The Austral Bugle

Newsletter of the Southern Tablelands Grassy Ecosystems Conservation Management Network, in association with the Grassy Box Woodlands Conservation Management Network

Volume 2/ issue 1 ISSN 1446-8581 Winter 2009

Baselines: surveying the landscape of Weereewa.

Mary Appleby, Facilitator STGE CMN.

The Baselines forum was an initiative of CraftACT, and grew from a collaborative exhibition by painter and CMN member Christine James, and textile artist Beth Hatton. The focus of the exhibition was the natural grassland landscape of Lake George (Weereewa), and how this has changed from pre-colonial times, through the process of colonisation, to present efforts to restore the landscape. The forum, held at George and Erica Gundry's beautiful property, 'Willeroo' near Lake George (Weereewa) embodied the synergies of people united by a passion for landscape and conservation.

Both artists share a respect for the original inhabitants of Weereewa – the Ngunnawal, Pejar, Wallabaloola and Gundungurra peoples, and have researched the earliest impressions of the country by European surveyors – the agents of colonisation. Frances Ingram's talk gave an insight into the deep understanding of country that forms the basis of every aspect of Aboriginal culture, and of the incredible wealth of knowledge about grassland flora. Her readings from accounts of early encounters with Europeans revealed the dreadful ignorance of the latter, and the paucity of knowledge that has survived.

Early European explorers of the district included Governor Macquarie, Charles Throsby and Major Thomas Mitchell. The descriptions of Lake George by Charles Throsby attest to the abundance of the landscape: "fine, open country" and "an open plain of considerable extent...high grass as yet undiminished by the herds of cattle and sheep that graze on it" (cited James, 2008).

Figure 1: *Women's Country East of Weereewa (2008)* by Christine James

Christine James' paintings document Weereewa as "a living barometer of the region's water table" – images of remnant eucalypts bearing silent witness to wet cycles when huge flocks of waterbirds gathered, to the fencing of the dry lake, and depredations made by (in places) overstocking with goats. The lustrous textures and subtle colours of her paintings show a love of and deep understanding of the seasonal cycles of grassy landscapes, with their deep autumn hues, bleached winter appearance and abundance of life and colour as spring geophytes

emerge. In her painting, *The Earth Beneath Our Feet (2008)*, Christine James acknowledges the efforts made to care for this country by two of its current custodians, assisting the land to regenerate after years of overgrazing.

Here I must pay tribute to two more CMN members, Ruth Corrigan and George Gundry, who both addressed the forum. Ruth and her husband Rod restored their property 'Gilead' (a biblical reference to a rocky, goat-infested mountainous region of Jordan where a health-giving balm grew) from a barren, overgrazed piece of hard-bitten Tablelands country to a beautiful tract of native grassland. They did this by systematically removing weeds, some judicious planting, and minimizing grazing pressure. Their efforts are rewarded by a rich diversity of native forbs and wildlife. Ruth's knowledge of botany and the species list for 'Gilead' has burgeoned!

George Gundry decided on a paradigm shift in managing his cattle property after severe erosion problems and an outbreak of Johne's disease. A well-known Holistic Management practitioner, George uses an ecosystem approach to farming, where soil health and the regenerative capacity of native pasture are constantly monitored. A very flexible grazing regime allows grasses to recover, and for their biomass to add to soil organic matter. As a result, the Gundry's property retains both a healthy and resilient grassy ecosystem and healthy, productive livestock. George's advice to farmers is: "love your grass better than you love your cows".

Beth Hatton's work has focused on Australia's appalling rate of fauna extinction, and the struggle for both indigenous and settler fauna to survive in a challenging environment. She has researched the trade in carcasses and skins of native animals, and the establishment of the pastoral industry. Beth Hatton is fascinated by the tools and artifacts of early European settlers – rifles, axes, tanning knives, scissors and boots. Combining traditional European methods (as described by Mary Gilmore) and Aboriginal textile techniques learned from Nalda Searles, she creates astonishingly detailed and textured interpretations of these objects using the ephemeral beauty of both native grasses and feral species. (At last – a benign use for Serrated Tussock!)

Beth Hatton's inspiration for the Baselines exhibition was a display of the early surveyor Robert Hoddle's instruments. She was particularly captivated by the surveyor's chain, both for its technological significance, and its potency as a metaphor for charting, fencing and appropriating land for private use – concepts totally foreign to Weereewa's original inhabitants. Baselines refers to the fact that Mitchell used the baseline from Lake George to Sydney Lighthouse as the foundation of his remarkable 1834 map of the Colony of New South Wales (Mitchell measured the Lake George part of the baseline with two tent poles and then his assistants triangulated from this with surveyors' chains.) As lake levels fluctuated, so was the baseline moved over subsequent years to its final location in 1874.

Figure 2: Beth Hatton's *Surveyor's Chain*

Like Christine James, Beth Hatton is inspired and heartened by the efforts of people like Ruth Corrigan and George Gundry. Her *Regeneration* series pays tribute to these efforts, and the natural capacity of ecosystems to recover from degradation and drought. These works contain seed heads of kangaroo, plume and red-anther wallaby grasses, signifying ongoing life and hope.

Figure 3: Beth Hatton's Offering 1: *Regeneration Series*

The capacity for art to illuminate science and technology, to provide rich metaphors for environmental understanding and to captivate a wide audience (especially children and blokes!) was discussed and amply demonstrated by Jennifer Lamb, former curator of the Goulburn Regional Art Gallery and Paull McKee, who talked about his own and collected waggas – decorative hessian blankets, as a symbol of a blokey, 'make-do' outdoor culture. Congratulations to CraftACT's Barbara McConchie and Diana Hare, the artists, and other participants for opening our eyes to the many and varied aspects of grassy ecosystems, and providing a stimulating forum for collaborating on biodiversity conservation.

Editor's Note

Welcome to the Austral Bugle, newsletter of the Southern Tablelands Grassy Ecosystems Conservation Network (STGE CMN). This is my first Austral Bugle, and the contents provide a good overview of my time as Facilitator of the CMN, as well as the many inspiring efforts of network members. The cover story about CraftACT's Baselines forum epitomises the strengths, synergies and diversity of the network. Focusing on artists Christine James' (a CMN member) and Beth Hatton's exhibition of works inspired by the grassy landscape of Lake George, the forum explored issues of land use, degradation and rehabilitation from different perspectives – historical, Indigenous, farming, technological, scientific, artistic and personal – and engaged an audience of farmers, scientists, artists and natural resource management professionals.

Greg Baines' article on the efforts of the Natural Temperate Grassland Recovery Project highlights the work of many dedicated people and organisations committed to grassland conservation. Several of the articles cover aspects of the Recovery Project: Rainer Rehwinkel's piece on the floristics of grassy ecosystems of the Southern Tablelands; David Hunter's work on the Booroolong Frog; and Rebecca Hall's article on the Southern Rivers Catchment Authority's Native Pastures Study. Greg's article documents the gains that have been made in our understanding and conservation of Natural Temperate Grassland across the Southern Tablelands. This periodic reflection is heartening – too often the emphasis is on the degree of threat and the enormity of the task ahead. Sue McIntyre's dieback article was prompted by queries I received about the state of paddock trees and stands of Blakely's Red Gum/Yellow Box Woodland. Finally, two articles that feature the dedication and sheer hard work of all those individuals and groups that make up the CMN: a story about Queanbeyan Landcare's mission to improve habitat for the vulnerable Pink-tailed Worm-lizard (Aprasia parapulchella), and Jo-Anne and Michael Rooker's restoration of River Tussock Grassland and Box Gum Woodland at their aptly named property, Mijn Paradijs (My Paradise), adjacent to the Tarlo River National Park north of Goulburn.

Mary Appleby,
Facilitator, STGE CMN.

