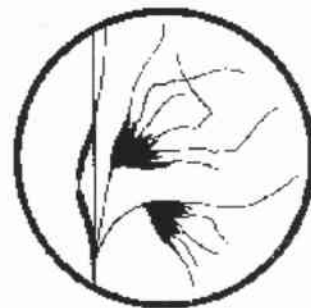


News of Friends of Grasslands

Supporting native grassy ecosystems

November-December 2001



MEMBERSHIP RENEWAL TIME

Yes, it is time to get out the chequebook and renew your membership for 2002. Please do this promptly to save Margaret from chasing you up.

We have again kept fees to their current low levels: \$20 individuals and families, \$50 for corporate members and \$5 concession for students and those on social security benefits. A membership renewal form is enclosed.

If you have any doubts about rejoining, remember we need your support. In this year we have:

- continued with a quality newsletter,
- had a widely supported field program, particularly reaching out to new areas,
- established the Old Cooma Common Reserve at Radio Hill,
- been involved with many official agencies on behalf of grassy ecosystem conservation and lobbying,
- networked with people and groups with shared agendas,
- played an important part in the Mulwaree to Monaro field day projects,
- continued to visit member's properties or sites in which they are involved,
- assisted with field surveys, and
- enhanced member's hands-on conservation skills.

We continue to practise our belief that we need to work with everyone to get good conservation outcomes.

SPECIAL CHRISTMAS OFFER

If you are a member, how about joining up a friend as a Christmas gift. The membership renewal form allows you to join up as many friends as you like for the usual price of \$20 per membership.

Now for the special offer: for \$30 per new membership we shall also send them a copy of *Grassland Flora*.

FOG'S 2001 PROGRAM

17 October to 5 December - Grassy ecosystems: from Mulwaree to the Monaro. a series of field half days (two hours) organised by NPWS, Environment ACT, and FOG. A great brochure has been produced for the program which is already rolling but there is still plenty to come. This is an opportunity to find out about the Recovery Plan, the grassy ecosystem Conservation Management Network, how to get involved (if you wish) and a great way to see many fantastic sites in spring. Contact Steve Priddy or Rainer Rehwinkel of NSW NPWS, telephone 6299 2929 or email: rainer.rehwinkel@npws.nsw.gov.au for further information or bookings. Program visits:

- Tumut - 17 Oct
- Yass-Gunning - 23 Oct
- Gundaroo-Sutton - 24 Oct
- Goulburn-Crookwell - 30 Oct
- Bungendore-Tarago - 31 Oct
- Braidwood-Captain's Flat - 6 Nov
- Queanbeyan-Stoney Creek 7 Nov

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 for 2002, also contact Margaret.

- Canberra - 13 and 15 Nov
- Cooma - 20 Nov
- Nimmitabel - 21 Nov
- Adaminaby - Beloka - 26 Nov
- Bombala - 4 Dec
- Jindabyne - 5 Dec

Saturday 17 November, 2pm - Theodore grassland Come along to see this grassland at Theodore which is significant for more than just its plants. Meet at 2pm at the Canberra Nature Park sign on Christmas Street, Theodore (at the Lienhop St end of Christmas St).

Saturday 1 December, 9.40am - In pursuit of the Golden Sun Moth at Belconnen Naval Station It's three years since we visited this quality grassland, so take the opportunity to join us for a look at this gem right in our midst.

For security reasons, please let Margaret know in advance if you will be coming to this activity. We'll meet at the gates to the Belconnen Naval Station off Baldwin Drive, Kaleen (opposite Kaleen High School) promptly at 9.40am so we can enter as a group. Please be punctual as there are security procedures to complete before we shall be able to proceed onto the grassland.

8/9 December - more Monaro grassland gems This is our annual visit to grasslands on the Monaro with the normal option of making it a one or a two day activity. Those joining us for the two days are welcome to stay at Garuwanga (Geoff and Margaret's weekend at Nimmitabel) for the Friday and/or Saturday nights. Contact Margaret for details of our proposed destinations and meeting arrangements.

One site we hope to visit is in the remote and picturesque Yaouk Valley, surrounded by Yaouk Bill Range, Scabby Range and Kosciuszko National Park. It is a montane grassland (at 1100m), in excellent condition with regionally uncommon species, a yet undescribed species of *Prasophyllum* and extensive areas of montane wetland. About 1000 ac were recently added to Scabby Range Nature Reserve which is not normally accessible to the public. However we need 4WD vehicles to enter the reserve so I need to know who is interested in coming and if they can help with transportation. It is only for the last few kilometres that the 4WD is needed, so we can carpool for that distance.

19-20 January - Restoring native vegetation to the landscape. This will be a small informal workshop (if there is sufficient interest) on the why and how of native revegetation and the skills required, using 'Garuwanga', near Nimmitabel as a case study. It will attempt to marry two approaches to nature conservation: passive management of remnants and active revegetation, and may assist to develop FOG's thinking. It will be of interest to conservationists, landcare and parkcare volunteers, and land owners and managers. The program will allow plenty of time to explore Garuwanga, and families are welcome. Costs are minimal to cover some food expenses. Contact Geoff Robertson on 6241 4065 for further information and booking (you will need to book early).

NEWS ROUNDUP

Old Cooma Common Grassland Reserve opened

Over fifty people attended the opening of the Old Cooma Common Reserve on 7 September, Threatened Species Day. A large group came from years eleven and twelve of Cooma High School. The restoration of the reserve had led to their adopting the site as a focus for their studies. FOG wishes to thank its many members who have contributed to the success of this project. A copy of the brochure is included in this issue. If you need more, please contact Margaret Ning.

remove woody and other weeds, to fence the site and erect signs. This work was undertaken by Friends of Grasslands, Cooma-Monaro Shire Council, local contractors and residents. Radio Hill not only makes an important backdrop to Cooma, but it is also special because it is a good example of a natural grassland which has remained intact. It is also the home of the Monaro Golden Daisy.

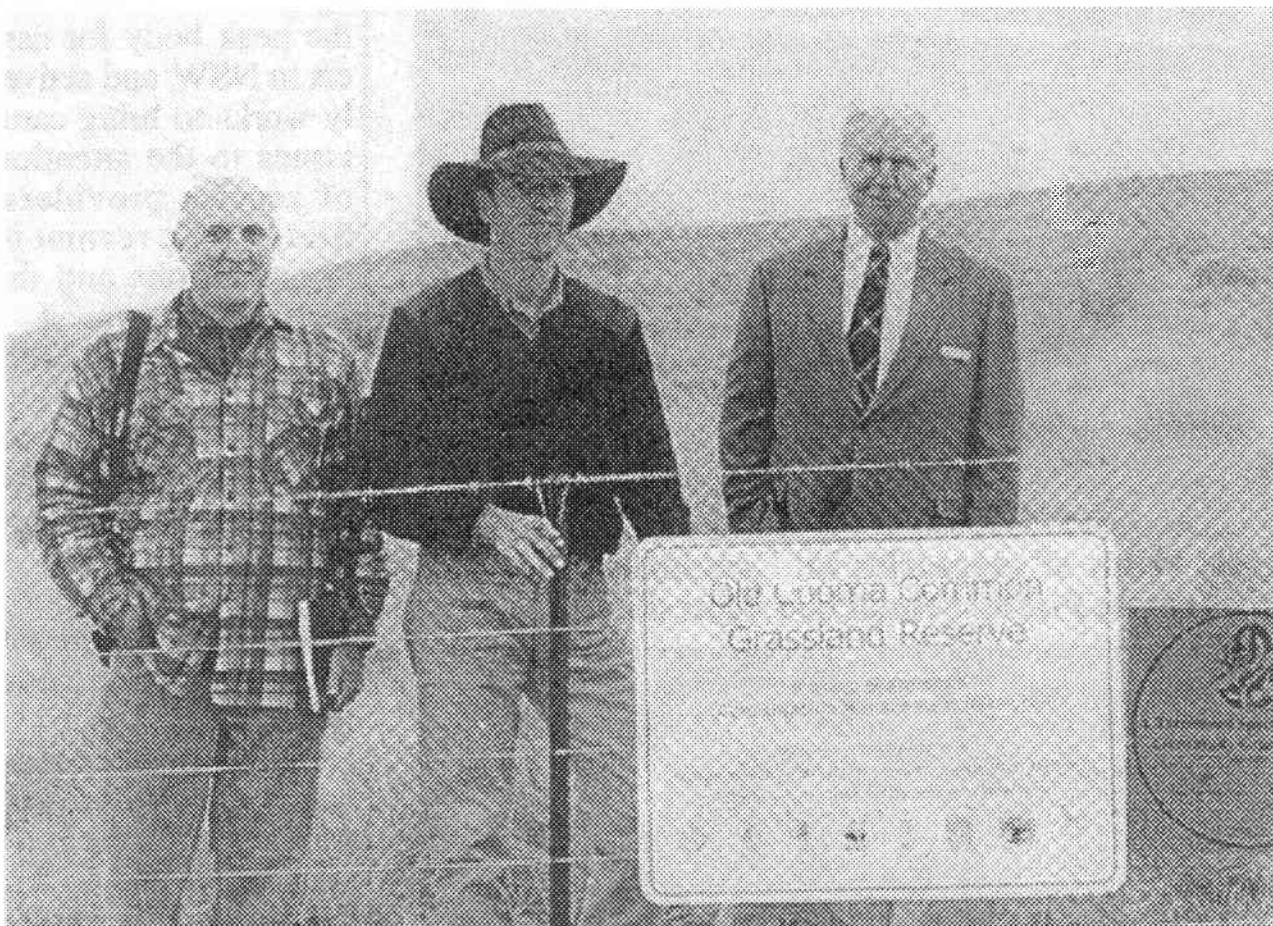
The restoration of Radio Hill has been funded under a Natural Heritage Trust and World Wide Fund for Nature Threatened Species Grant. The Department of Land

