

# News of Friends of Grasslands

Supporting native grassy ecosystems

May-June 2002



## MAY-JUNE 2002 PROGRAM & BEYOND

### Saturday 11 May, 10am - Old Cooma Common sign erection

We'll check/verify that gates are in place and locked, erect reserve signs and hopefully do some follow-up control of Briar and Hawthorn by cut and paint method. Maybe also some back-pack spraying of new suckers/germinants, and generally putting Margaret's new equipment through its paces. We'll have lunch and a yarn and enjoy the occasion! Please inundate Margaret with offers to join us for this activity.

### 24-26 May - FOG Trip to New England

Wal Whalley will show FOG the grasslands and grassy woodlands of New England over a Friday, Saturday and Sunday. The broad plan is to hold a discussion/workshop on the Friday morning on what is happening in New England, the Southern Tablelands and elsewhere. On Friday afternoon we attend the launching of *Grasses of New South Wales* by D.J.B. Wheeler, S.W.L. Jacobs and R.D.B. Whalley, 3rd Edition. On Saturday and Sunday we will visit a number of grassland sites. The key sites would be on Saturday so that they can be promoted locally. We will fit in a BBQ somewhere.



Learning from a landscape walk workshop: the sun shines on leader David Tongway. Photo by Jean Geue

Wal tells us that *Grasses of New South Wales* is still black and white with the same distinctive cover and lots of line drawings. Introductory material and nomenclature are updated, species descriptions added and Glossary expanded and improved. It has a more compact font and 446 pages (313 previously). For durability as a field guide, it has laminated covers and wire loop binding. Anticipated cost is around \$30.

Wal says there are several places on campus and in Armidale and others on private property or TSRs close to town that are worth looking at. He hopes that Surrey Jacobs, Jeremy Bruhl and Dorothy Wheeler may join us for some of the field trips, together with some post-graduate and ex-post-graduate students.

We are looking for accommodation at the cheaper end of the market with possibly cooking facilities to keep costs down. We plan to travel there and back by car which will take a full day either side of the above dates, but plane travel may be more appropriate for some. If interested contact Margaret on 6241 4065 asap.

**Saturday 1 June - Insects and Southern Tablelands Grasslands**, at Mugga Mugga Educational Centre. This one-day workshop (9am to 4pm) is presented by entomologists and FOG mem-

bers, Roger Farrow, Kim Pullen and Ted Edwards. It will unravel the cryptic lives and role of insects in the functioning of grassland ecosystems and the threats to their survival. Insects are the dominant invertebrate group of all terrestrial ecosystems, including the native grasslands. They are both taxonomically and functionally diverse in the grasslands and include a range of herbivores, fungivores, saprophytes, parasitoids and predators from a range of different taxonomic groups and can be found in both the plant canopy, on the ground surface in the litter/soil interface (epigeal insects) and below ground in the soil. Learning something of their identification, ecological roles and distribution and numbers can assist in understanding the functioning of natural ecosystems. Methods of sampling and identifying insects and allied invertebrates and assessing their significance to the conservation status

of local regional grasslands will be explored. Mugga Mugga is located off Narrabundah Drive, Symonston - the gate to Mugga Mugga is opposite the Therapeutic Goods Administration Building. There is a charge of \$6 to cover hall hire and catering. We will provide tea, coffee, cordial and the makings of sandwiches for lunch. **Please register by 24 May.** If you have insect specimens you wish identified, please bring them along. To collect and store specimens, capture the animal

and store it in a plastic vial in the freezer or in a vial of 70% ethyl alcohol. **For inquiries, registration and payment contact Susan Winder:** 6251 6373 (home), 0401 303 625 (mobile), or [susan.winder@ca.gov.au](mailto:susan.winder@ca.gov.au).

**Saturday July 27, 2pm - ACT grassland sites** This year the annual FOG outing to sites in the Grassland Action Plan will be to Sites 36 and 37. We are to meet at 2pm at the southern end of Jerabomberra Ave, just before the end of the Avenue, outside the entrance to Callum Brae. We will spend 60 to 90 minutes there before going to Woden, which is on the Monaro Highway, directly to the south of Callum Brae. There will be a short drive between the properties.

**Late August - grassy ecosystem reptiles** Ric Longmore of the ACT Herpetological Association.

**21-22 September - South Coast trip** Let's see what those coastal headland grasslands look like at the end of September.

**October - Cootamundra/Tumut visits**

**Saturday 26 October** - visit a top grassy woodland at Gundaroo.

**November** - Tinderries walk and a grassland on the way.

**December** - Smokers Flat in Namadgi NP.

## NEWS ROUNDUP

**A landscape walk***Goundcover reporter*

The FOG workshop, *Reading the Landscape: Learning from a Landscape Walk*, held at Garuwanga 6-7 April was acclaimed by all eighteen participants. By early afternoon Sunday, people were generally feeling confident that they had mastered the essentials of the conceptual and interpretational frameworks and field methodology associated with landscape functional analysis (LFA). Meanwhile, David Tongway, author of the LFA and the course presenter, still showing boundless energy, was about to head off to Western Australia to present another LFA course. Participants were left in awe of someone who with discipline, humour, skill, and a teaching facility, had changed their way of looking at grassy ecosystems.

The conceptual framework is best understood by doing and interpreting. The measurement is based upon a two-stage process. Stage one involves taking several representative transects at a site, and along each transect identifying a series of zones, which may be bare soil, vegetation and/or other obstructions. Where a transect runs across different vegetation patches, changes in the vegetation pattern mark the beginning and end of zones. Zones are classified so that like-zones are categorised together. One then takes several sample sites within each zone category.

In phase two, eleven measurements of each sample site are taken. Some measures in turn are multi-dimensional. They include: rainsplash protection, vegetation cover, litter cover, cryptogam (bacteria, lichen and moss) cover, crust brokenness, surface smoothness, soil ability to retain water, type of soil erosion, presence of deposited material, stability of soil when wetted, and soil texture.

The results of these indicators are fed into specially designed software, which produces three measures: stability, infiltration and nutrient cycling. Much science lies behind these indicators. David used the results that the workshop had gathered to explain what the overall indicators meant. He stressed that indicators are aids to interpretation and not end measures in themselves. He illustrated how the indicators can be used either for benchmarking different types of sites and/or undertaking monitoring in the forms of time series analysis, especially to understand the recovery of a system after disturbance or revegetation.

Particularly important is to assess whether systems are either robust or fragile, or sites are in a relatively poor or good condition.

The question for FOG participants is how we might use and interpret LFA in assessing grassy ecosystem sites. A number of suggestions were made which will be followed-up once we have had more time to assimilate what was learnt.

On the Saturday evening, Janet Koop, a new FOG member who is winding up her PhD studies, enlightened us on her work in reading patterns in the soil surface. We encourage FOG members to take the opportunity to hear from David and Janet whenever the opportunity arises.

**In this issue:**

- Australian grasslands: their status and future for grazing, part 1
- Bega Valley grassy veg survey
- Outback jewels - chances are it's a grasshopper
- What to do with all that data.
- Florabank

**FOG in a Swamp...***Alan Ford*

and in a rainforest on Saturday 2 March. On the way down Fastigata Road, adjacent to Brown Mountain, Jackie Miles stopped to show us a little remnant rainforest which follows a creek down the escarpment. *Sassafras* and a *Pittosporum* stand out in my memory as examples of the vegetation that set this refugium apart from the surrounding forest.

This was a brief interlude on our way to Bega Swamp. Geoff Hope kindly provided notes for our visit. The Swamp is a valley fill shrub bog ('bog' is the right word!) at about 1080 metres altitude on the crest of the eastern escarpment. The bog occupies an elongated north-south valley on a heavily forested granitic plateau. The major part of the swamp is dominated by the rushes *Empodisma* and *Baloskion* (it is really dominated by leeches!!) with scattered sedges and epacridaceous and myrtaceous shrubs. Woolly Teatree (*Leptospermum lanigerum*) is dominant in some places and very, very thick. A mosaic of communities is present with a fairly homogeneous restoration grassland, some low shrublands and small areas of *Sphagnum* hummocks at the interface of dryland and swamp.

