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SEPP 46 FORUM:

What is a native grassland?

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Summary: With an increased interest in protecting native grassland for conservation and agricultural purposes there is a need to define the different types of grasslands that are present in Australia. In order to help landholders and regulators to assess grasslands, this paper provides definitions of various types of grassland beginning with the generic term "grassland", and then other terms "native grassland", "natural native grassland", "derived (secondary) native grasslands", "exotic grassland" and "native pasture". The "native grassland" definition is the most important because of its use under vegetation clearing guidelines and regulations in New South Wales. A short discussion is provided on grassland conservation and the importance of species diversity for ecosystem resilience and productivity.

The main formations of native grasslands in Australia are described in Beadle (1981). They include: the tall savannah grasslands of northern Australia dominated by genera such as *Heteropogon* and *Sorghum*; the widespread hummock grasslands from semi-arid and arid zones dominated by *Triodia* and *Plectrachne* (spinifex grasses); littoral (coastal) grasslands; freshwater or periodically flooded grasslands; tussock grasslands in semi-arid regions on fine-texture soils dominated by a range of genera including wire grass (*Aristida* spp.), Mitchell grass (*Astrebla* spp.), love grasses (*Eragrostis* spp.) and corkscrew grasses (*Stipa* spp.); and grasslands dominated by snow grasses (*Poa* spp.) occurring in cooler, temperate zones. The last two categories make up the tussock grasslands of south-eastern Australia that are most relevant to grassland management in NSW.

In southern Australia, agriculture is most concentrated in regions that were originally grassland or grassy woodland. These regions were exploited since they were flat to undulating and generally contained rich soils derived from fine-grained sediments or volcanic rocks. These grass-lands and woodlands are now among the most threatened ecosystems in Australia (McDougall and Kirkpatrick 1993) as most of the original vegetation has been altered by stock grazing, pasture improve-ment and cultivation of crops. Most of the tussock grasslands have also been altered since European settlement, some more than others. Alpine and sub-alpine grasslands are in relatively "pristine" condition compared to the lowland tussock grass-lands on the Monaro, in Victoria and in the mid-lands of Tasmania. Some sites, however, that have been sympathetically managed (by accident or otherwise) survive in "good" condition in these regions today. Benson (1996) discusses the success-es and failures to date of efforts in conserving these better sites in south-eastern Australia.

With the introduction of vegetation clearing controls (SEPP 46), that originally included native grasslands, in NSW in August 1995, grassland conservation became a topic of considerable discussion. Native grasslands were removed from SEPP 46 in January 1996 in response to opposition from some sections of the rural community. To provide some protection for native grasslands, regional grassland management plans were then prepared by catchment management committees covering the five main regions in NSW where grasslands occur - Walgett, Moree, Liverpool Plains, Monaro and Western Riverine Plain. These plans remain under review and may be revised over time as more information comes to hand. A model grassland plan of management has recently been produced by the NSW Department of Land and Water Conservation in order to assist with reviewing the regional grassland plans. Additionally, a Grassy Ecosystem Reference Group (GERG), composed of representatives from government agencies and the rural community, was established to review the grassland regional plans, provide definitions of native grasslands and offer other specialist advice to the NSW Vegetation Fo-

rum, a committee established to advise the NSW Government on native vegetation issues.

One of the main difficulties facing those administering grassland protection guidelines or regulations is in identifying different levels of "naturalness" of native grasslands. The purpose of this paper, therefore, is to provide some definitions of native grasslands that may assist with future conservation and management assessments.

Definitions

It is perhaps impossible to come up with definitions that will prove legally foolproof and expert opinion about particular sites may often be required to resolve disputes. GERG was given the task to derive a workable definition of the term "native grassland" for the Vegetation Forum to be used in the development and implementation of the grassland management plans. At the time of writing this paper such a definition had not yet been finalised. Definitions of "grassland" and "native grassland" are presented and these are complement-ed by definitions of sub-types of these terms. The relationship between these definitions is shown on Figure 1. The definitions have been derived with the assistance of submissions sent to GERG in April 1996 by W. Whalley, S. Sharp and S. Jacobs, and by referring to Foreman (1995a).

Grassland

Grassland is vegetation dominated by grasses and forbs, containing less than 10% woody plant cover (shrubs or trees).

Grassland is usually composed of a matrix of long-lived perennial plant species of various life forms (most often dominated by grasses and forbs), with a variety of other, mostly short-lived annual or biannual or sometimes perennial, plant species occupying the interstitial space (Grubb 1986).

The <10% cover figure used in this definition is equivalent to the "very sparse" crown cover class in Walker and Hopkins (1990). Woody vegetation with <10% cover is equivalent to shrubs or trees being separated by more than 20 crown widths (*i.e.* isolated trees or shrubs).

Native grassland

Native grasslands are "grasslands" where >50% of the vegetative ground cover is composed of indigenous species of grasses and forbs (species native to the area before European settlement), >50% of the number of species are native, and where the minimum standing vegetation ground cover, alive or dead, exceeds 10%.

