

Conservation and protection of Northern Plains Grasslands

– a strategic direction



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Foreword

'Conservation and Protection of Northern Plains Grasslands – A Strategic Direction' provides the vision to secure the ecological integrity of the Northern Plains Grasslands for the future. This Strategic Plan sets the direction for creating an ecologically connected network of public and private conservation lands across the landscape.

The Avoca and Patho Plains contain the last remaining areas of Northern Plains Grasslands in Victoria. Because of this rarity, Northern Plains Grasslands are one of the most threatened vegetation communities in the State. A disproportionate number of National and State threatened flora and fauna are represented here. The grasslands have already been highly fragmented by settlement and agriculture, and many of the last remnants remain unprotected.

Over the past two decades, much has been achieved by the many determined individuals and organisations working to ensure the future of the Northern Plains Grasslands. Reserves have been dedicated, private lands covenanted, sympathetic land management practices implemented, and conservation threats documented. Today, the grassland communities are recognised as a high priority asset within the North Central catchment.

However many threats remain. Of these, the current rate of vegetation clearing for cereal cropping is our greatest challenge. The need for strategic action has never been more critical.

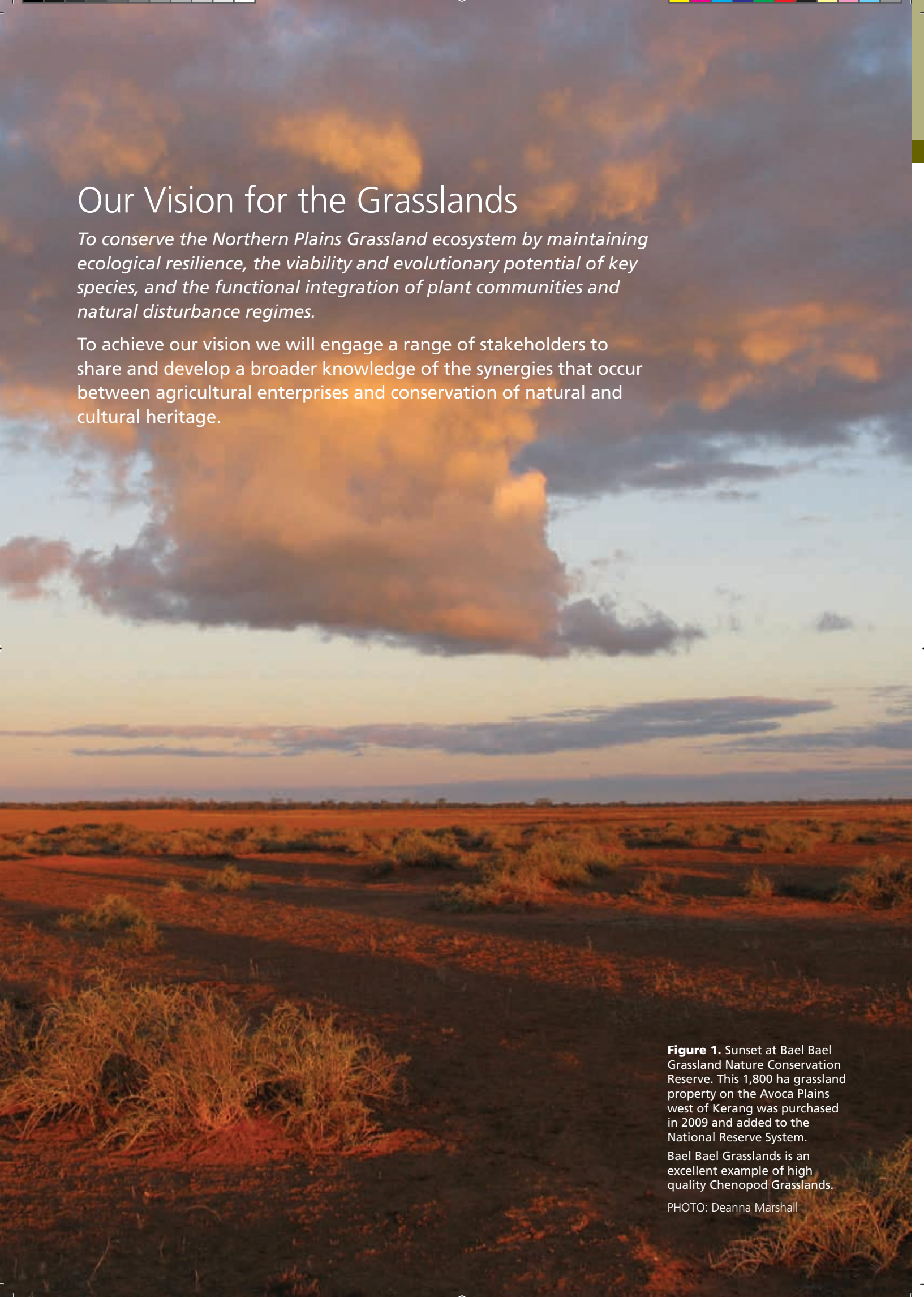
Many individuals and organisations have a role in caring for our grasslands. This Strategic Plan brings together the efforts and responsibilities of all these stakeholders in a joint vision for improving the protection and management of the Northern Plains Grasslands. Conserving the grasslands requires both strategic acquisitions of grassland remnants, managing those remnants, and facilitating private conservation efforts.

In 2007, over 40 community representatives, technical specialists and landholders combined to identify the issues and knowledge gaps central to managing the Northern Plains Grasslands. Ongoing development of the Strategic Plan has been guided by a Steering Committee and a Technical Advisory Group of land managers, researchers, and private individuals.

Conservation and Protection of Northern Plains Grasslands – A Strategic Direction describes the Northern Plains Grasslands Community, outlines its recent conservation history, and identifies the threats to its sustainability. This Strategic Plan outlines our long-term vision for the Northern Plains Grasslands and provides actions to guide decisions about their management over the next 10 years.

Actions outlined in this Strategic Plan cover both local on-ground management and broader policy initiatives. The ten Key Strategies focus on preventing the destruction of remnant grassland patches by clearing and overgrazing, managing threats such as weeds and pest animals, revegetating and restoring damaged landscapes, and increasing community awareness and involvement. Ongoing research and monitoring will enable our actions to be adapted as required.

The Actions in this Strategic Plan are based on the understanding that protecting our Grasslands involves us all working together – governments, landholders and the community. This Plan provides a blueprint for us all to ensure the protection of our vital heritage.



Our Vision for the Grasslands

To conserve the Northern Plains Grassland ecosystem by maintaining ecological resilience, the viability and evolutionary potential of key species, and the functional integration of plant communities and natural disturbance regimes.

To achieve our vision we will engage a range of stakeholders to share and develop a broader knowledge of the synergies that occur between agricultural enterprises and conservation of natural and cultural heritage.

Figure 1. Sunset at Bael Bael Grassland Nature Conservation Reserve. This 1,800 ha grassland property on the Avoca Plains west of Kerang was purchased in 2009 and added to the National Reserve System.

Bael Bael Grasslands is an excellent example of high quality Chenopod Grasslands.

PHOTO: Deanna Marshall

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Introduction

The Northern Plains of Victoria are a unique and unusual landscape. A mosaic of Black Box, Buloke and Red Gum woodlands interspersed with grasslands and ephemeral wetlands.

This particular mosaic is a product of the climate and soils of the region. Sandier and better drained soils support woodland. Where soils contain more clay, trees give way to grasslands and ephemeral wetlands of Black Box and Lignum. These different ecosystems interact and complement each other. Many species have evolved in response to the particular characteristics of the different ecosystems.

Today, our woodlands are held in high regard across the community. But all parts of this landscape interact in a complex, fragile balance. The grasslands in particular, whether small patches or vast plains disappearing to the horizon, are a unique and interesting environment that supports numerous distinctive plants and animals – from abundant wildflowers to the Plains-wanderer, a bird so unique it is classified in its own separate Family.

Rich soils, temperate climate, and ease of clearing have made these grasslands a prime target for agriculture. Increasingly, clearing for cropping is threatening the last remaining patches of this ecosystem.

Agriculture is a vital part of the Northern Plains, so too are our natural landscapes a valuable asset, essential for a balanced environment and economy, and strong and diverse opportunities for the future.

The entire Northern Plains Grassland Community, and many of its plants and animals, are listed under the Victorian *Flora and Fauna Guarantee Act 1988* and nominated for listing under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* – recognising both their vital ecological importance, and their threatened existence.

For several decades, many people across the Northern Plains have worked tirelessly to ensure these unique grasslands retain their place in our landscape. Landholders, Department of Sustainability and Environment, Trust for Nature, Department of Primary Industries, Department of Water, Heritage and the Arts, Parks Victoria, North Central Catchment Management Authority, local shires, researchers and other individuals have all helped achieve the gains we have made.

Grasslands won't survive in isolation. A healthy landscape requires a network of conservation areas, connected to allow species to move between patches. National Parks and reserves, roadsides and rail reserves, and private landholdings – wherever grassland occurs – it needs to be connected up to allow species to travel for feeding, breeding, repopulating areas damaged by clearing or other disturbances, and to allow plant and animal populations to shift where climate change makes this essential.

Over the last twenty years, the Protected Area Network on the Northern Plains has grown steadily with land acquisitions and conservation covenants over private landholdings. However, we need to continue to develop the Protected Area Network of lands set aside to conserve our grasslands and their species. This Strategic Plan aims to strengthen the whole community's involvement in conserving our grasslands.

In managing our small public reserves (e.g. road, rail and water reserves), we need to recognise the vital contribution these areas make to the grasslands future, and manage to protect this. On our farms we need to recognise the values of the grasslands, and our responsibility and the opportunities to conserve them. We need to begin restoring the many patches degraded by past management. We all need to continue to learn about the grasslands, by research and monitoring, and by sharing our experiences and anecdotes.

Many people have contributed to the development of this Strategic Plan. In it, we briefly describe the values of the Northern Plains Grassland Community and the progress we have made towards protecting them, and outline the threats and challenges they face. We have outlined ten broad Strategies, with a range of Actions to achieve them. In applying these Actions, we will monitor the outcomes and continuously adapt our actions. We urge you to join with us in implementing these Actions.

A handwritten signature in black ink, appearing to read 'Paul Foreman', with a long horizontal line extending from the left and a small loop at the end.

Paul Foreman
Chair
Northern Plains Grassland Technical Advisory Group

Aims of the Strategic Plan

Conservation and Protection of Northern Plains Grasslands – A Strategic Direction provides the vision to secure and improve the ecological integrity of grasslands for the future. This Strategic Plan is an important tool in achieving our aims:

- To provide an overarching framework to align all major stakeholders in grassland conservation.
- To establish a landscape-scale, ecologically connected, cross tenure network of land managed primarily for conservation outcomes. This will be achieved by improving the protection and management of the Northern Plains Grasslands through strategic acquisition, market based-incentives, voluntary agreements and promotion of sustainable land use principles.
- To contribute to the implementation of recovery plan actions of nationally listed plants and animals that inhabit Northern Plains Grasslands.
- To contribute to the implementation of the Northern Plains Grassland Action Statement.

Although this Strategic Plan is framed around a 10 year vision it should be regularly reviewed to provide ongoing direction for conserving the national and state significant flora and fauna of the region.



Figure 2. Red Swainson-pea (*Swainsona plagiotropis*), a stunning nationally endangered species with deep pink flowers, surviving where there is an absence of cultivation and overgrazing.

Populations have been in decline because of land clearing, grazing, loss of pollinators and invasion by exotic plants.

PHOTO: Ben Thomas



Figure 3. The Plains-wanderer (*Pedionomus torquatus*) is a small, rarely seen, nocturnal ground-dwelling bird about 15 cm tall when on tip-toes. This is an unusual bird. So unusual it has a classification Family just for itself! All its close relatives in the Order Charadriiformes are shorebirds or waders! It is most closely related to an ancient line of South American shorebirds called seed-snipes (*Thinocorus* species) originating in the Gondwana supercontinent over 60 million years ago.

Across their range, Plains-wanderer numbers have declined significantly, and are now listed as endangered at the National and State level. Plains-wanderer numbers are closely linked to the survival of healthy grassland habitat, where well-developed grass tussocks, inter-tussock spaces of varying size and character, and a variety of forbs, provide nesting material and protection from predators. The Plains-wanderer eats both seeds and insects.

The Plains-wanderer superficially resembles button-quail (*Turnix* species), and is often shot by mistake when first flushed out of grass. The female (shown here) is distinguished by her prominent white-spotted black collar above a rich rufous breast patch.

PHOTO: Ben Thomas

1

The Northern Plains Grassland Community

Significance of the Northern Plains Grasslands

Mediterranean grasslands are one of the world's major ecosystems, occurring widely on all continents except Antarctica. Being generally fertile and occurring in mild climates, they have declined dramatically for more than a century, diminishing faster than most other ecosystems (Henwood 1998, Enquist & Gori 2008). Thus, the native grassland communities of the North American prairies, South American pampas, European chalk grasslands, Asian steppes and south-eastern Australian plains are among the earth's most threatened and poorly-reserved ecosystems (IFFA 1992, Henwood 1998).

Similarly, the lowland grasslands of south-eastern Australia (map 1) are among the nation's most threatened and poorly conserved ecosystems (McDougall & Kirkpatrick 1994). As little as 1% of the original extent remains (Barlow 1998). But these remnant grasslands have great conservation value, often supporting many rare or threatened species of flora and fauna. Despite being highly modified by grazing, cropping, irrigation and fertiliser input, they are the best – often the only – remaining examples of plant communities now virtually extinct (Foreman 1995).

In Victoria, the Northern Plains Grassland Community occurs on the Northern Plains of the Murray Darling Basin, known also as the Riverine Plains (map 2) (Bennet *et al.* 1988). An impressive diversity of plant and animal species live within the grasslands of the Northern Plains. Many species are threatened at the state and federal level. Significant plant species include Turnip Copperburr (*Sclerolaena napiformis*), Chariot Wheels (*Maireana cheeli*), Red Swainson-pea (*Swainsona plagiotropis*), Spiny Rice-flower (*Pimelea spinescens* ssp. *spinescens*) and Northern Golden Moths (*Diuris protea*). Significant animals include the Plains-wanderer (*Pedionomus torquatus*), Pale, Golden and Striated Sun Moths (*Synemon* spp.), Fat-tailed Dunnart (*Sminthopsis crassicaudata*) and Hooded Scaly-foot (*Pygopus nigriceps*).

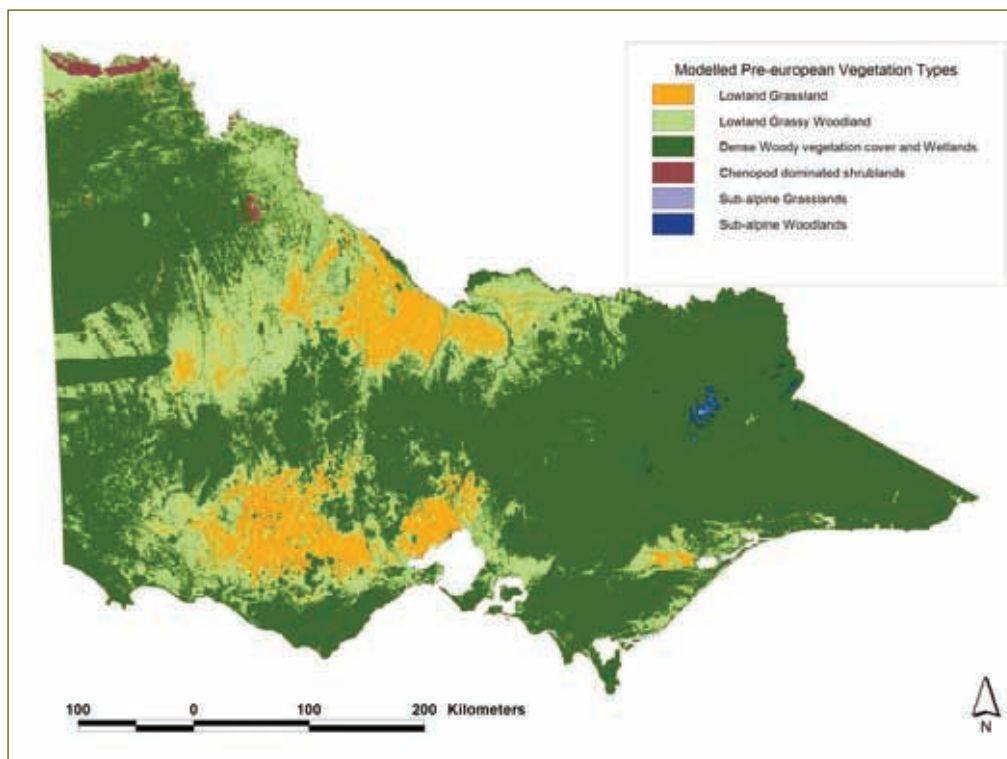
Description

Northern Plains Grasslands are naturally treeless plains. Trees and large shrubs are very uncommon in the landscape. But these are not treeless wastelands. Grasslands complement the adjacent woodlands, providing essential habitat for many valuable and endangered species of plants and animals. The grasslands have great diversity, with numerous species of grasses and herbs. Floristic diversity is greater than 10 species per 100m², often exceeding 20 and occasionally 30 species per 100m² (Foreman 1996).

