

# **A Small Property Case Study 1997- Ongoing**

**Replacing exotic grasses and weeds with  
native perennial grasses, using our  
'mosaic of managed seed crops model'**

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Grasses Steering Committee 1994-1997 and the Native  
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Life Member N.G.R.G.***

Section 6 in Native Grass Strategy for South  
Australia 2. Management of Native Grasses and  
Grassy Ecosystems for Sustainable Production  
and Biodiversity Conservation(2009), Reseigh J,  
Foster P and Myers R.J. Rural Solutions SA, is  
an edited version by G.Bishop, of my original  
case study..expanded for this March 2012 Forum.



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Photographs © R. Myers

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# By Way of Introduction

**“Once upon a time, there was a great southern landmass.....”**

One of the many influential people in my environmental life, palaeobotanist Mary White, can lead my “Once upon a time...” story. It was Mary whom I invited to speak at the Native Grass Resources Group’s first public AGM in 1998 to set the Grass scene for us. In *The Greening of Gondwana* (Reed Publications 1986, mine was 2<sup>nd</sup> Edition 1994) she explains:

*“The landmasses of the world were once aggregated into a single supercontinent called Pangea. Eventually Pangea separated into two parts, Laurasia to the north and Gondwana in the south. Gondwana (an Indian word meaning “land of the Gonds) comprised South America, Africa, Madagascar, Antarctica, Australia and New Zealand and some now northern lands including India, Turkey and Arabia. Gondwana started to break up into smaller continents about 180 million years ago. Fifty million years ago, Australia broke away from Antarctica, severing its last links with the other great lands of Gondwana”.*

And Mary continues...

“Grass pollen remains rare in Eastern Australia until the Pliocene (5.3 million years ago) and only abundant in the Pleistocene (1.6 million years ago). However, in Central Australia, it reflects the development of the sclerophyll-xerophyte flora of the Arid Region and is increasingly dominant from the Mid Miocene (14 million years ago)”.

**Then last summer 2010-2011** that ‘breakaway period’ and the subsequent evolution of Australia's animals and plants - especially the grasses - came into focus for us, albeit in **minuscule** form, on our property at Birdwood.

A Small Property Case Study 1997-Ongoing (R Myers 2012 Native Grass Resources Group)

# By Way of Introduction

## Cont

But there was nothing minuscule about our reaction after I left some of the tiny insects we had found with Mike Gemmell at the Museum. Within hours and a phone call from Mike, exhilaration and wonder was the emotion.

He identified them as *Hispellinus australicus*, the Spiny leaf beetle. This genus is widespread in the paleotropics *with four species being Australian only*. *H.australicus* occurs throughout S.A., feeding only on grasses\*.

So, some time from the appearance of the grasses in the Eocene from 50 million years to the dominance of grasslands from 1.6 million years, this bristling, metallic black Chrysomelid began its life and evolution in lock-step with them; perhaps an intimate relationship with that widely distributed summer active perennial grass, *Themeda triandra* (Kangaroo Grass). That is where I found it, in a tarpaulin of *Themeda* hay about to be threshed. That grass came from the first of our seed crops, from a few plants established in 1994, which were survivors from the fields of *Themeda* reported in the Upper Torrens Catchment of 1839.



Actual size 5mm

\*E.G.Matthews & C.A.M.Reid (2002) Beetles of South Australia Part 8, SA Museum



# By Way of Introduction

## Cont

We should not forget that with the dominance of grasslands in vast areas across the world from 1.6 million years, came human evolution and, with the interglacial Holocene epoch from 10,000 years, came agriculture.

For thousands of years South Australia has been a grassland state, not a tree state. Our dominant taxa of grasses, sedges, chenopods and other ground layer species used to protect soil health, hydrology and insect/animal diversity.

This forum topic and action from it, on a broad scale, is way overdue.

**Here is the Myers' contribution.**

# lichen rocks - PROPERTY PROFILE

**LAND MANAGERS:** Bob & Wanda Myers  
**LOCATION:** Birdwood S.A.  
Upper River Torrens Catchment

**SIZE:** 16ha

**LANDSCAPE:** Geology: Sandstone & quartz  
(both visible)  
Soils: Sandy loams over clay  
pH 5.3 to 5.6  
Annual average rainfall: 730 mm  
Land class: 5

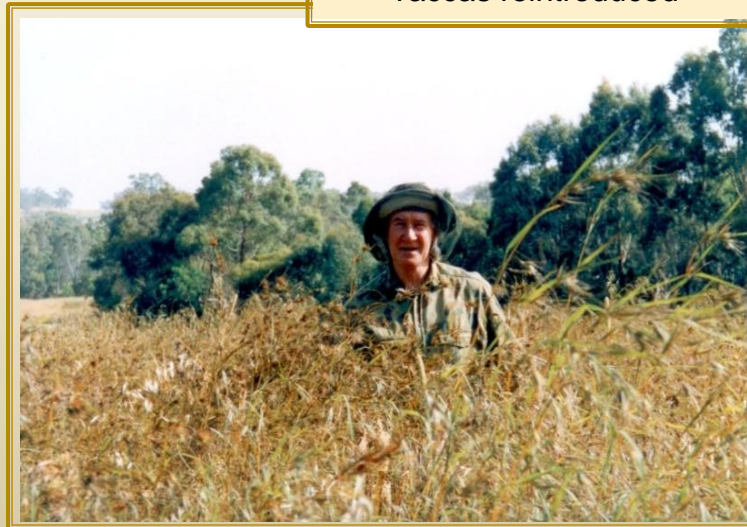
**ENTERPRISE:**

Rebuilding habitats and production  
of native grass seed.

**Business name:** Aussie Roots



Yaccas reintroduced



Up to my armpits in *Themeda*

# lichen rocks - PROPERTY PROFILE

The land roamed by the Paramangk people for over 2500 years was first 'settled' by Wilhelm Russack in 1856. In 1929, our 40 acres of the 500 acre property was called "poverty farm" by the second owners, the Rathjen family.

