



Evaluating regional plans in Australian tropical savannas

A guide for planners and reviewers

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Framework Basics

Introduction and purpose

The framework presented in this guide can support regional planners intending to revise or review existing regional natural resource management plans, or in developing new regional plans.

The framework allows planners to ask in a structured way:

- 1) Does this plan consider the critical issues (or criteria) for regional sustainability relevant to northern Australia?
- 2) How comprehensively does this plan address these issues in terms of the technical information applied to these issues?
- 3) In which parts or ‘components’ of the plan are these issues addressed?

The framework is presented in two parts:

- **Framework Basics** – this document - introduces the main parts of the framework – the criteria, plan components and rating scheme - and describes how it may be applied to evaluating regional plans; and,
- **Criteria and application notes** - provides a *detailed* description of each of the regional planning criteria, a rationale for their selection and a set of application notes that point to examples of ‘what to look for’ when applying the criteria.

How the framework was developed

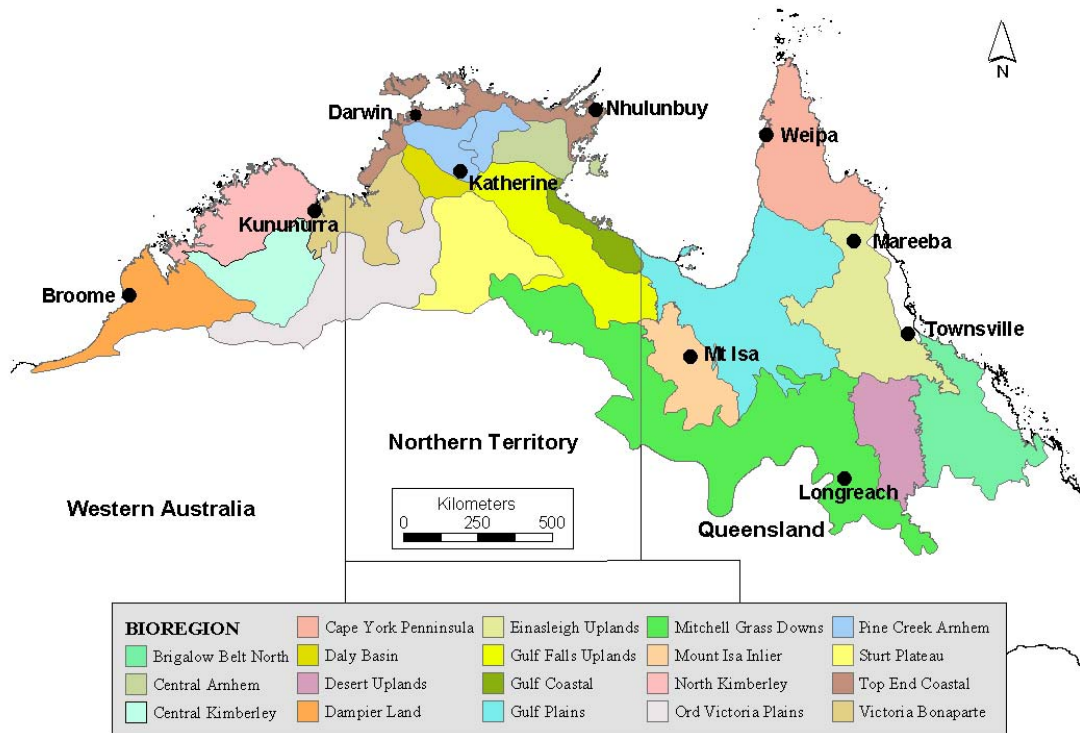
This framework has been developed as a product from a Tropical Savannas CRC project with project partners from the University of Queensland and Department of Natural Resources and Mines (Qld). For a full discussion on the methodology for criteria selection and framework development see the Stage 1 report from this project: *Criteria and methods for evaluating Regional NRM Plans In Tropical Savannas Regions, Stage 1 Project 3.2.1 report, TSCRC.*

Why a northern Australia focused framework?

As a broad generalisation, the tropical savannas exhibit relatively low productivity of soil and pasture resources and high spatial and temporal climatic and resource variability. In contrast to southern Australia, the natural resources of the north are still being developed, land use pressures are in general low and many landscapes are still relatively intact. There are however issues of degradation caused by overgrazing, intensification, fire and pest plants and animals and other pressures.

When evaluating regionally focused plans seeking to address these problems, it is essential then that the evaluation framework reflects or is tailored to an understanding of the regional landscape characteristics in which planners are working. Figure 1 below, shows the bioregions of the tropical savannas.

Figure 1. Bioregions of the Tropical Savannas of Northern Australia



What does the framework actually evaluate?

The framework has been designed to provide both plan developers and plan reviewers a structured approach for evaluating the existing or proposed **technical content** of regional NRM plans in Northern Australia.

To summarise the three key questions stated in the introduction, the framework can be used to evaluate –

