Grass Clippings

Native grasslands and grassy woodlands newsletter

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Grass Clippings is an occasional newsletter to provide brief updates on initiatives and activities aimed at conserving and managing grassy ecosystems.

Please send comments, contributions or requests for further information to:

Helen Ryan
Grassy Ecosystems Network Coordinator
Victorian National Parks Association
10 Parliament Place
East Melbourne 3002
Ph. (03) 9650 8296 fax (03) 9654 6843
Email helenr@vnpa.org.au
Or
Vanessa Craigie
Grassland Coordinator
Dept. of Natural Resources and Environment
4/250 Victoria Parade
East Melbourne Vic 3002
Ph. (03) 9412 4199 fax (03) 9412 4586
Email vanessa.craigie@nre.vic.gov.au

Grassy Ecosystem Reference Group - Research Projects

This edition of Grass Clippings is devoted entirely to presenting the results of the research projects undertaken as a result of initiatives of the Grassy Ecosystem Reference Group (GERG).

GERG was established in 1995 and provided with Commonwealth funding for three years, for GERG to disburse on projects that promoted the conservation and management of grassy ecosystems throughout Victoria. GERG set aside approximately $40,000 per annum for three years for grassy ecosystem research projects, and established a Research Advisory Group to evaluate applications from researchers.

Results of the year 1 research projects were disseminated at a workshop in 1996, and those from year 2 at the "Down to Grass Roots" conference in 1998. This newsletter presents the results of the third year of research projects.

Copies of the reports are the property of Environment Australia and the authors, and requests for copies should be directed to them.

RAG membership

The Research Advisory Group comprised:

Dr Graham Coulson (University of Melbourne (chair)) - vertebrates
Tim Barlow (La Trobe University) - plant ecology
Jim Crosthwaite (University of Melbourne) - socio-economics
Dr Gordon Friend (NRE) - vertebrates, fire ecology
Dr Ian Lunt (Charles Sturt University, Albury) - plant ecology
Adrian Moorrees (NRE) - plant ecology
Dr Bob Parsons (La Trobe University) - plant ecology
Peter Robertson (Wildlife Profiles P/L) – reptiles and amphibians
Assoc Prof Martin Westbrooke (University of Ballarat) - plant ecology
Dr Alan Yen (Museum of Victoria) - invertebrates

Fifteen applications were received by the Research Advisory Group, and eight were recommended for funding. This recommendation was endorsed by the GERG.

Priorities

RAG's priorities for research areas were:

- grassy woodland communities
- ecological processes
- weed identification and control
- social and economic research
- threatened and sparse taxa
- methods of management (including reconstruction and restoration)

Applications were assessed on the degree to which the project:

- concentrated on regions, biota or communities that are poorly known
- demonstrated cooperation with other projects and organisations
- included a potential to include or establish long-term monitoring programs
- incorporated matching or additional funding/resourcing
- linked strategically to existing or proposed projects

or

- was a pilot project which may act as a catalyst for further studies or attract further funding.

Project Results - successful projects, their objectives and outcomes

Unless stated otherwise, descriptions of the project outcomes are paraphrased by the editors from the research reports. Where an actual abstract has been provided, this has been identified.

An assessment of past, present and potential patterns of tree invasion in remnant *Callitris* woodlands at Terrick Terrick National Park

Ian Lunt, Charles Sturt University

Aims:

- to assess and compare woodland stand structures in different areas of Terrick Terrick State Park, by measuring tree densities and the size structure of tree populations, including seedlings.
- to attempt to determine the age of existing trees using historical records and tree ring counts
- to describe historical changes in tree densities based on the evidence gathered in (1) and (2) above.
- to identify existing areas of dense sapling recruitment, and to assess whether such recruitment is beneficial or problematic for ground flora diversity.
- to provide suggestions for future management of tree recruitment at Terrick Terrick.