The Myers' purchased part of its sub-divided land in 1973. The property was agisted until 1986 when Bob & Wanda developed the foundation for their habitat rehabilitation project.

A farming history of haymaking on the low nutrient, sandy, river flats and grazing on the rocky hill country **and on** the River Torrens over summer had depleted the land of most native shrub and herb species. Some large Eucalypts had survived post-settlement timber felling.

The property's riparian revegetation project made it one of the demonstration site jewels in the crown of the Upper River Torrens Landcare Group, which Bob helped form and chair from 1989. The river zone has not been grazed since 1986 and was fenced in 1991.



Workshop. Understanding Watercourses



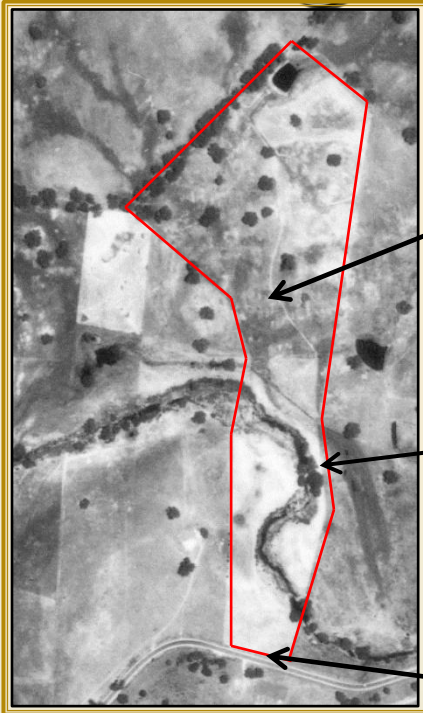


# Aerial View

B/W 1974



1975 photos



View from rocky hilltop  
down to the river



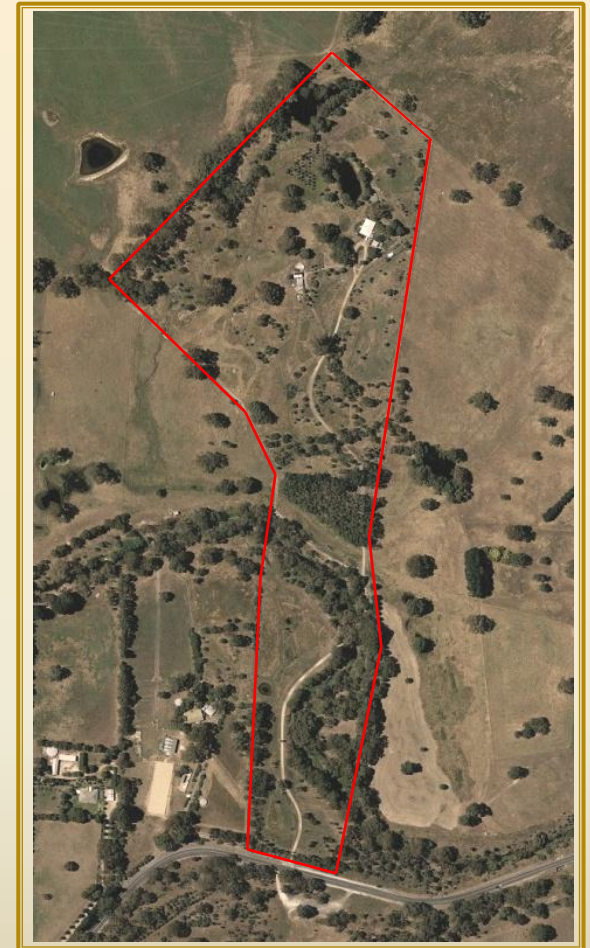
A section of river banks  
covered in gorse



View from the road,  
across the oats crop to  
the river lined with  
poplars

Heavily grazed pasture and crop area  
12 old large River Redgums  
12 other River Redgums  
2 old Manna Gums  
2 old Blackwoods, hidden in gorse  
Some common reed and bulrush, grazed  
No other visible native vegetation  
1000m x 5-15m of river bank gorse  
43 Poplars, apparently a 'heritage'  
planting!!

2011



You really need low level, oblique  
angle photography to highlight grasses





# WHAT DROVE OUR NEED FOR SEED

Due to its Land Class, our property should have been fenced as the 'bush block' for what NSW Government Botanist Fred Turner\* called "seed reserves", in a paper presented at Melbourne University, January 1890.

We wanted a return to

- a semblance of the grassy woodland community that covered this region at settlement; with pest weeds eradicated and native species' recruitment happening naturally and by enhancement;
- an area where all components of the ecological environment can function with minimal disturbance;
- a trial site with a developed template for other landholders to enact.

We wanted a process to replace the dominating, high fuel load exotic grasses and weedy broad-leaved annuals with native perennial, hot and cool season grasses.

So, we first identified small areas of remnant native grasses from 1986 onwards. From 1990, we pegged, protected and weeded these. The first trial of a 'cropping plot' began in 1996.

\* Fred Turner's Wisdom. My editorial Native Grass South Australia Vol 2 No 2 Winter 2004

# FRED TURNER



Fred Turner\*



*Read his 1<sup>st</sup> paper on native forage plants and grasses at Melbourne University before the Australian Assoc for the Advancement of Science,*

## *Reaction to Overstocking and Trampling of the Soil Surface...*

*"Pastoralists must systematically conserve areas where native grasses and other forage plants may be still growing and redisseminate the seeds where the plants have entirely disappeared..."*

*"...Such reserves need not occupy large areas. It is astonishing the quantity of seed that can be harvested from just a few acres..."*

*"...Aust Governments should make this compulsory..."*

*"...I would certainly recommend the best of these grasses, more particularly on the hills and hillsides, where the more tender exotics suffer during the hottest and driest part of the year. New ones might be grown in an experimental way and, when found suitable for any particular locality, larger areas might be devoted to their cultivation..."*

\*Photo from Trove ((Internet)  
Australian Town & Country Journal  
NSW 17 June 1893

January 1890

# OUR SEED STORE

## we had a head start

After the exclusion of stock from the River Torrens and other watercourse and drainage areas, plus fencing to prevent sheep from accessing areas for staged revegetation, we started (with help at first) to identify scattered individual native grass tussocks and a number of areas of rhizomatous species like *Microlaena*, *Distichlis*, *Hemarthria* and *Phragmites* in the river.