Natural Temperate Grasslands of the Southern Tablelands (NSW and ACT) Recovery Plan Implementation Project

Greg Baines, Grassland Project Officer Natural Tem perate Grasslands of the Southern Tablelands and ACT National Recovery Team

The aim of the Natural Temperate Grassland Recovery Plan is to arrest the decline in extent and quality of Natural Temperate Grassland of the Southern Tablelands region. The Plan sets out the steps to achieve this, involving the establishment and maintenance of an information base, protection and management arrangements, community involvement, and integration of Natural Temperate Grassland (NTG) conservation into regional planning processes. The plan has been implemented over a four year period, primarily with funding provided under the Natural Heritage Trust grant program and with additional resources from State and Territory agencies and the assistance of community organisations and landholders. This article summarises actions taken to implement the Recovery Plan.

Identify and evaluate the extent and quality of NTG and component species

Vegetation modelling was used to predict areas of NTG to target further survey efforts and assist with regional planning. This was based on existing NSW Department of Environment & Climate Change (DECC) models and a predictive map of pre-European settlement vegetation developed by Rainer Rehwinkel from DECC. The Grassland Model developed (see Baines & Dunford 2008 for more information) provides a prediction of extant NTG across 3.1 million hectares (88%) of the Southern Tablelands. Extensive roadside surveys were done to provide an estimate of NTG distribution outside the model's boundaries. The modelling indicates that there are between 52,037ha and 165,055ha of potential Natural Temperate Grassland within the modelling area.

Gaps in the existing inventory and a map of known sites were identified and survey areas targeted using a method relying on Dunford and Baines' Grassland Model and analysis of remotely sensed data performed by Environmental Research and Information Consortium (2001) and AGRECON (2005). All sites were assessed using the ACT Botanical Significance Rating method (ACT Government, 2005; Sharp 2006). Later sites were also assessed using the NSW Method to Assess Grassy Ecosystem Sites (Rehwinkel 2007). Floristic analysis from this survey data was conducted by Rainer Rehwinkel (see article in this edition of Austral Bugle).

The assessment results were included in follow-up letters to all participating landholders and were used in the selection of key sites and to support proposals for inclusion of sites into the reserve system.

Maintain an information database to support protection, management and monitoring activities

Using funding provided by the Natural Temperate Grassland Recovery Plan Implementation Project, ACT Territory and Municipal Services (TAMS) developed a Grasslands Database to store all site information collected during the field surveys. NSW DECC produced and populated the database with existing NSW data. This database allows researchers and managers to query both NSW and ACT data using the same methods and standardises data storage between the two jurisdictions.

Establish a comprehensive, adequate and representative system of NTG areas protected either by reservation or conservation agreements

Key sites with outstanding floristic and other values were identified from these surveys. A range of protection measures was investigated to ensure the long-term viability of these sites. Property Vegetation Plans administered by local Catchment Management Authorities were considered to be the most appropriate form of protection for key private land sites in most instances. The key public sites are all within current conservation reserves. After identification of the Jerrabatgulla Road site near Braidwood (see photo), the NTG Recovery Team approached the NSW Nature Conservation Trust (NCT) to determine if they would be interested in purchasing the property, which was on the market at that time. NCT subsequently purchased this property, placed a voluntary Conservation Agreement (VCA) on the title, and has onsold part of the property with a conservation management

agreement to two very dedicated conservationists and now active CMN and Friends of Grasslands members. Due to surveys conducted as part of this project and liaison between the National Recovery Team and Hawkesbury-Nepean CMA, two Property Vegetation Plan incentive agreements were entered into between landowners and the CMA on key NTG sites.

Grassland Site at Jerrabatgulla purchased by the Nature Conservation Trust.

The National Recovery Plan Implementation Project has partly funded a Conservation Management Network (CMN) Coordinator within NSW DECC to focus on NTG, including the ongoing identification and conservation of sites. The CMN coordinator has worked with DECC Conservation Partners to secure VCAs or Wildlife Refuges on several sites containing significant grassy ecosystems, and has promoted CMA and other incentives such as the recent Box-Gum Stewardship Agreements to members.

Ensure 'best practice' management is applied to sites containing NTG ST

During the course of the National Recovery Plan Implementation Project, service agreements were negotiated with the Goulburn, Cooma, Bombala, Braidwood, Yass and Young Rural Lands Protection Boards (RLPBs) for funding to manage specific NTG sites under each board's control. Travelling Stock Reserves (TSRs) managed by the boards represent a network of generally high quality vegetation remnants throughout the landscape – some of the most significant grassland sites in SE Australia occur on TSRs. The agreements allowed for weed control, other rehabilitation works and signage. NSW DECC has continued to work closely with RLPBs, and has provided advice on high conservation value Travelling Stock Reserves during the recent restructure of the RLPB and establishment of Livestock Health and Pest Authorities.

In the ACT, statutory management plans exist that deal with the management of all reserves in the ACT. In addition, works plans have been prepared for all sites containing NTG or threatened species habitat that occur on unleased Territory Land. There is a need for Commonwealth agencies to similarly develop works plans to guide day to day actions within a strategic approach. All agencies (Commonwealth and Territory) have agreed to prioritise weed control on sites of high conservation significance (including all sites with NTG and threatened species).

During the course of the project, National Recovery Team members presented at or organised over 30 field days with hundreds of participating landowners, government agency staff, private consultants and community group members. These field days aimed to assist people in the identification of NTG, associated species and management options and identification of the ecological values of sites on their property. This also involved many other agencies with an interest in grassland conservation - RLPBs, Southern Tablelands Grassy Ecosystems CMN, Monaro Grasslands CMN, Grassy Box Woodland CMN, Australian Network for Plant Conservation, DECC, TAMS, Friends of Grasslands, ACT Parkcare, Lachlan CMA, Hawkesbury-Nepean CMA, CSIRO and Greening Australia.

One of the key aims of the NSW DECC CMN position partly funded by the National Recovery Plan Implementation Project is to promote best practice management of grassy ecosystems across all land tenures. The CMN has run many field days, assisted with several CMA, Landcare and Friends of Grasslands (FOG) field days, attended small farm field days and other activities to promote best practice management. One of the key resources used is the Grassy Ecosystems Management Kit, developed by Sarah Sharp (formerly ACT PCL), Josh Dorrough (CSIRO), Rainer Rehwinkel (NSW DECC), David Eddy (Monaro Grasslands CMN) and Anne Breckwoldt. Sarah Sharp and the STGE CMN are currently running a series of training days on the kit for people managing grassy ecosystems

on farms, conservation reserves, council land and a range of other tenures and land uses. The CMN has provided assistance with survey and monitoring, management advice and finding funding incentives to individual CMN members. The CMN sends out regular newsletters and information to members.

Another focus of the Recovery Plan is the establishment of rural industries and land uses that support NTG ST conservation. One of the main themes of field days that have been run as part of the National Recovery Plan Implementation Project has been sustainable grazing. This theme has been augmented by field days run by the RLPBs, CMAs and CMNs. In addition to field days the theme of sustainable grazing has been promoted by the project though the distribution of relevant literature (Eddy 2002 & Langford et. al. 2004) to landowners attending field days or participating in floristic surveys.

Research and monitoring: the basis for adaptive management

ACT and DECC monitoring of population abundance and condition has been undertaken on an annual basis according to the State/Territory government's monitoring programs. The ACT Government has committed funding for the past four years to research projects related to NTG diversity. This includes studies on the Grassland Earless Dragon, invertebrates in NTG and kangaroo studies. Results are implemented as required into management and monitoring. ACT TAMS commissioned a Technical Report by Dr Ian Lunt ("Effects of stock grazing on biodiversity values in temperate native grasslands and grassy woodlands in SE Australia: A literature Review" Lunt, 2005). A national woodland research study by David Lindenmeyer at ANU is investigating the impacts of burning, grazing by kangaroos and addition of tree litter in woodlands. Part of this study includes extensive trials being undertaken at Goorooyarroo and Mulligan's Flat Nature Reserves by Adrian Manning (ANU) and ACT PCL. The results of these studies have direct implications for impacts of kangaroo grazing and burning in NTG.

NSW DECC has continued to undertake monitoring and adaptive management on nature reserves with NTG, including Turallo NR, Queanbeyan NR, Kuma NR and the grasslands within South East Forest National Park.