to undertake further work to remove weeds and general restoration.

At the opening, a colourful brochure explaining the importance of grasslands and the significance of the Old Cooma Common Grassland Reserve was launched. There were also tours of the reserve."

South western slopes

The first of the field days, organised by NPWS and FOG, started well with over fifty people attending the morning session at Yaven Creek and over forty people the afternoon session at Rosewood on Wednesday 17 October. Both locations are on the Riverina Highlands. A comprehensive report will be provided in the next newsletter. On Monday 15 October, Geoff Robertson gave a talk on grassy ecosystems at Cowra to the local Society for Growing Australian Plants, over twenty people attended. Great interest was shown in the local woodlands, especially as earlier in the day, Geoff, Margaret and Rainer had surveyed several sites north



The photo is one of two printed in the Cooma Monaro Express. Still recognisable are Geoff Robertson, David Eddy and Deputy Mayor Tony MacKenzie.

The following was reported in the Cooma Monaro Express, Tuesday September 11. "Cooma Council officially opened the newly established Cooma Grassland Reserve at Radio Hill Cooma last Friday. According to Friends of Grasslands' spokesman, Geoff Robertson, the occasion marked two years of effort to get the area into shape. He said Cooma residents have noticed slow but steady work on the hill to

and Water Conservation also supplied additional funding and Cooma Council has contributed much staff time. Mr Robertson said the reserve not only represents a good conservation outcome, its establishment is resulting in the flow of funds into Cooma, visitors from interstate and other parts of NSW, and an improved passive recreational facility for local residents. Interest in the reserve will continue, as will the need

of Cowra and were able to report on some exciting plants and birds (including Brolgas, White-browed Babblers, and Superb Parrots) they had seen. FOG is planning a weekend in the south western slopes in spring next year to show off the gems to FOG members and local residents. In his talk Geoff used a set of slides recently acquired by FOG using slides from David Eddy's and Rainer Rehwinkel's collections. These may be used by FOG members to give talks, etc

East O'Malley assessment

Readers may recall (January-February 2001 Newsletter) that FOG made a submission on 20 November 2000 opposing the proposed residential development of East O'Malley, as set out in the draft development control plan. Our reasons were twofold. First the timetable given by PALM was insufficient to undertake any proper assessment and consultation on the detailed proposal. Second, given that the area proposed for development was 'very high' and 'high' conservation value Yellow Box/Red Gum Grassy Woodland (a threatened ecological community), FOG opposes any reduction in area of these varied and threatened communities. Various arguments as to the importance of conserving these communities were included. FOG was given the preliminary assessment for comment in August 2000, with less than a month to respond. Again there was inadequate time to undertake any detailed work and consultation, although in the meantime we had become more familiar with the issues. PALM had at no stage attempted to consult FOG on its previous submission. The preliminary assessment merely gave some broad statistics on the previous responses and the issues covered. It in no way attempted to discuss the nature of concerns. As a preliminary environment assessment, the document was poorly argued, although between November 2000 and August 2001, the ACT Government had decided to conserve a greater area of East O'Malley and develop the residual 27ha.

The preliminary assessment quoted the ACT Conservator of Flora and Fauna as saying that the preliminary assessment takes into account the ecological conditions at the site and is consistent with Action Plan 10. While this is clearly a crafted statement, it is bureaucratic nonsense. Certainly the assessment discusses ecological issues (as it is bound to do, and badly in our view) and is consistent with Action Plan 10's politically compromised recommendations that 'high' and 'very high' conservation areas may be developed. Unfortunately both the Conservator and PALM are not independent sources of political advice. The biggest difficulty for the

authors of the assessment is the presence of certain bird species (Double-barred Finch, Speckled Warbler, Southern Whiteface, and Painted Button-quail), whose decline is a serious environmental concern (see next item - new bird findings) in the area proposed for development. These birds are not

rarer phenomena; and the presence of the declining bird species is sufficient justification to retain their habitat.

Apart from FOG, submissions with similar themes were made by the Conservation Council, the Red Hill Regenerators (Park Care Group), and the Chifley/Pearce Urban Landcare Group.

Tribute to David Sledge

David Sledge passed away on 22 August. David had a distinguished career in the Royal Air Force which brought him to Australia with Bess and their three children, and they made Canberra their home. With retirement came leisure to immerse himself in painting, a passion that sustained him to the end. His commercial success reflected his talent, and his generosity swelled Bess's fund for the Parkcare group's work on Cooleman Ridge. Together, David and Bess made a formidable team who fought a quiet, long, hard, battle to free the Ridge of its stock and then its weeds. David was also interested in the birds of the Ridge and inspired others to get out there and examine the comings and goings. At working bees the first sight of David would usually occur as he was putting up the signs directing helpers to the site for the day. He will be missed by all of us who knew him as a kind and generous man.

being recorded in other parts of Canberra and Canberra Nature Park, including the areas of East O'Malley which the Government proposes to include in Canberra Nature Park. The assessment suggests these birds may move elsewhere, which is unlikely, or may be found in the woodland at Symonston, which is currently earmarked for clearing for the ACT prison. Finally the assessment did not undertake any serious animal and plant surveys to provide objective benchmark data.

The arguments for retaining East O'Malley intact are that: it is the second largest area of Yellow Box/Red Gum grassy woodland (a threatened and diverse ecological community) in Australia; East O'Malley may

They recorded 67 species of birds including the following sightings of uncommon and declining woodland species: Speckled Warbler (16), Double-barred Finch (12), Dusky Woodswallow (8), Varied Sittella (8), Rufous Whistler (5), Golden Whistler (4), Southern Whiteface (3), and Diamond Firetail (2). The figures in brackets are the number of visits on which birds were sighted. Readers will recall an article by Barry Traill (November-December 2000 newsletter) on the concern for these birds which have largely disappeared from the region. Their and other evidence in the Preliminary Assessment point to the absence of these birds in that part of East O'Malley that the government has agreed to save. The presence of any one of these species should be seriously regarded as a reason for development not to occur. To provide more anecdotal evidence, Gill and Richard are familiar with other birding hotspots (the upper eastern slopes of East Mount Mugga Mugga, West Majura and Campbell Park) but they regard the threatened part of East O'Malley as clearly superior.

It has since come to our attention that the Speckled Warbler and the Diamond Firetail have received preliminary assessment as threatened in NSW, with final listing imminent. Therefore a very strong case exists for also list-

In this issue:

- News Roundup.
- The Great Salinity Debate, Part IV: Role of small native mammals in soil building and water balance - Greg Martin.
- Field Trip Roundup: Soiuth Coast Grasslands, Michael Treanor, Diverse daisies and a sampling of saltbush, Rainer Rehwinkel, and Gungahlin Hill, Alan Ford.
- Extract from *Canberra: a Nation's Capital* - held over previous issue.
- Native Grasses: Preserevation, Production or Both? Tony Wilson

differ in certain respects as evidenced by the presence of declining bird species; the presence of the creek adds special significance as wet grassy ecosystems are even

ing these species in the ACT. So much for the claim in the Preliminary Assessment that no threatened species exist at the area under threat at East O'Malley.

