Bird-friendly burning and grazing best-practice for grasslands

Achieving bird conservation and economic grazing objectives together in South Africa's grasslands

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BirdLife South Africa

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1. BirdLife South Africa as a stakeholder in the Grassland Biome

BirdLife South Africa is the only dedicated bird conservation non-government organisation (NGO) in South Africa, and is actively involved in various conservation projects that deal with species, sites, habitats and people. Our main focus is on threatened (Red Data) bird species and Important Bird Areas (IBAs). We are working to protect important sites and habitats, especially the threatened grasslands and wetlands at Steenkampsberg, Chrissiesmeer, Wakkerstroom, Memel, Ingula and the Mistbelt Grasslands in southern KwaZulu-Natal. Formal protected area status for privately-owned land in areas of critical biodiversity importance can be achieved through the Biodiversity Stewardship Programme, implemented under s.28(1) of the National Environmental Management: Protected Areas Act (Act 57 of 2003). We have partnered with provincial conservation agencies and other environmental NGOs in this pursuit. BirdLife South Africa's Grasslands Programme (funded by the WWF Nedbank Green Trust) has made momentous progress since inception in 2011 in initiating co-operation and collaboration with provincial government and NGOs.

2. Purpose and context

This 'bird-friendly best-practice' document is intended as guidance for management planning and to compliment the draft *Biodiversity-Friendly Grazing and Burning Best-Practice for Grasslands* (Lechmere-Oertel in prep.) that is being developed by the Agricultural Component of the South African National Biodiversity Institute's (SANBI) Grasslands Programme. It is not intended to be an academic output and is not equivalent to Ecosystem Guidelines or Biodiversity Management Plans for Ecosystems (BMP-E) or Species (BMP-S), as provided for in the National Environmental Management: Biodiversity Act (Act 10 of 2004). We acknowledge our data deficiency limitations and encourage researchers to fill these gaps for the benefit of bird conservation. This 'bird-friendly best-practice' forms a component of BirdLife South Africa's Grassland Programme commitment to produce a user-friendly set of management recommendations to promote the conservation of threatened grassland bird species, primarily in the agricultural (red meat production) sector.

Implementation of this 'bird-friendly best-practice' will be closely linked to provincial Biodiversity Stewardship Programmes and prioritised in IBAs. As such, this 'bird-friendly best practice' covers the entire South African Grassland Biome (*sensu* Mucina and Rutherford 2006), which can be further divided into four major grassland units: Dry Highveld Grassland, Mesic Highveld Grassland, Drakensberg Grassland and Sub-Escarpment Grassland (Mucina et al. 2006). However, the focus for implementation will be on ecosystems of special concern[1] outside of existing national/provincial protected areas where management interventions by landowners, resource users and key stakeholders can make a positive contribution to biodiversity conservation.

[1] For example, Threatened Ecosystems listed under s.52(1)(a) of the National Environmental Management: Biodiversity Act (GG 34809, GN 1002, 9 December 2011).

The intended audience for this document is anyone involved in rangeland (veld) management and biodiversity conservation in the southern African Grassland Biome. A shorter and more user-friendly end-product will also be produced, and this resource will be aimed at landowners and managers, extension officers, biodiversity stewardship officers and key stakeholders working towards the parallel objectives of economically-viable livestock production, improved veld condition and biodiversity conservation in our grasslands.

3. Grassland bird diversity – significance and benefits

The Grassland Biome has high avifaunal significance, because it supports about 350 of the 846 bird species, 29 of the 125 Red Data bird species (Table 1; Barnes 2000) and 53% of endemic bird species (Clancey 1986) occurring in South Africa. Consequently, 50 of South Africa's 122 Important Bird Areas are in grasslands (Barnes 1998). South African grasslands are considered an international Endemic Bird Area (EBA091; Stattersfield et al. 1998), with the priority ranked by BirdLife International as *Critical* due to the very high level of threat.

