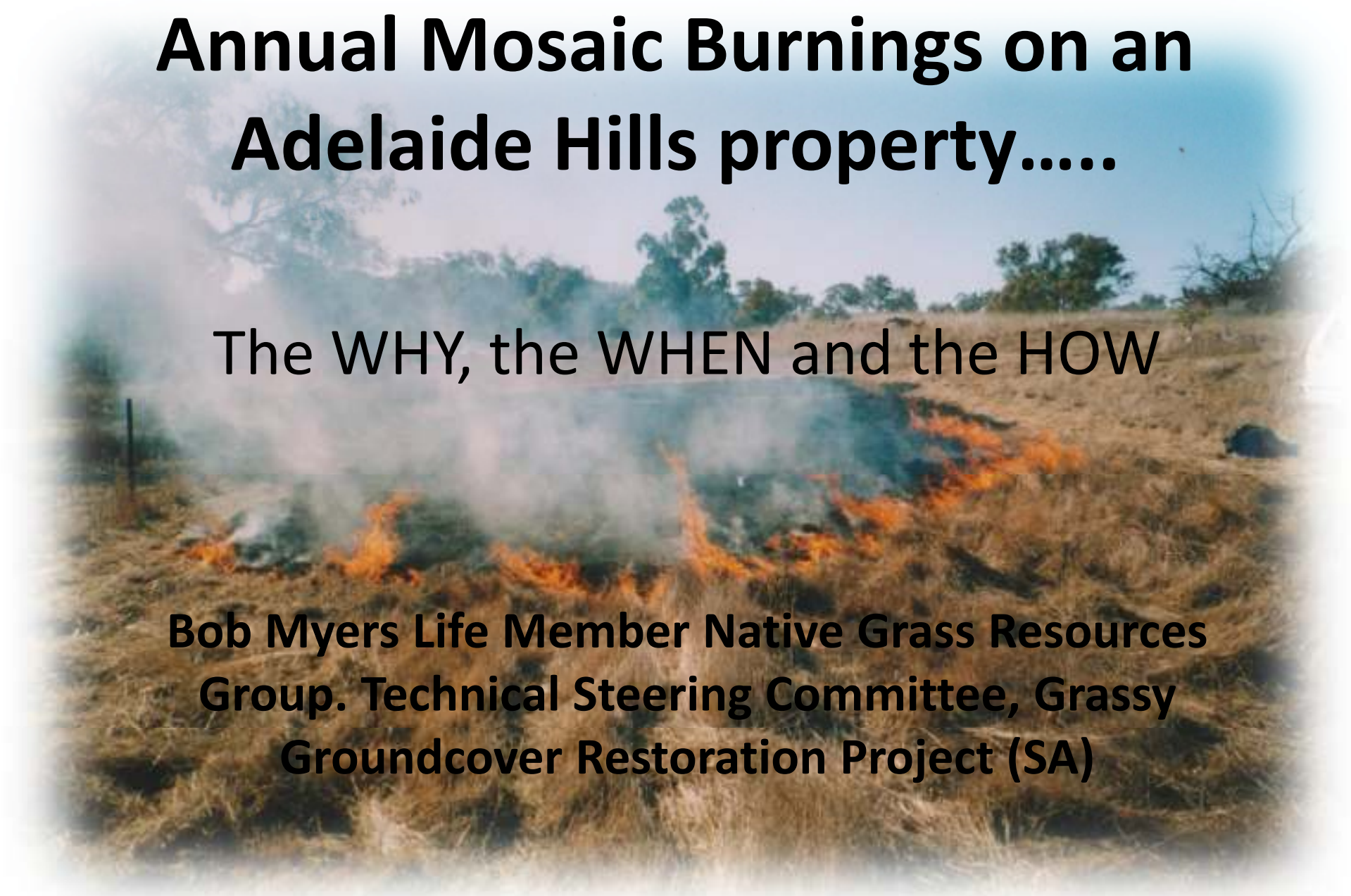
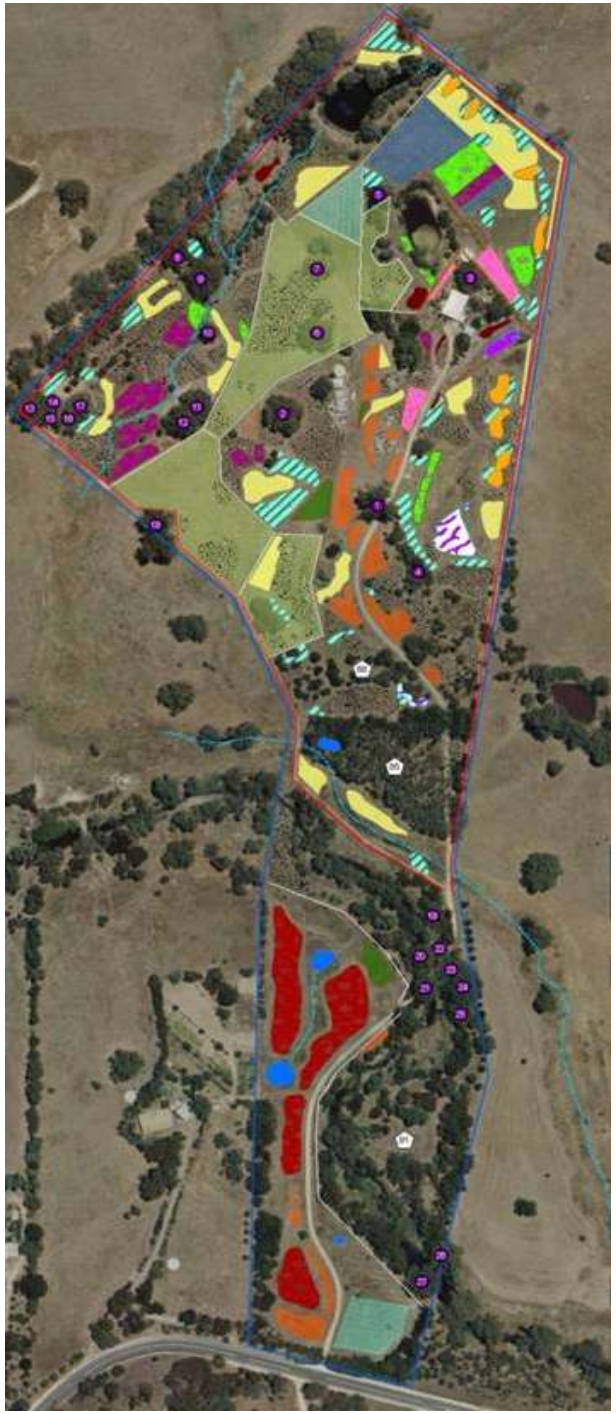
Annual Mosaic Burnings on an Adelaide Hills property…..



