

News of Friends of Grasslands

supporting native grassy ecosystems

May - June 2001



FOG'S COMING EVENTS

FOG'S 2001 PROGRAM

Sunday 29 April – the Salinity Battle We'll meet on the left hand side of the Barton Hwy near the Gold Creek development (Curren St going into Harcourt Hill) at 1pm for a trip to a property at Murrumbateman.

When they bought their place, 'Talaheni', John and Robyn's farm was fairly degraded with very bad salinity problems, unproductive pastures and poor natural flora and fauna health. Over the past 21 years, they have gradually turned it around to the point where it is a relative oasis and a site where many ideas have been applied, results monitored and valuable lessons learned. For over a decade, groundwater levels have been persistently falling to the point where pasture now covers what was previously bare eroding land. They have a very balanced approach - they want the farm to look good and be a great habitat for native wildlife but it has to be productive as well. It is a great source of information and inspiration. Pasture production has increased and with it wool and beef production but at the same time some 20% of the property has been excluded from grazing by domestic stock and 4 km of linking corridors established. The net result is that production and conservation values have both been significantly improved.

If you are interested in the latest on salinity abatement works, erosion control, recharge reduction, building a wildlife habitat, turning rainfall into money through pasture improvement and farm forestry then this visit will be well worthwhile. It is also a great spot and the right time of year to enjoy a lot of bird life.

We hope you can make it along - we would like an idea on numbers beforehand, so if you can make it please contact me on 6241 4065 or by email at margaretning@primus.com.au.

Saturday 19 May, 2pm – Rainer Rehwinkel's slides of western grasslands at Mugga-Mugga, Symonston. Rainer's slides will include grasslands from the Young area, which we shall visit on 22 September, as well as grasslands from the Deniliquin and Tumut areas.

Saturday 16 June, 9.30am - Local grasslands from Action Plan Number 1 More of our annual familiarisation with local remnants, including St Mark's in Barton. The other sites are all in the vicinity of Yarralumla and Barton. We'll meet at the lookout to the Governor General's residence along Lady Denman Drive at 9.30am. (For those who wish to join us for the afternoon only, we shall have lunch at St Marks and visit two woodland sites on State Circle early in the afternoon.) Contact Margaret if you'd like to make arrangements to join us for the afternoon part of the activity.

Saturday 28 July, 2pm - Grassland Earless Dragon - Lyn will present information about her part-time PhD project on the endangered Grassland Earless Dragon (*Tympanocryptis pinguicolla*). The research is focusing on life-history differences between populations near Canberra and Cooma and their relationship with the thermal environments at the two altitudes. Her work is examining differences in temperature selection, field metabolic rates, recruitment and population structure, growth and body size, and diet. At Mugga-Mugga, Symonston.

Saturday/Sunday 25/26 August - South coast grasslands A weekend of south coast grasslands with Rainer Rehwinkel, including the unique Eurobodalla Headland grassland.

8/9 September – Riverina grasslands Please see below for an invitation from one of our FOG members who lives in that area.

Have-you-been-a-wandering-along-a-mountain-track.....?"

Well that may be OK, but give that away this year and come wandering out to the plains country of the Western Riverina of southern NSW to wander amongst some very large expanses of diverse grasslands. There is a FOG field weekend proposed for the second week of September around the Hay/Deniliquin area to experience first hand the native grasslands species including Downy Darling Pea (*Swainsona swainsonoides*), Small-flowered Goodenia (*Goodenia pusillifolia*), Hard-headed Daisy (*Brachyscome lineariloba*), Yam Daisy (*Microseris lanceolata*), Rough

Burr-daisy (*Calotis scapigera*), Pale Beauty-heads (*Calocephalus sonderi*), Grey Sunray (*Rhodanthe corymbiflora*), Woolly Plover-daisy (*Ixiolaena tomentosa*) and Bristly Sea-heath (*Frankenia serpyllifolia*). There are of course many, many more. All welcome.

Saturday 22 Sept - Grasslands in the Young area with Rainer Rehwinkel

Saturday 6 October, 2pm - Orchids at Gungahlin Hill A compact grassy woodland remnant which contains a surprising number of spring orchids.

late October - Kowen Forest

Saturday 16 November - Theodore grassland We'll visit a grassland site in Theodore.

Saturday 1 December, - In pursuit of the Golden Sun Moth We'll visit Belconnen Naval Station.

8/9 December – more Monaro grassland gems

Important notes on coming events:

- Please put firm dates in your calendar.
- For outdoor activities, don't forget your hat, sunblock and drinking water.
- For insurance purposes, sign in/out at activities.
- For any information about activities (including times, venues and carpooling details), please contact Margaret Ning on 6241 4065 (home) or 6252 7374 (work).
- To make program suggestions, contact Margaret.



IN THIS ISSUE

- *News roundup*
- *Hidden native flora in Australia's rangelands*
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- *A sedge of grassy ecosystems (Fimbristylis dichotoma)*
- *New book - Saving Rare Plants and Animals*
- *Newsletters received*

APOLOGY:

Unfortunately we have had to hold over Lindsay Pryor's chapters on forests from "Canberra: A Nation's Capital 1954" till the next newsletter. Apologies to those of you who have been waiting for it.

NEWS ROUNDUP

Watson Woodlands

Conder, East O'Malley, Percival Hill, South Bruce and Watson all have one thing in common. They are all battlegrounds over the preservation of native vegetation and reveal the present lack of a strategic approach to planning the urban infrastructure and maintaining urban biodiversity.

The Watson woodlands have been the subject of dispute for some time now. In recent months the Watson Community Association had asked the ACT Government to consider an alternative development plan for North Watson, which would have moved the 1300 homes planned for the woodlands to land designated for tourism facilities in the area. The Government argued that the land to the west of Antill Street was shown as residential land use under the Territory Plan and appeared to hold to the proposal to develop the area.

Subsequently, a public rally was held in the area on Saturday 10 March 2001. This appears, according to press reports, to have resulted in some shift in the Government's hard line position. At the rally, Minister Smyth presented a revised proposal that involved 5 hectares of the woodland becoming open space, with some of the other trees protected under the significant tree register. The Opposition has agreed to save the whole 15 hectare site. Naturally, the Watson Community Association supports saving the whole site.

St Mark's grassland burn

On 9 March 2001 about 2/3 of the Natural Temperate Grassland at St Mark's

Theological College was burnt for ecological reasons. The Kangaroo Grass had become overgrown and required intervention to prevent it from inhibiting the growth of other native species.

An autumn burn was chosen on the basis that the Button Wrinklewort and other plants had mostly finished flowering, and it was considered that any fauna present were at the lowest level of risk. Consultation with grassland flora and fauna scientists was undertaken before the burn occurred. Not all the site was burnt, however, so that a mosaic approach to this type of management can be followed. The rest of the site may be mown in late autumn 2001, then followed by a spring or autumn burn.

The rain that followed the burn has already caused the grasses to sprout, ensuring that there will be green growth before winter.

The landholders, St Mark's Theological College and Australian Centre for Christianity and Culture, supported the burn. City Operations (Cityscape Services) undertook the burn, led by the Bushfire Officer, Brian Murphy.

Other grassland sites burned for ecological reasons this autumn include those at McTaggart St, Kambah (containing *Swainsona recta*); William Webb Drive, Evatt and Umbagog Park South. If weather permits, the grassland at Monash will be burnt also.