During the course of the day we found about a dozen leek orchids (*Prasophyllum*

*wilkinsoniorum*) a very large Greenhood (*Pterostylis* sp) and a daisy that we usually associate with the alpine areas - it will probably become *Celmisia pulchella*. Unlike the large areas of *Celmisia* that we are used to seeing in alpine grasslands, this was found as scattered individual plants. A range of plants was present, including the Ladies Tresses orchid (*Spiranthes sinensis*) and Fairies Aprons (*Utricularia dichotoma*), which you would expect to see in these areas.

There were also jumping ants and numerous examples of an alpine grasshopper (*Monistria* sp), to say nothing of the evidence of horses that are clearly in the vicinity. Our thanks to Jackie Miles, Geoff Hope and Kim Pullen for advice during the day.

**ACT budget submission**

On 6 March, FOG made a submission to the Planning and Environment Committee of the ACT Legislative Assembly seeking funding in the 2002-3 Budget for two important initiatives. The first is the creation of a long-term strategic plan for nature conservation in the ACT which would draw together work on threatened species and communities, biodiversity, catchment management, and management of Canberra nature reserves, Canberra Nature Park and Open Spaces. The second is the establishment of a small unit to develop the strategies and practical skills required for restoring natural vegetation in the ACT. A component of the second task would be to plan a low cost regional botanic garden focusing on ground storey plants from the region. These tasks would lay the foundation for nature conservation planning in future. A copy of the submission can be obtained from Geoff Robertson.

**Funding for ACT rural leases***Jean Geue*

Canberra Times (article by Leesha Furse, 7 February) recorded \$100,000 was given to ten ACT rural lessees under the Rural Conservation Fund funded by the ACT Government and the Natural Heritage Trust and administered by Greening Australia. These funds are available to lessees who have signed a 99 years lease and a Land Management Agreement. The grants will help protect vegetation, waterways and wildlife habitat on their properties. Urban Services Minister Bill Wood said the grants recognise the good work farmers are doing in conserving the biodiversity of the ACT. The largest grant (\$34,000) was given to

Anne Stewart and Janice Furth, from near Point Hut Crossing, to protect and rehabilitate Freshwater Creek and nearby woodland. Ms Stewart said the grant would be used to build on conservation works already completed, and to further advance their goal for an ecologically sustainable rural enterprise. Five grants went towards fencing and revegetating parts of Paddys River, Geales Creek, Bulga Creek, Belconnen Creek and two sections of Naas River.

### Problems with tree planting

Many grassy ecologists are increasingly focusing on restoration of grassy ecosystems but believe that appropriate scientifically-based protocols need to be developed and many past revegetation practices stopped. Others are raising similar concerns.

A recent Radio National Interview with Patricia Murray 1 December 2001 has been brewing up a storm on publicly funded tree-planting schemes. Patricia Murray, from Greening Australia, was employed by the Kyeamba Landcare Group as a project manager to monitor and review tree plantings in the Kyeamba Valley, near Wagga Wagga, that have occurred over the last decade, from the perspective of ground water and salinity control and biodiversity.

In the interview she raised a number of concerns. For a start she found it was difficult to find where plantings had occurred because of poor records and lack of maps. No record was kept of what tree and shrub species had been planted or their quantity. Therefore it was impossible to determine the survival rate of individual species. Although there were records of recommended plant lists, this does not mean those species were available at the time of planting. Issues such as patch size, biodiversity and connectivity were largely ignored, but ten years ago these issues were not goals for plantings in the Kyeamba Valley. However, these issues are now on the agenda and should be considered when future revegetation is being planned for both biodiversity and land degradation.

She asked whether we are getting value for money, given the cost of fencing and planting. Between 1998 and 2001 it is estimated that \$4.2m was put into conservation works in the Kyeamba Valley, of which \$1.6m came from the Natural Heritage Trust. Not all of the money went into revegetation. However, for all the effort expended within Kyeamba Valley in revegetating 400 patches, it has only resulted in 600 hectares being revegetated. She believes that it is important to have base information on where and what ground works have been done, especially as we are facing a new round of public funding. A better reporting and planning protocol would address the collection and

habitat woodland and migrate from northern Australia to the south east of the continent. This group includes some cuckoos, Dollarbird, Rufous Whistler and maybe others. Philip suggests that habitat loss in the area mostly north of Canberra may be a significant factor in these declines. Local factors also contribute to the decline. Many species only occur at sites that are close to woodland reserves. Some species disappear quickly as the suburbs spread into woodland areas. These include Brown Tree-creeper, Speckled Warbler, Southern Whiteface, Jacky Winter, Hooded Robin, Yellow Robin and Diamond Firetail. While raptors are observed in the suburbs, they need the nearby bush for breeding.



Learning from a landscape walk workshop: measuring up. Photo by Jean Geue

storage of base information about on-ground works which is needed for future monitoring. In her view, it is important to know whether we are getting it right.

### Canberra bird trends

Philip Veerman, Coordinator of the Canberra Bird Survey highlighted some interesting trends in Canberra birds in the Spring 2001 issue of *Life Lines*, the Bulletin of the Community Biodiversity Network. The survey has been running since 1981 and has recorded between 130 and 147 species a year, with 100 of those bird species turning up every year. Two hundred bird species have turned up in total over the eighteen years.

Many common birds have sustainable populations. All of the larger parrots have increased significantly, but one small resident species, the Red-rumped Parrot, appears to be in marked decline. Several "common species" that are in decline in-

The Common Mynah has drastically increased. These he speculates may be the cause of the decline in Starlings, House Sparrows and the Red-rumped Parrot. Other species that have increased dramatically include the Crested Pigeon (repeating the performance of the Galah some years ago), Superb Fairywren, White-browed Scrubwren, Brown Thornbill, Eastern Spinebill, Golden Whistler, Rose Robin and Satin Bowerbird. Many of these benefit from the maturing of Canberra native gardens which provide suitable habitat.

The Pied Currawong has now taken up permanent residence in Canberra and may be a cause of the decline of successful breeding in many species, including the Laughing Kookaburra which has markedly declined.

### Practical restoration

Geoff Robertson

FOG is becoming increasingly interested in restoration, so when Rainer Rehwinkel said he had been invited to see a practical example of re-introduction of the threatened Button Wrinklewort I jumped at the chance to join him. Margaret Howitt from Friends of Hughes Buffer Area and Open Spaces (a landcare group) showed both of us various things she and the landcare group had been trialing in Hughes.

We saw several clumps of Button Wrinklewort. She had gained permission to collect seed from the Red Hill population which she then raised and planted. These were in full flower when we visited on 2 April, thanks to Canberra's heavy late summer rains. A few self-sown plants were also in evidence. She also showed us a

number of other introductions - all from nearby seed sources. For those who want to rid yourselves of *Paspalum*, Margaret took us to a spot where a dense sward of *Paspalum* had been sprayed out and replanted with Kangaroo and Wallaby Grasses. These were thriving, and no *Paspalum* was in evidence. Margaret was also proud of areas of *Microlaena*, which with encouragement, had extended its range. The site had minor infestations of African Love Grass, Chilean Needlegrass and Serrated Tussock. These were being controlled with spot spraying.

Most of this work took place on the large site behind Margaret's house. The site held remnants of Yellow Box - Blakely's Red Gum Grassy Woodland. There was a reasonable amount of native tree regeneration. Rainer, as is his wont, made up a reasonably impressive plant list. However, the site appears to fall outside the scope of Action Plan 10, due largely, no doubt, to the many planted non-indigenous trees, the most troublesome being River Peppermint and Cootamundra Wattles, which were recruiting vigorously. In fact, seedlings from the River Peppermints are so dense that they are competing with the native vegetation. This would be an excellent area where more rigorous weeding of non-indigenous woody species would be highly appropriate.

The Hughes Buffer Area and Open Spaces site holds many instructive lessons for those wanting to restore our bushland remnants. Margaret and her team are to be congratulated for their enthusiasm, and a job well done!