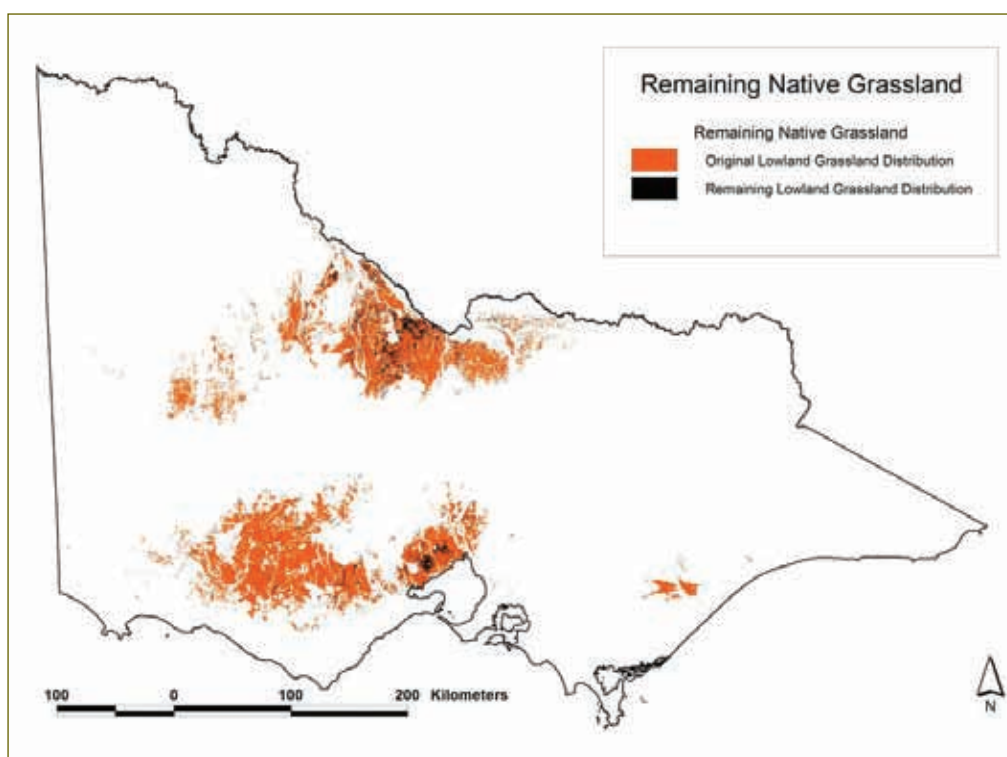
Figure 4. Northern Plains Grassland dominated by annual herbs in full bloom at Terrick Terrick National Park (Fabians Paddock). These naturally treeless grasslands complement the adjacent woodlands, providing essential habitat for many valuable and endangered species of plants and animals. Grasslands are a vital part of the Northern Plains landscape. They are very dynamic systems that have evolved in these often harsh environments, many plants responding rapidly to the slightest drop of rain.

PHOTO: © Norm Stimson





Map 1. Predicted pre-European Vegetation Types for Victoria. Lowland Grassland is comprised of three Ecological Vegetation Classes: Plains Grassland, Chenopod Grassland and Plains Savannah. Source: ARI, Department of Sustainability and Environment, 2009.



Map 2. Modelled distribution of Lowland Grasslands in Victoria prior to European settlement, and current (2009) extent. The Northern Plains Grasslands Community occurs in the north of the map, as a large treeless plain. The grasslands near Horsham are regarded as outliers of this Community.

The Gippsland (Coastal Plains Grasslands) and south western (Volcanic Plains Grasslands) grasslands are separate vegetation communities. Source: ARI, Department of Sustainability and Environment, 2009.

Vegetation communities

The Northern Plains Grassland Community are lowland grasslands included in three Ecological Vegetation Classes: Plains Grassland, Chenopod Grassland and Plains Savannah. Trees and shrubs may occur sparsely, but grasses, mostly perennial, are dominant.

Northern Plains Grasslands are distinct from other Victorian grasslands such as on the Volcanic Plains to the south. The presence of saltbush (Chenopod) species, including members of the *Maireana* and *Einadia* genera, and a high diversity of annual wildflowers, suggests close links with the vegetation communities of the semi-arid and arid interior of Australia.

In the lower rainfall parts of the Northern Plains, today's remaining grasslands consist either of a plains herbland of no particular dominance, or an open to closed tussock grassland dominated by Wallaby-grasses (*Austrodanthonia setacea* and *A. caespitosa*), Spear-grasses (*Austrostipa scabra* and *A. gibbosa*) and Spider Grass (*Enteropogon acicularis*). Such dominance tends to be the result of past grazing and disturbance events.

Occasionally, Northern Plains Grasslands occur as an open grassy shrubland dominated by a variety of species. A range of perennial and annual herbs occupy the inter-tussock spaces. Prior to intensive livestock grazing and cultivation, the grasslands would probably have contained a greater abundance of annual and perennial herbs, shrubs and summer growing (C4) grasses.

Image Gallery: Vegetation communities



Figures 5a. b. c. Northern Plains Grasslands may occur as an open grassy shrubland dominated by a variety of species. A range of perennial and annual herbs occupy the inter-tussock spaces.

PHOTOS: **a, b** Nathan Wong, **c** © Norm Stimson





Figure 6. Chenopod Grassland at Korrak Korrak Grasslands – a Trust for Nature managed reserve.

Early explorer accounts (Major T.L. Mitchell – 1836, George Augustus Robinson – 1843, Edward Curr – 1840's) include references to the widespread presence of shrubs across the open plain country.

Shrub species are still present, albeit rarer, where stock grazing has been absent or relatively infrequent.

PHOTO: © Norm Stimson



Figure 7. Shrub species provide valuable habitat for numerous species of fauna including reptiles.

PHOTO: Nathan Wong



Figure 8. Very high quality Plains Savannah. This vegetation community is a structurally diverse vegetation unit which includes 'grassy openings' ranging from a few hectares to many hundreds of hectares, with a variable tree density ranging from a very sparse savannah to woodland. It is the 'grassy openings' that fall within the Northern Plains Grassland Community.

PHOTO: © Norm Stimson

Fauna

The unique characteristics of the grassland soils and vegetation provide habitat for a range of grassland dependent fauna species.

Grassland soils are predominantly heavy-textured grey and red clays, which swell and shrink extensively as they become successively wet then dry, leaving deep cracks characteristic of these soils. These deep soil cracks provide key habitat for grassland dependent fauna, such as small mammals (Fat-tailed Dunnart *Sminthopsis crassicaudata* and Common Dunnart *S. murina*), reptiles (Hooded Scaly-foot *Pygopus schraderi* and Curl Snake *Suta suta*), and some bird species escaping extreme heat.

For other fauna species, the structural complexity of the grassland vegetation, with well-developed grass tussocks, inter-tussock spaces of varying size and character, and a variety of forbs, provides vital habitat. Vegetation provides sources of food, protection from predators, and nesting material for omnivores such as the Plains-wanderer (*Pedionomus torquatus*); predominantly granivorous birds such as the Brown Quail (*Coturnix ypsilophora*), Stubble Quail (*C. pectoralis*), Little Button-quail (*Turnix velox*) and Red-chested Button-quail (*T. pyrrhothorax*); and birds that are mainly insectivorous such as the Rufous Songlark (*Cincloramphus mathewsi*), Brown Songlark (*C. cruralis*) and Australasian Pipit (*Anthus novaeseelandiae*) (Baker-Gabb *et al.* 1990, Marchant and Higgins 1993, Higgins *et al.* 2006).



Figure 9. The Hooded Scaly-foot lizard is threatened with extinction in Victoria due to destruction of the Northern Plains Grasslands, where the deep soil cracks of the self-mulching clays provide its key habitat.

The Hooded Scaly-foot is a legless lizard that can grow to about 50 centimetres in length. Although a lizard, it has no forelimbs and its hind limbs are only a scaly flap. It can initially appear snake-like, but several characteristics distinguish it from snakes including obvious ear openings, a broad fleshy tongue and a tail that is much longer than its body.

The top of the Hooded Scaly-foot lizard ranges in colour from pale grey to reddish brown, and it is whitish underneath. Its darker head gives it a hooded appearance, hence its name.

PHOTO: Geoff Brown

Location

The Northern Plains Grassland Community occurs throughout the southern regions of the Northern Plains (Shepparton formation) (map 3). This landscape is a mosaic of Black Box, Buloke and Red Gum woodlands interspersed with grasslands wherever soil textures are heavier and less well-drained, and ephemeral wetlands on wetter areas and along drainage lines.

Grasslands occur generally on the heavier-textured quaternary alluvial sediments – calcareous clay loams, or clays on wetter sites. Areas include the self-mulching (cracking) grey clays, and red clay soils.

As soils become sandier and better drained – areas associated with prior stream channels and old dune systems – shrubs, and then trees become increasingly common in the landscape. On the wettest areas, ephemeral wetlands complete the landscape. These grassy wetlands remain inundated for only short periods after flooding, and support swampy vegetation and Lignum or Black Box / Lignum on drainage lines.

The naturally treeless grasslands are a product of their environment. A number of factors have likely contributed to the absence of trees in the landscape, such as cracking clay soils, seasonal rainfall patterns, competitive exclusion, flooding, fire and grazing.

On the heavier self-mulching clays, the swelling and shrinking of the soils – constantly expanding and contracting – kills most tree and shrub seedlings by breaking their tap root systems. Additionally, seasonal rainfall patterns may contribute to the presence of a large sward of grass tussocks, competitively excluding woody species.

Prior to European settlement, Victoria's Northern Plains Grasslands extended across 730,000ha (map 3), according to estimates based on vegetation modelling and historical sources. (ARI modelling, 2009)

Since the early 1840's, intensive agriculture and domestic stock grazing has destroyed and degraded much of the Northern Plains Grassland Community. Approximately 6.6% of the original grassland areas remain across the Northern Plains. However all of this area has been subject to some form of agricultural disturbance with the vast majority of these remnants remaining in a highly disturbed state. The area of grasslands that best represents pre-European structure and composition is estimated to be less than 1% of the original extent.

Today, the remaining Northern Plains Grasslands occur broadly in two locations in Victoria:

(i) the Patho Plains of the Loddon catchment (map 4)

Grasslands extend from the Patho/Mitiamo Plains westward over the Loddon River at Serpentine on the Powlett Plains

(ii) the Avoca Plains of the Avoca catchment (map 5)

Grasslands are found to the north west of Kerang in the Avoca, Wanderers and Beauchamp Plains areas associated with the Avoca River.

Grasslands also occur in the higher rainfall areas (up to 550mm p.a.) on the far eastern edge of the Northern Plain(s) around Wangaratta, Chiltern and immediately adjacent to the Warby Ranges. (maps 2 and 3).



Figure 10. The landscape is a mosaic of Box Gums, Buloke and Red Gum woodlands interspersed with grasslands wherever soil textures are heavier and less well-drained, and ephemeral wetlands on wetter areas and along drainage lines.

Grasslands (purple), ephemeral Red Gum wetlands (red) and Gilgai depressions (green) complement the adjacent woodlands (yellow), providing essential habitat for many valuable and endangered species of plants and animals.

THE woodland occurs on a slight rise and consists of Buloke and Yellow Box.

IMAGE: Google Earth

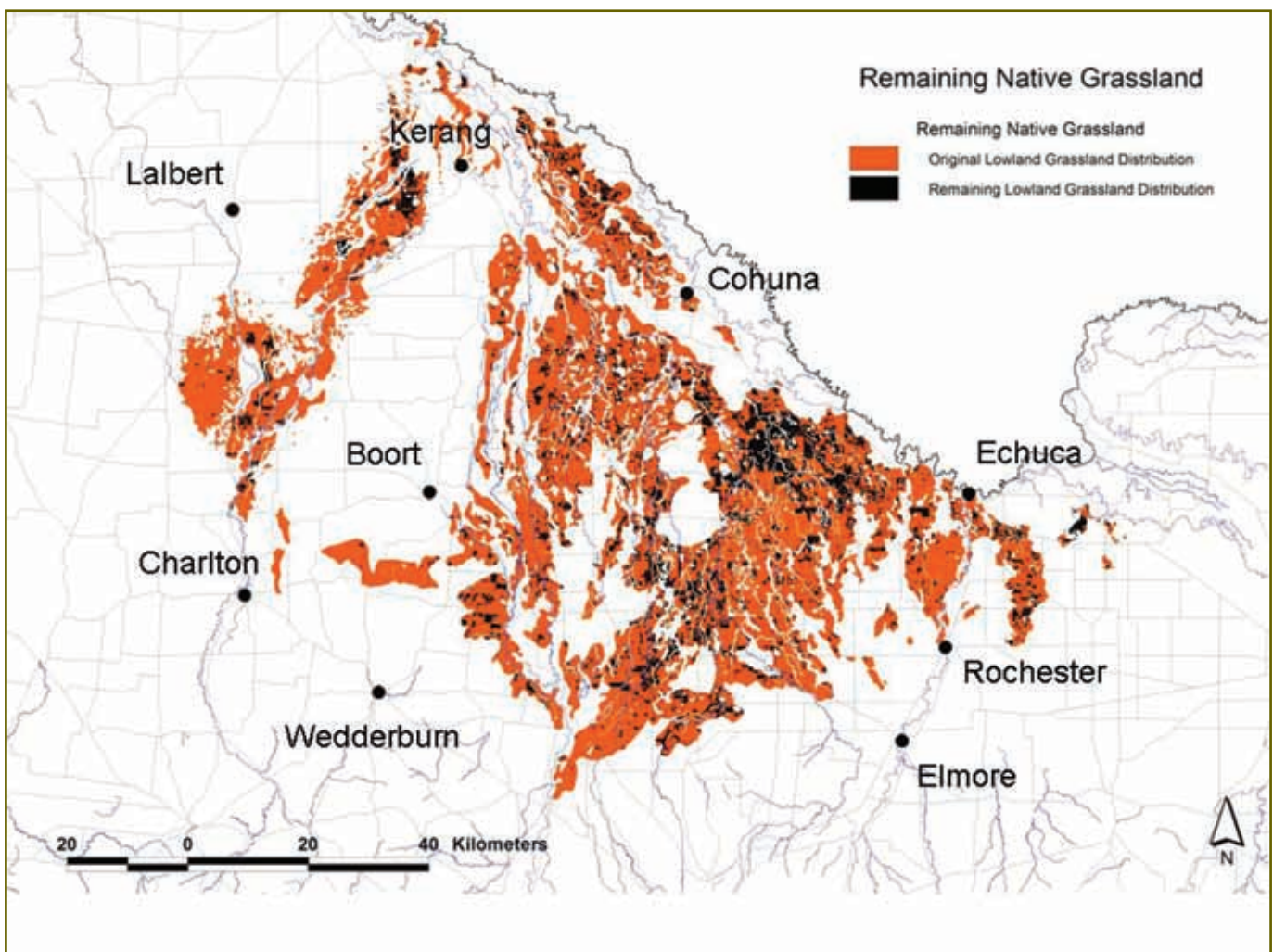
How the Mapping is done

To model the pre-European extent of grassland we use soil type, historical records and field assessment of tree cover to help define the broad geographic envelope where grasslands once occurred.

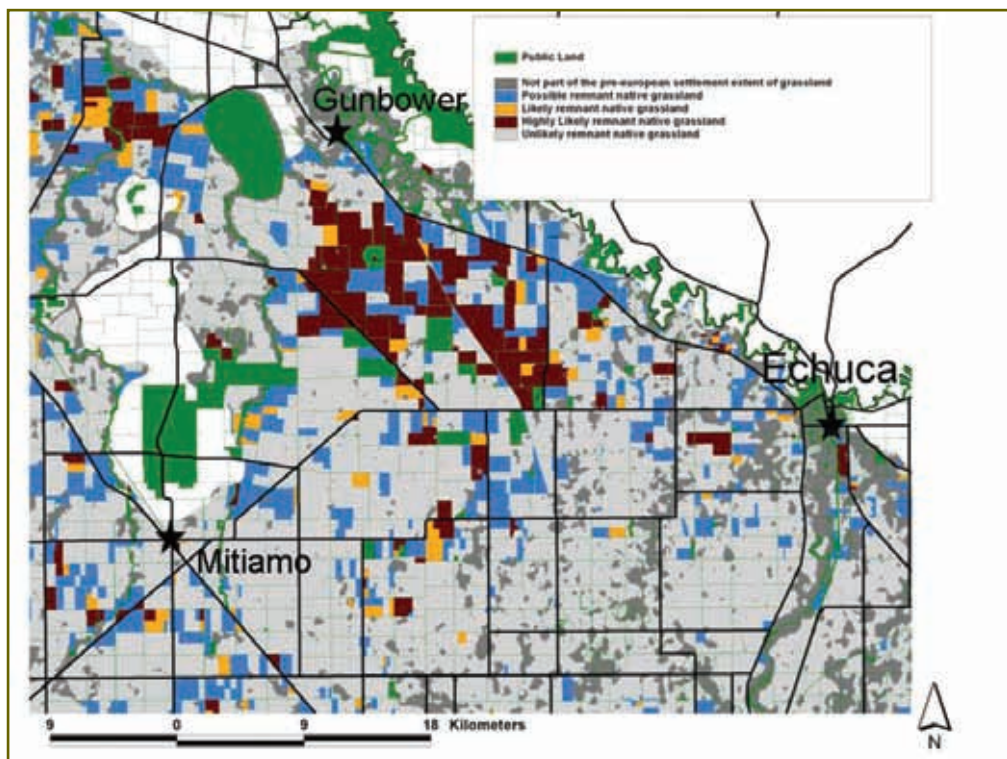
Remote sensing can indicate the likely current extent of grassland vegetation. Most importantly, it also indicates the absence of grassland vegetation.

This remote sensing helps target field assessment, which is then used to identify the many different grassland vegetation communities that are similar yet with different composition, structure and function.

