Travelling Stock Reserves

Best environmental management practice

Tool kit for travelling stock reserves

NSW GOVERNMENT | Local Land Services

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REGENERATION SOLUTIONS P/L
Working with Nature

Best Environmental Management Practice Tool kit for Travelling Stock Reserves

Prepared for NSW Local Land Services

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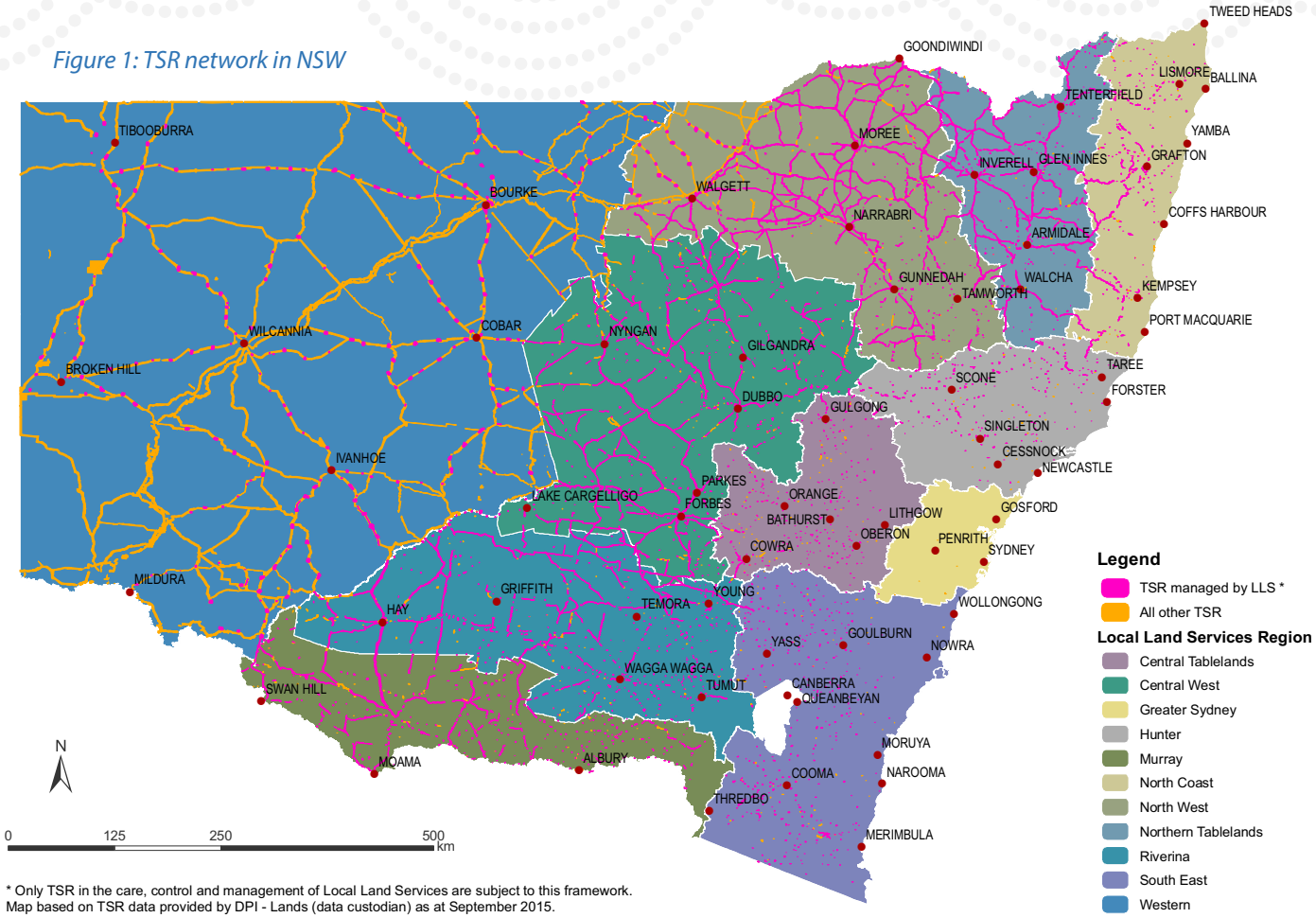
Figure 1: TSR network in NSW



* Only TSR in the care, control and management of Local Land Services are subject to this framework.
Map based on TSR data provided by DPI - Lands (data custodian) as at September 2015.

Background

Travelling Stock Reserves (TSRs) are widely recognised as playing a key role in landscape ecological connectivity and biodiversity conservation across NSW (Figure 1).

As TSRs are public land and are largely uncleared, it means that in many parts of the landscape they contain the highest quality and most interconnected remnants of native vegetation. TSRs are often located in the most fertile and cleared parts of the landscape and are therefore vital for supporting high levels of biodiversity and many threatened species and communities.

The NSW Travelling Stock Reserves State-wide Plan of Management (the Plan of Management) provides the framework for managing TSRs for conservation. The Best Environmental Management Practice (BeMP) tool kit is prepared to assist Local Land Services deliver land management outcomes consistent with the Plan of Management.

The tool kit deals primarily with environmental matters consistent with those principles adopted in the Plan of Management, namely to maintain the conservation value TSRs, their role in landscape connectivity and their sustainable use and with due consideration of the other principles.

The BeMPs are based on existing published and unpublished information, and regional experiences of Local Land Services staff.

Use of the best environmental management practice tool kit

The BeMP tool kit is designed to be:

1. suitable, for example, field based TSR and other linear reserve managers
2. to be updated and produced at a later date by Local Land Services when required
3. applicable to the management and best practices of all reserves (including large, small, connected, linear or discrete).

A rapid conservation assessment methodology (RAM) and associated training package has been developed and implemented to enable TSR managers to actively monitor conservation values and adapt management with the aim to maintain and/or improve conservation values over time. The RAM determines the conservation value of TSRs using three factors:

A. The conservation status of the vegetation type, which includes:

- presence of threatened ecological communities in state or federal legislation
- presence of wetlands (Ramsar, DIWA and SEPP 14)
- presence of site managed species.

B. The landscape context of the vegetation, which includes:

- patch size in comparison to the surrounding landscape
- connection and corridors to other patches
- extent of vegetation type remaining in the landscape, compared to the original extent (pre-European settlement).

C. The condition of the vegetation, which includes:

- vegetation integrity including all layers of the vegetation community and resilience that is their regeneration capacity
- presence/absence of large old trees and woody weeds and vines
- ground layer condition including native vs exotic cover and relative native plant diversity.

Part A and B of the RAM rely on available spatial data to verify the presence of these key attributes. Part C covers the vegetation condition of a reserve and is assessed on site by suitably trained staff and contractors.

The RAM provides the rating method of high, medium or low conservation value applied to all TSRs which enables the appropriate BeMP to be applied for a given reserve. Refer to *Rapid Conservation Assessment Method Training Package and Guidelines* for further explanation.

Note: A limitation of the RAM is that many TSRs have several habitat types or vegetation classes whereas the assessment will be based on the most relevant habitat type for example a threatened ecological community or area of best condition.

Recommended TSR management for conservation values

The following sections cover the principles Local Land Services will use to manage TSRs in a manner that will maintain and/or improve their biodiversity conservation values.

The conservation values of TSRs under the care and control of Local Land Services have been collated to assist regions develop their regional TSR management plans. Historical assessment and those completed using the RAM, provide a rating for TSRs as high, medium and low conservation value. An associated training package has been developed to enable TSR managers to actively monitor conservation values and adapt management with the aim to maintain and/or improve conservation values over time.

Management regimes for a TSR will vary dependent upon its conservation value along with the vegetation condition (as determined by Part C of the RAM) of the reserve.

Local Land Services will aim to manage TSR to maintain or improve conservation values as set out in the Plan of Management by applying the following management principles:

- Environmental protection compliance with environmental law and application of the precautionary principle.
- Use and conservation of natural resources application of ecologically sustainable development and multiple-use principles.
- Land administration application of a collaborative funding model based on the impactor/risk creator pays, cost-sharing and beneficiary principles.
- Accountability and transparency decisions should be consistent, efficient, effective, fair and capable of withstanding public scrutiny.

Funding for conservation investment should be prioritised for high-conservation value areas with threatened species and or threatened ecological communities. The greatest gain in conservation outcomes can be made when reducing the impacts of key threats that can degrade conservation values, for example invasive species.