The WHY, the WHEN and the HOW

Bob Myers Life Member Native Grass Resources Group. Technical Steering Committee, Grassy Groundcover Restoration Project (SA)



Wanda & Bob Myers' Property Map

The coloured patches make up a mosaic of species' reconstruction and restoration. Burning, mowing, whippering, raking and pre-emergence herbicide treatments are part of management of all the grassy areas.

A context for the presentation

- What's behind my presentation
- Some of you present will remember my Small Property Case Study at the 2012 Forum.
- Refer: City of Salisbury website http://www.salisbury.sa.gov.au/Our_City/Environment/Sustainability_and_Climate_Change/Biodiversity_and_Open_Space/Grassy_Woodlands_Forum_2012_Documentation
- Or Native Grass Resources Group Website:
- http://www.nativegrassgroup.asn.au/events.html
- Briefly, we bought a 16Ha part of a large grazing & cropping property in 1973. We agisted sheep & cattle until 1987 by which time we'd planned to reconstruct a semblance of the Grassy Woodlands that we would have seen if we'd been here in the late 1830's…. particularly the summer green native grasslands.
- But with the grazers gone from 1987, the introduced pasture grasses became dense and tall and Eucalypt seedlings popped up everywhere.
- The same thing – rampant vegetation – happened to the First Australians/ the Aboriginal People when the Megafauna died out (Flannery). That must have terrified them – like it's doing to us today but it's unimaginable that the Aboriginal National 'lived'in fear of fire for 38,000 years! They didn't! Whatever the actual trigger, the vegetation management plan that evolved with fire as the tool turned much of the Continent into "a gentlemans' park". Fire had become a 'nurturer', a 'provider' to them (Gammage).
- Then the Anglo-European colonisers arrived with their Northern Hemisphere farming practices, nasty weeds, and fear of fire. Restrictions and bans were quickly placed on the lighting of fires.
- A land transformation, in the hands of Aboriginal colonisers, that had taken so long to develop, was rapidly overturned. In just 50 years, we changed the composition of the dominance of summer active, summer green (C4) native grasses and companion plants into summer dead or dormant introduced cool season (C3) grasses and broadleaf weeds across the grasslands and grassy woodlands that we'd changed into farms.
- People now live in real fear of fire. It is costing us dearly at the levels that count – the human level with loss of life, mental torment, sacrifices of firefighters and their families and the ecological level with large scale, long-term loss of habitat, let alone property and infrastructure losses.
- Clearly, a transformation (again) is needed. See reference to the science of Social-Ecological Systems (page 4).
- At a local scale and at an individual property level we can, and in my assessment, have to reconstruct C_4 dominance. Whether we take this on at a broadscale level depends on how we want our landscapes to function. We can't continue to turn a blind eye to the degradation of land each summer, nor can we turn a blind eye to the rampant, rank unmanaged vegetation in areas of high fire risk – towns, suburbs in the Hills, the North & South, rural properties and roadsides.
- The existing systems of (mis)management are both untenable and unsustainable. We are facing thresholds into collapse on various fronts.
- So, looking at the immediate future
- What sort of landscapes (natural, semi-natural, farmed & built) do we need to live abundant, convenient & predictable lives (ie. with other life forms living similarly)?
- How should we reconstruct these landscapes (as the Aboriginal People reconstructed theirs over time)?
- How should we manage the landscapes we reconstruct (as the Aboriginal People managed theirs over time)?
- It is both contemptuous and foolish of us (yet true to colonial thinking) to ignore the wisdom of people who have endured and thrived on this continent since their arrival well over 40,000 years ago. We've made it to 200 odd years here and we, the land and its ecosystems are in serious trouble.
- What concerns me the most and emboldens Wanda and I
- We new Australians have a big problem. We don't really "get" Australia and its ecology and unpredictable climate. We don't (probably can't have) a shared Dreaming to guide us. For the Aboriginal People "the cycles of life and season change constantly and a managers duty is to shepherd land and creatures safely through these changes. Land care is the main purpose of life". (Gammage 2010).
- **Can mosaic burning, to something like our formula, involve more landholders in care for their land and at a deeper level than they thought possible?**
- **How can this be taught locally across the regions? The wisdom is still around.**
- **THINK AUSTRALIA. ACT LOCAL (by "knowing Country").**
- **So, as I said at the 2012 Forum "here is the Myers contribution". Thanks for this opportunity again – when I'm a lay person and not a scientist.**