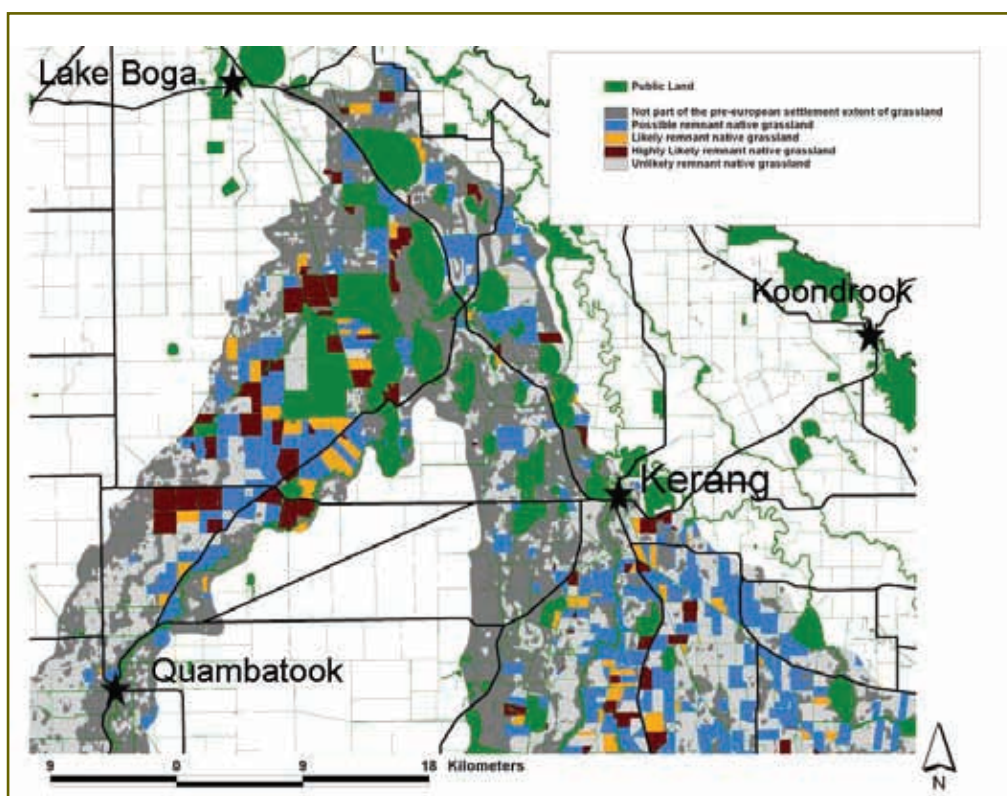
Satellite images are repeated every 16 days, so modelling can be theoretically updated to detect any clearing of vegetation.



Map 3. Modelled distribution of Lowland Grasslands of Northern Victoria prior to European settlement, and 2005 extent. Source: ARI, Department of Sustainability and Environment, 2009



Map 4: Estimated native grassland areas on the Patho Plains prior to European settlement, and predicted current remnant native grassland areas. Public Land also shown. Source: ARI, Department of Sustainability and Environment, 2010.



Map 5: Estimated native grassland areas on the Avoca Plains prior to European settlement, and predicted current remnant native grassland areas. Public Land also shown. Source: ARI, Department of Sustainability and Environment, 2010.

Condition of the grasslands

An impacted landscape

The Northern Plains Grassland Community is one of the most endangered vegetation communities in Victoria (Frood & Calder 1987, DCE 1992, McDougall & Kirkpatrick 1994) and has been listed as a threatened ecological community on Schedule 2 of the Victorian *Flora and Fauna Guarantee Act 1988* (FFG) (SAC 1992).

Dominant land uses are grazing – whether set stocking, occasional grazing of roadsides and reserves, or grazing and cropping rotations – and land clearing for broadacre cropping. All existing grassland remnants have been grazed in the past. Since the 1900s, the Northern Plains Grasslands have been typically used for set stocking in large fenced paddocks at low densities. Under set stocking, stock numbers are maintained throughout the year, with no spelling or seasonal adjustment of stocking rates. This grazing strategy shifts growth patterns to a winter dominated growth cycle of grasses, eliminating native herbs and summer growing species.

Until recently, all roadsides were lightly grazed during drier months, or heavily grazed during drought periods, for stock movement (Foreman 1996). Although FFG listing should protect all public land grassland remnants, droving of sheep and cattle along roadsides still occurs.

Today, broadacre clearing for intensive cereal cropping is expanding rapidly in the Northern Plains, following advances in cropping technology (Hamblin 2001). This expansion completely destroys the natural grassland vegetation. The few remaining areas of lowland grasslands that had previously never been cultivated have been almost completely eliminated by the recent expansion of cropping. Less than 1% of these areas remain.

Figure 11. Effects of set stocking at Wanurp Nature Conservation Reserve. Photo was taken at the time Wanurp was purchased by the Victorian Government in September 2002.

Under set stocking, stock numbers are maintained throughout the year, with no spelling or seasonal adjustment of stocking rates.

Although grasses will recover, much of the diversity and structural complexity of the vegetation can be permanently altered. This grazing strategy shifts growth patterns to a winter dominated growth cycle of grasses, eliminating native herbs and summer growing species.

PHOTO: Deanna Marshall





Figure 12. Due to low rainfall and poor soils, cereal crops in the Avoca Plains often fail.

PHOTO: Nathan Wong



Figure 13. When the cereal crops do fail, the bare paddocks become vulnerable to wind erosion as depicted here in 2008. The fine clay particles disperse with the wind and the cycle of degradation continues.

PHOTO: Nathan Wong

Reduction in biodiversity

Some level of agricultural disturbance has impacted all remnant grassland sites – no known sites remain in an ‘undisturbed’ state. Fertilisers, selective removal of palatable native species through overgrazing, and poor vegetation management have brought changes in floristic composition and structure, including loss of herbaceous biodiversity, decline of the summer grassy sward and weed invasion.

Some functionally important species (e.g. summer growing grasses, chenopod shrubs, and perennial herbaceous species) appear to be restricted to the least modified remnant patches. Many shrubs, sub-shrubs and grazing sensitive grasses such as Tall Oat-grass (*Themeda avenacea*), Kangaroo Grass (*Themeda triandra*), Yakka Grass (*Sporobolus caroli*) and Native Millet (*Panicum decompositum*) are now either locally extinct or rare in the system.

Exotic flora invasion, initiated by past disturbance, poses the biggest threat to the long-term integrity of remnant grassland vegetation. Infiltration by species from the families Poaceae, Fabaceae, Asteraceae and Iridaceae are of particular concern.

Recovery of native grassland vegetation following overgrazing may be possible with active intervention, such as strategic grazing (timing, number of stock), and propagule addition (Scott in prep., Wong *et al.* 2010).

Cultivation for exotic pastures and cereal crops destroys plants and habitat, dramatically increasing the number and types of weeds, and soil nutrients, and reducing fauna diversity. Recovery following cultivation is only ever partial – a number of species (such as orchids, lilies and a range of perennial herbs) are only ever found in areas that have never been cultivated (Wong *et al.* 2010).

Faunal populations are similarly affected, with reported declines in reptiles and the quality of bird habitat. All medium sized mammals (e.g. White-footed Rabbit-rat, Pig-footed Bandicoot, Eastern Quoll and Bridled Nailtail Wallaby) are either extinct or have disappeared regionally (Lunt *et al.* 1998).

A fragmented landscape

Of all the processes that threaten the condition and survival of the Northern Plains Grasslands, clearing for cereal crop production is by far the most significant impact.

The recent widespread clearing has left a landscape of fragmented and isolated remnant grassland patches (map 3). Most grassland remnants are small, isolated patches that remain wherever disturbance has been minimal – along railway lines, roadsides, on miscellaneous Crown Land and on private farmland. The largest and most important remnants are still mostly found on private land, and therefore still threatened by destruction resulting from agricultural changes (SAC 1992).

The impact of habitat clearing is not uniform across all landscapes. In the Patho Plains area, rainfall has historically been more reliable, and thus clearing for cultivation is more widespread, and settlement densities higher. Consequently, the landscape is far more fragmented, with remnant grassland patches smaller and more scattered. In this area, our knowledge of the extent and condition of the remaining fragments is high.

By contrast, rainfall in the Avoca Plains has been less reliable, and this is reflected in the patterns of land use across the landscape. Properties are much larger, and many contain significant areas that have had minimal or no cultivation.

The condition of the remnant grassland patches varies widely. Threatening processes include further cultivation, inappropriate grazing management, habitat fragmentation, weed invasion, feral predators, chemical and fertiliser application, and inappropriate tree planting. These are discussed in Chapter 3.

Image Gallery: Condition of the Northern Plains Grassland Community

The condition of the remnant grassland patches varies widely depending on past and current land use practices. The following images illustrate the variations in both quality and floristic species assemblages for the Northern Plains Grasslands Community.

High Quality Grasslands



Figure 14. Excellent quality Northern Plains Grassland at Terrick Terrick National Park.
Birds such as the Plains-wanderer and Rufous Songlark depend on the particular characteristics of the natural grassland vegetation. Well-developed grass tussocks, inter-tussock spaces of varying size and character, and a variety of forbs, provide food, nesting material and protection from predators.

PHOTO: © Norm Stimson



Figure 15. Excellent quality Chenopod Grassland at Korrak Korrak Grasslands – a Trust for Nature managed reserve.
The presence of saltbush (Chenopod) species, including members of the *Maireana* and *Einadia* genera, and a high diversity of annual wildflowers, suggests close links with the vegetation communities of the semi-arid and arid interior of Australia.

PHOTO: © Norm Stimson



Figure 16a. b. c. Species that are unique in grasslands include all geophytes (plants with bulbs under the ground) such as Early Nancies, Chocolate Lilies, Vanilla Lilies and Orchids. Once a grassland is cultivated, these geophytes are completely eliminated. They are an indicator of high quality grasslands.

PHOTOS: **a.** Prasophyllum Orchid, Deanna Marshall; **b.** Northern Golden Moths, © Norm Stimson, **c.** Lowly Greenhood, Geoff Nevill

Figure 17. Biological soil crusts at Bael Bael Grassland Nature Conservation Reserve.

Biological soil crusts are good indicators of ecosystem health. They contribute to soil stability, atmospheric nitrogen fixation, plant nutrients, soil-plant-water relations, infiltration, seedling germination, and plant growth.

PHOTO: Deanna Marshall



Figure 18. Biological soil crusts at Terrick Terrick National Park.

Biological soil crusts are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials

Some species within the soil crust system may regrow within a few years of a disturbance. But it may be more than a century before the delicate soil returns to its former productivity following damage to slow-growing species.

PHOTO: Deanna Marshall



Grasslands Uncultivated for More than 50 Years



Figure 19. A section of Trust for Nature's Kinypanial Grassland, last cropped approximately 50 years ago.

The vegetation structure characteristic of grasslands has returned, with inter-tussock spaces (bare ground) and plant species diversity. The variation in structure is important for biodiversity.

PHOTO: Andrew Scott

Grasslands Uncultivated for More than 20 Years



Figure 20. Wanurp Nature Conservation Reserve was last cultivated in 1982. The past history of cultivation and overgrazing on this property has completely eliminated certain floristic species from the system (geophytes, perennial herbs). Since being purchased by the Crown and managed with strategic grazing, the Northern Plains Grassland values are slowly returning, with the Nationally endangered Red Swainson-pea *Swainsona plagiotropis* identified in September 2006. Swainson-peas are renowned for having a persistent hard seed coat, allowing the seed to lay dormant in the soil for decades, and to re-appear when conditions are favourable. There is concern though, as to whether the native bee pollinators will still be present in the landscape.

PHOTO: Deanna Marshall



Figure 21. A section of Trust for Nature’s Kinypanial Grassland, last cropped approximately 20 years ago. Note the development of inter-tussock spaces (compare to Fig. 19 that shows more pronounced inter-tussock spaces).

PHOTO: Andrew Scott

Highly Degraded Grasslands



Figure 22. Degraded grassland dominated by Rye Grass (*Lolium* spp.). Rye Grass is an annual exotic grass that thrives in disturbed grasslands. The complex vegetation structure of the Plains Grasslands has been lost. The lack of a variety of grasses and forbs, and limited inter-tussock spaces, provides little food, shelter or protection for ground dwelling birds and many reptiles.

PHOTO: Deanna Marshall

2 Conserving the Northern Plains Grasslands

Introduction

Connectivity

Protecting and maintaining the best remaining remnants is a critical conservation goal. But isolated remnant patches – even of high biological integrity – do not provide a sustainable solution. Ecologically, our goal must be to conserve a connected, functioning landscape. Thus, the continued destruction of all known grassland remnants must be prevented.

Many fauna species are inherently mobile and dispersive. Movements may be linked to breeding, dispersal or seeking food in isolated refugia during drought conditions. For some species, recovery of populations following catastrophic events (such as drought, fire or ploughing) may require direct connectivity to other habitat.

Other species are known to be moving in response to shifting climatic and seasonal conditions. While the Protected Area Network has grown significantly in the region, building long-term functional connectivity will be critical to buffer against the impacts of climate change (Buckley 2008). Connectivity will allow a range of plant and animal species to persist through a climate-changed future, providing pathways for dispersal and migration.

Furthermore, vegetation community types are not uniform. Variations in soil, topography and climate give rise to numerous different vegetation assemblages, creating a variety of niche ecosystems. Such diversity may be critical to individual species, both routinely and in recovery situations.

Conserving a connected landscape

Because of the widespread fragmentation of the grassland ecosystems, piecing together a connected, functioning landscape requires a three-pronged focus on larger patches, smaller fragmented areas, and roadside and other public reserves.

Larger patches, particularly those less disturbed by cultivation, provide the core of the Protected Area Network. The circumstances of today's remaining large patches vary widely. Many significant patches have already been purchased by DSE and Trust for Nature and added to this network. These have often been areas of higher conservation value.

On private land, patches vary in both condition (depending on land use) and protection, depending on the presence or absence of voluntary management agreements, or conservation covenants.

But larger reserves are just one component of a dynamic and functional network of protected areas. The many smaller fragmented areas, often scattered across numerous properties, provide vital connections between the larger remnants. Ideally such connecting patches would be grasslands. But in practice this is rarely possible, and woodland patches also provide these corridors for connectivity.

The third type of remnant landscape is the numerous roadsides, unused roads, rail reserves and other Crown reserves. These land tenures have often been least impacted by post-European land uses. Road reserves are usually under local government or VicRoads tenure. These are often extensive, and many are in reasonable enough condition to provide connections and 'source' populations of rare and endangered species. The nationally endangered Spiny Rice-flower has 24 populations occurring on road and rail reserves on the Patho Plains compared to three populations on private land.



Figures 23a. b. The Nationally endangered Spiny Rice-flower (*Pimelea spinescens* ssp. *spinescens*) growing on a roadside on the Patho Plains.

There are 24 known roadside populations of Spiny Rice-flower on the Patho Plains, compared to only 3 on private land – a legacy of past and current management practices.

Listing under the Flora and Fauna Guarantee Act should protect all grassland remnants on public land. But roadside, rail reserve and other Crown reserve vegetation is often damaged or destroyed, either inadvertently or intentionally, by grazing, herbicides, machinery and vehicles, and illegal cropping.

PHOTOS: Ben Thomas

The need to conserve remnants

Between 1998 and 2008, the area of grassland cleared illegally on the Patho Plains alone greatly exceeded the area of grasslands added to the Protected Area Network during the same period (Marshall & Fitzsimons 2008). It is likely that a similar area has been lost on the Avoca Plains.

Although grasslands that have been uncultivated for many decades are rare, many private landholdings still contain valuable grasslands. All remnants are of value, as they often harbour threatened plant and animal species. The largest and most important remnants are still mostly found on private land, and thus are still threatened by destruction resulting from agricultural changes (SAC 1992).

On private land, an additional 127 hectares have been permanently protected by voluntary BushTender management agreements with landholders. However, the majority of government funded BushTender agreements only guarantee *temporary* protection for the five year life of the voluntary agreements. These areas range from high to low conservation value. Other grassland patches on private landholdings carry no protection.

Roadsides, rail reserves, cemeteries, water reserves and other miscellaneous Crown Land can support very significant, though often small and isolated, grassland refuges. However, these land tenures are not secure. Many of these patches are licensed for private operations, and breaches of licence conditions result in the further loss and destruction of many remnant grasslands.

The conservation of native grasslands remains a challenge on private agricultural land. The use of native grasslands for cropping has meant that losses are, and will continue to occur. Refining the regulatory system to enable agricultural development to occur in areas of low biodiversity value while preserving high value native grasslands is a high priority. Ultimately a mix of policy tools such as incentive payments, education, regulation and enforcement will need to be used more effectively.

Voluntary, market-based and incentive-based conservation programs have achieved some short-term, localised benefits. But arresting the current rates of destruction requires effective legislative tools and policy frameworks. Legislation to halt this trend needs to be fully enforced if landscape-wide protection is to be achieved.

Active management is also required for Grassland remnants. Few Northern Plains Grassland remnants are large enough for natural processes to control biomass levels and composition and maintain the viability of the ecological community without active intervention by land managers. Research has indicated that a lack of active management of even small areas leads to decline in species richness.

The opportunity

Today, there is still great potential to conserve the remaining grassland areas and create a landscape-scale network of protected land capable of stimulating ecosystem recovery and resilience.

Our knowledge of the distribution of remnant and high quality grasslands is extremely high compared to other vegetation communities, such as the Victorian Volcanic Plains Grasslands. And our understanding of the ecosystem processes within these communities enables us to undertake specific actions to conserve this living landscape.

The acquisition of the grassland section of Terrick Terrick National Park in 1999 and subsequent strategic acquisitions by the Department of Sustainability and Environment (DSE) and Trust for Nature (TfN) (supported by the National Reserve System program), the signing of conservation covenants, short-term habitat management agreements and the establishment of a Conservation Management Network provides a strong foundation on which to build this functioning connected landscape.

Conservation of the Northern Plains Grasslands

Perhaps the first significant efforts at conserving the Northern Plains Grasslands date from the Land Conservation Council's (LCC) regional reviews during the 1970's and 1980's. A handful of small parcels of public land in water and stock reserves (such as Yassom Swamp) were recognised as being ecologically significant and were converted into conservation reserves. However, other areas of public land such as cemeteries, roadsides and railway reserves were similarly recognised but have proven much harder to protect.

The LCC reviews also recognised that grassy ecosystems could only be adequately protected by incorporating remnants on private land, where the largest remnant grasslands persisted. Without these linkages, large areas of grassland would be lost.