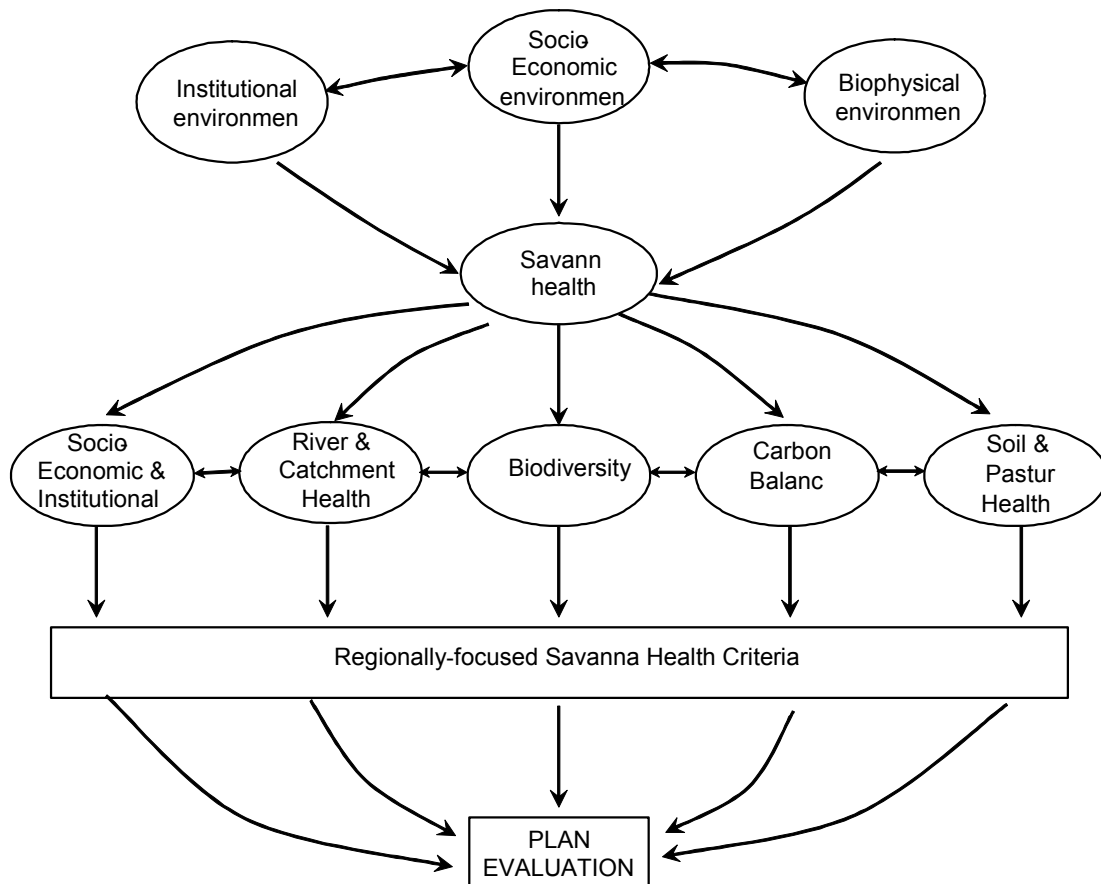
“To what extent are desirable regional planning outcomes (savanna health criteria) reflected in the major plan-making components, and, what is the quality of information being used in these steps?”

Analysing the results of the evaluation may identify:

- key strengths and weaknesses of plans;
- priorities or guidance for further investment,
- key lessons or adaptive management opportunities in plan review.

When several plans in a given region are evaluated using the framework, a picture emerges of the ‘overall’ regional planning effort or focus in terms of the scope and relative strengths and gaps in regional plans. It may also help identify opportunities for linkages or integration with other regional plans on the basis of complimentary or shared monitoring, investment or actions.

Figure 2. Outcome based criteria for regional plans



How to apply the framework

It may be helpful to readers to refer to the framework as presented in **Table 1** while reading through the following section. There are three parts to the framework that need to be applied:

1. Outcomes-based Criteria

Does this plan consider the critical issues (or criteria) for regional sustainability relevant to northern Australia?

There are twenty-four planning outcomes-based criteria (see **Figure 2** and **Table 1**). These have been developed from five broad criteria areas:

- Society, Economy and Institutions
- Biodiversity
- Soil and pasture health.
- Catchment and river health.
- Carbon.

These criteria reflect the generalised, desired planning outcomes for northern Australia savanna regions at the region or landscape scale. They are derived from core threats and issues for these regions and adaptation indicators developed for monitoring condition and trend in these landscapes. They cannot be prescriptive as to plan content but offer the reviewer (and plan developer if used in a more formative way) a structured and explicit approach to evaluating (or designing) the planning documentation. The criteria and application notes of the guide should be consulted for more information on each of the criteria and their application.

2. Plan Components

In which parts or 'components' of the plan are these issues addressed?

Plan components are the important plan 'parts' which represent and document the mechanics of the plan. The five key plan components are:

- Information
- Objectives and Targets
- Options
- Priorities
- Implementation
- Monitoring and review

These plan components have been derived from EMS ISO14001 components as well as the emerging models of planning being currently presented through the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust. Again, these components may be modified to suit the specific plan or may be applied in a best-fit type scenario.

3. Rating scheme

How comprehensively does this plan address these criteria in terms of the technical information applied?

A *descriptive* five point rating scale is used to assess the quality of the information incorporated into the plan for each criteria / component relationship. This rating scheme is presented in Table 2 below.

4. Approach

There are two possible approaches (and probably more) to applying the framework to a plan (See also **Table 1**):

1. Plan reviewers can move methodically through the Outcomes based **criteria**, locating where these criteria are addressed in their plans (which **components**) and then assigning a **rating** to how comprehensively this criteria is addressed using the above rating scheme.

OR

2. Plan reviewers work methodically through the parts (**components**) of their plan – in a best fit type approach using the components presented – identify the **criteria** addressed in each part, and assign a **rating**.

Important issues and limitations

There are a number of important points to consider when using the evaluation framework presented here, including limitations of the approach:

- Importantly, this framework is limited to the *plan* itself – it does not attempt to evaluate the important considerations of *planning process* or the *actual outcomes* of implementing the plan. It is intended as an adaptive management tool for improving the technical content-based development of planning documentation as an important management blueprint for planners and their organisations.
- Where a plan is being designed to meet program-based accreditation criteria, the savanna regions criteria provide a broader issue-based framework within which programmatic criteria can be considered. As such, these criteria complement rather than compete with more specific program requirements such as those required by NAPSWQ or NHT2.
- It is also important to emphasise that the whole set of outcomes-based criteria would rarely be encompassed by a single plan.
- The criteria and application notes of the guide should be consulted for more information on each of the criteria and their application. These notes provide a detailed description (and rationale) for each criteria and present practical examples, case studies and guidance on how the criteria could be represented within a given natural resource management or development plan.
- We suggest (and expect) that regional planners will seek to ground truth or modify the criteria and incorporate more specific regional or program-based requirements. The same can be said for the planning components.