This is the key definition that should apply to regulations on clearance control as it covers all native grasslands whether they are natural, derived or occur as an understorey in a woodland or forest (see below). The 10% cover figure used in this definition caters for times of drought when standing vegetation has been reduced and many species only persist in the soil seed bank. In average years the ground cover should exceed 10%.

It is best to assess the naturalness of a grassland in average or better rainfall years, in spring or summer and when an area has not been overgrazed. Species composition can also vary with season of rainfall. Some, such as Mitchell Grasses, respond to summer rainfall, others respond to winter and spring rainfall. If environmental conditions are temporarily unfavourable, or the assessment is affected by recent events such as fire, then the area should be designated as a native grassland if it is suspected that there is any potential for the seedbank to produce a native grassland as specified in the above definition.

Natural native grasslands

Natural grasslands are "native grasslands" that occur in regions that are considered to have had <10% tree or shrub crown cover at the time of European settlement.

Natural native grasslands tend to grow on heavy textured soils in areas subjected to periodic drought with annual precipitation of about 500 mm (Ripley 1992). In south eastern Australia such grasslands were restricted to a few regions in NSW, Victoria, Tasmania and South Australia and only small remnants of native grassland in "good" condition are present today (McDougall and Kirkpatrick 1993).

In NSW, the main natural native grassland regions include:

- Mitchell grass (*Astrebla* spp.) grasslands of the semi-arid inland plains of far north western NSW and south western Queensland;
- Sections of the North Western Plains around Moree and Walgett where Mitchell grass (*Astrebla* spp.), *Leptochloe*, *Panicum*, *Eragrostis* and wire grass (*Aristida* spp.) commonly dominated;
- Liverpool Plains near Breeza, southern section of the Northern Tablelands, dominated by plains grass, *Stipa aristiglumis*.
- Small areas on poorly drained flats and in valleys subject to cold air drainage on the Northern Tablelands where snow grass (*Poa* spp.) was dominant;
- The Monaro region of the Southern Tablelands where originally approximately 250 000 ha of

native grasslands was present dominated by kangaroo grass (*Themeda australis*), corkscrew grasses (*Stipa* spp.), wallaby grasses (*Danthonia* spp.), snow grasses (*Poa* spp.) and forbs (see Benson 1994 for a description of the Monaro native grasslands);

- Alpine and sub-alpine regions of Kosciusko and Namadgi National Parks on the Southern Tablelands dominated by snow grasses (*Poa* spp.) and forbs;
- Coastal clayey headlands dominated by kangaroo grass (*Themeda australis*).

Floristic associations vary across each of these regions as an indicator of environmental differences. Therefore, several grassland communities may be present in each region. For example, on the Monaro, Benson (1994) classified eight types of native grassland communities that grow in response to different environments in the region. Also, in any region, some grassland communities will be more restricted and threatened than others.

The natural native grassland communities in regions 2-5 above have been severely depleted due to 150 years of intense European land use and some are highly threatened. In contrast, the natural native grassland communities in regions 6 and 7 are well conserved and are generally in good condition with alpine and subalpine grasslands recovering after the removal of stock grazing after World War II.

The extensive native grasslands of the Riverine Plain generally do not qualify as natural native grasslands, although Foreman (*pers. comm.*) points out that some areas may have contained less than 10% shrub cover in pre-European times. They are defined as "derived or secondary native grasslands" in this paper (see below).

Derived (secondary) native grasslands

Derived native grassland is a "native grassland" remaining after the removal or dieback of previous woody canopy vegetation (shrubs or trees), to a point where woody vegetation has less than 10% cover.

Derived from woodlands and forests. Native grassland is present in regions of the coast, tablelands, slopes and plains of NSW that once contained trees. While the trees have been removed, in many instances the ground cover has not been cultivated or improved but only grazed. It may be dominated by native grasses and forbs and may be floristically similar to some "natural native grassland" communities. Such grasslands have largely been ignored in conservation assessments in the past (McIntyre *et al.* 1993).

Derived from shrubland. Native grasslands derived from shrublands include much of the grasslands present on the Riverine Plain in south western NSW (described in Benson *et al.* 1996) and northern Victoria (described by Foreman 1995b). The grasses and forbs growing in the native grasslands today on the Riverine Plain were originally components of a vegetation type that once contained the small tree Myall (*Acacia pendula*) and shrubs such as saltbush (*Atriplex* spp.) (Moore 1953). It is postulated that the woody vegetation was eliminated by a combination of stock and rabbit grazing, and drought after 1870 (Moore 1953). This does not belie the importance of the present Riverine grasslands for native species and habitat protection, as a number of plant communities and rare or threatened plants and animals are restricted to the region.

Native grassland as a ground layer in woodlands and forests

"Native grassland" present as a ground cover in woodlands and forests where the shrub layer has <10% cover and the tree canopy has >10% cover.

