

Presentation for AABR symposium
Re-building ecosystems: What are the principles?



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Presentation overview

- **Reconstructing grassy woodland plant communities**
 - *What (description of what we're doing)*
 - *Why (what motivates us?)*
 - *How (approaches, options, technologies)*
 - *Results (what's happened)*
 - *Insights (some lessons to date)*
 - *Directions (where we're headed & future challenges)*

We want to reconstruct grassy woodlands on highly degraded sites



WHAT?

- Coal & Allied are reconstructing (as best they can) *Central Hunter Woodlands*
- No resilience; *totally from seed*
- Cpseeds are assisting with some key aspects:
 - Understory *seed supply* through rural *land management*
 - Understory seed supply through *seed orchards*
 - *Seed processing*
 - Rehab *advice* & some *rehabilitation*

WHY?

- *Genuine passion*: both practitioner & customer
- *Regulation*: Coal & Allied have committed to the process
- *Botany*: to conserve local plants & plant assemblages
- *Function*: to restore resilience & restore landscape functions

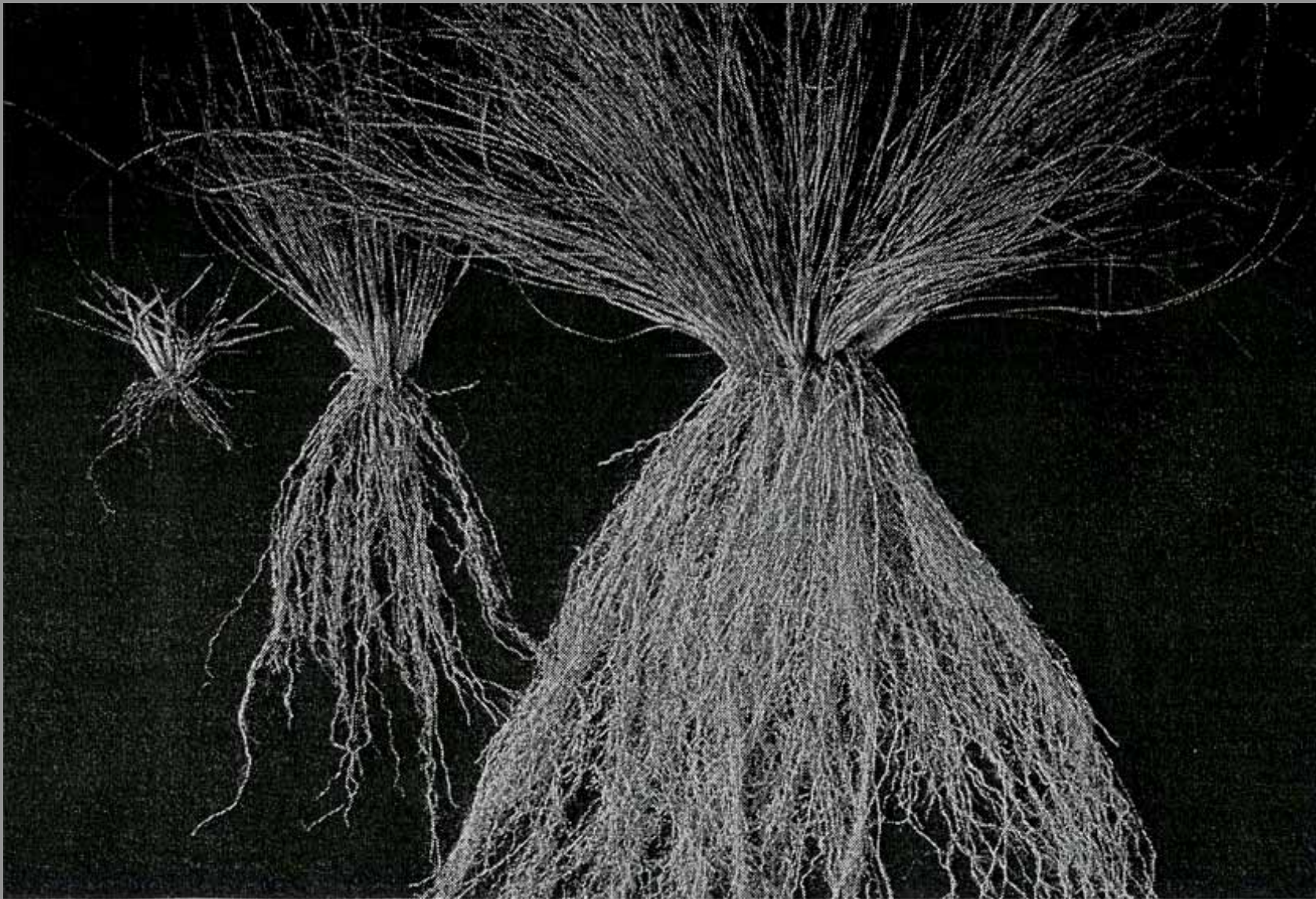
Perennial Grasses:

Ecological Function

- Deep-rooted persistent cover, providing:
- Persistence in drought &/or quick recovery
- Soil stability & regulating overland flow
- Providing soil carbon above & underground
- Habitat & food for soil microbes
- Regulation of water infiltration & loss (salinity & acidity)
- Habitat & food for native fauna

Function: Soil hydrology & Carbon accumulation

Source: Dr Christine Jones



Function, dysfunction & perennial grasses

- Functional systems retain vital resources (eg, soil, water, seed) within the local landscape
- And “leak” those resources very slowly beyond the landscape boundaries
- A high degree of resource retention and cycling confers self-sustainability and resilience in the face of episodic stress and/or disturbance (eg, drought & grazing) (risk higher when combined)
- Perennial grass cover often crucial to the outcome

Function: *why use native grasses*

- Tough summer conditions on difficult sites sorts out what persists & what doesn't; slow growing perennial grasses tend to persist.
- Non-native alternatives are limited in number (Rhodes grass for example) & are generally problem weeds.
- Species selection Criteria (& native grasses):
 - *Performance / Ecological Function* (YES)
 - *Availability* (Getting better)
 - *Cost* (Getting better)
 - *Establishment agronomy* (Can be done well)

Botany: *Hunter Iron bark, grey box, spotted gum woodland*



Rehab: how it Was done: exotic pasture or thick trees



Coal & Allied native seeding rates

Note the inclusion of understory species

	Woodland Mix		Pasture/Light Wooded Mix	
Category	No. of Species	Rate/ha	No. of Species	Rate/ha
Overstorey				
Eucalyptus	7	0.6kg/ha	4	0.2kg/ha
Acacia	8	1.2kg/ha	3	0.7kg/ha
Other Tree/Shrub	14	1.8kg/ha	7	0.6kg/ha
Total Overstorey	29	3.6kg/ha	14	1.5kg/ha
Understorey				
Grasses	20	12.1kg/ha	25	17.1kg/ha
Sub-shrubs, forbs, monocots other than grasses	23	2.0kg/ha	4	0.5kg/ha
Total Understorey	43	14.1kg/ha	29	17.6kg/ha

Coal & Allied hunter mines



COAL
&
ALLIED
Managed by Rio Tinto Coal Australia

Sourcing understory seed from derived grasslands on rural lands



2,000 acres of rural land actively managed for seed supply



Sourcing understory seed from derived grasslands on rural lands

–Land management for native seed purity, species diversity & composition, and seed yield:

- Strategic grazing
- Slashing
- Aerating
- Over-sowing
- Weed control
- Selective herbicides
- Fire



Seed from seed orchards



Seed from seed orchards



Seed from seed orchards



Seed harvesters



Drying igloos, sheds & grain dryer



Seed processing: when to & when not to



Seed processing- Raw seed



Seed processing- Equipment



Seed processing- thresher



Seed processing- pre & post thresher



Seed processing- screens & shaker



Seed processing- for flow & placement



Rehab approaches / options

- Clean-up topsoil (weeds) *vs* Ameliorate subsoil
- Drill processed seed *vs* Hydroseed & harrow/aerate raw seed
- Sequence of natives *vs* All in at once