### Visit to Callum Brae

*Rosemary Blemings*

Canberra Ornithologists' Group, 3 March, visited the Yellow-Box Red Gum Grassy Woodland at Callum Brae. Some of the plans put forward to place the ACT prison at Symonston would have encroached on this site. Like East O'Malley, it has special interest as habitat for declining bird species. Abundant and interesting birds did not reveal themselves for over an hour, but by this time a few of us were rejoicing in the forbs and grasses that were evident. The early February rains had encouraged renewed greening and flowering. *Chryscephalum*, *Goodenia*, *Plantago*, *Hypericum*, *Tricoryne*, *Hydrocotyle*, *Wahlenbergia*, *Cheilanthes*, *Cymbonotus*, *Vittadinia*, *Desmodium* and *Glycine* were among the names hastily scrawled into notebooks by 'P' plated observers. Over forty bird species were sighted including Brown Tree-creeper (regarded as threatened in ACT and NSW), Diamond Firetail and Speckled

Warbler (being listed in NSW as threatened), Rufous Songlarks, Triller, Sacred Kingfisher, Butcherbird, Dusky Woodswallow and Horsfield's Bronze Cuckoo. FOG has scheduled a field trip in July to this private property more to look at the grassland end, home of the Grassland Earless Dragon.

### Wangaratta Common

*Grasscover Reporter*

Trolling through some Australian Plant Society/Society for Growing Australian Plants newsletters, I came across a piece by Ray Purches on the Wangaratta Common Grassland Reserve (*Growing Australia* 2001). The reserve consists of 45ha of Northern Plains Grassy Woodland and 30ha of Red Gum Woodland. The site contains a long list of exciting wildflowers. The reserve resulted from local lobbyists getting State Government agreement in 1995 to recognise 'a Significant Native Grassland Community'. However an area of 5ha was omitted, 3ha of which is quality intact grassland, and local environmentalists are still trying to save this area. Patrick Ward, who has taken over from Ray, is the Botanic Guardian of the Reserve and described to me some of the plants and the unusual Gilgae formation found in the grassland section of the site. He has promised FOG he will compile a list of good grassy sites to visit in the area, and would welcome any FOG visitors.

### Living with dragons

The November 2001 issue of the Hub, published by Canberra Airport, reported that the Airport is planning to develop and implement a Conservation Management Plan to enhance the protection of Grassland Earless Dragons living within its boundaries. The article throws a little more light on the removal of the eight dragons from the airport late last year, also see our September-October 2001 issue. We hope to hear more as the Conservation Management Plans develop.

### Gungahlin catches up

It is reported that Gungahlin is catching up with the rest of Canberra with large areas of Ngunnawal now having strong infestations of African Lovegrass, not previously present. Also of interest are large areas of roadside north of the Gungahlin Town Centre with healthy populations of Wallaby Grass.

### Learning more about grassland ecology

At the latest committee meeting it was suggested that we should encourage FOG members, many of whom have web access,

to subscribe to various on-line products which provide useful information on grassy ecology.

As a start Sue Winder put the following together on **Grassecol**, which is a mailing list for people involved in conservation, management and research on temperate, native grasslands and grassy woodlands in southern Australia. To subscribe, send the following to [majordomo@life.csu.edu.au](mailto:majordomo@life.csu.edu.au)

"subscribe grassecol [your email address]  
end".

To unsubscribe, send the following message to [majordomo@life.csu.edu.au](mailto:majordomo@life.csu.edu.au)

"unsubscribe grassecol [your email address]  
end."

To send a message to everyone on the list, send message to [grassecol@life.csu.edu.au](mailto:grassecol@life.csu.edu.au)

Ros Wallace provided the following on **CONPLAN** - Conservation on Private Land Network. Conplan is an informal network of individuals and non-government, government organisations with an interest in nature conservation on private land. The listserver provides a simple way of sharing information with all CONPLAN members and interested others. To subscribe: send an e-mail message to [majordomo@erin.gov.au](mailto:majordomo@erin.gov.au) with the following in the body of the message (leave the subject line clear)

"subscribe conplan"

Subscription to this listserver is currently open to all interested parties. If you require further information about CONPLAN contact [mark.rouds@ea.gov.au](mailto:mark.rouds@ea.gov.au).

Finally the FOG Committee would like to recommend to members that they consider subscribing to *Stipa*, the title of the newsletter published by Stipa, Native Grasses Association Inc. *Stipa* is making a superb contribution to native grasses, especially promoting their use in grazing. *Stipa* comes out four times a year and contains excellent articles on issues of grassy ecology and a subscription is only \$11 a year. The Committee considers that the FOG newsletter and *Stipa* complement each other with each adopting a different focus and regional perspectives. We believe that we already have many members in common. Inquiries, contact phone 02 6377 1487, fax 02 6377 1295, email [stipa@stipa.com.au](mailto:stipa@stipa.com.au), address PO Box 18 Coolah, NSW 2842.

### Local press roundup

Nature conservation issues have been receiving a lot of press of late. Eleanor Stodart gave a good rap on grasslands in Panorama in the Canberra Times on 9 March.



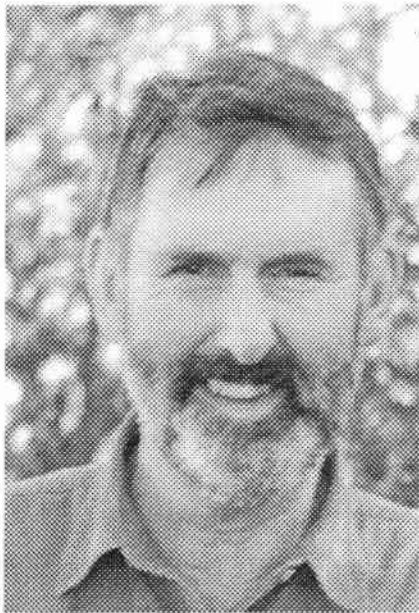
Stacey Lucas showed a wonderful picture of many recognisable faces, including many FOG members, in her write up of attempts to save the spectacular remnant woodland trees on Nettlefold St and Coulter Drive, Belconnen (Chronicle 12 March). In the same issue, John-Paul Moloney did a piece on Chilean Needle Grass

and its spread across the suburbs. Geoff Butler was extensively quoted in the article. While a little dated, Danielle Cronin (Canberra Times 14 June 2001) wrote an interesting piece on Bob Carveth who has been locked in battle with Cooma Council regarding the cost of weed spraying. Bob paid \$20,000 for a small Bredbo property

ten years ago and council wanted him to spend \$36,000 every three years on spraying African Love Grass. Attempts have been undertaken to work through this conundrum taking account of financial hardship.

## AUSTRALIA'S GRASSLANDS: THEIR STATUS AND FUTURE FOR GRAZING PART I

Ken Hodgkinson



*This article, the first of three, is based on a paper Ken was invited to present at the XIX International Grassland Congress held in Brazil during February 2001. He was asked to speak about "de-intensification of grazing" and he addressed this issue from an Australian perspective. The second article will look at the worldwide phenomenon of deintensification and the causal factors in Australia. The third looks at the Australian response, especially government policy, and*

*the research agenda that needs to be developed to ensure good production and conservation outcomes.*

### Background

There is a growing trend in Australia, and other developed countries, to reduce animal production from grasslands and for grasslands to be used for purposes other than livestock grazing.

Three pastoral systems exist in Australia today. Intense systems rely on high inputs of human, nutrient and/or water and structural resources, coupled with precision management of the added resources. Low input systems occur where rainfall is too low and unreliable for the reliable establishment of sown pastures, land is too steep for cultivation or when pastoralists choose low intensity to minimise costs. In the middle are many pastoral businesses of the agricultural grasslands, which are failing to capture the benefits of intense systems.

Most pastoral businesses are seeking greater profit; "intensifiers" strive to raise livestock output per unit of land (and other inputs) and "de-intensifiers" strive to lower costs of management inputs and gain efficiencies. Change to non-pastoral use is also occurring in both the agricultural and semi-natural grasslands (rangelands), as rural people strive to achieve profitable businesses. In addition to profit seeking, pastoral managers are increasingly being challenged to find a new balance between production and conservation goals.

