rapid wet-dry cycle **Physical dormancy**

Fracture woody endocarp Germination

Bury in sphagnum moss

- 15°C 18°C darkness
- 3 weeks 3 months

Variable seed quality

4 of 12 accessions viable 50% germination rate







BOTANIC GARDENS









Progress

19 seedlings with Acacia hosts produced at Australian National Botanic Gardens

Leaf material collected to assess genotypic diversity



Next steps Translocation onto Park

Supplementary watering and habitat protection

Augment local genotype pool



Case studies







EPBC CRITICALLY ENDANGERED

- 3 sub-populations
- < 200 individuals, < 40 mature
- Fluctuating population structure

Threats

Recurrent cyclones, habitat erosion

Life history unknown Reproductive biology unknown

Pneumatopteris truncata Ramsar site The Dales Christmas Island National Park

- Remote location Christmas Island National Park, Indian Ocean
- Rarity Few mature plants
- Population size and structure Fluctuating
- Reproductive biology Drivers? Seasonality?
- Spore biology Longevity, germination unknown
- Propagation and cultivation unknown
- Life history stages unknown
- Habitat niche Limestone specialist?
- **Changing threats Insectivores**

Key partners

Alasdair Grigg, Christmas Island Minesite to Forest Rehabilitation program, Parks Australia

Director of National Parks, Department

Living Collections, National Seed Bank Australian National Botanic Gardens

Australian Tropical Herbarium

Objectives

Develop ex situ conservation techniques for threatened ferns

Germination

Cultivation

- Cryopreservation?
- Drivers of rarity in island ferns

Progress

underway

Import approval attained Field collections, population surveys at all 3 localities Spore and leaf material collected Nursery propagation trials Spore biology research

Outcomes

- Conservation techniques for tropical threatened plants
- Knowledge of fern habitat and regeneration requirements
- Relationship between population trends and threatening processes
- Data and germplasm secured as spore, plants and DNA
- Training and research capacity

Summary: a herb, hemiparasite, fern...

Many diverse puzzles to solve Biological Operational **Resources for restoration** Research Propagation Supply Partnerships

Thank you caroline.chong@environment.gov.au

1000 µm

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NSB Seed Imaging and trait data projects

- **Bush Blitz** supported seed imaging • project
- Contributed > 1000 seed images to • Australian Plant Image Index, ALA
- CSIRO summer scholar 2018-19 •
- Al to harvest seed trait data •
- Open access digital collection of • seed images data http://www.anbg.gov.au/cgi-bin/photo

Epilobium sp. Image: John Fitzgerald

PF021 Carex hypandra