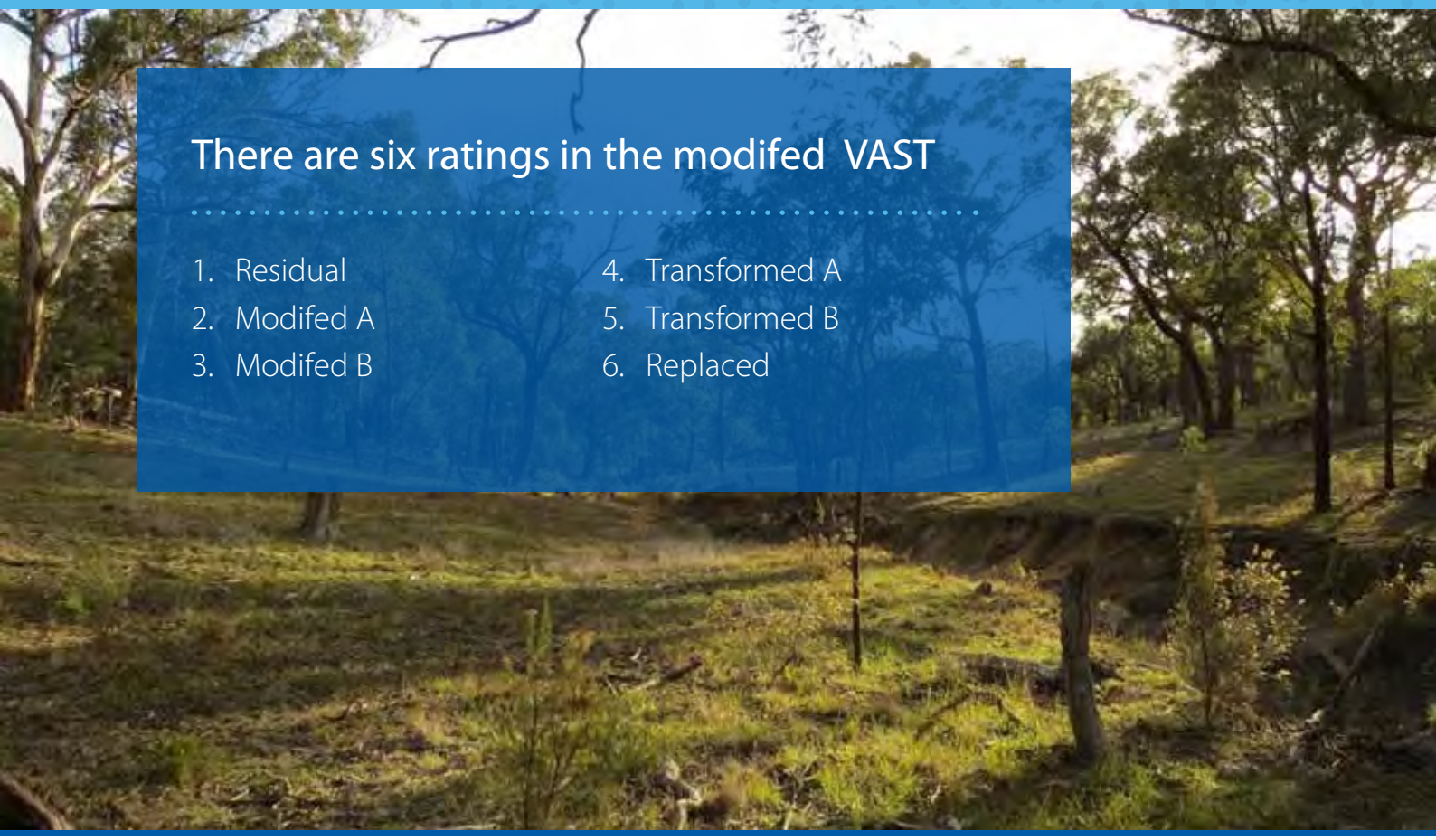
TSR vegetation condition ratings

The size, scale and diversity of the TSR estate necessitates the use of an efficient field assessment and monitoring methodology such as the RAM. The method needs to be robust and flexible enough to ensure that vegetation condition can be accurately identified across a range of habitats. Another important factor was the diversity of skills and capacity of the end users involved in assessing conservation values.

With these factors in mind a modified Vegetation Assets, States, and Transitions (VAST) model was developed, to assist with vegetation condition assessments. This method was developed and trialled in a large-scale habitat restoration project. ***Enriching biodiversity in the NSW Riverina Bioregion by managing the TSR Network for nature conservation - A large scale habitat restoration project (2017)***

The modified VAST

The vegetation condition classification for the above project was based on the VAST model (Thackway and Lesslie, 2006). The modified VAST was chosen because it summarises the degree of change that has occurred to native vegetation relative to its pre-European condition. It is a useful model for land managers because it also incorporates an estimate of the regenerative capacity of modified native vegetation.



There are six ratings in the modifed VAST

1. Residual
2. Modifed A
3. Modifed B
4. Transformed A
5. Transformed B
6. Replaced

Table 1 presents Modified VAST ratings by vegetation condition (Part C of RAM), cover, regeneration potential, vegetation layers present, groundlayer character and overall attributes.

Table 1 Modifed V AST vegetation condition

Vegetation cover	Regeneration potential	Trees and shrubs	Ground layer	Attributes
Vegetation condition rating: High quality				
RESIDUAL Native vegetation community near natural	Excellent potential for natural regeneration	All vegetation layers (stratum) present	Ground layer has high species diversity	Very rare, only small fragments remain
MODIFIED A Native vegetation community intact	Good potential for natural regeneration	Most vegetation layers present	Ground layer has mostly high species diversity	Best examples of local native vegetation Few weeds are present
MODIFIED B Native vegetation community mostly intact	Reasonable potential for natural regeneration	Overstorey vegetation present	Ground layer has low species diversity	Good examples of local native vegetation Weeds <50% and mostly annual pasture grasses and herbaceous weeds
Vegetation condition rating: Moderate quality				
TRANSFORMED A Native vegetation community significantly altered	Some potential for natural regeneration	Overstorey vegetation mostly present	Ground layer has low species diversity	Moderate examples of local native vegetation Weeds >50% of groundlayer
TRANSFORMED B Native vegetation community significantly altered	Little potential for natural regeneration	Dominant overstorey patchy	Ground layer has few native species Most groundlayer species are absent	Poor examples of local native vegetation Groundlayer dominated by weeds
Vegetation condition rating: Low quality				
REPLACED Native vegetation replaced	No potential for natural regeneration	Natural vegetation layers absent	Native species absent-sparse	Native species absent or sparse Groundlayer dominated by weeds

Notes:

- *The modified VAST ratings have a direct link with the vegetation condition scores in Part C of the RAM. Refer to Table 4 of the RAM Training Package and Guidelines for more detail, and*
- *The modified VAST is a best fit model and therefore consideration of the overall characteristics of a TSR when rating the reserve in the field is essential.*

Managing TSRs for maintenance of conservation values

The Plan of Management provides the guiding principles for TSR management to inspire others in public land management by setting the new standard.

Further, the Plan of Management states that Local Land Services will aim to manage TSRs to advance the contribution that TSRs make to biodiversity conservation at various scales by applying prescribed management principles.

Maintaining conservation values of TSRs

Maintaining conservation values for TSRs means maintaining the vegetation condition of TSRs over time.

The degree of resourcing required to maintain the vegetation condition of a TSR varies according to, amongst other things, its existing condition.

As a general rule, TSRs with very good vegetation condition need very little management input to maintain this state. A further general rule is that the condition state of a TSR cannot be moved up more than to the next level, irrespective of management input, and in fact, this improvement may be a process that takes decades to achieve.

Table 1 explains the modified VAST ratings and the characteristics relevant for each condition state provides a simple framework for management of TSRs.

TSRs of high quality vegetation condition (Residual and Modified A and B)

Mostly have good regeneration potential, most vegetation layers present and a relatively natural groundlayer with few exotic grasses, herbaceous weeds or woody weeds.

To maintain condition:

- Periodic grazing only needs to occur to control exotic annual grasses and palatable herbaceous weeds that grow in response to seasonal rain, and
- Regular, occasional inspections to identify and treat potential invasive pests and weeds or other potential impacts which can be more easily controlled at this stage.

Notes:

1. *TSRs rated Modified B may require more grazing pressure in seasons when exotic annual grasses are more prolific to control their biomass and seeding. In these cases, short term grazing permits may be most suitable.*
2. *In both treed and shrubland habitats some regeneration of the main overstorey species is necessary for maintenance of vegetation condition.*
3. *On TSRs where invasive plants exist for example woody weeds and vines, maintenance of condition requires some level of active control to limit spread.*

TSRs of moderate quality vegetation condition (Modified A and B)

The native vegetation community is significantly altered, there is little or no potential for natural regeneration under current management, the native ground layer has low native species diversity and exotic plants cover most of the site.