Table 1 Standard' criteria and plan component-based evaluation framework for technical content of regional plans in the tropical savannas

| Key Criteria Areas | Outcomes-based Criteria for Regional Plans (Derived from sustainability attributes for tropical savanna regions. See <i>criteria application notes</i> for guidance in use) | Plan component framework for assessment | | | | | |
|--|--|--|---|--|--|---|--|
| | | 1. Information - Regional profiles, condition and trend, situation analysis | 2. Objectives & Targets - aspirational, resource condition or mgt targets | 3. Options – including impact assessment, feasibility, cost-benefit etc. | 4. Priorities – inputs, processes and tools used | 5. Implementation including actions, investment, agreements etc | Monitoring & Review - including indicators, evaluation and reporting |
| Society, Economy and Institutions | 1. Stakeholders participating effectively in regional planning and decision-making | Apply Rating Scheme (p. 5 Part A) | | ▲ | | | |
| | 2. Regions consider population, employment and infrastructure requirements for regional sustainability | | | | | | |
| | 3. Regions are able to respond positively to external change pressures | | | | | | |
| | 4. Indigenous values are recognised and indigenous cultural heritage is protected | | | | | | |
| | 5. Social and economic impacts are considered and costs of resource management shared equitably | | | | | | |
| | 6. People are actively involved in groups and networks | ▼ | | | | | |
| | 7. On-going learning, skills development and training is supported | | | | | | |
| | 8. Adequate information and technical support available for decision-making | | | | | | |
| | 9. Economic viability of savanna industries is improved at enterprise and industry scales | | | | | | |
| | 10. Institutions are aligned with regional ESD planning and management priorities | | | | | | |
| Catchment and River Health | 11. Soil and water salinity levels are maintained or improved | | | | | | |
| | 12. No leakage from land use to other systems (water quality in streams and lakes is maintained) | | | | | | |
| | 13. Physical structure and environmental flow regimes of streams are maintained | | | | | | |
| | 14. Groundwater levels are maintained | | | | | | |
| Carbon | 15. Above and below ground carbon stocks are maintained | | | | | | |
| | 16. Progress towards a comprehensive, adequate and representative reserve system | | | | | | |
| Biodiversity | 17. Landscape structure and complexity are maintained | | | | | | |
| | 18. Ecosystem diversity is maintained | | | | | | |
| | 19. Species diversity is maintained | | | | | | |
| | 20. Ecosystem integrity is maintained | | | | | | |
| Soil and Pasture Health | 21. Soil condition and health maintained | | | | | | |
| | 22. Pasture condition and health are maintained | | | | | | |
| | 23. Effective resource capture and retention (minimisation of soil, soil nutrient and water loss) | | | | | | |
| | 24. Appropriate fire management regimes are maintained | | | | | | |

Table 2: Descriptive rating scheme for criteria / component relationship

| Assessment Rating | Description |
|---|--|
| <p>Not relevant (code as 1)</p> | <p>Many plans have defined scope and a criterion may be deemed irrelevant. Care needs to be taken in assigning this rating given the commitment of NRM planning to sustainable development and the consideration of social, economic and ecological criteria. Where there is any doubt as to the relevance of a criterion, this rating should not be used.</p> |
| <p>Not included or identified (code as 2)</p> | <p>This rating is for plans where a given criterion for a planning element is not covered in any meaningful way at all. This applies to plans that simply mention an issue in most general terms in overview sections.</p> |
| <p>Identified and described only (code as 3)</p> | <p>This rating applies to criteria that have only been identified as a given criterion for a planning element without addressing it in specific terms that have some concrete local interpretation. There would be little or no analysis.</p> |
| <p>Moderately detailed description with limited analysis (code as 4)</p> | <p>This rating applies to a criterion for a planning element that has been clearly identified and addressed in specific local terms with a moderately detailed description based on desktop data with some analysis.</p> |
| <p>Comprehensive systematic analysis (code as 5)</p> | <p>Detailed description and analysis based on a combination of desktop and field data with analysis based on wide range of data sources</p> |

Criteria and Application Notes

Introduction and purpose

This document is the second part of a guide for regional planners and plan reviewers. The framework presented in this guide has been designed to provide both plan developers and plan reviewers a structured approach for evaluating the existing or proposed **technical content** of regional NRM plans in Northern Australia.

The two parts of the guide are:

- **Framework Basics** – introduces the main parts of the framework – the criteria, plan components and rating scheme - and describes how it may be applied to evaluating regional plans; and,
- **Criteria and application notes** - this document - provides a *detailed* description of each of the regional planning criteria, a rationale for their selection and a set of application notes that point to examples of ‘what to look for’ when applying the criteria.

The framework can be used to evaluate –

“To what extent are desirable regional planning outcomes (criteria) are reflected in the major plan-making components, and, what is the quality of information being used in these steps?”

A word on using the application notes

These application notes can be considered as practical examples or case studies on how the criteria could be represented or addressed within a regional natural resource management plan. They are not intended to be prescriptive as to plan content but offer the reviewer (and the plan developer if used in such a way) a structured and explicit approach to evaluating (or designing) the planning documentation with respect to addressing regional savanna sustainability criteria in the plan.

The source report for this guide is: *Criteria and methods for evaluating Regional NRM Plans In Tropical Savannas Regions, Stage 1 Project 3.2.1 report, TSCRC*. This report contains the relevant rationale, methodology and references for the selection of criteria.