Rehab approaches: Topsoil prep



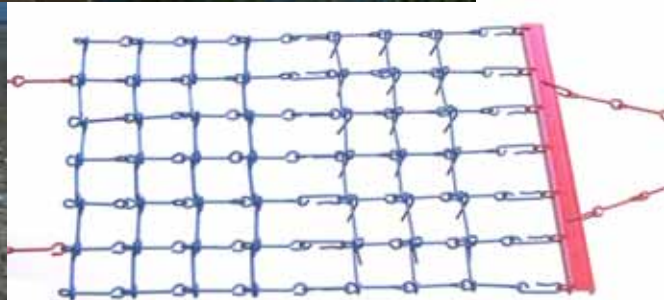
Rehab approaches: Spoil use & amelioration (no topsoil)



Prep & sowing equipment: Drilling



Rehab Equip: raw seed hydroseeder



Rehab Equip- others variants eg GA



Sequence of native sowing (grassy cover crop) vs All in at once



Rehab results- hunter



Rehab results- hunter



Rehab results- hunter



Rehab results- hunter



Cpseeds rehab results- Sydney



Cpseeds rehab results- Sydney



Cpseeds rehab results- Sydney



Planting vs Direct-seeding



Cpseeds Sydney Seed Orchards



Insights: Success Imperatives

- Species selection
- Sowing rates
- Quality seed
- Ground preparation
- Seed placement
- Agronomy (timing, temp, depth, water..)
- Post-sowing weed control
- Commitment to ongoing restoration maintenance & learning



Insights: seed delivery / seed placement



Insights: Soil Preparation

Problem:

- Sometimes hostile soils (dispersive, low biology, weedy) & difficult slopes

Solutions:

- Better planning & care
- Pre-sowing weed control
- Light cover crop can assist
- Soil testing & amelioration (chemical & biological health)
- Surface roughness; water & seed capture



Perennial native grasses: their health needs

- Patchy, intermittent disturbance
- Pulsing growth for regeneration
(above & below ground) so as not to senesce
& to build soil carbon
- Relief from low (& frequent) slashing heights
- Rest/growth at critical life history events (seed set,
recruitment & establishment period)
- Soil health & soil microbial relations
- Species specific agronomy
(variable nutrition, pH, light, grazing tolerance, etc)

A few industry issues (*i*) & solutions (*s*)

- (*i*) **Specifications**; often prescriptive due to accountability, but lacking flexibility as result
- (*s*) Aim is restoration & **resilience building not contract clause management**. Engage qualified / accredited practitioners, audit & verify procedures & seed quality, & collaboration / partnerships between land managers & practitioners
- (*s*) Have high expectations & demand quality procedures, but recognise the **inherent uncertainties** in delivering outcomes
- (*i* & *s*) Provenance vs **habitat matching**
- (*i*) Lack of certainty & consistency to build reliable & cheap **seed supply capability**
- (*s*) **Embrace direct-seeding** as a method of restoration & resilience building. Be ambitious but also patient.
- (*s*) Commit to **experimentation**, research & knowledge sharing

Future Directions: Cpseeds & Coal & Allied

For Coal & Allied:

- Monitoring & adaptive management:
 - Spoil (productivity issues) vs Topsoil (weed issues)
 - Species successes & failures
 - Refining seed delivery & placement techniques
 - Weed control (Galinea & Rhodes grass)
 - Soil health; monitoring, fast-tracking, targeting to plant species
 - Productivity, scale, efficiency & safety
 - Meeting completion criteria

For Cpseeds:

- Paddock manipulations of species composition; more diversity
- Seed production agronomy of a wider range of species; including herbs
- Seed separation, processing & value-adding
- Increasing seed volumes & efficiencies as well as seed quality
- Rehab seed mixes for SE Australia

Thank You

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