### Our Seed Bank Inheritance

#### Cool Season Perennials

*Lachnagrostis filiformis* (also grows as an annual)

*Amphibromus archeri*

*Austrodanthonia*<sup>†</sup> *caespitosa* (several forms),

*A.geniculata*, *A.pilosa* and *A.racemosa*

*Austrostipa nodosa* and *A.scabra*

*Microlaena stipoides* (several forms)

*Phragmites australis*

*Poa labillardieri*

<sup>†</sup>Genus name change to *Rytidosperma* in 2010

#### Warm Season Perennials

*Aristida behriana*

*Chloris truncata*

*Distichlis distichophylla*

*Hemarthria uncinata*

*Themeda triandra*

The smile  
that home  
grown seed  
can put on  
your face  
eh, Wanda





# OUR SEED STORE (Cont)

From these, we initially chose to multiply:

*Austrodanthoria geniculata*

*Microlaena stipoides*

*Themeda triandra*

*Chloris truncata*

Since 2006, we've added 11 **C<sub>4</sub>**'s and 10 **C<sub>3</sub>**'s.

We now have a property mosaic of 19,000m<sup>2</sup> of managed plots, from as small as 1m<sup>2</sup> to 600m<sup>2</sup>.  
2800m<sup>2</sup> are currently under fallow.



# THE SEARCH FOR SEED

Naturally, you need to identify the species recorded for the native vegetation communities in your area. Usually in S.A. there's not much left. That's why seed cropping is 100 years overdue!!

NB. In 1999, just before his retirement, Darrell Kraehenbuehl (DENR) convened a meeting to call for a seed orchards/crop approach to revegetation to take the pressure off wild stock and generate large volumes of seed from a diversity of species. I attended on behalf of the N.G.R.G. having already written to our members about the need for seed and seed orchards in 1998 (NGRG Journal Vol 1 No 2).

**So, if you don't have access to enough seed on your land or nearby, then.....**

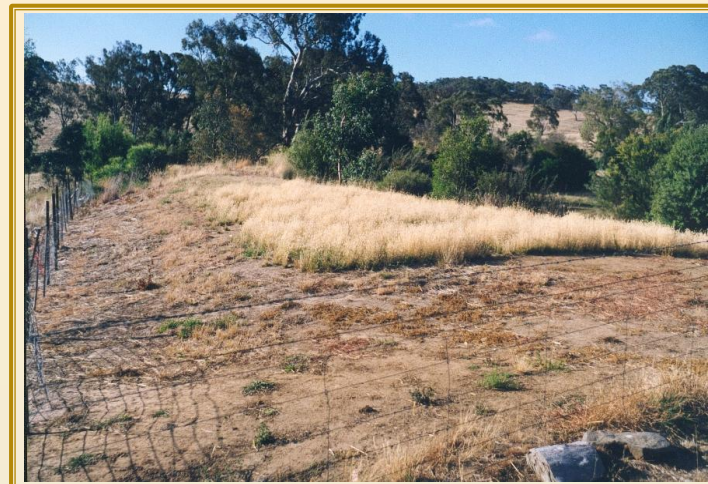
- Find other sites, permit where necessary. You won't need much seed really. A handful of florets will be plenty for a 1m<sup>2</sup> start up of every chosen grass.
- Contact regional native seed suppliers.
- Check the NGRG website – [www.nativegrassgroup.asn.au](http://www.nativegrassgroup.asn.au) for its grower/collector list.
- Find an interstate\* supplier from S.E. Temperate Australia.

*\*Remember: Cross fertilisation via wind pollination is not the main method of fertilisation in Australia's native grasses. The majority are self fertilizing or apomictic (production of viable seeds without fertilization) Most keep their evolutionary options open in response to climate and other environmental changes, many being both cleistogamous (selfing) or chasmogamos (can cross-fertilize). That's no doubt a reason why grasses are the most widely distributed family of flowering plants on Earth. In fact migration and adaptation are two strengths of the Gramineae. As well, they're opportunistic, resilient and persistent... In spite of us and our often misguided beliefs.*

# LET'S START WITH WHAT TO EXPECT

**Here are a few personal discoveries.**

This is the 5m x 20m starter patch of Wallaby Grass (*Austrodanthonia geniculata*) sown 2002. The harvest has been regularly between 8 – 10kg.



Part of a patch of Windmill grass (*Chloris truncata*) 10m x 25m, sown 2004, produced 8kg at the first harvest and some summer rain led to, and can usually lead to, the production of another crop.



Chloris plants die back after 5 years but keep re-establishing naturally from seed.