De-intensification is occurring elsewhere in the world. Reasons for the change differ according to the cultural, economic and political situation in each region and country, including the commitment to trade liberalisation and abandoning agricultural subsidies. In Australia a major reason for de-intensification is the Federal Government's policy of minimal direct subsidy to primary and other industries. In 1999 the OECD percentage Producer Support Estimate was 6% for Australia - only New Zealand was lower at 2% - and the European Union was 49%. This "equal playing field" policy of governments is strongly driving de-intensification in Australia and sets this country apart from most others.

### Overview of Australia's grasslands

Australia has four major grassland types (see Figure). The grassland industries based on each are strongly shaped by the soils, vegetation and climate.

Australian soils are very old, severely leached and infertile. Australia is the only continent with entirely passive continental margins. There has been no mountain building in Australia since New Zealand and New Caledonia separated from the east coast 90 million years ago. Erosion of the low range of eastern mountains has provided little fluvial soil. The western two-thirds of Australia have been geologically comatose for hundreds of millions of years.

Australia is also the smallest, driest and most isolated of the continents and the rainfall is the most variable of anywhere in the world. Isolation in evolutionary time has led to a unique flora and fauna that are the pride of most Australian people.

One striking aspect of the Australian large-sized herbivore fauna is that the combined grazing pressure of these herbivore populations on the grasslands has been light and itinerant until very recently. The marsupial fauna of 20 to 5 million years ago lacked any grazing species - they were all arboreal browsers with the exception of a wombat. About 5 million years ago, members of the present day genus *Macropus* (the larger kangaroos) and a variety of wombats appear in the fossil record.

Temperatures over the continent are generally suitable for plant growth and reproduction in all seasons. Rainfall, however, in much of southern and central Australia is low and erratic; droughts, fire and floods therefore tend to occur in cycles determined primarily by the Southern Oscillation. In the north the climate is tropical and there is a regular "wet" season accompanying the summer monsoon. In general, the European-based agriculture and intensive grazing systems are perilous ventures; the financial and economic systems that were developed in highly seasonal Northern Hemisphere environments, place undue 'seasonal' demands on pas-

toralists striving to cope with considerable annual variation in grass and livestock production.

In summary it can be said that the Australian grasslands evolved under conditions of erratic droughts, low soil fertility and low grazing pressure. These grasslands are complex ecological systems with many interwoven levels of interdependence between organisms that have evolved over many millions of years of undisturbed co-evolution. Adaptation of perennial grasses to survive the combined pressures of drought and grazing is poor and there are many "death traps" for them in these grasslands. The landscapes of the grasslands vary in the way they organise the limiting resources of nutrients and water but all are prone to dysfunction and biological collapse with intensification of grazing pressure.

### **Hummock grasslands**

The hummock grasslands occupy 23% of the continent. For Australians, these grasslands epitomise the quintessential desert heartland.

The hummock grasslands take their name from the physical shape of the grasses that dominate the vegetation. They belong to the endemic genera *Triodia* and *Plectrachne*, and are perennial, highly unpalatable, evergreen grasses that grow as rounded hummocks. Sparse, low trees and shrubs of many species are also a feature. These grasslands comprise a rich and diverse flora. The mostly sandy soils are both stable and infertile. Fauna is also abundant and diverse, the hummock grasslands supporting the world's richest lizard fauna.

These grasslands are unimportant for pastoralism. Mining of iron ore and other minerals in the Pilbara region and the tourist industry contribute significantly to GDP.

Although remote from coastal cities and other towns, the management of this grassland is critical for conserving the natural resources in these ecosystems. The fire regimes have changed with the loss of the patchwork successional pattern so important for the maintenance of habitat and food supplies required by the unique array of faunal species. Today, large-scale wildfire started by lightning is the norm because Aboriginal people, once nomadic but now focused in small, scattered settlements, have nearly lost the knowledge and interest to burn these grasslands like their ancestors. The changed fire regimes will reduce the survival ability of certain species, especially amongst the fauna, bringing about rarity or worse, extinction.

### **Mitchell grasslands**

The Mitchell grasslands occur in a broken arc across northern Australia. These grasslands occur within a region where summer rainfall is dominant and the average annual rainfall is between 250 and 550 mm. Within this envelope the Mitchell grasslands are restricted to cracking clay soils with a uniform profile. Soil fertility is generally high and plant growth is not usually limited by nutrient supply. The dominant grasses belong to the genus *Astrelba* and there is a diverse annual flora. Native trees and shrubs are rare.

Extensive grazing by sheep and cattle commenced late last century and remain as the predominant use of the Mitchell grasslands. There is wide variation in quality of forage for livestock because of the influence of rainfall variation on recruitment and growth of annual forbs – this affects the reproduction of sheep and the ability of businesses to fatten livestock at critical times. De-intensification is only occurring when large tracts of land are set aside for biodiversity conservation.

Although generally stable under grazing, these grasslands are being invaded by introduced exotic shrubs, especially *Acacia nilotica*. They reduce forage production, obstruct livestock management and restrict livestock access to water. However at this stage these "woody weeds" do not appear to be driving any de-intensification of livestock production enterprises in these grasslands.

### **Semi-arid wooded grasslands**

The semi-arid wooded grasslands occur in tropical and temperate Australia in a broken band around the hummock grasslands. There are distinctive vegetation types within this complex but here they are considered as a single complex. As such, this is the largest grassland type in Australia, occupying about 35%.

The soils are infertile. However, within the landscapes are many small patches of higher fertility where surface water has carried nutrients to be captured and held to become resource rich 'sinks'.

Domestic livestock have grazed these lands for up to 150 years: cattle in the north and sheep in the south. They are the classic "outback" lands of extensive pastoralism. Mining is an important industry in many parts of these lands as is tourism. Increasingly, pastoralists are operating a tourist enterprise in conjunction with their pastoral business. There has also been a small but steady change of land use from pastoralism to National Parks and other forms of reservation for nature conservation.

De-intensification of pastoral businesses is occurring throughout these lands although the pattern in space and the nature of the drivers, are not consistent. Conservation of natural resources is an important driver and areas of wooded grasslands are being set aside from grazing where there is inadequate representation of particular ecosystem types in the national network for biological reservation. Lower livestock density, along with better management of total grazing pressure, is increasingly practiced to limit loss of perennial grasses and landscape function through overgrazing at times of drought. Land claims by Aboriginal people with non-European aspirations are changing land use to less intense pastoral systems or some other use. Increase in native shrubs and trees (called "woody weeds") in the absence of fire is also reducing the number of livestock in many parts of these lands.

### **Agricultural grasslands**

The agricultural grasslands are located in the south-west and south-east corners of Australia. Here there is relatively reliable winter rainfall. However, the probability of droughts at any time of the year, but especially during summer and autumn, is reasonably significant and can strongly impact on the productivity and financial viability of pastoral businesses. The higher rainfall and more fertile soils have led to the development of intense systems. These intense systems occur in the valleys where the landscape is now fragmented with a patchy distribution of remnant vegetation.

Pastoral industries were well established in these wooded grassland ecosystems by the end of the 19th century and they were almost completely based on native herbaceous flora. Trees and other native vegetation were cleared setting up a practice that continues, although much reduced, to this day. The dominant native grasses at the time of settlement were warm-season species that were frost susceptible and quickly lost nutritive value in the winter. Various attempts were made to introduce cool-season European grasses and legumes that would continue growing in winter but these were only successful on the most fertile sites in higher rainfall areas.

Modern agriculture began in the agricultural grassland ecosystems at the turn of the last century. State Departments of Agriculture established experimental farms and investigated crop/pasture rotations, the use of superphosphate and the establishment of clovers and European grasses. New forage plants were systematically introduced from around the world. By the early 1930s these practices were well established but were not very successful on certain soil types and in certain districts. Pasture improvement was limited to arable land.