Since these reviews, on the Patho Plains alone we have lost more grassland areas than have been reserved, with more than 30% of the grasslands existing at that time having since been cleared.

Figure 24. There are three species of rare Sun-moths on the Patho Plains: Golden Sun-moth, Striated Sun-moth and Pale Sun-moth. Pictured here is the Golden Sun-moth.

Potential grassland habitat exists through most of the Patho and Avoca Plains. Further survey work is required to determine the presence of these rare species of sun-moths.

PHOTO: Nathan Wong



Efforts to conserve the remaining grasslands have focused on land acquisition for public reserves; awareness, incentives and regulations to encourage protection of grasslands on private landholdings; and increasing our scientific understanding of grasslands ecology.

Victorian Flora and Fauna Guarantee Act

In 2003 the entire Northern Plains Grasslands Community was listed under the *Victorian Flora and Fauna Guarantee Act 1988*, as a threatened ecosystem. Similarly, many grassland plant and animal species were also listed individually. This listing provides absolute protection for the grasslands on all public lands (see Appendix B). However, this has thus far failed to protect the many roadsides, rail reserves, cemeteries, water reserves and other miscellaneous Crown Land that support significant, often isolated, grassland refuges.

Currently the Northern Plains Grasslands Community has been nominated for listing under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999*.

National Reserve System

The National Reserve System (NRS) is Australia's network of protected areas, conserving examples of our natural landscapes and native plants and animals for future generations. Based on a scientific framework, the NRS is the nation's natural safety net against our biggest environmental challenges.

The National Reserve System incorporates protected areas administered by public and private agencies that meet criteria of ecological quality and size. This includes reserves and patches managed by Parks Victoria and Trust for Nature, and many Crown and municipal reserves. Privately held land covered by Trust for Nature covenants are also included. Unused and disused roads may be included, but as a rule roadsides are not included.

In 1999, the National Reserve System set a long-term objective for the Riverina bioregion of reserving 10–15% of grassy ecosystems in the Protected Area Network.

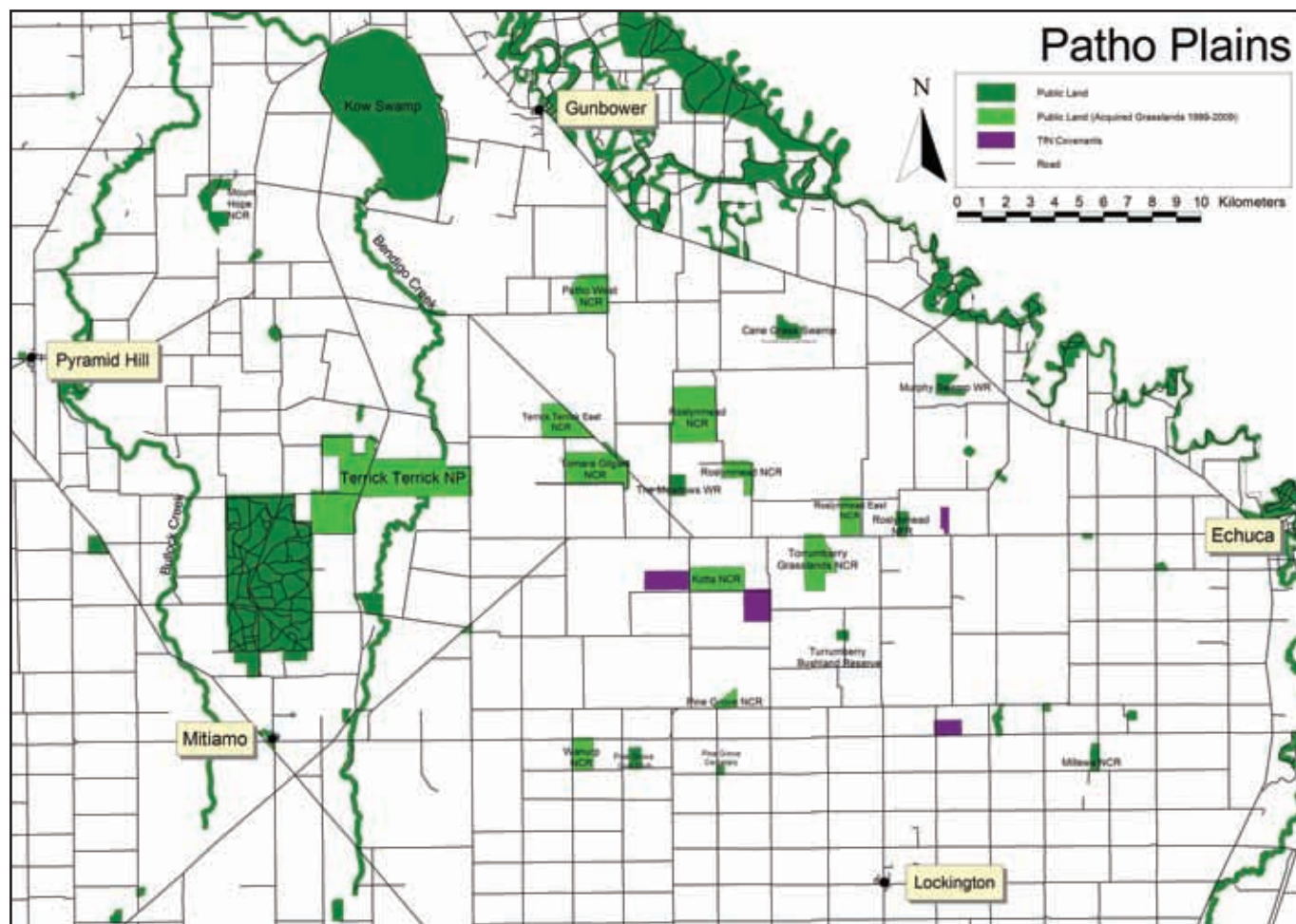
In 1999, the highly significant 1,277 ha 'Davies Property' was incorporated into the new Terrick Terrick National Park. This was followed by further land purchases funded by the Victorian Government and the Federal National Reserve System (NRS) Program, reserving 14 properties, totalling 5,131 ha. Through philanthropic donations and federal government funding, Trust for Nature has added eight properties to the National Reserve System, totalling 4,194 ha of grasslands.

Further recognition of the significance of Northern Plains Grasslands and the growing network of recently acquired reserves was provided by the Victorian Environmental Assessment Council (VEAC) River Red Gum Forests Investigation in 2007. VEAC's final proposal for public land in the region recommended an expanded Terrick Terrick National Park incorporating ten of the recently purchased grassland reserves and a series of smaller nature conservation reserves on public land currently used for other purposes (VEAC 2007). In the Northern Plains, the National Reserve System now totals 8,500ha of grassland (maps 6 and 7).

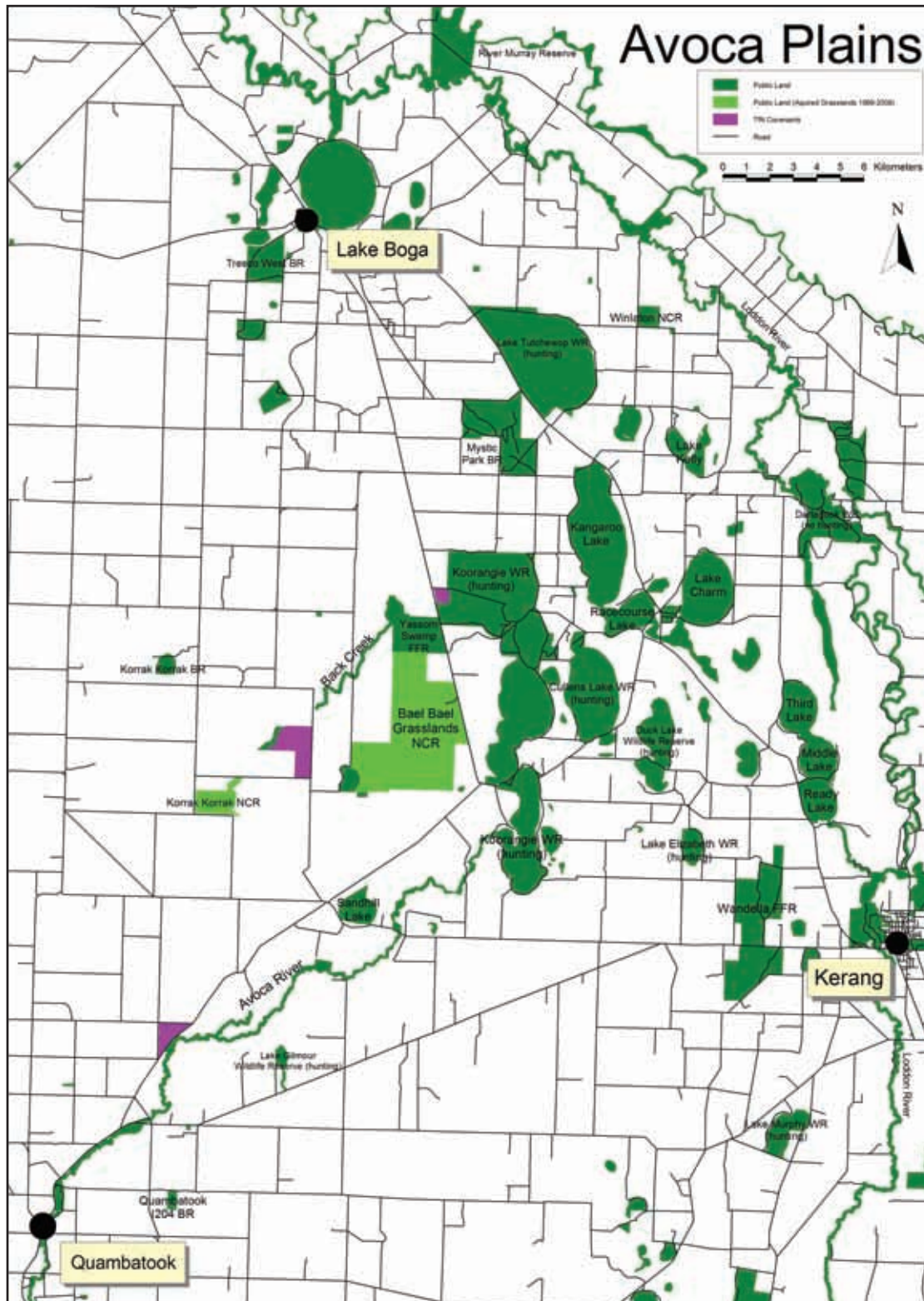
Trust for Nature covenants

The land acquisition program for addition to the National Reserve System is complemented by Trust for Nature's covenanting program, which provides permanent protection to habitat on private land through the registration of covenants on property title. Covenants are recognised as a permanent form of protection that contribute to the National Reserve System and provide an important, flexible option for maintaining and managing native habitat on private land for conservation.

Trust for Nature currently administers 13 conservation covenants covering over 648 ha of Plains Grassland and Plains Grassy Woodland on private land on the Northern Plains. These areas contain a range of nationally and state listed species and have significant conservation values, including their role as linkages between Crown land reserves or buffers to Crown land reserves.



Map 6: The National Reserve System on the Patho Plains, showing Public Land, Public Land Acquisitions of native grassland, and Trust for Nature covenanted native grassland areas. Source: Department of Sustainability and Environment, 2010.



Map 7: The National Reserve System on the Avoca Plains, showing Public Land, Public Land Acquisitions of native grassland, and Trust for Nature covenanted native grassland areas. Source: Department of Sustainability and Environment, 2010.

Community awareness

Incorporating grassland reserves into Terrick Terrick National Park will raise the profile of Terrick Terrick and the Northern Plains Grasslands and attract more interest and resources for improved conservation outcomes. The Friends of Terrick Terrick group has already begun to focus attention on these grassland additions.

After early attempts to establish a network of interested landholders in the region, the Northern Plains Conservation Management Network (CMN) was formalised in 2005. The Northern Plains CMN aims to facilitate effective conservation on private land by creating strong linkages between private and public land managers. With 150 members on the mailing list, activities include guest speakers, chemical-user courses, field days, coordinated landscape scale fox baiting programs, and flora and fauna surveys of properties. Supporting the CMN is an important element of DSE's and TfN's efforts.

The challenge for the Northern Plains CMN is to shift the community's focus beyond simply conserving local patches of woodlands and birds, and build an awareness of the values of grasslands and their need for conservation.

In a recent concerted attempt to raise awareness amongst landowners, DSE and Local Governments have sent letters to landholders advising of the importance of the Northern Plains Grasslands Community ecosystem, and of their legal responsibilities to ensure these ecosystems are not inadvertently destroyed. BushTender management agreements, and the Department's ongoing interest in land purchase were also highlighted.

At every opportunity, DSE and TfN field staff actively engage landholders in discussion of the values of grassland ecosystems, and the responsibilities and opportunities available to protect remnant areas.

Market based incentives

Market based incentive policies from the State Government aim to overcome the economic costs of committing private land to conservation programs, for both the individual primary producer and the local economy.

BushTender is an auction-based approach to improve management of native vegetation on private land. Landholders competitively tender for contracts to improve their native vegetation. Successful bidders – those that offer the best value for money – receive periodic payments for their services under management agreements with the Victorian Government.

Since 2007, three rounds of BushTender targeting Northern Plains Grasslands have committed \$4.3 million to landholders for voluntary Management Agreements over 9,230 ha of native vegetation, predominately, though not exclusively, grasslands. Of this area, 772 ha are secured under on-title permanent protection agreements (this total includes 545 ha of existing voluntary Trust for Nature conservation covenants). The remaining 8,450 ha are secured under *temporary* agreements for five years. Over five years, landholders will receive annual payments as they meet their BushTender commitments and management actions.

A related program, BushBroker, enables vegetation to be cleared subject to the purchase of offsets (native vegetation credits) on a different property. Such offsets must produce a gain in the quantity and/or quality of native vegetation protected, of a similar vegetation type to that being cleared. Offsets are subject to a secure and ongoing agreement.

To date, there has been little demand for purchasing offsets in the Northern Plains Grasslands. However, demand for offsets will likely increase in the region as on-going development of regional centres such as Bendigo and Echuca create a demand for vegetation clearance.

Clearing regulations

Retaining native vegetation is a priority in Victoria. Native vegetation is essential for a healthy environment, including the continued survival of native animals, control of dryland salinity and the protection of water quality. All native vegetation is valuable. However, some ecosystems are recognised as more valuable than others, having been cleared to the point where very little remains, and associated dependant animals are threatened.

Although the emphasis has been on voluntary, incentive and market-based conservation programs, including acquisition, there are also statutory clearing restrictions under Victoria's Planning and Environment Act and Victoria's Native Vegetation Management Framework (the 'framework').

Under these regulations an application is required to remove native grasslands. These applications are assessed according to the 'avoid – minimise – offset' principles of the framework. A key component of the assessment of these applications is establishing the 'conservation significance' of the vegetation proposed for removal. Increased emphasis is placed on the avoidance of removing vegetation in the very high and high conservation significance categories. The framework applies across all land tenures and land uses.

Projects are underway to embed detailed mapping overlays of known grassland remnants into local shire planning schemes. Thus, land purchasers are aware of any obligations. By combining these overlays with due diligence assessments in planning submissions, local government will be able to ensure land management decisions satisfy the statutory requirement to "avoid, minimise and offset" vegetation clearance (DSE 2002).

Scientific knowledge

Our knowledge of the location, composition, condition and significance of remnant Northern Plains Grasslands, though still limited, continues to grow. Remote sensing combined with intensive field survey has produced detailed maps of all known remnants. This information will greatly assist future monitoring, research, strategic acquisition, incentive programs and statutory planning.

DSE Threatened Species staff have implemented Action Statements and National Recovery Plans for a range of threatened species and ecological communities, including Spiny Rice-flower, Red Swainson-pea, Turnip Copperburr, Chariot Wheels, Plains-wanderer and Hooded Scaly-foot. These programs have improved our understanding of the distribution and ecology of these species, resulting in many important conservation measures such as strategic land acquisition, taxonomic clarifications, fencing and sign posting, new translocated or re-introduced populations and community awareness raising.



Figure 25. Field days on the Plains are invaluable for sharing knowledge and experiences of the values of grassland ecosystems, and their management needs.

PHOTO: Deanna Marshall

3 Conservation Values and Threats

Strategic planning – the adaptive framework approach

Adaptive planning recognises that our initial management decisions are made before we have a detailed understanding of how natural systems will respond to our actions. Although our understanding of ecological processes is incomplete, we implement actions, monitor the results, and adapt our strategies and actions as required. Continually, we are building our knowledge of how Northern Plains Grassland ecosystems function, and how they can best be managed.

The adaptive framework approach used in developing this Strategic Plan involves six key steps:

1. Identify focal values. (see Chapter 3)
Focal values are the species, communities, or processes within the natural ecosystem with the greatest strategic and functional significance.
2. Identify critical threats to these values, including threatening processes. (see Chapter 3)
3. Develop Strategies to address threats and to recover values already degraded. (see Chapter 4)
4. Plan and implement Actions to deliver the Strategies. (see Chapter 4)
5. Monitor outputs – the tangible things we have done e.g. reduction in fox numbers. This will measure the effectiveness of our actions.
6. Monitor and evaluate outcomes – the ecological improvements we have made e.g. increase in populations of threatened species. This will measure our success or performance in addressing threats and recovering focal values.

Monitoring and evaluation provide feedback that allows us to either maintain a particular path, if actions are achieving our goals, or to go back and adjust strategies or actions to steer management in the desired direction.

This Strategic Plan develops Steps 1, 2 and 3, and begins Step 4 by identifying the Actions to deliver the Strategies (chapters 3 and 4). Steps 4, 5 and 6 are developed further by an ongoing Operational Plan. This is outlined in Chapter 5. The Operational Plan is not included in this Strategic Plan as it will be adjusted each year in line with adaptive planning.