Grassy Box Woodlands Conservation Management Network

Woodland Wanderings

The first newsletter of the Grassy Box Woodlands Conservation Management Network was released in January 2000. The grassy box woodlands cover the western slopes of NSW from the Queensland border in the north, to the Victorian border in the south, and FOG explored some of the sites closest to Canberra in a field trip in early October 2000. Read about different aspects of this endangered ecological community, including:

- an introduction by Erica Higginson
- an article by Rainer Rehwinkel on management of the invisible species within the community
- articles on the Yam Daisy (*Microseris lanceolata*) by Suzanne Prober and Kevin Thiele and the Striped Legless Lizard (*Delma impar*) by Erica Higginson
- various contributions by managers of

- specific sites within the network; and
- summaries of research being undertaken into management of the community.

If you would like a copy of this informative and beautifully presented newsletter please contact Erica Higginson on 02 9585 6659 or erica.higginson@npws.nsw.gov.au.

Workshop

A national workshop on conservation management networks (CMNs) was held on 5-6 March in Canberra. Supported by NSW National Parks and Wildlife Service (NPWS) and the National Reserve System Program of Environment Australia, the workshop was designed to bring together people from throughout Australia who are involved in or have an interest in CMNs. CMNs are targeted networks of remnant vegetation sites, their managers and other interested parties and organisations that have a direct interest in the long-term protection and management of those sites. On day 1, the CMN concept was introduced and a framework was discussed. Day 2 saw case studies of working or potential CMNs being examined, outlining different approaches and circumstances as well as strengths and weaknesses of current approaches. The final session involved discussions of the CMN concept based on what had been discussed earlier in the workshop; including the potential, impediments and linkages of CMNs. Through those discussions, it is hoped to develop an agreed framework and achievable plan for the national implementation of CMNs.

Salinity

This is a regularly recurring topic which seems to pop up everywhere. It is the theme of our April field activity where we shall at least hear some good news on the subject. At the Conservation Management Network workshop held in Canberra on 5-6 March, however, the news was not so good. It was baldly stated that salinity is the greatest single threat to the continued existence of many healthy Grassy Box Woodland ecosystems as well as to a vast area of Western Australia. On the next page are some key findings from two reports compiled by the National Land and Water Resources audit and released in March 2001. They all set the context for a four part article on salinity by Dr Christine Jones which begins in this issue (see page 7).

KEY FINDINGS

Key findings of Australian Dryland Salinity Assessment 2000 and Australian Water Resources Assessment 2000 reports issued yesterday:

- Almost six million hectares of arable land now affected by salinity, expected to rise to 18 million hectares by 2050 — or an area twice the size of Tasmania.
- 219 country towns and parts of Sydney, Perth and Geelong to be affected by salinity by 2050, with flood risks expected to increase because of shallow water-tables.
- Salinity impact on rivers to grow from 11,800km of streams to 41,300km.
- 70,000km of roads and 5100km of railway line to be salt-affected within 50 years.
- Worst-affected state to be Western Australia with salinity impact to hit 8.8 million hectares of farming land.
- Over two million hectares of remnant native vegetation to be salt affected.
- Water use has grown to 23,300 gigalitres from 14,600 gigalitres since 1983.
- More than 20 per cent of water diverted for use never arrives because of evaporation and seepage.

ACT plants and where to buy them

We've had a request from a member, for information on ACT plants and where to buy them. The Society for Growing Native Plants Canberra Region (SGAP) has recently updated the following fact sheets:

Some local ACT native plants - contains sections on grasses and clumping plants, ground covers, climbers, container plants, trees and shrubs (the latter is divided into various sizes - small, medium and large). Other information includes the names of local field guides plus a couple of more general references; and

Where to buy Australian plants in the Canberra region - contains the names and contact details of small Canberra nurseries and small rural nurseries in the Canberra region. There is also a summary of what is available from each nursery with an indication of current prices, plus a contact number for those wanting details of SGAP's public plant sales which are held twice a year.

If you'd like copies of either of these fact sheets, they are available at SGAP's monthly

meetings, or contact Margaret who can arrange for a copy to be sent out to you.

NCC Bushfire Management Workshop, Talbingo, 31March-1 April

Margaret Ning

Around 70 people gathered in Talbingo on 31March-1 April for a Nature Conservation Council of NSW (NCC) workshop on bushfire management. The workshop is the latest in a series of ecological bushfire workshops which have been gathering momentum since 1995, and Talbingo was the best attended so far.

Representatives from the NCC, regional bushfire management committees, the NSW Rural Fire Service (RFS) and NSW National Parks and Wildlife Service (NPWS) attended along with representatives from bush care groups, the national trust, councils, national parks association, landcare groups, confederation of bush walking groups, and environmental consultants. Interested parties came from as far away as Sydney, Leeton, ACT, Dubbo and from Victoria, the Yarra Ranges and the Dandenongs.

All were all keen to learn as much as possible during the weekend. The aim of the workshops is to offer free educational presentations on ecological bushfire management, and to provide a forum for the community to discuss the issues.

The program had a heavy emphasis on NSW NPWS bushfire experiences and management issues, especially as they related to Kosciuszko National Park (KNP), which was virtually around the corner from Talbingo. Day 1 saw presentations by NPWS officers and RFS representatives, and also a session on the main bushfire management issues confronting NCC and the RFS. This involved discussion with the audience, and various solutions were suggested. Grasslands were often referred to throughout the day, and Roger Good of NSW NPWS maintained that a stable grassland community is the moistest community and the least likely to be a fire hazard. Day 2 included visits to Jounama Plantation within KNP to view different stages in the process of removing pine plantations and attempts to restore the sites to a semblance of their former selves.

In a totally picturesque setting, it was the most congenial workshop atmosphere I have ever encountered, and the networking and constant exchange of information was

extremely stimulating. Although I didn't fulfil my main hope of learning specific aspects of fire management that we could apply on our property at Nimmitabel (where we do not use grazing to keep the biomass at manageable levels), I came away with many relevant information sheets, including:

- The State of Native Vegetation in NSW 2001 (NCC of NSW Inc);
- Threatened Species Conservation Act 1996 and the Rural Fires Act 1997 (RFS Planning Note 1/98);
- Overview of the Annual Fuel Reduction Reporting System - 2000-2001 Reporting Period (RFS);
- Rural Fires Amendment Bill 2000;
- NCC Bush Fire Policy 2000;
- Hazard Reduction and the Native Vegetation Conservation Act, 1997;
- Legal Clarification of the Rural Fires Act, 1997 (NSW NPWS); and
- High Frequency Fire: a key threatening process (NSW NPWS).

The bushfire workshops will continue to be held around the State at approximately three month intervals, and next year the NCC intends to hold a "what works" conference which will focus on discussing and spreading the word as to what has been successful in bushfire management.

Other free NCC bush fire workshops this year will be held at: Richmond Valley 16 - 17th June 2001 Narrabri 15 - 16th Sep 2001 Central Coast 10 - 11th Nov 2001

If you are interested in copies of any of these information sheets or in contact details for future NCC workshops, please contact me on 6241 4065.

Horses in Kosciuszko National Park - an Update

Dierk von Behrens

'Frenetic' is the best word to describe recent activities relating to horses in KNP: public and private meetings, phone calls, inspection tours, consultations and a three-day media excursion to document horse damage in the alpine area. The latter will form input to four half-hour programs on management issues in the Park to be screened by the ABC next year.

There is widespread agreement that horses must be excluded from the alpine area. Salt licks and trap yards are likely to be used before winter to try to trap and remove at least the bachelor group of up to 7 on the Ramshead Range. We doubt whether this

mechanism will achieve removal of the three horses that have made the headwaters of the Swampy Plains River - beyond Leather-barrel Creek Gorge - their home, but it's a start. Any trapped horses will need to be led out by riders on horseback.

How the feeder or re-supply areas south of the Alpine Way are to be managed is not at all clear at this stage, especially since the official policy is one of managing the impacts, not of eliminating the horses.