We're not members of the No Fuel Load is Best Club. We're aiming for a complex and diverse grassy groundcover landscape which will recover from fire events.

A context for the presentation (contd.)

FOR THOSE WHO NEED TO DELVE MORE DEEPLY

I have discovered in my practice that the science of Social-Ecological Systems (to which Prof. Wal Whalley alerted me) can greatly assist thinking and planning around transforming dysfunctional and undesirable systems. The dynamics of such systems have to be understood – the level of their resilience and the capacity of the actors in a system (ie. us, in a SES) to influence resilience.

It is fascinating to imagine that the Aboriginal people eventually, by chance or instinct, or prior practice in the use of fire, applied this modern science when faced with the loss of megafauna herbivores.

ABSTRACT

The concept of resilience has evolved considerably since Holling's (1973) seminal paper. Different interpretations of what is meant by resilience, however, cause confusion. Resilience of a system needs to be considered in terms of the attributes that govern the system's dynamics. Three related attributes of social-ecological systems (SESs) determine their future trajectories: resilience, adaptability, and transformability. Resilience e (the capacity of a system to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks) has four components – latitude, resistance, precariousness, and panarchy – most readily portrayed using the metaphor of a stability landscape. Adaptability is the capacity of actors in the system to influence resilience (in a SES, essentially to manage it). There are four general ways in which this can be done, corresponding to the four aspects of resilience. Transformability is the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable.

The implications of this interpretation of SES dynamics for sustainability science include changing the focus from seeking optimal states and the determinants of maximum sustainable yield (the MSY paradigm), to resilience analysis, adaptive resource management, and adaptive governance.

Published: September 16, 2004

Walker, B., C.S. Holling, S.R. Carpenter, and A. Kinzig. 2004. **Resilience, adaptability and transformability in social-ecological systems.** *Ecology and Society* ***9****(2): 5. (online) URL: http://www.ecologyandsociety.org/vol9/iss2/art5/*

