Native grasses:

Pasture restoration & establishment

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Presentation overview

- *Conserving bushland*
- *Grasses for grazing*
- *Grassland dysfunction (healthy v unhealthy systems)*
- *Pasture restoration strategies*
- *Local species*
- *Seed production & supply*

Grasses & Grasslands

- Threatened or almost extinct communities (American Prairie, Russian Steppe, etc)
- Basis of agriculture (pastoral industry & grains including corn & wheat, sugar, etc)
- Distribution often overlaps with agriculture and degrading disturbance regimes continues

Grasses & Grasslands

- Over 700 native grasses in NSW
- Over 70 native grasses in Western Sydney
- Much of the plant diversity in many grasslands are in the forbs & herbs

Diversity & Function

- Floristic diversity high in understory of Western Sydney
- Grassy layer can:
- Provide soil carbon above & underground
- Conserve & protect the soil
- Habitat for soil biota & above ground biota
- Persist in drought &/or recover quickly
- Regulate water in the landscape (salinity & acidity)

Animal / Plant relationships

- Animal likes plant & plant doesn't like animal (plant doesn't respond to grazing; some species may be conservatively grazed with rest periods)

  (*many natives in this group*)
- Animal likes plant & plant likes animal (productive grazing species) (*smaller group of natives; maybe 20 species*)
- Animal doesn't like plant & plant doesn't like animal (*many natives in this group*)
- Animal doesn't like plant & plant does like being grazed (animal will eat if it has to) (*some natives in this group*)

Animal / Plant relationships

- Generally in temperate Australia tall grasses don’t respond well to grazing & low-growing species do..
- Some tall species are in the group that animals like, but the plant doesn’t..
- Some low-growing species are in the group that do like to be grazed but the animal is not so keen..

Example: Animal likes plant but plant needs rest periods- *Themeda*

Example: Animal likes plant & plant does well under heavy grazing- *Microlaena*

Microlaena:
Some Adaptions to Grazing

- Cross & self pollinate & apomictic (genetic variety in good times, efficient reproduction in lean times)
- Hidden (clandestine) seed low within tillers (grazing)
- Large morphologic diversity (ecotypes)
- Rhizomes & stolons
- High tolerance for shade & soil acidity

Grazed Grasslands & Dysfunction

- Original native grasslands had ***high productivity***
- Trampling & over-grazing caused; compaction, soil loss, organic-matter loss, etc & ultimately ***lower productivity***
- Lower productivity (thought to) necessitate **higher inputs** (fertiliser, seeding exotics, etc)
- Higher stocking rate required to recoup investment (above)
- Productivity **temporarily restored**; ultimately soil decline, increase in annuals, loss of native perennials, etc

Vital resources in a grazing system

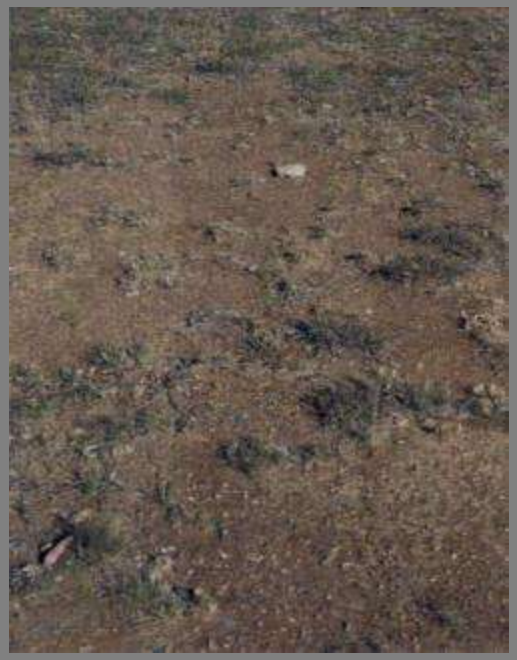
- Water
- Soil
- Soil microbes
- Organic matter
- Seed and plant propagules
- Grasses & plants

Function & dysfunction

- 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)
- Landscape dysfunction increases as vital resources are less well retained and leak away more rapidly

Function & dysfunction

Over-grazing is a key cause of pasture decline & loss of some native grass species….