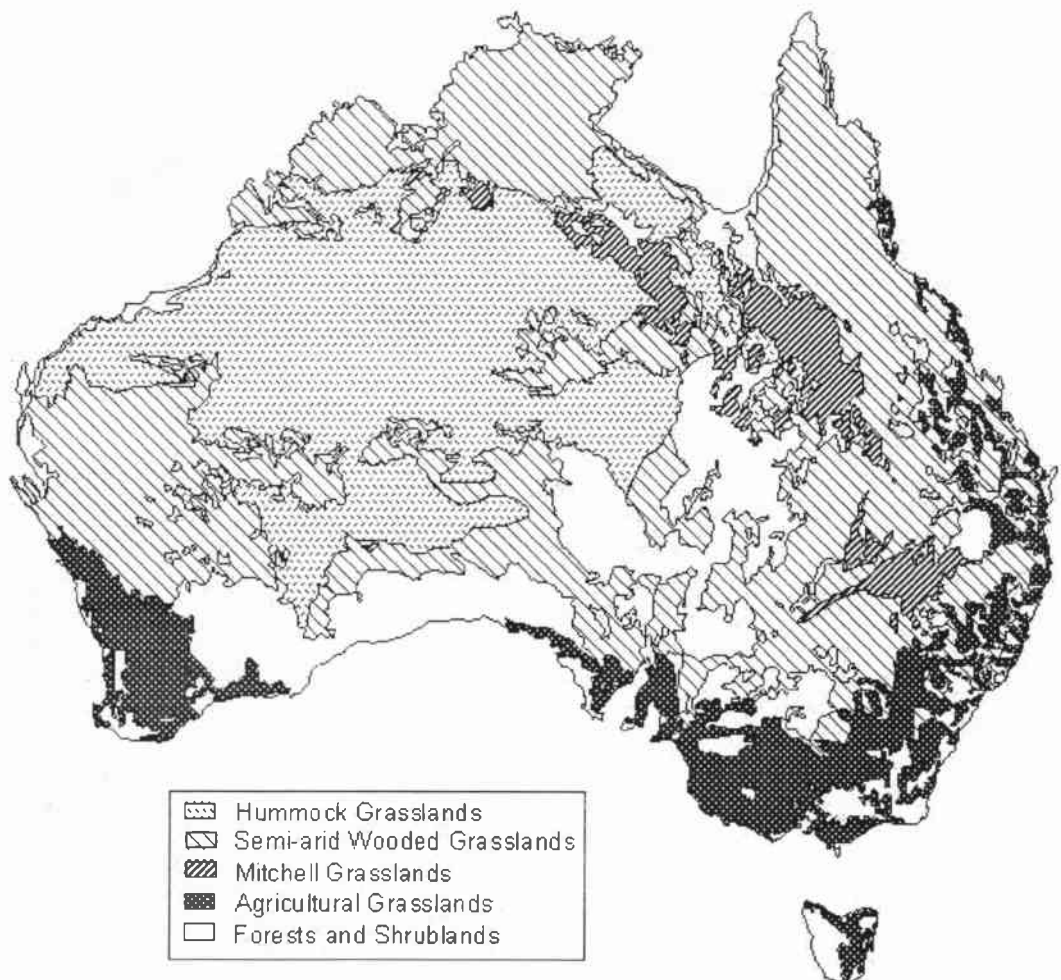
From 1930s to 1960s pioneering research on the importance of trace elements in pasture and livestock nutrition was conducted and there was rapid uptake of the solutions. After the end of the Second World War there was rapid expansion of "improved" pastures with the development of aerial agriculture pioneered in Australia and New Zealand. In the 1950s there was a concerted effort to increase the stocking rate on "improved" pastures so as to utilise the additional forage and to maximise the return on investment. Native pasture species were completely discounted on the grounds of being incapable of high production in response to high levels of fertility. The prevailing view was that native grasses were seen to be only adapted to poor soils, light grazing by nomadic soft-footed marsupials and possibly also to drier climate conditions than the present.

A severe drought in 1965 and the widespread death of many trees in pastures, shifted thinking by pastoralists and the observant public increasingly concerned about environmental and conservation problems, to the need for land management where long-term sustainability of natural resources rather than short-term production, is the goal. The environmental problems that had emerged were the rise of soil salinity in local areas, widespread soil acidification from agricultural practices and loss of biodiversity, especially amongst the charismatic birds and marsupials. Research began in the 1970s to gain better understand-

ing of the processes that determine botanical composition of semi-natural pastures and in particular the effect of time and intensity of grazing, and time and length of rest. However research on the more fundamental problems of resource degradation lagged because of the strong prevailing focus on high intensity production.

The Australian people in general accepted as worthwhile and successful the conversion to agricultural grasslands. Conquering the "bush", taming nature and establishing livestock grazing businesses were seen to be appropriate activities for rural pioneers and later generations. However, increasingly the general public has become concerned about the natural environment and the impact of livestock production and pasture improvement on the environment and nature conservation. Governments have established new legislation dealing with conservation of native vegetation and many pastoralists see this as political encroachment on the rights of landowners to manage the land as they see fit. Currently in these agricultural grasslands, the majority of pastoralists are caught in a financial and management trap; they do not have sufficient profit, and sometimes knowledge, to raise the intensity of production nor are they convinced they should de-intensify and embrace emerging technologies for low input systems.

*The full paper entitled De-intensification of grasslands: understanding the processes to find the balance is available by phoning Ken on 02 6242 1601 or by emailing [ken.hodgkinson@csiro.au](mailto:ken.hodgkinson@csiro.au).*



## BEGA VALLEY GRASSY VEG SURVEYS

Jackie Miles

### Project's scope

In 2000 Bega Valley Shire Council obtained a WWF/NHT Grassy Ecosystems Grant to help me complete a survey of roadsides and cemeteries in agricultural areas of the Shire, which I had commenced on an unpaid basis in the spring of 1999. The findings of the earlier survey suggested that it was well worth continuing, as a number of plant species were found which had previously not been recorded from the region. They were all species which confirmed the strong link between the grassy areas of the coast (the areas on granite-derived soils, which have been used for agriculture for the last 150 years, and which constitute perhaps 20 percent of the Shire), and the grasslands and grassy woodlands of the southern tablelands.

In addition to completing the survey the objectives of the project were:

- to educate local land management agencies and the community on grassland values in rural reserves,
- to prepare management plans for identified sites of high conservation significance, in consultation with the relevant land managers,
- to implement urgent management actions to protect high conservation value sites,
- to set up a monitoring system to determine effectiveness of management activities.

In practice, these objectives turned out to be over-ambitious within the time frame of the project (one day per week for one year).

Another activity, which was not funded, but which was going on at the same time, was a survey of Travelling Stock Reserves as part of a state-wide audit of Rural Lands Protection Board assets. A brief assessment of ecological values of TSRs in grassy areas was done by myself or Paul McPherson, another amateur botanist from the Towamba valley. A surprising number of South Coast TSRs are actually located in forest outside the farming areas, and are unlikely to have ever been used for stock. These were ignored. Few of the TSRs were found to be much good in terms of groundcover diversity, but a couple had some good species in them. Most are very small compared with tablelands TSRs, and seem to have suffered from over-use.

Other types of reserves were also checked along the way, as I became aware of their existence. Examples are the old Bemboka rubbish tip, various recreation reserves and a large patch of vacant Crown Land near the Bemboka cemetery.

### Surveys and their impacts

The roadside survey was a quick one, conducted from the car, so it is possible I missed a few good spots. Things that tended to catch my eye and make me stop for a closer look were conspicuous herbs such as Rock Lily (*Bulbine glauca*) or Spur Velleia (*Velleia paradoxa*), and patches that had been obviously burnt in the last season. Areas which were exceptionally wide but had nothing else obvious to recommend them were also checked, and it was on one of these that I found the first record for the Shire of Austral Toadflax (*Thesium australe*). Species lists were recorded from the best quality sites and incorporated into Rainer Rehwinkel's Grassy Ecosystems flora database.

The best 70 or so sites were marked with a red and green rectangular metal marker plate, carrying no writing, and mounted on a

post at the start and end of each site (keep your eyes open if coming down the Snowy Mountains Highway). Most of the sites marked were ones with significant grassy veg. Plenty of areas with trees remain on the roadsides in the farming areas, but these mostly weren't marked, because it seemed easier to just tell staff to avoid damaging areas with trees. None of the sites have gone onto Council's GIS database, but this could be done later by staff.