Recognise and incorporate NTG conservation issues into all planning processes

As part of the National Recovery Plan Implementation Project, meetings were held with Southern Rivers CMA, Hawkesbury-Nepean CMA, Murrumbidgee CMA and Lachlan CMA to raise the issue of NTG protection and foster cooperation between these organisations and the Recovery Team. This has led to NTG specific incentive strategies being developed by Lachlan and Southern Rivers CMAs and investment in the management of NTG sites by Hawkesbury-Nepean CMA, and assistance with each of these CMAs in funding CMN staff working in these catchments. In addition, the grassland modelling undertaken as part of this project will be provided to the CMAs along with the Site Assessment Guidelines and analysis of grassland associations.

The National Recovery Plan Implementation Project also provided input to the review of the Cooma-Monaro Local Environment Plan, helping to ensure NTG was considered in the planning and assessment processes of Cooma-Monaro Shire. NSW DECC continues to work with local government, particularly with Cooma-Monaro Shire Council in its development of planning tools based on the grassland models. DECC has also contributed to planning for NTG in Palerang, Queanbeyan City, Goulburn Mulwarree and Upper Lachlan Shires. DECC is also collating all TSR data to provide input into the statewide assessment process.

Baines, G. & Dunford, M. (2008) National Recovery Team for Natural Temperate Grassland – Grassland Modelling in the Southern Tablelands (Unpublished report to the National Recovery Team for Natural Temperate Grasslands).

What's in a name? The STGECMN and grassland types across the Tablelands

Rainer Rehwinkel,
Senior Threatened Species Officer, DECC

One of the reasons for the STGECMN's long-winded name (the Southern Tablelands Grassy Ecosystems Conservation Management Network) is the sheer diversity of grassy ecosystems across the Southern Tablelands. This cumbersome title recognises that many grassy vegetation associations exist: Natural Temperate Grassland (NTG) and its variants on the Monaro and in wetter sites: River Tussock Grassland, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland, and derived grassland; Snow Gum Woodland, and Black Gum Woodland. While woodland ecosystems are easily classified according to their component tree species, different grassland associations are more subtle. Recent analysis of plot data across the Southern Tablelands by DECC Senior Threatened Species Officer Rainer Rehwinkel has recognised eight major grassland associations in the region. These can be easily recognised in the field by their dominant grass species, geology, topography and regional distribution.

Using data from John Benson's 1994 grassland classification of the ACT and Australian Alps, further data from Sarah Sharp (formerly of the Wildlife and Monitoring Unit, ACT Parks Conservation and Lands), Greg Baines' extensive surveys as part of the NTG Recovery Team, and his own plot data (much of it collected from CMN sites), Rainer used a computer program, PATN, to compare plots and sort them into comparable groups (associations). PATN, developed by Lee Belbin from CSIRO, generates estimates of association (in this case, similarity of species composition) between plots. The software then classifies the plots into groups, represented graphically in a dendrogram (Figure 1) This can then be interpreted into associations which 'make sense' on the ground.

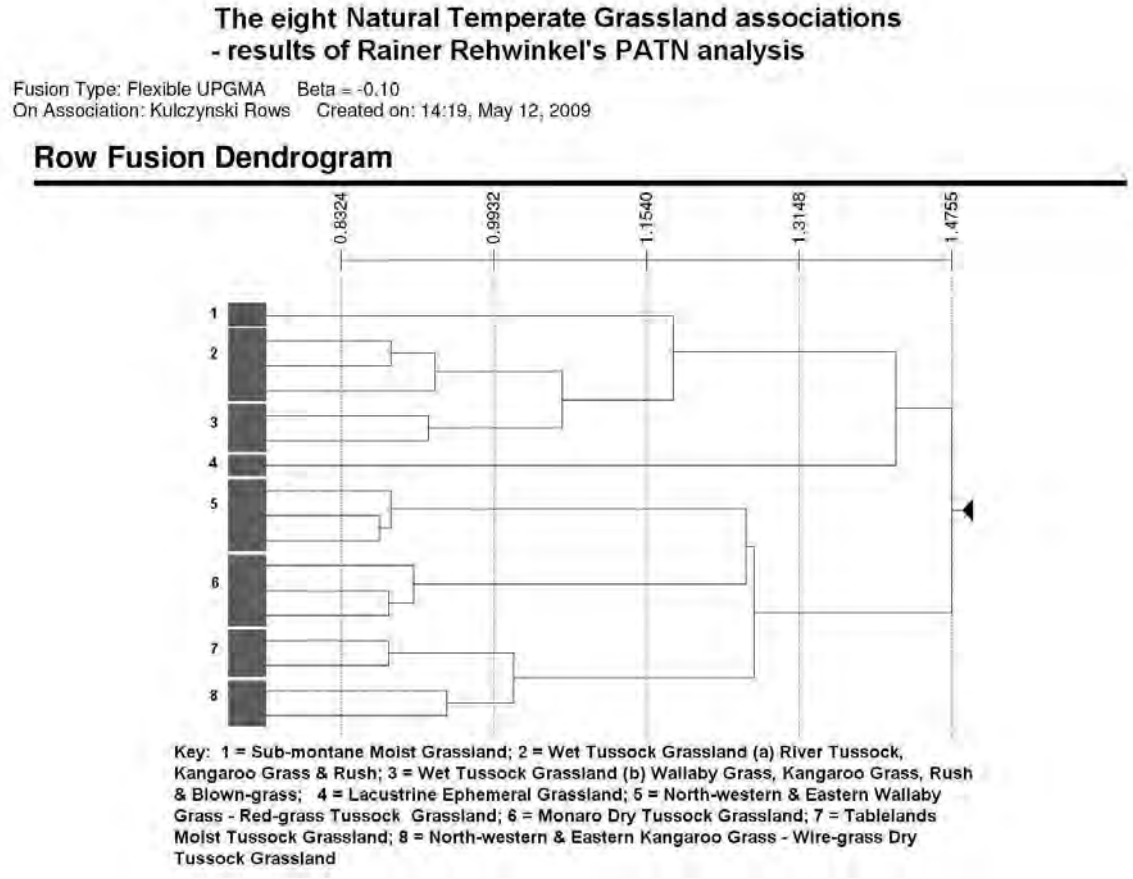

Figure 1: Results of grassland PATN analysis by Rainer Rehwinkel

The analysis aligned well with previous grassland classifications (Benson, 1994; Sharp, 1997), although there were some previously unrecognised associations. The associations determined by Rainer's PATN analysis are described below.

• Wet Tussock Grassland
This is the most distinct and easily recognisable grassland association on the Tablelands. It occurs along drainage lines, depressions and flats and is dominated by River Tussock (*Poa labillardieri*). Associated species are Rushes (*Juncus species*), Tall Sedge (*Carex appressa*), Kangaroo Grass (*Themeda australis*), Wallaby Grasses (*Austrodanthonia species*) and Weeping Grass (*Microlaena stipoides*).

• Sub-montane Moist Grassland
This is a newly-recognised association occurring in sub-montane areas of the southern Shoalhaven valley, on the outer fringes of the Monaro and southern ACT. This vegetation association is dominated by Snow Grass (*Poa sieberiana*), Kangaroo Grass (*Themeda australis*), Asperula spp. and Pale Everlasting (*Helichrysum rutidolepis*). The best example of this association is near Alexander's Hut, Nunnock swamp area, South-east Forests National Park.

• Lacustrine Ephemeral Grassland
This is another newly recognised association restricted to Lake George and Lake Bathurst. Component species are *Agrostis* sp., *Carex bichenoviana, Wilsonia rotundifolia*, *Selliera radicans* and *Juncus* spp.

• Red-grass Tussock Grassland
This association is dominated by Red-grass (*Bothriochloa macra*), Wallaby Grasses (*Austrodanthonia* spp.), Tall Speargrass (*Austrostipa bigeniculata*), Common Everlasting (*Chrysocephalum apiculatum*), Kangaroo Grass (*Themeda australis*) and *Lomandra* spp. The best example of this association is at Queanbeyan Nature Reserve. This conforms with Benson's Communities 1 and 5, and Sharp's Danthonia grassland and Stipa grassland.