Environmental plea

The following article was written by Leesha Furse in the Canberra Chronicle, 2 October. "Thirty environmental groups

vironment impact of development on the area." **Thirty groups lobby candidates**

Thirty Canberra conservation groups, including FOG, have sent letters to major candidates in the ACT election asking for a commitment for no further clearing of temperate grasslands and Yellow Box/Red Gum Grassy Woodlands, a review of re-

Ian Lunt kicked-off with the *History of Australian native grasslands*. He argued that the history of grasslands and woodlands does matter as it provides a benchmark to determine past changes and an understanding of the cause of problems, and can be used to predict impacts of future activities. "History is politics". There had been a vigorous debate about grassland/woodland changes in NSW/Queensland centred on how many trees were there originally. The controversy developed to include the nature of the vegetation pattern, and the processes that maintained those patterns and caused change. In his view, the reasons for disagreement include the political implications of the arguments, personal biases, inadequate information and the lack of a sense of geography. He gave an erudite description of the various classifications of vegetation type involved in these debates and argued that most of the agricultural belt had been dominated by woodlands. There were regional differences in the response to similar processes. He suggested a balanced assessment was that change occurred in the woodland/grassland/shrubland equation although the processes are debatable. His view was that it had been a data free debate with few rigorous studies. To move forward, we need a landscape framework, maps of past and present patterns, and agreement on why this matters and that rural sustainability needs a common vision of future landscapes. He concluded that we need to build a history on reasoned debate, otherwise our future will be as nebulous, contested and imaginary as our past.



This photo printed in the Chronicle. Recognise any familiar faces?

have called on all ACT election candidates to commit themselves to protecting the ACT's remnant woodlands and grasslands. Conservation Council South East Region and Canberra director Nicola Davies made the call on behalf of the groups, with the support of the Australian Conservation Foundation President **Peter Garrett**. Ms Davies said that the ACT has some of the largest and most diverse remnant woodlands and grasslands remaining 'anywhere' and was a stronghold for many nationally threatened, endangered and declining species.

"We are seeking an immediate end to clearing temperate grasslands and Yellow Box/Red Gum Grassy Woodlands and the inclusion in Canberra Nature Park of all areas of high and very high conservation value that are within the urban fabric", she said. One area surveyed as having high conservation value is 27ha of Yellow Box/Red Gum Grassy Woodland in East O'Malley. It is scheduled for residential development within the larger area of East O'Malley which the ACT Government has agreed to protect. Friends of Grasslands has objected to the preliminary assessment of the site, which includes a survey of the en-

lated action plans; and incorporation of remnants into Canberra Nature Park. Positive

commitments were made by all major groups. **While on the subject of Territory election matters, FOG would like to congratulate the Conservation Council for the sensible, balanced, and energetic campaign it conducted on environmental, especially grassland and woodland, issues.** Let us hope it makes a difference.

STIPA Conference

Alan Ford

The STIPA Native Grasses Association conference, *Our Valuable Native Grasslands, Better Pastures, Naturally*, was held at Dookie in northern Victoria, 27 to 28 September. There was a pre-conference grass identification workshop, jointly organised with the University of Melbourne with a campus at Dookie, and a visit to the Dookie Reserve, a magnificent 270ha Grey/White Box Grassy Woodland reserve with a stunning understorey. The conference was based on three themes: *Productive use of native pastures, Conservation and biodiversity* and *Water use*.

occurred in the woodland/grassland/shrubland equation although the processes are debatable. His view was that it had been a data free debate with few rigorous studies. To move forward, we need a landscape framework, maps of past and present patterns, and agreement on why this matters and that rural sustainability needs a common vision of future landscapes. He concluded that we need to build a history on reasoned debate, otherwise our future will be as nebulous, contested and imaginary as our past.

The session on *Productive use of native pastures* focused on farmers' experiences with native grasses, including the use of native pastures as the base for grain crops (pasture cropping). In a major contribution, Meredith Mitchell observed that when we look at a pasture very few of us consider what is below the ground and what impact grazing has on this. We need a better understanding of water and nutrient absorption, anchorage, storage of carbohydrates, and the production of hormones that regulate root and shoot growth, as roots play an important role. For better managed native grass pasture we need to have a greater understanding of what is happening below the soil.

The most impressive thing about the *Conservation and Biodiversity* session was the mix of management ideas for both reserved land and farmland. In the latter, one man's journey led him to propose a model for restoring land for conservation and production: rest, burning, a tightly controlled grazing regime and continuous monitoring. Another contribution centred on the collection and use of local native grass seed. A third contribution examined the need to understand more about the ecology of native grasses and their ecological relationships, if we are going to develop effective management, repair and rehabilitation strategies for native grasslands. Such factors as the level of weeds and soil nutrient relationships are key issues but we have a lot to learn.

In the *Water use* session, Christine Jones started the ball rolling by arguing that conventional methods of cropping and grazing often lead to excessive removal of groundcover, a deterioration in soil quality and an increased prevalence of dryland soil salinity. The challenge for agriculture is to simulate the patchy and intermittent disturbance regimes found in nature, using the livestock and mechanical tools available. With appropriate land management, traditional enterprises can be conducted in such a way that perennial groundcover is restored and the moisture-holding capacity, nutrient content and structural properties of the soil are improved. Mark Cotter followed this with an impressive and frightening overview of the salinity problem in Victoria's Goulburn Broken Catchment. To simply maintain the status quo, and prevent the problem getting any worse, would take an investment of seven million dollars annually for fifty years. I enjoyed the learning experience of the STIPA conference and the growing acknowledgment of the importance of preserving our remaining grassy ecosystems

Dananbilla Biodiversity Survey

Alan Ford

A large contingent of FOG members were involved in the NSW National Parks and Wildlife (NPWS) Dananbilla Biodiversity

serve and surrounding sites. To do this they had organised in excess of 50 volunteers to assist in the various survey processes. If the night teams appeared dedicated then the day events were no less exacting in the required effort. People were, after all, setting out at 6am to check the trap lines or simply to go birding.

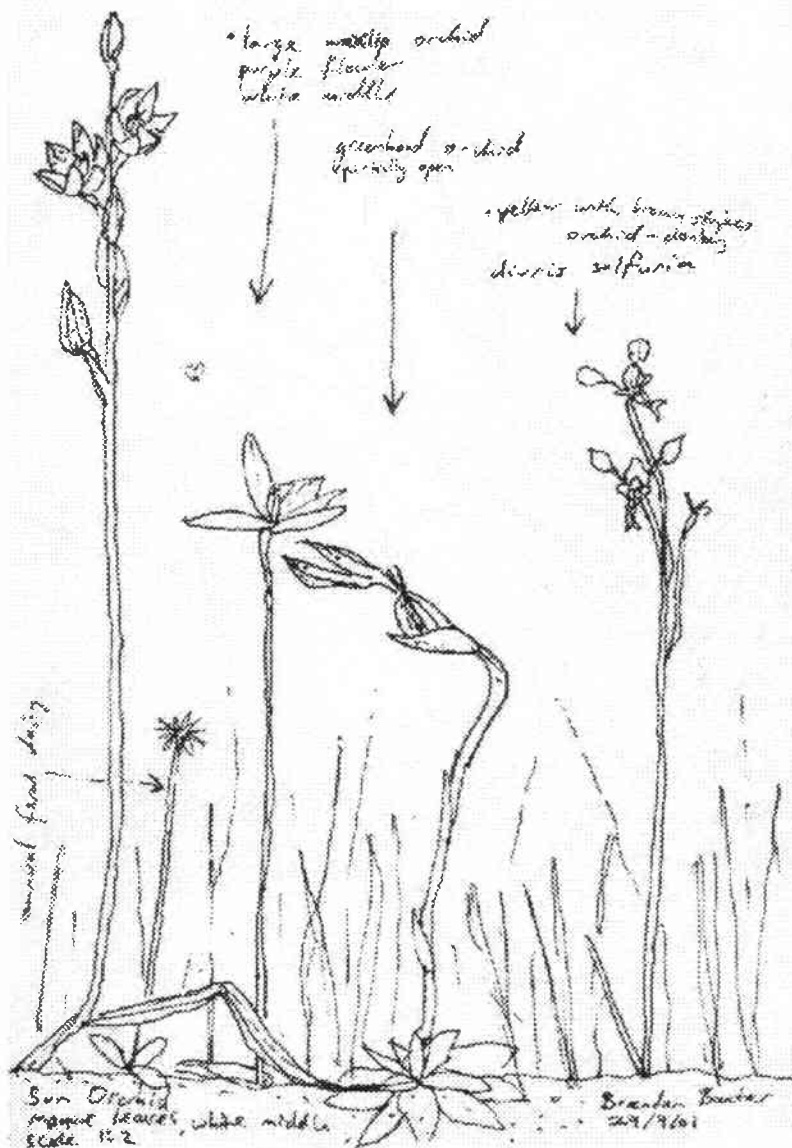
I stuck to the simple path for the weekend. Plant surveys took me to a Spring Forest property, Crowther and Yellow Waters Travelling Stock Reserves (the mosquitos at Yellow Waters had to be seen to be believed), as well as surveying at Koorawatha itself. The methodology was an intriguing mix of the traditional and the radical. Michael Mulvaney would set up his plots and examine the contents in detail while Rainer Rehwinkel would practice his tried and true rapid assessment ramble. These two methods allowed for the diversity of flora to be picked up. At Koorawatha, in the gullies behind the campsite and adjacent areas, thirteen orchids was the highlight of the day.