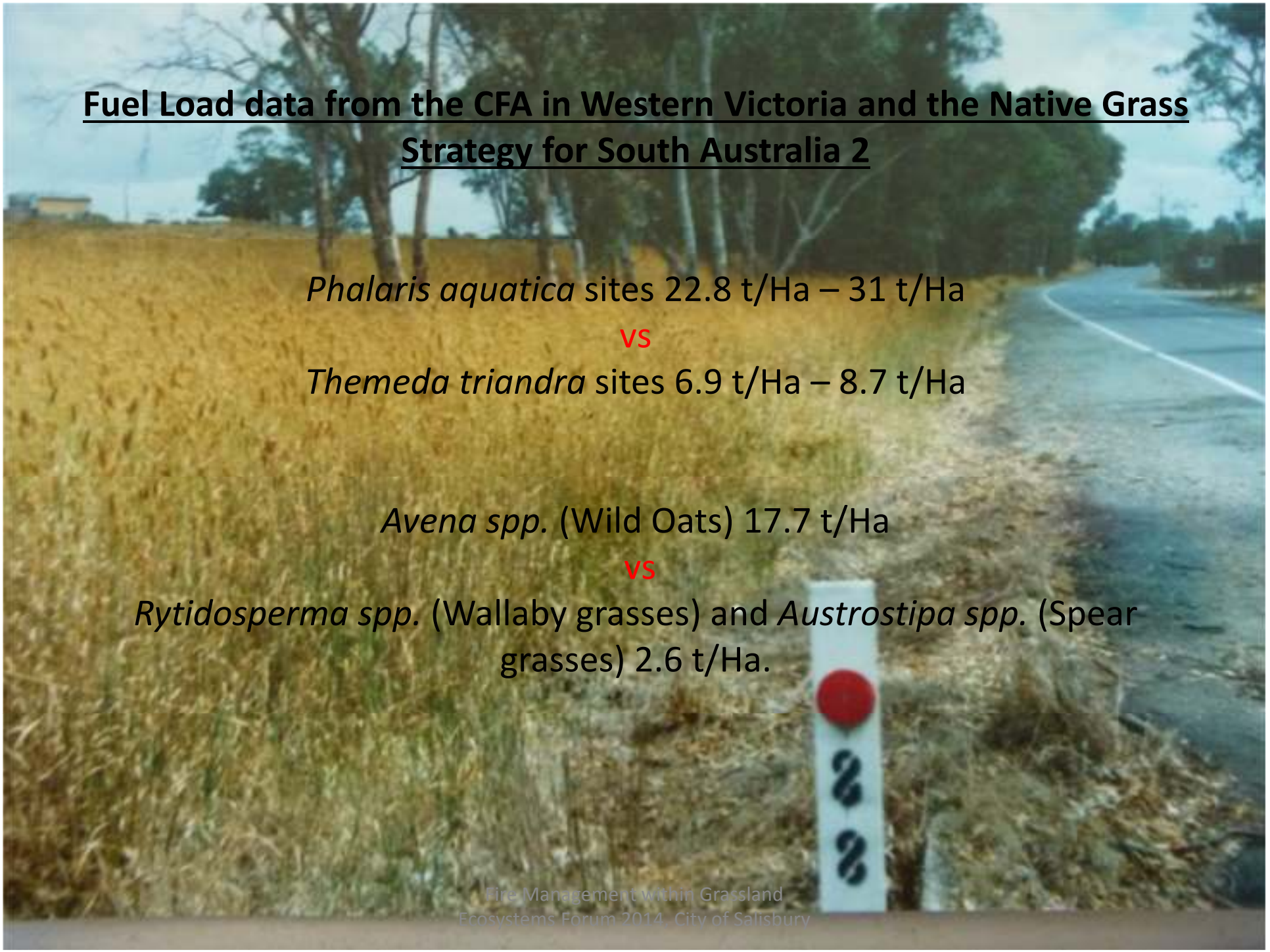
Using fire to protect our built asset

The Why….

- We have undertaken revegetation since 1986 and natural recruitment by many species is now occurring (in Sanctuary zone – no rabbits or hares) which makes grazing by domestic stock detrimental to this process…. So, no grazing in the management formula.
- We did a fire apprenticeship on the banks of the River Torrens from 1985. The banks (a distance of 500mx2) were covered with gorse which burns well dry or green with volcanic flames and searing heat. We burned 50m x 8m 'patches' at a time, poisoning regrowth & reburning. Then I found out about fire to establish *Themeda triandra* and gave that a go in 1992…. Now almost yearly since 1997, I burn some patch of established *Themeda.* It's working a treat.
- Many areas of the 11Ha Sanctuary zone are rocky and can't be easily mown. I'll be using a flame-thrower amongst these in future.
- Our bandicoots love digging the burnt patches – an important part of their life.
- The native C_3 & C_4 grasses that I've been harvesting for seed since 1997 need de-thatching every few years. Fire is the best tool.
- We are not foolish enough to keep putting up with weedy, introduced grasses when we know the comparative fuel load figures.

One of the many rocky areas

Flame thrower – potential for use amongst rocky areas



Fuel Load data from the CFA in Western Victoria and the Native Grass Strategy for South Australia 2

Phalaris aquatica sites 22.8 t/Ha – 31 t/Ha

vs

Themeda triandra sites 6.9 t/Ha – 8.7 t/Ha

Avena spp. (Wild Oats) 17.7 t/Ha

vs

Rytidosperma spp. (Wallaby grasses) and *Austrostipa spp.* (Spear grasses) 2.6 t/Ha.

The Why..... (contd.)

- To help me understand my country, I've read heaps of significant research papers and books on First Australians/the Aboriginal People and fire… from Prof. Rhys Jones 1969 - Fire-stick Farming; to Tim Flannery - The Future Eaters 1994; Bill Gammage - The Biggest Estate on Earth 2010; and back to Tim Flannery - Quarterly Essay 48/2012 - After the Future. The point of agreement is that we really don't ''get'' Australia and its ecological systems.
- Aboriginal people used fire as a nurturer/provider (Gammage*). We see it as a destroyer.
- Mosaic burning, "planned, precise & predictable*'' is the way to go for me.

The When…

- My experience in my region of the Mt Lofty Ranges, on my valley floor, with my local seasonal (>4) and daily conditions tells me that the safest time for me to use fire in early morning and late afternoon in **Autumn**, after the breaking rains have greened up the landscape.
- But more importantly, the winds in Autumn are more predictable, often slight to light with balmy conditions. Bulbous and corm native plants haven't yet popped their heads up.
- Fire bans in my region are from Dec 1 – April 30 (but have started as early as Oct 15). Our Local Government regulations restrict any burning to between 10am-3pm – not what I'd call 'early' and "late". As my burns are small and of short duration and I'm several kilometres out of town, a pall of smoke is usually not created to concern a built-up area.

cf: Appendices – suburban Melbourne

- Since the noughties drought (2004-2010), **Winter** has become a burn option in the grass only areas. There can be long periods without much rain and the winds help to dry the dampened thatch. The green (usually mown) exotic grass around a to-be-burnt patch is a comfortable buffer.

The When...(contd.)

A change of wind pushes fire into the perimeter grass.

A nice burn into the wind, before it changed

Any other options

- Yes, **Spring** is a possible burn time but there are many negatives:
  - the winds don't know whether its winter or summer; they're gusty, fickle and difficult to predict
  - The native grasses are ripening seed (which I need)
  - Grassland companion plants are in flower and/or seed set
  - The fauna (insects to birds) are morphing, mating, breeding…..

