Land for Wildlife Notes

Native grasslands of the bassalt plain

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This Note is intended to provide an overview of some important management considerations of native grasslands on private land, particularly those grasslands that occur on the basalt (volcanic) plains of southern Victoria. Readers should note that there is a great deal of information about grasslands that remains unknown and this Note should be read with that knowledge in mind.

Kangaroo Grass

Recognition

When we speak of grasslands we mean a community of plants, many of which are not grasses, of which grasses are the most obvious. The term 'grassland' is used to describe a wide range of plant associations i.e. not all grasslands are the same. Typically, a grassland community includes dominant, usually tussock-forming, long-lived grasses in association with other species, especially of the daisy, pea, lily, rush and orchid families of plants, of which a number may be annuals. Trees are often present but, at the time of European settlement, extensive areas were 'treeless' (with few, but usually some, plants of tree size, especially where water was abundant and in fire refuges) or lightly treed. Typical grasses include Kangaroo (*Themeda triandra*), Wallaby (*Danthonia spp.*), Spear (*Stipa spp.*) and Tussock (*Poa spp.*) [see LFW News Vol. 1, No. 6, p3].

Native grasslands were once extensive and have been replaced, by cultivation, grazing, weed competition and so on by agricultural 'grasslands' of exotic species. Most native grassland remnants are confined to refugia, such as paddock corners, steep swamp margins, rocky areas, lambing paddocks, old cemeteries, roadsides, railways, escarpments, steep creeklines, locations where machinery access has been difficult and similar locations where they have escaped destruction. In a few cases, conservative management by landholders has saved the grassland community and left them with a rare asset.

Status

Because these grasslands typically occupy fertile sites on flat country they have been severely affected by settlement and agriculture and are now extremely rare. You are indeed fortunate if you have a native grassland remnant as less than 0.2% of the original area in Victoria remains in an intact and diverse condition.

Yam Daisy. Note the characteristic drooping heads. Usually an indicator of a well-managed site.

Potential economic values[1,2,3]

The economic values of native grasses are being increasingly recognised. Some species have high protein levels, they are hardy and drought tolerant and some continue to produce green growth into summer when introduced species have declined. Grasslands offer a genetic resource of plants that are adapted to the agricultural zones and may yield future crops or species of

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horticultural or medicinal value. Perrenial grasses are suggested as a partial solution to soil acidity and a method for controlling grasshopper numbers through planting in egg-laying sites (north facing hillsides). Native grasslands provide habitat for native predators of agricultural pests such as Red-legged Earth Mite. The grasslands were used extensively by aborigines and bush tucker species, including the staple Yam Daisy, may offer scope for ecotourism/restaurant ventures. Native grasslands are unique and rare.

Notable species

Several grassland species have become well known including the most endangered mammal in Victoria, the Eastern Barred Bandicoot (many of the extinct Victorian mammals occurred in grassland and woodland habitats). Australian Bustard, Eastern Quoll (extinct in Victoria), Plains-wanderer, Striped Legless Lizard and Button Wrinklewort are also well known threatened species. Unfortunately, there are many other lesser known grassland species that are threatened including over 125 plant species. Wetlands on the volcanic plain, such as in the Lake Bolac-Willaura area, are significant habitats supporting many waterbirds.

Female Plains-wanderer

Species for which a Flora and Fauna Guarantee Action Statement exists

Obtainable free from NRE offices or call the Flora & Fauna Guarantee Unit on (03) 9412 4011. Notes are available on the web. http://www.nre.vic.gov.au

4 Eastern Barred Bandicoot *Perameles gunnii*,

17 Striped Legless Lizard *Delma impar*, 35 Lined Earless Dragon *Tympanocryptus lineata*,

28 Button Wrinklewort *Rutidosis leptorrhynchoides*,

14 Estern Quoll (extinct in Victoria),

31 Small Psoralea *Cullen parva*,

47 Hairy Anchor Plant *Discaria pubescens*,

50 Sunshine Diuris *Diuris fragrantissima*,

53 Western Basalt Plains Grassland Community,

63 Brittle Greenhood *Pterostylis truncata*,

66 Plains-wanderer *Pedionomus torquatus*,

68 Large Fruit Groundsel *Senecio macrocarpus*, Northern Plains Grassland Community (in prep.).

How to obtain a species list for your area

Options

1. submit a request to the Flora Information System and Atlas of Victorian Wildlife (form available from *Land for Wildlife* assessors);
2. purchase the Victorian Flora Database CDRom from the NRE Information Centre Tel: (03) 9637 8080,
3. Contact your local library, schools, naturalist clubs for local species lists,
4. consult the references at the end of this Note or
5. talk to your *Land for Wildlife* Extension Officer about alternative sources of information such as local herbaria and reports,
6. Contact the librarian at the National Herbarium of Victoria (Botanic Gardens).
7. Your most valuable resource is local grassland remnants - become familiar with them.