• Monaro Dry Tussock Grassland
As its name suggests, this association is restricted to dry sites on the Monaro. The association is dominated by Snow Grass (*Poa sieberiana*), Wallaby Grasses (*Austrodanthonia* spp.), Kangaroo Grass (*Themeda australis*), Corkscrew Grass (*Austrostipa scabra*), Sheep's Burr (*Acaena ovina*) and Sweet Woodruff (*Asperula conferta*). There were three distinct sub-groups identified within this association. Examples representative of each of these are Ravensworth TSR (Bobundara Rd., south of Cooma), Top Hut TSR (Dry Plains Rd., west of Cooma), and Dartmoor TSR (Carlaminda Rd., east of Cooma). This conforms with Benson's Communities 3a, 3b and 4, and Sharp's Dry Themeda Grassland.

• Tablelands Moist Tussock Grassland
This is widespread in the Southern Tablelands and Monaro regions. Dominant species are Kangaroo Grass (*Themeda australis*), Wallaby Grasses (*Austrodanthonia* spp.), Snow Grass (*Poa sieberiana*), Common Everlasting (*Chrysocephalum apiculatum*), and Scaly Buttons (*Leptorhynchos squamatus*). Two sub-groups were identified. Examples include Steves TSR south of Delegate, Yaouk Nature Reserve, Round Plain TSR south of Berridale, Gundary TSR, near Goulburn, Collector TSR, Gundaroo Common, Turallo Nature Reserve and Tarengo TSR near Boorowa. This conforms with Benson's Community 2 and Sharp's Wet Themeda Grassland.

• Wire-grass Dry Tussock Grassland
This is a newly recognised association found in riparian or upper slopes on shallow or skeletal soil in north-western and eastern sub-regions of the Southern Tablelands. Dominant species are Wire-grass (*Aristida ramosa*), Kangaroo Grass (*Themeda australis*), Lomandra spp.,Wallaby Grasses (*Austrodanthonia* spp.), and Common Everlasting (*Chrysocephalum apiculatum*). Two sub-groups are recognisable. Examples are a reserve on the Yass River south of Yass, and the upper slopes of Gundary TSR near Goulburn.

Figure2: An example of Monaro Dry Tussock Grassland, Kuma nature Reserve

So why complicate our lives with even more grassy vegetation associations? Grassland managers and conservation planners can now fine-tune management and conservation decisions to ensure all grassland associations are adequately conserved. This knowledge adds another dimension in our enjoyment of grasslands on the Southern Tablelands. The richness of the species within grasslands can now be appreciated alongside the knowledge that there is a richness of distinct grassland types across the region.

Further descriptive material, including a full species list of each association, lists of unique and other indicator species, details of the geological substrate and topographical positions occupied and the distribution of each association appears in the unpublished paper that was presented to the Australian Government on completion of the project. Copies of the analysis results can be obtained by emailing: rainer.rehwinkel@environment.nsw.gov.au

P.S. Notwithstanding this article, the STGE CMN desperately needs a more user-friendly name! Please send your suggestions to Mary Appleby, PO Box 733 Queanbeyan NSW 2620, or email: mary.appleby@environment.nsw.gov.au. The winner will receive a hefty parcel of CMN books and resource material!

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Conserving the Endangered Booroolong Frog on the South West Slopes.

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The Booroolong Frog (*Litoria booroolongensis*) is a medium sized tree frog (see Figure 1) that lives and breeds along permanent streams and rivers between 250 and 1000 meters above sea level. This species was once common along streams flowing west of the Great Dividing Range in New South Wales, from the New England Tablelands down to the Southern Tablelands. During the 1980s and early 1990s, the Booroolong Frog suffered a very dramatic decline. Recent surveys have confirmed that this species has disappeared from more than 50% of its former range, with the main area of persistence being on the South

Figure 1. Male Booroolong Frog showing the typical mottled colouration of this species.

The introduction and spread of an introduced pathogen, known as the Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*) appears to be the primary cause of these recent declines. This fungus damages the skin of frogs and has caused the decline and possible extinction of many frog species along the Eastern Ranges of Australia. The introduction of the amphibian chytrid fungus has created a problem for conservation managers, as it is very difficult to

control diseases in wild populations. Despite this, it is possible to help the Booroolong Frog survive in the presence of this pathogen by reducing the impacts of other environmental stresses. An interesting feature of the Booroolong Frog's current distribution is that it mainly persists along streams that flow through agricultural landscapes, particularly areas used for cattle and sheep grazing. The persistence of the Booroolong Frog in these areas, despite the historic removal of much of the native riparian vegetation, is due to the species' lifecycle being strongly tied to cobble bank and bed rock structures along streams (Figure 2).

Figure 2. Cobble bank habitat used by the Booroolong Frog for breeding along Gilmore Creek. Sections of stream where the riparian vegetation has been removed, such as this one, are more prone to sedimentation that fills the aquatic rock crevices critical to the persistence of the Booroolong Frog.

Figure 3. Male and female Booroolong Frog in amplexus. Note; female is depositing eggs deep within this rock crevice.

The most important of these structures is rock crevices in the aquatic environment. This is where the Booroolong Frog deposits its eggs (see Figure 3). Two factors that greatly reduce the presence of rock crevices are willows, as their surface roots smother the rock banks, and high sedimentation entering the stream which fills the crevices. Hence, management actions which remove or control willows, and which reduce levels of sedimentation will greatly assist the conservation of this species.

Another process threatening populations of the Booroolong Frog is stream drying during severe drought events. This species has a very rapid lifecycle (typically one year for males and two years for females), so populations of this species are highly susceptible to failed recruitment to metamorphosis. One year of failed recruitment will greatly deplete the adult population and two years of failed recruitment is likely to cause local extinction. Consistent with this was the observation that the Booroolong Frog became locally extinct from numerous stream sections on the South West Slopes that dried during the 2002/2003 drought period, and also during the 2006/2007 drought period. This raises much concern for many populations of this species on the South West Slopes, as under a predicted climate change scenario, we could expect further severe droughts that will result in stream drying. Protecting populations that occur along streams prone to drying will rely on limiting activities that increase the likelihood of drying, such as the large scale establishment of softwood plantations and pumping water directly from streams.

While the Booroolong Frog is facing a struggle for survival, recent initiatives provide hope for the species. Currently, an incentives program being undertaken by the Murray Catchment Management Authority, and an Environment Trust program being undertaken by the Riverina Highlands Network are facilitating property owners to undertake riparian restoration works that will help protect the Booroolong Frog and enhance the environmental health of rivers flowing through their properties. These exciting programs have received much support from the rural communities of the South West Slopes and will provide a valuable opportunity to explore ways of combining agricultural practices with the conservation of an endangered species.

Article written by David Hunter. David is a Threatened Species Officer with the NSW Department of Environment and Climate Change, and did his PhD on the conservation management of the Booroolong Frog and Southern Corroboree Frog. For further information about the Booroolong Frog, contact David by phone (0439 131 593) or by email (david.hunter@environment.nsw.gov.au).

Eucalypt Dieback

Sue McIntyre
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Trees can die from all kinds of causes, but there is a particular syndrome of repeated defoliation and eventual death known as 'dieback', which affects eucalypts in eastern Australia. Eucalypt dieback can be a great worry to landowners, particularly when they have only a few precious trees remaining on their land. The first widespread recognition of eucalypt dieback occurred in the 1970's on the New England Tablelands in northern New South Wales. This was a very severe event which had many people worried and a small flurry of research developed around it. Unfortunately this is now recalled as a large body of research, leading many people to think that the issue is well understood and no longer in need of investigation. The reality is that we still only have a vague understanding of how dieback operates, with small fragmented insights and no robust, overall picture of the syndrome.

Figure 1. Intensive land use in the Yass River valley has resulted in few remaining trees. These are highly stressed trees with a poor prospect of future health or regeneration.