To maintain condition:

- Regular seasonal grazing is required to reduce exotics and enhance native species as a cessation of grazing can lead to an increase in the exotic groundlayer biomass. As well as being a potential fire hazard the exotic biomass often suppresses the potential for natural regeneration to occur.
- Weeds tend to be more prolific, in part because there is less native perennial grass which competes with exotic plants. In many cases many of these weed populations increase without active control.

TSRs of low quality vegetation condition (Replaced)

The natural vegetation is more or less replaced with exotic plants dominating the ground layer, few if any remnant trees and little chance of natural regeneration.

Regarding maintaining condition – these sites have little or no environmental value, although may be important for biosecurity or connectivity purposes.

Managing TSRs for improvement of conservation values

Improving the conservation values of TSRs means both maintaining the overall vegetation condition of TSRs and focussing management activities on improving aspects of the vegetation condition. An example would be increasing natural regeneration, reducing exotic groundcover abundance or replanting missing components of the vegetation.

Land management actions to maintain or enhance the condition of TSRs fall into two main categories:

1. enhancement of existing management practices
2. application of new management practices.

Enhancement of existing management practices includes altering grazing regimes and concentrating weed and pest control activities in parts of reserves where new management practices occur. Altering grazing regimes aimed to increase grazing pressure on exotic annual grasses, and reduce pressure on preferred native perennial grasses and shrubs. Grazing changes may involve fencing - including removal, subdivision, erecting stockyards or improving water points.

New management practices may include revegetation by direct seeding, environmental weed control and pest animal control aimed at species predating seedlings and limiting small woodland birds.

It is important to note that the most intact high quality TSRs, that is Residual and Modified A rated reserves, have very little need or scope to improve and maintenance of these sites should be the objective. As a result, most vegetation condition improvement is likely to occur on TSRs rated at the low end of high quality, Modified B or in the moderate quality range, Transformed A and B.

TSRs of high (Modified B) quality vegetation condition

Most have natural regeneration potential, vegetation layers missing and more than 50 per cent natural groundlayer with some exotic grasses, herbaceous weeds or woody weeds present.

Improving condition:

The aim should be to try and move the condition from Modified B to A over time. This includes activities like:

- annual seasonal grazing to control exotic annual grasses and herbaceous weeds
- active revegetation such as direct seeding of missing palatable shrubs and trees
- targeted and timely weed and pest animal control.

TSRs of moderate (Transformed A and B) quality vegetation condition

The native vegetation community is significantly altered, there is low potential for natural regeneration, the native ground layer has low native species diversity and exotic plants cover most of the site.

Improving condition:

- Regular seasonal grazing using travelling stock and short-term grazing permits is can be used to reduce exotics and enhance native species. The cessation of grazing on TSRs rarely leads to condition improvement because of the exotic ground layer biomass. Further this can increase the potential fire hazard and often suppresses the potential for natural regeneration to occur. Note however that ecologically targeted burning may have a role to play. Improvement through grazing management is often opportunistic and long term and reacting to seasonal favourable seasonal conditions. Examples include harnessing tree, shrub and preferred native grass natural regeneration events by excluding grazing to allow vulnerable seedlings to grow.
- Weeds tend to be more prolific, in part because there is less native perennial grass which competes with exotic plants. In many cases many of these weed populations increase without active control. As mentioned above, allowing perennial native grasses to flower, seed and regenerate can reduce the available open ground for exotic species to flourish in.

TSRs of low quality vegetation condition

The natural vegetation is more or less replaced with exotic plants dominating the ground layer, few if any remnant trees and little chance of natural regeneration.

Maintaining condition:

- These sites have little or no environmental value, although may be important for biosecurity or connectivity purposes.

The Plan of Management identifies five TSR categories based on uses and values:

Category	Description
Category 1	TSRs that are only used for travelling stock or emergency management and biosecurity purposes. These sites have not other important uses or values.
Category 2	TSRs that are used for travelling stock, emergency management or biosecurity purposes, but they are also important and used for other reasons, e.g. biodiversity conservation, First Nations Peoples' cultural heritage or recreational purposes.
Category 3	TSRs that are rarely, if ever used for travelling stock or emergency management, but are important, valued and used for other reasons such as biodiversity conservation, First Nations Peoples' heritage or recreation. These TSRs are not Stock Watering Places.
Category 4	TSRs in the Western Division only, that are rarely used, if ever used for travelling stock or emergency management, but are important, valued and used for other reasons such as biodiversity conservation or First Nations Peoples' heritage. These TSRs are Stock Watering Places.
Category 5	TSRs that are no longer used or valued for any of the above reasons.

Table 2 illustrates the preferred methods of grazing for conservation values and the suitable TSR management category.

Table 2 Preferred grazing methods on TSRs for conservation

Vegetation condition Part C of RAM	Modified VAST condition State	Appropriate TSR use category	Grazing method		
			Exclude*	Travelling Stock	Grazing Permits
High	Residual	3 and 5	✓		
	Modified A	1,2 and 3	✓	✓	
	Modified B	1,2,3 and 4		✓	✓
Moderate	Transformed A	1,2,3 and 4		✓	✓
	Transformed B	1,2,3 and 4		✓	✓
Low	Replaced	1,2,3 and 4		✓	✓

* Exclude unless historic management includes regular grazing.

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Thackway, R. and Lesslie, R. 2006. Reporting vegetation condition using the Vegetation Assets, States and Transitions (VAST) framework. Volume 7, Issue 1 Pages 53–62. Ecological Management and Restoration. Blackwell Publishing Asia Pty Ltd

Useful websites:

- www.dpi.nsw.gov.au/agriculture/pastures-and-rangelands/native-pastures/what-are-c3-and-c4-native-grass
- www.mla.com.au/research-and-development/Grazing-pasture-management/native-pasture/

Part 2

Best environmental management practice of key activities occurring on TSRs

The NSW Travelling Stock Reserves Plan of Management lists the following uses of TSRs:

- Stock use including grazing
- Biodiversity conservation including native seed collection
- Aboriginal cultural heritage
- Historical significance
- Recreation
- Emergency management
- Other productive uses, including apiary.

The above uses, along with the below form the basis for the subsequent BeMP chapters:

- Weeds and pests
- Soil disturbances
- Revegetation on TSRs
- Due diligence.

Grazing

Grazing has the potential to provide environmental benefits on TSRs based on the existing vegetation condition of the TSR. In particular the key natural value is the groundlayer or sward condition in grassy environments. A basic understanding of native grasses and their management on TSRs for conservation values is essential to implement grazing on TSRs.

One of the main assets that TSRs in a good condition retain is their native grass layer which is often more intact than the surrounding agricultural land. The advantages of having a healthy native grass sward include:

- Providing year-round groundcover which minimizes weed incursions and erosion
- Providing the ability for active plant growth, except in the coldest weather, in response to rainfall
- The tussock formation of perennial native grass provides an ideal micro-habitat, with open patches suitable for many wildlife for example ground feeding birds and non-grassy plants such as trees, shrubs and wildflowers to grow and regenerate
- Comprising and storing large amounts of carbon underground
- Requires little or no input to maintain condition

Grazing TSRs for conservation values

The main management tool for managing vegetation on most TSRs is grazing. Many TSRs on the inland side of the divide still occur along major travelling stock routes and have remained subject to regular grazing for over 100 years (refer to Figure 1). On TSRs where travelling stock travel is not used or the reserves are isolated, grazing often occurs under a short or long-term grazing permit.

Most TSRs grow abundant grass following good rainfall because they are often found on fertile soils. If such rain falls in the cooler times of the year exotic pasture grasses (such as Barley, Rye and Brome grasses) will be prolific, whereas if the rain falls in the warmer months perennial native grasses mostly dominate.

Generally, recommended grazing regimes seek to favour the preferred native perennial species by limiting grazing at certain times and pressure the exotic annual species by promoting grazing when they are abundant. Given the uncertain nature of travelling stock, where stock is most available when feed is limited on private lands, it is difficult to have the ideal stock numbers present at the most beneficial time; however, this is a long-term endeavour and an understanding of each TSR's current sward condition can allow grazing to be directed into achieving the best outcome possible.

Note: The information provided is based on current literature and field experience and is intended as guidance requiring adjustment to suit local conditions by reserve managers.