The adaptive planning framework

For strategic and operational planning, the Department of Sustainability and Environment uses program logic to achieve defined ecological outcomes. This approach is similar to the adaptive learning cycle proposed by the International Union for the Conservation of Nature (IUCN) World Commission on Protected Areas (WCPA) framework for evaluating effectiveness of actions (Hockings *et al.* 2006).

Adaptive planning has a number of benefits. Firstly, it improves the effectiveness of planning and investment in conservation projects or actions by identifying the links between all steps. For example, when we make adaptive changes to our Actions, what will be the changes in the outcomes? Secondly, it increases the transparency of the investment strategies for reporting, auditing and accountability. Finally, it helps build a broad and comprehensive conservation program that strategically identifies and fills key knowledge gaps and deficiencies.

See *Appendix A: Strategic Planning – the Adaptive Framework*, for further information.

Identifying focal values

Focal values are the important species, communities, or processes within the natural ecosystem. Focal values are not the only conservation values within a system. But they are those values with the greatest significance, or that play the greatest role in the functioning of the ecosystem.

For practical purposes, we primarily focus our conservation efforts on the focal values. Because these values are at the heart of the ecosystem, non-focal species will benefit from any ecological improvements. Focal values also provide our Indicators – indicators of both ecosystem condition, and of the success of our management actions.

The list of focal values (Table 1) was developed by the Northern Plains Grasslands Technical Advisory Group (TAG) – a collective of grassland experts from the public, private, academic and conservation sectors. This list of focal values is a starting point for our management planning. As we learn more about the grasslands of the Northern Plains we will adjust and refine the list.

The list of focal values have been derived from the following categories: National Reserve System; threatened species and communities; species rich and other least modified remnants patches and refugia; source areas (wet grasslands, wetlands and adjoining Lignum / Blackbox drainage lines and Red Gum swamps); and functionally significant species (including raptors and predators).

Table 1: Focal Values – Northern Plains

1.	Species-rich and other least modified remnant patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grasslands – FFG)
2.	Plains Grassland listed species
2.1	Red Swainson-pea (FFG, EPBC)
2.2	Spiny Rice-flower (FFG, EPBC)
3.	General listed species
3.1	Plains-wanderer (FFG, EPBC)
3.2	Chariot Wheels (FFG, EPBC)
3.3	Golden Sun-moth (FFG, EPBC)
4.	Species significant to ecological function
4.1	Hooded Scaly-foot (Reptile, FFG)
4.2	Fat-tailed Dunnart (Mammal)
4.3	Brown Falcon (Bird – raptor/predator)
5.	Ephemeral treeless Lignum/Goosefoot and Canegrass swamps and drainage lines and swamps dominated by Black Box and Red Gum (Lignum Swampy Woodland EVC)
6.	Plains Grassy Woodland EVC

Notes:

- 1. The entire Northern Plains Grassland Community, and thus all its component EVCs, is listed under the FFG.
- 2. Plains Grassy Woodland and Lignum Swampy Woodland are also included as focal values. These often exist in a complex soil-driven mosaic with grasslands, with critical ecological interactions.

EVC – Ecological Vegetation Class

FFG, EPBC – denotes species or community is listed under:

- EPBC – Australian Governments *Environment Protection and Biodiversity Conservation Act 1999*
- FFG – Victorian Governments *Flora and Fauna Guarantee Act 1988*

Identifying threats and threatening processes

Grasslands – despite being listed under the Victorian Flora and Fauna Guarantee Act and protected under the state’s planning framework – are still amongst our most actively threatened ecological communities. Key threats and threatening processes are:

1. Cultivation
2. Inappropriate grazing management
3. Habitat fragmentation
4. Weed invasion
5. Feral predators
6. Chemical, biocide and fertiliser application
7. Inappropriate tree planting
8. Deficiencies in information and awareness in the community
9. Knowledge gaps

1. Cultivation

Cropping is one of the main land uses that has led to a loss of grassland habitat, mostly occurring during this century. Cultivation for exotic pastures and cereal crops destroys native plants, habitat, and soil structure, thereby dramatically increasing weed presence and diversity, increasing soil nutrients and reducing fauna diversity. Repeated cultivation destroys the values of the grassland and its associated species permanently.

Land purchase and reservation, legislative action and management agreements have helped reduce the destruction of grasslands, with varying levels of effectiveness. Privately held grasslands are protected under Victoria’s planning framework, and all clearing must be approved by local government in consultation with the Department of Sustainability and Environment.

Between 1998 and 2008, 5,050 ha of privately owned grassland remnants on the Patho Plains alone – a vastly greater area than was added to the Protected Area Network during the same period – have been lost through a shift from dryland grazing to cultivation and cropping (Marshall & Fitzsimons 2008). It is likely that a similar area of grasslands has been lost on the Avoca Plains. This clearing has occurred without approval.

This destruction, if left unchecked, will further fragment the ecosystem. Some cultivated sites can recover, such as those cultivated only once, or many decades ago. But mostly, recovery following cultivation is only ever partial, with a number of species only ever found in areas never cultivated (Wong *et al.* 2010). Across the entire Northern Plains Grassland region, it is estimated that less than 15,000 ha remains in a pre-European least modified condition. Of this, less than 50% is currently secured in perpetuity.



Figure 26. Loss of remnant Northern Plains Grasslands continues, despite being listed as a high priority for retention under Victoria’s Native Vegetation Management Framework.

Grasslands are protected under the state’s planning framework, and all clearing must be approved by the Shire and the Department of Sustainability and Environment.

The native grassland vegetation on this site was cleared without a permit.

PHOTO: DSE 2007

2. Inappropriate grazing management (particularly during drought)

In parts of the Northern Plains (the Patho Plains), cropping and pasture improvement dominate the landscape. In other areas, particularly in the north (Avoca Plains) where rainfall is less reliable, native-pasture based pastoralism is more common.

The impacts of grazing vary with the management regime. For example, set stocking or year-round grazing has a significantly different impact than turning dairy cattle out for the winter months.

Grazing has long been present throughout the landscape. Most remaining sites on private land are significantly modified by a long history of grazing and differ greatly from their original composition. Grazing radically transforms the function and structure of the grassland ecosystem through the loss of palatable species including woody shrubs, soil loss and ecosystem fragmentation.

Under a grazing regime, the most palatable species are the most impacted. The long-term goal of conservation management is to restore the ecosystem by increasing the biodiversity of these most impacted species. Grazing can be used as a conservation management tool. But published guidelines for this have largely focused on the private pastoral sector (e.g. Plains-wanderer Habitat Management Guide, NPWS 2002). Here, grazing can be used to maintain heavily modified grasslands, incorporating conservation outcomes alongside pastoral productivity, by reducing the impact of exotic grasses and the cover of indigenous tussock grasses following good rains, especially on grey soils.

Best practice grazing management of conservation reserves – optimising conservation outcomes rather than productivity – is less well understood. As well as overgrazing, undergrazing can be a problem, allowing biomass to accumulate to a point where inter-tussock spaces are crowded.

When the first private grassland remnants were purchased for conservation reserves, stock grazing was continued as an interim management tool. Further research was strongly recommended to determine optimal conservation systems that may or may not involve stock grazing in the long-term. Over a decade on, the need for this research remains a priority.

3. Habitat fragmentation

Maintaining and creating as much quality grassland habitat as possible is a critical conservation goal. But the spatial configuration and location of habitat is also important.

The design of the Protected Area Network must consider the requirements of mobile and dispersive fauna. Connected habitat areas are critical for species such as the Hooded Scaly-foot lizard, for whom dispersal into new habitat is only possible where it is directly connected to existing habitat. Other species are also known to be moving on various spatial and temporal scales in response to climatic and seasonal conditions. Movements may be linked to breeding, dispersal or seeking food in isolated refugia during drought conditions.

4. Weed invasion

A century of intensive land management has seen the spread of numerous exotic plants – from tiny annuals and bryophytes to large trees – sourced deliberately or inadvertently from most continents of the globe.

The dominant weeds however, are of a Mediterranean temperate origin. Annual or short lived grasses and forbs adapted to soil disturbance and readily spread by management practices such as cropping are especially abundant and dominant. These species are so well adapted to this climate that they have pervaded the entire landscape and aggressively out compete most indigenous species in most locations.

There are a number of woody weeds present in the region, but only Boxthorn is a major weedy element in the landscape.

5. Feral predators

The devastating impact of foxes, cats, dogs and other feral predators on the Australian biota and landscapes has been well documented. The Northern Plains of Victoria are no exception. Feral predation has played a significant role in the extinction of many species, both locally and absolutely. All medium sized mammals have disappeared, including the White-footed Rabbit-rat, the Pig-footed Bandicoot and the Lesser Stick-nest Rat (all extinct); and the Rufous Bettong, Tasmanian Bettong, the Plains Mouse, and Eastern Quoll (all locally extinct).

One of the few remaining indigenous mammals in the region, the Fat-tailed Dunnart, has fared better presumably because of its smaller size – better able to utilise cover from predators in gilgai cracks, logs and rocks – although there are real concerns of decline in more recent times (Lunt *et al.* 1998). Existing threatened species such as Hooded Scaly-foot, Striped Legless-lizard and Plains-wanderer are also known to be threatened by foxes and cats but have persisted – just, presumably because of their cryptic markings and behaviours.

Foxes and cats are known predators of a number of significant grassland species and continue to be recognised as major threatening processes (Baker-Gabb 2002, Robertson 1999).

6. Chemical, biocide and fertiliser application

The broadscale application of chemicals has disastrous impacts on the flora and fauna of native grasslands. Many native herb species are not able to compete in high nutrient environments. Fertiliser additions create denser grasslands and vigorous weed growth, eliminating native flora and fauna, either temporarily or permanently.

Aerial spraying of pesticides (fenitrothion, fipronil) onto the Australian plague locust (*Chortoicetes terminifera*) hoppers occurs periodically over a large portion of the native grasslands. Metarhizium, a parasitic fungus that grows naturally in soils throughout the world, causing disease in various insects, is also used in the control of plague locust (under the commercial name of Green Guard).

There is little Australian research on the impacts of these insecticides and biocides on non-target species in the native grasslands of south-eastern Australia. Impacts can be direct or secondary. These insecticides and biocides kill many invertebrates, therefore removing a vital food source for the survival and breeding success of grassland fauna, including the nationally endangered Plains-wanderer.

Spraying directly affects the many species of native grasshoppers which occur naturally in the grasslands providing a valuable food source for many fauna species. We have a very poor knowledge of the conservation status, distribution and ecology of some of these native grasshoppers, such as the Grassland Froghopper (*Perelytrana rana*), a large, flightless grasshopper only recorded three times in the grasslands of Victoria.

Other environmental impacts associated with the use of these insecticides include chemical residues in water and in aquatic organisms, and effects on non-target organisms, both invertebrate and vertebrate.

Figure 27. The recent discovery of the Grassland Froghopper (*Perelytrana rana*) in the Avoca Plains was the third record of this species in Victoria.

The Froghopper was not known to occur in Victoria until first identified in a native grassland reserve near Mitiamo in 2004.

More information on Grassland Froghopper's distribution, threats and ecology is required before we can assess its threatened status.

PHOTO: Ben Thomas.



7. Inappropriate tree planting

Inappropriate tree planting can be a major threat to grassland remnants. Seemingly vacant roadsides and miscellaneous public reserves scattered throughout agricultural landscapes often harbour valuable grassland remnants.

These grassland remnants can be inadvertently damaged by tree planting projects. Generally, there is a lack of understanding that these valuable treeless ecosystems are an integral part of the landscape.

While planting of trees may not significantly damage grassland remnants, site preparation causes significant impacts. Disturbance such as cultivation, deep ripping and weed control results in habitat destruction, weed invasion and soil erosion that can be expensive – even impossible – to repair.

The natural distribution of vegetation types, ‘woodlands’, ‘treeless plains’ and ‘drainage lines’ are strongly linked to soils and associated parent materials and geomorphic processes. These patterns are not random.



Figure 28. Inappropriate tree planting – Towaninny South Flora Reserve

Site preparation for tree planting can cause significant impacts. Cultivation, deep ripping and weed control can result in habitat destruction, weed invasion and soil erosion.

Altering the vegetation structure can also have unintended consequences. For example, Plains-wanderers will not inhabit grassland areas within a certain radius of trees because of the threat from birds of prey that utilise treed areas.

PHOTO: DSE 2009

8. Deficiencies in information and awareness in the community

The Northern Plains are predominantly agrarian communities. Historically, much of the prosperity and culture of the community has been derived from agriculture – particularly pastoralism, cereal cropping and irrigation. Today, the vast majority of the region remains in private ownership and supports various primary industries. Therefore, successful biodiversity conservation depends on the support and cooperation of the farming community.

The growing community concern for conservation of woodlands is not shared for grasslands. The Department of Sustainability and Environment and Trust for Nature field staff are actively involved with landholders regarding their remnant grasslands, building awareness and understanding of the values, responsibilities and opportunities available to protect remnant areas.

The importance of including remnant vegetation in local shire planning overlays will assist awareness raising within Local Government and local communities. Since these overlays are attached to land titles, the ecological values, and landholders' responsibilities, would be apparent to new purchasers in the region.

9. Knowledge gaps

Considerable research has been undertaken in the region over the last decade. But there are still significant gaps in our understanding of the functional ecology of grasslands, especially at the landscape-scale, and how we might properly assess the progress and success of our conservation investments.

As we develop the Protected Areas Network, these areas require continued research and monitoring to ensure critical long-term conservation outcomes are met effectively and efficiently.

Assessing the Level of Threat

All of the threats described are impacting on the ecological values of the Northern Plains Grasslands. These impacts operate under different mechanisms and over different spatial and temporal scales.

Relationships between threats and values are complex, and there is often no neat, one-to-one relationship. For example, overgrazing can simplify vegetation structure, thus putting Plains-wanderers at risk. Deficiencies in ecological knowledge introduce considerable uncertainty.

Table 2 is a matrix of inter-relationships between focal values and threats, showing the level of threat to the focal values. The level of threat that a particular threat or threatening process poses to a focal value is based on the probability of the threat occurring, and the impact the threat would incur.

This table informs the Operational Planning by identifying the high level threats that require the most immediate action (see chapter 5).

Table 2: Matrix of focal values and threats, showing level of threat to the focal value

Focal Values \ Threats		Threats								
		1. Cultivation	2. Inappropriate Grazing Management	3. Habitat Fragmentation	4. Weed Invasion	5. Feral Predators	6. Chemical, Biocide & Fertiliser Application	7. Inappropriate Tree Planting	8. Deficiencies in Information & Awareness	9. Knowledge Gaps
Northern Plains Grassland Community (FFG)										
1	<i>Species-rich and other least modified remnant patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs</i>	High	Med	Med	High	–	High	High	High	Med
2	<i>Plains Grassland listed species</i>									
	Red Swainson-pea (FFG, EPBC)	High	Med	High	High	–	High	High	High	Med
	Spiny Rice-flower (FFG, EPBC)	High	Med	High	High	–	High	High	High	Med
3	<i>General listed species</i>									
	Plains-wanderer (FFG, EPBC)	High	High	Med	Med	High	High	High	Med	Low
	Golden Sun-moth (FFG, EPBC)	High	Med	Low	Med	–	High	Med	Med	Med
	Chariot Wheels (FFG, EPBC)	Med	Med	Low	High	–	High	Low	High	Med
4	<i>Species significant to ecological function</i>									
	Hooded Scaly-foot (FFG)	High	Med	High	Med	High	High	Med	Med	Med
	Fat-tailed Dunnart	Med	Med	Low	Med	High	High	Med	Med	Med
	Brown Falcon	High	High	Med	Med	–	Med	Med	High	Med
5	<i>Ephemeral treeless Lignum/Goosefoot and Canegrass swamps and drainage lines and swamps dominated by Black Box and Red Gum (Lignum Swampy Woodland EVC)</i>	Low	High	Low	Med	–	High	Med	Med	Med
6	<i>Plains Grassy Woodland EVC</i>	Low	High	Med	High	–	High	Low	Med	Med

High, Med, Low – High, medium and low level of threat to the focal values

EVC – Ecological Vegetation Class

FFG, EPBC – denotes species or community is listed under:

EPBC – Australian *Environment Protection and Biodiversity Conservation Act 1999*

FFG – Victorian *Flora and Fauna Guarantee Act 1988*

4 The Northern Plains Grasslands Strategic Plan

Key Strategies for conserving our Grasslands

The nine threats and threatening processes (Chapter 3) were developed into Key Strategies by the Northern Plains Grasslands Technical Advisory Group. As well as urgently addressing these immediate threats to the grasslands, the Strategic Plan should also begin restoring degraded landscapes. Thus, a tenth Strategy was developed.

1. Preventing the destruction of remnants

Manage to:

- i) prevent the further cultivation and destruction of all high quality remnant grasslands across all land tenures
- ii) minimise the impact of cultivation and destruction on other remnants

2. Preventing inappropriate grazing management (particularly during drought)

Manage to:

- i) prevent the overgrazing or undergrazing of high quality remnant grasslands where grazing is used as a conservation management tool on reserves
- ii) minimise the harm of overgrazing or undergrazing on private land

3. Maintaining an ecologically connected, functioning landscape

Manage to prevent further fragmentation and to increase the extent and quality of habitat and landscape connectivity through the strategic protection of high quality remnant grasslands

4. Eradicating key environmental weeds

Manage to:

- i) eradicate all key environmental and noxious weeds from all high quality remnants
- ii) minimise the harm of all other environmental weeds

5. Controlling pest animals

Manage to minimise the harm of feral animals especially predators (cats, foxes and dogs) by establishing and maintaining strategic, coordinated, cooperative and long-term control programs

6. Minimising chemical, biocide and fertiliser application

Manage to:

- i) reduce the harm of chemical and fertiliser application to remnant grasslands
- ii) minimise application of biocides to remnant grasslands

7. Enhancing and revegetating grassland remnants

Manage to:

- i) prevent tree planting in grassland remnants
- ii) encourage indigenous revegetation and ecosystem restoration, where appropriate

8. Community education, engagement and extension

Manage to ensure all information relevant to the conservation of Northern Plains Grasslands is readily available and understood by the local community, especially landholders and agribusiness managers

9. Research, monitoring and management planning

Manage to establish an on-going research, monitoring and management planning program to improve knowledge of the ecology of Northern Plains Grasslands, and the success of conservation actions

10. Long-term ecological restoration

Manage for long-term ecological restoration through long-term strategies to restore and improve ecosystem condition or function

Developing Actions to deliver the Strategies

A one day Technical Workshop involving over 40 Northern Plains Grasslands technical specialists and stakeholders developed a list of issues and knowledge gaps facing the Northern Plains Grasslands. These have been developed into a set of management actions by the Northern Plains Grasslands Technical Advisory Group. Actions applying to each Strategy are listed in Table 3. Agencies – both government and non-government – in a position to implement these actions are listed.