In combing the scant lines of evidence, I have gleaned a picture of what I interpret dieback to be. Firstly, numerous species of insects occur in our natural systems that are adapted to consume eucalypt leaves. These insects can irrupt in large numbers depending on the seasonal conditions, and these are thought to be natural events. It is the interplay of the natural population fluctuations with our land management practices that seems to exacerbate the problem, in the following ways:

- **Tree clearing**

Some insects, notably beetles, undergo the larval stages of their lifecycle underground, feeding on the roots of herbaceous plants. By decreasing the ratio of living trees to pasture, there is increased pressure by adult leaf-eating beetles on the few remaining trees.

- **Grazing**

Livestock tend to camp under trees, often concentrating nutrients there through an accumulation of dung and urine and trampling the soil. Although eucalypts can tolerate high nutrients, they are generally adapted to low nutrient conditions and nutrients will disrupt their relationship with soil root fungi (mycorrhiza), withunknown consequences. It can also make the leaves more nutrient-rich, and therefore more attractive to defoliating insects. In addition, grazing, particularly in fertilized pastures, can prevent tree regeneration, which adds to the long-term problem.

- **Fertilizer**

This is one factor for which we have some good empirical observations. At the property scale, the greater the extent of sown, fertilized pastures, the more severe is the dieback. One explanation is that root-feeding beetle larvae respond to the more favourable nutrient status in the soil, just as livestock do through the improved quality of the fertilized pasture plants. This puts more defoliating pressure on the trees when the adult beetles emerge. Again, fertilized pastures disrupt the regeneration of eucalypts, either through livestock defoliation or, in an un-grazed situation, through the competition of the thick swards of grass that develop.

As the above factors can all interact, there is a great complexity in the way dieback occurs and this makes it difficult to observe simple patterns in the landscape. The process of tree death is also complicated, with repeated defoliations followed by re-sprouting from

epicormic buds that are located in the larger branches. Death itself may be triggered by stressors in addition to loss of leaves. For example, drought was thought to have been the immediate cause of many tree deaths during the New England Tablelands dieback event, with the trees being already weakened from insect attack.

While the dieback syndrome is complicated, the practical management response to reduce dieback is simple - stop fertilizer use near the trees you wish to save, and keep the use of fertilizers on the landscape to no more than about one third of the total area. This is obviously a longer term scenario and I am not aware of any short-term strategies for saving individual trees. This can be heart breaking when mature trees are dying in paddocks. One feels particularly sorry for Blakely's Red Gum (*Eucalyptus blakelyi*) which appears to have a genetic predisposition to insect attack. While the species seems to have a compensatory response through its vigorous regeneration habits, this does not necessarily make up for the loss of mature trees. In these situations it might be worth reminding ourselves that the land management that got us here took many decades, and the restoration processes are likely to be as slow, or even slower.

Apart from keeping livestock away from the canopy area of individual trees, grazing is not necessarily a big problem if stocking rates are reasonable and the soil nutrient status is kept under control. In southern Queensland, where fertilizers are not used in cattle-grazed native pastures, controlling tree regeneration is the major cost of managing pastures, a very different situation from the Southern Tablelands, where tree planting is the norm. However, the fewer the trees in the paddock, the more they will be used for camping and shelter by livestock and under these circumstances, livestock can be a problem that they would not otherwise be if trees were abundant. Excess phosphorous in the soil will decline over years or decades, depending on the levels present when fertilizer input stops. During the time of nutrient run-down, grazing may still be needed to prevent thick swards of grass developing which in itself can inhibit seedling establishment.

The beauty of reducing fertilizer inputs is that it will simultaneously contribute to adult tree health, help restore regeneration processes, improve the quality of ground cover though reversion to perennial dominance and encourage plant diversity in the ground layer. Habitat for birds will also be enhanced and hence improve the general level of insect predation by birds, though it should be noted that even good bird populations may not be able to suppress all insect irruptions.

The limitation of this advice is that fertilizer use across the wider landscape may not be in your control. This is where the role of community action becomes all important, and where the assistance of regional organizations such as conservation networks, landcare groups and catchment management authorities become all important. Although the restoration of tree regeneration processes would be the ultimate aim of conservation management, in some cases where isolated populations of trees occur in a highly developed or cleared landscape, the planting of trees might be useful for establishing viable populations and a better balance of pasture and trees.

Figure 2. Previously grazed land that had not been heavily fertilized allows for abundant regeneration - part of Mulligan's Flat Reserve.

Maintenance of Biodiversity in Native Pastures – What are the benefits for primary producers and grassy ecosystems on the Southern Tablelands?

By Rebecca Hall, Southern Rivers CMA.

Time has passed quickly since the June 2007 completion of the NSW Environmental Trust funded native pastures project undertaken by the Southern Rivers Catchment Management Authority. Thankfully since that time, a few more drops of rain have moistened the region's tired and thirsty soils and pastures. In the softer light of winter, it's time to reflect upon what resulted from the study.

The primary aims of the study were to understand the dynamics between grazing management methods, the factors that influence management decisions and the pastures that result from this. Forty two farmers participated in the project, and manage properties that contained native pastures with a 60% or greater native plant component. Where possible, we aimed for properties with up to 30 years continuous ownership or a known management history back to the 1950s.

Figure 1: A pasture dominated by Weeping Meadow Grass (*Microlaena stipoides*)

Some key results from the study were:

- participating farmers showed a general shift away from set stocking. Over 50% of farmers had changed from set stocking to non-set stocking (i.e. varying types of grazing managements such a rotational grazing, cell grazing, time-controlled grazing), with a further 13% being in transition from set to non-set stocking.
- there was considerable variability in the way paddocks were rested. The most commonly given influences on farmers' decisions to rest a paddock were the growth, health and condition of plants and pastures.
- despite the dry conditions, ground cover was generally high, however paddocks stocked by sheep had significantly more bare ground than those stocked by cattle.
- while a variety of plant species were found in native pasture regardless of the management method, our findings suggest that plant composition between these methods is likely to vary.
- paddocks stocked by sheep had significantly lower total plant diversity, forb diversity and Kangaroo Grass cover.
- pastures with a history of super phosphate application had significantly lower forb diversity and total plant diversity.
- the majority of farmers considered native pastures to be advantageous for a variety of reasons, particularly for their tolerance to a wide range of climatic extremes.

Near completion of the project, a field day was held to thank all farmers who had shared their practical knowledge and insights. The project's success largely resulted from the information gained from these farmers, and their input has provided SRCMA with a much richer understanding of grazing management. This information will greatly assist SRCMA to develop practical and realistic programs that reflect the needs of farmers.

Figure 2: Recent pasture plants field day near Braidwood

Four participating farmers also agreed to share some of the perceptions and beliefs that influence their decisions when managing their enterprises and maintaining natural values on their farms. Their 'stories' were profiled as case studies that are available from SRCMA, Braidwood Office and through the CMN.

Conservation of grassy ecosystems and sustainable grazing of native pastures is considered a high priority in the Upper Shoalhaven sub region of SRCMA and is a key target outlined in SRCMA's Catchment Action Plan.

SRCMA is continuing its commitment to foster sustainable grazing management of natural grassy ecosystems through supporting the Southern Tablelands Grassy Ecosystems CMN and sees this relationship as pivotal to expanding protection of grassy ecosystems across our region. SRCMA is also delivering a variety of programs such as Farming for the Long Haul, Bush Incentives Scheme and Good Grass and Soggy Bogs (GGSB). The GGSB project will focus primarily on those natural grasslands and upland wetlands with high biodiversity values that are used as part of grazing enterprises. It will also begin mapping and classifying upland wetlands in the Upper Shoalhaven.

Restoring weed-invaded woodlands: the importance of Kangaroo Grass

Photos and article by Suzanne Probera and Ian Lunt
CSIRO Sustainable Ecosystems
Institute for Land, Water & Society, Charles Sturt University

Conventional approaches to controlling environmental weeds often target the invading species directly. For example, weeds can be manually removed or killed by herbicides. However, these "top-down" approaches are often ineffective, because the weed can easily re-invade or be replaced by other weed species. A solution to this problem is to combine "top-down" weed control with an ecological approach that targets the "bottom-up" restoration of the native ecological community (Sheley and Krueger-Mangold 2003).