Why Graze for environmental purposes?

Grazing can be used to control palatable exotic plants, reduce the quantity or manipulate the composition of the sward resulting in healthier native woodlands and grasslands while potentially providing a productive benefit.

When not to graze for environmental purposes?

- When the TSR is in good condition without the need to control grass.
- When problem grasses are not green as they will be less palatable and livestock will eat preferred native species giving exotic species an advantage. If perennial native grass growth is abundant following good warm-season rains some grazing is unlikely to be harmful.
- When grazing sensitive preferred species are setting seed and flowering.
- When invasive weeds such as St John's Wort and Chilean Needle Grass are likely to get an advantage by germinating in open ground.
- When the site is very dry and susceptible to degradation or very wet and prone to pugging.
- After natural regeneration events occur including following fire and flood when seedlings are most susceptible to grazing.

Note: This BeMP is relevant for vegetation formations with a grassy groundlayer or palatable shrublands for example, Chenopod shrublands because other formations are not generally grazed. The grazing of some coastal habitats such as coastal wetlands is not well understood and local expertise should be sought where possible when developing management plans.

Rules of thumb to consider to minimise environmental impacts when grazing TSRs

- TSRs differ greatly depending on their management history and location.
- Annual variation occurs at different TSRs subject to the season, rainfall and temperatures.
- The best guide to management is the current status of a target species (is it germinating, growing, flowering or seeding) and the abundance of the exotic and native grass sward. The target species is usually the preferred palatable native grass and is determined by sward inspection.
- It is preferred to graze with more animals for a shorter time rather than less animals for a longer time. This reduces grazing selectivity and allows longer rest periods for desired species to recover.
- Minimise grazing when the preferred native (target) species are setting seed. Refer to suggested handbooks and guides within the regional RAM tool kit to assist with species identification and understanding their lifecycle characteristics for example flowering times.
- Identify and become familiar with a native species to use as an indicator to determine when to remove stock.
- Exclude fertilizer use as it increases exotic grasses and weeds and decreases native species.
- Avoid feeding stock in sites being managed to improve native vegetation condition as stock may select native pasture over dry feed which has been introduced. Dry feed may also may introduce weeds to the site.
- Maintain average sward height of native grasses (using most common palatable species present on the TSR such as Wallaby Grass, Curly Windmill Grass) above the height that enables native tussocks to rebound when conditions improve.
- In sites with high variability in vegetation condition manage the site for the best condition parts unless the paddock can be sub-divided.
- Use the type of stock most appropriate to the desired outcome.
- Where invasive weeds are present such as St John's Wort, Coolatai and Chilean Needle Grass, carefully consider grazing because these weeds are likely to spread once the perennial grass sward is opened up by grazing.

Understanding grasses and grazing

Most native grasses retained on TSRs are perennial forming tussocks that grow actively from the base. They include cool season C3 and warm season C4 grass types. For further deail visit: www.dpi.nsw.gov.au/agriculture/pastures-and-rangelands/native-pastures/what-are-c3-and-c4-native-grass.

Healthy native grass swards on TSRs can have 20+ species present and therefore tend to be very dynamic, varying markedly in composition over time depending mainly on the season rainfall and grazing pressure, heavy sustained grazing may reduce more palatable species. This high species diversity affords TSRs a lot of resilience against the vagaries of climate such as drought, floods and fire as each grass has slightly different requirements.

Research has shown that with low grazing pressure (including periodic intense grazing with long spell periods) native pastures are mostly dominated by larger perennial tussock grasses, with smaller grasses and forbs (herbaceous flowering plant other than a grass) growing between tussocks.

With consistent heavy grazing over time the taller palatable grasses and forbs are gradually replaced by more tolerant grasses such as exotic annuals and low growing native species. In some cases, less palatable native grasses such as some wire *Aristida* and spear *Austrostipa* grasses proliferate. Heavy grazing will favour invasive grass weeds such as Coolatai, Chilean Needlegrass and African Lovegrass.

Much of the damage is done to large-medium perennial tussock grasses from heavy grazing which occurs during their growing season because they are not able to change their growth habit. Whereas short-growing grasses with small tussocks or stolons (runners along the ground) are favoured when grazing pressure increases A large proportion of this latter type are exotic annual grasses which set seed rapidly and die after one season.

During cold periods including frosts native grasses become dormant and lose their nutritional value to livestock. The C3 native grasses do not start growing again until warmer temperatures return in spring. Meanwhile exotic annual C3 grasses and legumes grow during cold periods and can proliferate in spring potentially dominating the sward. This is most likely to occur if the overall native grass cover is low. These are the periods when travelling stock or short-term grazing can have a positive effect on sward condition in TSRs.

The Meat and Livestock Australia (MLA) website https://www.mla.com.au/research-and-development/Grazing-pasture-management/native-pasture/ has some excellent advisory notes on grazing native pastures including for temperate native grassy systems "… *defer grazing when native grass seed heads begin to appear in late spring. A rest will increase seed production in native grasses, as well as replenish plant energy reserves.*"

Native grass nutrition varies markedly between species and the growth stage of the plant; however, many species have high grazing value at times. For example, at a native pastures workshop for landholders run by Riverina Local Land Services at Tubbo station earlier in 2017, assessment of the sward in a large paddock with hundreds of nursing ewes showed that both sheep and lambs were grazing almost exclusively on Wallaby Grass *Austrodanthonia spp.*

This preference for a native grass species occurred even though there was abundant clover, medic and Rye Grass present in the pasture that is, highly nutritious and palatable alternatives. These observations stimulated much discussion and interest by the farmers present to research native pasture and its management on their own properties as an alternative to the current practices of relying on exotic pastures only. This example is likely to be relevant for much of the wheat-sheep belt of NSW.

Further information is available regarding native grass species identification and nutritional values from guides produced by Local Land Services, MLA and local experts.

Grazing management tips to promote healthy native grass sward

- Aim to maintain or increase cover of large and medium native tussock grasses across roughly two thirds of the TSR.
- Aim to maintain groundcover of 60-70 per cent throughout the year.
- Where possible, graze TSRs when exotic annuals are actively growing.
- Spell TSRs when preferred native grasses flowering and seeding. This often means deferring grazing for 6–8 weeks after spring break to allow native grasses to grow and increase their competitiveness. This also protects native grass seedlings.

Figure 2: Regularly checking sward condition is vital to understand grazing effects

Grazing TSRs with varying vegetation condition for conservation

The chapter, TSR vegetation condition ratings, described the modified VAST condition state which was developed for the RAM. The grazing regimes recommended are reflective of the current condition of the vegetation and what the land manager is trying to achieve.

Note: this general advice is provided to assist in making on ground grazing management decisions, applied with an understanding of the current ground layer vegetation condition of the site, informed by an inspection by the reserve manager.

Grazing high quality vegetation condition (Residual or Modified A) TRSs

TSRs in this condition state are often the best examples of local native vegetation in a district and in the case of Residual state sites are very rare, with only small fragments remaining. Usually their grazing history is one of only periodic grazing by travelling stock and long spell periods, often because the TSR lacked reliable water or was not along a regularly used stock route.

The main objective of management on these TSRs is to maintain their condition and therefore maintenance of their current/historic grazing regime is preferred. However periodic very short-term grazing following very wet seasons may help maintain sward quality.

Note: high quality natural grasslands and chenopod shrublands with a history of regular grazing may degrade without maintenance of similar or existing grazing practice.

Grazing high quality vegetation condition (Modified B) TSRs

TSRs in Modified B condition state are relatively common and are good examples of local native vegetation. They generally have a grassy character with native species most common and mostly annual pasture grasses and herbaceous weeds being greater than 50 per cent cover.

The main objective of management on these TSRs is to maintain their condition and if resources are available to move these reserves towards Modified A condition. Maintenance mostly means maintaining current practices for example periodic grazing through occasional travelling stock to control grass biomass and regular weed control. More constant stock grazing is likely to lead to degradation of the vegetation condition state, unless carefully managed to allow timely spell periods, as grazing sensitive plants, such as tall palatable native grasses, some tree and shrub regeneration is supressed.

Improving the condition state usually involves increasing the regeneration of preferred trees, shrubs or grasses and often requires implementing specific grazing regimes. Infrastructure investment (such as erection of holding yards, temporary sub-division fencing and water point improvement) is often needed to implement enhanced grazing regimes.

Grazing moderate quality vegetation condition (Transformed A) TSRs

TSRs in Transformed A condition state are relatively common and are moderate examples of local native vegetation with exotic grasses and herbaceous weeds mostly more than 50 per cent of groundlayer.