Table 1. *Bird species of conservation concern in the Grassland Biome, including species that occur in grassland and/or their associated wetland habitats, and species not strictly dependant on, or specialised to, grasslands.*

Species	***Scientific Name***	**Global Status (IUCN 2012)**	**Regional Status (Barnes 2000)**
Rudd's Lark *	*Heteromirafra ruddi*	VU	CR
Wattled Crane	*Bugeranus carunculatus*	VU	CR
Blue Swallow *	*Hirundo atrocaerulea*	VU	CR
Botha's Lark *	*Spizocorys fringillaris*	EN	EN
Bearded Vulture	*Gypaetus barbatus*	LC	EN
Grey Crowned Crane	*Balearica regulorum*	EN	VU
Southern Bald Ibis	*Geronticus calvus*	VU	VU
Yellow-breasted Pipit *	*Anthus chloris*	VU	VU
Blue Crane	*Anthropoides paradiseus*	VU	VU
Cape Vulture	*Gyps coprotheres*	VU	VU
Southern Ground-Hornbill	*Bucorvus leadbeateri*	VU	VU
Lesser Kestrel	*Falco naumanni*	VU	VU
Denham's Bustard	*Neotis denhami*	NT	VU
White-backed Vulture	*Gyps africanus*	EN	VU
African Grass Owl	*Tyto capensis*	LC	VU
Kori Bustard	*Ardeotis kori*	LC	VU
Short-tailed Pipit	*Anthus brachyurus*	LC	VU
White-bellied Korhaan *	*Eupodotis senegalensis*	LC	VU
Black Harrier	*Circus maurus*	VU	NT
Secretarybird	*Sagiatarius serpentarius*	VU	NT
Melodious Lark *	*Mirafra cheniana*	NT	NT
Blue Korhaan *	*Eupodotis caerulescens*	NT	NT
Pallid Harrier	*Circus macrourus*	NT	NT

Black-bellied Bustard	*Lissotis melanogaster*	LC	NT
Black-winged Lapwing *	*Vanellus meianopterus*	LC	NT
Black Stork	*Ciconia nigra*	LC	NT
Lanner Falcon	*Falco biarmicus*	LC	NT
Peregrine Falcon	*Falco peregrinus*	LC	NT
Yellow-throated Sandgrouse	*Pterocies gutturalis*	LC	NT

CR = *Critically Endangered*, EN = *Endangered*, VU = *Vulnerable*, NT = *Near-Threatened* and LC = *Least Concern*.
* Species that may be considered as grassland specialists.

3.1. Birds as environmental indicators

The global IBA network shows that birds are useful indicators for other biodiversity, species richness and endemism patterns (www.birdlife.org/action/science/indicators/birds_as_indicators.html). Evidence suggests that changes in bird populations often indicate or track broader environmental change. For example, large terrestrial birds such as cranes and bustards can be used to indicate ecosystem health and changing environmental conditions on farmland (Barnard and de Villiers 2012). Compared to most other animal taxa, (1) better data are available for birds, for example the Southern African Bird Atlas Projects (SABAP) 1 and 2, the Coordinated Avifaunal Roadcounts (CAR) project and the numerous bird guide books that are available to the public, (2) they are readily surveyed – unlike for most invertebrates, birds can be identified to species by sight and without trapping, and (3) their biology and life histories are relatively well understood. Therefore, threatened and specialist grassland birds are predicted to be good indicators of the population status of other grassland-dependent bird species, and of habitat quality, functionality and intactness. Changes in bird species abundance (population numbers), range changes, and assemblage shifts (species composition) can also be used as early warning signs of environmental change. These 'indicator' bird species can be promoted as flagships for biodiversity-friendly best-practice grassland management.

3.2. Ecosystem services provided by grassland birds

Birds provide supporting and regulating services through invertebrate and rodent control, pollination, seed dispersal and nutrient cycling. These ecosystem services benefit plants, which in turn provide grazing, food, medicine, flood and erosion control, wetland water storage and purification, carbon sequestration, and many other ecosystem services to humans (Wenny et al. 2011). Additional benefit comes from the enjoyment of wild birds, which can lucratively and sustainably be extended to avitourism (Taylor 2010) and job creation opportunities.

4. Threats to grassland birds

Threats to the Grassland Biome at large also directly, indirectly and cumulatively threaten grassland bird species. The Grassland Biome is among the least protected biomes in South Africa, with few choices for meeting protected area targets because of many competing land and resource uses (NPAES 2008). Only 2.8% of the Grassland Biome is under formal protection (SANBI 2011), and most of the formal conservation areas are found in the Drakensberg. The Highveld is particularly poorly

conserved, with only 1.5% of Mesic Highveld Grassland conserved in formally protected areas. Only 1% of the KwaZulu-Natal Mistbelt Grassland remains in a pristine state (Scott-Shaw 1999), with more than 90% permanently transformed (Wakelin 2006).