Meanwhile, no action is being taken regarding the mobs of horses around Cave Creek in the Northern part of the Park - an area that looked like an agistment paddock to Anne Reeves, President of the NSW National Parks Association, when she inspected it on 3 April 2001.

The build-up of horses in this northern area of the Park is resulting in reinfestation of Namadgi National Park via Murray's and Leura Gaps. The ACT Parks Service had courageously eliminated their wild horse problem some ten years ago - in the face of public controversy. Now there is a threat of recurrence of this problem.

Not only is no control action being undertaken in this part of the park, but a new facility for horse-riders is currently being constructed to the East of the Snowy Mountains Highway. Here, along an old, disused track following the former telephone line to Kiandra a new blue-metal road has been almost completed leading to a horse-camp that is characterised by:

- a huge fireplace and scar,
- a horse-float turning area,
- uncrushed grain used as horse-feed scattered over the ground,
- horse-tracks of varying depths and
- significant damage to creek-banks.

A large slab over a toilet excavation will soon bear a pit toilet.

This construction of new facilities is in line with the KNP - PLAN OF MANAGEMENT, 2ND EDITION - 1988. Here, under OUTDOOR RECREATION OPPORTUNITIES para 6.4.7 on horse riding reads, in part: "This plan recognises horse riding as an appropriate form of access to, and use of, parts of Kosciusko National Park ..."

The Plan continues in para #63568: "There will be some development and/or maintenance of appropriately located bridle tracks in some areas of the Park. Such tracks would only be

constructed, marked or maintained in a way that is consistent with the objectives of management of the management unit(s) concerned, and only in locations where they **are justified by existing or proven potential use.**"

However, para #63568 states: "Recreational horse riding **will be permitted throughout the Park, except** for all or parts of the following management units:

Kosciusko (A-I): (see section 1.3.1), Sawpit Creek (F-4): (see section 5.3.4), Lower Thredbo (F-S): (see section 5.3.4), Charlotte Pass Village (J-I): (see section 7.3.3), Thredbo (J-2): (see section 7.3.4)

Perisher Valley-Smiggin Holes (J-3) (see section 7.3.5), Guthega (J-4): (see section 7.3.6)

Blue Cow (J-6): (see section 7.3.8), Link Management Unit (J7): (see section 7.3.9)

All management units within wilderness management areas (see section 6.3)"

It follows, therefore, that the more the horse-riding fraternity use the park, the greater the number of facilities that management will be justified in constructing.

In summary, the official attitude to horses in KNP can only be characterised as schizophrenic. This will continue until such time as the Plan of Management is reviewed and totally excludes horses - since the damage that they do is inconsistent with the primary objective of the Park, namely the maintenance of its natural values.

After many years the planted pine inclusions within what became KNP are now in the process of being eliminated. Congratulations to the Park managers on that decision - one which is also controversial. A similar bold plan is needed in respect of horses in KNP.

Chilean Needle Grass Survey

Sarah Sharp

Many thanks to those of you who undertook surveys of Chilean Needle Grass this summer. I received 39 survey forms from sites throughout ACT. I also got records from David Eddy and Rainer Rehwinkel for any other sites in the region.

Using these data, together with that collected by Nicky Bruce, who undertook a detailed survey of all the Natural Temperate Grassland sites as well as several others, the following information can be summarised:

1. There were no records of Chilean Needle Grass from surveys undertaken on the Monaro.
2. Chilean Needle Grass has been found in NSW to the east, north and west of Canberra, but mostly at low abundance.
3. The highest abundance of Chilean Needle Grass is in the districts of Canberra Central, Canberra North, Canberra South and Belconnen. It is also present at generally lower abundance in the Jerrabomberra and Majura districts. It was in low abundance in several sites in Gungahlin, but many sites in Gungahlin that have recently been incorporated into the urban area do not (yet) contain the species. There was none in sites surveyed in Tuggeranong, Tidbinbilla or Namadgi districts.
4. It was more common and more abundant at sites within the urban area, but nevertheless, it was present in more than 50% of peri-urban and rural sites.
5. It is present in or closely adjacent to 85% of Natural Temperate Grassland sites. The only sites that did not contain Chilean Needle Grass were 'Kuringal' property; Mulanggari Reserve; North Mitchell; Kaleen East paddocks and Lake Isabella, Monash. There was also none on a property on Cotter Road, or along Tidbinbilla Road. Heavy infestations occur at CSIRO Corporate Offices, Campbell; Constitution Ave, Reid; Dudley St Yarralumla; Black St Yarralumla; Stirling Park foreshore (along road edge); St Mark's Theological College (around perimeter); York Park Barton; and HMAS Harman.
6. 70% of mown sites contain Chilean Needle Grass, generally with a moderate to high abundance. 53% of grazed sites contain Chilean Needle Grass, but generally with a lower abundance and 38% of the sites with no management contain Chilean Needle Grass, but again generally at a lower abundance. Vehicles appear to be a likely source of distribution (mowers, cars, trucks, tractors).
7. There was no apparent relationship with evident disturbance levels, except that where there was Chilean Needle Grass there were generally moderate to high levels of other weeds present.
8. Chilean Needle Grass was more abundant than the other three species

targeted in the survey in urban and peri-urban sites, whilst Serrated Tussock and St John's Wort were more abundant in rural sites.

Nicky Bruce in her report recommends the following:

- A careful review of current and past management practices to ensure that there is not continued indiscriminate spread of the species.
- Mowing equipment to be cleaned before entering and/or leaving sites.
- Restrictions on vehicle and stock access when Chilean Needle Grass is in seed.
- Provision of information on Chilean Needle Grass to a wide range of people involved in the management and use of the temperate grassland areas in the ACT.
- Eradication of isolated populations.
- Control of spread from heavily infested areas.
- Continued vigilance to ensure the species does not spread further, by encouraging reports of new outbreaks and monitoring the situation.

As you can see, the problem is very daunting. As an outcome, the Weeds Working Group is hoping to extend the surveys into other areas of conservation value, and to develop site specific management plans and guidelines to try and contain the species according to management regimes, incorporating Nicky's recommendations. The Weeds Working Group is going to apply for funding from NHT for the survey work and this will involve

support from community groups. There is also a program coordinated by Natural Resources and Environment in Victoria, with whom Environment ACT is liaising to ensure that relevant research results are incorporated in the ACT program.

The results from the survey will be invaluable for future monitoring, both in those sites where the species was found, and those sites where it was not found at this time. Your assistance is greatly appreciated, and may be called on again in future to undertake further surveys.

References:

Bruce, N. (2001) ACT Survey of Chilean Needle Grass (*Nassella neesiana*). An unpublished report prepared for Environment ACT.

Surveys undertaken for Environment ACT by community members.

GININI FLATS

Alan Ford

On a sunny Saturday 10 March, 13 members and friends set off for a day at Ginini Flats, just below the summit of Mt Ginini, south of the Bulls Head picnic area on the Mt Franklin Road, in the high Brindabellas.

We started by going down a short track through the snow gum forest to one of the swampy creeks that lead into the Ginini Flats wetland area and subsequently traversed the edge of the Flats. Apart from the ever present

Poa sp we found the Leafy Bossiaea (*Bossiaea foliosa*), a *Podolepis* and Elderberry *Panax* (*Polyscias sambucifolius*) on the track to say nothing of other *Pea* species. We also came across the Small fruit Hakea (*Hakea microcarpa*).

Unfortunately, as we traversed the edge of the Flats, we found evidence that the situation described by Ian Fraser and Margaret McJannett in *Above the Cotter* concerning damage by wild pigs in this area still applied. It was really noticeable in parts and another control program is needed.