A full day training session in the significance of remnant native vegetation on roadsides was provided for 15-20 Council outdoor and planning staff involved with roads, at the beginning of the project. A written report on the roadside sites was provided, as well as the "glovebox guide". The latter is a smaller report, amply illustrated with photos, intended for the on-ground and engineering staff. As a result of all this, there does seem to be a much greater awareness in Council of the fact that there could be something of significance on roadsides, and more consultation before roadworks is undertaken. However, there has also been a compromise or two, and there is still a steady attrition of road verges which carry mostly native grass but no species of any great significance. Council has no road-base quarry in the shire, and most of the material for surfacing unsealed roads is obtained by mining the road verges. This partly explains why road verges are usually very narrow.

The survey of cemeteries was extended to cover all cemeteries in the Shire, about half of which were either predominantly exotic veg, or in areas where the original vegetation was shrubby coastal forest rather than grassy ecosystems. The remaining cemeteries with good grassy veg got a very thorough working over, with several visits made over the course of spring and summer. Despite this, a few previously unrecorded species are still coming out of the woodwork even after the completion of the project (I can't keep away from the places now), proving how chancy the detection of grassland species can be. Most cemeteries are managed by a local committee, though this is a fairly recent phenomenon. Formerly they were managed (or not managed, as most committee members were quick to tell me) by Council.

Fortunately, each committee had at least one person on it who was prepared to give me a hearing, and I did manage to get them to reduce the frequency and area of mowing in most of the good cemeteries. Unfortunately this sometimes had the unwelcome effect of allowing the exotics in the most disturbed areas around the graves to go to seed, but I think the message has now got through that you mow the weedy bits often, but not the rest of it. The committees are small and under-resourced (possibly a good thing, or who knows what they might get up to?) so usually fairly willing to listen to advice that means less work for them. I also did a bit of weed control with or for the committees, including Blackberry, African Lovegrass, Serrated Tussock, and St Johns Wort. A few things that had been planted around graves and were spreading, received a quiet squirt of something hopefully lethal, but a few outstanding problems remain where the committee is not keen to annoy relatives by removing something they have planted. Trees which were planted by the committees are another potential problem, and I haven't succeeded in convincing anyone to remove any of them yet, though I would like to.

A couple of the cemeteries were burnt, one at my urging and one fortuitously just before I started the survey. The results were spectacular in terms of forb diversity and flowering. The contrast in the Rocky Hall cemetery, which I got to see both before and after, and



which had apparently not been burnt for many years, was impressive.

Information about past management was requested from committees and neighbours. Apart from a vague impression of "neglect" by Council, little hard information was provided. The Towamba Rural Fire Service Captain did report that Towamba cemetery was burnt annually at least over the past 15-20 years, but this ceased when the committee took over management three or four years ago. A neighbour of the Rocky Hall cemetery could only recall it being burnt twice in the last twenty years, one of those occasions being in spring 2000, as part of this project. Most informants stated that the cemeteries were only mown when a funeral was occurring, and then often only partially. If true, this indicates there has been a dramatic shift in management practice in the past few years, as most of the cemeteries are now mown completely at least once a year, and much more frequently in the most used areas. The reduction in burning is another worrying area.

A final recommendation of the survey was that Council erect signs at the cemeteries explaining the presence of remnant grassy vegetation and requesting the public not to mow or spray herbicides in the cemetery without first consulting the committee. This has not been done yet. In spring of

2001, when I was no longer working on the project, I heard from Council staff that there have been complaints about the untidiness of some of the cemeteries. Signs may help, so here's hoping that they happen soon.

Some monitoring transects were set up in Towamba and Wyndham cemeteries, and at the old Bemboka tip site. These will need me to continue monitoring, as they involve small quadrats, and identification of all the species therein, not something the committees can be expected to do.

### Reporting to stakeholders

Reports were provided to Council, to each participating cemetery committee, to the RLPB on the TSRs and the significant roadside sites, and to the RTA. Local fire brigades were addressed at their AGM about the need to burn grassy vegetation periodically to

keep it in good health. This was done because a decrease in burning of roadside remnants has been observed to occur in the district over the past few years, and it appears to be linked to a deterioration in condition of some remnants. Invasion by dense shrub and tree regrowth, and an increase in weeds are the obvious consequences.

An article was placed in the local newspaper at the beginning and end of the project. An article was also placed in the Bega Environment Network newsletter, in hopes of raising the profile of grassy veg with local conservationists.

A photographic display was maintained in the Bega public library for one month during spring 2000, depicting types of grassy remnant vegetation in the Shire, and some of the plants found in such remnants.



A presentation was made at a Field Day organised by Council to showcase its Grassy Woodland Recovery Project on farms in the Shire, with a field trip to a nearby site (the Tantawangalo churchyard).

An application was made for further funding in order to complete urgent on-ground weed control works, and facilitate the signing of Joint Management Agreements between Council and NPWS over some of the sites. Most of the remnants are examples of either Bega or Candelo Dry Grass Forests, both recently listed as Endangered Ecological Communities under the NSW *Threatened Species Conservation Act*, a development which occurred after the project began, and which theoretically strengthens protection of these remnants.

### Species newly recorded from the Shire during the project

Some of these were recorded before the project began, and were partly what prompted the funding application, while a few have been recorded since the project finished. Most were found on roadsides or in cemeteries, and a small number on private property in lightly or intermittently grazed areas. Most of them illustrate the affinities between Bega/Towamba valley grassy veg and the tablelands grassy veg. Some might argue that livestock has moved back and forth between the two areas for decades, and that some native species travelled down here in or on animals, but if that is the case, why are they turning up in areas with little or no grazing history?

Grasses: *Capillipedium parviflorum*, *Digitaria brownii*  
 Sedges: *Eriocaulon scariosum*  
 Orchids: *Diuris lanceolata*, *Diuris* sp. aff. *dendrobioides*, *Pterostylis truncata*  
 Daisies: *Brachyscome rigidula*, *Helichrysum rutidolepis*, *Leptorhynchus squamatus* ssp. A, *Leucochrysum albicans* ssp. *albicans* var. *albicans*, *Podolepis litoracoides*, *Triptilodiscus pygmaeus*  
 Peas: *Lespedeza juncea*, *Lotus australis*  
 Other forbs: *Chamaesyce drummondii*, *Erodium crinitum*, *Rumex dumosus*, *Thesium australe*, *Velleia paradoxa*, *Veronica gracilis*  
 Shrubs: *Discaria pubescens*

## OUTBACK JEWELS

*This article was first published in the Australian Minerals & Energy Environment Foundation's Groundwork Number 4, Volume 2, June 1999. We have had this article for some time and we were thrilled when we read it. We decided that publishing it in the FOG newsletter is long overdue.*

### Chances are, it's a grasshopper

It's dark. You're in central Australia, kilometres from the nearest civilisation. You peer into the pitch black night beyond the flickering light of your campfire. You know there's something out there, something that is making a hell of a noise.

Chances are, it's a grasshopper.



Spotted Stropis: common along roadsides in northern Australia

At least, that is what Dr Dave Rentz and Piotr Naskrecki found recently when they spent six weeks studying the grasshopper fauna of central and northern Australia.

"We found the source of the loudest sound in the desert at night. It's a katydid, a long-antennaed grasshopper, which is still unclassified by science in spite of the racket it makes," explains Dr Rentz. "It must have given the early explorers quite a fright. Of course, they didn't have electric torches to go and find out what was making the noise."

Dr Rentz is a senior taxonomist with CSIRO Entomology and the Australian National Insect Collection. The fact that his noisy neighbour in central Australia hasn't yet been classified by scientists highlights how little we know about an insect as common as the grasshopper.

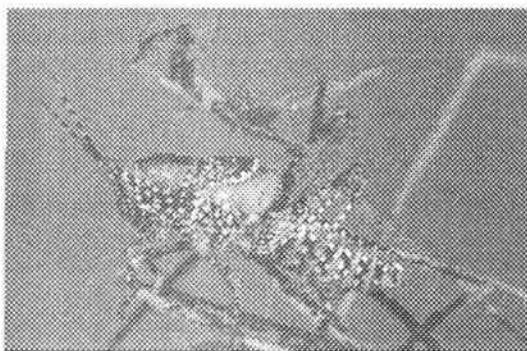
"There are 735 species of grasshopper in Australia, approximately half of which are undescribed," says Dr Rentz. This means they have no formal names in the scientific literature. But it is not correct to say that they are 'unknown' to science, as all are repre-

sented in the Australian National Insect Collection. However, there are not enough skilled taxonomists to keep up with the work of classifying new species as they are found.