# WHAT TO EXPECT cont

**A 600m<sup>2</sup> patch of *Austrodanthonia geniculata* sown 2006, has produced up to 55kgs of florets annually.**

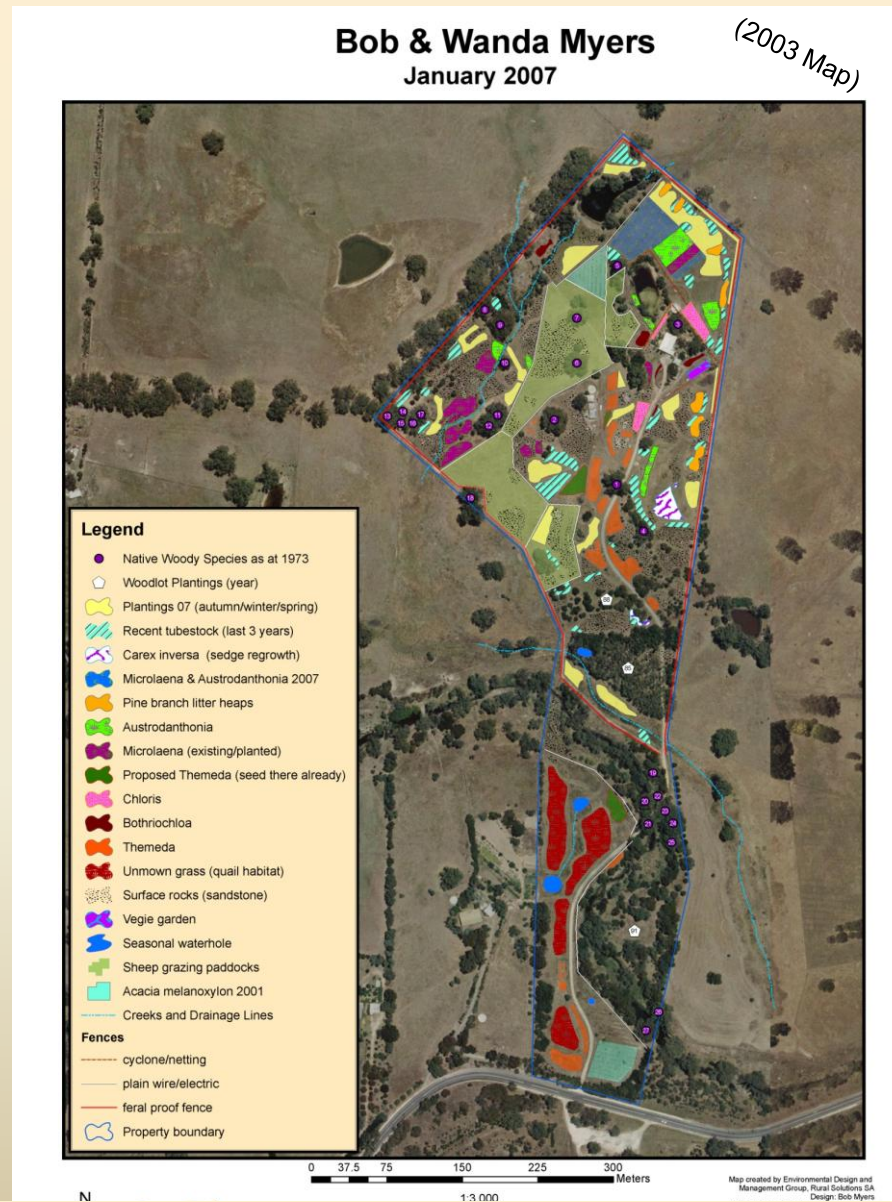
This grass is also grown by Native Seeds P/L and sold under the name 'Oxley'



600m<sup>2</sup> plot in background; new crop in foreground

Now, after 14 years, the property is a patchwork, a mosaic of managed seed crops. Whether by wind, machinery, ants or whatever, the plots are enlarging and merging naturally and by my intervention.

# The Mosaic Plans .... January 2007 version.



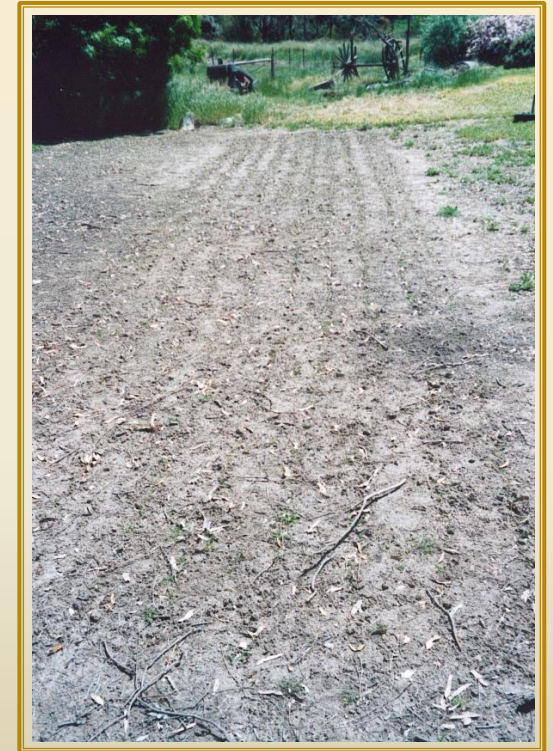


# HOW TO DO IT CHEMICAL FALLOWING

Native grasses don't like competition when establishing, so I try to keep plots-to-be-sown free of weeds (especially grassy weeds) for the bare minimum of a year prior to sowing. Two years is better. Three is best, especially if you have weeds like Couch, Silver Grass, Brome, Wireweed.