The trees come to an abrupt halt at the bog line, probably because of a combination of frost hollow and boggy ground. The vegetation changes dramatically. In these areas, the spiky leaves of Candle Heath, (*Richea continentis*) merely add to the discomfort already caused by hordes of ants that swarmed from vegetation at the edge of the bog. The upright stems of Cord rush (what used to be *Restio australis*), a *Lycopodium* sp, and the little *Empodisma* sp, appear and mark out the change.

Sphagnum moss forms the base of this fragile alpine bog system, acting as a giant sponge. Thankfully, the area is protected as part of the Park and only possible climate change threatens its existence.

An unexpected sighting on the day was a Ring-tailed Possum that we disturbed during the afternoon.

HIDDEN NATIVE FLORA IN AUSTRALIA'S RANGELANDS

John K. Layton

(This article was first published in *The Canberra Times Panorama* magazine on 24 February 2001. We thank John Layton and Jacqui Stol (who are FOG members) for allowing us to reproduce it, and for their help with photos, etc.)

One hundred and sixty years ago Australian pastoralists began moving their flocks and herds to far-flung regions of the inland where rainfall is not generally adequate to support introduced pastures and crops. Nonetheless, native plant communities provided sufficient forage to enable grazing on enormous properties some of which cover hundreds of thousands of hectares. These areas became known as the Australian rangelands.

Jacqui Stol, a botanist at CSIRO Sustainable Ecosystems in Canberra, said, "When we say rangelands we are looking at vast areas – around two thirds of the continent. Although many Australians haven't visited the outback they may have heard of mulga and mallee country, spinifex and mitchell grasslands, saltbush and bluebush country as well as the Central Australian woodlands. These are the main examples of arid and semi-arid rangeland plant communities."

During the early 1990s, CSIRO researchers Jill Landsberg, Craig James and Steve Morton initiated a study to understand the impacts of grazing on native plants and animals throughout the rangelands. The proliferation of introduced watering points (tanks, dams and bores) also warranted investigation. How were the native flora and fauna responding to these new sources of water and the consequent pressures

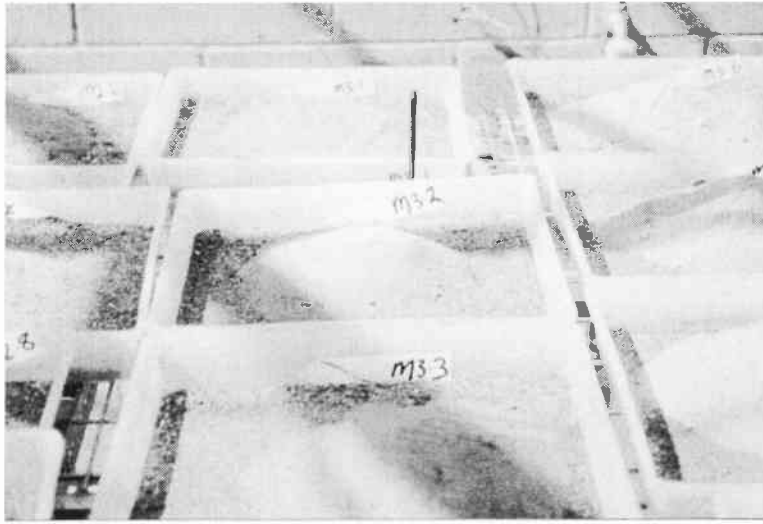
from livestock and predators that frequented the water? The impact of grazing and introduced pasture grasses has been evident throughout the temperate areas of south-eastern Australia.

"Here, on the southern tablelands, many of The challenge for the team was to get the hidden seeds to germinate and to grow the plants through their lifecycles.

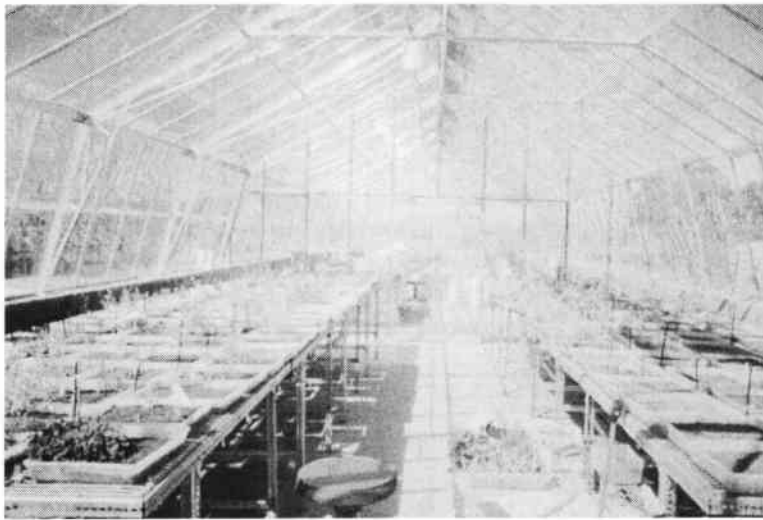
Stol says, "We spread the collected soil in seed trays one centimetre deep over a base-layer of sterilised potting mix and sand. We placed the trays in glasshouses where the temperatures were set to mimic typical warm and cool seasons. In cool seasons more forbs grow; in warmer seasons more grasses grow. We supplied plenty of water via a micro-spray irrigation system to mimic a good soaking rain and, because follow-up rain is very important, we kept the soils well watered but were careful not to over-water, because this could have caused fungus and disease to develop."

Within two days the rangelands soils began to sprout a profusion of plants which play a significant role in the lives of native fauna, livestock and people. Among the first plants to emerge were native grasses including Mulga Mitchell Grass (*Thyridolepis mitchelliana*), which the researchers nicknamed "Hairy Legs" because the grass blade has a leggy shape with a fringe of hairs along its margins. Woollybutt (*Eragrostis eriopoda*) followed hard on the heels of Hairy Legs.

Woollybutt grass sprouts from a densely woolly butt and produces immense quantities of seed after rain, which remain on the plant for months after ripening. Although the seeds



Above: Before



Above: Experimental site at Gungahlin



Above: After - a profusion of cool-season ephemerals

are the size of sand grains, Aborigines find them relatively easy to collect, winnow and grind. The flour, which is nutritionally equivalent to whole wheat, is baked into loaves. Woollybutt is a prime example of an important food plant for Aborigines and native fauna, and which is also valued by rangelands graziers. The dominant grass over extensive areas, its deep vigorous root system enables it to withstand dry conditions and stabilise soil and vegetation. It can persist relatively well under grazing and, like many native grasses, can increase following adequate summer rains. But, like many native plants, it is often difficult and slow to re-establish if grazed out.

The prostrate herb Common Pigweed (*Portulaca oleracea*) also came up quickly. Pigweed is cosmopolitan and often appears in Canberra gardens. The Central Australian species is a traditional staple food plant of local Aborigines. Small black seeds are produced in enormous quantities and are ground into a nutritious paste. Roots are cooked and eaten, and leaves and stems are used as an emergency food. European settlers used pigweed as a substitute for spinach and as a protection against scurvy. A few weeks before their deaths, the explorers Burke and Wills, ate "an abundance of Portulac [pigweed]" as Wills wrote in his diary. This herb may well have extended their lives for several days.

The fleshy herb parakeelya (*Calandrinia* spp.) also germinated. The young plants have very succulent leaves, similar to coastal pigface, and can seem out of place among red rangelands sands. Parakeelya bears attractive purple or pink flowers which last longer than those of most rangelands annuals because of the moisture

stored in the leaves and stems.