SEPP 46 includes a provision for protecting native grasslands in forests and woodlands. The definition provided above may assist with the administration of SEPP 46 or subsequent regulations. Forests or woodlands containing a grassy ground cover are often referred to as "grassy woodlands". They usually occur on high nutrient soils in regions receiving low to medium rainfall. These include the grassy open forests of coastal valleys and the tablelands, and the grassy woodlands of the western slopes and inner western plains in NSW. Using the definitions in Walker and Hopkins (1990), if the tree crowns are distinctly separate (10-30% cover) the vegetation is an open woodland or woodland, if the tree crowns are touching or slightly separated (30-70% cover) it is an open forest.

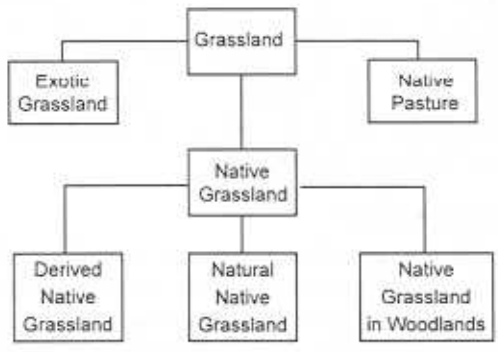

Figure 1. Relationship between different types of grasslands including three forms of native grassland.

Native pastures

"Grassland" that contains native and introduced species where the introduced species are dominant, i.e. *they compose >50% but <75% of the species present and cover >50% but <75% of the area and where pasture species have been mechanically sown.*

Native pastures may contain native species that have naturally re-invaded a cultivated field that has been previously sown to an introduced pasture using exotic grasses and/or forbs such as clovers. Sometimes native species not indigenous to the area could have been sown. Native pasture does not include areas where exotic species have invaded without the assistance of soil disturbance, an example being the invasion of wild oats (*Avena* spp.). It also excludes areas subjected to the aerial spraying of pasture species, such as clovers, over uncultivated ground although it is recognised that this activity can lead to a significant floristic change in a native grassland. The term "native pasture" has colloquially been used to describe all grasslands excluding the highly modified "exotic grassland" category. The above definition places native pasture between the more pristine "native grassland" and "exotic grassland" types.

Exotic grassland

"Grassland" where all or the vast majority, >75%, of species are introduced to the area, and all or most, >75%, of the canopy cover is composed of introduced species, and where all or most of the indigenous vegetation has been removed.

Exotic grasslands include improved pastures, lawns and cultivated fields in agricultural and urban areas.

Factors that degrade native grassland

While native grasslands are able to tolerate certain grazing and burning regimes, changes of these affect species composition. Increased grazing pressures from hard-footed domestic stock have eliminated some of the more palatable grass and forb species. The sowing of exotic species accompanied by the application of fertiliser and the invasion of exotic weed species has been a major cause of change in the species composition of native grasslands. The greatest cause of change, however, has been through the ploughing of land for the cultivation of fields or establishment of exotic pastures.

The native grasslands surviving today in good condition tend to occur in places that have not been regularly ploughed or consistently, intensively grazed. Most of these sites, however, have been grazed lightly or intermittently, or have been subjected to burning regimes that have served to maintain plant species richness.

Native grassland conservation

There are agricultural as well as nature conservation reasons for maintaining native grasslands. Native grass species are generally more resilient to drought than introduced species and some genera such as *Danthonia* and *Microlaena* contain nutritional values matching favoured imported species (Waterhouse 1993; Munnich *et al.* 1991). Some research has shown that productivity in an ecosystem is linked to species diversity. In a long-term study of biomass change in a native grassland in Minnesota in the United States, Tilman and Downing (1994) demonstrated that resilience to and recovery from drought correlated with the presence of more native species, thus supporting the diversity-stability hypothesis in ecology. Translated to Australian grasslands, this means it may be wise to maintain species richness in native grasslands and native pastures.

In the main, the most important native grassland sites for nature conservation are those remnants that retain a high number of native species, even though there may have been changes in the biota since European settlement. These sites also often contain rare species. Some grassland communities may be naturally plant species-poor. The conservation of these communities should be addressed by applying the concept of protecting a representative range of biological communities in a region. Such places may contain other biodiversity values such as a particular assemblage of invertebrates.

One of the challenges for the next decade is to undertake sufficient biological surveys and mapping of native grasslands in NSW, on a property by property basis, to be able to delineate sites of conservation significance. Regional surveys such as Benson (1994) for the Monaro and Benson *et al.* (1996) for the Riverine Plain identify some sites of significance and act as a springboard for more intensive investigations.

Some of the criteria that could be applied to distinguish a grassland site of significance from less important sites include:

- presence of rare or threatened species;
- presence of regionally significant species;
- presence of an unusual association of native species;

- presence in good condition of a plant community once more common;
- relatively high species richness for a particular plant community;
- low proportion of exotic to native species;
- ease of management of the area - fences *etc.*;
- size of the remnant.

Many of these criteria can more easily be judged by expert biologists since they require the identification of species. Nethertheless, with the development of local identification kits and education kits, it may be possible for more landholders to become involved in identifying a greater range of native grassland species and therefore important sites for biological conservation. They should at least be able to alert experts to apparently significant grassland on their properties.

Once sites of significance have been identified it is important that follow-up protection action is implemented as soon as possible to minimise the chance of accidental or deliberate damage to them.

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