Outcomes-based Criteria for Regional Plans and Application notes

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|---|--|--|---|
| 1 | Stakeholders participating effectively in regional planning and decision-making | <p>Transparent, inclusive and effective processes for stakeholder participation are widely recognised as critical for successful outcomes in regional planning and decision-making. Benefits include improved capacity for adaptive management, improved understanding of resource management problems and solutions amongst stakeholders; alternative information sources and values considered; improved involvement in implementation and reduced conflict.</p> | <ul style="list-style-type: none"> • A profile or overview of communities in the region (including geographical, demographic, cultural, sectoral or industry based); • Sectors, communities and their representatives are sufficiently resourced to be able to participate equitably, stakeholder-specific processes and approaches used when required and constraints to participation are recognised and planned for (e.g. distance, remoteness, financial, cultural etc). • Key stakeholders, participants and contributors to the planning process are identified and recognised in the plan. • The diversity of stakeholder attitudes and values on critical issues are recognised and/or documented; • Communication and consultation planning have been undertaken (e.g. including awareness raising and communication activities about the planning activity); • Evidence of conflict resolution processes, structured negotiation arrangements or clear decision-making processes used or proposed are outlined; • Terms of reference, roles or responsibilities of representative or consultative structures and participants roles generally are clearly defined (e.g. reporting or decision-making requirements); and, • Plans identify performance measures associated with effective stakeholder or sector based participation and broader community engagement including: reviewing priorities, setting goals and targets, developing monitoring frameworks and supporting implementation. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|---|---|---|---|
| 2 | <p>Regions consider population, employment and infrastructure requirements for regional sustainability</p> | <p>What defines a desirable population will differ between regions and stakeholders, however the population structure, employment and infrastructure provision influences economic activity and viability; social cohesion, health and self-sufficiency through family and other social support networks, industry adjustment and perceptions of quality of life. The provision of adequate transport and communications infrastructure has considerable implications for economic activity and social activity (maintenance of social networks, familial ties and access to human, recreational, cultural and educational services).</p> | <ul style="list-style-type: none"> • Planning for regional growth pressures in high in-migration regions, estimating required resources and regional capability to support and manage growth; • Analysis of relevant statistical data sets (ABS, ABARE etc) such as mobility (including youth and indigenous mobility), youth net migration rates and age dependency ratios in terms of trends and spatial distribution for their communities; • Analysis of employment by industry type and employment and under-employment trends; • Where possible population, industry or employment data is concorded (statistically matched) to IBRA, catchment or SLA level for larger regions or relevant primary source data is collected or used (e.g. local social survey information); • Some analysis of industry and community specific profiles is undertaken, and where relevant 'masking' of pastoral / rural communities by adjacent urban or mining-related settlements accounted for; • Community values on population, infrastructure provision and employment opportunities articulated; and, • Existing and proposed regional infrastructure, its condition and location is documented and mapped, infrastructure priorities are identified and impacts of existing and proposed infrastructure on social and landscape health are assessed including cumulative impacts. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|---|--|---|---|
| 3 | Regions are able to respond positively to external change pressures | Savanna regions are highly susceptible to shifting national and global economic, social and political priorities. This means community vitality and industry viability depend on a proactive and positive response by regions to change – that is - adaptability is considered a key element of sustainable habitation in the rangelands. | <ul style="list-style-type: none"> • External change pressures on the region and their contributing factors are identified including emerging relevant international, national and state level policy and planning agendas or relevant market trends or export demand; • Some assessment of regional or sector based sensitivity to change, resource dependency, or present and future resource use/demand trends identified and analysed; • Natural resource condition indicators and monitoring systems are linked to relevant indicators designed to identify and track 'pressures' (e.g. through a Pressure-State-Response type approach); • For key savanna industries such as pastoralism, structural adjustment pressures (and spatial and temporal trends) recognised, analysed or mapped • Land use change is mapped and/or analysed; • Relevant case studies on change management and adaptive management are identified or used in some way; • Internal and external stakeholder values are monitored and considered in planning and decision-making; and, • Specific investments or strategies identified for managing change pressures on the region including capacity building of regional community, planning processes or particular sectors to manage change effectively. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|---|---|---|--|
| 4 | Indigenous values are recognised and cultural heritage is protected. | Recognition and inclusion of indigenous values and aspirations into planning and management is a key attribute of healthy savanna regions. This includes supporting participation and culturally appropriate consultation processes, and integrate, where appropriate, indigenous planning and management activities associated with cultural heritage, traditional ownership and native title. The maintenance and management of cultural heritage linked with community identity, spiritual needs, human health and economic diversification is also important. | <ul style="list-style-type: none"> • Traditional owner, land council and other indigenous stakeholders are recognised and identified in the plan; • The plan integrates with, where appropriate, existing and emerging indigenous planning associated with Indigenous Land Councils, Native Title Representative Bodies and regional Traditional Owner groups; • Evidence of use of culturally appropriate consultation and/or participation processes for plan development and implementation; • Plan explicitly seeks to achieve: protecting access; maintaining sites, coordinated land management among neighbouring estates etc. • Cultural heritage sensitivity 'zone-based' mapping is used in resource planning, • Cultural heritage resource surveys are referred to and considered as inputs to land use planning; • The plan supports or is linked directly to mechanisms that support the appropriate management of indigenous cultural heritage (e.g. cultural heritage registers, regulation or policy); • Indigenous knowledge on resource or land management is incorporated; • Collaborative action or investment with indigenous stakeholders is proposed; • The lead agency for cultural heritage protection is involved in plan development monitoring and implementation. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|---|---|--|---|
| 5 | Social and economic impacts are considered and costs of resource management are shared equitably | Social and economic impacts of decisions regional communities need to be considered. Issues such as 'cost-sharing' for sustainable development; perceived decline in property management rights; conflict between resource users; the application of appropriate incentives or market based instruments require the inclusion of social and economic information into NRM decision-making frameworks and within monitoring on a regional and biophysical unit basis. This is critical in addressing equity, and the perceived equity of resource management decisions. | <ul style="list-style-type: none"> • Formal social and economic impact assessment methodologies employed ie. impacts of proposed actions or investments explicitly identified, analysed and supported by qualitative or quantitative assessment methodologies, potentially including: social surveys, interviews, economic modelling of impacts of proposals, cost-benefit analysis, public/private benefit testing; • Identified impacts are incorporated into the decision-making process through a range of practical tools or approaches e.g. negotiation of mitigation strategies or investments; decision-support technologies such as multi-criteria analysis; • Social or economic criteria for funding allocation or investment priorities are used; • Plans monitoring and evaluation framework includes indicators track the effects of significant investments or decisions; and, • Plan seeks to institutionalise social and economic assessment as part of its planning process. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|---|--|---|--|
| 6 | People are actively involved in groups and networks | Groups provide local points of contact and processes for improved awareness and involvement in of NRM decisions and planning. They also provide social support and social networks for members in human-service poor environments. Involvement in land management related networks supports informal & formal training opportunities, peer level support for trialing innovative practices and bolsters individual, community and regional capacity for adaptive management. | <ul style="list-style-type: none"> • The plan recognises and promotes membership or involvement in groups and networks as an important contributing factor to improved efficacy, adaptability and innovation (including in sustainable land management practices); • Membership or group participation rates is analysed as part of the regional social profile; • Membership or involvement is applied as a performance measure or indicator of strategies to improve stakeholder involvement or support information networks; • Relevant group activities and priorities in the region are assessed to determine what support is required / is provided for coordinated planning and investment outcomes (especially in voluntary planning contexts). |
| 7 | On-going learning, skills development and training is supported | Involvement in formal and informal education and training has been found to have a strong relationship to land manager capacity for change at a regional scale. Participation in and access to these training opportunities for all resource managers (including government) also contributes to self-sufficiency, equity and general well being. The different land users or sector-groups of the tropical savannas have specific learning styles and requirements and NRM agencies need to consider this when designing activities targeted at this sector. | <ul style="list-style-type: none"> • Existing participation levels in relevant learning and training activities are recorded; • Preferred stakeholder learning styles and environments are known; • Training needs analysis for stakeholder groups conducted with stakeholders active in setting priorities for required training and education investments. • Investment and/or support identified for activities such as Property management planning, QA, Grass Check training; Landcare, Saltwatch, Water watch, catchment or similar field days; rural leadership or self-development courses; university, TAFE or distance education; short courses such as chemical accreditation and WHS related training. • Indicators related to training and learning are included in monitoring and reporting frameworks. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|---|---|--|--|
| | | | <ul style="list-style-type: none"> • Evaluation systems (as part of the learning cycle) are hardwired into the plan itself as well as promoted within the implementation of the plans strategies through projects or investments. |
| 8 | Adequate information and technical support available for decision-making | <p>The adequacy and availability of sound technical support and information for resource managers is widely accepted as a critical criterion for sound regional NRM planning and decision-making. There are considerable differences between regional industries or sectors' access to and use of information. Access to information becomes even more critical due to the need in savanna regions for managers to make resource management or business management decisions in remote contexts.</p> | <ul style="list-style-type: none"> • Preferred information sources of stakeholder groups and current access and use levels (including to information technology) are analysed; • Access to and use of information technology-related tools that support integrated decision-making such as decision support systems or Geographical Information Systems; • Regional information and data needs are assessed including existing gaps and priorities in data and information identified. • Investment in improving the regional information management system is identified including the establishment or negotiation of a distributed regional information system incorporating monitoring and reporting tools and indicators. • Investment links to training, information systems, extension services and aligning R&D culture and operation are identified. |