Grasslands are among the most threatened vegetation types in South Africa, because they contain most of the country's economic riches (mostly mineral resources), crop agriculture and population (SANBI 2011). Most grassland vegetation types are *Endangered* (>40% transformed) or *Vulnerable* (>20% transformed). Of the 80 vegetation types in the Grassland Biome (Mucina and Rutherford 2006), more than half are Threatened Ecosystems listed under s.52(1)(a) of the National Environmental Management: Biodiversity Act (GG 34809, GN 1002, 9 December 2011).

Roughly 22.7% of the Grassland Biome is under cultivation, with 60% (perhaps as much as 80%) of the biome irreversibly transformed (SANBI 2011). Permanent transformation of suitable habitat has taken place through anthropogenic impacts by way of cultivation, commercial afforestation, urbanisation and mining. Further severe degradation of the remaining habitat has resulted from erosion, agricultural improvement (e.g. draining wetlands) and other factors. Significant proportions of the remaining habitat may be secondary lands or gradually degrading through woody plant encroachment and other processes. The few remaining untransformed areas are highly fragmented. As much as 50% of the remaining areas may consist of fragments of only a few hectares in extent (SANBI 2011). Further ploughing of natural, intact virgin grassland is thus strongly discouraged.

In addition to these habitat-related threats, birds are also at risk from non-habitat related threats, including poisoning, power line collisions and electrocutions, fence collisions, mortalities caused by motor vehicles, drowning in farm reservoirs, agro-chemical pollution, nest or roost site disturbance, depredation by dogs, hunting, snaring, persecution, trade, traditional medicine (muti) and disease. Potential future threats include wind energy facilities (WEFs) better known as wind farms, solar energy facilities (SEFs) and climate change.

Nevertheless, birds can survive and often thrive in a rangeland farming context. Thus this 'bird-friendly best-practice' document focuses on burning and grazing practices that compliment bird conservation in an extensive commercial and communal livestock production setting. These recommendations can be, or are already being (MTPA 2010), applied in the Biodiversity Stewardship Programme within the Grassland Biome, but apply more broadly as well.

5. Burning and grazing recommendations for bird conservation

It is generally accepted that some degree of compromise and precautionary approach is required to achieve balance between intact species diversity, functional ecosystem services and productive grazing rangelands. Burning and grazing programmes should represent a compromise between fire protection, livestock production and conservation goals. It is assumed that burning and grazing regimes designed for the protection of plant diversity will also be appropriate for grassland bird conservation. Such regimes typically include variability in the fire frequency, timing and intensity, as well as the appropriate grazing system that avoids the extremes of high- or low-intensity grazing, but

that ensures complete rest for at least one growing season out of four. Areas that are naturally protected from fire (fire refugia) and important for their high plant diversity, especially rocky outcrops and wetlands, should not be grazed for extended periods, especial after recent burning, and protected from too-frequent (annual) burning. Protection of fire refugia could be achieved by occasional cool burning (when there is moisture in the soil and under cool weather conditions). If fire is "withdrawn" artificially from outcrops and wetlands, the build-up of phytomass (plant material) could become a significant risk to their destruction. Runaway fires generally occur under hot, dry conditions, and the accumulation of too much phytomass creates conditions that will burn in to the soil. Protection of natural fire refugia is essential to ensure that nesting, and to a lesser degree foraging, habitats of threatened bird species are managed appropriately (Muchai 2002; Little et al. 2013).

5.1. Burning

Avoid annual burning other than in fire breaks, as this may lead to altered species composition and may result in insufficient food (i.e. forb[2] and invertebrate[3]) availability, fewer refugia to escape from cold/heat, and inadequate cover for nesting by increasing exposure and detection by predators. Fire breaks must be prepared (burnt) annually before the end of June, in order to meet legal and protection requirements. Burning rather than ploughing or mowing fire breaks is less ecologically harmful and therefore more compatible with conservation goals. Annually burnt fire breaks within a matrix of unburnt blocks can provide sufficient habitat heterogeneity (i.e. variability) to accommodate terrestrial avian insectivores (e.g. lapwings and thick-knees) and grazers (anatids) that prefer open, short-grass habitat (Little et al. 2013), as well as threatened species such as Botha's and Rudd's Larks. As such, the grassland matrix blocks need not be burnt on an annual frequency. Indeed, Little et al. (2013) recommend that in Mesic Highveld Grassland annual burning should be avoided, because the fire season overlaps with the territory-forming stage of the breeding cycle for many grassland-breeding bird species.