TSRs in this condition are prone to increasing exotic plant problems because often the grazing management that led to its weediness favoured exotic plant growth. Regular heavy grazing or more constant grazing, frequently leads to a lack of spelling of the TSR. This is particularly important during the critical early summer and late autumn periods when the flowering and settings of seed of the preferred palatable native grasses occurs.

Further, the total removal of grazing from these TSRs often leads to an increase in exotic annual grass growth that supresses perennial native grass germination and produces an increased fire hazard.

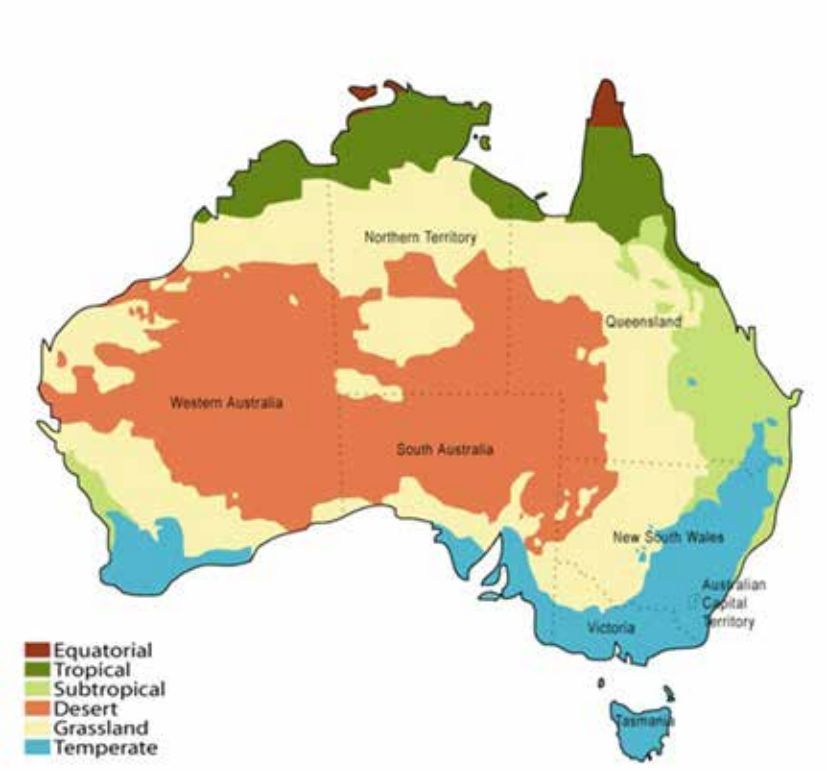


Figure 3: Simplified map of Australia's climate zones

The preferred grazing regime for grassland and temperate parts of NSW (refer to Figure 3) is to have grazing during the active growing period of the exotic annual grasses, particularly winter – spring and spelling or reducing the grazing pressure when preferred native grasses flower and set seed. Note the cool season grazing scenario above is based on their being adequate seasonal rainfall to stimulate grass growth and is less suited to sub-tropical areas of NSW.

Note: if tree or shrub regeneration is desired, TSRs or portions of the TSR should be protected by excluding grazing from once the seedlings are detected until they are robust enough to withstand grazing. Some infrastructure investment for example the erection of holding yards or temporary sub-division fencing is often needed to protect tree or shrub regeneration.

Grazing moderate quality vegetation condition (Transformed B) TSRs

TSRs in Transformed B condition state are poor examples of local native vegetation with their groundlayer dominated by weeds.

TSRs in this condition usually have little or no potential for natural regeneration and require significant and sustained investment to improve.

The grazing management with respect to conservation values is of low priority.

Grazing low quality vegetation condition (Replaced) TSRs

These TSRs are of little conservation value and grazing for this purpose is not recommended, but other interventions may be desirable in some cases.

Apiary

The practice of apiary has been well established with between 2,000-3,000 apiary sites established on TSRs.

The NSW commercial bee-keeper relies heavily on the flowering resources of native vegetation. Due to varying flowering seasons of most eucalyptus varies from year to year across a given geographic area, each beekeeping business requires access to a network of sites with a range of floral species represented. The NSW commercial beekeeper is nomadic, with movement dependent on what is in flower in any particular year, there is not an annual pattern in place.

With respect to managing apiary sites in an environmental conservation framework the New South Wales Apiarists' Association position paper "Apiary sites on public land" outlines national best practice guidelines for beekeeping in the Australian environment. The goal of these guidelines is to minimise any impact of their activities on the greater environment.

The 19 elements identified to achieve this goal are:

1. Respect for heritage and areas of interest to indigenous Australians.
2. Display warning signs in appropriate places to announce proximity of an apiary to the public.
3. Maintain stocking rates to the floral conditions prevailing. Ensure colonies have adequate stored honey.
4. Ensure that the appropriate authorities have been notified of the arrival and departure of apiaries and they have the beekeeper's address and contact details.
5. Keep the area of the apiary clean and tidy.
6. Ensure appropriate availability of water when required.
7. Incorporate best management practice to reduce the incidence of swarming.
8. Maintain swarm traps in and around apiaries, particularly during the spring period.
9. Prevent the spread of soil pathogens such as phytophthora and weed seeds by vehicle movements.
10. Clean footwear/shoes and vehicles after inspecting potential sites in high risk areas and regularly maintain and service vehicles according to manufacturer's recommendations.
11. No travelling on access tracks where there is a high likelihood of damaging the track.
12. Only the immediate area of the apiary is to be cleaned of combustible vegetation.
13. Only camp on site with approval of the property owner or manager. All presence of the camp site to be removed once the camp is finished with.
14. All fire warnings and restrictions are to be strictly adhered to and local fire codes should be taken into consideration whenever working bee hives.
15. Whenever the opportunity arises, provide information on the value of nectar and pollen producing flora to highlight the value of specific floral species.
16. Locate apiaries with consideration of the general public and livestock movements. Stocking rates in urban areas should be appropriate to the circumstances.
17. Keep records of flowering events.
18. Consider the most energy efficient manner in which the beekeeping operation is conducted.
19. Store, use and dispose of chemicals in the most appropriate manner, according to state, MSDS and label requirements. Keep chemical use to a minimum.

The TSR BeMP recommends adherence to the principle of minimising soil disturbance when maintaining apiary sites consistent with the BeMP on soil disturbance.

For further information visit: www.honeybee.org.au or: www.dpi.nsw.gov.au/animals-and-livestock/bees/policy-framework

Native seed collection

The native seed collection BeMP ensures that seed collection on TSRs is undertaken in a way that minimises the harm to the plants the seed is collected from and that there is sufficient seed remaining for natural recruitment

The collection of native seed for use in growing seedlings for planting or direct seeding is an essential part of revegetation. Most habitats in the main agriculture zones of NSW are lacking species often distinctive with these habitats due to historic clearing and grazing and in many cases their seed store is depleted, meaning that natural regeneration is severely limited. Often, the only way to restore these habitats is through active revegetation involving the collection of appropriate native seed.

Further, as much of the remnant vegetation in agricultural areas is found on TSRs, they are often both the best place to undertake seed collection and the area's most in need of revegetation.

There are many excellent regional revegetation guides which outline the best methods for undertaking native seed collection – refer to local revegetation guides or specialists for your area.

However, there are several key rules that should be followed if possible:

- Avoid unnecessary damage – (for example trampling of understorey plants) minimise the use of vehicles driving over fragile vegetation such as shrubs to collect seed.
- Ensure nesting sites or other animal habitats are not disturbed – observe the shrubs or trees where seed collection is to take place for signs of active nests or roosts and avoid when active.
- Do not remove more seed or plant material than is required – have a clear plan of the amount of seed of any particular species needed to be collected and stick to this amount. Large seeding episodes are often important for natural regeneration, replenishing soil seed stores and for seed eating wildlife like parrots, finches and doves and some invertebrates.
- Do not remove too much of the fruit from any one plant – various guides recommend around 20 per cent of the total.
- Do not take more than 10 per cent of plant material from any one plant (larger seed quantities should be obtained by collecting from more plants) – in some cases such as eucalypt seed collection entails taking branches and leaves of a plant. The retention of most of the plants foliage ensures that the plant remains healthy.
- Avoid bringing weeds into the collection site by practicing good plant hygiene by cleaning under vehicles and collection equipment. This is particularly relevant when moving between TSRs when a) they are wet and weed seeds and other material can adhere to the mud under vehicles and on equipment or b) where spiny weed seed is present for example Spiny-burr Grass and seeds stick to tyres.
- Take particular care when collecting from rare or threatened plants — if collecting may put a local population of a species further at risk, it may be better not to collect at all.