Other options available which were chosen by FOG colleagues included the day and night insect activities and the night frog and bat surveys. One matter for concern was the shortage of mammals; my memory is that the traps caught one Yellow-footed Antechinus, and that was it. Contrast that with the moths. When one returned from the morning plant survey Ted was sitting in a remote corner sorting and pinning the previous nights work into the

collection boxes. He estimated that he may have had around 120 species, and that excluded the Sunday night collection. Someone also found a legless lizard; they were still debating what it was as the weekend came to an end. Thanks to the dedicated Queanbeyan NPWS staff who did the cooking and organised the weekend.

Southern Tablelands conservation strategy

NSW National Parks and Wildlife Service has advised FOG on efforts to develop a conservation strategy for the Southern Tablelands. The strategy is being developed as part of the NHT funded *Joint Regional Biodiversity Survey of Grassy Ecosystems Project*. The project was initiated following discussion with the Housing Industry Association and is supported by many Com-



A leaf out of Brendan Baxter's book - some orchid and lily sketches at Dananbilla survey.

Survey, from 29 September to 1 October at a newly-acquired property near Koorawatha. The lights glittered on the fencing wire as the frog, mammal, bird and bat teams moved out of the camp in the moonlight towards their various destinations, some nearby and some further afield. At night, if you looked into the forest behind the camp you could see the reflections of the moth lights on the surrounding canopy in the distant gloom. Ted Edwards was gathering his harvest.

This night-time survey ritual emphasised the serious intent of the NPWS to gather data on as wide a range of flora and fauna of this soon to be proclaimed Nature Re-

monwealth, State (both ACT and NSW), and local governments (Queanbeyan, Yarrowlumla and Yass). FOG will be asked to attend a workshop to discuss progress in the near future

FOBM formed

The Canberra Chronicle 9 October reported on the formation of Friends of Black Mountain (FOBM) in response to the ACT Government's suggestion that as part of the Gungahlin Drive Extension, the northern end of Caswell Drive be moved 200 metres to the east, cutting off an important Black Mountain area. The article includes a nice photo of veteran campaigners, Jean Geue and Dierk von Behrens framed by two Scribbly Gums.

Caterpillar Tracks

This is not a story about the fuzzy, crawly kind! In late September or early October a large earth-moving machine, with three metre wide caterpillar tracks, doing work for the Conder 9 development, used the nearby Conder 9 grassy woodland (which had been reserved under Action Plan 10), as a short-cut. The machine went through three creeks and a locked gate in a new fence which had been installed at the request of FOG specifically to keep ma-

chines of this kind out of the site. It caused some damage to the flora, particularly on the creek crossings, and whenever there was a change in direction and the machine rotated, it removed the topsoil. Fortunately, it did not go anywhere near the large patch of the rare orchid, *Diuris dendrobioides*, an important feature of the site. It also missed the rare *Zornia dyctiocarpa* patch by a matter of feet. But it didn't miss a pair of Swan Greenhood Orchids, nor the wombat hole near the gate. The event was reported to Environment ACT which entered the

Send in those news stories

Many people have contributed to this News roundup by sending in short articles, press clippings, things from the net, snippets of information, etc. Thank you all and keep those items coming in.

fray and laid an Environment Protection Order on the developer, requiring them to repair the damage. Unfortunately, initial repair attempts may have done further damage. More information next time.

Plant conservation techniques course

The Australian Network for Plant Conservation will present its third Plant Conservation Techniques Course in Lismore, New South Wales, from 1 to 8 December. The

course is suitable for those who are undertaking or wish to undertake practical plant conservation projects, including community group members. The organisers will be looking to create a balance of government, NGO, industry and community enrolments. For further information contact (02) 6250 9509 or email: anpc@anbg.gov.au. Registrations close on 2 November.

Conservation income tax break

Grassy Ecol picked up the following item from the 3 September issue of LAWNinfo: "The Federal Government has announced changes to the taxation law to allow income tax deductions to land holders who enter into perpetual conservation covenants for the protection of their land. The measure was recommended by the Partnerships Taxation Working Group following its review of the recommendations of the CSIRO report, *Sustaining the Land*. The new conditions applying to the deduction will be consistent with the existing gift provisions in the tax law in relation to donations of land and other property. Deductions will only be available for covenants that are supported by state legislation and accredited by the Commonwealth Minister for the Environment."

The Great Salinity Debate Part IV: Role of small native mammals in soil building and water balance

Greg Martin.

"The most essential of the world's primary resources are water and soil."

(Mary E. White, *Listen ... Our Land is Crying*)

Introduction

Australian soils have been shaped by a number of processes and events that differ in significant ways to those operating on other continents. The rapid prominence of Australia's livestock industries after European settlement resulted in the extensive changes to the environment often being poorly recorded and little understood. Consequently many of our farming practices and much of its research has been based on overseas ideas and practices that were developed after the land was significantly altered. By looking more closely at our own history, farmers can perhaps gain benefit for our future.

Early records from many areas of Australia indicate that at the time of European settlement soils were often soft, crumbly, and friable. It has long been assumed that the hoof action of domestic stock was the principal cause of the ground becoming hard and capped. However, the deterioration of soil health also coincided with the dramatic decline or complete extinction of many small native mammals and the consequent cessation of the soil disturbances and interactions that they created.

Extracts from pioneers' journals describe a significantly different soil and water environment to what can be seen today. For instance, James Cotton was the stock inspector for the Cobar Sheep District and in giving evidence to the Commission into the Western Lands 1901 stated that, "In the years 1880 and 1881, before this district was stocked, and when it was being improved, the country was covered with a heavy growth of natural grasses - kangaroo grass, star grass, blue grass, mulga, and other grasses. The western half of the district abounded with salt [bush] and cotton bush together with the grasses mentioned. **The ground was soft, spongy and very absorbent.** One inch of rain then, in spring or autumn, produced a luxurious growth of fresh green grass". Cotton continued "There has been a gradual deterioration of the country caused by stock, which has transformed the land from its original soft, spongy, absorbent nature to a hard clayey, smooth surface (more especially on the ridges), which instead of absorbing the rain runs it off in a sheet as fast as it falls, carrying with it the surface mould, seeds of all kinds of plants, sheep manure, sand etc., to enrich the lower lying country and plant it with pine, box and other noxious scrubs".

George Riddoch also remembered his early years at Weinteriga "When I got away from the track the horses went up to their fetlocks in loose, friable soil...it was like a well tilled field; and the moisture, as it fell, penetrated the soil and fertilised the plants,

Now it is scarcely an exaggeration to say that the very ground I am speaking of rings under the horses hooves...".