A high quality basalt plains grassland remnant on red soils. Note the number of non-grass species. 10-25% bare earth between tussocks is desirable.

Ecology and management considerations

General

Precautionary management

As a general rule of management, always test and evaluate your management regime before applying it to the entire area. Establish reference areas. Take time to learn about how your grassland operates. If your grassland is in good condition, practice conservative management by maintaining existing management until new methods prove their value.

Adaptive management

This involves setting up alternative management options and evaluating results against controls.

As a general rule-of-thumb be guided by what you would expect to be the natural process/recent history and try to maintain or re-establish it.

Grasslands tend to occur on soils with relatively high fertility and are capable of supporting a relatively frequent fire regime. Sites with lower fertility tend to support heathlands or dry forests. Trees and shrubs become more common as water availability increases. The ability to survive extreme periods of dryness is typical of many native grassland plants.

Grassland communities vary throughout the year and between years in response to the prevailing environment. Species can easily be overlooked. Continue to survey your grassland in different seasons and over many years.

Soil and water

Soil profiles

(see LFW News Vol. 1, No. 6, p7).

The flat nature of much of the volcanic plain is very deceptive. Underneath the ground there can be enormous variation.

Above*: Black soils over white kaolin* clays with bedrock at 2m depth.

On the basalt plain, soils began as solid rock formed from a lava flow from one of the many extinct volcanoes dotting the plains. Water has penetrated the rock and weathered it to varying degrees. Where water lies for a long time the soils tend to be black, alkaline and deep, often underlain by white kaolin clays over dissected columnar basalt bedrock. Rises tend to have shallow red soils with columns of rock, showing as exposed rock, at their peaks. These rocks protect plants from close grazing. Rock crevices are important as perennial plants can, if they survive a risky childhood, establish roots in the cracks which act as reservoirs of water during dry periods. Loose rocks on the surface act as homes for a range of animals such as Blue-tongue Lizards, Fat-tailed Dunnarts and Marsh Frogs.

[Left] Fat-tailed Dunnart [Right] Dunnart burrow beneath an upturned basalt rock.

Soil dynamics - cracking, clays, crusts, 'bare' areas.

Basalt soils are highly variable. Red soils tend to be acidic while black soils are usually alkaline. Within short distances soils may vary incredibly. Grey sticky (when wet) clays often surround depressions that seasonally fill with water. Adjacent to these may be loamy red soils. On rises soils may be shallow and skeletal (poorly formed). Plants respond to these conditions.

Soil cracking may be severe in summer causing roots to be ripped apart (many species have strong rope-like roots) but allowing water to enter the soil profile and resupply underground reservoirs and animals, including Striped Legless Lizards, to escape fire.

Possible management responses:

Avoid using fertilizers which will promote weeds and change soil chemistry to the disadvantage of soil fungi, invertebrates, etc. Addition of soil modifiers, such as gypsum, usually leads to loss of native grassland species. Avoid soil disturbance which encourages weed invasion. Return rocks from rock fences to the rises where they naturally occur (check first with your council that they are of no heritage value).

Flowering, pollination and seed set

Flowering typically occurs from late winter/early spring to early summer with different species peaking in sequence according to genetic factors. Fire and other environmental variables may be a trigger for some species. For example, ethylene gas produced by a fire can be important in triggering flowering in orchids. Some species may not flower, or even appear, in adverse seasons.

Native bees, beetles, butterflies, wasps and flies are important pollen vectors as are, no doubt, many other invertebrates. Wind is also important, especially for grasses whilst birds and mammals are less significant compared to other plant communities. Large dense populations of flowering species may attract more pollinators and have greater seed set than small populations or scattered plants.

Possible management implications:

Avoid management, such as soil compaction, use of chemical insecticides, etc that may be harmful to pollinators.

Seed set occurs following the onset of summer. January - February is the main seed collection time for the area immediately west of Melbourne.

Recruitment/revegetation

Very little is known about this most important aspect of grassland ecology. Perennial species may live for long periods (decades) and so successful recruitment events may be at lengthy intervals, probably when a form of disturbance, such as fire, physical removal or death due to drought or age, creates a space (gap) in the grassland mosaic and frees the resources needed for establishment; there is good seed set and follow up rains. On the other hand, annual species typically occupy the spaces between tussocks and use the seasonal opportunities, when water is plentiful, to complete their life cycle. Soil stored seed is another factor. Successful germination and recruitment probably normally occurs at the autumn break (April). Soil crusts (mosses, lichens) may be important as microsites for seedling establishment.