| 9 | Economic viability of savanna industries is improved at enterprise and industry scales | <p>Despite rapid changes the well being of human populations in savanna regions is currently tied to the viability of traditional agricultural, pastoral and natural resource-based industries and increasingly important tourism and recreation industries. Long-term viability of pastoral enterprises in particular is considered a potentially important vehicle (and constraint) for the sustainable management of the natural resource base and social cohesion of many savannas regions.</p> | <ul style="list-style-type: none"> • Farm financial and agro-economic data trends analysed at regional and industry scales • Key data sets might include farm cash income, family members working on farm, off-farm family income, profit at full equity, farm equity ratio, median income (region) and economic diversity (region), required living areas. • Plan promotes diversification and innovation, business management systems, QA and relevant accreditation systems as production options, supports 'clean and green' production and supply chain marketing focus. • Data on employment and income generating contribution of tourism (including indigenous cultural tourism) and recreation industries tabled or assessed. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|----|--|---|--|
| 10 | Institutions are aligned with regional ESD planning and management priorities | <p>How well do regional institutions (organizations, agencies etc) conduct and prioritise their activity to be consistent with regionally identified ESD planning and management needs. Removing or lessening the effects of legislative, policy or incompatible R&D as barriers to regional sustainability is important. Historically poor institutional coordination and cross-agency support for plan development and implementation has been the norm. Evidence of agreements or arrangements for collaborative action imply an awareness of the need for a coordinated approach, integrated outcomes and the respective efficiencies and benefits of organizational coordination</p> | <ul style="list-style-type: none"> • Awareness of (listing) other relevant regional and sub-regional planning activities and formal consideration of the functional relationships with these bodies; • Plan or investment plan is developed cooperatively by a range of regional stakeholders including participation of other regional planning agencies or organizations; • Clear agreements, arrangements or partnerships for collaborative action exist amongst stakeholders - presence of MoUs, MoAs or 'regional handshakes' are established between stakeholders / sectors for planning activities for collaboration on investment (NB: These may not be included in the actual planning documentation but may for part of the implementation arrangements or process, there should however, be some stated intent to develop these partnerships and possibly a proposed process for doing so, in the plan); • Communication, implementation or policy development protocols are proposed or developed; • Evidence of in-kind or financial contributions to meeting shared regional priorities or cooperative projects / actions developed; • Regional ESD priorities are clearly articulated in plan and where these are shared with other institutions; • Policy, legislative or other such barriers/ supports for sustainable natural resource management outcomes in the region are identified. • R&D institutions are considered as contributing stakeholders in the planning, investment and implementation phases; and • Support for developing and trialing cost-effective technologies at farm and catchment scales that support sustainable development. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|-----|--|--|---|
| 11. | Soil and water salinity levels are maintained or improved | <p>In the tropical savannas, the area affected by salinity is currently relatively small. Salinity is uncommon in areas with <600 mm rainfall, or in areas of high rainfall >1500 mm. However, scientific evidence suggests that all the factors that contribute to salinity hazard in southern Australia also exist over large areas of the semi-arid zone of northern Australia. The risk of increased soil, stream and groundwater salinity is potentially an important savanna health issue in several regions, especially the Fitzroy and Burdekin catchments of Queensland and the Ord Irrigation Area of the Kimberley, Western Australia</p> | <p>Assessment and Analysis:</p> <ul style="list-style-type: none"> • Digital mapped information is required on climate, geology, soils and topography plus vegetation cover and land use. Scale 1:250,000 or better at catchment scale. • Assessment and modelling of salinity hazard based on geology, soil attributes, vegetation cover and topography. • Assessment of current surface water salinity conditions, including recharge and discharge areas, surface water quality. • Models of the risk/hazard of surface and groundwater salinity associated with broad-scale clearing. • Groundwater resource assessments and modelling. This should include assessment and models of the interaction of groundwater levels, groundwater quality, aquifer/soil descriptions (lithology, confined, unconfined, semi-confined), aquifer dimensions, sustainable yield assessments, bore locations, source of recharge to identify high hazard areas and priority management issues. • Sub-catchment scale assessment and analysis will require much more detailed information based on preferably 1:50,000 maps. • Objectives and Targets could include - Soil and water salinity levels maintained at close to baseline or current conditions; Minimise risk of increasing salinity levels by maintaining minimum 30% deep-rooted native vegetation cover at the sub-catchment and regional-scales; Maintain the quality of groundwater. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|-----|---|---|--|
| 12. | No leakage from land use to other systems (water quality in streams and lakes is maintained) | <p>The water quality and biological integrity of streams and lakes are a reflection of land use and land cover within the catchment. This criterion is closely linked with criteria 23 (resource capture and retention in production landscapes). Total nitrogen and total phosphorous concentrations are elevated in a significant portion of Queensland's waterways, including the Fitzroy Basin. Little is known of the water quality in the northern and western areas of the State. In the Kimberley Region of Western Australia, the expansion of irrigated agriculture, especially cotton and sugar in the Ord River catchment, with the potential for further schemes, has the potential to have major impacts on river health in the region.</p> | <p>Targets are specified for the maintenance and improvement of water quality in management regions considering:</p> <ul style="list-style-type: none"> • The management issue the condition of the catchment • type of ecosystem (e.g., rivers upland; rivers lowland, wetlands, estuaries). • range of scales and time frames • Management action targets that have a shorter time span (1-5 years) than the regional resource condition target. • Resource condition targets that are specific, and time-bound targets used to work towards the overall goal or vision for the water body in the medium term (10-20 years). • Are measurable by linking to monitoring indicators, including: Dissolved oxygen; pH; Electrical conductivity (EC); Total nitrogen; Total phosphorous; Pesticides; Heavy metals; Algal blooms; Sediment/suspended solids; Biological indicators such as insects, algae, fish, plants that can provide information on the ecological condition of a water body. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|----|--|---|--|
| 13 | Physical structure and environmental flow regimes of streams are maintained | <p>Compared to southern Australia, the environmental flow of most rivers of northern Australia is not regulated by barrages, dams, weirs and levy banks. In the Murray-Darling basin, excessive water harvesting for irrigated agricultural crops such as cotton reduces environmental flows with resulting changes in abiotic and biotic processes. Proposed similar large schemes for northern Australian rivers would have similar impacts. Environmental flows in the Ord River in northwest Western Australia and the Burdekin and Fitzroy Rivers in Queensland, are already modified by irrigation schemes.</p> | <p>Assessment and analysis:</p> <ul style="list-style-type: none"> • Assessment and monitoring of medium-long term trends in environmental flows in streams and lakes. • Comprehensive assessment and analysis of the environmental/ecological consequences of decline in environmental flows • Source and rates of water harvesting be assessed and monitored. • Changes in structural indicators of river health including: Channel habitat types and dimensions, Extent and condition of riparian vegetation; Number of dams, barrages and weirs. <p>Targets and thresholds:</p> <ul style="list-style-type: none"> • Water allocation scenarios/modelling developed • Environmental flow allocations clearly articulated and supported with condition and trend information and monitoring frameworks • Non-statutory plans consider / reflect environmental flow allocations in statutory planning (e.g. targets relating to maintaining, improving or supporting environmental flows, • Water efficiency measure and programs are proposed and supported to minimise environmental and production costs. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
|-----|---|--|--|
| 14. | Groundwater levels are maintained | <p>Groundwater is water that occurs beneath the surface of the earth. It is available over most of Australia and in many parts of the country, especially the arid and semi-arid inland, it is of critical importance for both domestic, grazing and irrigation use. Some systems such as the Burdekin Basin are under stress from over use of resources. Others, such as the Daly River Basin in the NT are in relatively good condition. In the Great Artesian Basin, the present rate of extraction is about 0.5 million ML/year At the present rate of extraction, the remaining supplies may only last a few decades. However, present wastage is over 80%.</p> | <p>Assessment and analysis:</p> <ul style="list-style-type: none"> • Assessment of groundwater levels and trends including rate of recharge • Assessment of the number of free-flowing and capped bores. • Assessment of the number and distribution of dry bores. • Assessment of the condition and trend of ecosystems dependent on groundwater (e.g. mound springs) <p>Targets and thresholds:</p> <ul style="list-style-type: none"> • Maintain or improve groundwater levels across the management region. • High proportion of bores capped (e.g. >90%) |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
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| 15 | Above and below ground carbon stocks are maintained | Major factors causing changes in carbon stocks in the tropical savannas are land cover change through clearing, and grazing pressure. Clearing: Native forests and woodlands are large sinks of CO ₂ . Land use and land use change affect the amount of carbon stored in the soil and vegetation. Clearing of native forests and woodlands in Queensland is estimated to have resulted in 54.5 Mt CO ₂ emitted in 1999. Thickening of woody vegetation in grazed woodlands also represents large carbon fluxes. Grazing pressure: In the degraded grazing lands of northern Australia, adoption of reduced stocking rates has been estimated to have the potential to increase carbon sequestration in the top 10 cm of soil by 0.24 t Carbon/ha/annum, a total of 315 Mt Carbon over 30 years. | <p>Assessment and Analysis:</p> <ul style="list-style-type: none"> • Inventory of carbon stocks in the region based on satellite (preferably Landsat TM) estimates of Foliage Projective Cover (FPC) and basal area. • Estimates of above-ground woody biomass based on basal area of woody plants. • Estimates of below-ground woody biomass based on basal area of woody plants. • Assessment of risk of land degradation from excessive grazing pressure, and resulting changes in soil carbon stocks. <p>Targets:</p> <p>Regional NRM plans should seek to maintain carbon stocks by:</p> <ul style="list-style-type: none"> • Reducing the rate of clearing of forests and woodlands for non-forest use; • Protecting and enhancing soil carbon stocks through management to reverse deteriorating land condition and protect against future land degradation; and • Increase in standing biomass through regeneration on previously cleared areas. |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
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| 16. | Progress towards a comprehensive, adequate and representative reserve system | <p>A comprehensive, adequate and representative reserve system is critical to conserving biodiversity at a bioregional scale. Reserves protect native ecosystems and biota from the deleterious effects of human land use. However, maintenance of biodiversity within reserves is dependent on sound environmental management of disturbances such as fire, weed invasions and feral predators. Endemic ecosystems/communities and highly sensitive vegetation communities and landscape elements such as mound springs may need specific protection, both within and outside reserve system. Wetlands are key biodiversity elements in the tropical savannas, and are highly sensitive to grazing impacts and biological invasions. It is important that the full complement of wetland ecosystems be adequately protected from these exogenous disturbance processes</p> | <ul style="list-style-type: none"> • Maps of existing reserve system and regional ecosystems, including wetlands and endemic ecosystems. • Gap analysis of comprehensiveness, adequacy and representativeness of existing reserve system • Plan should aim to achieve representation of all ecosystem types in protected categories as defined by IUCN, with 10-15 % of the pre-1750 area protected for each IBRA bioregion. • Critical habitats such as endemic communities and highly sensitive ecosystems such as mound springs should be adequately protected. • Wetlands represented in protected areas grouped according to international (RAMSAR), national and regional significance. • Wetlands listed under RAMSAR should be given high level (e.g. >80%) of protection |