Water and soil

These, and other journals indicate that the hardening of the soil surface occurred rapidly. Indeed, this transformation was often regarded as necessary for profitable live-stock production. When soils were spongy, rain-fall was easily absorbed. When the surface hardened and sealed, water ran off and filled the waterholes and tanks which initially increased the stock carrying capacity over a larger area in a country with few rivers and little standing water. Little did settlers realise that this was not just a simple change.

Soil disturbance regimes

Brush-tailed Bettongs (*Bettongia penicillata*), also known as woylies, make between 20 to 100 diggings a night foraging and may churn up more than six tonnes of soil each year. The number of digs by many other species including the Burrowing Bettong (*Bettongia lesueur*), Southern Brown Bandicoot (*Isodon obesulus*), Bilby (*Macrotis lagotis*) and Long-nosed Potoroo (*Potorous tridactylus*) are similar although the amount of soil turned over may vary with the difference in size of the animal and variations in their diet. This represents a significant impact on the soil when the number of animals and the time they have been in that location are taken into consideration. The ancestors of today's bettongs and bandicoots have been around for at least 20 million years.

Observing the action of this digging shows that not only is the soil moved under and behind the animal but it is also turned over and organic matter is broken into smaller particles and mixed into the soil. This is important for its rapid breakdown. It is estimated that 75% of Australian soils now contain less than one percent organic matter, whereas at least 2% is needed for soil stability.

Some varieties of mycorrhizal fungi produce underground fruiting bodies which are filled with spores. These are favourite foods of many of the small native mammals such as potoroos, bandicoots and bettongs. Although the bulk of the fungal tissue eaten is digested, the spores pass through the gut of the mammals intact, and are voided back. The dispersal of mycorrhizal fungi in this manner maintains their diversity in soil and this, in turn, contributes to the health and diversity of the plant community.

Moving water carries with it many things. The visible components of muddy water, the suspended soil particles, are frequently regarded as the greatest loss. Their removal results in soil erosion and their deposition lower in the landscape clogs tanks and water-

The importance of microbes for soil fertility

Organic matter provides food for microorganisms, which include algae, bacteria, fungi, protozoa, invertebrates and viruses. The total biomass in a fertile soil may exceed twenty tonnes per hectare. With the loss of organic matter, microorganism populations can be reduced in number and variety as their source of food is removed. Microorganisms perform a wide range of functions in the ecosystem including the acquisition and cycling of carbon, nitrogen, sulphur, phosphorus and other nutrients.

Nitrogen-fixing bacteria for example, thrive under conditions in which ample organic matter is intermixed in the surface layers. The moisture and temperature conditions which stimulate the growth of free-living nitrogen-fixing bacteria also stimulate plant growth, so that plants can utilise the nitrogen as it is fixed from the air, preventing its loss or movement. In this way, vigorous grassland communities can thrive in seemingly low nitrogen soils.

Conversely, nitrogen-fixers are less tolerant of soils which are compacted, or low in organic matter. In these situations, nitrogen needs to be supplied via legumes or fertilisers as an expense to the landholder, but because nitrogen supplied in this form is very mobile, its loss can lead to acid soils or cause undesirable effects elsewhere.

About ninety percent of plants form a symbiosis with a range of fungi. Mycorrhizas are highly evolved associations between soil fungi and plant roots. The fungus is made up of fine threads that wind between soil particles and grow into decomposing organic matter. When in symbiosis, the fungi take nutrients and water from the soil and translocate these to the host plant. In return, the fungus receives energy in the form of carbohydrates.

Benefits to plants of mycorrhizal fungi include faster growth, improved nutrition, better recovery after drought, protection from pathogens and greater reproductive capacity. These factors encourage higher species diversity in native plant communities and enhance their competitive abilities against weeds.

Mycorrhizal fungi are extremely important for supplying phosphorus to plants in Australian soils where the phosphorus exists in relatively unavailable forms. Phosphatase enzymes produced by soil bacteria can also release phosphorus which would be otherwise "fixed" in our deeply weathered soils. Because these bacteria and fungi require carbohydrates for survival, in bare soils their functions cease.

In addition to their contribution to plant nutrition, microorganisms produce sticky secretions and humic materials that cement mineral particles together into crumbs or aggregates. The thread-like filaments of mycorrhizal fungi help bind smaller soil crumbs into larger aggregates that do not collapse when wet.

Together with the organic matter, these secretions and fungal filaments improve the structure and texture of the soil. Improved soil structure means more water can be held in the pores between and within the soil aggregates. This ability to hold water between the pores of the soil is a key factor influencing plant establishment, growth and persistence.

Higher soil water holding capacity also means water percolates slowly downwards rather than draining rapidly into lower profiles, or running off sloping land, where it may contribute to rising groundwater and increase the likelihood of dryland salinity.

ways. But the invisible components of moving water, and the water itself have a less obvious but far more significant impact on farm productivity than the loss of soil.

Many of the soil's humic materials, microorganisms and plant-available nutrients are transported with runoff water, leading to its rapid impoverishment. Healthy soils result from interactions between rock minerals and living things including large and small animals, plants, invertebrates and microorganisms, and are not solely about nutrient content but also structure, organic matter and soil organisms.

The maintenance of the delicately balanced components and the interactions between them is necessary for soil health and soil formation to be effective. Soil formation is, or should be, an ongoing process.

Small native mammals

Because farmers and the farming industry usually see a continuously grazed landscape, or if ungrazed, a landscape devoid of many of the components that existed pre-1788, it is difficult to understand the processes that operated and to visualise the landscape prior to European settlement.

The future for small native mammals

What does the future hold for Australia's critically endangered small mammals, the activities of which were fundamental to the evolution and maintenance of healthy landscapes prior to European settlement? Many species are now extinct and the few that remain have a precarious existence in dwindling colonies in remote locations. Increasing numbers are being rehabilitated in the protective environment of Earth Sanctuaries, where their activities can be observed and studied first hand in a natural environment. You can learn more about Earth Sanctuaries at their website at www.esl.com.au.

Small Australian mammals such as bettongs, potoroos, bilbies and bandicoots use their long claws and strong forefeet to turn over plant litter and dig shallow pits, scratchings and holes when foraging for a variety of foods that includes fruits, seeds, roots, insects, fungi, tubers and invertebrates. During the foraging process they turn organic matter into the soil, spread mycorrhizal fungi and seeds and their diggings provide a perfect bed for seeds to germinate in and allow rainfall to be easily absorbed. Although the numbers of these small animals were quite high for new topsoil to form. To achieve this, the grazing activities of domestic livestock, kangaroos and feral animals must be controlled to allow plenty of groundcover. Farmers should aim for a broad range of annual and perennial plant species that take advantage of rainfall at differing times of the year. When properly managed, grazing can be a powerful and positive tool in land restoration.

Soil surfaces require organic matter and **intermittent, shallow and patchy** disturbance regimes to facilitate its incorporation. This allows the infiltration of water where it falls, reduces damaging runoff and stimulates microbial activity.

Broad scale soil inversion or the creation of large areas of bare soil by any means should be avoided and burning should be used only in exceptional circumstances.

Water repellent soils

Common to many areas are soils that are non-wetting or water repellent. This usually is apparent as a crust-like surface feature, which acts as a barrier to an underlying wettable soil. The foraging actions of small native mammals provide sites for water to infiltrate. Studies conducted by Mark Garkaklis in Western Australia on the effects of the foraging activities of woylies (Brush-tailed Bettong) on soil water repellence and water infiltration, showed that at the edge of the digging spoil, water repellency fell sharply and remained low throughout the entire disturbed region, albeit with a slight increase in water repellence at the bottom of the hole.

After heavy rainfall, distinct colour differences were clearly visible in the soil profiles near diggings, indicating preferential water infiltration. Sub-soil water content was significantly greater in the darker soils below each digging, compared with the paler soils in the undisturbed zones.

With more effective water cycle comes a more effective nutrient cycle, as nutrients are only available to plants in solution. Because water is trapped in the foraging pits, runoff velocity is also slowed, resulting in a lower tendency for erosion.

Breakthroughs such as annual crops direct drilled into perennial native pastures and pulsed grazing to stimulate biological activity in soils provide a place to start (see Parts I and III of this series).