The key to "bottom-up" restoration is to recreate an ecosystem that naturally maintains an environment that is unfavourable to weeds, and so is "resistant" to weed invasion. And the key to such ecological resistance is often related to interactions between native species and their environment. For example, a native species may pre-empt resources such as light, nutrients or water, so that weeds are unable to grow, or might secrete allelopathic chemicals that inhibit weeds. Some weeds can invade natural, undisturbed ecological communities, so this approach will not be successful for controlling such species. Commonly though, weeds invade most vigorously when external disturbances damage the ecological resistance of the native community.

Restoring resistance to weed invasion in temperate grassy ecosystems

This approach is highly relevant to the restoration of ecosystems across southern Australia where the native groundlayer was naturally dominated by Kangaroo Grass (*Themeda australis*). These include White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*) and Red Gum (*Eucalyptus tereticornis* or *Eucalyptus blakelyi*) woodlands. As a result of livestock grazing, fertilization and other disturbances, Kangaroo Grass has been lost from many remnants of these ecosystems, which have instead become dominated by annual weed species and other natives. These weeds outcompete native forbs, prevent native seedlings from establishing, and change habitat conditions for native fauna, leading to reduced woodland diversity over broad scales. Eventually, seed banks of native species become depleted, and chances of spontaneous recovery of native plants become very low.

How then do we restore natural resistance to invasion by exotic annuals in these disturbed grassy ecosystems? What are the ecological processes we need to restore, and what native species drive these processes?

In an earlier issue of Woodland Wanderings (Prober et al. 2004) we described some novel approaches for restoring weed-invaded native understoreys in temperate Kangaroo Grass ecosystems. We showed that areas that were heavily invaded by exotic annuals had high soil nitrate levels, whereas areas with few exotics had very low soil nitrate levels. We hypothesized that soil nitrate levels were the key underlying driver of natural resistance to weed invasion in these ecosystems, and that if soil nitrate levels could be reduced, weeds would grow less and establishment of native plants would be enhanced.

We tested these hypotheses in field trials near Young, NSW, and found that, in weedy areas with high soil nitrate levels, Kangaroo Grass was unable to re-establish, even when we added lots of Kangaroo Grass seed (Figure 1). However, when we actively intervened to reduce weed growth, Kangaroo Grass was able to re-establish successfully.

We reduced weed growth using two very different techniques: (1) by reducing soil nitrate levels using carbon (sugar) additions, and (2) by reducing weed seed banks by burning the standing weed crop before it set seed. Other techniques such as spraying might be similarly effective, so long as Kangaroo Grass seed is added. The first method conclusively demonstrated the importance of soil nitrate: by reducing soil nitrate levels, weed growth was greatly reduced and native plant establishment was enhanced.

Control + Kangaroo Grass

Sugar + Kangaroo Grass

Figure 1. Effective establishment of Kangaroo Grass swards in this weedy site was achieved by suppressing the nitrogen supply to weeds using carbon (sugar) additions. Few weeds were then able to persist in the re-established Kangaroo Grass sward, even when we stopped artificially suppressing nitrogen using sugar. In the control + Kangaroo Grass plot, by contrast, Kangaroo Grass was not able to establish even when we added seed, and weeds and high soil nitrate levels persisted.

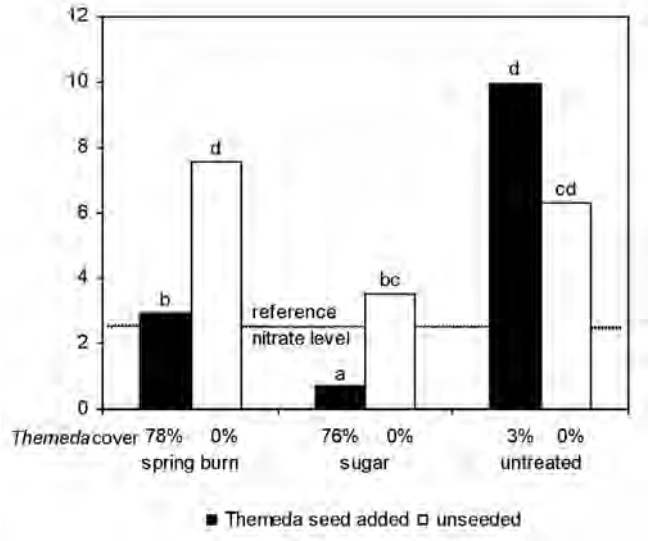

Figure 2. Data showing how soil nitrate levels were reduced on plots with established Kangaroo Grass (Themeda) swards (with >75% Themeda cover as indicated), compared with higher nitrate levels on remaining plots where Kangaroo Grass didn't establish successfully (0-3% cover). Nitrate levels on unseeded sugar plots remained somewhat suppressed due to the residual influence of sugar, but they were still higher than on the seeded plots. The reference nitrate level indicates natural levels we have commonly observed in weed-free reference sites. Different letters indicate that treatments are significantly different at $P<0.005$. Modified from Prober and Lunt (2008).

But how sustainable is this approach? The critical next step was to ensure that weeds did not re-invade after we stopped actively controlling them. For example, sugar addition only provides temporary weed control, because soil nitrate levels increase again after about three months. Similarly, burning and spraying have a short-term effect, as annual weed seeds can move in from surrounding areas even if their seed banks are controlled on site.

Three years after we successfully established Kangaroo Grass by adding sugar or burning, we found some exciting results (Prober and Lunt 2008). In many places, the Kangaroo Grass seedlings had grown to form a dense sward (Figure 1). When we measured soil nitrate levels beneath these swards, we discovered that they had become extremely low, even on burnt plots where we had never added sugar (Figure 2). Indeed, soil nitrate levels were similar to those we have measured in weed-free, undisturbed reference sites.

In these places, few weeds were able to grow with the Kangaroo Grass. In more intact remnants, we've found that even when Kangaroo Grass swards are burnt or mown, allowing plenty of light through the recovering sward, nitrogen-loving weeds remain inhibited. It appears then that the ability of Kangaroo Grass plants to lock up soil nitrate is an important mechanism for inhibiting weeds. This has led us to conclude that Kangaroo Grass is a keystone species in these ecosystems, that provides long term resistance to invasion by nitrogen-loving exotic annuals through its ability to control soil nitrate levels (Prober et al. 2009).

Other native species

With Ian Cole from the NSW Department of Environment and Climate Change, and funding from the NSW Environmental Trust, Murray CMA and Future Farm Industries Cooperative Research Centre, we are undertaking further studies to test whether other native grasses are as effective as Kangaroo Grass for providing this ecological resistance to weed invasion in temperate grassy ecosystems. Preliminary indications are that other species are not as effective, suggesting that Kangaroo Grass itself is one of our most important tools for restoring temperate grassland and woodland understoreys that were originally dominated by this species.

Another question is whether other desirable native species are inhibited by Kangaroo Grass due to its effects on soil nitrate. A study by one of our honours students, Lisa Smallbone, provided illuminating results. Results from Lisa's pot trials showed that increased levels of soil nitrate can increase the growth rate of native forbs, but that nitrogen-loving exotic annuals are far more inhibited by low soil nitrate levels than are many native forbs. This suggests that while low soil nitrate levels might reduce the growth rate of native forbs, the forbs may still be better off because they don't need to compete with weeds (Smallbone et al. 2008). When Lisa tested this in the field experiment, she found that native forbs established significantly better on plots where we reduced soil nitrate levels to control weeds (Smallbone et al. 2007).

Conclusions

The simple message from this article is that to restore weed-invaded native understoreys in temperate Kangaroo Grass ecosystems, we need first to focus on

restoring swards of the keystone dominant Kangaroo Grass, using any effective short-term intervention (such as those we've mentioned). Once we achieve a healthy sward, this species will then do the ongoing weed control for us, by locking up soil nitrate and creating an environment unfavourable to weeds.

This provides an effective example of a 'bottom-up' approach to weed control. By re-establishing Kangaroo Grass, we remove an underlying driver of weed invasion and thereby create an ecosystem that is resistant to annual weeds in the longer term.