There has been little research done into the food preferences, life histories and role in the environment of most grasshoppers. We do, however, know a little about a few species and can make inferences about others.

One thing we do know is that there are good grasshoppers and there are bad grasshoppers. "We know that most grasshoppers are beneficial to the environment," says Dr Rentz. They recycle nutrients back into the ecosystem and provide food for birds, lizards and frogs. Many species feed on plants which are toxic to livestock and may therefore be helping to keep these plants under control.

Then there are the locusts. Locusts are a variety of grasshopper that can have a devastating impact on the environment. The best known of the five locust species is the Australian Plague Locust, which, in periods of drought, swarm and move across the landscape en masse, eating everything in their path and compounding the effects of the drought.



A juvenile or "nymph" Leichhardt's Grasshopper, Australia's most colourful.

This differentiation between grasshopper types can be used as an indicator of ecosystem health. "We have discovered that, on the whole, good grasshoppers are concentrated in native, undisturbed habitats, while the few baddies tend to be found on agricultural and mined lands," explains Dr Rentz. "This means the prevalence of good or bad grasshoppers is an indication of the degree to which land is disturbed. By monitoring grasshopper populations, we can determine the health of an ecosystem and measure whether a revegetated area is recovering from disturbance."

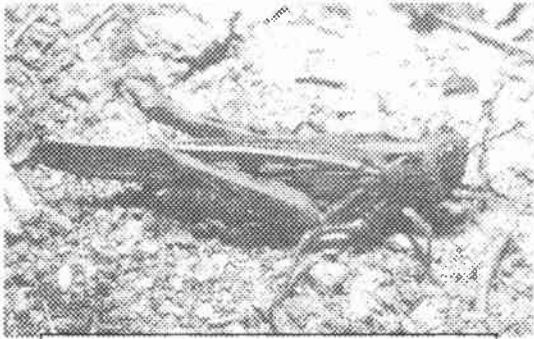
Dr Rentz is currently working on a major project to compile a field guide to the grasshoppers of Australia. The guide will be a com-

panion for avid naturalists and an important tool for miners, graziers and rangers responsible for caring for the landscape. If you are interested in sponsoring this important project, Dr Rentz would like to hear from you.

### Grasshopper superstars

Dr Rentz and Piotr Naskrecki's six week trip across north and central Australia produced more than 4000 specimens, including 12-18 probable new species and possibly even a new genus or two.

"We found grasshoppers with a wingspan of 15 centimetres, like little aircraft. So large, yet still undescribed by science. We also found grasshoppers of every imaginable hue - green and gold,



Australian Plague Locust, the most destructive grasshopper in Australia.

black and white, red, purple, striped yellow and black like wasps. They are truly the jewels of the Outback. One specimen from near Alice Springs is bright green with purple wings and speckled with opalescent spots. It's truly a thing of beauty," Dr Rentz says.

Australia's grasshopper fauna presents a dazzling array of colours, some of them changing. The only grasshopper in the world known to change colour is an Australian species, the Chameleon Grasshopper (*Kosciuscola tristis* Sjöstedt), which lives high in the Snowy Mountains. It can change its colour from very dark, almost black, when cold to blue and green as the temperature rises.

Many of the colours and patterns of Australian grasshoppers are reminiscent of the traditional artforms of aboriginal people from central Australia. Dr Rentz has suggested the dot and other colour patterns of Australian grasshoppers have provided an inspiration to aboriginal artists. The conspicuously banded legs of some grasshoppers in the Northern Territory, for example, are very similar to the ceremonial bands of white paint some aborigines apply to their limbs.

One of the rarest grasshoppers is Leichhardt's grasshopper, a strikingly coloured species from Kakadu National Park. This species is a tourist attraction and has been featured on a stamp, hand-

kerchiefs and other souvenirs of the region. Unfortunately, populations are threatened by fire including prescribed burns for management purposes.

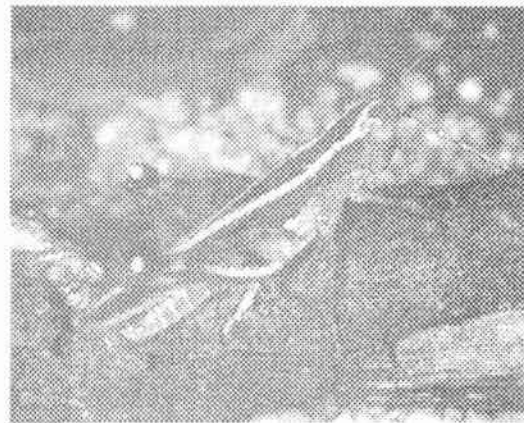
Besides their colours, grasshoppers have an interesting collection of survival techniques.

The Great Grasshopper (*Ecphantus quadrilobus* Stål), and several other species, rub their mandibles (lower jaws) together to produce a squeaking sound. The unexpected sound can cause a predator to drop the grasshopper, allowing it to escape.

Desert grasshoppers often resemble stones or toads and live amongst gibbers. They can remain as eggs in the ground for years until the proper climatic conditions initiate hatching. At these times, the grasshoppers can be extraordinarily abundant. They feed on the minute plants that also grow under the favourable conditions. These grasshoppers have a highly adapted physiology that allows them to live on the ground amongst rocks in temperatures that often exceed 70°C. After a short period, they lay eggs and die and the next generation does not appear until climatic conditions again initiate egg hatching.

Grasshoppers are highly adaptive. Because most species are the prey of other insects, birds, frogs lizards and the like, they either use concealment or protective coloration to remain undetected or their great powers of jumping combined with flying to escape. Some are the shape of the grasses they feed on. Others resemble stones or lichen covered rocks. Others are sand coloured and still others resemble leaves, living and dead.

Many grasshoppers have no natural predators because they are toxic or distasteful or poisonous. They incorporate alkaloids or other noxious chemicals into their bodies from the plants they eat. These grasshoppers advertise their toxic qualities to the animal world by their bright colours.



*Marcocara conglobata* Sjöstedt is a grasshopper of subtle beauty and common in northern Australia.

## WHAT TO DO WITH 'ALL THAT DATA'?

Richard Bomford

A FOG workshop on the weekend of 19-20 January 2002 raised the question of how to make use of the data on grasslands that are being collected by FOG members. Rainer Rehwinkel (NSW NPWS) has done rapid biodiversity assessments and has species lists for some 1000 grassland sites on public and private land. Species lists are being compiled on many areas of private land, some by their owners, some professionally, some in the process of de-

veloping conservation covenants. The workshop introduced participants to a number of data collection techniques so that they can start collecting their own data. So FOG potentially has access to a quite lot of data on grasslands, with every prospect of getting more over the coming years.

Does all this data tell a story? Can we bring it all together in a way that helps grassland conservation? Does the data have to be 'professional' to be valuable? Can it help us find special grasslands? Can we put the information on one piece of land into a conservation context - can we tell what it 'means'?

The data management and decision support software tools developed for the Regional Forests Agreement (RFA) process may be able to help. The RFA tools were developed by the Commonwealth and the States and may be able to be made available to community groups such as FOG at low cost. The tools run on a reasonably powerful laptop computer. What can they do?