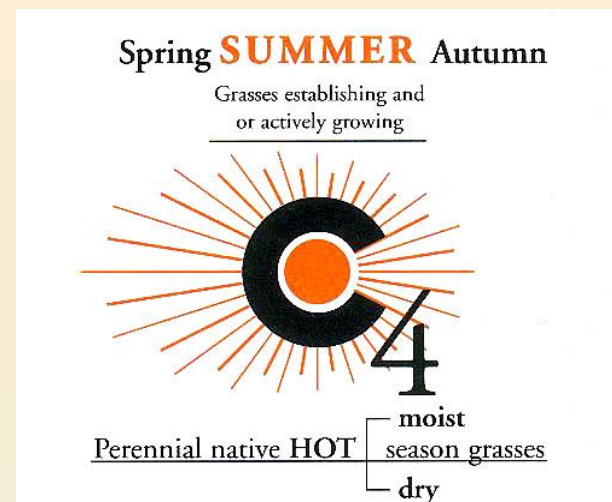
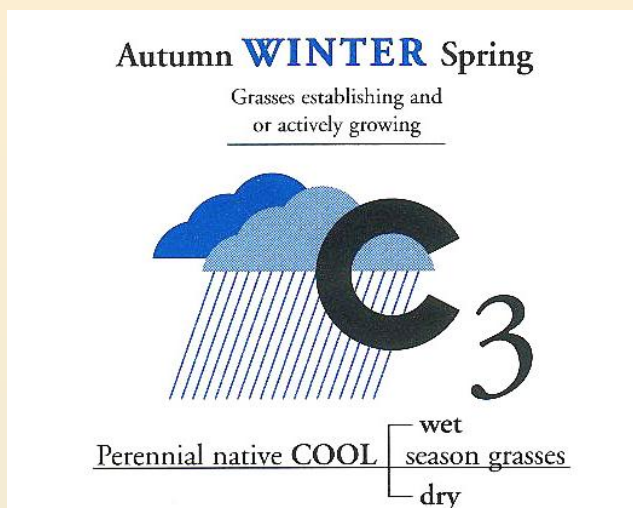
A light harrowing i.e. just tickling the surface on a number of occasions will encourage a maximum number of soil seed bank germinations.



My 20 spike harrow



# WHEN TO PLANT



This tells you that cool season grasses are best planted in autumn and warm to hot season grasses in spring.

The upper soil zone should be constantly moist to get the best germination result, and temperatures for germination need to be right... **C<sub>3</sub>** 12°C – 22°C, **C<sub>4</sub>** 25°C – 30° C (optimum range)

**C<sub>3</sub>** I sow after the breaking rains and immediately before rain where possible. Rain helps bond the florets to soil particles.

**C<sub>4</sub>** I sow late winter or in the warmer period of spring, but still while the surface soil is **constantly moist** ... or you could irrigate, to ensure germination.

# WHEN TO PLANT- cont

**Kangaroo grass is my exception to the rule** i.e. the way I do it is to cast seed bearing Kangaroo grass hay in January. Then in spring I burn the poisoned site. By December there are seedlings everywhere. This method was pioneered by friend, colleague and native grass guru, John Stafford from 1977!! while weeds officer at East Torrens District Council.



Workshop : casting the hay,  
January 2000



Beginning property fire-proofing\*  
with *Themeda*

\*Summary points Page 38-39

# CROP INSURANCE

If you want to ensure seed set and get multiple harvests, subsurface irrigation, with e.g. soaker hose, is needed.

Depending on your soil type, the application of a soil wetting agent will help the soil retain water, so assisting the plants to get through excessively long, dry and hot periods.

Some species won't set or will abort seed under conditions of stress.



Soaker hose at 20cm depth, prior to top-dressing



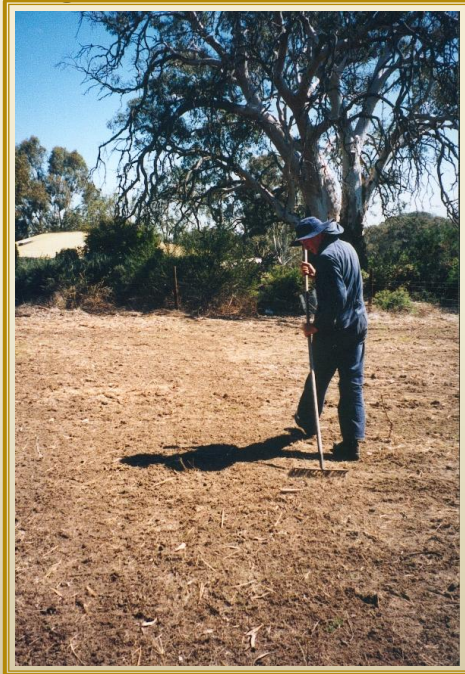
Weed mat with buried soaker hose in an *Elymus* crop, Woodside



# SOIL PREPARATION JUST PRIOR TO SOWING

Most native grass florets like to lay on the surface, lodge in crevices or drill themselves into the top four millimetres of soil. Kangaroo grass and the Spear grasses (hygroscopically awned) drill much deeper.

I use a rake for small areas and, for larger areas, an ATV bike pulling a simple harrow to crumble the soil surface.



Dragging a simple 20 spike harrow

# SOWING FLORETS by Broadcasting



We try to broadcast in light breeze conditions to assist the spreading of the florets. Sometimes if strong winds follow, or the soil surface isn't evenly crumbled, it can be useful to use a light roller or drag a bag or lightly rake-over to ensure good soil-floret contact.

## SOWING RATES FOR OUR SMALL PLOT, HIGH YIELD PROCESS

I have not been too fussed about weighing bags of florets. We harvest plenty for our plot size needs, so we probably sow to excess; perhaps 3-5gms/m<sup>2</sup>? The broadcast method lets you see how the florets are falling across the ground.

Some formulae, necessary for sowing pasture, broadscale revegetation and turf, are given in two excellent publications.

*C.Waters, W.Whalley & C.Huxtable (2000) Grassed Up. Guidelines for revegetating with Australian Native Grasses, NSW Agriculture.*

*I.H.Chivers & K.A.Raulings (3<sup>rd</sup> Ed 2009) Australian Native Grasses. A manual for sowing and using them, Native Seeds, Melbourne*





# SOWING FLORETS with Machinery

For larger areas: I've used \*John Stafford's hydro-pneumatic seeder. The seeding rows can be sprayed using this machine and weed establishment in the inter-row poisoned later.



