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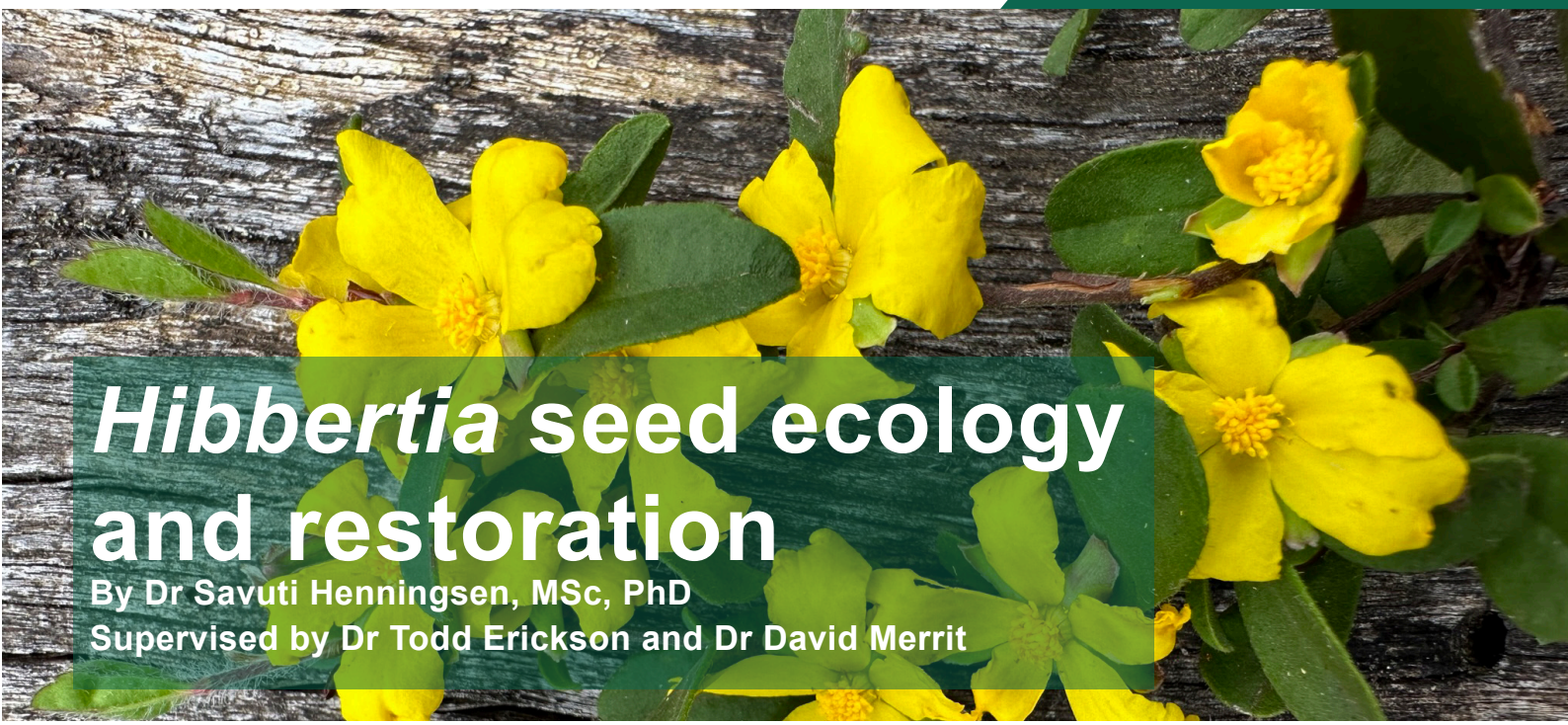
Project Fact Sheet



Hibbertia seed ecology and restoration

By Dr Savuti Henningsen, MSc, PhD
Supervised by Dr Todd Erickson and Dr David Merrit

Introduction

Hibbertia, or 'yellow buttercups', are small shrubs and groundcovers with distinctive bright yellow flowers. These species form a key part of the jarrah forest understory, contributing structural diversity and supporting ecological processes.

The jarrah forest is a Mediterranean ecosystem, characterised by hot, dry summers and cool, wet winters with frequent fire - conditions that have shaped the ecology of *Hibbertia*.