Possible management responses:

Planting should be undertaken in autumn with minimal soil disturbance or spring (heavy soils). It is critical that plants are placed in a habitat comparable to where they would naturally occur (see Fig. 1). Determine this by looking at the location (soil type, slope, height, etc) of remnant populations of the same species and plant in the same site. Transplanting small quantities of soil crusts to previously disturbed areas may be valuable.

Anticipate substantial mortality due to season, competition with established plants, etc. Try multiple plantings, in clusters, in less competitive sites (e.g. where a tussock has died, where shallow soils prevent tussock competition). Make sure biomass is controlled in sebsequent years or seedlings may be outcompeted.

Fungal associations

Some grassland plants have mychorrizal fungi associated with their root system (eg. orchids). The fungi are essential to the plant's health, allowing it to obtain otherwise unavailable nutrients.

Management implication:

Transplanting or propagating individual plants without the associated presence of, and conditions for, the fungus is likely to be unsuccessful. Soil collected when the fungus is active can be introduced to the site or pot.

Left: Mychorrhizae on and in orchid cells in first stages of germination (fraction of 1mm). Right: Rare Diuris fragrantissima (approx: 12cm tall).

Grazing

Grasslands are adapted to grazing by native herbivores. However, many species are not well adapted to sustained grazing by large populations of introduced livestock. Palatable herbs are particularly vulnerable. Soil crusts may be destroyed and soil compaction can affect recruitment, soil fungi, etc. However, since most private land grasslands will have been subject to grazing for lengthy periods, it is likely that grazing will continue to be a major management tool.

Possible management responses:

Maintain grazing regime and trial practical alternatives such as burning, particularly when re-establishing palatable species. Create grazing exclusion plots to monitor affects of grazing, restrict the timing of grazing to after seed fall and prior to soil wetting (i.e. late summer when soils are hard and dry). It is extremely important to monitor biomass levels. Excluding livestock without replacing grazing with a viable alternative, such as fire, is likely to be counterproductive. Consider pulse grazing. A large number of stock graze at one time, forcing consumption of less palatable species and so removing excess biomass.

[Left] Native grasslands are adapted to frequent fires. Fire is an important management tool.

Fire

Without biomass removal by fire, grazing or slashing, grasses can dominate a site and exclude other species through accumulation of prior years leaf litter. Kangaroo Grass may die from self-shading if unburnt. Thus, fire is usually regarded as an important management tool for grasslands. An alternative form of management to maintain an open structure to the vegetation is grazing and mowing followed by raking which may be alternatives if fire cannot be used. Most grassland species tolerate and even thrive with frequent fires (possibly every 1-3 years). Naturally, fires would have been most common in summer, normally after seed set (February - March) and when soil cracks are available as a refuge for animals. However, aboriginal patterns of burning are unknown and may be significant. Underground tubers, dense tussocks with protected buds, resistant seeds and other mechanisms are used by plants to survive fire. Grassland fires may be fast and intense when there is a large quantity of fine dry fuels.

Disturbance, in this case a graded firebreak, has allowed weeds (Chilean Needle Grass) to invade this grassland.

Possible management responses:

Consider the use of regular fires to maintain the diversity of plant species and remove biomass. Seek advice on options for controlling weeds using fire (see below). Do not attempt to undertake an ecological burn without first consulting the local fire authority, NRE, council and weather bureau to obtain advice on safety, weather conditions and restrictions. Prepare a fire plan first.

In practice: ecological burning, a method for grasslands.

A technique of burning that has been used successfully for grasslands is for a mown fire break, at least 5 metres wide, to be created (a brush cutter avoids compaction but for large areas a mower may be required) around the entire perimeter. For large areas, a further break is then established by back burning inside the mown break. With the breaks in place, burn in strips to the firebreak or, for smaller areas, the fire is lit on the leeward end and burnt back into any small breeze. Two people control the fireline at either end where it meets the break. Wet hessian sacks may be useful. Maintain a watch on the site as fires can recur from under rocks or smouldering heaps of plant material. The soles of footwear may be destroyed by heat even after the fire has apparently passed. Ensure all equipment is thoroughly cleaned and free of weed seeds. Think about escape routes for native animals

Introduced species

(see LFW Notes 24, 25, 31, 39).

A good quality grassland site may still have up to one third introduced species. Typically, in more disturbed sites, half the species will be introduced. Weeds are a major grassland management issue.

