

Table 1:

Features and management issues associated with commonly used grazing management practices



Continuous grazing systems	Features	Management Issues
Set stocking	<ul style="list-style-type: none"> Stock levels set at conservative rate – i.e. a level where forced destocking is only rarely required (1 in 10 years) Most common in southern areas – widely used in the chenopod shrublands and mulga woodlands / shrublands of South Australia and Western Australia (GLMZs 8 and 9) – where ephemeral and annual species provide forage when sufficient rain has been received, and the perennial shrubs are relied upon to provide feed at other times. 	<ul style="list-style-type: none"> Knowing the best time to destock or reduce numbers in worsening seasonal conditions Common problems include leaving stock on too long when going into drought which causes declines in perennial shrub density. Can lead to increased, and irreversible impact in practical terms, in areas surrounding water points. Can be managed using simple plant-based indicators and spatial monitoring.
Seasonal tracking	<ul style="list-style-type: none"> Tracking of seasonal conditions occurs and livestock numbers are varied depending on seasonal conditions and forage availability. Usually some livestock is maintained on properties even in the worst years. Commonly used in the semi-arid woodland areas of New South Wales and South Australia. 	<ul style="list-style-type: none"> This can have short- and long-term financial benefits for pastoral enterprises when used to moderate extent, as very conservative stocking rates may not provide satisfactory economic returns in the short term. This approach is associated with higher economic and ecological risks and good managerial skills are required to implement this approach properly to minimise these risks.
Set utilisation	<ul style="list-style-type: none"> Practiced in tropical and subtropical savanna systems where there is a distinct summer growing season and perennial grasses dominate pastures. Stock numbers are set by forage available at the end of the growing season and the defined safe use levels for this forage. Once livestock have been allocated to paddocks at the end of the growing season, they usually remain in place until the end of the next growing season. 	<ul style="list-style-type: none"> Use rates of between 10% and 30% of standing forage at the end of the growing season are recommended, with the actual rate depending on the ecosystem and management context. Computer-based models of pasture growth based on rainfall received during the growth season are sometimes used to estimate the appropriate livestock number to achieve the specified safe utilisation level. While this system is a form of continuous grazing, it is 'set use' rather than set stocking.
Rotational grazing and spelling	<ul style="list-style-type: none"> Rotational grazing and spelling systems take many forms but they usually involve multiple paddock systems. Many rotational grazing systems use regular spelling (or grazing) on a calendar basis or on the basis of the number of days of grazing or spelling. Numerous systems are in use in rangelands in the United States but few have been tested in Australian rangelands – some principles might be relevant. 	<ul style="list-style-type: none"> There is growing interest in this system in recognition that most native pasture species are not well adapted to continuous grazing, and some form of pasture resting/spelling is needed to let plants to recover from grazing and complete their life cycle processes. However there is little objective information to support or challenge the claimed benefits of rotational grazing, or the pros and cons of alternative rotational grazing schemes, so their value remains unproven. In systems where rainfall and plant growth are unreliable and unpredictable this approach may not offer any benefits. These systems (including cell grazing) can operate on recommendations that we consider inappropriate such as the use of very high stock densities, often well above usually accepted limits. Despite a lack of explicit scientific evidence with which to refute them they are contrary to normally accepted practice for protecting the soil surface and limiting plant defoliation.
Opportunistic	<ul style="list-style-type: none"> Other less formal spelling or rotational grazing systems can sometimes offer benefits for natural resource condition. These can include opportunistic spelling (often with forced destocking due to drought and/or deferring the build-up of stock numbers following drought-breaking rains), or rotation of stock between water points in a paddock (especially where forced to do this due to seasonal waters drying up). Resting can also involve taking advantage of exceptionally good seasonal conditions to rest a few paddocks at a time. 	<ul style="list-style-type: none"> One problem with resting is that it is rarely done for sufficient time. Resting should occur for long enough to allow plant responses to reduced grazing. One difficulty in applying resting is a lack of indicators and rules for resting strategies. Where there is a variety of range types with differing plant communities and growth habits is available within a single property, then it can be useful to devise rotational systems that take advantage of seasonal differences in growth, forage availability or resistance to defoliation Currently wet-season spelling is not widely applied on commercial properties but is an appropriate management practice in GLMZs 2 and 4. Early wet season spelling is currently recommended for tropical and subtropical savanna pastures to maintain palatable, perennial and productive native grasses (i.e. the '3P' grasses). This protects palatable perennial grasses from defoliation during the sensitive period when the plants are just beginning to regrow following the start of the wet season. Wet-season spelling also allows an increase in utilisation rates and animal production that compensated for having some land 'out of production' during the spelling period.
Tactical grazing	<ul style="list-style-type: none"> Tactical grazing involves adjusting stock numbers in accordance with changes in seasonal and climatic conditions and plant growth. The key principle underpinning tactical grazing is the need for grazing to be managed in a way that recognises the critical importance of perennial plants. These species must be able to complete all life cycle stages to ensure the persistence of plant populations. Decisions are made, based on plant condition scores, to alter stock numbers or destock. For example, in the semi-arid woodlands of New South Wales or wherever seasonal conditions are unpredictable, minimum stubble height (grazing residue) for perennial grasses is 10 cm. The mortality of the grasses increases dramatically during drought by grazing beyond this limit. 	<ul style="list-style-type: none"> For regions where the climate (and rainfall in particular) is erratic and unreliable, tactical grazing is recommended (e.g. GLMZs 6, 8 and 9). An important part of applying tactical grazing is the identification and definition of objectives and strategies on a paddock-by-paddock basis (Campbell & Hacker 2000) Tactical grazing acknowledges the potential for plants to be killed by grazing and for recruitment to be limited because grazing can limit growth, flowering, and seed production. Regions with an erratic and unreliable climate are most likely to benefit from tactical grazing since many plants do not complete life cycle processes on a regular or annual basis.