Acknowledgements

This work was funded by the NSW government through its Environmental Trust. We thank the Johnson family for generously assisting with these studies on their property 'Windermere' near Young, NSW. This article is modified from the following article published by the Australian Network for Plant Conservation:
Prober, S.M. & Lunt, I.D. (2008) Kangaroo Grass: a keystone species for restoring weed-invaded temperate grassy woodlands. Australasian Plant Conservation 17, 22-23.

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This project was funded by the NSW Government through its Environment Trust

Habitat restoration works for the Pink-tailed Worm-lizard Queanbeyan Landcare Group

Tom Baker, Queanbeyan Landcare

The Fairlane Flora and Fauna Reserve is a small reserve located in suburban Queanbeyan. The reserve is an important remnant of high quality grassy box woodland and is a tribute to the late Dr. Peter Barrer, a local naturalist and professional botanist.

The reserve was dedicated to protect the habitat of the Pink-tailed Worm-lizard (*Aprasia parapulchella*), a threatened species listed as vulnerable on the NSW *Threatened Species Conservation Act 1995*. The Pink-tailed Worm-lizard grows to a maximum length of 24cm and occupies native grasslands where there is substantial cover of partially buried rocks. The lizard lives under these rocks in the nests and tunnels of ants. To be suitable for lizard habitat, rocks must have been partially buried for some years. For this reason, signs on the reserve have advised visitors not to move or remove rocks.

Since its dedication, a large amount of work has been undertaken by Queanbeyan Council and Queanbeyan Landcare, including regular weed reduction and fencing. "The main focus of our work has been the control of the weed St. John's Wort, as well as the usual woody culprits such as blackberry, firethorn and privet," said Queanbeyan Landcare member Tom Baker. "Reducing these weeds has created more open space for native grasses and herbs to prosper. We've also 'planted' pavers to provide additional habitat for the lizards." This has increased access to suitable rocks and improved the habitat for the Pink-tailed Worm-lizard.

Figure 1. Pavers "planted" in the reserve are being used as habitat by the Pink-tailed Worm-lizard

Figure 2. One of the juvenile Pink-tailed Worm-lizards found during a post-restoration work survey. Volunteers were delighted to find the babies, and lizards colonising areas of habitat restoration.

Regular surveys of the Pink-tailed Worm-lizard population have indicated that the species is surviving in the reserve. During these surveys, volunteers have found juvenile lizards and recorded lizards colonising specifically placed rocks. This is a credit to the work of Queanbeyan Council, Queanbeyan Landcare and importantly the people of Fairlane Estate (aka Karabar) who are the custodians of this small remnant of habitat for future generations to enjoy.

Figure 3. Tom Baker with an adult Aprasia

All management actions are in accordance with the Plan of Management prepared for the site with funding provided under the NSW Environment Trust. Further information may be obtained by contacting Queanbeyan Landcare, PO Box 878, Queanbeyan NSW 2620.

Landholder Profile

The sign on the gate says it all: *Mijn Paradijs* (My Paradise). The afternoon I visited Jo-Anne and Terry Rooker's property at Greenwich Park was a perfect spring day. Early Black Wattles (*Acacia decurrens*) gilded the hillsides in the late afternoon sun. Two emu chicks being cared for by the Rookers until they are "fox-proof" ran up to greet me. Kangaroos quietly grazed in a nearby paddock. Spring wildflowers were just beginning to emerge from the ground and burst into bloom.

The Rookers' Long Swamp property adjoins Tarlo River National Park in the Cockbundoon Range near Goulburn. Vegetation consists of Grassy Box Gum Woodland (an Endangered Ecological Community), Tablelands Dry Open Forest association, and a vast expanse of River Tussock Grassland associated with Long Swamp.

Figure 1: River Tussock Grassland, Long Swamp

Figure 2: Grassy Box Woodland, with adjoining open forest.

Jo-Anne's initial reaction to my request for a landholder story was, 'We're not doing anything!' After listening to a talk at a local Landcare meeting, Jo-Anne has come to understanding that 'not doing anything' also means that it gives the land an opportunity to regenerate. "We're very lucky to have land which has a mixture of open area, swamp area and bushland areas," said Jo-Anne. "And we're not trying to make a living from the land. This helps enormously, as we're able to allow it to do its own thing."

Before the Rookers bought the property seven years ago it was set stocked with sheep and heavily grazed. The River Tussock Grassland was severely infested with blackberry and thistles. 'Not doing anything' has in fact involved a great deal of hard work in the form of years of relentless weed control and planting hundreds of tubestock. Now the weeds have virtually disappeared and the spaces between the *Poa labillardieri* tussock grass are now being replaced by native forbs such as Billy Buttons (*Craspedia variabilis*), Swamp Dock (*Rumex brownii*), Swamp Raspwort (*Haloragis heterophylla*) and Native Geranium (*Geranium solanderi*). Some of the rarer birds of the district are also making a comeback. These include spoonbills and even a curlew.

With stock now excluded from most of the property, isolated paddock trees are regenerating spectacularly. Jo-Anne showed me a magnificent old Yellow Box (*Eucalyptys melliodora*) surrounded by her "babies". The ground flora is also making a comeback. We walked over a paddock now grazed by kangaroos and wallabies with a native pasture of Wallaby Grasses (*Austrodanthonia* species) and Weeping Grass (*Microlaena stipoides*). Here again, native forbs are beginning to regenerate. Dead trees and fallen timber are left to provide hollows and ground habitat for reptiles and small mammals.

The Rookers' experience shows that conservation in agricultural landscapes is not all about back-breaking work: allowing the natural capacity of the landscape to regenerate is an important first step.

Snippets

Friends of Grasslands (FOG)

Friends of Grasslands is a community group whose aim is to promote understanding of grasslands and grassy woodlands. FOG organises interesting field trips and forums and publishes a regular newsletter. For more information, contact FOG, PO Box 987, Civic Square ACT 2608 or visit the FOG website on www.fog.org.au

The Far South Coast Conservation Management Network (FSC CMN)

The FSC CMN supports landholders that manage native vegetation on private property on the Far South Coast of NSW. The network is for members and is facilitated by two local landholders. Financial support is provided by the Southern Rivers Catchment Management Authority (SRCMA). For more information, contact Dan or Vickie Williamson on (02) 6492 5558, or visit the FSC CMN website at: www.thebegavalley.org.au/12108.html

Kosciuszko To Coast (K2C) Project

K2C is a community partnership established to help landholders reconnect isolated woodlands and grasslands between Kosciuszko NP and Namadgi NP to the coastal forests of the NSW South Coast. K2C offers landholders in this region a range of management options, including advice, funding and partnerships. The K2C partners are Bush Heritage Australia, Greening Australia Capital Region, NSW DECC, Southern Rivers CMA, ACT Government, NSW Nature Conservation Trust, Molonglo Catchment Group, Friends of Grasslands, Upper Murrumbidgee Catchment Coordinating Committee and Upper Murrumbidgee Landcare Committee. If you want more information, please ring the K2C Facilitator, Lauren Van Dyke on 0411402 978 or email: facilitator@k2c.org.au

New preliminary listings of grassland and grassy woodland species

The NSW Scientific Committee has made a number of preliminary determinations to list several grassland or grassy woodland species as Vulnerable on the Threatened Species Conservation Act 1995, including Black Gum (Eucalyptus aggregata), Small-leaved Gum (E. parvula), Flame Robin (*Petroica phoenicea*), Little Eagle (*Hieraaetus morphnoides*), Scarlet Robin (*Petroica boodang*), Spotted Harrier (*Circus assimilis*), Varied Sittella (*Daphneositta chrysoptera*) and White-browed Woodswallow (*Artamus superciliosus*). The Committee has also proposed to list the following species as Critically Endangered: *Jalmenus eubulus* (a butterfly), Wee Jasper Grevillea (*Grevillea iaspicula*) and Bredbo Gentian (*Gentiana bredboensis*).