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| 17. | Landscape structure and complexity are maintained | <p>Habitat loss through clearing has a major impact on regional biota. NRM plans should seek to minimise loss of native vegetation, by setting retention thresholds preferably > 50% in fragmented landscapes and minimising clearing in intact landscapes. These criteria should apply equally to both freehold and leasehold lands. Large patches provide core habitat for forest and woodland dependent fauna species, and are better able to buffer increased external abiotic influences such as fire and climatic variability. Improved pastures and permanent cropping represent permanent loss and conversion of native ecosystems. They have low habitat value to the majority of regional biota, and are an important source of biological invasions. Cropping also represents permanent barriers to movement for most native biota.</p> | <p>Assessment and analysis:</p> <ul style="list-style-type: none"> • Recent maps of landscape structure classified according to land cover (e.g. SLATS land cover data in Queensland, which is classified in forest, woodland, cleared, cropping etc). • Assessment and analysis of the level of habitat loss and fragmentation in the region, including proportion native vegetation remaining, mean patch size, number of patches > 1000ha, total length of edge habitat, riparian vegetation and landscape connectivity. <p>Targets and thresholds:</p> <ul style="list-style-type: none"> • Intact bioregions with >90% native vegetation remaining (e.g. Cape York): preferably no clearing • Fragmented bioregions with 40-60% native vegetation remaining such as the Brigalow Belt North: minimum threshold >30%, preferably no clearing below 50%. • Large patches of core habitat should remain intact. • Mean patch size should remain constant or increase compared to current baseline levels. Edge habitat should remain constant or decrease compared to current baseline levels. • Improved pastures and cropping- Maximum 30% in fragmented landscapes, Maximum 10% for intact landscapes |