In practice: a technique for removing weeds to establish natives (see also News Vol.1, No.10)

A chemical-free technique that has proven successful in managing weeds where they occur in a monoculture is to cover the area with black plastic until existing plants die, water and cover with clear plastic to germinate weed seeds, which will die under the plastic if water is excluded. Clear the area and plant densely with native species suited to the site.

Possible management responses:

Avoid/minimise soil disturbance. Hand weeding. Spot spraying with herbicides. Create 'sterile' edges perhaps using an infertile crop species. Always replace weeds with natives. Research indicates that >50% cover of Kangaroo Grass is a greater deterrent to competing weeds such as Chilean Needle Grass. See *Land for Wildlife* News Vol.1, No.10 'Environmental weeds - the little known curse' for a list of options.

Grassland weed notes available from NRE .

It is yet to be determined whether fire can be used effectively against grassland weeds. Typical approaches involve setting the fire regime so that it has a greater affect on the biology of introduced species than on natives. Unless specific advice is available, time fires to occur as close to the natural fire season as possible within the limitations of fire season restrictions, preferably after seed set and fall. Fire can also be used to remove weed masses (e.g. Rye Grass mats) at other times.

Be extremely careful to avoid transporting and introducing weed seeds in hay, clothing, mud on vehicles, etc. (e.g. Wear gum boots in summer! It'll save your socks).

Introduced foxes (see LFW Note 24), caterpillars and slugs can be a major problem in grasslands.

Monitoring

The following techniques are suggested as a minimum.

Photopoints

Vertical (ideally stereo) photos and oblique at a range of sites.

Herbarium

A collection of pressed and dried specimens with details.

Exclusion plots

Fenced plots to monitor the impact of grazing. Miniature plots may be used to exclude introduced invertebrates.

Testing soil-stored seed

Collecting a quantity of surface soil (top few centimetres) which is watered and grown on till plants can be identified.

Mapping records -

Aerial photos make an excellent base. Draw areas burnt, sites of transplants, etc. onto clear overlays.

Grassland nurseries.

Nurseries specialising in grassland plants include:

Geelong: Grey Box and Grasslands Nursery, 50 School Road, Balliang East, 3340 (Peter Wlodarczyk); Geelong Indigenous Nursery, 45 Clarence St, Geelong West, 3218 (Mark Trengrove); West Coast Indigenous Nursery, 50 Coppards Road, Newcomb, 3219 (Graeme Stockton).

Melbourne: La Trobe Uni. Wildlife Reserve nursery (03) 5428 2738. SGAP (Keilor Group) (03) 5428 2738.

South-west: "Larapinta",YULCART VIC 3300, near Hamilton. Tel:(055) 734555. Contact: Liz Fenton. "Seawinds", Wellington St., PORTLAND VIC 3305. Tel: (055) 234896. Contact: Tilly Govanstone. Condrington Nursery, RMB 2480, PORT FAIRY VIC 3284. Tel: (055) 684344. Ballarat Indigenous (Native) Plant Nursery, RSD R572, DEREEL VIC 3352. Tel:(053) 461495. Contact: Tim D'Ombrain

Ask your *Land for Wildlife* Extension Officer for others.

Further reading/study

See also LFW Note 1, list available from Vanessa Craigie, Flora and Fauna Program, NRE.

Identification:

Cunningham, G.M. et al., (1981). *Plants of Western New South Wales*, Soil Conservation Service and Government Printing Office of New South Wales.

Scarlett, N.H., Wallbrink, S.J. and McDougall, K., (1992). *Field Guide to Victoria's Native Grasslands*, National Trust of Australia.

Lunt, I, Ross, J & Barlow, T., (1998). *A Field Guide to the Native Grasslands and Grassy Wooodlands of South-Eastern Australia*. Victorian national Parks Assoc. Melbourne.

Management:

Barlow, T., (1998). *Grassy Guidelines: How to manage native grasslands and grassy woodlands on your property.* Trust for Nature, Melbourne.

Craigie, V. & Stuwe, J. (1992). *Derrimut Reserve Draft Management Plan*, Department of Conservation and Environment, May 1992.

Values:

Crosthwaite, J., (1997). *The economic benefits of native grasslands on farms*. Environment Australia, Canberra.

van Gameren, M. (1997). *Looking After Native Grasslands and Grassy Woodlands*. Victorian National Parks Association Inc.

Courses:

VUT St Albans Tel: (03) 9365 2322, Greening AustraliaTel: (03) 9457 3024, A Grassland Ecology course is planned by NRE (Tel: (03) 9412 4011 and ask for Flora and Fauna Program).