Healthy soils are essential for the survival of a wide range of native plants and animals, including

many small native mammals, reptiles, birds, microorganisms, and soil invertebrates. When communities of plants and animals are managed appropriately, their activities result in the formation of soils high in organic matter, a rich and diverse number of species, a productive landscape for agricultural and other pursuits and the restoration of water balance.

In addition to the preservation of biodiversity, retrieving native species from the brink of extinction may have implications for the productivity of rural landscapes far exceeding those which could have been originally envisaged. By studying their activities today, we can better understand how unique ecosystem processes in Australia functioned prior to European settlement. The linkage of that knowledge with human creativity could revolutionise land management practices and productivity in the future.

The history of the world is riddled with examples of man creating deserts where once there was healthy biodiversity regardless of the rainfall. In the past, people simply moved on to new lands, often abandoning whole cities and cultures.

Today we do not have that choice.

Greg Martin grew up on a mixed family farm south of Adelaide. After leaving school he took a number of jobs around Australia which fuelled his keen interest in early explorers and settlement. He joined Earth Sanctuaries Ltd as project manager at Scotia Earth Sanctuary near Broken Hill where he oversaw the construction of the first two stages and the setting up of successful breeding programs for a number of rare and endangered native mammals. His contact details are PO Box 28, Kingswood, SA, 5062, email: scotiagmart@bigpond.com.au. He wishes to acknowledge Christine Jones and Cheryl McEgan for their generous help and encouragement. This article has previously appeared in the Stipa Native Grasses Newsletter, Australian Farm Journal and Holistic Management Australian Quarterly Newsletter.

FIELD TRIP ROUNDUP

South Coast Grasslands

Michael Treanor

Starting at South Moruya Heads on a beautiful sunny Saturday morning (25 August) was a great beginning to what was to be a successful weekend with a unique gathering of people. Led by Rainer Rehwinkel, a group of over 20 members of both FOG and the local SGAP group followed the 'finds' of interesting plants and animals around four grassy headlands between Moruya and Bodalla over the weekend. As with many of the other grassland-dominated headlands in the region, South Moruya Heads had a long and interesting history of use, from continual use by Aboriginal tribes as foraging and camping sites, to the more recent use for grazing and housing. The first European settlers used the headlands as livestock holding areas, as their shape meant that only one length of fencing was required to keep the animals in. Nowadays these grasslands, where they remain, are amongst the most important areas to be conserved, with a wide variety of both fauna and flora being protected in many new additions to the Eurobodalla National Park.

South Moruya Heads had been recently burnt, possibly deliberately, which had, as an accidental bonus, killed quite a few trees that had been planted by a Landcare group, in good faith but possibly to the detriment of the grasslands. The 'twitchers' were out, and quite a few interesting bird species were seen, many also common to Canberra, such as the Satin Bower-Bird and the Jackie Winter. Apart from a few weedy Freesias and native Buttercups there was not a lot out in flower this early in the season. However this and the other sites look very promising and next year FOG will have the same trip...in September!

The second site was Jemisons Point near Potato Point. This was a large and scenic headland that had previously being named 'Black-



Coastal grasslands have it all - grasslands, scenery and beach.

fellow Point' due to its heavy use by Aboriginal people, some of whom still visit the area. This grassland was one of the first coastal sites to have Austral Toadflax (*Thesium australe*), a

threatened species, found on it, and given its many other species it is a very diverse and interesting area.

After a great night of long and heated, but very friendly debating, and the occasional battered fish, we met at Bindie Bindie Heads on the Sunday morning. We were met by Robyn Corringham, a local Australian Plants' group member who gave us a brief history of the heads, which included a bizarre tsunami that arose from the Macquarie Uprise a few million years ago and shaped the land to what it is today! Again the area has a diverse history from Aboriginal middens to corn and potato growing, and camel and goat grazing! The shrubs appear to be taking over, begging the question that is asked of many coastal grasslands, were they always grassy? Some sites show evidence of tree stumps,



while others have species present that can only establish in well-developed grasslands, so the question can really only be answered for individual sites.

The fourth and last site was Mullimburra Heads, near Bindie. This smaller and spotty site was to yield a new population of *Thesium* for the coast, as well as many other wildflowers that had not been seen flowering at other sites.

Overall it was one of the most successful FOG trips to date, and many expressed interest in doing it in spring next year. FOG would like to thank Rainer, Jackie, Robyn and Alan for their great information and very interesting facts, and finally Margaret for organising, to the minute, the whole shebang!

Diverse daisies and a sampling of saltbushes

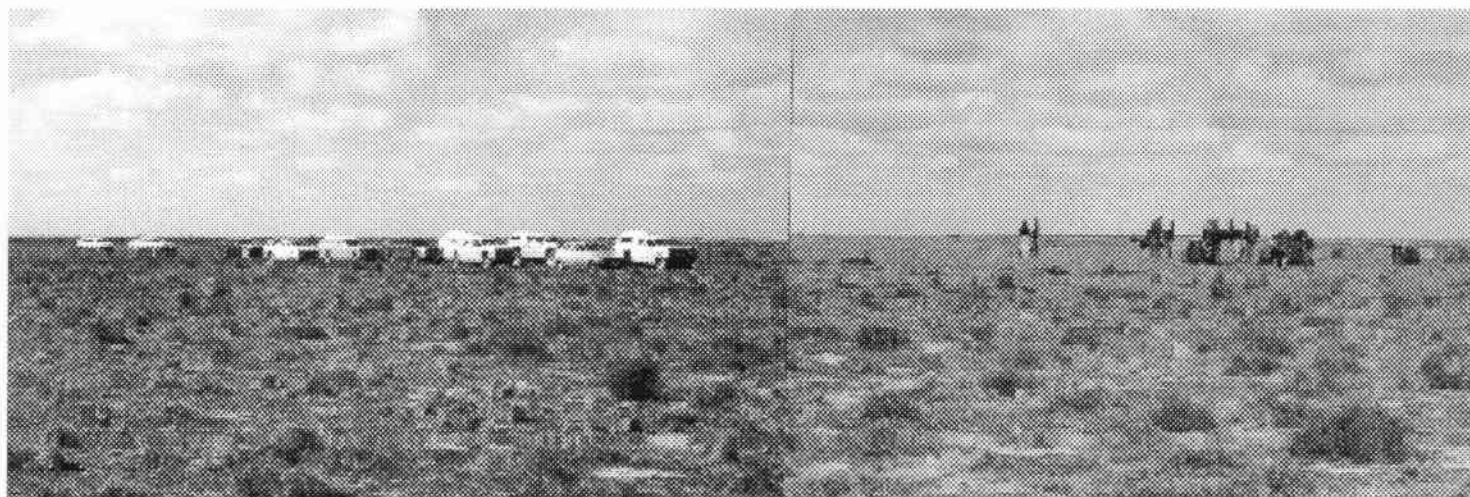
Rainer Rehwinkel

A tiny, annual *Podolepis*, Hard-headed Daisy, a miniature *Senecio*, a yellow *Leucochrysum*, minnie daisies, the showy, white *Calotis scabiosifolia* - just a few of the unfamiliar daisies amongst a host of other unfamiliar flora and fauna species encountered during FOG's Western Riverina trip (8 and 9 September). We were led by Roger McGrath, a newly appointed project officer for the Western Riverina Vegetation Planning Committee, and were welcomed and hosted by John Hanna at Embah Station, and Neville and Nerida Read at South Burrabogie Station. Then there was the entourage of wonderful people who laid out ample spreads for morning tea, lunch and dinner! The trip was special in another way too, because

tered the diminutive *Goodenia pusilliflora*, so tiny that only a careful inspection reveals it to be a Scrambled Eggs.

A point of amusement at this site was John's description of the "creek" running through this paddock - merely the tiniest depression amid the vast plain, but clearly marked by a sinuous band of Old Man Saltbush. John proudly showed us his newly-found treasure - some *Swainsona procumbens* plants. This species, commonly called Broughton Pea, is amongst the most spectacular of wildflowers - showy, sweet-pea-sized flowers of pale pink or mauve. These are carried above the distinctive ferny leaves composed of a double series of neat, rounded leaflets. The fauna species that made this morning memorable was the Shingleback Skink. Many had a chance to handle this animal and Dierk's dissertation of its pineal or third eye added to the interest.