For further information visit: www.florabank.org.au/ or www.environment.nsw.gov.au/resources/cpp/SeedCollecting.pdf

Emergency response/refuge for livestock

A recognised use for TSR across the state is as a fodder reserve and refuge for livestock in emergency management situations including flood, fire and disease. During such times there is the potential for significant impacts to the vegetation condition.

The measures recommended below are provided to minimize these impacts, but may not be practical or applicable in all circumstances.

Assuming similar emergency events have likely occurred in the past on given TSRs and that the use is temporary it is likely that the vegetation condition will bounce back quickly with suitable pre-planning.

TSR Selection for emergency response/refuge for livestock

There is little opportunity for impact mitigation once an emergency situation occurs so it is vital for conservation management that pre-planning regarding site selection occurs. The key issues that need to be considered include:

- TSR condition rating – preferably target those TSRs with a Low (Replaced) or Moderate (Transformed A and B) vegetation condition rating for emergency response/refuge for livestock because there is less likelihood of important or fragile habitat being damaged, and
- TSR fencing infrastructure – TSRs with good stock yards and/or holding yards allow stock to be better managed and kept in suitable areas, thereby minimising broader impacts across the reserve.

  In situations where the emergency response/refuge for livestock is on a higher condition rated TSR, High (Modified A or B), having and using stock yards and/or holding yards is vital to minimise stock disturbance impacts.

  Further, stock yards and/or holding yards benefit good biosecurity practice by limiting the opportunity for weed seed spread and for dealing with animal health issues.

Threatened ecological communities and species

The NSW Travelling Stock Reserves Plan of Management states … TSRs provide corridors connecting otherwise isolated patches of habitat providing opportunities for many native plants and animals to survive the rigours of a changing climate. Their location on fertile soils and in over-cleared landscapes means they support threatened species and habitats that have largely been cleared elsewhere, and are therefore at risk of extension and poorly represented in the formal conservation estate. TSRs are also an important source of native seed.

Threatened Ecological Communities management

Many Threatened Ecological Communities (TECs) are well represented on TSRs because the majority of these vegetation communities on fertile soils other than TSRs have been cleared for agriculture. The vegetation condition predicates the appropriate management for TEC.

A large biodiversity conservation project undertaken on TSRs in the Riverina between 2012-16 (Davidson, I. 2017) illustrates the high percentage of Endangered Ecological Communities (EEC) present on TSRs with over 80 per cent of 108 TSRs sampled containing EECs – Figure 4.

Note: EECs are a subset of TECs.

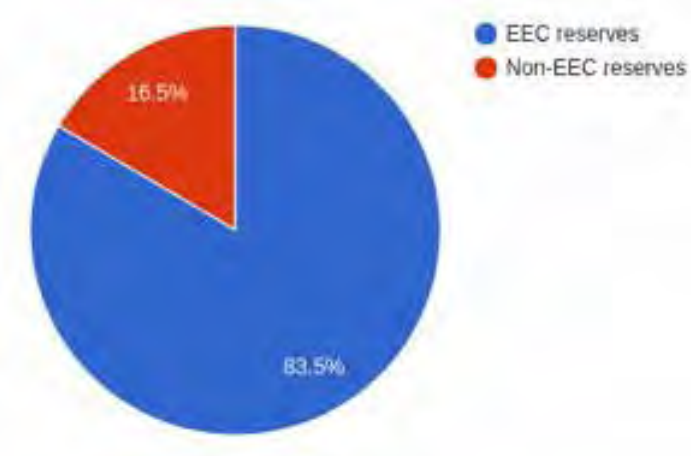


Figure 4: Percentage of EECs found in Riverina TSR sample

Management of TEC in high quality vegetation condition TSRs

Residual or Modified A

The aim of management should be to maintain the condition of these sites with regular monitoring to identify potential disturbances that, if left unchecked, could lead to significant site degradation and where necessary take timely ameliorative action for example control of potential invasive weeds and animal pests.

Modified B

The aim of management should be to improve the condition state of the vegetation by actions including:

- Improving grazing regimes to reduce exotic grasses and promote native grasses via strategic use of short-term grazing permits – refer to grazing BeMP,
- Considering revegetation to recover lost key habitat components of these vegetation communities e.g. direct seeding palatable shrubs and trees – refer to revegetation BeMP,
- Using ecological burning, where suitable knowledge and experience is available, to stimulate germination of desirable plants, and
- Where necessary, install suitable infrastructure such as holding yards, sub-division fencing, new water points to enable ideal management regimes.

Management of TECs in moderate quality vegetation condition TSRs

Transformed A

The aim of management when the native vegetation community is significantly altered and there is little or no natural regeneration and exotic plants cover most of the site should be to achieve natural regeneration of overstorey plants. This is particularly important on those TSRs that have many mature hollow bearing trees and are therefore likely to be important for hollow dependent wildlife.

This is best achieved through the implementation of grazing that reduces the biomass and opens the exotic sward prior to the seed fall of overstorey species and then implementing a lengthy spell period. This provides the potential for seeds to fall into gaps and germinate if there is adequate moisture and in most areas, this means heavy grazing in the cooler months and spelling in summer. As the seeds of some key woody species (eucalypt and callistemon for example) have relatively short viability, the reserve manager can assess whether these species have available seeds by simple observation, prior to implementing the grazing regime recommended above.

In some cases where the sward can be managed accordingly (via suitable temporary fencing) and there is a reasonable native grass component, revegetation through direct seeding or planting may be viable. Direct seeding should use local provenance sources of seed.

Note: when grazing areas with desirable natural regeneration or revegetated seedlings within the sward, ensure that there is adequate green (palatable) grass and ensure the grazing period is short to minimize the risk of damage to the seedlings.

Transformed B

Manage as for Transformed A to promote natural regeneration if the TSR has a particular ecological asset (such as large hollow bearing trees).

Management of TEC in low quality vegetation condition TSRs

Replaced

Management of TSRs with TEC in this condition are a low priority and should only be considered if there is a broader regional strategic reason for doing so, or very specific opportunity to enhance conditions for rare species for example.

Threatened Species management

TSRs are known to provide habitat for many threatened species and their specific requirements are best identified through accessing the state and commonwealth threatened species websites as noted below and/or by contacting regional threatened species experts.

For further information visit www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species or www.environment.gov.au/biodiversity/threatened/species

Threatened species that occur on TSRs can be put into broad categories and the management issues are described below:

Site-managed species

These are threatened plants and animals that can be protected by conservation projects at specific sites. In the case of site-managed species present on a TSR, Local Land Services should liaise with the Office of Environment and Heritage (OEH) regarding site management and resourcing.

Threatened species that are dependent on TSRs

These are often wildlife species that use the extensive local TSR networks for their core habitat because their preferred habitat has been mostly lost elsewhere. Examples from the Riverina include Grey-crowned Babbler and Superb Parrots. Where these species occur, adherence to the BeMPs is generally consistent with habitat conservation for these species.

Endangered or critically endangered wildlife that use TSRs

These wildlife species often use the broader landscape but rely upon TSRs sometimes to meet their habitat needs. Examples include Regent Honeyeaters and Swift Parrots which seek out the nectar rich flowering resources from preferred trees across NSW. Maintaining the health of the high-moderate quality TSRs through application of BeMPs is ideal. In respect to the management of specific TSRs seek advice from OEH and local experts.

Another group of endangered wildlife are those that are reliant on particular elements of habitat at a local scale for their conservation. For example, ground nesting birds like Plains Wanderer and Bush Stone Curlew are dependent on suitable grassy habitat being managed, mainly through grazing, to ensure that the sward composition is neither too dense or tall and that local fox control is regularly undertaken to reduce the incidence of predation of young. Advice on the specific management is available by contacting the relevant OEH officer or local expert.

Threatened plants that are locally common or sparsely scattered across a large range

Many of these species have been impacted historically by grazing which has often reduced natural recruitment, leading to their current threatened status. These species should be the target species for management and monitoring. Refer to grazing BeMP and TSR Monitoring and Audit Strategy.

Revegetation on TSRs

Revegetation, in the context of the BeMP for TSRs, is the re-introducing by either planting from seedstock grown for the purpose, or re-seeding of plants formerly found on the site.

Revegetation is differentiated from natural regeneration by the need to actively re-introduce plants whereas natural regeneration is the germination and growth of plants from existing plants or seedbed.