Seeding Tube



Florets in watery gel

\*Vegetation Management Services, Lenswood



# EMERGENCE

All things going well (remember these are 'wild' seeds), you should see young plants emerge within a fortnight. It can be within a few days for some C<sub>4</sub> species.

FOR BEGINNERS: plant some florets in a pot of sterile seed raising mix near the back door at the same time as you sow your patch. Then you'll know what the young native grass plant should look like as it emerges and develops.

## INSURANCE AGAINST WEEDS

Once the seedlings have emerged, an application of pre-emergent herbicide can be used to deter (even to totally prevent) the return of winter or summer weed species. There is trial and error in this process But it is as labour-saving as weed mat.

Depending on the life of the herbicide in the soil, follow-up applications may be needed. Experimentation and experience teaches this.

# POST EMERGENCE

This is the critical weed observation time. If you had good site preparation, the weed load should be low or confined to your local broad-leaf weeds e.g; sorrel, catsear and clover and summer wireweed for me.

These can be hand-pulled, wick-wiped or spot-sprayed with an appropriate herbicide.



Broadleaf herbicide treatment in young Kangaroo grass plots.



Hand weeding Wallaby grass plot with a lino knife (sickle- shaped blade)

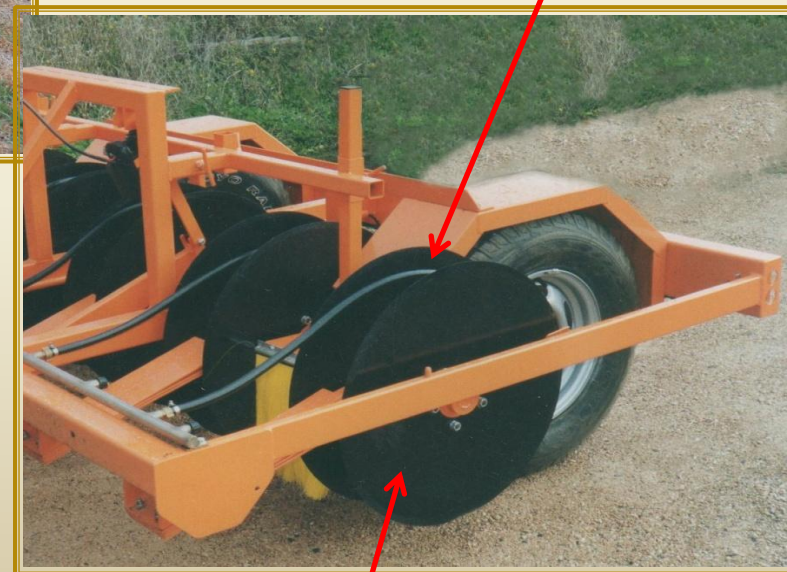
# THIS IS JOHN'S POST EMERGENCY TREATMENT

His Seeder becomes a Sprayer

His Seeder can also be converted to mow the inter-rows



Knock-down herbicide in the inter-rows



Twin coulter discs become spray shields



# SOME OF OUR PRODUCTION PLOTS Around Harvest Time



The 2000 sown *Themeda*, 2009



Yellowish *Themeda*



Burgundy *Themeda*



2006 sown Wallaby crop, 2009



# SOME OF OUR PRODUCTION PLOTS

## Around Harvest Time



The 600m<sup>2</sup> *Austroanthonia tenuior* plot



56m<sup>2</sup> Red-leg grass *Bothriochloa macra* in our driveway garden. Other areas north & east of the house mown and green over summer



1. *A. caespitosa* blue, hairy leaves 14m<sup>2</sup>
2. *A. caespitosa* green, smooth leaves 6m<sup>2</sup>
3. *A. racemosa* 20m<sup>2</sup>



The 200m<sup>2</sup> Windmill grass plot

# SOME OF OUR PRODUCTION PLOTS

## Around Harvest Time

You should get your first harvest within 6 months of emergence for **C<sub>3</sub>**'s often within 3 months for some **C<sub>4</sub>**'s. If you irrigate (i.e. a few deep soakings, perhaps a month apart over summer), you can get successive harvests. Lots of factors can influence whether this happens or not. Because many species don't ripen synchronously, you can harvest the same crop several times over several weeks by hand, brush or vac stripping.

### CHECKING FOR SEED MATURITY

#### Flick Test

Ripe/mature florets of many species will fly from the seedhead when you flick it, or will come off as you draw your closed hand up the seedhead.

#### Pinch Test

The hard seed (ripe/mature) in an individual floret can be felt when the floret is pressed between index finger and thumb.



# HOW TO HARVEST

I use a power vac, tailor-made harvester, blade-brushcutter, or manually cut off the seed head clusters. Various ways for different species.

## **Power Vac.**

The action is generally a sweeping motion through the seedheads. Best for Wallaby grasses. This is an electric STIHL, not as powerful as my STIHL BG75 petrol now replaced by a BG66.



A Victa footpath Vac converted for me by friend, Neil Hodge - The "Modge"