Avoid burning at an inappropriate time of year. Repeated burning long after the growing season has started in spring (i.e. beyond the recommended fire season) can also damage vegetation and alter plant species composition; and may negatively impact nesting birds (eggs), nestlings or juvenile birds in spring-summer. Conversely, repeated burning more than just fire breaks too early in the season, i.e. in autumn, may result in equally unwanted damage to soil and vegetation, with a knock-on effect on bird species as they may have insufficient cover and food to survive the winter.

Regardless of the grassland type, burning should be implemented in **both unclean block and patch mosaic burns** in order to leave natural refugia for birds and their prey. Patchy burns also establish and maintain habitat heterogeneity, which is needed to sustain the biodiversity integrity of climax specialist bird species as well as short grass and pioneer bird specialists. Preferably less than half of any management area should be burnt in one year, to maintain the necessary patchwork of burnt

[2] Forbs are non-woody flowering plants other than grasses and sedges
[3] Invertebrates include all insects, spiders, snails and other boneless animals

and unburnt areas. Conversely, management areas should also not be burnt less frequently than every four years. Grasslands are fire climax adapted systems and need to be burnt in order to retain their diversity and ecosystem processes. Grasslands that are left without sufficient burning become moribund and the resultant overshadowing of forbs reduces plant diversity and grassland nesting birds can no longer use these areas as they are literally inaccessible.

Avoid repeatedly burning extremely large camps or blocks. Some fire-intolerant animal species recolonize burnt areas from neighbouring unburnt source populations. If the burnt area is always too large and not burnt patchily, localised extinction of fire-intolerant species may occur.

Mowing of natural grasslands as an alternative to burning **is not recommended**. While the resultant defoliation of the veld mimics burning to a certain degree (both bulk removal), mowing has a number of detrimental impacts. These include excessive soil compaction, crushing subterranean forb root structure, removal of nutrients from the system (in the case of bailing), direct disturbance caused by the vehicle, and often impacts related to mowing at the wrong time of year (which should follow burning recommendations), as mowing does not have the same associated risks of burning in dry, windy conditions.

5.2. Grazing

While grazing has always been part of the natural processes in grasslands, many species are not adapted to the intensity of commercial livestock grazing or the livestock species farmed today. Consequently, **current livestock grazing practices have significant ecological impacts**, especially on the forb component of floral diversity in grasslands, the invertebrate food webs, and the bird species that depend on these forbs.

Prevent prolonged over-grazing, as this may lead to a loss of vigour in the sward, altered species composition and veld degradation, and a resultant change or decrease in bird diversity[4].

Avoid selective-grazing by concentrate grazers such as sheep and wild ungulates (e.g. Blesbok), as this may decrease forb and associated invertebrate diversity. To avoid selective-grazing, sheep in particular should not be left in an area for too long; this will require intensive management. Furthermore, to avoid selective grazing, cattle to sheep ratios should be maximised, where possible in a cattle to sheep ratio of 1:1 or higher. This recommendation urges reduction in sheep numbers rather than inflation of cattle numbers.

Minimise or avoid intensive late-season grazing, because many ground-nesting birds could be negatively impacted through direct damage to nests (trampling or exposure to hail damage) or indirectly by increasing predator detection of nests.

[4] Diversity is the interaction between richness, abundance and composition. The composition of a community can change without the richness changing. For example, losing Wattled Crane but gaining Common Myna would not change the species richness (number) but would be a big problem for biodiversity conservation because of the change in composition and abundance-ratio.

Grazing the new growth immediately after a burn can increase susceptibility to soil erosion and result in loss of the humus layer in which many invertebrates live, thereby decreasing prey availability to grassland birds such as Blue Swallow (Wakelin 2006). This also results in nutrient leaching of the soil, causing reduced productivity of the grassland and hence lower carrying capacity for grazing animals. Although this grazing practice is very common because livestock do well on the 'green flush', it should not be done over the entire management area every year.