The study involved a survey and description of the *Callitris-Eucalyptus* association. Three distinct vegetation zones were recognised, each occupying slightly different environments. Size class analysis showed that *Callitris glaucophylla* and *Eucalyptus* species recruited at different times in the past. Most *Callitris* resulted from a single recruitment pulse which is thought to have occurred between 1865 and the 1870s, whereas *E. microcarpa* and *E. melliodora* have recruited continually throughout the 20th century. Between the 1870s and 1970s, no *Callitris* recruitment occurred except in small plot from which stock grazing was excluded. *E. microcarpa* has recruited abundantly in recent years, which may be due to the removal of grazing from within the Park after 1993.

A dendrochronological study of *Callitris* confirmed that the major recruitment pulse was between the 1840s and 1880s but the technique failed to give exact dates. Historical changes in Callitris stand structure were examined by sampling old tree stumps. This suggested that Callitris density prior to the 1880s was only 6-11 trees/ha, although the true density may be under-estimated. Successive silvicultural treatments in the dense Callitris zone have thinned the dense 19th century recruitment from about 354 trees/ha in the early 1900s to 126 trees/ha in 1999.

The results provided supportive evidence of major changes in vegetation structure since European settlement. The author suggests that all tree species within the Park have the ability to recruit where and when conditions are suitable. If it was believed desirable to return the vegetation structure to one resembling that described by the first European surveyors, an intensive thinning program would be required.

Selective removal of Serrated Tussock from native grasslands by Frenock at different levels and impacts on native forbs

(Colin Hocking, Victoria University of Technology)

Aims:

- To determine the effect of Frenock at two different rates on the survival and growth of mature plants and seedlings of Serrated Tussock (*Nassella trichotoma*) and Kangaroo Grass (*Themeda triandra)*.
- To plant five species of forbs (*Arthropodium strictum, Bulbine bulbosa, Chrysocephalum apiculatum, Leptorhynchos squamatus* and *Velleia paradoxa*) into a mixed sward of Kangaroo Grass and Serrated Tussock, and subsequently overspray the site with the two rates of herbicide, and assess the impact on all species.

In late spring 1998 the forbs were planted into the 50-50 mix of Kangaroo Grass and Serrated Tussock. Six replicates were established, and tetrapion (as ICI Frenock) applied in late autumn with three treatments:

1. without Frenock
2. one fifth of agricultural rate (label strength) Frenock
3. broadacre agricultural rate of label strength Frenock,

Early 1999 autumn results were positive, and initially provided a good basis for assessing the impacts of the herbicide on each species. However, poor rains since winter 1999 have interfered with the project. In the early stages, there was presumably insufficient water in the ground to carry the Frenock into the plants, or to promote sufficient growth of plants so that the Frenock was able to act. Survival of the planted forbs appeared to have been affected by the lack of water, and no discernible

difference in the effects of Frenock on any of the forb species could be detected.

Despite the lack of distinct differences in survival between Serrated Tussock and Kangaroo Grass, there was sufficient indication from the drought-affected results that Frenock might remove Serrated Tussock selectively from amongst Kangaroo Grass, if there was sufficient moisture in the soil, so low level monitoring was continued. Dry conditions only broke in late autumn 2001. Final assessments of all plots are now being undertaken in mid-winter 2001, to ascertain whether any significant differences in effects of Frenock on Kangaroo Grass and Serrated Tussock can be detected.

The planted forbs appear to have been adversely affected by the dry conditions, to the extent that little useful information is likely to be gained from assessment of surviving plants.

It appears that Frenock is likely to lead to some difference in vigour, and possibly in mortality, between Kangaroo Grass and Serrated Tussock, when applied at the lower rate of approximately one fifth of broadacre agricultural rate. Whether this benefit sufficiently outweighs the disadvantage of Kangaroo Grass mortality in mixed stands of the two species, and the subsequent invasion by thistles, other broadleaf weeds and annual grasses, is doubtful, despite the differential effect of Frenock on the vigour of Serrated Tussock compared with its effect on Kangaroo Grass.