"Another quick germinator was New Zealand Spinach (*Tetragonia tetragonoides*), which is very common along the NSW South Coast," Stol says. "I found some last Christmas, on the Mollymook Beach headland, and we had a good munch of it." James Cook and botanist Joseph Banks also had a good munch of it when they found it growing along the shores of New Zealand in 1769. Cook was particularly interested as he was the first mariner to diligently supply his crews with fresh vegetables as a protection against scurvy. He thought so highly of the plant that, depending upon availability, it was served to his crew twice daily. A denizen of salty soils, New Zealand Spinach thrives on sheltered coasts, marshes, and throughout a range of Australian regions from the Nullarbor Plain to the Simpson Desert and the Queensland brigalow belt. Banks took seeds back to England and grew the plants in Kew Gardens in 1772. By the 19th century, New Zealand Spinach, also known as Botany Bay Greens, had become a popular summer vegetable in Britain and America. Although it fell from general favour rather quickly, the seeds can still be bought from specialist suppliers.

Somewhat surprisingly, Mulga (*Acacia aneura*) seedlings also sprouted from the soil samples. Mulga seeds have a hard coat typical of acacias and are usually immersed in hot water to induce germination. "Out west mulga can extend as the main tree species for thousands of kilometres," Stol says. "The mulga woodlands we surveyed in western New South Wales contain many of the same plants as the mulga areas we surveyed in Central Australia south of Alice Springs."

Mulga woodland contains a rich source of wild food. There are always a few trees bearing seed pods for several months, even during dry years. Aborigines roast the seeds and grind them to a paste which is as nutritious as peanut butter. The mulga lerp, a sap-sucking bug, often infests large areas of mulga. The lerps attack terminal branches which become covered in small red lumps and exude large quantities of honeydew. Aborigines suck the honeydew by drawing broken twigs through their mouths and soak branches in water to produce a sweet drink. Small green galls, called mulga apples, are gathered from the foliage. The galls are formed by the larva of a wasp and have a slightly sweet taste reminiscent of dried apple. The

white grub in the centre of the gall is said to be the sweetest part. During drought, mulga foliage has proved valuable as sheep and cattle feed.

A species of the sticky ground-hugging herb tar vine also emerged from the rangelands soils. Tar vine (*Boerhavia* spp.) sprouts from a starchy taproot and can be important summer forage for livestock. Central Australian Aborigines spread tendrils of some of the stickier species around water holes to capture small birds. The roots are eaten as an emergency food during dry seasons but a caterpillar, commonly found on the vine, is the more important food. The tar-vine caterpillar is the larva of a large hawkmoth and is about 5cm long. The caterpillars are gathered and stored for a day until ingested plant material has passed through them. Then they are winnowed to remove the dung before being cooked in a coolamon (shallow wooden dish) of hot ashes. Surplus cooked caterpillars keep well and can be stored for long periods. In the Alice Springs area the tar-vine caterpillar is known to the Aborigines as *yeperenye* and is an important totemic animal.

"We ran the germination trials for three months and the majority of plants germinated, grew, flowered and died off within that time," Stol says. "We needed to grow them through their life cycles as it is easy to misidentify plants, particularly grasses during their early stages, and spoil your data. Around 140 different species germinated and the important thing is that prior to our work there had been no real appreciation of how extensive the seed bank is in the rangelands. It would have taken 10 years of plant field surveys to get the same sort of results that we did from surveying the existing plants and getting the seed bank in the collected soil to germinate."

"Our plant surveys and germination trials revealed five new species and four that may be new but need more taxonomic work to determine their status. Five species were collected from well outside their previously known range and we identified another four which are so rare that little is known of their range."

The survey results indicate that although many native plants and animals seem to be compatible with current rangelands grazing practice there is a significant number of species which are particularly sensitive to grazing. These species are only found 8-12km from watering points. While this is beyond the normal grazing range from water for sheep

and cattle, a greater number of areas are now within about 5km from watering points, and it is suspected that many species are at risk and need to be focused on for conservation.

It is important for the long-term future of the outback that graziers respond to these findings. They must consider the impact of installing new watering points in areas inhabited by plants and animals which are unable to withstand pressures from livestock.

Government support and community awareness are essential for landholders to achieve effectual and viable results.

THE GREAT SALINITY DEBATE: PART I - Controlling the salinisation process

Christine Jones

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INTRODUCTION

Water is a great solvent, especially for salts, and most moving water carries a variety of dissolved salts to either an ocean, inland sea, or a salt lake. When water evaporates it leaves much of the salt behind, hence water bodies subject to salt inflows and evaporation become progressively saltier. The world's oceans are the result of a "natural" salinisation process which has been going on for millions of years. Soils are also subject to salinisation when soil water carries dissolved salts close to the surface and then evaporates, thereby concentrating the salt.

High loads of innate, connate and cyclic salts are characteristic of much of the Australian environment. Historical records indicate that there were saline scalds, brackish springs and brackish creeks in many parts of the landscape at the time of European settlement. However, the salinisation process in both rivers and on dry land has rapidly accelerated over the last 200 years. That is, the movement of salt has become more active due to changes in soil hydrology

(water balance) since European settlement. To this point we all agree. When it comes to **why**, and how to fix it, we enter the great salinity debate.

I believe that many incorrect assumptions have been made about dryland salinity, and therefore many ill-conceived and simplistic “solutions” have been proposed. So let’s start with what we know. Two hundred years ago, most of the areas currently affected by dryland salinity were open grassy woodlands (widely spaced trees with a grass/forb understorey), grasslands (no trees) or shrublands. Much confusion regarding this pre-European vegetation exists. Due to a complex of interacting factors including the loss of small ground foraging native fauna and changes to burning and grazing regimes, many grassy woodland areas in eastern, southern and south-western Australia experienced an increase in woody vegetation in the mid to late 1800s. Clearing of this “regrowth” was a widespread activity in the late 1800s and early 1900s, partly to re-open areas for grazing and partly coincident with the expansion of cropping enterprises and the development of a railway system. This resulted in a misleading emphasis on trees when people tried to recall the nature of the original vegetation. To assess the pre-European vegetation as accurately as possible, the diaries and other records made by explorers and early surveyors need to be consulted.

There is absolutely no doubt that an increase in dryland salinity is closely linked to the loss of perennial native vegetation – but I believe it is the “overlooked understorey” which has undergone the most dramatic changes. That isn’t to say that too many trees have not been removed from the landscape in some areas. However, in the majority of cases the reduction in soil health has been a function of declining organic carbon levels **BELOW** ground more so than above ground, due to