| | Outcomes-based Criteria for Regional Plans | Description | Application Notes |
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| 18. | Ecosystem diversity is maintained | <p>Clearing targets ecosystems on more fertile soils. It is important therefore to ensure NRM do not reduce and fragment native ecosystems to a level where their long-term viability is at risk. Altered fire regimes pose a major threat to fire-sensitive savanna ecosystems such as monsoonal vine forests. Regional fire management strategies should adequately take into account the risk of fire to ecosystems so as to ensure their long term health. Key management factors include timing and intensity of burn. Excessive grazing pressure tends to concentrate around watering points and in riparian landscapes, altering the structure and composition of affected ecosystems and negatively impacting on their long-term health. Barrages, dams and weirs disrupt environmental flows and change the health of aquatic ecosystems.</p> | <p>Assessment and analysis:</p> <ul style="list-style-type: none"> • Mapping of regional ecosystems at scale of 1:250,000 or better. • Assessment of the conservation status compared to original or pre-clearing extent. • Assessment and analysis of condition of grazing and fire sensitive regional ecosystems such as riparian areas and monsoonal vine forests. • Special attention should also be given to native grassland ecosystems and changes in tree-grass ratio. • Comprehensive assessment of pasture composition and structure (cover) by land systems within the region. This should include desirable grass species, and the level of pasture deterioration and degradation. <p>Targets and thresholds:</p> <ul style="list-style-type: none"> • No ecosystem should become endangered or threatened as a result of a planning action. • Intact landscapes: no regional ecosystem should be cleared to below 70% retention threshold. • Fragmented landscapes: no regional ecosystem should be cleared below 30% retention threshold. • NRM planning actions should not negatively impact on riparian ecosystems, which are sensitive habitats and require protection from exogenous disturbances associated with grazing, clearing and draining. • Need to assess area of vegetation burnt, by frequency and intensity and vegetation/ecosystem type. |