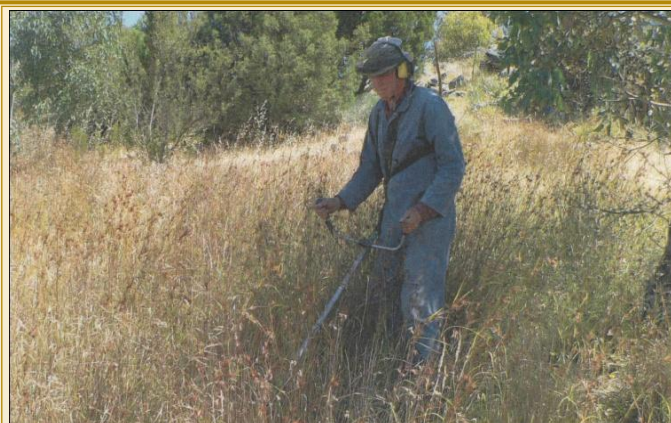
John's Reel over Brush Harvester



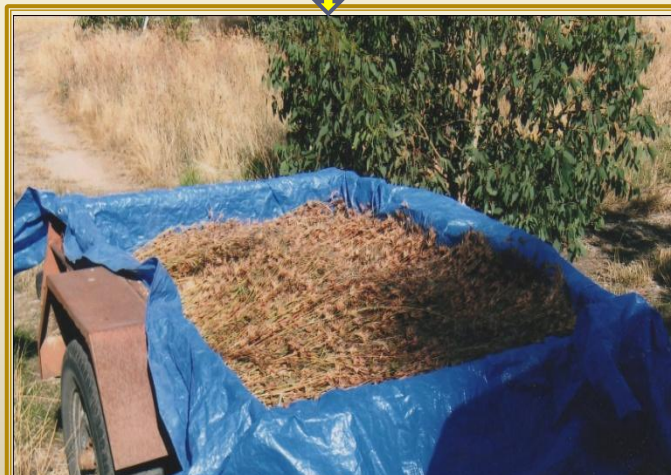
Catcher-mower set on highest elevation



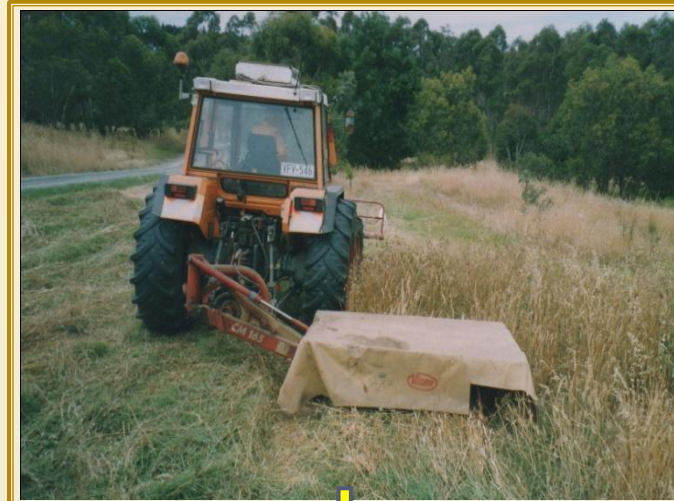
# DECKING KANGAROO GRASS WITH A BRUSHCUTTER OR HAY MOWER



You can layer the hay in rows for easy pick-



Sheaves of hay ready for transfer to new site



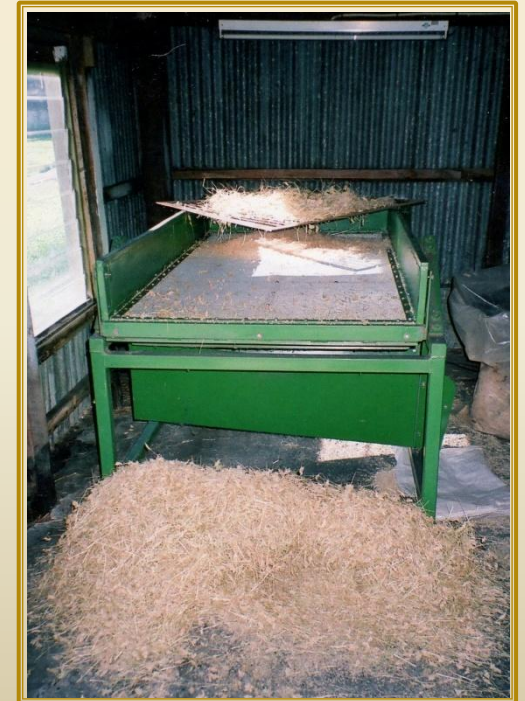
Hay forked up and carried to new site

# CLEANING and STORAGE

PRESUMING your plots are weed free or you are able to recognise some weeds you've missed as you're harvesting, then:

- Most hand vac'd florets (e.g. Wallaby grasses) are a clean product – no trash
- All hand-stripped florets are a clean product
- Blade brushcut material – stems and seed heads intact - can be a clean product
- Catcher-mowers gather everything the blades cut – including lifting dirt and overlooked weeds I've used the NGRG funded Vibrator Cleaner to remove most leaves and stems
- Brush Harvesters, Reel over Brush Harvesters and my "Modge" all rip some whole seed heads, bits of seed heads, leaves and stems into the catcher-box/bag.

I use the simplest cleaner to sieve the collected material – a hanging frame of birdwire surrounded by plastic sheeting





# CLEANING and STORAGE cont

Often fully mature florets will shed their seeds/caryopses in the harvesting process. This is common for Wallaby grasses.



N.B. A consideration from the third, fourth and fifth dot points from page 32. Because of some green seedheads in the harvested material, I air-dry it on tarps for a few days. Protect from wind.

**Storage:** Mostly I store florets in plastic or steel 44 gal drums, dust with Magnesite (for bugs) and seal. Avoid places of extreme heat or moisture.

# POST HARVEST MANAGEMENT

After several years, the task is to remove any build-up of thatch



The hard way  
.. Hand raking  
of mown  
thatch



The starter plot of *A.geniculata*

I 'm a devotee of  
using fire in  
Autumn in plots  
with a large, dead,  
leaf and stem mass  
(late winter for  
Kangaroo grass!!)