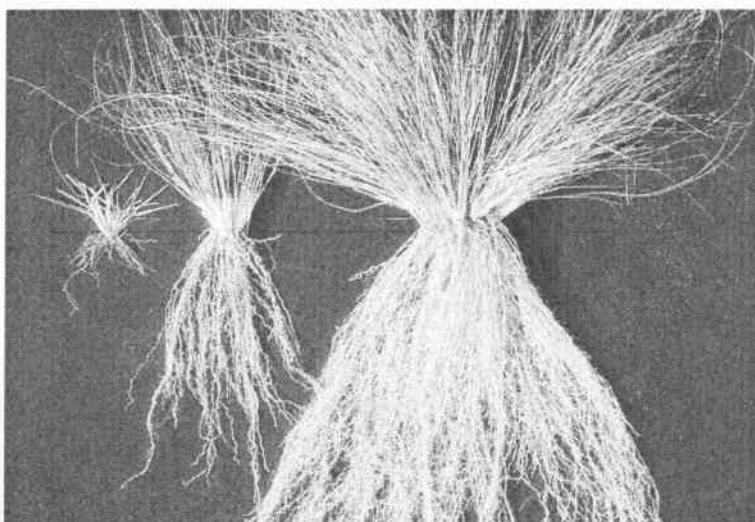
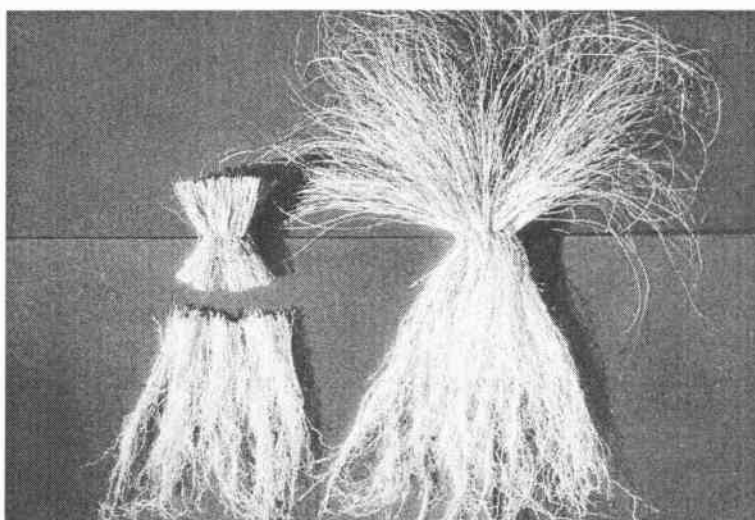


Fig. 1. ABOVE: The biomass of the roots and the tops of grasses are roughly equal, forming a mirror image. Short grasses (LHS) have small root systems.

Fig. 2. BELOW: When desirable grasses are rested (RHS) and then rapidly defoliated through pulsed grazing, the roots are effectively “pruned” within a few hours to equalise the biomass (LHS). The root pruning effect (LHS) is regenerative rather than degenerative.



the loss of perennial groundcover and the types of disturbance regimes which stimulate soil forming processes. The consequent reductions in root biomass, soil organic matter and surface litter on our agricultural land can be linked to many degradation processes including soil structural decline, nutrient decline, water repellence and increased soil acidity and sodicity.

Let’s put the other land degradation issues to one side for the moment and focus on the salinisation process. There are two important pieces of information provided in the publication entitled “Assessing the causes, impacts, costs and management of dryland

salinity” by Lin Martin and Jenni Metcalfe (LWRRDC Occasional Paper 20/98), which are worth repeating here:

- In a healthy catchment, salt is **slowly leached downward** and stored **below** the root zone.
- In some dryland areas – especially those with winter rainfall patterns – **recharge may have increased up to 100 times** since clearing [of native vegetation] and the introduction of [annual] crops or pastures.

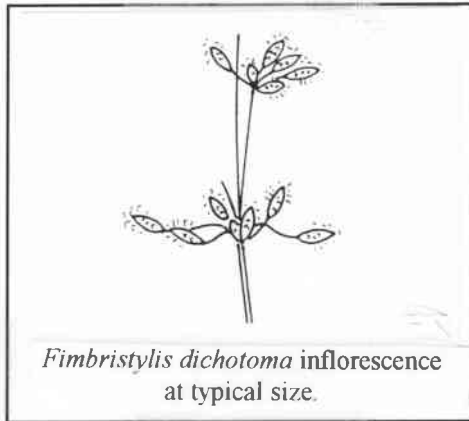
In other words we need a little bit of water going into deep drainage but not too much. If too much goes down it will come back up – with salt! Let’s go through that again. In order to reverse the salinisation process, water has to be flushed **downwards** in the soil profile to take salts below the root zone, while at the same time **not adding significantly** to groundwater recharge. A fine juggling act indeed! This is only possible in the presence of a permanent groundcover of plants which enhance the infiltration of rainfall, have fibrous root systems with a high water holding capacity but low water use (thus holding water in the root zone for both plants and soil biota) and which facilitate the very slow percolation of some rainfall to groundwater.

You guessed it! Perennial native grasses fit these requirements perfectly,

especially the tussock species which once inhabited many of the areas of Australia now plagued by accelerating dryland salinity. When grazed appropriately, a diverse stand of native tussock grasses (such as kangaroo grass, *Themeda australis*), inter-tussock grasses (such as microlaena, elymus) and forbs (such as native legumes, wild geranium, native plantain and wildflowers) can provide reliable year-round production and, if required, form an excellent base for direct-seeded grain or fodder crops. Crop production undertaken in conjunction with native groundcover has been shown to enhance, rather than compromise, both the

crop and the grassland.

I'm not ignoring the ecosystem function of trees. Apart from the areas which are natural grasslands, up to 30% cover of trees and shrubs in the landscape can be extremely beneficial both ecologically and economically. Scattered trees may also help contain



recharge. However, recent research has shown that plantation tree-lots, widely promoted as band-aids to utilise saline discharge water, often use the fresher water from the top 1–3 m of the soil, leading to an upward movement of the saltier groundwater from below, and slowed tree growth rates. That is, the movement of groundwater upwards becomes self-defeating. If you're relying on trees alone to **solve** your salinity problems, you'll be waiting a long time.

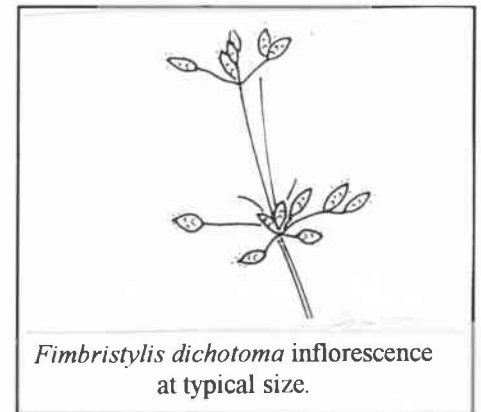
It surprises many people to discover that both root mass and microbial biomass can be much higher in a healthy perennial grassland soil than in a healthy sclerophyll forest soil. For a grassland to be healthy, however, requires

much more than just the presence of grassland species. The biomass of the tops and the roots of grasses are roughly equal, forming a mirror image (Fig.1). Short grasses have short roots (Fig.1, LHS). Vigorous grasses have vigorous roots (Fig.1, RHS). The energy for root growth and metabolism can only come from sunlight trapped by the leaves during photosynthesis. A small leaf area cannot possibly support a large root system.

In addition to increased soil water holding capacity and reduced groundwater recharge, large, fibrous root systems provide a multiplicity of other benefits including erosion control, soil aeration, habitat, and a continuous food supply for soil biota. The compromised root system of overgrazed or overrested plants cannot perform those functions very well. If there are no permanent roots in the soil at all, a whole suite of soil degradation problems will ensue, including soil structural decline and nutrient loss, and of course, in areas prone to salinisation, dryland salinity.

When perennial grasses are provided with an appropriate rest period (Fig. 2, RHS) and then defoliated in a single grazing event (using high stock densities such as in pulsed grazing), a large proportion of roots cease respiring and die in order to equalise the top and root biomass. These "pruned roots" provide an extremely important source of organic matter which improves the physical, chemical and biological attributes of the soil, including soil water holding capacity (more on this in Part III). The "pulsed" root pruning effect (Fig. 2, LHS) is therefore regenerative rather than degenerative. In the context of controlling recharge, the large volume of fibrous roots

added to the soil system with each grazing pulse is invaluable (Fig. 2, LHS). This is a difficult concept for many people to grasp, because conventionally grazed grasses and annual grasses have shallow root systems



which allow excessive leakage of rainfall to groundwater.

It is fundamentally important that perennial grasses be rested prior to the next graze, to rebuild new root systems. If conditions are favourable, leaf regrowth will begin within hours of removal. However, re-grazing in the sensitive early stages will severely deplete plant reserves, resulting in either death or the formation of a steady-state type of equilibrium, where both tops and roots remain restricted in size, such as is found with mown turf and continuously grazed grassland.