5.3. Rest

Rest from both fire and grazing is paramount to maintaining the health and biodiversity of grasslands. For each rotation block, one rest period should be implemented **for a full growing season** at least every four years. This is important to allow grass to maintain good vigour, recover from grazing and trampling, and build up sufficient energy reserves to be able to grow quickly in the new growing season. This also creates the important patch mosaic needed to maintain ecosystem integrity.

Increasing the frequency and duration of rest periods can have a **remedial effect** on the ecological integrity and functioning of land that has been selectively- or over-used, thereby aiding certain specialist grassland bird species to return and/or breed.

5.4. 'Exclusion zones' in sensitive and species-rich areas

Zonation of grasslands is imperative to enable different intensities of fire and grazing to be applied to different areas.

High intensity use planted pastures, located on already transformed areas, can alleviate pressure on areas that have high biodiversity value. New planted pastures should however only be used to reduce the existing pressure on the natural rangelands and not to facilitate increased overall carrying capacity of the farm. Planted pastures can support certain threatened bird species, such as some korhaans and bustards.

Natural hotspots of diversity, especially in "virgin" grassland, should be managed with a separate biodiversity objective within the overall management plan, and in special cases be **set aside as grazing exclusion zones**.

Remote, inaccessible and ecologically sensitive areas such as **rocky outcrops, riverine edges** and other natural fire refugia should be protected as such. The highest levels of plant diversity are often present in these refugia. These areas should therefore be zoned with the intention to conserve the grassland endemic and other high altitude specialist bird species. In the Drakensberg, these refugia offer suitable habitat for endemic species such as Buff-streaked Chat, Drakensberg Prinia, Drakensberg Rockjumper and Drakensberg Siskin.

5.5. Wetlands

Various types of wetlands are embedded in the grassland matrix, including high altitude mountain seeps (where water comes out of the ground), river catchments, peat wetlands, flood plains, oxbow lakes and permanent or temporary pans. These should be treated as part of the management camp, but managed more carefully because they are often more **susceptible to erosion** caused by livestock.

Wetlands should **not be burnt annually** and burning the entire wetland in a single fire should be avoided. Wetlands should also **not be heavily grazed in winter** and trampling should be minimised. Where possible, natural breaks (such as wetter areas) should be used to divide the wetland, rather than artificially dividing it using fire breaks.

Many bird species use wetlands seasonally for **nesting** (including threatened species such as Wattled Crane, Grey Crowned Crane, African Grass Owl and African Marsh Harrier) or are **summer migrants** that use wetlands as roost sites (White-winged Flufftail and Barn Swallow). Both Wattled Crane and White-winged Flufftail are listed as regionally *Critically Endangered* and therefore require special attention in management planning.

5.6. Manage for variability

As much **variability** as possible **in the timing, intensity and frequency of fire** should be applied to ensure that land is not subjected to the same kind of fire, applied at the same time of year, every year. This is fundamental to maintaining spatial and temporal heterogeneity. When managing for bird conservation, it is important to maintain this heterogeneity so that conflicting ecosystem requirements for the various species are met in different spatial areas.

Some species prefer recently-grazed grassland while others prefer intact grassland. For example, the endemic, *Endangered* Botha's Lark prefers heavily grazed and/or recently burnt areas compared to intact tall grassland, and uses both good (naturally short) and poor quality (over-grazed) grassland habitats. The *Critically Endangered* Rudd's Lark favours short, dense Highland grassland on hilltops and ridges, tolerating heavy winter grazing (Hockey et al. 2005). By comparison, the endemic, *Vulnerable* Yellow-breasted Pipit provides a good example of a grassland specialist that prefers intact grassland (Little et al. 2013). Red-winged Francolin, for example, is also considered a reliable indicator of intact grassland with a good forb component, because it cannot tolerate intensive grazing or frequent burning and is becoming increasingly dependent on isolated patches of tall, rank, pristine Highveld grassland (Jansen 2001).