Key threats to native grass persistence

- High fertility
- High disturbance
- Over grazing
- Aggressive competitors

So, we have pasture decline & need to remediate …..

- Do we build on the asset we have, & *restore*?
- Or do we start again & *reconstruct*?

Restoration **is ……**
Reconstruction **is ……**

- ***Restoration*** taps existing *resilience* to build on the seed (in soil) resources & plant (on paddock) resources present
- ***Reconstruction*** assumes the existing assets are not workable and cultivation & re-sowing are required

Restore?- ***Some criteria***

- Type of assets present
- Standard of assets present
- Level of resilience present
- Time available / speed
- Value of local eco-types
- Risk of failure
- Cost to reconstruct
- Seed available to reconstruct

Restore- *some tools*

- The ***grazing*** animal (paddock rest; grazing frequency, intensity & duration..)
- Partial ***cultivation*** & supplementary ***sowing***
- ***Fire***

Restore- Paddock *Rest* Triggers

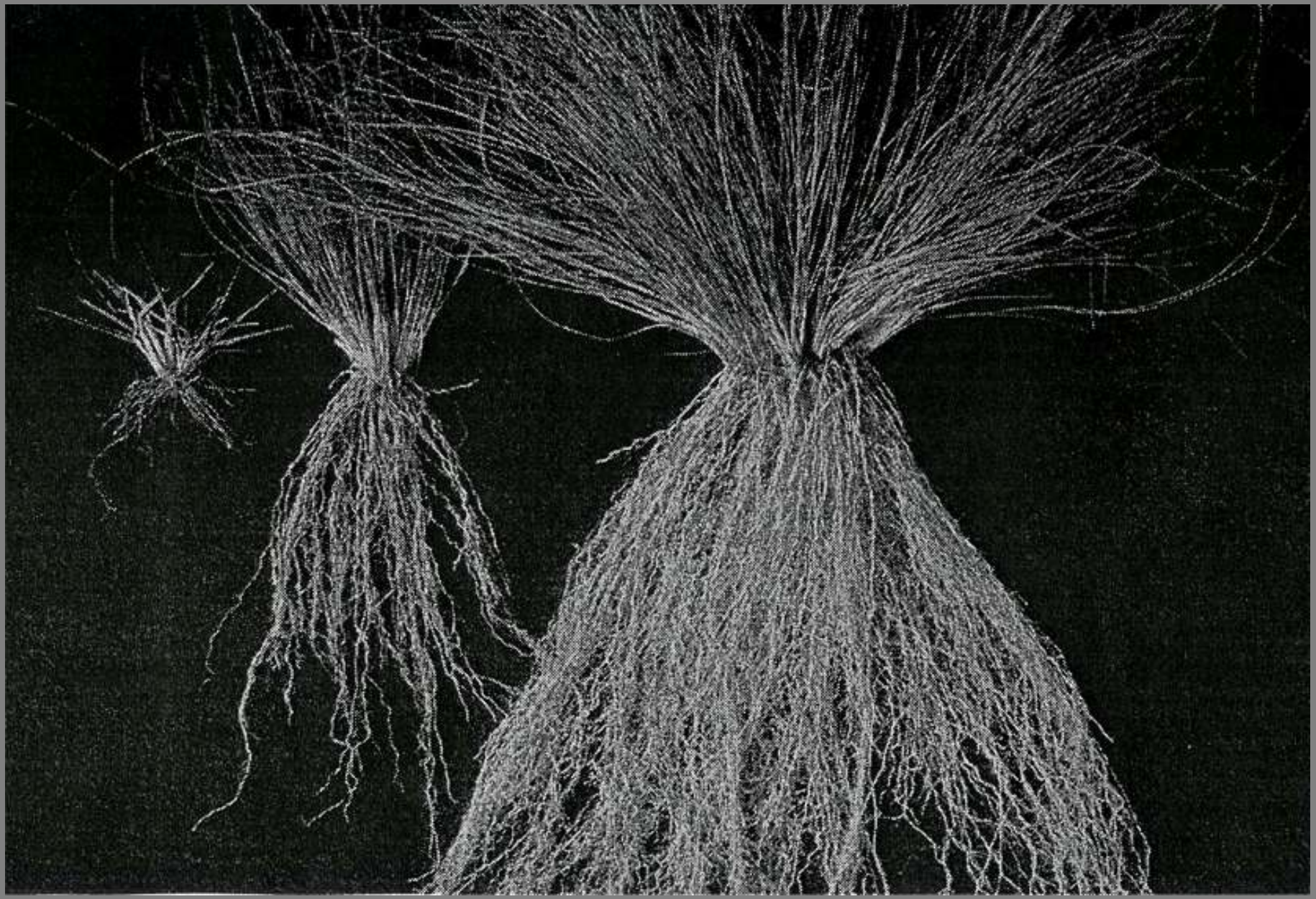
- Healthy pastures need ***Rest***..
- Rest, can be governed by:
  - Livestock Condition
  - Vegetation Biomass
  - Plant Life History
  - Decisions based on the plants (life history & condition), rather than animals, are sustainable..