Continuous grazing, that is, continuous root pruning, is a degenerative process. When pastures look like bowling greens, not only is the water cycle completely out of balance, but natural nutrient cycles can't function,

Grassland Beyond the Reserve Workshop Proceedings Now Available!

Cost, including postage, \$10

The 80 page workshop proceedings are available. They contain a wealth of information and come highly recommended for anyone interested in grassy ecosystem conservation and management. For example:

- For ACT residents, Sarah Sharp's paper is a must-read for an up-to-date understanding of the ACT Government's active grassland management program.
- FOG's paper provides a good

understanding of what is happening in grassland conservation and describes its approaches, experiences and successes.

- NSW Government agencies, NPWS and DLWC, are major players in grassy ecosystem conservation and their papers put their work into perspective.
- Experiences in Victoria, South Australia, and Western Riverina provide valuable insights into approaches being tried elsewhere.
- The three case studies illustrate how farmers, Local Government, and Rural Lands Protection Boards see their role.

The presentation by the NSW Farmers Association and the opening address illustrate how farming and conservation values interact.

- There is ample information on what financial and other assistance is available.

To order your copy send payment and your address details to Friends of Grasslands Inc. PO Box 987, Civic Square ACT 2608. For inquiries contact margaretning@primus.com.au or 02 6241 4065

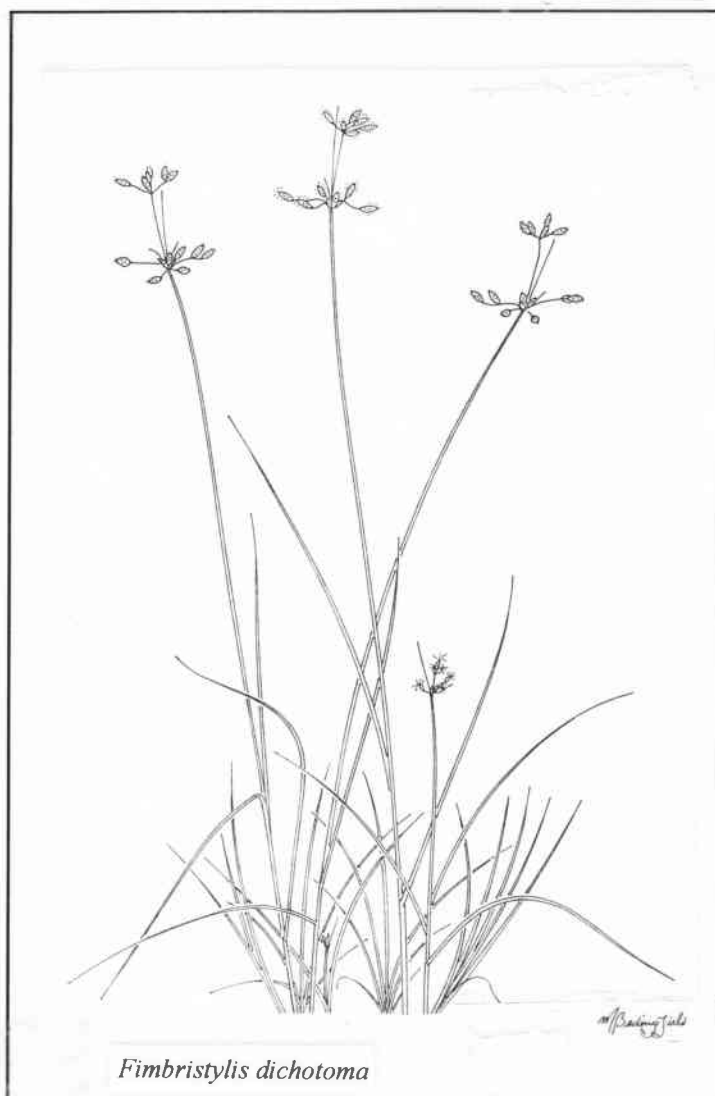
plants are extremely vulnerable during droughts, and the low level of groundcover encourages weed invasion, erosion, and off-site impacts such as sedimentation and salinisation of dams and rivers. These degenerative processes also occur where the pasture base is annual, because groundcover and root biomass are not permanent. The severe nature of soil degradation, including salinisation, in the areas of southern and western Australia where annual crops, grasses and weeds have replaced perennial vegetation, bears witness to this. When there is no groundcover in the landscape at all (e.g. bare crop fallows) need I go on? A special message for those croppers who have neither perennial groundcover nor livestock – think carefully about where you're headed in the next decade or so!

Like all ecosystem processes, salinisation is something we can control, provided we understand it. Reversing salinisation isn't easy, but we know it can be done. My key message is that bare ground, annual crops and pastures, and continuously grazed perennial pastures (in decreasing order) result in excessive groundwater recharge. High water use plants such as trees can be useful for lowering water tables, but the downside to high water-users is that they concentrate salt in the root zone. Let's start treating causes rather than applying band-aids to symptoms.

Plants with root systems which are "water-holders and slow drippers" are required. **The inescapable solution for many of our agricultural areas is a permanent cover of fibrous-rooted, native perennial grasses**, either as part of a diverse sward for grazing, or as a productive base for a multiplicity of other land use systems including cropping, horticulture, viticulture and alley-farmed

silviculture. Because native grass roots hold water in the root zone, but the plants are themselves water-use efficient, other plants can be profitably grown in a native pasture base. Native trees and shrubs can also form a valuable component of the vegetation in areas which were originally grassy woodlands, for ecological, economic and aesthetic reasons, albeit ineffective for controlling the "root causes" of salinity.

Whatever your enterprise choice, think carefully about what's stopping YOU from



Fimbristylis dichotoma

controlling the salinisation process on your property. Remember, there are NO EXCUSES for bare ground outside the arid zone.

Part II Why the recharge-discharge model is fundamentally flawed

Part III Soil organic matter: past lessons for future learning

Part IV Understanding soil building processes

Part V Balanced soil, balanced water

Acknowledgments: The ideas presented here result from discussions with many people. In particular, I'd like to thank Darryl Cluff for helping me overcome my blinkered view of the nature of the pre-European vegetation and for supplying valuable reference materials. Special thanks also to Colin Seis who has been involved in salinity investigations on his own property "Winona" for well over a decade, and brought my attention to the "sponge-like" effect of C4 native grass roots in the soil. Fundamental to my view of ecosystem processes has been the visionary thinking of Allan Savory.



A SEDGE OF GRASSY ECOSYSTEMS - *Fimbristylis dichotoma*

Michael Bedingfield

The *Fimbristylis dichotoma* is a small sedge from the large family Cyperaceae. It is usually about 20 cm tall, but can grow to 40 cm in favourable conditions. It is considered to be a rare plant locally and has been described as "uncommon or declining" in ACT grasslands (see article on significant species in FOG's newsletter for Jan-Feb.)

This plant occurs in both wet and dry situations. It has grass-like leaves but its attractive reddish-brown flower heads with a distinctive shape make it easy to identify among the grasses.

The stem with the flower heads present is called an *inflorescence*. On the ends of the small branches at the top are oval shaped objects called *spikelets*. The spikelets contain many tiny flowers called *florets*. These tiny florets are fascinating to see and are best looked at through a hand lens. They appear as delicate white filaments coming out of the spikelets, turning yellowish as they dry out. Later, minute seeds are formed within the spikelet.

The adjacent drawing of the complete plant

is shown at 50% of the typical size, with the inflorescence shown at a full size elsewhere in the newsletter.