In the afternoon, Neville and Nerida's property *South Burrabogie* gave us a glimpse of the variety of landscapes that can be revealed amongst the seemingly endless, and superficially monotonous plain. Here, low sandy rises supported various tree species, and even the grasslands started to show subtle differences to those with their "eyes in". Highlights here were various *Ptilotis* species (pussytails), some too-early-to-be-flowering *Pterostylis* rosettes and the delicate *Swainsona murrayana*, a threatened species. Again, daisies were prominent. Of interest here too was the *Senna phyllodenia* that Neville and Nerida had fenced off for protection against grazing. *Senna* (formerly *Cassia*) is a cosmopolitan genus, distantly related to the peas (family Caesilpinaceae). Australian



we were joined by people who came from as far afield as Victoria, Albury, Deniliquin and Griffith. Amongst these were naturalists, scientists and agency staff - the resultant mix made for a most informative and very enjoyable weekend. Special thanks to Eric Whiting for his contribution to identifying the myriad unfamiliar flora we came up against.

And then there is the landscape! I guess it's a cliché to say that the Hay Plain is flat - anyway, it's always so good to see so much horizon and so much sky. David Eddy and I had a chuckle over a "sunset-viewing spot" off the highway west of Hay. Any place would have done as well!

Our first spot 'Embah', was a 11,812 ha sheep station, which runs one head per 4 acres! John Hanna led us to the boundary of two paddocks that showed the contrast between different management regimes. One, a grass-based pasture, revealed some of the daisies that were soon to become familiar. The neighbouring paddock, dominated by saltbushes, was the challenge - especially for those unfamiliar with this characteristic group of plants. Here I encoun-

The Hay Plain - a totally different grassland landscape.

sennas are characteristically arid-zone plants. Some of our old friends were here too, including Native Flax, Blue Stork's-bill and Scrambled Eggs. However, we knew that we were out west when a mob of Red Kangaroos (and Blue Flyers) bounded across the horizon.

For me, the highlight of the whole trip was the spot-lighting expedition held at *South Burrabogie* in the evening after a great barbecue. The spot-lighting was led by David Parker who is working for the Plains-wanderer Recovery Team. The Plains-wanderer is a bird of ancient lineage, whose closest relatives live in South America. Superficially quail-like, it is the female of this species who is the more ornate, while the male is more cryptic and takes on the family rearing role. The open grasslands in the Riverina are the stronghold of this threatened species, which ranges from eastern South Australia to southern Queensland. There is an old record too, from the ACT. Agricultural development has been the Plains-wanderer's biggest threat.

A few dedicated night owls accompanied David on the spot-lighting trip. He warned us that it may take two or three hours to find one of these elusive birds. Our first encounter was with a male Stubble Quail, a strongly marked bird, with an orange-brown throat and a large black breast mark. Within only half an hour, we came across our quarry - a female Plains-wanderer, quietly beautiful with her black and white spotted collar and red-brown breast band. Through my binoculars, her large brilliant yellow eyes and long yellow legs were striking. A two-way-radio call back to the homestead, and soon we were joined by the rest of the FOG trippers, who all managed a close-up view of this extraordinary and rarely-seen bird.

The next morning, our destination was the *Tchelery Conservation Reserve*, a 60 ha remnant set up by the Soil Conservation Service some 50 years ago. Although sometimes illegally grazed, this site was still however, a revelation. Scattered low wattle trees (*Acacia homalophylla*) provided some structure for birds, the most spectacular of which, seen by some on this morning, was the lovely Blue Bonnet, a parrot coloured in the muted browns, reds, golds and blues of the interior itself.

Tchelery was a floral treasure-trove too, with many species of salt-bush interspersed with patches of varied wildflowers, daisies again being prominent. The most spectacular was a brilliant diminutive annual sunray with shimmering golden papery rays. Again, old friends in the form of Grass Cushion, Austral Sunray and Blue Stork's-bill were here, clearly more at home with their varied annual associates. Communities in arid environments tend to have proportionally more annual species than are encountered in more temperate climates. Succulents were here too, *Tetragona*, *Calandrinia* and *Carpobrotus aequilateralis*, the brilliant crimson flowered pig-face that incidentally, many of us encountered only a few weeks earlier on our South Coast trip!

As always, the best things must come to an end, and our last stop was an impromptu picnic by the Murrumbidgee River at Hay, at a

spot that was Bob Wilkinson's playground when he was a boy! We lunched and lazed under towering River Red Gums ringing with bird calls. Then a reluctant departure - seemingly, no-one really wanted to get away too soon. I remember the first slight rise we came upon, on the homeward highway somewhere the other side of Wagga Wagga, and feeling a sense of leaving something very special behind.

Gungahlin Hill

Alan Ford

On a fine, sunny day (6 October), nine FOG members set out to examine this element of the Canberra Nature Park to the north of the City. It is adjacent to the Gungahlin Grasslands, although it is largely a Brittle Gum (*Eucalyptus mannifera*)/Scribbly Gum (*E. rossii*) woodland with a mixed shrub/grassy understorey. We managed to find approximately 70 native species during the afternoon.

We came upon Australia Indigo (*Indigo australis*) and False Sarsaparilla (*Hardenbergia violacea*) in profusion at times but apart from the prolific Redanther Wallaby Grass (*Joycea pallida*) it was the 12 orchids that consumed time and searching energy. Among the stunners were two donkey orchids, one on the higher parts of the site, *Diuris pardina* and the other in the lower, more grassy, sections of the site, *Diuris chryseopsis*. At times we were overwhelmed by the gardens of *Caladenia carnea*, with a scatter of the occasional *Caladenia* sp. aff. *dimorpha*. One of the intriguing mysteries that caused considerable discussion during the afternoon was the discovery of some unusual eucalypts. I think the tentative conclusion was that they might be *E. dives*/*E. rossii* hybrids. Such are the mysteries of eucs!!

While this site may not be in the Black Mountain class, it is clearly worth a visit at this time of year. At the end of the day we found a Brown Snake basking in the sun. It noticed us but really didn't make a fuss. Our thanks to Dave Mallinson for leading the party.

Final Extract from *Canberra: a Nation's Capital*

(Concluding our extracts from "Canberra: a Nation's Capital, Edited by Harold L. White, prepared for the Thirtieth Meeting of ANZAAS, 1954. 'The Minor Communities' was written by Professor Lindsay Pryor and 'The Plant Communities Following Settlement' by R.M. Moore.)

The minor communities

Amongst the original communities there are several that might be called minor because they occupy small areas in relation to the whole plant cover. They grow only in certain habitats, for example in places where free water or swamps, river sandbanks, or undeveloped soil are present.

These communities can be listed in series - which may indicate the course of primary succession - according to the state of the substratum on which they develop, but generally various events supervene which prevent the idealised succession from taking place. The process is very slow and these communities are relatively stable and unchanging compared with the others referred to above, in which large modifications were brought about by settlement. The main exception to this may be the communities on the river sandbanks, where there is probably rather active succession.

There are a number of interesting features about these communities, and these are best illustrated by arranging the communities in

the series through which succession can theoretically ultimately occur.

One of the most interesting sets of communities occurs in the alpine woodland zone in broad depressions at the heads of gullies, which provide a habitat for the succession from a free-water surface. These mountain swamps are a very distinctive feature of areas above 5000 feet on the south-eastern highlands.

The sequence of associations may be outlined as follows:

Ranunculus pimpinellifolius

Juncus falcatus-*Carex gaudichaudiana*

Hypolaena lateriflora

Restio australis

Richea gunnii

Epacris paludosa

Baeckea-Callistemon

Leptospermum lanigerum

Eucalyptus niphophila

The *Ranunculus pimpinellifolius* community, the first colonizer, is an aquatic community, which is replaced in the shallow portions by a community of *Carex gaudichaudiana* and *Juncus falcatus*. For the succeeding communities the habitat is progressively drier. The dominants form a closed community in all stages later than the *Hypolaena lateriflora*, and in this *Sphagnum* forms a continuous ground cover, which continues into the *Leptospermum lanigerum* community.

In all the communities except the second and the third last mentioned the only dominants are the species from which the community name is taken, although in the *Baeckea-Callistemon* community other species are found as co-dominants - chiefly *Helichrysum baccharoides*, *Hakea microcarpa*, *Helichrysum semipapposum* var. *brevifolium*, *Oxylobium ellipticum* and *Grevillea australis*. Below a well-developed community like this there is often as much as 6 feet of *Sphagnum* peat.