Lessons from the intensive use zones

Some principles and practices from the intensive use zone in southeastern Australia are relevant for the more extensively used and managed rangelands. However, the transfer of these techniques is affected by several factors including: differences in enterprise types; level of productivity and extensiveness of properties; and wild stock problems (with some species absent or in fewer numbers in the south). These factors affect the practicality and cost of implementing grazing management practices or of control methods for pest animals.

One such series of management principles for domestic stock management for biodiversity protection has been developed for the grassy eucalypt woodlands of southeast Queensland. These areas are grazed predominantly by cattle. Based on a landscape planning approach, the principles are:

- property planning and management should include a long-term vision that considers the whole of the property and its place in the catchment;
- soils should be managed to prevent erosion and to maintain productive capacity and water quality;
- pastures should be managed for production and to maintain the variety of plants and animals;
- local native trees should be maintained for the long-term ecological health of the property and catchment;
- all properties require an environmental reserve for species that are sensitive to agricultural land uses; and
- watercourses are particularly important to the ecosystem and grazing enterprise, and require special management.

One practical measure also developed for the grassy eucalypt woodlands but with potential for wider applicability is the use of indicators for monitoring results and improving management. These indicators are based on land use and the proportion of a property in particular land use classes. The principle is that certain proportions of each property should be allocated to land uses that are favourable to biodiversity conservation (although the achievement of these ideals is limited by the degree of landscape modification already having occurred). The precise thresholds depend on landscape types with different vegetation communities, however three key recommendations hold in all ecosystems:

- only 30 percent of the land should be used for high intensity land use;
- the remaining 70 percent should include uses that have a range of intensities of use with varying levels of impact on biodiversity; and
- within this 70 percent, about 10 percent should be allocated as environmental reserve.

Thresholds recommended for semi-arid rangelands (which are considered to be essentially intact landscapes with few areas of intensive use, at least in comparison with more temperate areas) reflect the role of water sources in controlling the distribution and activity of livestock in rangelands. The recommended areas of land in different distance-from-water classes are:

- no more than 10 percent close to water points and therefore heavily grazed;
- 40 percent grazed at intermediate distance from water;
- 40 percent grazed but at greater distance from water; and
- 10 percent far from water, beyond the reach of livestock and very infrequently grazed.

For more extensive discussion on indicators for specific ecosystems (e.g. grassy eucalypt woodlands) see the full report.





Management methods for wild stock

Managing grazing pressure from wild stock (including native herbivores such as kangaroos) is more challenging than for domestic stock. While management strategies and associated issues for specific pest animals are discussed in the main report, issues to note for management methods are listed below.

- There are legislative requirements for control methods and approaches to control of wild stock such as management policies and requirements for different species, access of poisons, options for native species.
- Management of wild stock generally involves removal or destruction of the animals – moving wild stock to another part of the landscape is not an option, fencing is not usually feasible for extensive control.
- Regional coordination of management activities is important for some species of wild stock, particularly those that are highly mobile or have large home ranges.
- Timing control operations to take advantage of natural declines in abundance due to poor seasonal conditions or disease outbreaks
- It is vital that part of wild stock control is ongoing with follow-up control of pest species to maximise the long-term effectiveness of management activities.
- Monitoring of populations of wild stock and their impact is also essential, as it is for domestic stock.
- Effectiveness of control should be measured in terms of impact (such as reduction in damage to the environment or production) not numbers of animals killed or removed.
- Ecological benefits should be measured through monitoring the resource base.
- Spatial issues where some species are constrained to particular areas, such as landscapes types or near water, means that control programs may not need to be overly widespread and can be targeted effectively.