Burning *Microlaena*



Mid winter burn in Kangaroo Grass



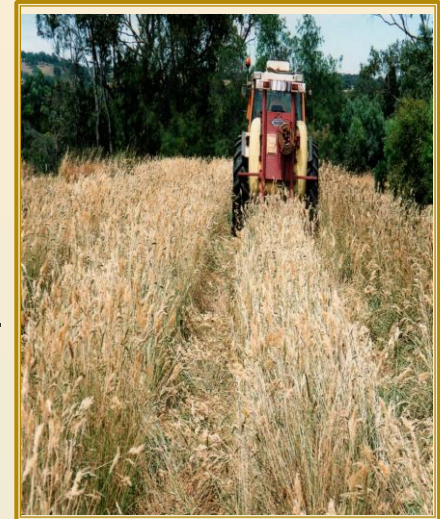
Winter re-growth of *Microlaena*

***A dedicated sheep flock - 'properly used' - would be a good PHM tool on larger cropping sites. Grazing and grasses co-evolved, remember.***

# SUMMARY POINTS

## Planning and Maintenance

- Remember: How you'll sow and how you'll harvest primarily dictate plot design. Here the Harvester is flattening useful plants. The plot was not designed for it.
- Your ability to irrigate will give you more flexibility and certain harvest(s). NB: In SA native grasses (both **C<sub>3</sub>**s and **C<sub>4</sub>**s) have evolved with relatively short, often repeated rain events. There is a message here for the way you water.
- Bags on Vacs are made of fluffy-lined interlock cotton to retain dust. I had Anthony Buhlman (Saddler, Birdwood) replace them with ones made of woven poly-fabric; better air flow and easy to clean.
- Weeds MUST NOT GET A FOOTHOLD in your crops.  
NB: Using contaminated seed creates problems at home and selling contaminated seed is irresponsible in the least.
- In **C<sub>4</sub>** plots, with the grass dormant in the chill of winter, weeds can be killed with knockdown herbicides. The Adelaide Plains may stay too warm for this action?
- There will be critical sowing, weed maintenance and varying harvest times which mean that **YOU MUST BE AROUND**.

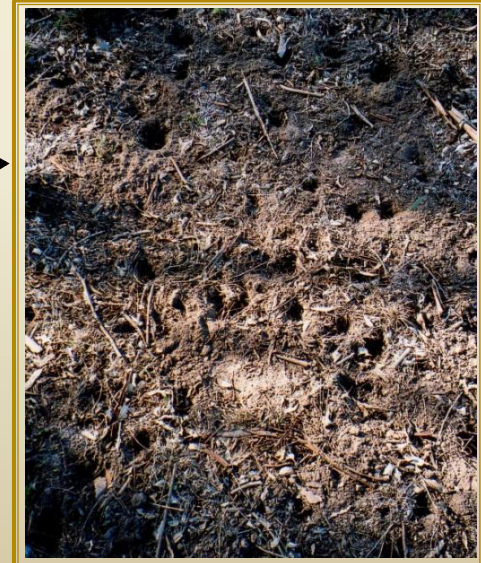




# SUMMARY POINTS

## Results and Bonuses

- For some time we have had seed surplus to annual project needs from the multiplier plots. This has been sold.
- The original wallaby grass starter plot of 100m<sup>2</sup> produced 10kg. Some of this seed grew a 300m<sup>2</sup> plot which produced 25 kg. Some of this seed grew a 600m<sup>2</sup> plot which produced 55kg.
- Strong wind and rain events have damaged some harvests, stripping florets from seed heads and laying the stems flat.
- Our bandicoots build nests, make tunnels and dig for food between the tussocks. We're sharing a feral-animal-proofed 30 acre zone. Bonus: They're composting, recycling, stimulating soil organisms and aerating our surface soil.



# SUMMARY POINTS

## Results and Bonuses cont

- We know seed heads have begun ripening when Firetail finches appear in numbers to grab their bit of our harvest. They continue to benefit from fallen seed into Autumn .... so important!



# SUMMARY POINTS

## Fuel Load Reduction Benefit

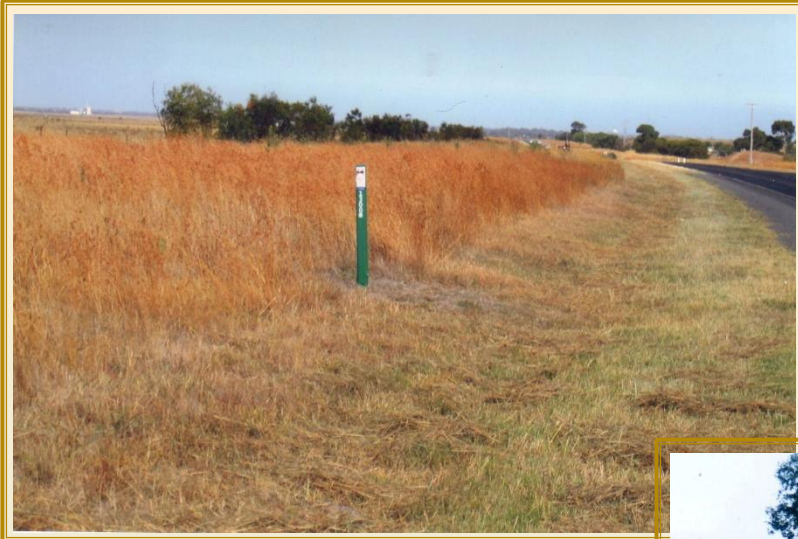


Summer fuel loads of exotic grasses like Phalaris and Wild Oats are considerably higher than those of native grasses like e.g. **C<sub>3</sub>** Wallaby and Spear grass and **C<sub>4</sub>** Kangaroo and Red-leg grass (Detailed in Native Grass Strategy2 p.p. 81-89). The CFA in several regions of Western Victoria confirm this and have worked on roadsides to reconstruct a managed, native grass regime to achieve fuel load reductions (CFS S.A. advised of this by Wayne Brown and myself in correspondence 19/12/2006 with no reaction). S.A. Councils with fire prone areas should not think twice about implementing actions from CFA Roadside Program Case Studies.



# SUMMARY POINTS

## Fuel Load Reduction Benefit cont



Kangaroo grass, standing and slashed, in mid summer – Bacchus Marsh to Werribee, Vic



Kangaroo grass, slashed (and burned) mid summer on approaches to Dunkeld, Vic