Fimbristylis dichotoma, one of the sedges, which are an integral and interesting part of the amazing variety of plants that are part of a grassy ecosystem.

NEW BOOK - SAVING RARE PLANTS AND ANIMALS

New clues to help save rare plants and animals are revealed in a book to be launched by Dr Sharman Stone MP, Parliamentary Secretary to the Minister for Environment and Heritage, tomorrow at CSIRO Discovery in Canberra.

Genetics, Demography and Viability of Fragmented Populations brings together research from across the world on the genetic and ecological threats limiting the survival prospects of plants and animals living in small isolated populations.

"The book provides both theory and examples of attempts to understand the genetic and ecological processes underlying extinction," says Dr Geoff Clarke of CSIRO Entomology.

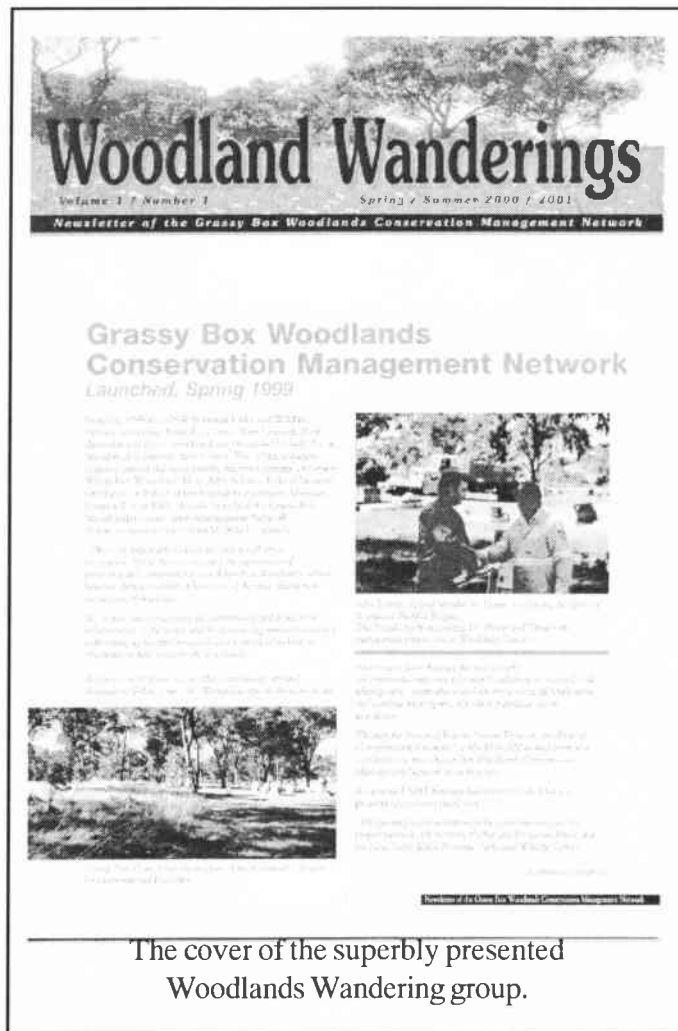
"It is only by understanding how these processes work and interact that we can hope to slow down and hopefully prevent further extinction."

About one in four Australian native plants and animals are considered rare or endangered and many only persist in small fragmented populations as their original habitat has been so widely destroyed.

A case study taken from the book looks at the Button Wrinklewort, a small native daisy that occurs around Canberra and NSW. Now endangered owing to grassland clearing the Button Wrinklewort is often restricted to patches of less than 200 plants.

"Populations of this size have some serious problems in maintaining genetic diversity," says Dr Andrew Young of CSIRO Plant Industry.

"Even over the short term these small populations are in grave danger of



disappearing. The individual plants are so genetically similar that their ability to evolve and adapt to threats is very limited."

It is therefore important that when considering the conservation of a species the conservation of its genetic diversity is considered.

In the case of the small Button Wrinklewort populations, if left alone, their genetic diversity and viability will deteriorate to a point the populations may disappear. If this happens in all the small populations it may lead to the extinction of the entire species.

Co-edited by Dr Young and Dr Clarke, Genetics, Demography and Viability of Fragmented Populations details genetic and ecological research into a range of plant and animal case studies from across the world.

Each case study addresses the changing genetic and demographic features of the plants and animals when restricted to fragmented habitats. And, importantly, the affect this has on their long term viability as a species.

The book will be most useful for people trying to conserve and manage species occurring in fragmented populations as it discusses possible management options.

"It is a timely reminder of how important it is for us to research and understand other species to determine the most effective way to protect them," says Dr Young.

Newsletters received

Stipa newsletter announces that their 2001 conference will be held on 27-28 September in north eastern Victoria, and will have three themes: conservation, grazing and water use. The newsletter also has an article on the work of the Department of Land and Water Conservation Cowra Research Centre, on weed control in native grass crops for seed production purposes.

Life Lines (Community Biodiversity Network) reports that the Australian and New Zealand Environment and Conservation Council has prepared a draft national approach to firewood collection and use in Australia, for public comment. CSIRO did some research on firewood collection, and reported that inland forests and woodlands in lower rainfall zones appear to be the ecological communities most threatened by firewood collection. About half of domestic firewood is collected by consumers, and 84% is collected on private property. The most commonly burnt trees are river red gum, jarrah, red box, yellow box and ironbark. We don't know the rate of accumulation of fallen timber for different species, the amount of wood required to retain woodland species, or what is a sustainable rate at which to harvest timber.

A number of NSW ecological communities have been recommended for listing under the NSW Threatened Species Conservation Act, 1995, including ribbon gum-mountain gum-snow gum open forest - tall open forest with a grassy understorey on basalt on the Northern Tablelands, *Stipa aristiglumis* grasslands of the Liverpool Plains, Bega dry grass forest and Candelo dry grass forest.

Don't forget that you can contact Margaret if you want to have a look at any of the newsletters discussed in this column.

FRIENDS OF GRASSLANDS INC*Supporting native grassy ecosystems***Address: PO Box 987, Civic Square ACT 2608**Web address: http://www.geocities.com/fog_act**Your committee:**

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Membership inquiries: Please contact Margaret Ning whose details appear above.

**FRIENDS OF GRASSLANDS
NEWSLETTER**

You have read this far, so we must have kept your interest. If you are not a member of Friends of Grasslands why not subscribe to the newsletter? It comes out six times a year and contains a lot of information on native grassland issues.

You can get the newsletter by joining Friends of Grasslands. You do not need to be an active member - some who join often have many commitments and only wish to receive the newsletter.

However, if you own or lease a property, are a member of a landcare group, or actively interested in grassland conservation or revegetation, we hope we have something to offer you. We may assist by visiting sites

and identifying native species and harmful weeds. We can suggest conservation and revegetation goals as well as management options, help document the site, and sometimes support applications for assistance, etc.

Of course you may wish to increase your own understanding of grasslands, plant identification, etc. and so take a more active interest in our activities. Most activities are free and we also try to arrange transport (or car pool) to activities.

If you are already a member, why not encourage friends to join, or make a gift of membership to someone else? We will also send a complimentary newsletter to anyone who wants to know more about us.

**HOW TO JOIN
FRIENDS OF GRASSLANDS**

Send us details of your name, address, telephone, fax, and e-mail, etc. You might also indicate your interests in grassland issues. Membership is \$20 for an individual or family; \$5 for students, unemployed or pensioners; and \$50 for corporations or organisations - the latter can request two newsletters be sent. Please make cheques payable to Friends of Grasslands Inc.

If you would like any further information about membership please contact Margaret Ning, or if you would like to discuss FOG issues contact Geoff Robertson. Contact details are given in the box above.

We look forward to hearing from you.

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