Restore- *Plant Life History*

- ***Rest*** from grazing & manipulation of; ***timing***, ***duration*** and ***intensity***, based on:
- ***Plant life-history***
  - Flowering
  - Seed-set
  - Recruitment
  - Root reserves
  - Season of growth

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
- Rest at critical life history events (seed set, recruitment & establishment period)
- Mycorrhiza & soil microbial relations
- Species specific agronomy (variable nutrition, pH, etc)



- Photo: Dr Christine Jones

Reconstruct- *Imperatives*

- Considered species selection
- Quality seed
- Ground preparation
- Agronomy (timing, temp, depth, water..)
- Post-sowing weed control
- Back to the restore / pasture management principles

Reconstruct- ***Imperatives***

Species selection

- Matching habitat (environment) with species characteristics (soil preferences, etc)
- Matching management regime (eg, intensity of grazing) with species characteristics
- Compatible blends of species, such as quick & slow growers, summer & winter growers
- Seeding of monoculture mosaics may be more suitable than blended mixes in some circumstances (for some species)

Reconstruct- ***Imperatives***

Species agronomy- eg, *Microlaena*

- If reconstructing a pasture, individual species agronomy is important..
- Time of sowing: Late winter or mid autumn
- Depth of sowing: 5-10mm
- Sowing rate: 20-50kg/ha (floret)
- Weed control: Broadleaf 8 weeks after germination, pre-emergent in spring
- Grazing: well established beforehand, then tolerates medium/high grazing, rest to set seed & during low growth periods

Reconstruct- ***Imperatives***

Species agronomy- eg, *Themeda*

- If reconstructing a pasture, individual species agronomy is important..
- Time of sowing: Late spring to early autumn
- Depth of sowing: 5-10mm
- Sowing rate: 50-80kg/ha (floret), 5-8kg/ha (clean seed)
- Weed control: Broadleaf 8 weeks after germination, pre-emergent in late autumn
- Grazing: well established beforehand, then tolerates low-medium grazing, rest to set seed & during low growth periods

Reconstruct- *Slow growth*

- **Control quick growing weeds**
- **Perennials will "punch through" & prevail under correct management**

Reconstruct- ***Imperatives***

Ground preparation

- If reconstructing a pasture, ground prep is important
- Slow growing natives need weed control strategies, including reducing weed seed-bank
- Spray & cultivate, or spray & drill

Ground preparation trial with Mulch