Grazing land management zones



Major issues across grazing land management zones

Total grazing pressure issues and solutions vary from region to region, depending on the pastoral infrastructure in place, the type and number of grazing species present, and environmental conditions. The following sections summarise the major issues, knowledge gaps, and priorities arising from a synthesis across the GLMZs.

Biodiversity issues relating to total grazing pressure

Across all zones

- **Habitats of high biodiversity value** (e.g. restricted, sensitive) are often subjected to a concentration of grazing pressure. This is most notably the case in wetland, riparian and run-on habitats, but also some other habitats in particular regions (e.g. breakaways, monsoon rainforests, restricted vegetation communities in arid ranges). Both stock and feral grazers contribute to this pressure, the relative importance of these pressures varying between zones.
- Predation by cats and/or foxes is a serious issue

In most zones

- **Low level of reservation**, or a high bias in reservation.
- **Ubiquity of grazing pressure** across broad landscapes due to the proliferation of water points is a significant issue in many zones. Studies have demonstrated that this results in a significant reduction in biota in a range of rangeland ecosystems.
- **Changes in vegetation structure** are a significant issue in most of the more intensively used zones. This includes clearing, loss of perennial pasture species (grasses and shrubs) or shifts in perennial composition, and vegetation thickening (woody weeds), which creates complex relationships with grazing and fire management.
- **Noxious weeds** have at least the potential for major biodiversity impact. In many cases, weed management is inextricably linked with grazing management, and the removal of grazing does not necessarily produce an improvement in the weed problem.
- **Exotic pasture grasses** have spread to become environmental weeds particularly in the central and northern GLMZs.

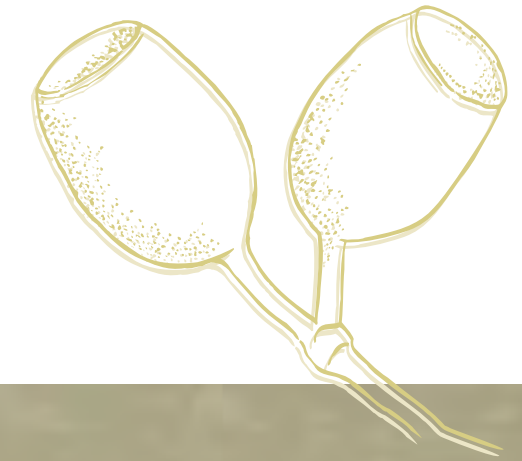
- **Changed fire regimes.** The precise nature of the impact on biodiversity of changed fire regimes is usually unclear. Outside the tropical savannas, this is generally related to suppression of fire by pastoral managers, often combined with occasional hot and extensive fires. Again, fire management is usually inextricably linked with grazing management.

In a few zones

- **Widespread land degradation** across entire landscapes due to stock, goats and rabbits.
- **Threatened species management** is primarily an issue in the southern GLMZs, but there are significant declines of at least mammals and birds in the northern GLMZs (and ongoing declines in the southern ones). A range of pressures, including grazing, is implicated in these declines, but the specific causes are unclear.

Knowledge and capacity gaps

- For many of the zones there is a lack of knowledge, understanding and tools required for basic biodiversity management. More basic biodiversity information is required such as knowledge of species distribution, accurate listings of threatened or priority species and ecosystems, as well as an ability to delineate management 'hotspots'. Effective tools for monitoring biodiversity are also required.
- There is also a lack of understanding of the impact of pastoral use on biodiversity in many zones, particularly the details which may be important for good management, such as the impact:
 - > on riparian / aquatic biodiversity
 - > of environmental weeds, notably pasture grasses
 - > of changed fire regimes
 - > of alternate grazing strategies (e.g. rotational, tactical grazing) and the resulting benefits from biodiversity that ensue from different management strategies



> of meaningful incentives for public-good conservation, notably when conservation values are high, active management is needed, and other sources of income are foregone

- Even where there is a willingness to implement off-reserve conservation actions, there may still be an inadequate understanding of the best ways to approach it (e.g. what is the most appropriate management in ungrazed areas).
- While the impact of feral animals may be recognised, there is often a poor understanding of the location of priority areas for feral control, and/or the most cost-effective means of feral control.