Table 3: Management Actions within the Key Strategies

Strategy	Management Actions	Agency Responsible
1. Manage to: • prevent the further cultivation and destruction of all high quality remnant grasslands across all land tenures • minimise the impact of cultivation and destruction on other remnants	Strategically acquire the most significant remnants, especially those that have never been cultivated.	DSE, TfN
	Provide financial assistance to landholders to reduce threats to Northern Plains Grasslands on their property.	DSE, TfN
	Continue to offer conservation covenants and Section 69 Agreements to landholders with significant remnants.	DSE, TfN
	Market Based Incentive Schemes for grasslands to remain a state priority.	DSE
	Prepare and implement Planning Scheme Overlays that protect the current extent of Northern Plains Grassland Ecological Vegetation Classes.	DPCD, DSE, Local Government
2. Manage to: • prevent the overgrazing or undergrazing of high quality remnant grasslands where grazing is used as a conservation management tool on reserves • minimise the harm of overgrazing or undergrazing on private land	Develop protocols and Expressions of Interest for tendering out grazing on the existing Protected Area Network.	DSE, NPG TAG, PV, TfN
	Tender out grassland grazing to give all local graziers an opportunity to work towards grassland conservation within the Protected Area Network – having them involved at the local level.	DSE, NPG TAG, PV, TfN
	Develop grassland vegetation monitoring guidelines.	DSE, NPG TAG, PV, TfN
3. Manage to: • prevent further fragmentation and to increase the extent and quality of habitat and landscape connectivity through the strategic protection of high quality remnant grasslands	Identify the priority geographical areas for the Protected Area Network.	DSE, TfN
	Continue to identify private properties for purchase that can contribute to the Protected Area Network.	DSE, PV, TfN
	Add sites to the Protected Area Network in priority landscapes. Target properties for acquisition where they provide high priority linkages.	DEWHA, DSE, PV, TfN
	Create a multi-tenure network of conservation lands across grassland landscapes.	DSE, NP CMN, PV, TfN, Local Government
4. Manage to: • eradicate all key environmental and noxious weeds from all high quality remnants • minimise the harm of all other environmental weeds	Prioritise pest plant species and potential future weed threats ('sleepers' weed species').	CMA, DPI, DSE, PV, TfN, Local Government, Landholders
	Prioritise pest plant sites for control.	DPI, NP CMN, PV, TfN, Local Government, Landholders
	Develop and implement a control program and 'Replacement Species Protocol'.	DPI, NP CMN, PV, TfN, Local Government, Landholders
5. Manage to: • minimise the harm of feral animals especially predators (cats, foxes and dogs) by establishing and maintaining strategic, coordinated, cooperative and long-term control programs	Trial targeted, strategic fox control programs in conjunction with community groups and landholders.	DSE, NP CMN, PV, TfN, Landholders
	Prioritise and control areas affected by rabbits.	DSE, NP CMN, PV, TfN, Landholders
6. Manage to: • minimise the harm of chemical and fertiliser application to remnant grasslands • minimise application of biocides to remnant grasslands	Establish protocols to prevent spraying of Australian Plague Locusts in Plains-wanderer primary habitat.	DSE, TfN, PV, NPG TAG
	Obtain funding for research to establish whether or not the use of control agents for the Australian Plague Locust have a major impact on non-target invertebrate and vertebrate fauna species in remnant Northern Plains Grasslands.	NPG TAG
	Minimise the use of chemicals, biocides and fertilisers on remnant Northern Plains Grasslands.	DSE, TfN, PV

Strategy	Management Actions	Agency Responsible
7. Manage to: • prevent tree planting in grassland remnants • encourage indigenous revegetation and ecosystem restoration, where appropriate	Direct tree planting and understorey enhancement to woodland remnants in the landscape.	DSE, NP CMN, Landcare & Friends Groups
	Trial the restoration of grasslands on private land and parcels already in the Protected Area Network.	DSE, GA, NP CMN, PV, TfN
	Support the development of resources needed to undertake large scale restoration activities.	DSE, GA, TfN, Friends Groups
	Provide fencing, sign posting and targeted community education to help prevent inadvertent damage to grassland remnants by landholders and community groups.	DSE, NP CMN, TfN, Landcare, Local Government
	Provide education within the natural resource management industry, and wherever resources are made available for tree planting.	DSE, NP CMN, TfN, Landcare, Local Government
8. Manage to: • ensure all information relevant to the conservation of Northern Plains Grasslands is readily available and understood by the local community, especially landholders and agri-business managers	Educate landholders and land managers on the values and significance of Northern Plains Grasslands.	CMA, DEWHA, DPI, DSE, NP CMN, PV, TfN, Local Government
	Develop a community education campaign that looks at the stakeholders in detail, their current knowledge, behaviours, attitudes, preferred media, the key messages DSE are delivering, who the messengers are and what media is most appropriate.	CMA, DPI, DSE, NP CMN, PV, TfN, Local Government, Landholders
	Capture the oral history of landholders and document private land management history.	DPI, DSE, NP CMN
9. Manage to: • establish an on-going research, monitoring and management planning program to improve knowledge of the ecology of Northern Plains Grasslands, and the success of conservation actions	Establish a Northern Plains Technical Advisory Group (TAG) consisting of at least four recognised experts in the fields of grassland ecology and research, threatened flora and fauna, conservation management and other relevant fields; members of recognised research organisations; Parks Victoria; and Trust for Nature.	DSE
	Develop, implement and review an Operational Plan to help prioritise on-ground works for the Protected Area Network.	DSE, NP CMN, NPG TAG, PV, TfN
	Advise on landscape scale conservation planning and strategy, including the structure of conservation grazing management systems as is currently practiced by Parks Victoria and Trust For Nature.	NPG TAG
	Implement baseline monitoring for the Protected Area Network.	DSE, TfN, NP CMN, NPG TAG, PV
	Compare the economic value of Land Purchase and management compared to BushTender and conservation covenants over the past decade.	DSE, NPG TAG, PV
	Advise on current directions for conservation and ecological research.	DSE, NPG TAG
	Determine what research is required and prepare research briefs for PhD candidates and other researchers on Northern Plains Grasslands.	DSE, NPG TAG
	Determine the ecological value of lower quality grasslands in the landscape.	NPG TAG
	Determine the relationship between grasslands and adjoining woodlands.	NPG TAG
10. Manage for long-term ecological restoration through long-term strategies to restore and improve ecosystem condition or function	Establish clear ecological outcomes-based goals for NPG ecosystem recovery at the (a) landscape scale and (b) property, reserve or paddock scale, especially for properties in the Protected Area Network.	DSE, PV, TfN
	Identify modified areas that provide significant landscape scale benefits to the Protected Area Network, for future acquisition and restoration.	DSE, TfN
	Develop and implement specific projects on Protected Area Network reserves, based on improving ecological health and function through: • strategic re-introductions of locally rare or extinct species such as palatable shrubs and forbs and even locally extinct fauna, • revegetation (e.g. grassy ground cover research project) and • intensive restoration of key ecological processes (e.g. weed control using targeted chemical control and fire).	CMA, DSE, NP CMN, PV, TfN, Landholders

CMA – Catchment Management Authority

DEWHA – Australian Department of Environment, Water, Heritage and the Arts

DPCD – Department of Planning and Community Development

DPI – Department of Primary Industries

DSE – Department of Sustainability and Environment

GA – Greening Australia

NPG TAG – Northern Plains Grassland Technical Advisory Group

NP CMN – Northern Plains Conservation Management Network

PV – Parks Victoria

TfN – Trust for Nature

Implementing the Actions

Actions fall into two broad categories:

- i) Landscape-level Actions: those to create the environment conducive to protection of remnant grasslands, e.g. policy, administrative decisions and responses.
- ii) Patch-scale Actions: those to address issues in on-ground land management, e.g. practical property, reserve or paddock level management decisions.

Landscape-scale Actions

This Strategic Plan lays out the Strategies and Actions for protecting and enhancing the Northern Plains Grassland Community across northern Victoria. This landscape focus gives us the broad picture, and allows us to target our efforts. Many Actions are designed to create an environment conducive to protecting our remnant grasslands. This includes Actions aimed at enhancing the Protected Area Network (PAN), research activities, and assistance, incentives and controls for privately held grasslands.

DSE will continue to set operational goals for these Actions, measure outputs achieved, and report annually to funding agencies. Within the DSE framework, goals must be spatially and temporally defined to provide tangible decision-support on achieving specific outcomes. For example, where stock grazing is used for vegetation biomass/structure management, how do we decide when to graze or not graze – or alternatively burn – at a particular point in time and/or throughout the coming season? Goals must be SMART – Specific, Measurable, Achievable, Realistic and Time-bound.

On-ground Actions at the patch scale

This landscape-wide focus is appropriate for broad ecological goals. But at the patch level (reserve, paddock, etc), decisions must be made on how to manage grasslands, often on a paddock by paddock basis. Therefore, Actions focusing on practical on-ground land management works are required.

For privately held grasslands, management lies with the landholders. DSE, Parks Victoria and Trust for Nature will continue to support and advise landholders, and disseminate the experience and knowledge gained from public land management and research.

For the Protected Area Network, once patches are secured, or clearing halted, real management is required at the patch level. This is the practical level where land managers can begin to address degradation processes, and implement restoration programs.

Management at this level is the responsibility of the appropriate agency, e.g. Parks Victoria, Trust for Nature, etc. However, to share the expertise and experience of all agencies, and to coordinate monitoring and research, the Northern Plains Grassland Technical Advisory Group is pooling its resources to develop a Northern Plains Grassland Operational Plan. This is outlined in the next chapter.

Implementing Actions on-ground: the Protected Areas Operational Plan

This Strategic Plan focuses on the Northern Plains grasslands as a whole. This landscape-wide focus on broad ecological goals is essential in building a landscape-wide network of interconnected protected grassland areas.

But once reserves or patches are secured, or clearing halted, management is required at the patch level. This is the practical level where land managers can begin to address degradation processes, and implement restoration programs. At this level, decisions must be made on how to manage grasslands, often on a paddock by paddock basis.

However, to share the expertise and experience of all agencies, and to coordinate monitoring and research, the Northern Plains Grassland Technical Advisory Group is pooling its resources to develop an Operational Plan for the entire Protected Area Network of public and private lands in the Northern Plains Grasslands. This Operational Plan will include individual reserve management guidelines and be focused on the management of ecosystems rather than on single species outcomes. The outcomes and best guess management strategies proposed will incorporate local landholder knowledge and observations, and the results from research and monitoring.

The NPG Protected Areas Operational Plan will only focus on grasslands in the Protected Area Network (PAN), and will be an advisory document only. The Plan will assist Parks Victoria, Trust for Nature and other land managers to prioritise on-ground works, and to develop a coordinated system wide monitoring framework.

To ensure the consistent implementation and understanding of these recommendations and monitoring, the Technical Advisory Group will also develop monitoring guidelines that focus on the overall condition of the ecosystem.

The Protected Area Network (PAN)

The Protected Area Network (PAN) includes reserves and patches managed by Parks Victoria and Trust for Nature, and many Crown and municipal reserves. Privately held land covered by Trust for Nature covenants are also included. Unused and disused roads may be included, but as a rule roadsides are not included

The Northern Plains Grasslands Technical Advisory Group

The Northern Plains Grasslands Technical Advisory Group, comprises grassland experts from the public, private, academic and conservation sectors, including representatives of the agencies responsible for managing the various reserves. The TAG was established to advise on landscape scale conservation planning and strategy, including developing the Operational Plan.

The NPG Protected Areas Operational Plan involves four stages:

1. Data Inventory

Compile and review all available background physical data on the Northern Plains Grassland Community. Assess the quality of the data, and identify what useable data we have, and where we need data.

2. Apply the Strategies and Actions at the patch level

For each reserve in the Protected Area Network, outline how the 10 Strategies from the Strategic Plan can be implemented on that reserve. This involves a paddock by paddock approach. For example, advice may be given on how we decide which paddocks should be grazed, when, and under what sort of grazing regime.

3. Monitoring

Outline a Monitoring Program to assess the effectiveness of Actions undertaken at reducing threats and threatening processes and enhancing the focal values. The Monitoring Program will outline priority focal (ecological) values to be monitored, and the methods, criteria and standards to be applied (see text box).

4. Re-evaluate the Actions at the patch or paddock level

The results of monitoring of on-ground activities will be used to adapt and adjust our Strategies and Actions, to ensure our efforts are effective.

Monitoring Program

Establishing an ongoing research, monitoring and management planning program is the key to identifying the outcomes of our conservation efforts, and measuring the effectiveness of our Actions.

Baseline monitoring of all areas in the Protected Area Network is a necessary first step. Research by universities should also be encouraged. Ideally, a percentage of all funding allocated to agencies for incentives, management and planning should be allocated to monitoring the outcomes of this funding input, and to fostering ecological research within the Northern Plains Grasslands.

Monitoring focused on improving ecological values

Strategies may involve practical Actions on-ground – such as fencing off an area to implement different grazing management regimes, and thus increase biodiversity. But our focus must always be on achieving outcomes in terms of the focal (ecological) values at the landscape level. Rather than focus on our *outputs* (e.g. how much fox baiting we have completed), the Operational Plan will focus on the ecological *outcomes* (e.g. how much has biodiversity increased).

This too is where our monitoring must focus. Thus our achievements, measured at the patch level, are accumulated to give a picture of our progress across the entire Northern Plains Grassland Community.

Monitoring and Evaluation – the Adaptive Framework Approach

Evaluation against stated goals is the basis of the adaptive cycle under the adaptive framework (see Appendix A). Initial decisions are made in the absence of adequate information. The required knowledge is gained through trial and error.

The monitoring and evaluation phase allows the conservation manager to either maintain a particular path (if a goal is being achieved, or management is heading towards that goal) or to go back and adjust strategies or actions to steer management in the desired direction.

Furthermore, goals must be spatially and temporally defined so as to provide tangible decision-support. For example, where stock grazing is used for vegetation biomass and structure management, how do we decide when to graze or not graze – or alternatively burn – at a particular point in time or throughout the coming season?

Monitoring must be structured to support this decision making. The monitoring regime must be clear on what is being measured or estimated, how this is implemented, and how to interpret the results. Monitoring results only provide decision-support.

Selecting the appropriate monitoring method is important. There are usually many techniques available – varying in terms of accuracy, precision, objectivity, repeatability, complexity, cost and duration. For the practical adaptive manager, the final choice will come down to a trade-off between accuracy and the overall cost in terms of time, equipment and expertise. Selection of monitoring method should occur only after deciding what is being measured.

The monitoring regime proposed has been developed to provide a balance between level of detail and resources required. Each proposed monitoring activity has been prioritised as essential or optional, based on its level of resources required and the level of information it provides to the decision making process. A further short-term consideration is whether the technique is currently operational, or requires further research and development before being applied.

Resources will not be available to monitor all stated or desired conservation goals. Nor is this necessary or desirable. In some cases, the cost of undertaking a monitoring activity will be prohibitively expensive. In others, broader functional indices can be used to imply that species level values are likely to be in an optimal state. For example, healthy grassland structure on red soils can indicate the likely condition of the Plains-wanderer population.

The proposed monitoring regime (Table 4) comprises 12 essential monitoring activities and six optional activities for each of the focal values. Optional activities are lower priority activities, based on an assessment of cost and utility. If either cost or utility change for a particular activity (e.g. due to new technology or research results), it may be reprioritised. Table 6 provides detailed information on the monitoring regime.

Each monitoring activity is organised against a key goal and criterion (i.e. the principle or standard by which something is judged), associated indicator (i.e. measure of the quality or condition), metric, scale and benchmark. Optional monitoring activities are shown in grey.