Yes, believe it or not, **Summer** too is a possible burn period – pre European data tells us so – but only in the vegetation system that was made by the Aboriginal people and existed prior to Anglo-European occupation of the land. That is, a system dominated by warm to hot season grasses (C_4), with a vast diversity of groundcover plants, scattered trees and managed belts of/copses of shrubs and trees (see Gammage Ch. 7 & 8). Can we reconstruct something like this? Sure can, but it isn't easy and it isn't quick. But the science behind it has been and continues to be explored (See Page 4) – We should embrace it.

The How….

Practical experience since 1997 in ‘grassland’ areas tells me that I can set-up and manage 50-600m^2 a burn with optimum conditions.

Initially, in the Sanctuary Zone,

I will search the site for bandicoot

nests and spray active nests with a

Fire suppressant.

The How....(contd.)

- I will determine wind direction to burn into any wind. I have managed burns comfortably in light to moderate winds.
- I will mow the perimeter, just 1-2m on 3 sides. In between native grass crops, this may be a bare soil area. If there are phalaris, oats, fog grass or cocksfoot seed heads standing dry & tall (with potential to be little ember bombs blown by any wind), I'll whipper them off. Now I'm also using a high-set pram wheel seed head harvester-mower for this task.

Pram wheel mower

Mown edges

The How … (contd.)

A stand-by 200-400L tank is risk insurance

- I will place buckets of water and 5 x 20l water containers around the perimeter.
- If there is potential flammable material just outside the mow line, I'll hit it with KILFIRE ™, but from now on BLAZETAMER 380 ™.
- I will place 2 knapsacks on the ute tray (for ease of putting on) (with 2 x 20l containers on the ute)
- I'll take out my Redheads[R] and start the burn.

The How ..... (contd.)

- Usually I can sit and watch it. Sometimes I need to intervene with the knapsack if a finger of fire finds fuel in the mown perimeter. But if the perimeter has been sprayed with suppressant, this will not happen. Occasionally, the wind might gust and change direction and have me grabbing for a bucket of water. Other surprises? Well, yes there can be:
  - A willy willy can suddenly appear and race across the burn
  - The fire hits a really good, dry fuel load spot and shoots up a mass of flame
  - A wind comes from nowhere, changes direction and gets the adrenaline pumping

In Conclusion

- What sort of landscapes (natural, semi-natural, farmed & built) do we need to live abundant, convenient & predictable lives (ie. with other life forms living similarly)?
- How should we reconstruct these landscapes (as the Aboriginal People reconstructed theirs over time)?
- How should we manage the landscapes we reconstruct (as the Aboriginal People managed theirs over time)?
- Can mosaic burning, to something like our formula, involve more landholders in care for their land and at a deeper level than they thought possible?
- How can this be taught locally across the regions? The wisdom is still around.

THINK AUSTRALIA. ACT LOCAL (by "knowing Country").

Appendices

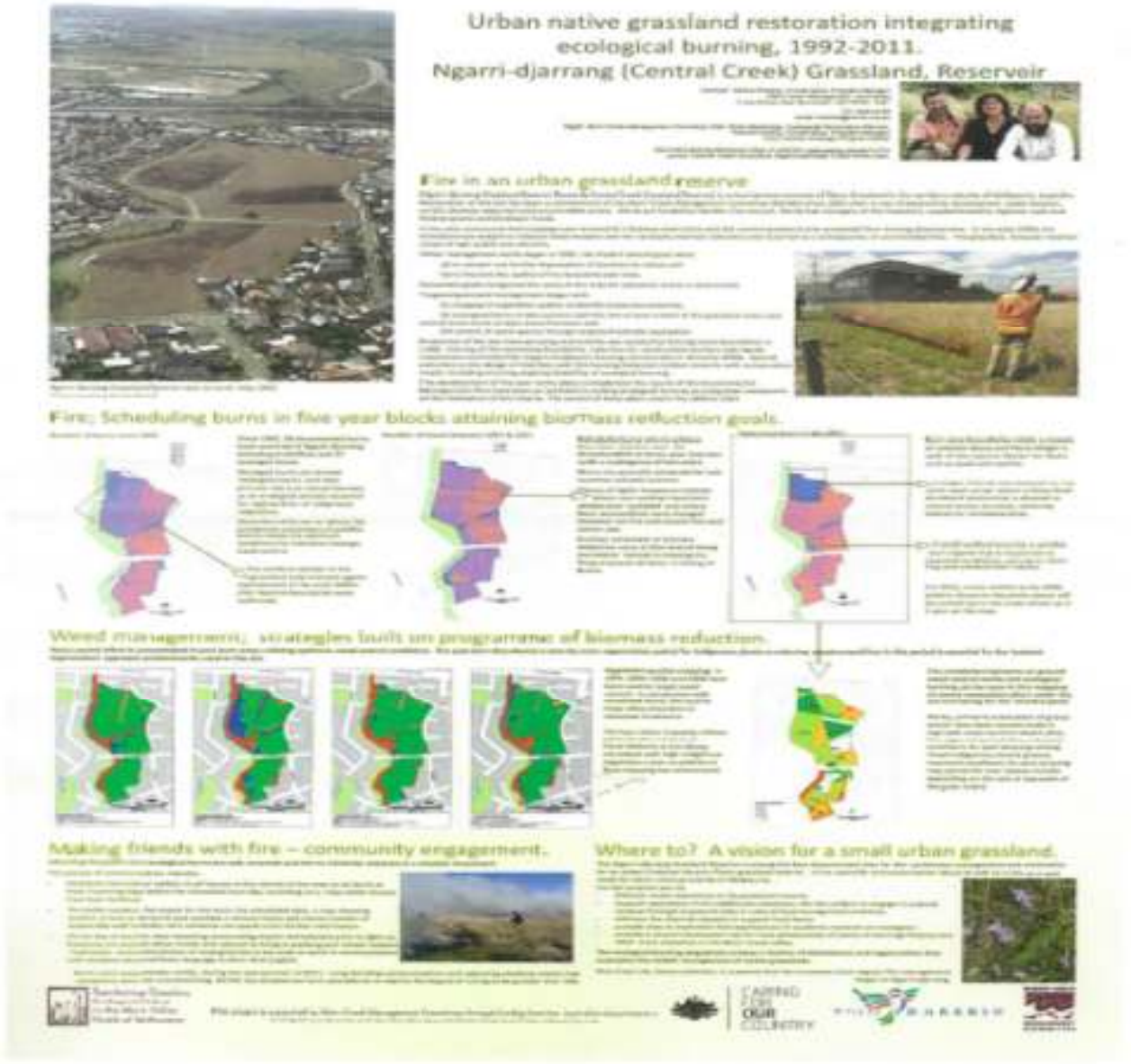
- The Merri Creek Management Committee Projects – The Central Creek Poster
  www.mcmc.org.au
- Understanding C_3 & C_4 Native Grasses
  www.nativegrassgroup.asn.au/publications
- Kilfire™ Information Sheet