For more information and a chance to make comments, please see:

http://www.environment.nsw.gov.au/committee/preliminarydeterminationsbydate.htm

Biodiversity in the paddock: a land manager's guide **by Josh Dorrough, Jacqui Stol & Sue McIntyre, Future Farm Industries CRC.**

The role of native pastures in landscape health and biodiversity conservation is the focus of this small but hugely informative handbook. There are between three and ten million hectares of native pastures on the south-western slopes of the Murray Darling Basin that were once grassy woodlands but which now support a range of land uses. Native pasture is the most widespread form of native vegetation in these landscapes and is likely to be playing an important role in the persistence of native fauna and flora. Furthermore, increases in the cover of native perennial grasses within these areas could substantially contribute to improved ecosystem function and soil protection. CSIRO Sustainable Ecosystems worked with Future Farm Industries CRC, Meat and Livestock Australia and the Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Victoria to produce this handbook. This booklet describes native grasslands, grassy woodlands, secondary grasslands derived from woodlands after tree clearing, and both

low and high input native pastures, their natural values, management, and strategies to maintain orimprove biodiversity for wildlife habitat, landscape function and improved agricultural production. There is a wealth of information about integrating biodiversity management with farm management: grazing management, fertiliser effects, and the role of native plants and animals in maintaining a healthy ecosystem, incorporating the experiences of many farmers involved in the project. The booklet is available from the CMN, at http://www.csiro.au/resources/biodiversityinthepaddock.html, or by contacting Jacqui Stol at CSIRO (6242 1625 or Jacqui.Stol@csiro.au).

Flower photos on Flickr

The Grassy Box Woodlands CMN has set up a website of photos of flora species found in NSW grassy ecosystems. A number of members have been contributing images to the site (and helping us pick up a few mistakes!). The images are organised into sets including native flora, exotic species, flower colour, management and important remnant sites. This is a great way to check your plant identifications, and also contains links to PlantNet for further species information. Setting up a Flickr site is free, so if you have photos you want to share, set up a site and let us know about it. If you have some images you think would be useful on the Grassy Ecosystems Flickr site contact the site manager at lorraine.oliver@environment.nsw.gov.au. You can visit the Grassy Ecosystems Flickr site at http://www.flickr.com/photos/nswgrassyecosystems/sets/.

Local indigenous plant lists

Molonglo Catchment Group and Southern ACT Catchment Group have produced some fantastic local indigenous plant lists for the Molonglo River, Burra Creek and Jerrabomberra Creek. These are detailed lists, reflecting vegetation differences along sections of each waterway. While they obviously apply to a very specific geographic area, they're worth a look for other groups interested in revegetation. Check them out at www.molonglocatchment.com.au, from the Molonglo Catchment Group (6229 7715), or the CMN.

Weed Information Packs

Another great publication from Molonglo Catchment Group, this pack contains detailed identification and control guidelines for high priority weeds in the Molonglo catchment. This list is relevant across the Southern Tablelands. Available from www.molonglocatchment.com.au, from the Molonglo Catchment Group (6229 7715), or the CMN.

Blue Devils (*Eryngium ovinum*), a grassland forb sometimes mistaken for a variety of thistle. Photo: Maryke Booth.

Wild Sorghum (*Sorghum leiocladum*), a close relative of the grain crop, indigenous to the Southern Tablelands. Photo: Rainer Rehwinkel, DECC

Woodland Wanderings

Our network is currently in a state of flux while we wait to see if we have funding to continue. We have formed a partnership with a number of key groups to develop a comprehensive Box Gum Grassy Woodland proposal for the "Caring for Our Country" program, Landcare NSW Inc, Stipa, CSIRO, University of NSW, Department of Primary Industry and Department of Environment & Climate Change (DECC), World Wildlife Fund, Birds Australia and Greening Australia/Flora Bank.

In the interim the Southern Tablelands Grassy Ecosystem CMN has agreed to share its newsletter. It is full of great information that I'm sure you will find useful!

A big thankyou to the 66 respondents to our survey! The management results are collated on the following page. Congratulations to the 10 winners of the survey draw who won a copy of David Lindenmayer's book "Woodlands – A Disappearing Landscape".

Bill Langshaw,	John Lemon
Robyn O'Bryan	Ian & Tessa Ponder
Kate Boyd	C. Brammall
John Tucker	Sam & Claire Johnson
Katrina Hudson	Anne Sloane

On the 8th of July the network is hosting a conference in coach "Riding the weed-bus from Canberra to Tamworth" to look at weed invasion which is one of the greatest threats to the biodiversity of Grassy Woodlands. Thirty-five scientists, land managers, local, state and commonwealth government officials are taking the long route between Canberra and Tamworth to spread the word and see for themselves the increasing threat of weeds to the remaining stands of Grassy Woodlands across the slopes and tablelands of NSW.

Thankyou to all the network members who have contributed to the organisation of sites and local gatherings that support this event.

One of the sites the weed bus will be visiting is Klori TSR where "friends of Klori have been managing the threat of Coolatai grass. This National Heritage listed Travelling Stock Route is used by the local Somerton school for environmental education.

Class members (photographed below Somerton students looking for life in the Lizard Lounge leaf litter) were asked to record there thoughts after visiting the site. Bradley Swain year 6 wrote:

Klori TSR is important to our community because it has biodiversity such as chirping birds, crawling echidnas, munching white ants and lizards. There are also many different types of native plants; white box and kurrajong trees, wattles, grasses, shrubs and herbs. There are over 200 plant species at Klori. The old trees, with many hollows and the shrubs that flower at different times, leaf litter and understorey all provide good nesting sites, food and shelter.

All of this means that Klori is a good, healthy environment

MANAGEMENT SURVEY FOR CMN MEMBERS	YES	NO	NA	COMMENTS
Do you consider biodiveristy outcomes when managing your grassy woodlands	54	0	3	
Have you implemented any of the management suggestions supplied inside the last newsletter	37	6	14	
Strategic stock grazing	26	8	23	
Stock exclusion	36	6	15	
Expansion and connection of existing remnants	25	8	24	
Weed control	42	4	11	
Slashing	14	23	20	
Re-planting	21	17	19	Would like to, but lack funding
Supplementary planting	24	14	19	Would like to, but lack funding
Feral and/or native herbivore control/exclusion fencing	21	17	19	
Retention of all alive and dead timber	46	2	9	
Exclusion of fire	32	11	14	
Application of ecological fire management	11	23	23	
Contol of feral pigs	12	16	29	
Retention of rocks	42	0	15	
Exclude miscellaneous feral species	26	12	19	
Maintain natural nutrient levels	40	0	17	
Additional management actions implemented				Fenced off riparian/ rem. Veg. Areas. Soil erosion/stream flow management. Grazing to control spp. Diversity. Ecological thinning. Development of wetlands. Biodynamics to improve soil structure
CMN AND LANDCARE NSW SURVEY OF CURRENT SERVICES. ARE THEY OF VALUE TO YOU OR YOUR GROUP?	**YES**	**NO**	**NA**	**COMMENTS**
Grassy Ecosystem management newsletter	62	1	3	Particularly case studies/research
CMN Grassy Ecosystem web site	32	21	13	Needs to be finished. Do not have net
Field Days	55	8	3	Paddock Plant days. Weed identification. Soil structure /compaction. Mychorizae
Workshops	48	12	6	
Forums	37	18	11	Carbon capture
CMN electronic monthly events newsletter	45	16	5	
CMN E-mail discussion group	13	37	16	
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Murrnong or Yam Daisy (*Microseris lanceolata*), once a common food plant of grassy ecosystems. Photo: Lorraine Oliver, DECC

Austral Bugle (Southern Tablelands Grassy Ecosystems CMN) newsletter was edited by Mary Appleby and was produced with funding from ACT Parks, Conservation and Lands (ACTPCL), Natural Temperate Grasslands Recovery Team (NTGRT), Hawkesbury-Nepean CMA (HNCMA) and Southern Rivers CMA (SRCMA). The views expressed in this publication do not necessarily represent those of the NSW Department of Environment and Climate Change (DECC), ACTPCL, NTGRT, HNCMA or SRCMA. Whilst every effort has been made to ensure that the information in this newsletter is accurate at the time of printing, DECC, ACTPCL, NTGRT, HNCMA and SRCMA do not accept responsibility for any errors or omissions.

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