Table 4: Proposed monitoring activities

	Focal Value	Monitoring Method	Monitoring Activity	Essential/ Optional
1	1. Species-rich and other least modified remnants patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grassland Community)	Remote sensing	to track the spatio-temporal extent of remnant grasslands throughout the bioregion that are maintained within acceptable/optional limits of biomass dynamics	Essential
2	1. Species-rich and other least modified remnants patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grassland Community)	Patch-based point transect measurements	of key vegetation structural indices (e.g. bare ground and tussock-grasses) in grassland remnants for both operational decision-support (e.g. whether or not to graze in the current season) and reporting in a way that complements the broader remote sensing assessment	Essential
3	1. Species-rich and other least modified remnants patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grassland Community)	Patch-based point transect; Soil surface measurements	of key vegetation structural and soil surface indices in grassland remnants for strategic decision-support (eg. use of stock as a conservation management tool) and reporting	Essential
4	1. Species-rich and other least modified remnants patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grassland Community)	Remote sensing	to map the spatio-temporal extent of grassland remnants never disturbed (by cultivation, fertilisation and the like) or with a very long time since last gross disturbance	Essential
5	1. Species-rich and other least modified remnants patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grassland Community)	Remote sensing	to map the spatio-temporal extent of grassland remnants throughout the bioregion recovering from fertilisation and cultivation	Optional
6	1. Species-rich and other least modified remnants patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grassland Community)	Point transect; Soil surface measurements; Assessment of flora and fauna richness and abundance	to assess the resilience and vulnerability of species and key processes to disturbance events such as drought and (large scale) fire (i.e. time to recovery from pre-disturbance levels) at a landscape scale	Optional
7	1. Species-rich and other least modified remnants patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grassland Community)	Bird surveys – time budgets and diet analysis	for key raptors (Brown Falcons and Kestrels) to assess the ecological condition of higher order trophic groups at a landscape scale	Optional
8	2. Plains Grassland listed species: Red Swainson-pea	Census survey; Mapping habitat extent	to assess the viability and evolutionary potential of Red Swainson-pea across all known sites/populations	Essential
9	2. Plains Grassland listed species: Spiny Rice-flower	Census survey; Mapping habitat extent	to assess the viability and evolutionary potential of Spiny Rice-flower across all known sites/populations in the bioregion	Essential
10	3. General listed species: Plains-wanderer	Fixed transect spotlighting; Mapping habitat extent	to assess the viability and evolutionary potential of Plains-wanderer across all known sites/populations in the bioregion	Essential
11	3. General listed species: Chariot Wheels	Census survey; Mapping habitat extent	to assess the viability and evolutionary potential of Chariot Wheels across all known sites/populations in the bioregion	Essential
12	3. General listed species: Golden Sun-moth	Invertebrate census;	to assess the viability and evolutionary potential of Golden Sun-moth across all known sites/populations in the bioregion	Optional
13	4. Species significant to ecological function: Hooded Scaly-foot	Mapping habitat extent	to assess the viability and evolutionary potential of Hooded Scaly-foot across all known sites/populations in the bioregion	Essential

	Focal Value	Monitoring Method	Monitoring Activity	Essential/ Optional
14	4. Species significant to ecological function: Fat-tailed Dunnart	Pit-fall traps, fixed transects (spot-light) or active searching under introduced cover; Mapping habitat extent	to assess the viability and evolutionary potential of Fat-tailed Dunnart across all known or selected sites/ populations in the bioregion	Optional
15	4. Species significant to ecological function: Brown Falcon	Bird surveys – time budget;	to assess the viability and evolutionary potential of Brown Falcon across all known or selected sites/ populations in the bioregion	Optional
16	5. Ephemeral treeless Lignum/Goosefoot and Canegrass swamps and drainage lines and swamps dominated by Black Box and Red Gum (Lignum Swampy Woodland EVC) 6. Plains Grassy Woodland EVC	Remote sensing	to track the spatio-temporal extent of remnant grassland-associated woody refugia and source areas (e.g. ephemeral treeless Lignum/Goosefoot and Canegrass swamps and drainage lines and swamps dominated by Black Box and Red Gum)	Essential
17	5. Ephemeral treeless Lignum/Goosefoot and Canegrass swamps and drainage lines and swamps dominated by Black Box and Red Gum (Lignum Swampy Woodland EVC) 6. Plains Grassy Woodland EVC	Patch-based point transect; Soil surface measurements	of key vegetation structural and soil surface indices for both operational decision-support and reporting in a way that complements the broader remote sensing assessment	Essential

EVC – Ecological Vegetation Class

Integration of monitoring among agencies

The monitoring program assumes an integrated approach whereby all relevant stakeholders have a responsibility for monitoring and evaluation. It is assumed that these groups or individuals either have an existing program or have resources available that could be integrated into a comprehensive, system wide monitoring framework.

Integration of ecological monitoring requires that the various partners pool resources and strongly collaborate. Current monitoring programs (Table 5) already show considerable alignment with the monitoring activities proposed in this Strategic Plan. DSE, for instance, already engages in significant threatened species monitoring (EPBC and FFG listed) with Australian Government support. Only minor adjustment should be necessary to adequately cover the majority of the threatened species based monitoring activities recommended.

Initially, the overall investment should be capped at current levels, with the focus on improving integration and collaboration of the various agencies existing programs.

Table 5: Summary of key ecological monitoring activities currently undertaken in the Northern Plains Grasslands by various conservation agencies

Species/Value	DSE	Parks Victoria	Trust for Nature	Other
Red Swainson-pea	Implement EPBC Recovery Plan		Implement EPBC Recovery Plan; Pollination ecology research	
Spiny Rice-flower	Implement EPBC Recovery Plan; National Recovery Team; Recent FFG prosecution	Recipients of introduced populations	Negotiating conservation covenants	DEWHA – Recent EPBC Act Enforceable Undertaking
Plains-wanderer	Implement EPBC Recovery Plan; National Recovery Team	Incidental records (spot-lighting); National Recovery Team; Banding program	Implement EPBC Recovery Plan	
Chariot Wheels	Implement EPBC Recovery Plan		Implement EPBC Recovery Plan	
Golden Sun-moth	Implement FFG Action Statement		Implement FFG Action Statement	
Hooded Scaly-foot	Implement FFG Action Statement	Incidental records (spot-lighting), monitoring	Implement FFG Action Statement	
Fat-tailed Dunnart	Incidental records (spot-lighting)	Incidental records (spot-lighting)	Incidental records (spot-lighting)	
Brown Falcon		Incidental records		

EPBC – Australian *Environment Protection and Biodiversity Conservation Act 1999*

FFG – Victorian *Flora and Fauna Guarantee Act 1988*

DSE – Department of Sustainability and Environment

DEWHA – Australian Department of the Environment, Water, Heritage and the Arts

Implementing the monitoring

Each of the proposed monitoring activities requires further planning and structure before operational roll out. Site selection (including patch stratification), baseline values, current values and target values need to be determined, along with the details of the monitoring methods, data sheets, data storage and analysis.

As indicated, some activities will require further research and development and specific projects may need to be funded to facilitate this. Remote sensing is a good example – although considerable work has been undertaken in recent years, some (minimal) investment is likely to be required for operational use.

Roll out of the various activities by the Northern Plains Grassland recovery partners will require training and standardisation to ensure consistency and quality assurance. DSE will endeavour to utilise the Actions for Biodiversity Conservation (ABC) database to facilitate strategic analysis and evaluation work – structuring reporting in a way that simultaneously addresses both the broader and lower-level needs of the various stakeholder partners.

The key strategic shift will be to focus monitoring more explicitly on recovery of the greater Northern Plains Grassland ecosystem. This will require minor methodological adjustments and some gap filling whereby new species are monitored and monitoring of other species possibly scaled back or abandoned. Some of this extra workload could be met by skilled and experienced volunteers, recruited through the community education, engagement and extension targets (Strategy 8).

Standardising key field-based methods – such as the widespread adoption of the point transect method for measuring key vegetation structure indices – would significantly assist integration between groups.

A hierarchical framework of “permanent” monitoring sites should be established:

- **Primary site** – simplest and most widespread method; Visual Structural Assessment methods only.
- **Secondary site** – intermediate complexity and moderate frequency of use; Visual Structural Assessment methods, vegetation structure (point) transects, photopoints.
- **Tertiary site** – most complex and least numerous; Vegetation structure (point) transects, full floristic quadrats, fauna survey methods depending on the groups of species present or being targeted, including: active searching, artificial harbour, standardised bird surveys, census transects, banding and harp nets/bat detectors.

The key elements of the monitoring evaluation framework, including the strategic siting of permanent monitoring sites, will be included in the Northern Plains Grassland Protected Areas Operational Plan and routinely reviewed and revised.



(a) 23 September 2002



(b) 4 October 2003

Figure 29a. b. Spring in Fabians Paddock, Terrick Terrick National Park (a) after a long, dry spell in 2002; and (b) following below average rainfall in 2009. This is one of the highest quality grasslands in the Protected Area Network, and it highlights the problem of the perception of grasslands. After a long, dry spell, it can be very difficult to identify grasslands in good condition, even in spring. However, with expertise, the presence of soil crusts, seeds and vegetation structure can provide key indicators of high quality grasslands.

PHOTOS: **a)** Nicky Bruce **b)** Ben Thomas

Figure 30. Members of the Northern Plains Grassland Operational Group undertaking transect monitoring at Terrick Terrick East Nature Conservation Reserve.

Under the Operational Plan, monitoring will focus on ecological outcomes (e.g. how much has biodiversity increased), rather than on our outputs (e.g. how many fox baits have we laid).

PHOTO: Deanna Marshall

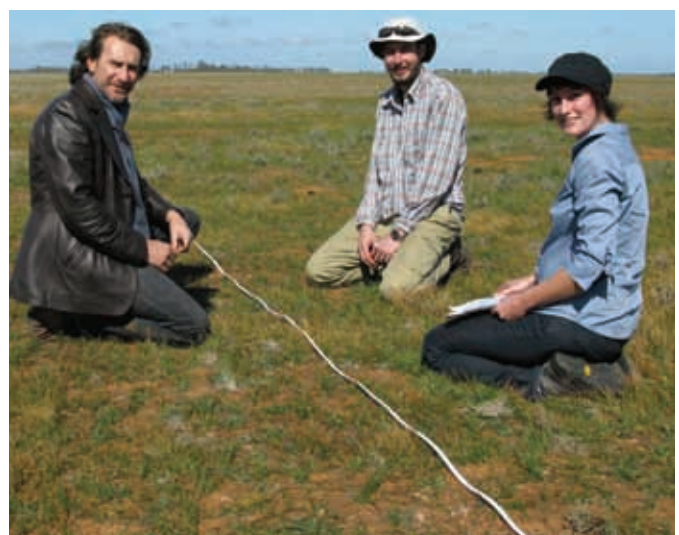


Table 6: Detailed monitoring regime for the Northern Plains Grasslands, showing links to focal values (chapter 3). Further work is required to quantify benchmark and target values, and to select sites.

Focal Value	Goal	Criterion	Indicators	Metric	Scale	Frequency/ Timeframe	Method	Benchmark	Sites	Responsibility
1. Species-rich and other least modified remnants patches of Plains Grassland, Chenopod Grassland and Plains Savannah EVCs (Northern Plains Grassland Community)	Maintain or restore minimal variation in mean biomass at optimal and sub-optimal ecosystem levels	Ecological resource (water, nutrients and energy) conservation	Level and evenness of Primary Productivity/Rain Use Efficiency	Percentage or area of grassland patches with optimal Primary Productivity/Rain Use Efficiency profile and low variance	Landscape	Short (annual/seasonal)	Remote imagery	ARI	Bioregion	DSE and TfN
			Level of soil surface condition indices/Vegetation cover	Percentage bare ground; Percentage cover exotics and natives	Patch; Paddock	Short (annual/seasonal)	Vegetation (point) transects (Tertiary Sites)	Diez and Foreman (1996)	All remnants (especially in Public Area Network (PAN))	DSE, PV, TfN, NP CMN, Landholders, Volunteers
	Maintain or restore high microhabitat (functionally integrated communities)	Diversity of structural and functional types	Number and abundance of growth or life forms and soil surface types	Percentage cover of each strata and soil surface types	Patch	Medium/Long (5 to 10 yrs +)	Vegetation (point) and soil surface transects (Secondary sites)	Assessment of reference patches	Selected Subset	DSE, PV and TfN
	Maintain or restore viability and evolutionary potential of NPG ecosystem	Restore and maximise the proportion of high quality NPG habitat	Extent of areas never or very long undisturbed	Percentage or area never disturbed or with very long time since last cropping	Landscape	Medium (5 yrs +)	Remote imagery	ARI	Bioregion	DSE and TfN
Maintain or restore natural disturbance regimes	Maintain or restore low levels of key soil nutrients (N and P)	Ecological resource (water, nutrients and energy) conservation	Extent of areas long undisturbed	Percentage or area with long time since last cropping/fertilisation	Landscape	Medium/Long (5 to 10 yrs +)	Remote imagery	ARI	Bioregion	DSE and TfN
	Maintain or restore natural disturbance regimes	Resilience and vulnerability of populations to disturbance events	Capacity for populations of key species to recover following drought and fire (large scale).	Time for populations to recover to pre-disturbance levels/structure	Landscape	Short to medium (1 to 5 yrs) species dependent	Vegetation (point) and soil surface transects and vegetation quadrats (Primary sites); Bird, mammal, herpetological and invertebrate surveys	Pre-disturbance assessments	Selected small subset	DSE, PV and TfN
	Maintain or restore high abundance of key raptors (Brown Falcons)	Functionally integrated trophic structure profile	Size class distribution profile of higher order trophic groups	Percentage total time budget over grasslands and biomass of natives in diet	Landscape	Medium (5 yrs +)	Bird surveys – time budgets and diet analysis	David Baker-Gabb	Selected landscapes	DSE, PV, TfN, NP CMN, Landholders, Volunteers

Table 6: Detailed monitoring regime for the Northern Plains Grasslands.... continued

Focal Value	Goal	Criterion	Indicators	Metric	Scale	Frequency/ Timeframe	Method	Benchmark	Sites	Responsibility
2. Plains Grassland listed species	Red Swainson-pea (EPBC, FFG)	Maintain or restore viability and evolutionary potential of Red Swainson-pea in NPG	Restore and maximise the proportion of high quality habitat	Population densities (against benchmarks); Realised potential range	No. of populations; No. per unit area; Extent and spatial distribution of habitation	Patch; Paddock; Landscape	Short (annual)	Census Quadrats; Mapping	All populations mapped; Selected subset for census	DSE, PV, TfN, NP CMN, Volunteers
	Spiny Rice flower (EPBC, FFG)	Maintain or restore viability and evolutionary potential of Spiny Rice-flower in NPG	Restore and maximise the proportion of high quality habitat	Population densities (against benchmarks); Realised potential range	No. of populations; No. per unit area; Extent and spatial distribution of habitation	Patch; Paddock; Landscape	Short (annual)	Census Quadrats; Mapping	All populations mapped; Selected subset for census	DSE, PV, TfN, NP CMN, Volunteers
	Plains-wanderer (EPBC, FFG)	Maintain or restore viability and evolutionary potential of Plains-wanderers in NPG	Restore and maximise the proportion of high quality habitat	Population densities (against benchmarks); Realised potential range	No. per unit area; Extent and spatial distribution of habitation	Patch; Paddock; Landscape	Short (annual)	Transects (spot-light) – Maher and Baker-Gabb (1993); Robertson (1999)	All populations mapped; Selected subset for census	DSE, PV, TfN, NP CMN, Volunteers
3. General listed species	Chariot Wheels (EPBC, FFG)	Maintain or restore viability and evolutionary potential of Chariot Wheels in NPG	Restore and maximise the proportion of high quality habitat	Population densities (against benchmarks); Realised potential range	No. of populations; No. per unit area; Extent and spatial distribution of habitation	Patch; Paddock; Landscape	Short (annual)	Quadrats; Mapping	All populations mapped; Selected subset for census	DSE, PV, TfN, NP CMN, Volunteers
	Golden Sun-moths (EPBC, FFG)	Maintain or restore viability and evolutionary potential of Sun-moths in NPG	Restore and maximise the proportion of high quality habitat	Population densities (against benchmarks); Realised potential range	No. per unit area; Extent and spatial distribution of habitation	Patch; Paddock; Landscape	Short (annual)	To be specified	All populations mapped; Selected subset for census	DSE, PV, TfN, NP CMN, Volunteers
	Hooded Scały-foot	Maintain or restore viability and evolutionary potential of Hooded Scały-foot in NPG	Restore and maximise the proportion of high quality habitat	Population densities (against benchmarks); Realised potential range	No. of populations; No. per unit area; Extent and spatial distribution of habitation	Patch; Paddock; Landscape	Short (annual)	Transects (spot-light); Active searching under introduced cover	ARI, Literature	All populations mapped; Selected subset for census
4. Species significant to ecological function	Fat-tailed Dunnart	Maintain or restore viability and evolutionary potential of Fat-tailed Dunnart in NPG	Restore and maximise the proportion of high quality habitat	Population densities (against benchmarks); Realised potential range	No. of populations; No. per unit area; Extent and spatial distribution of habitation	Patch; Paddock; Landscape	Short (annual)	Transects (spot-light); Pit-fall traps; Active searching under introduced cover	All populations mapped; Selected subset for census	DSE & ARI, PV, TfN, NP CMN, Volunteers
	Brown Falcon	Maintain or restore viability and evolutionary potential of Brown Falcon in NPG	Restore and maximise the proportion of high quality habitat	Population densities (against benchmarks); Realised potential range	No. of populations; No. per unit area; Extent and spatial distribution of habitation	Patch; Paddock; Landscape	Short (annual)	Bird surveys – time budgets	All populations mapped; Selected subset for census	DSE & ARI, PV, TfN, NP CMN, Volunteers

Table 6: Detailed monitoring regime for the Northern Plains Grasslands.... continued

Focal Value	Goal	Criterion	Indicators	Metric	Scale	Frequency/ Timeframe	Method	Benchmark	Sites	Responsibility
5. Ephemeral treeless Lignum/Goosefoot and Canegrass swamps and drainage lines and swamps dominated by Black Box and Red Gum (Lignum Swampy Woodland EVC)	Maintain or restore viability and evolutionary potential of NPG ecosystem	Maintain associated woody refugia and source areas	Abundance of patches with high primary productivity and low temporal variability	Percentage or area of patches with highest GPP/ RUE and low variance	Landscape	Medium/ Long (5 to 10 yrs +)	Remote imagery	ARI	Bioregion	DSE and TfN
	Maintain or restore high microhabitat (functionally integrated communities)	Diversity of structural and functional types	Number and abundance of growth or life forms and soil surface types	Percentage cover of each strata and soil surface types	Patch	Medium/ Long (5 to 10 yrs +)	Vegetation (point) and soil surface transects (Secondary sites)	Assessment of reference patches	Selected landscapes	DSE and TfN
6. Plains Grassy Woodland EVC	Maintain or restore viability and evolutionary potential of NPG ecosystem	Maintain associated woody refugia and source areas	Abundance of patches with high primary productivity and low temporal variability	Percentage or area of patches with highest GPP/ RUE and low variance	Landscape	Medium/ Long (5 to 10 yrs +)	Remote imagery	ARI	Bioregion	DSE and TfN
	Maintain or restore high microhabitat (functionally integrated communities)	Diversity of structural and functional types	Number and abundance of growth or life forms and soil surface types	Percentage cover of each strata and soil surface types	Patch	Medium/ Long (5 to 10 yrs +)	Vegetation (point) and soil surface transects (Secondary sites)	Assessment of reference patches	Selected landscapes	DSE and TfN

Note: Optional monitoring activities are shown in grey.