BioCentral Laboratories, Thebarton SA 0415 824 608

- BlazeTamer™ Information Sheet

Distributor: Chubb. Fire & Safety, Cnr Richmond Rd & Railway Tce., Keswick SA 131 598

Central Creek Grassland Poster



With thanks to Katrina Roberg, Conservation Program Manager

NGRG C_3 & C_4 List

UNDERSTANDING C3 AND C4 NATIVE GRASS SPECIES

Plants use sunlight and carbon dioxide to make sugars which fuel their growth; this is photosynthesis. Sunlight is harnessed for energy by the same process in all plants, but carbon dioxide can be taken up by different means in different groups of plants.[1] Two pathways, the C3 and C4 pathways for the uptake of carbon dioxide, have evolved in the grasses. Not only do these differ in the chemical reactions that incorporate carbon dioxide into organic molecules and in the structures in which photosynthesis occurs, they lead to marked differences in the distribution and growth patterns of C3 and C4 grasses.[2]

Only 3% of plants use the C4 pathway and more than 60% of these are grasses. Among the Australian grasses, some 65% of native species are C4. They are most numerous in the Northern Territory, northern Queensland and the warm-season grasses. They brown off in winter in southern Australia. And C3 grasses, also known as cool-season grasses, have their period of active growth in autumn and spring. While many brown off over summer, they remain green all winter.

At the time of European arrival, native grasslands were a mix of mainly perennial, warm- and cool-season grasses. In South Australia, the drought tolerant and often tall-growing warm-season grasses were dominant over the smaller cool-season grasses. While much flourished on the diversity of year-round food, the C4 summer-green species in particular were most eaten out and to this day remain largely absent in the landscape.[3] These mostly perennial warm-season grasses have a far wider adaptive range and respond more rapidly to summer rain than the frequently

Autumn WINTER Spring

Grasses establishing and so actively growing

C3

Perennial native COOL — wet / season grasses / dry

Spring SUMMER Autumn

Grasses establishing and so actively growing

C4

Perennial native HOT — moist / season grasses / dry

Kimberley, where they can make up more than 90% of the grass species. On the other hand, C3 grasses are most numerous in the south-eastern and south-western corners of Australia. These distribution patterns relate particularly to temperature and rainfall. In general, C4 species are most common in areas with a warmer, wetter, growing season and often with a drier cold season than are C3 grasses. Conversely, fewer C3 species are found in areas with high January average maximum temperature and more in areas of high spring rainfall.[3]

The biochemical and structural differences between the C3 and C4 pathways mean that the optimum temperature for photosynthesis is higher in C4 than in C3 plants. As a result, C4 grasses tend to have their period of active growth in summer and so are also known as summer-active or annual cool-season grasses that replaced them. As a group, the C4 grasses not only can have value in extending the availability of useful forage, but their active summer growth (when the annual cool-season grasses are dead) reduces deep drainage to water tables, a factor contributing to dryland salinity, and protects against erosion.[4]

Just as C3 and C4 grasses are actively growing at different seasons, their seed germinates most reliably over different temperature ranges. C3 grasses germinate best over a temperature range of 15–25 °C while C4 grasses germinate best over the range 25–35 °C. Choice of sowing time largely depends on the rainfall distribution at the site and the species to be sown. In South Australia, C3 grass seed should be sown in autumn and C4 grass seed from spring to early summer to catch the growing conditions that suit each best.