Some species need areas of **tall, dense grass for roosting and nesting;** a good example of which is African Grass Owl. However, grass that has become moribund with collapsed dead material in areas that have not been burnt for extended periods is generally not suitable for African Grass Owl,

because they need to “burrow” in order to build an overhead shelter in the grass. While the general recommendation for rangeland grazing is to avoid a moribund state developing, there may be a potential livestock production benefit of retaining tall, dense grass and some moribund grass in drainage lines and wetlands, because this can act as a fodder reserve in times of drought. These “fodder reserves” should only be grazed if absolutely necessary and then only for very brief periods (less than one month) during times of environmental stress.

Many of the larger bird species, e.g. Denham’s Bustard and Secretarybird, are grassland generalists, requiring **large areas (several km^2) of suitable habitat**. Maintaining habitat connectivity is thus important, and needs to be managed at both a farm and landscape scale.

Insectivorous raptors (e.g. Lesser Kestrel and Amur Falcon) do not directly depend on grassland habitat integrity, but are **reliant on healthy invertebrate populations**. Invertebrate abundance and diversity change seasonally in response to management practices (Little et al. 2013). As a general rule, most invertebrate taxa in grasslands, apart from some Orthoptera (grasshoppers) and other herbivorous taxa with strong dispersal abilities, are intolerant of widespread annual burning and require refugia to recolonize areas post-burn (Uys et al. 2006).

Some threatened bird species, e.g. Blue Crane and Southern Bald Ibis, also use degraded and/or transformed habitat for foraging. For certain species, with a good example being the Southern Bald Ibis, **nest/roost sites rather than foraging areas should be the focus of conservation**.

6. The way forward

These are only a few examples based on key grassland bird species and the principles of burning and grazing best-practice. They are intended to promote awareness of birds as an integral component of grassland biodiversity. The implementation of these recommendations must be through coherent and annually adapted management plans, which would ultimately lead to improved veld condition, economically-feasible livestock production and biodiversity conservation.

7. Acknowledgements

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Appendix A. Summary of bird-friendly burning and grazing best-practice for grasslands

Management recommendations		Bird-related reasons
Burning	**Avoid annual burning other than in fire breaks.**	The fire season overlaps with the territory-forming stage of the breeding cycle for many grassland-breeding birds. Annual burning may result in insufficient food availability and inadequate cover for nesting by increasing exposure and detection by predators. Annually burnt fire-breaks provide sufficient habitat for birds that prefer open, short-grass habitat.
	Avoid burning too late or too early.	Repeatedly burning long after the growing season has started may negatively impact nesting birds (eggs), nestlings or juvenile birds in spring-summer. Repeatedly burning more than just fire breaks too early in the season, i.e. in autumn, may result in insufficient cover and food for birds to survive the winter.
	Burn less than half of any management area in one year.	Many grassland birds need sufficient unburnt cover and foraging habitat to persist in an area.
	Burn at least every four years.	Nesting birds can no longer use moribund grasslands as they are literally inaccessible.
	Avoid repeatedly burning extremely large camps.	Animals that can't survive fire need to be able to return to burnt areas from neighbouring unburnt populations. If the burnt area is always too large and not burnt patchily, localised extinction may occur.
Grazing	**Prevent prolonged over-grazing.**	This may lead to a loss of vigour in the sward, altered species composition and veld degradation, and a resultant change or decrease in bird diversity.
	Avoid selective-grazing by concentrate grazers (sheep and Blesbok).	This may decrease flowering plants and insects. To avoid selective-grazing, cattle to sheep ratios should be maximised, where possible in a cattle to sheep ratio of 1:1 or higher. This recommendation urges reduction in sheep numbers rather than inflation of cattle numbers.
	Minimise intensive late-season grazing.	Ground-nesting birds could be negatively impacted through trampling or by increasing predator detection of nests.
	Avoid grazing new growth immediately after a burn every year.	This can cause soil erosion, loss of nutrients, and loss of the leaf-litter in which many insects live, thereby decreasing prey availability to grassland birds.
Wetlands	**Avoid annual burning and burning entire wetland in a single fire. Avoid heavy winter grazing and minimise trampling.**	Many birds use wetlands seasonally for nesting, and summer migrants use wetlands as roost sites.
Exclusion zones	**Rocky outcrops, river edges, natural fire refugia and diversity hotspots should be protected.**	These areas often support the highest levels of plant diversity. Rocky outcrops especially support grassland endemic birds.