Frenock applied at agricultural rates to mixed stands of Kangaroo Grass and Serrated Tussock would appear to cause as much damage to the Kangaroo Grass as the Serrated Tussock, although this result needs to be interpreted in the light of the unusual ongoing dry conditions over the period of the investigation.

Other trials at Victoria University have shown that removal of Kangaroo Grass leads to increased invasion of Serrated Tussock. On this basis, the application of Frenock, especially at agricultural rates, to mixed stands of Kangaroo Grass and Serrated Tussock, in anticipation that there might be some differential benefit, should be discouraged. Other means of removing the Serrated Tussock from amongst the Kangaroo Grass (e.g. C3 specific herbicides such as atrazine or simazine) should be pursued as more appropriate alternatives.

It is intended that the trial plots will be burnt next spring, and an ongoing assessment of survival of Kangaroo Grass, Serrated Tussock and forbs will be undertaken in the autumn of 2002, possibly as part of a B.Sc. Honours project investigating methods for control of Serrated Tussock.

Management of Introduced Molluscs and Mites *(Paul Horne, IPM Technologies* **)**

Aims:

- To determine the effectiveness of fire and grazing in reducing large populations of pest molluscs and mites.
- To provide information on the pest pressure that introduced molluscs and mites apply to native grasslands, and in particular linear remnants such as roadside reserves.

The project sampled burnt and unburnt native grasslands for introduced molluscs and mites and potential predator. Sites were paired close together, with identical rainfall, temperature, surrounding land use and locality.

The main pests were molluscs, almost all collected being exotic slug species, mainly *Deroceras reticulatum*. Population densities of the slugs were far higher in unburnt native grasslands and pastures than burnt native grasslands.

Numbers of predatory carabid beetles (possible biological control agents against the slugs) were not noticeably lower in burnt sites., suggesting that burning is not necessarily disruptive to native grassland invertebrates.

Populations of Red-legged Earth-mite (*Halotydeus destructor*) were highest in pastures and capeweed, and lowest in unburnt native grassland sites.

The practice of ploughing firebreaks along fencelines encourages Red-legged Earth-mites. The presence of capeweed increases the risk of mite damage to linear grassland reserves.

The author suggested that ploughing firebreaks can encourage the growth of capeweed and hence Red-legged Earth-mites and expose rocks that provide shelter for slugs.

Will the addition of Phosphorous-sorbing sludge assist restoration of native grasslands

(Dr Paul Dalby, University of Adelaide)

Aim:

To test whether the addition of water treatment waste could be used to reduce plant-available phosphorous in soil and so improve the success of native grassland restoration by reducing the competitive ability of weedy plant species.

Preliminary results indicated that:

- Water treatment sludge decreased plant available phosphorus in grassland soil but only when it was incorporated into the soil. This is unsatisfactory, as soil disturbance will create a habitat highly suited to weed establishment.
- The reduction in plant available soil P reduced the growth of one weed species, *Holcus lanatus*, but not another, *Trifolium subterraneum*.

Experiments to determine the impact of the sludge on the growth of *Themeda triandra* were unable to be carried out due to staff turnover.

Experiments with the three species growing together are needed to confirm the original hypothesis, but because severe soil disturbance will be required to reduce the levels of plant available P, it is unlikely that this method will be useful, except in habitats already highly disturbed.

Effects of population size and density on reproductive success in fragmented plant populations

(John Morgan, La Trobe University; co-authors Bradley J. Costin & Andrew G. Young, Centre for Plant Biodiversity Research, CSIRO Division of Plant Industry)

Aim:
To investigate the impact of habitat fragmentation on population size and density, using *Leucochrysum albicans* subsp. *albicans* var. *tricolor* to assess the importance of these parameters on reproductive success in a fragmented species.

Abstract from the report:
Fragmentation and isolation of plant populations can affect demographic processes such as seed production and cause reductions in fitness, but their relative effects are likely to depend on the life history of the species concerned (i.e. breeding system, dispersal syndrome and longevity). Currently, little information is available to grassland managers to help assess the threat of fragmentation to plant persistence.