Hibbertia seeds are known to be dormant, an evolutionary adaptation that prevents seeds from germinating during unsuitable ecological conditions that typically lead to low probability of survival. Species can be split into two groups:

- Resprouters - able to resprout following a fire
- Seeders - rely on their soil seed bank for recruitment, often unable to survive a fire

Why *Hibbertia* matter

Hibbertia species contribute significantly to understory diversity in the jarrah forest with over 80 recognised species. Many species exhibit complex seed dormancy, influencing their ability to establish in rehabilitated areas.

Understanding species-specific dormancy and germination traits helps inform expectations and guides research and trials.

Insights for rehabilitation

- No single method works for all *Hibbertia* - species-specific protocols are essential
- Smoke-based seed treatment is the most reliable enhancement tool
- Successful establishment is strongly influenced by timing, burial, and seasonal conditions
- Resprouter species show limited germination response and are generally unsuitable for broadcast seeding - vegetative propagation (e.g. cuttings) may be a better propagation method for this group
- The soil seed bank contains viable *Hibbertia* seed, but natural recruitment is typically low and supplementary hand seeding is likely to be required for restoration

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Key findings

This PhD thesis investigated 10 jarrah forest *Hibbertia* species and aimed to:

- Assess the variability in dormancy depth
- Test possible laboratory-based dormancy break treatments
- Characterise in-situ embryo growth, germination, and emergence timing

DORMANCY TYPE

- All 10 studied species possess morphophysiological dormancy comprised of an underdeveloped, tiny embryo and a physiological block to germination
- Dormancy depth varies by post-fire strategy:
  - » Obligate seeders - species that rely predominantly on their soil seed bank for recruitment after fire, have shallower dormancy, and are easier to germinate
  - » Resprouters species - species that can resprout after fire, have deeper dormancy, and low germination rates

GERMINATION CUES

- Karrikinolide (KAR_1)/smoke chemicals significantly boosts germination in all species
- Cool winter temperatures (5-15°C) optimal for most species
- Some species show light inhibition - six weeks of darkness improved germination
- Germination occurs in slow flushes over time

IN-SITU FIELD STUDY vs LABORATORY TRIALS

- Onsite soil burial outperforms all lab treatments
- Embryo growth starts 4–5 weeks after autumn rain with peak emergence ~15 weeks post-wetting
- Summer dry after ripening helps deeper-dormancy species

Operational recommendations

Seed handling	Pre-sowing treatment
Collect Nov–Dec at natural dispersal	Apply smoke (KAR_1) to all species
Store at 15°C and 15% relative humidity for medium term storage	Sow early to mid-autumn
X-ray to select filled seeds or assess seed batch quality	Bury seeds; avoid surface sowing
	Avoid: heat shock (80–100°C) and GA_3-only treatments

SPECIES-SPECIFIC NOTES FOR SEED MIXES

Following are some suggestions for pre-treatments and/or incubation conditions for nursery propagation of these species.

Dormancy depth describes how strongly a seed resists germinating until the right conditions occur. Seeds with deep dormancy need substantial environmental cues to germinate, while seeds with shallow dormancy require only mild signals.

Despite multiple trials, three species exhibited low germination in all conditions so propagation via cuttings is recommended.

Species	Recruitment type	Dormancy depth	Best practice for restoration
H. ambita	Seeder	Shallow	Strong smoke response; sow early autumn
H. amplexicaulis	Resprouter	Deep	Low germination; consider cuttings
H. commutata	Resprouter	Very deep	Very low germination; cutting propagation recommended
H. hypericoides	Resprouter	Deep	Very low germination; cutting propagation recommended
H. improna	Seeder	Shallow	High germination with smoke at 5/15°C
H. ovata	Seeder	Moderate	High germination with smoke at 5/15°C
H. perfoliata	Seeder	Moderate	Dark pre incubation helpful; warm germinator
H. racemosa	Seeder	Moderate	Prefers warmer temperatures (10/20–15/25°C)
H. semipilosa	Seeder	Moderate	High germination with smoke at 5/15°C
H. subvaginata	Seeder	Moderate	High germination with smoke at 5/15°C.

To find out more and explore research opportunities, please contact Research Manager Dr Lucy Commander
Email: researchcentre@alcoa.com Web: www.alcoa.com/australia/en/sustainability/forest-research-centre