It is imperative that suitable species are used to ensure that:

- plants used are endemic so they can survive and thrive by withstanding local climate and soil
- they don't become invasive weeds
- provide suitable foraging, nesting and roosting habitat for local wildlife.

Advice on revegetation is available by contacting your nearest Local Land Services office, local practitioners, NGOs like Greening Australia and referring to the many excellent revegetation guides available, however when attempting large scale revegetation, direct seeding using large volumes of locally sourced tree and shrub seed of multiple endemic species with good pre and post weed control is required for success.

Revegetation in high quality vegetation condition TSRs

Residual or Modified A

The only revegetation considered is the re-introduction of rare or locally uncommon species mainly for specific conservation purposes because these high value sites are usually ecologically healthy.

Modified B

The main thrust of revegetation in TSRs in this condition is to restore ecological function. For example, the large-scale loss of palatable shrubs throughout much of temperate Australia is an artefact of past grazing, because the parent stock is relatively short lived (compared with most trees), their seedlings are palatable and many species did not successfully regenerate for decades, meaning that many shrub species are now only found scattered in relatively small populations. This has reduced the structural diversity important for many wildlife species, especially small woodland birds which are known to be important for maintaining tree heath in woodlands. The revegetation recommended is primarily aimed at replenishing the seed banks throughout the TSRs so that they can self-regenerate in the future.

Revegetation in moderate quality vegetation condition TSRs

Transformed A

Generally TSRs in this condition state will be managed for natural regeneration through grazing management. In some cases where the sward can be managed well with temporary fencing and there is a reasonable native grass component, revegetation through direct seeding or planting may be viable. Revegetation in these cases should aim to increase the structural diversity by introducing more layers of vegetation.

Transformed B

Revegetation is not usually a priority on TSRs in this condition state.

Revegetation in low quality vegetation condition TSRs

Replaced

Revegetation is not usually a priority on TSRs in this condition state.

Weed control

Local Land Services is responsible for management of the TSR network has 11 statutory Regional Weed Committees made up of Local Control Authorities, public and private landholders and community members and support regional planning under the *Biosecurity Act*.

The goals of the Regional Strategic Weed Management Plans are that:

1. Responsibility for weed biosecurity is shared by all people of the region.
2. Weed biosecurity supports profitable, productive and sustainable primary industries.
3. Weed biosecurity supports healthy, diverse and connected natural environments.
4. Weed biosecurity is supported by coordinated, collaborative and innovative leadership.

The outcomes expected to be achieved by these goals and more specific and measurable objectives and strategies are outlined in the regionally specific plans.

This BeMP provides general advice relevant to conservation on TSRs and should be considered in conjunction with the appropriate Regional Strategic Weed Management Plan.

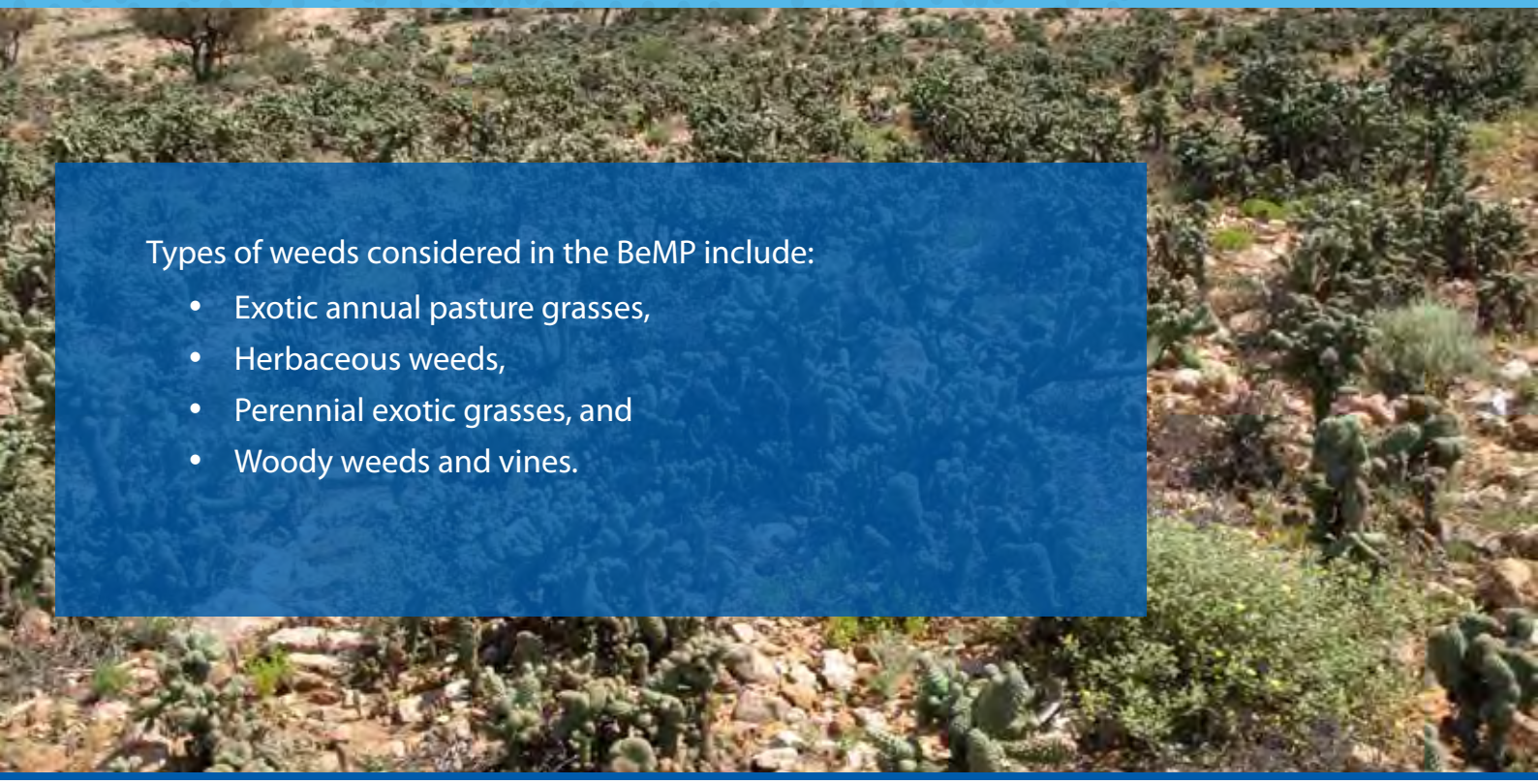
Priority for weed control on TSRs should be aimed at the systematic control of environmental weeds that if left unchecked could degrade the habitat qualities of many TSRs.

Failure to control some woody weeds and vines can lead to significant impacts on an individual TSR including:

- Loss of overall vegetation health and condition rating as habitat is crowded and suppressed by exotic species, and
- Lowering of priority for works because the cost of control may become prohibitive in terms of resources and time.

Based on previous work (Davidson, 2017. Enriching biodiversity in the NSW Riverina Bioregion by managing the TSR Network for nature conservation - A large scale habitat restoration project.), all TSRs assessed in that region had some level of weediness from exotic annual grass and this is likely to be the case on most TSRs.

A further source of environmental weeds on TSRs comes from the dumping of garden waste which should be discouraged wherever possible.



Types of weeds considered in the BeMP include:

- Exotic annual pasture grasses,
- Herbaceous weeds,
- Perennial exotic grasses, and
- Woody weeds and vines.

Weed control in high vegetation quality condition TSRs

Residual or Modified A

Minimal weed control is likely to be required because these high value sites are usually ecologically healthy. The main management activity is regular monitoring to identify potential invasive weed incursions (especially woody weeds and creepers) that, if left unchecked, may lead to significant site degradation and where necessary take timely ameliorative action.

Modified B

As part of any TSR management plan, the key weeds should be identified and where they are likely to thrive if left unchecked, a systematic control strategy should be developed and implemented. This is particularly relevant for herbaceous weeds, perennial exotic grasses and woody weeds and vines and may involve adjoining stock routes and roadsides.

On TSRs where revegetation is proposed, exotic annual pasture grasses need active treatment along direct seeding lines to prevent the suppression of shrub germination.

Weed control in moderate vegetation quality condition TSRs

Transformed A

As part of any TSR management plan the key weeds should be identified and where they are likely to thrive if left unchecked a systematic control strategy should be developed and implemented. This is particularly relevant for herbaceous weeds, perennial exotic grasses and woody weeds and vines and may involve adjoining stock routes and roadsides.