In fourteen isolated, remnant populations of the short-lived *Leucochrysum albicans* subsp. *albicans* var. *tricolor* (Asteraceae), where reproductive population size differed from 74 to over 50,000 flowering plants, seed set and germinability was determined for one flowering season. The breeding system was determined in a hand-cross versus self-pollination experiment in the glasshouse, whilst mating system parameters were determined by molecular methods for four sites spanning the range of reproductive population sizes. *Leucochrysum albicans* subsp. *albicans* var. *tricolor* is a self-incompatible species and outcrossing rates were uniformly high (>90%) in the populations observed. Seed set was not linearly associated with log (population size), although there was substantial within- and between-population variability. Seed germinability was rapid and substantial (>80%) in all populations and not linearly associated with log (population size).

This study suggests that (previously identified) short-term factors, such as the maintenance of habitat and safe sites for regeneration, are of immediate importance to the persistence of all *L. albicans* subsp. *albicans* var. *tricolor* populations. Maintaining frequent burning regimes in remnants where the species persists is a crucial management input necessary to conserve the species in the short-term. To uncouple the effects of population size and within-site factors on plant demography in fragmented plant populations, more research effort should be directed at quantifying the significance of the local-scale interactions that occur between individual plants, pollinators and site environmental factors.

Distribution and conservation status of the Corangamite Water Skink *Eulamprus tympanum marnieae* in the Victorian Volcanic Plain

(Garry Peterson, LaTrobe University)

Aims:

- To determine the geographical range of *E .t. marnieae* further to the west and north of existing study areas around Lake Corangamite.
- To determine the extent of integradation with *E. t. typanum* and the proximity of *E .t. marnieae* populations to *E. t. tympanum* populations further to the west and north.
- To continue collecting individuals for morphological analysis and tail samples for testing for genetic variation.

Surveys for the Corangamite Water Skink in 1996/97 and 1997/98 discovered previously undocumented populations of the species, resulting in ten extant populations. During 1998/99, surveys were undertaken as part of this project. A total of 197 sites were surveyed but no populations of *E.t.marnieae* were found. However the Southern Water Skink, *E. t. tympanum* was found at 16 sites. This taxon appears to favour regions of the Later Newer Basalts towards the western extreme of the Victorian Volcanic Plain, within the cool temperate thermal zone. The Later Newer Basalts inhabited by *E. t. marnieae*

however are within the warm temperate zone, which suffers dry arid summers. *E. t. marnieae* seems to handle these conditions by retreating into cool moist microhabitat provided by the surrounding lakes and deeply fissured basaltic barriers.

Most other regions of Later Newer Basalts and water bodies and courses surveyed within the warm thermal zone lacked any areas of suitable habitat. Suitable habitat was surveyed in a region south west of Lake Goldsmith but no animals were found.

No intermediate populations were found along the northern fringes of the Victorian Volcanic Plain and no further evidence was found to suggest that integration had previously occurred there, apart from those discovered during the 1997/98 survey.

The status of *E. t. marnieae* as an endangered taxon appears justified, with its current geographical distribution restricted to three isolated regions of the Later Newer Basalts. All ten populations are small and fragmented. It appears that *E. t. marnieae* has recently undergone a decline with the apparent extinction of two populations, and it may also have disappeared from other sites that appear suitable, both within and just north of its current range.

Distribution and abundance of *Swainsona* on grasslands of the Northern Plains
(Louise Rodda, University of Melbourne)

Aims:

- To carry out a survey of grassland sites known to carry populations of *Swainsona sericea*
- To search for the species in other potentially suitable areas.