These are lower priority activities, based on an assessment of cost and utility.

EPBC – Australian *Environment Protection and Biodiversity Conservation Act 1999*

EVC – Ecological Vegetation Class

FFG – Victorian *Flora and Fauna Guarantee Act 1988*

GPP / RUE – Gross Primary Productivity / Rain Use EfficiencyNPG – Northern Plains Grasslands Community

ARI – Arthur Rylah Institute for Environmental Research, a division of DSE

DSE – Department of Sustainability and Environment

NP CMN – Northern Plains Conservation Management Network

PV – Parks Victoria

TfN – Trust for Nature

A Appendix A: Strategic Planning – the Adaptive Framework Approach

For strategic and operational planning, the Department of Sustainability and Environment uses program logic for achieving defined ecological outcomes. This approach is similar to the adaptive learning cycle proposed by the International Union for the Conservation of Nature (IUCN) World Commission on Protected Areas (WCPA) framework for evaluating effectiveness of actions (Hockings et al. 2006) (Figure 31; Table 7). This framework itself builds on the Conservation Action Planning (CAP) framework developed and used internationally by The Nature Conservancy as a best practice conservation planning tool.

This program logic approach has a number of benefits. Firstly, it improves the effectiveness of planning and investment in conservation projects/actions for protecting Northern Plains Grasslands by identifying the linkages between all stages. Secondly, it increases the transparency of the investment strategies for reporting, auditing and accountability. Finally, it helps build a broad and comprehensive conservation program that strategically identifies and fills key knowledge gaps and deficiencies in the effort towards a stated goal.

Relating the DSE key process steps to the CAP and WCPA frameworks:

1. Identify focal values and goals (WCPA – Context; CAP – System);
2. Identify critical threats to these values (WCPA – Context; CAP – Stresses and Sources);
3. Develop strategies to address threats and/or recover values according to stated goals (WCPA – Planning; CAP – Strategies);
4. Plan and implement actions to deliver the strategies (WCPA – Inputs and Processes; CAP – Strategies);
5. Monitor outputs to measure effectiveness of actions (WCPA – Outputs; CAP – Success); and
6. Monitor and evaluate outcomes to measure success/performance towards stated value-based goals (Note: intermediate outcomes can be included here if shorter term reporting/evaluation is required) (WCPA – Outcomes; CAP – Success).

Figure 31. The IUCN-WCPA framework for assessing management effectiveness of protected areas (Hockings et al. 2006).

Evaluation that assesses each of the elements of framework (and the links between them) should provide a relatively comprehensive picture of management effectiveness. This kind of evaluation is regarded as having greater 'explanatory power' because it permits examination of the possible links between performance in different parts of the management cycle. For example, what is the influence of budgets or staff numbers on the processes or on outputs of management.

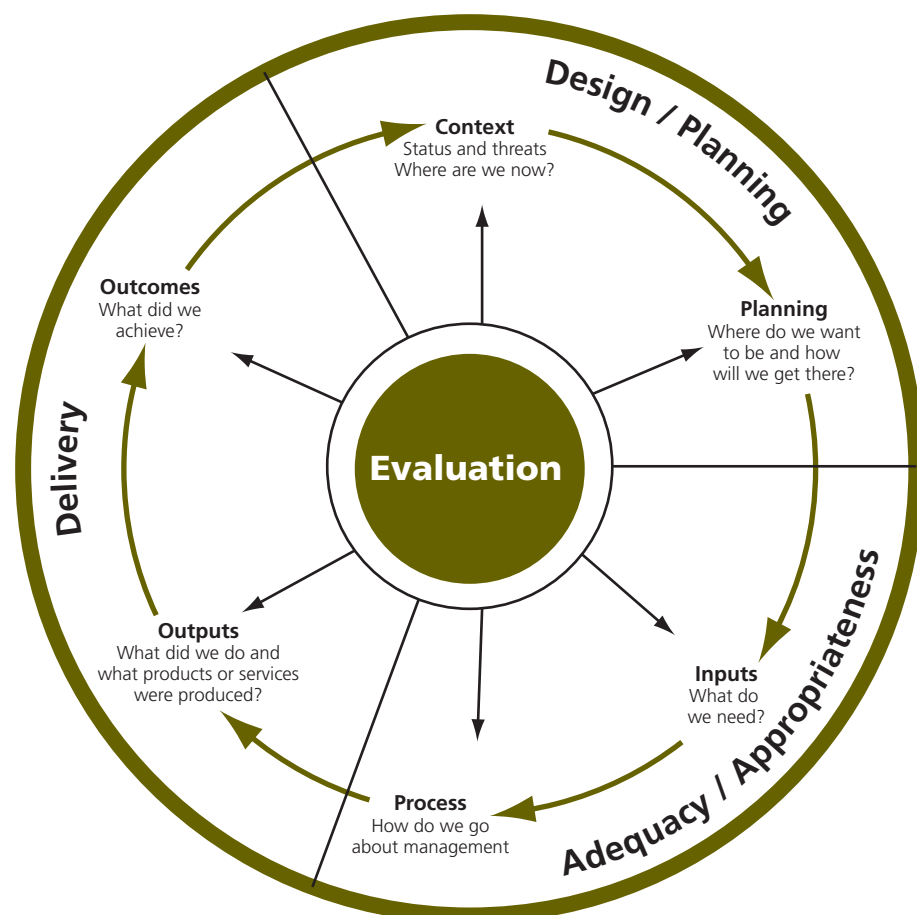


Table 7: IUCN-WCPA adaptive learning cycle framework for evaluating effectiveness of management actions, with CAP framework equivalent (Hockings *et al.* 2006)

WCPA Elements of Evaluation	Explanation	Criteria That Are Assessed	Focus of Evaluation	CAP framework equivalent
Context	Where are we now? Assessment of importance, threats and policy environment	<ul style="list-style-type: none"> • Significance • Threats • Vulnerability • National Context 	Status	System stresses and sources
Planning	Where do we want to be? Assessment of protected area design and planning	<ul style="list-style-type: none"> • Protected area legislation and policy • Protected area system design • Reserve design • Management planning 	Appropriateness	Strategies
Inputs	What do we need? Assessment of resources needed to carry out management	<ul style="list-style-type: none"> • Resourcing of agency • Resourcing of site • Partners 	Resources	Strategies
Processes	How do we go about it? Assessment of the way in which management is conducted	<ul style="list-style-type: none"> • Suitability of management processes 	Efficiency and appropriateness	Strategies
Outputs	What were the results? Assessment of the implementation of management programs and actions: delivery of products and services	<ul style="list-style-type: none"> • Results of management actions • Services and products 	Effectiveness	Success
Outcomes	What did we achieve? Assessment of the outcomes and the extent to which they achieved objectives	<ul style="list-style-type: none"> • Impacts: effects of management in relation to objectives 	Effectiveness and appropriateness	Success

IUCN- WCPA – International Union for the Conservation of Nature / World Commission on Protected Areas
CAP – The Nature Conservancy Conservation Action Planning framework

B Appendix B: Relevant Strategies and Programs

Relevant Commonwealth and State strategies for biodiversity

National Strategy for the Conservation of Australia's Biological Diversity 1996

Victoria is a signatory to the National Strategy for the Conservation of Australia's Biological Diversity. The goal of the Strategy is to 'protect biological diversity and maintain ecological processes and systems'. Central to the conservation of Australia's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and other resource production systems.

Victoria's Biodiversity Strategy 2010 – Draft

Victoria's Biodiversity Strategy provides overarching objectives for the conservation and management of biodiversity. One of the goals of the strategy is that there is 'an increase in the viability of threatened species and in the extent and quality of threatened ecological communities'.

Complementary projects

Implementation of Australian Government's EPBC Act Recovery Plans

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's principal piece of environmental legislation. The EPBC Act protects Australia's native species and ecological communities by providing for: identification and listing of species and ecological communities as threatened; development of conservation advice and Recovery Plans for listed species and ecological communities; development of a register of critical habitat; recognition of key threatening processes and where appropriate, reducing the impacts of these processes through Threat Abatement Plans.

Many species of plants and animals that are listed under the EPBC Act reside in the Northern Plains Grasslands. DSE actively seeks funding from the Australian Government to implement Recovery Plan actions for these threatened species.

Implementation of State Governments FFG Act Action Statements

The *Flora and Fauna Guarantee Act 1988* (FFG Act) provides for the listing of Victoria's threatened plant and animal species, ecological communities and potentially threatening processes. Under the Act, an Action Statement must be prepared by the Department of Sustainability and Environment for each item following its listing.

Action Statements are like brief management plans. They provide some background information about the species, including its description, distribution, habitat, life history, the reasons for its decline and the threats which affect it. They also state what has been done to conserve the species and what will be done. Action Statements are designed to apply for three to five years, after which time they will be reviewed and updated.

The Northern Plains Grassland Community is listed as threatened under the FFG Act, along with many species of plants and animals that make up the Northern Plains Grassland Community. DSE actively seeks funding to implement recovery actions for Northern Plains Grasslands and associated threatened species.

Market based instruments

BushTender

BushTender is an auction-based approach to improving management of native vegetation on private land. Under this system, landholders competitively tender for contracts to improve their native vegetation. Successful bids are those that offer the best value for money, with successful landholders receiving periodic payments for their services under management agreements signed with DSE.

BushBroker

Where mitigation for vegetation loss is required the preference is for offset gains to be generated on the same property. However, there are situations where this is not possible or preferred. In these situations there is a need for the offsetting gains to be generated elsewhere by third parties and to be available for purchase.

Complementary organisations

Trust for Nature

The Trust for Nature (TfN) is a statutory body established under the *Victorian Conservation Trust Act 1972*. It can hold, buy and sell property and has the power to enter into a binding covenant with a landholder. A TfN Covenant is a voluntary agreement between the Trust and the landholder. The covenant is registered on the title and binds future owners of the land to managing the land under the terms of the covenant. The Trust has an ongoing commitment through its stewardship program to assist landholders to manage and improve their land for conservation.

The Trust also operates a revolving fund that purchases areas of high conservation significance to ensure their protection. Those properties are then resold with a conservation covenant attached as a condition of sale.

Private Sector Interests

There is an emerging private sector interest with regards to purchasing properties that contain significant remnant vegetation, or properties that can be managed for the purpose of water and environmental assets for traditional and new income streams including agriculture, forestry, green energy, water and ecosystem services.

Relevant legislation

Planning and Environment Act 1987

The purpose of the Victorian *Planning and Environment Act 1987* (P&E Act) is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians. It provides the planning system through which environmental impacts of land use and development can be considered.

Clause 15.09 requires an assessment to be undertaken on the impact of a proposed development on the conservation of native flora and fauna. The approval of plans has to have regard to the Victorian Government's Native Vegetation Management Framework, which is incorporated under clause 15.09 of the P&E Act.

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as matters of national environmental significance.

Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act) is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes.

The objectives of the FFG Act are to ensure that all Victorian native species of flora and fauna, native ecosystems and communities can survive, flourish and retain their potential for evolutionary development; to protect representative and ecologically viable samples of all of Victoria's natural ecological systems, including land systems, native vegetation types and native animal communities; to protect genetic variability within Victorian plant and animal species; to protect areas of special value for natural heritage, flora and fauna habitat, or for maintenance of ecological processes for life support systems; and to arrest and reverse the decline of native vegetation in rural Victoria.

Other relevant policy

Land and Biodiversity White Paper

The Victorian Government's Land and Biodiversity White Paper aims to protect, enhance and restore highly valued native vegetation in areas at risk; and to improve the viability of rare and threatened species and ecological communities.

Native Vegetation Management Framework

Native Vegetation Management: A Framework for Action (NVMF) was developed to implement the objectives of Victoria's Biodiversity Strategy and the National Strategy for the Conservation of Australia's Biological Diversity. The Framework is the State Government's strategy to protect, enhance and revegetate Victoria's native vegetation.

The NVMF focuses on catchments as a whole; addresses critical issues on private land where native vegetation has been cleared or fragmented; provides a strong focus on protection and improvement of higher conservation significance vegetation; and provides a flexible but accountable approach for lower conservation significance vegetation, enabling landholders to move towards more sustainable land use options.

The NVMF's main goal is to achieve a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a net gain. Net gain is where overall gains in native vegetation are greater than overall losses and where individual losses are avoided where possible.

National Reserve System Strategy 2008–2030

Australia's Strategy for the *National Reserve System* (NRS) identifies priority actions to provide a nationally coordinated approach to protection of under-represented Interim Biogeographic Regionalisation of Australia (IBRA) vegetation communities, and sets out the following targets: examples of at least 80% of the number of extant regional ecosystems in each bioregion are represented in the NRS and effectively managed by 2030; and the biodiversity assets of each bioregion are clearly identified and adequately protected through collaborative and integrated management with other landowners and managers.

Strategic Plan for Conservation Management Networks Victoria: Working together to protect Biodiversity

The Strategic Plan for Conservation Management Networks sets out directions for the future and guides the efforts of all involved.

Biodiversity Action Plan

The Biodiversity Action Plan for the Victorian Riverina Bioregion translates state-wide strategy to the regional scale. The plan identifies biodiversity management priorities at the landscape-scale to guide on-ground works by land managers.

North Central Regional Catchment Strategy

The North Central Catchment Management Authority Regional Catchment Strategy (RCS) uses the bioregions to describe biodiversity assets and determine priority issues and management responses. This Strategic Plan will contribute to the resource condition targets in the RCS, namely: Maintain or improve existing viable populations of significant threatened species; Ensure that there are no further bioregional extinctions; Create a community that is actively engaged in natural resource management processes and equipped to implement landscape change by 2012; Improve the quality and coverage of all vulnerable or endangered Ecological Vegetation Classes and any others with less than 15% of pre-1750 distribution by 10% (as measured by habitat hectares) and increase native vegetation coverage to 20% of the region.

Role of the farming sector

There continues to be a conflict between managing native grasslands for short-term income and managing them for conservation of biodiversity or long-term productivity (Crosthwaite & Malcolm, 2000). However, the values and beneficial attributes of grasslands have recently been promoted by a range of agronomic research and development groups such as Grain and Graze, Rural Industries Research and Development Corporation (RIRDC) and Future Farm Industries Cooperative Research Centre (FFI CRC).

Stakeholders

Stakeholder	Requirements
Government ministers	Understanding and empathy regarding conservation of grasslands Proactive in protection Workable strategy
DSE Secretary	Landholders satisfied Framework and Strategic Plan to conserve grasslands Sustainable solutions Stakeholder involvement
Australian Government	Satisfy National Reserve System (NRS) and Comprehensive and Adequate Reserve (CAR) systems Fulfil EPBC Act obligations Ensure collaboration Matching commitment from State
DSE, DPI and other NRM staff	Ensure collaboration Common information base Commitment to Strategic Plan Certainty of corporate support
Landholders	Economic well-being Continued association with the land Management information Ensure collaboration Support, both financially and physically for protection of remnants Clarity from government agencies
NP CMN	Ensure collaboration Kept informed Understanding of issues Involved
Landcare and Friends groups	Kept informed Understanding of issues Involved
Indigenous associations	Ensure collaboration Kept informed Involved
NFF and VFF	Ensure collaboration Kept informed Clarity from government agencies

Stakeholder	Requirements
Local councils	Kept informed Ensure collaboration Support from DSE with regard to Native Vegetation Management Framework Implement planning scheme overlays Consider rate rebates Current and accurate mapping Sustainable development
CMA	Ensure collaboration Protection of native grasslands Identification of key biological assets within region Manage and implement projects
Parks Victoria	Increased public profile Ensure collaboration Open communication with regards to existing and proposed reserves Support from DSE
Conservation groups	Kept informed Understanding of issues
Trust for Nature	As much grasslands conserved as possible Ensure collaboration Increased public profile Community partnerships
Public utilities	Where native grasslands are found Restrictions and management requirements Information on grassland values
Academia	Kept informed Some collaboration with regards to research proposals
Private business sector	Kept informed Understanding of issues

CMA – Catchment Management Authority

DPI – Victorian Department of Primary Industries

DSE – Victorian Department of Sustainability and Environment

NFF – National Farmers Federation

NPCMN – Northern Plains Conservation Management Network

NRM – Natural Resource Management

VFF – Victorian Farmers Federation

Acronyms

ABC	DSE Actions for Biodiversity Conservation
ARI	Arthur Rylah Institute for Environmental Research, a division of DSE
CAP	The Nature Conservancy Conservation Action Planning framework
CAR	Australian Comprehensive and Adequate Reserve System
CMA	Catchment Management Authority
DEWHA	Australian Department of Environment, Water, Heritage and the Arts
DPCD	Victorian Department of Planning and Community Development
DPI	Victorian Department of Primary Industries
DSE	Victorian Department of Sustainability and Environment
EPBC	Australian <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Class
FFG	Victorian <i>Flora and Fauna Guarantee Act 1988</i>
GA	Greening Australia
IBRA	Interim Biogeographic Regionalisation of Australia
LCC	Land Conservation Council
NFF	National Farmers Federation
NPCMN	Northern Plains Conservation Management Network
NRM	Natural Resource Management
NRS	Australian National Reserve System Program
NVMF	Victoria's Native Vegetation Management Framework
PAN	Protected Area Network
PV	Parks Victoria
TAG	Northern Plains Grasslands Technical Advisory Group
TfN	Trust for Nature
VEAC	Victorian Environmental Assessment Council
VFF	Victorian Farmers Federation
WCPA	International Union for the Conservation of Nature (IUCN) World Commission on Protected Areas framework

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