CHECKLIST

C3

The Genera listed here **particularly refer to South Australia.**[1] A bracketed Latin name identifies the one species in that genus in S.A. The common name listed is the generally accepted name for that genus. The various species can be found in Grasses of South Australia.[2]

C4

GENUS	COMMON NAME	GENUS	COMMON NAME
Agrostis (various)	Graceful bent	*Aristida*	Wire-grass
Amphibromus	Swamp wallaby-grass	*Austrostipa*	Mitchell grass
Amphipogon	Grey-beard grass	*Bothriochloa*	Blue & Red-leg grass
Austrodanthonia	see *Rytidosperma*[1]	*Brachyachne*	Arrowgrass
Austrofestuca (*Stenostis*)	Coast fescue	*Brachyachne* (*ciliaris*)	Native sweet couch
Austrostipa	Spear-grass	*Chloris*	Windmill grass
Bromus (*arenarius*)	Sand brome	*Chrysopogon* (*fallax*)	Golden beard grass
Deyeuxia	Bent-grass	*Cymbopogon*	Lemon-scented grass & Silky-heads
Dichelachne	Plume-grass	*Cynodon* (*dactylon* var. *pulchellus*)	Couch-grass
Echinopogon	Hedgehog & Rough-bearded grass	*Dactyloctenium* (*radulans*)	Button-grass
Elymus	Wheat-grass	*Dichanthium*	Blue-grass
Ehrharta (*stipoides*)	Split-grass	*Digitaria*	Spider-grass
Festuca (*bromiformis*)	Fescue	*Distichlis* (*distichophylla*)	Emu or Salt-grass
Glyceria (*australis*)	Australian sweet-grass	*Echinochloa*	Channel millet
Lachnagrostis (*filiformis*)	Swamp millet	*Enneapogon*	Bottle-washers
Lolium (*perenne*)	see *Rytidosperma*[1]	*Entolasia*	Umbrella-grass & Cady windmill-grass
Lolium (*rigidum*)	Blown grass	*Eragrostis*	Lovegrass
Microlaena (*stipoides*)	Weeping rice-grass	*Eriachne*	Wanderrie
Monachather (*paradoxus*)	Bandicoot grass	*Eriochloa*	Cupgrass
Nassella[2]	Mulga-grass	*Eulalia* (*aurea*)	Sugar-grass
Neodanthonia	see *Rytidosperma*[1]	*Hemarthria* (*uncinata*)	Mat grass
Pentapogon (*quadrifidus*)	Five-awned spear-grass	*Imperata* (*cylindrica*)	Kunai grass
Phragmites	Common reed	*Isolema*	Flinders-grass
Poa	Poa / tussock grass	*Leptochloa*	Umbrella cane-grass & Beetle-grass
Polypogon (*tenellus*)	Beard-grass	*Monachather* (*paradoxus*)	Wiry-edge wedge-grass
Puccinellia (*stricta*)	Salt-marsh grass	*Oryzidium* (*varians*)	Winged rice-fish
Rytidosperma	Wallaby-grass	*Panicum*	Panic & Native millet
Sporobolus	Rat's-tail grass	*Paractaenum*	Barbed-wire grass
Themeda	Kangaroo grass	*Paraneurachne* (*muelleri*)	Northern wedge-grass
Thyridolepis	Mulga-grass	*Perotis* (*rara*)	Comet-grass
Whiteochloa (*airoides*)	Curly-grass	*Pseudoraphis* (*spinescens*)	Spiny mud-grass
		Setaria	Pigeon-grass & Paspalidium
		Spinifex (*hirsutus*)	Rolling spinifex
		Sporobolus	Dropseed
		Themeda	Kangaroo grass
		Tragus (*australianus*)	Bur-grass
		Triodia	Spinifex & Porcupine-grass
		Tripogon (*loliiformis*)	Five-minute grass
		Urochloa (*occidentalis*)	Purple heads
		Urochloa (*praetervisa*)	Hen-exit grass
		Zoysia (*macrantha*)	Beach grass
		Zygochloa (*paradoxa*)	Mulga grass
			Sandhill cane-grass

*Nassella has two C3 and one C4 species in South Australia.