On TSRs where revegetation is proposed, exotic annual pasture grasses need active treatment along direct seeding lines to prevent the suppression of shrub germination.

Transformed B

Unless part of a specific regional project to improve the TSR, manage weeds to minimise spread and otherwise meet the obligations outlined in the relevant Regional Strategic Weed Management Plan.

Weed control in low vegetation quality condition TSRs

Replaced

Manage as per the Regional Strategic Weed Management Plan.

Pest animal control

Local Land Services provide advice and assistance in eradicating declared pest species and work with private and government stakeholders to develop vertebrate pest management plans and cooperative management programs.

Regional Strategic Pest Animal Management Plans have been developed

Species currently declared pests in NSW are:

- Wild rabbits
- Wild dogs
- Feral pigs
- Foxes (European Red)
- Feral camels (Western Division of NSW only)
- A number of locust species (the Australian Plague, Spur-Throated and Migratory).

Under the *Biosecurity Act 2015* all land managers in NSW, whether on public or private land, have an obligation to control declared pest species on their land.

This BeMP addresses the control of pest animals that threaten the condition state of the vegetation on a TSR or the wildlife that use a TSR. The risk posed by pest animals varies from species to species across the state and therefore the priority for action and the control methods used is best guided by regional Local Land Services staff.

The main pest animals considered are:

- herbivores including rabbits, hares, goats, deer and pigs
- predators include foxes and feral cats
- native species that are listed as part of a Key Threatening Process (KTP). The common native bird the Noisy Miners which is found in many TSRs has had its behaviour of excluding other, mostly smaller, woodlands birds listed as a KTP in NSW and the Commonwealth.

As with most BeMPs the priority for action is usually weighted towards the higher condition rated TSRs, however, it is probably simplest to consider what are the other priorities for management action (e.g. revegetation) or what are the high value assets present on a TSR (e.g. threatened species) when considering pest animal control.

Natural regeneration and/or revegetation

Controlling herbivores is critical during early growth stages of palatable shrubs and trees because they are very susceptible to being damaged or destroyed whilst small, usually for the first year or two. For example, rabbits and hares will selectively browse along seed lines and can wipe out most seedling germination, whilst goats and deer if left unchecked will defoliate most seedlings and denude trees and shrubs below two metres above ground, and pigs can cause havoc with their foraging in wetlands and drainage depressions.

Threatened wildlife

Fox predation is recognised as a major threat to the breeding success of a number of threatened wildlife species including ground nesting birds like Plains Wanderer and Bush Stone Curlew. The on-going survival of these species is (in part) dependent on local fox control being regularly undertaken to reduce the incidence of predation of young.

Advice on the specific management is available by contacting the relevant OEH officer or local expert.

Feral cats threaten the survival of over 100 native species in Australia. They have caused the extinction of some ground-dwelling birds and small to medium-sized mammals. They are a major cause of decline for many land-based endangered animals such as the bilby, bandicoot, bettong and numbat.

Many native animals will have their survival improved if feral cat control occurs. Feral cat control is best undertaken in a TSR when a species of concern e.g. ground feeding parrots are known in a reserve with a feral cat(s) present.

For further information visit: www.environment.gov.au/biodiversity/invasive-species/feral-animals-australia/feral-cats

Noisy miner control

Many of the woodland TECs are dominated by Noisy Miners and consequently there are few small woodland birds present. This effect has been recognised and listed as a Key Threatening Process (KTP) by both the NSW and Commonwealth Government.

The occurrence of small woodland birds is known to be important for the health of trees and shrubs as they are the major control of plant insect predators in healthy woodlands.

At this stage Noisy Miner control should only be contemplated for high quality TSRs with TECs with the support of local experts and OEH.

Soil disturbance and drainage changes

TSRs are largely uncleared and are often located in the most fertile and cleared parts of the landscape and are therefore vital for supporting high levels of biodiversity and many threatened species and communities.

A major factor in TSR conservation is the relative intact nature of the groundlayer because in most cases they have not been subject to cropping or the addition of fertilizer.

On TSRs dominated by a native groundlayer they are more resilient to degradation from exotic plants and erosion.

Unnecessary or illegal soil disturbance or soil dumping can cause irreparable damage to the native groundlayer, primarily by providing an ideal situation for weed incursion.

Any soil disturbance should be avoided at all costs, particularly on TSRs with a High quality rating a vegetation condition state of Residual, Modified A or Modified B.

Similarly, changes to drainage, mainly by increasing the amount of runoff entering an area can lead to significant degradation to the ground flora by:

- acting as a path for weed seeds
- drowning the existing native vegetation and providing suitable for exotic plants to thrive
- changing the soil chemistry
- initiating soil erosion.

Examples of damaging practices

Road works stockpiling

Soil disturbance caused by road works stockpiling in inappropriate locations can cause significant damage to a number of TSRs, especially linear routes.

There is little opportunity for impact mitigation once a stockpile has been established so it is vital for conservation management that pre-planning regarding site selection occurs.

The key issue that needs to be considered is the TSR condition rating. Preferably, target those (parts of) TSRs with a Low (Replaced) or Moderate (Transformed A and B) vegetation condition rating for road works stockpiling because there is less likelihood of important or fragile habitat being damaged.

Figure 5: Illegal fire break

Figure 6: Excessive road widening

Figure 7: Illegal levees

Ploughing of fire breaks

Soil disturbance caused by the ploughing of firebreaks causes significant damage to a number of TSRs, especially linear routes. These can be a major source of weed invasion, often in otherwise largely weed free reserves and should be kept to a minimum. For example, the ploughing of a large firebreak along a travelling stock reserve can lead to weed seedlings germinating. Where firebreaks are necessary, consider the use of chemical breaks which reduces soil disturbance. The illegal firebreak shown in Figure 5 illustrates the scale and potential these activities can cause.

Widening and relocation of road and tracks

Soil disturbance caused by grading the sides of roads unnecessarily wide or the construction of new roads parallel to existing roads, in particular along lesser used and unsealed roads, can cause significant damage to TSRs and especially linear stock routes, like that shown in Figure 6.

Illegal levees

Illegal levees on floodplains to minimise flooding on private land can lead to vegetation degradtio9n by direct soil disturbance and through re-directing floodwater away from normally flooded habitats, or on normally dry habitats. Several TSRs have been subject to illegal levee construction, like the one above in Figure 7 at an otherwise high quality (Modified B) TSR. This practice should be strongly discouraged.

Aboriginal and European cultural heritage

Before European contact, Australia was criss-crossed by networks of Aboriginal trackways. These trackways connected food and water sources, and were used for travel, ceremonial and trade purposes.

Traditional camping places were often located along these trackways. It is now thought that in many cases, travelling stock routes developed from Aboriginal trackways, as these routes often followed the most accessible routes through the landscape, avoiding natural obstacles and linking water sources.

Many TSRs may have developed by transfer of knowledge from Aboriginal guides and trackers, and workers in the pastoral industry, or by early Europeans observing the physical signs of traditional pathways and adopting them.

TSRs have remained valuable to Aboriginal people since European colonisation. Many Aboriginal people have worked on the routes as drovers or in other roles, linking past and current uses of trackways.

Traditional camping places were also sometimes gazetted as travelling stock reserves. The presence of scarred trees, middens and artefacts on many TSRs are evidence of the traditional spiritual and cultural connections of Aboriginal people with these areas.

Due diligence

The Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales is to assist individuals and organisation to exercise due diligence when carrying out activities that may harm Aboriginal Cultural Heritage and to determine whether they should apply for consent in the form of an Aboriginal Heritage Impact Permit (AHIP).

The *National Parkes and Wildlife Act 1974* (NPW Act) provides that a person who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution for the strict liability offence if they later unknowingly harm an object without an AHIP.

The NPW Act allows for a generic code of practice to explain what due diligence means. Carefully following this code of practice, which is adopted by the National Parks and Wildlife Regulation 2009 (NPW Regulation) made under the NPW Act, would be regarded as 'due diligence'.

This code of practice can be used for all activities across all environments. This code sets out the reasonable and practicable steps which individuals and organisations need to take in order to:

1. identify whether or not Aboriginal objects are, or are likely to be, present in an area
2. determine whether or not their activities are likely to harm Aboriginal objects (if present)
3. determine whether an AHIP application is required. If Aboriginal objects are present or likely to be present and an activity will harm those objects, then an AHIP application will be required.

The Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales can be found at: www.environment.nsw.gov.au/resources/cultureheritage/ddcop/10798ddcop.pdf

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