- Species lists from many locations can be 'classified' - that is, the software can look for patterns or associations of species, find species that tend to be found with other species, find associations that are uncommon or special, and find the other species associated with rare species. The latter might encourage us to look again for rare or threatened species in locations where their associates occur.
- Once species have been classified and the site information transferred into the geographic information system (GIS) part of the tools, the software can provide maps of where each association occurs. That enables some geographic patterns to be picked up - which associations are more common in the west, which are found down the coast.
- Other data sets can also be included in the GIS. They include altitude, climate, land tenure, roads, geology, aspect and slope - much of it already on the public record or reasonably readily available in suitable formats at quite detailed scales. Data from the Regional Forests Agreement process is already in this form and includes substantial information on ecosystems - with a concentration on forest ecosystems on public lands, but with much other ecological data as well. The software can correlate all this other geographic and ecological information with data on grasslands from FOG. It works best for 'point' data which represent a single vegetation association, aspect, soil type etc. A particular value of this is that by identifying other areas with similar geographic (and perhaps land tenure) characteristics to known grasslands it can point to areas where we might look for similar grasslands - including rare grasslands and grassland species.
- Ultimately, the software can assist in designing a reserve system to protect representative grassland species and ecosystems. It does that on the basis of facts or assumptions about threatening processes - what is the minimum area of grassland required to sustain a species, how close (or far away) does it have to be to other grasslands or other ecosystems (eg inva-

sive species), what animals does it depend on and what are their requirements? Where are the core areas where species occur and are most ecologically secure? How important are alternative land uses? The system builds up a reserve system either manually ('let's reserve this bit first') or automatically (looking statistically for the 'best' answer - maximum conservation at least cost). FOG can put in its criteria and assumptions about grassland ecosystems and the validity of the data, other interested parties can put in theirs and the software can be used to see how it changes the answers.

The Regional Forests Agreement software has been extensively road tested. People who were involved in the RFA process in the second half of the 1990s are familiar with it and (largely) have come to trust the results (though not necessarily the other parties in the process) even when they appear initially to be counterintuitive - because of the software's ability to use varying ecological and economic assumptions, and the ability to build 'reserves' bit by bit before your eyes.

People are still arguing about the RFA process. The software was only ever a guide to decision makers. The results were a compromise and not everyone's objectives could possibly be achieved. Governments didn't always follow the results, the data were not and never will be complete, there was not always consensus on the assumptions, and there was a good overlay of politics on the outcomes. Most people who used it, though, found the software immensely useful - it made sense of things that are just too big, and too complex, to fit in your head. And those people include senior bureaucrats and Ministers. One other criticism of the process is that the final stages were negotiated behind closed doors - community groups were closed out.

For FOG, the RFA software promises to:

- Let us put all FOG's grassland data into one system
- Find patterns in the data
- Make sense of data for individual sites and put them in context
- Correlate FOG data with other geographic data sets to identify where else we might expect to find valuable grasslands or grassland species
- Put FOG data into a form which is understood by governments and can be used objectively to justify FOG calls for political action
- Put FOG in a position where it has access to its own independent data and the tools and skills to make sense of it, on a par with government agencies.

## FLORABANK GUIDELINES

*Naarilla Hirsch*

*Readers will recall Naarilla's earlier articles on Florabank guidelines. In this piece she describes numbers eight and nine.*

### Number eight

The eighth guideline is on *Basic germination and viability tests for native plant seed*. The efficiency and success of raising plants in a nursery or by directing seedling depends to a great extent on the physical quality of the seed, which can be gauged by the seed's viability and germinability. Poor germination can result from a number of factors, including incorrect germination procedure for the

species, lack of viability of the seed, or inappropriate storage of the seed. Many Australian species have naturally low seed viability, with perhaps one-third of native species requiring some form of pre-treatment for their seed to germinate, and perhaps the same numbers again being extremely difficult to germinate.

There are two different types of test used to determine seed quality. A viability test assesses whether a seed is dead or alive and therefore indicates the potential of a seedlot to germinate, but not the number of seeds able to germinate (and tends to overestimate



likely germination as this test ignores dormancy problems). Viability tests are useful when the quality of seed is in doubt after a visual inspection. A germination test assesses the portion of seeds within a sample that are able to germinate, giving an indication of how much you need to sow and how to best germinate.

Other tests that can be done are a purity test (for standardised assessment of the cleanliness of a seedlot), a vigour test (particularly on seed stored for some time), and a moisture content test (to understand better seed storage conditions). The guideline suggests that basic germination tests can be performed with very few resources if a standard approach is used consistently, and gives information about doing so.

The guideline also describes treatments for breaking seed dormancy, based on current practices at the Australian Tree Seed Centre ([www.ffp.csiro.au/tigr/atcmain.index.htm](http://www.ffp.csiro.au/tigr/atcmain.index.htm)). These include boiling water and hot water treatments (eg for some acacias), scarification or cracking of the seed coat, manual nicking, acid scarification, cold moist stratification (eg for some cool temperate eucalypts and acacias), chemical treatments, and procedures for removing inhibitory substances (eg for Kangaroo Grass (*Themeda australis*)).

#### Number nine

The ninth FloraBank guideline is about *Using native grass seed in revegetation*. It comments that using native grasses in revegetation is very much a learning experience at this time. Not surprisingly for those of us who have been struggling with it for a while, identifying native grasses (and similar-looking weeds) is listed as the first difficulty.

The seed isn't always easy to find in native grasses, and is present as a caryopsis or grain (a seed fused with the fruit surrounding it). The structures attached to the seed are often left intact for use in revegetation, even though this makes handling, cleaning and sowing the seed difficult when using conventional equipment. This is done in part because removing these structures can damage the seed, and in part because they may play a role in helping to locate the seed in more suitable microenvironments. For example, the awns of Spear Grass (*Stipa* spp.) and Kangaroo Grass help the seed to bed into the soil, while the surface hairs on Wallaby Grass (*Austrodanthonia* spp.) seed are thought to retain moisture around the seed and assist in germination.

Collecting mature seed is largely a matter of timing. In most species the amount of seed on the plant and its size varies with seasonal weather conditions, limiting the amount of seed available at harvest. However, seed also ripens gradually and unevenly on each flower head and is usually not retained once ripe. Seed ripeness can be estimated by running a seed head firmly through your fingers. Some spikelets will dislodge, including those with ripe seed.

Check a sample of spikelets for the presence of fully formed caryopses by feeling the grains with your fingertips, squeezing the dispersal unit between two fingernails (eg for Wallaby Grass or Redleg Grass (*Bothriochloa* sp.)), or using your teeth (for larger species such as Weeping Grass (*Microlaena stipoides*) and Themeda).

Make sure the collected seed is as weed-free as possible because the weed seeds could be very difficult to identify or remove from the seedlot later, and destroy seed that is contaminated with noxious weed seeds. Other potentially useful native species may be present in seed collected from natural stands and could even add biodiversity value to revegetation working.

For small-scale revegetation activities, useful collection methods are hand collection, cutting and baling (suitable for species that retain seed in the head, eg Mitchell Grass (*Astrebha* spp.) and Redleg Grass), and vacuum harvesting (effective for species such as Wallaby Grass and *Paspalidium* species). Drying, cleaning and storing native grass seed is basically carried out in the same way as for woody native plants, and has been covered earlier in this series.

Dormancy is a common survival strategy in grasses. It delays seed germination until conditions are favourable for growth, or spreads out germination to increase the chance of at least some plants establishing. Usually the most practical means of pentagram dormancy is by manipulating dry storage conditions. Experiment with temperature and the duration of storage. Injuring the seed exterior or applying gibberellic acid can also be effective.

Internationally recognised seed quality parameters, tests and standards are not easily applied to uncleaned native grass seed because of the likely presence of other seed, the complex dormancy response and low germination levels of many grass species, and the high levels of trash and chaff it contains. The guideline recognised that information on native grass seedlots should include information about seeds of other plants (including useful native species), important weed seeds, and the number of normal germinating seeds.

The methods for revegetation of native grasses are similar to those for revegetation of trees and shrubs. Australian grasses have generally evolved under a low disturbance-high stress environment. They may tolerate moisture stress, adverse soil conditions and low fertility, but do not necessarily establish easily or compete strongly with other species. Choose planting sites carefully and, given the high cost of seed, it may be wise to direct grass seeds separately from trees and shrubs, and concentrate grass seed over small areas to better ensure success. The guideline discusses planting by both direct seeding and seedlings raised by sell or plug methods. It also suggests that several sowing of different species may be necessary over time to achieve your objective, and post-planting management (such as grazing, weed control, burning or slashing) is almost certainly required.

For a copy of these guidelines, contact the FloraBank coordinator on 02 6281 8585.



Rainer and Paul also measuring up at the recent workshop: Photo by Jean Geue

# **FRIENDS OF GRASSLANDS INC**

*Supporting native grassy ecosystems*

**Address: PO Box 987, Civic Square ACT 2608**

Membership/activities inquiries: Please contact Margaret Ning whose details appear below.

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## **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 some-

thing 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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