Native Grass

www.nativegrassgroup.asn.au

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2. R. Barker, 'Morphology of grasses' in *Flora of Australia*, Vol 43, Poaceae 1, Introduction and Atlas, Australian Biological Resources Study (ABRS), Canberra, 2002, pp.111-7.
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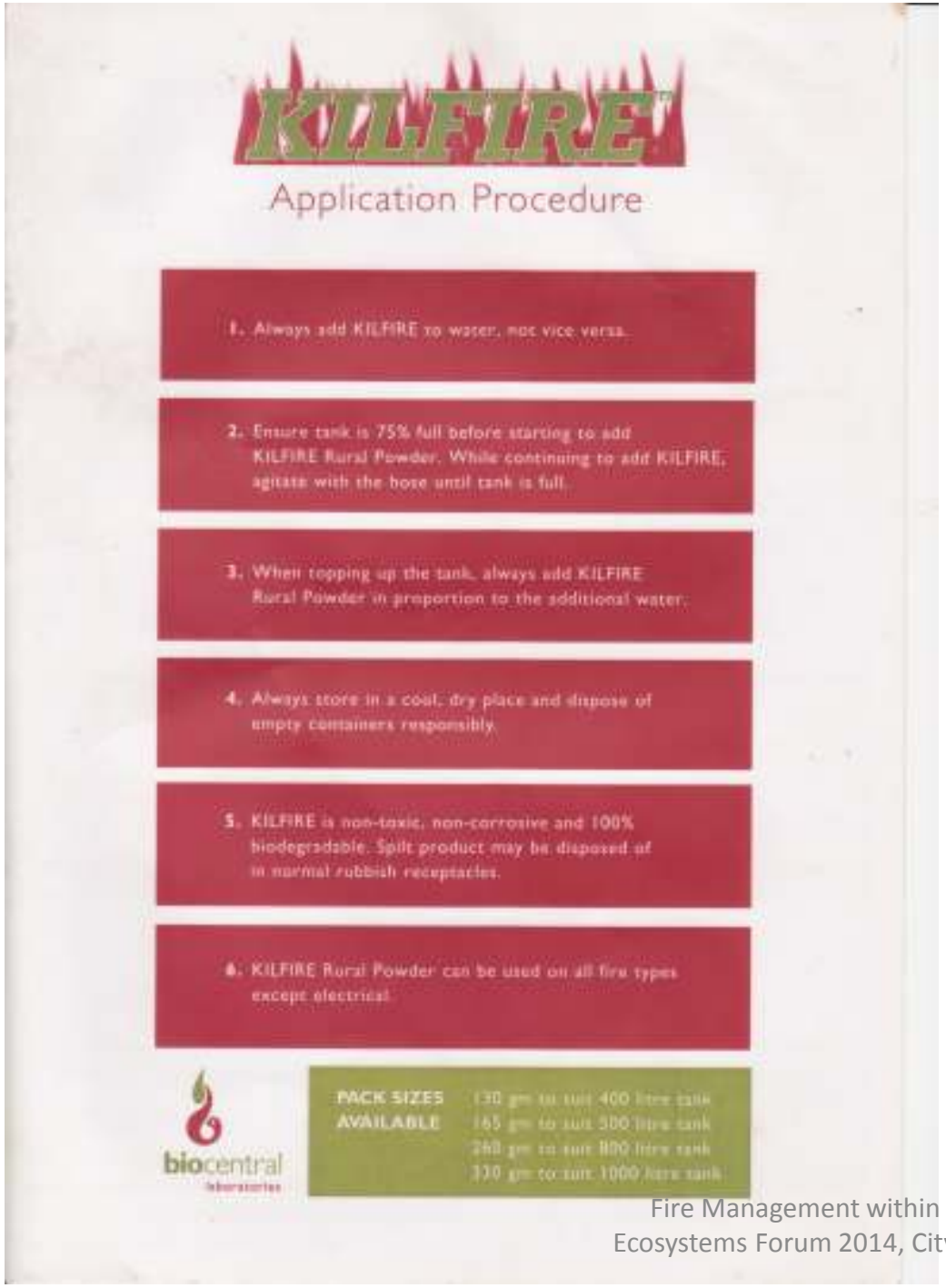
4. R. Johnston, D. Gardner, L. Ellis and C. Clifton, *Hill Country Native Grasslands: Better management for healthy catchments*, Murray-Darling Basin Commission, Canberra, 2000.
5. W.R. Barker, B.M. Barker, J.P. Jessop & W.F. Vanzo (Eds) *Census of South Australian Vascular Plants*, 2nd Edition, Botanic Gardens of Adelaide & State Herbarium, 2005.
6. J. Jessop, G.R.M. Thulborn & P.M. Symon, *Grasses of South Australia: An illustrated guide to the native and naturalised species*, Wakefield Press, Adelaide, 2006.
7. The Council of Heads of Australasian Herbaria in 2011 accepted the 2008 reclassification of Austrodanthonia, Joycea and Notodanthonia as Rytidosperma by an international vote of Santisteve et al. P. Linder et al. *Annals of the Missouri Botanical Garden*, 97(1), 2010, pp. 100–161.


KILFIRE
Application Procedure
1. Always add KILFIRE to water, not vice versa.
2. Ensure tank is 75% full before starting to add KILFIRE Rural Powder. While continuing to add KILFIRE, agitate with the hose until tank is full.
3. When topping up the tank, always add KILFIRE Rural Powder in proportion to the additional water.
4. Always store in a cool, dry place and dispose of empty containers responsibly.
5. KILFIRE is non-toxic, non-corrosive and 100% biodegradable. Spilt product may be disposed of in normal rubbish receptacles.
6. KILFIRE Rural Powder can be used on all fire types except electrical.
biocentral
PACK SIZES AVAILABLE
130 gm to suit 400 litre tank
165 gm to suit 500 litre tank
260 gm to suit 800 litre tank
330 gm to suit 1000 litre tank

Kilfire ™

BlazeTamer 380 ™