Swainsona sericea is vulnerable in Victoria and New South Wales and endangered in South Australia. The species is confined to south eastern Australia and inhabits semi-arid lowland grasslands. These grasslands have declined since European colonization and the introduction of associated disturbance regimes and the majority now exist as remnants on private land. The distribution, density, habitat requirements and recruitment strategies of *S. sericea* were assessed at five study sites on private land on the Northern Plains of Victoria in 1998 and 1999. Due to a lack of past studies, a pilot study was conducted to design the sampling methods for the principle study. Thirteen previously unrecorded populations were identified in the study area and entered onto NRE's Flora Information System (FIS) database. The results of the study indicate that the species is a perennial hardseeded cool season forb that inhabits sparsely vegetated, acidic, sodic, well drained red clay rises in semi-arid environment. The species germinates in response to mechanical scarification in the laboratory. It does not tolerate dense vegetation cover or high moisture regimes. Light intermittent or pulse grazing favours the species but it does not appear to tolerate disturbances such as irrigation, cultivation and heavy continuous grazing which should be avoided. However, populations may recover after these disturbances, from a soil stored seed bank and restoration of historic sites should be considered. The current lack of adequate reserve systems needs to be addressed. Ongoing monitoring over season and years is required to accurately assess the population status of the species as a variable number of plants may be dormant at any one time. The majority and the largest populations of *S. sericea* occur on private property and the assistance of landholders in conserving the species needs to be acquired before plants are lost in the pursuit of increased agricultural productivity.

An assessment of the distribution and habitat utilisation of the Hooded Scaly-foot (*Pygopus nigriceps*) in the grasslands area of Terrick Terrick National Park, and establishment of an on-going research and monitoring program for this species and the Plains-wanderer (*Pedionomus torquatus*)
(Peter Robertson, Wildlife Profiles P/L, Ian Lunt, The Johnstone Centre, Charles Sturt University, David Baker-Gabb, Elanus P/L)

Aims:

- to determine the distribution of the Hooded Scaly-foot in the Terrick Terrick grasslands;
- to investigate the habitat relationships of the Hooded Scaly-foot, and factors affecting its distribution;
- to initiate a monitoring program for the Hooded Scaly-foot to enable assessment of imposed management;
- to initiate a monitoring program for the Plains-wanderer to enable assessment of imposed management;
- to provide a basis for further management-oriented research by post-graduate students.

Over 105 vegetation quadrats were sampled and permanently marked during an earlier study of the vegetation of the Terrick Terrick grasslands, representing all vegetation communities and management histories in the area.

These quadrats provided a set of sampling points at which the habitat relationships of the

Hooded Scaly-foot were investigated in a comprehensive and carefully stratified manner.

Hooded Scaly-foot

Ten foot transects, each linking a number of existing vegetation quadrats were established, including the range of native grassland communities present and covering a broad geographic spread within the reserve. These were sampled repeatedly on warm summer nights.

Seventeen active Hooded Scaly–foot were recorded, with additional sloughed skins also located. They were found to use spider burrows as their main refugia. Most individuals were located in one field ('Fabians') but two were found in other fields from which they had not previously been recorded. ('Finns' and 'Yarran'). Observations were mainly from 'rich red-soil grassland' areas, with some in nearby areas of 'general grassland'.

The monitoring should be conducted annually, in all ten transects, using the standardised techniques established.

Plains Wanderer

A paddock in the east of Terrick Terrick National Park comprised largely of sparse grass was selected as the initial trial site. A 9km grid of flexible poles was set up, comprised of 14 transects 600m long and 50m apart across the paddock. The 1.5m poles were flexible to prevent them becoming rubbing posts for stock and perches for raptors. They were fitted with bands of reflective tape which showed up brilliantly in a spotlight 200m away. It then proved an easy matter to drive and adhere to this gridded transect at night. The vehicle was driven at <5 kph and a transect width of 15m was appropriate given the height and density of the grass. Several more nights of monitoring on this and additional grids are needed to test the efficacy of the technique.

Artificial Shelter study

A wide range of species quickly utilised the artificial shelter sites, however no Hooded Scaly-foot were located using these refugia.

Following this investigation, a monitoring program for this species and the Plains-wanderer was initiated. The monitoring program will be continued by Parks Victoria and other personnel.