An extension of the above points is that while there may be a 'scientific' understanding of biodiversity values and the impact of total grazing pressure, these issues are generally poorly understood by land managers. There is also a need for recognition of 'other types of knowledge' such as indigenous knowledge of biodiversity and biodiversity management.

To address these information gaps requires information on biodiversity and land management in appropriate and accessible formats appropriate to a diversity of land managers.

Priorities and Investment opportunities

Management for sustainable pastoral production and conservation of biodiversity in the rangelands requires the following top priority investments.

- A set of agreed objectives for biodiversity conservation and management across community and government so that adequate tools (i.e. identification and mapping, grazing management, feral animal control, monitoring etc) can be developed/adapted to meet the needs of those managing for biodiversity.
- The development and effective integration of regional and property NRM plans to provide the framework for TGP management and biodiversity conservation.

One important aspect of developing and integrating regional and property NRM plans is to clarify the expectations placed on individual land managers and to provide realistic, specific (rather than generic) goals.

- The adoption of recommended best management practice (grazing systems) and use of better tools and infrastructure for controlling grazing pressure. This needs to be supported with improved understanding of what is 'best practice' and capacity for landholders to implement it.
- The implementation of off-reserve conservation initiatives, notably:
 - > protection of 'special areas', particularly through fencing to exclude stock and/or feral animals
 - > management of water points (or fencing, in some zones) to ensure the retention of significant areas of all major ecosystems that have very low TGP
 - > the need to provide meaningful incentives for off-reserve conservation initiatives
 - > improved or continued control of feral grazers – this must be done in a strategic, targeted fashion, and in some zones, be supported by giving land managers better information or access to management technologies
 - > the need to provide biodiversity and management information to land managers in appropriate, accessible forms is a priority in many regions.

In addition, in most zones there is a need for:

- Further biodiversity inventories particularly for identification of management 'hotspots' – areas of high biodiversity value susceptible to damage by excessive grazing pressure. Priorities need to be determined so that effort is focused where improved management of TGP will have maximum benefit.
- Provision of information and training for land managers to recognise biodiversity hotspots and 'biodiversity-sensitive' management, and incorporate biodiversity conservation into property-level planning, integrated with regional priorities.
- Design and implementation of effective monitoring programs for biodiversity and total grazing pressure to facilitate tracking progress towards conservation and production objectives.
- Experiments on large-scale adaptive management regimes for better grazing management for improved biodiversity outcomes.

In zones with a high percentage of Aboriginal land there is a need for:

- support for local communities in a range of land management actions – one of the most effective ways would be support for Aboriginal ranger groups; and
- resolution to the tension between the control of feral grazers (or uncontrolled stock) and the desire to retain populations for use, either for subsistence or financial return.

Limitations on total grazing pressure management

Options are limited for managing total grazing pressure in the rangelands by a range of factors operating at several levels. The climate is variable and unpredictable; the scale of the enterprise and management unit can be small; feral pest populations can be widespread and hard to control; labour can be limited in availability; and stock and their movements can be difficult to control.

Another strong influence is the economic circumstances for grazing enterprises and the low financial returns that are generally achieved per land unit area in the rangelands. This is worsened by the tendency to view feral species as an economic resource, a 'cash crop' opportunistically harvested – even though these animals can in fact reduce livestock productivity.

In addition to the more general limitations to improvement in the grazing management systems, there are a number of specific barriers to progress. Finding solutions to some of these will result in far better management of rangeland landscapes, and many could be achieved with relatively small budget allocations.

These include factors at the institutional, regional, property and individual level.

Institutional/systemic

- Lack of incentives for land managers to do things that do not add value to the enterprise.
- Lack of formal recognition of landholders who maintain biologically important areas on behalf of society.
- Incorrect use of government processes in dealing with landholders, which signals an attitude of 'control' that engenders a fear of having things 'taken away' rather than co-managed.
- Poor mechanisms for making data on local and regionally significant areas available to land managers.

Regional

- Lack of appreciation of the potential significance of seemingly common habitat types to regional biodiversity maintenance.
- Poor techniques for monitoring the effects of total grazing pressure on elements of biodiversity.

- Inadequate and/or extremely costly techniques for managing total grazing pressure (i.e. controlling animals).

Property and/or Individual

- Misunderstanding of the damaging effect on biodiversity of uncontrolled grazing pressure.
- Misunderstanding of the potentially negative impact of wild stock components of total grazing pressure on economic bottom line of an enterprise.
- Lack of resources and knowledge by land managers to know what to do about managing areas that are obviously biologically special.
- Lack of knowledge of the biodiversity benefits of alternative grazing systems (e.g. rotational grazing), which allows pastoralists to dismiss research results in set-stocked systems.