Another interesting set of communities commences on bare, dry rock in the dry sclerophyll forest zone. The colonizing lichens give way to mosses and these are followed by an open community of *Veronica perfoliata*, *Bulbine bulbosa* and *Cheilanthes tenuifolia*, which in turn gives way to a closed community of *Indigofera australis* var. *platypoda*, *Cassinia aculeata* and *Dodonaea viscosa*. At this stage a small amount of soil has accumulated in rock depressions, and sometimes scattered trees of *Brachychiton populneus* or, more commonly, *Casuarina stricta* follow. The latter is a more or less closed community of trees 20 to 30 feet in height, with a very scattered undergrowth of shrubs similar to those in the previous communities. It is in turn succeeded by the *E. polyanthemum* community, in which the trees form a closed canopy, and have a gnarled, stunted appearance, with a very scattered undergrowth of small shrubs, such as *Hibbertia obtusifolia* and *Brachyloma daphnoides*.

A variation is associated with the river systems, where *Callitris calcarata*, which occurs almost invariably near larger rivers, replaces *Casuarina stricta* in the sequence. Similarly, a community of *Leptospermum stellatum* and *Kunzea peduncularis* replaces the *Indigofera-Dodonaea* association.

Of special interest is the *Casuarina cunninghamiana* association, which occurs in pure stands on river sandbanks. The trees, which grow to a height of 80 feet, actively stabilize the sand and are often successful in direct colonization. Their life is relatively short, probably less than a hundred years, and the trees appear to give way to either *E. viminalis* or *E. bridgesiana* under ideal conditions. It is common, however, when the river floods or changes its course, for old banks to be destroyed and new ones formed, which are again colonized by *Casuarina cunninghamiana*.

Finally, the interesting conifer *Podocarpus alpina* should be mentioned. This occupies rock crevices and scree at heights greater than 5500 feet, often in association with an attractive *Grevillea*, hitherto undescribed. *Podocarpus* grows very slowly, and one stem has been examined that was about five inches in diameter and two hundred and fifty years old. It is likely that there are still older specimens than this to be found.

The plant communities following settlement

The native plant communities most affected by settlement are those of the grassland and savannah woodland. Although the communities of the more elevated areas have been subjected to disturbances of various kinds, these have, in general, been short. Where pine plantations have been established the original communities, principally dry sclerophyll forest, have, of course, been replaced entirely. In other instances the disturbances have been cata-



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strophic in nature and have been followed by normal succession to the original community.

The grassland and savannah woodland communities have been subjected to disturbance in the form of continued grazing for more than a hundred years and this has produced marked changes in the communities. The disclimax communities in grassland and cleared woodland are essentially similar and they are discussed simultaneously.

The first and most striking effect of sheep-grazing is the virtual disappearance of *Themeda australis*, and the replacement of this and other tall grasses, such as *Stipa aristiglumis* and *Poa caespitosa*, by a relatively stable community of shorter grasses, principally *S. falcata*, *Danthonia auriculata* and *D. carphoides*. Because of the completeness and the extent of this replacement it was once believed that *S. falcata* and *Danthonia* spp. were the original dominants of the herbaceous strata of both communities.

Under continued heavy grazing *S. falcata* disappears and the resultant community is composed mainly of *Danthonia* spp. and *Enneapogon nigricans*. This short-grass community has been heavily invaded by exotic species, such as *Hypochaeris radicata*, *Hordeum leporinum*, *Vulpia bromoides*, *Bromus* spp., *Rumex acetosella*, *Carduus tenuiflorus*, *Erodium* spp., *Salvia verbenacea* and *Cirsium vulgare*. In wet summers native summer-growing grasses, chiefly *Tripogon loliiformis*, *Chloris truncata* and *Panicum effusum*, may be prominent in these continually grazed communities.

On the more heavily textured soils red grass (*Bothriochloa ambigua*) has spread during wet summers and is now prominent over

large areas. The only species found in areas subjected to heavy trampling, such as stockyards and sheep camps, are horehound (*Marrubium vulgare*) and dwarf nettle (*Urtica urens*).

On land cultivated for cereal-growing *Hirshfeldia incana*, *Hypochaeris radicata*, *Carduus vulgare*, *Rumex acetosella*, *Vulpia bromoides*, *Amaranthus retroflexus*, *Solanum triflorum* and *Eragrostis cilienensis* commonly occur in fallows, while on areas regularly cultivated skeleton weed (*Chondrilla juncea*) is rapidly taking complete possession.

The carrying capacity of a *Stipa falcata*-*Danthonia* sp. community is about two sheep to 3 acres. The use of surface-seeding subterranean clover and topdressing with superphosphate are becoming fairly common in the Australian Capital Territory, and by such means the carrying capacity is increased to three sheep per acre. Under grazing and with the regular application of superphosphate, subterranean clover may become completely dominant in the pasture; the native perennial grasses are replaced by winter annuals such as *Vulpia bromoides*, *Hordeum leporinum* and *Serrafalcus mollis*. A further increase in carrying capacity can be achieved by ploughing and sowing *Phalaris tuberosa* and subterranean clover. Such a pasture is relatively stable even when stocking is heavy, and if superphosphate is applied in adequate amounts the pasture is remarkably free of weeds. Wimmera rye grass (*Lolium rigidum*) is also used in association with subterranean clover in short-term pastures, and lucerne is grown alone for summer grazing or for hay.

NATIVE GRASSES - Preservation, Production or Both?

Tony Wilson

In the past decade, interest in the preservation, production and harvesting of native grasses, has increased dramatically. I myself have lived and worked on the land all my life, but it was only in 1995 that I was made aware of the benefits of native pastures. It was then that John Betts and Jim Ryan from the Murray Darling Commission asked me to develop an environmentally friendly harvester for Weeping Grass (*Microlaena stipoides*), which resulted in the continued evolution of the "Bushranger" range of native grass seed harvesters. It was from these humble beginnings that my long-time friend John Betts and I forged a partnership to try to develop better ways of preserving maintaining and harvesting our local native grasses in the Yass and Canberra region.

At this stage, we are only working with three of our local native grass species: Kangaroo Grass (*Themeda triandra*), Wallaby Grass (*Austrodanthonia duttonii*) and Weeping Grass. These three native species are the most common found in our region, and are often found mixed together with other pastures but are sometimes found in almost a monoculture state. These remnant areas were missed by European agriculture of the past 200 years allowing them to survive to the present day. Due to the difficulty in harvesting native grass seed, a variety of harvesters have been developed of which ALL have their good and bad points. Some are multi purpose and some are specialised, giving mixed results for different grasses.

After developing a system for cleaning Kangaroo Grass (almost an impossible task) we found that brush-type harvesters tended to collect more seed awn than seed, therefore suggesting that the floret and seed were either not taken up or were flicked back to

the ground. As a result we decided to develop a sickle-type harvester that cuts off the floret, which is then drawn by vacuum to a central collection point. The cutter bar is set to an optimum level and approximately 10% of the seed heads are left for regeneration along with what may have already been ejected. (When the seed is ripe (dark brown to black) a day of 26 degree plus will cause the seed to eject from the floret. We have lost whole areas within one day because of this).

This same header/vacuum unit is used to harvest Wallaby Grass, but we feel that a brush harvester would probably do just as well because the floret is light and easily drawn into the machine. Using the same central vacuum system and swapping the cutting head with a special suction head, Weeping Grass can be harvested, either in rows or in remnant areas. By using strong vacuum and rubber fingers, the ripe seed is collected leaving the parent plant intact, thus allowing the unripe seed to ripen and be harvested again at a later date.

As in all cases, some seed will escape the harvester to regenerate and although we don't harvest the same area every year, a controlled stocking program is essential to maintain a healthy and productive native pasture with few weeds.

At present we have 99/2000 and 2000/2001 stocks of Kangaroo Grass in floret, concentrate and pure seed (no awn), but would be pleased to take forward orders for the next harvest of Weeping Grass and Wallaby Grass as last season's stocks have run out.

Please address enquires to either John Betts on 02 6226 1843 or Tony Wilson on 02 6227 0159.

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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 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.

Friends of Grasslands Inc
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