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| 19. | Species diversity is maintained | <p>The tropical savannas have a rich diversity fauna and flora species. It is important that both fauna and flora populations are maintained as viable populations and not forced into local or regional extinction. Important threatening processes to species diversity include altered fire regimes, changed water regimes, clearing and land use intensification, climate change and biological invasions. Savanna ecosystems also support a rich flora of herbaceous and woody species. It is equally important that threatening processes such as excessive grazing pressure and intensive fires be adequately managed to ensure the long-term viability of these biota. This is particularly important in the face of potential changes induced by climate gradients and also the threats posed by biological invasions.</p> | <p>Assessment and analysis of trends in key fauna groups including:</p> <ul style="list-style-type: none"> • Ground-dwelling vertebrate and invertebrate fauna are dependent on adequate perennial grass and ground cover to provide shelter and food. Loss of cover results in reduced food supply for taxa such as granivorous birds, ground-dwelling mammals and reptiles, reducing habitat quantity and quality, and exposing species to increased risk of predation. • Frugivorous and nectarivorous bird species dependent on fruits and nectar of monsoonal rainforest and eucalypt ecosystems. • Arboreal marsupials such as the koala, possums and gliders dependent on tree cover and hollows. • Invertebrate species such as grasshoppers, ants and termites. <p>Targets and thresholds:</p> <ul style="list-style-type: none"> • No increase in the number of endangered species. • Number of recovery plans in place. • No net reduction in species distribution and abundance or more common fauna and flora species • Plans develop strategies and actions to ensure long term conservation of the rich diversity of savanna fauna and flora through the safe management of grazing pressure (see soil and pasture productivity indicators). |

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| 20. | Ecosystem integrity is maintained | <p>The invasion of woody species can disrupt the ecological balance between grass and trees within the savannas landscape reducing pasture production and altering vegetation structure. Some ways in which weeds can decrease the soil and pasture productivity include reductions in growth of desirable pasture species, increases in soil erosion and changes in fire regime. Pest species can increase grazing pressure on pastures and cause significant soil degradation as well as preying on native animals and livestock. Land uses can only be sustainable where the land type is capable of maintaining that use. Where land uses and practices are unsuitable to the land type on which they are occurring changes in the landscape such as biological invasions can be a warning sign to this factor.</p> | <ul style="list-style-type: none"> • Rigorous assessment of distribution, density and impacts of weeds species within the region and investigation of appropriate control measures for these species using best available knowledge. • Proven effective management strategies for the control and prevention of spread of weeds within the region based on comprehensive review of information of the ecology and dispersal modes of the weed species. • Effective management strategies to aid the identification of new weeds and to prevent the introduction of weeds to the region. • Prioritisation of significant weed species within the region in accordance with list of weeds of national significance • Rigorous assessment of distribution, abundance and impact of pest species within the region and investigation of appropriate control measures for these species using best available knowledge • Proven effective management strategies for the control of pest species within the region, including strategies to prevent further introductions, based on comprehensive review of best available knowledge. • Prioritisation for control measures of significant pest species within the region • Detailed checklist and comprehensive assessment of the risk of biological invasion associated with land use intensity (including extent of land use change, extent of grazing disturbance, control of exotic introductions and control of clearing) • Effective management strategies to assess and control the risks associated with the increase of biological invasion through increased land use intensity |

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| 21 | Soil condition and health maintained | <p>Declines in the soil condition may lead to degradation of the production and natural systems on which various land uses are dependant. It is essential to have knowledge of the soil resource attributes, such as soil fertility and structure, as these attributes will influence the effectiveness of land management actions and the impact various land uses have on each land system.</p> <p>The outcomes of various management tools used to improve the health of soil are dependent on current condition of the soil. For example, the implementation of a regime of regular burning on degraded soil may result in further depletion of the nutrients within the soil. Additionally, the higher the ratio of bare soil patches to vegetation patches the higher the impact of rainfall events on the soil resulting in soil loss and reduced soil fertility.</p> | <p>Assessment:</p> <ul style="list-style-type: none"> • tables and maps of soil resource attributes within the region (including soil type, soil erosion risk, soil fertility, soil structure, soil sodicity, soil acidity, dryland salinity risk, water availability, landform, geology and hydrology). • analysis, tables and maps of current soil condition and trends in soil degradation (including extent of changed soil condition, and changes in area of land subject to soil salinity and soil erosion) • analysis of land capability according to all current and potential land use interests within the region. • risk assessment of land use suitability according to key resource attributes of the region and the risks of particular land uses. • maps detailing the suitability of land systems within the region to various land uses including uses such as pastoralism, clearing for broad-scale cropping, and horticulture/forestry. <p>Actions:</p> <ul style="list-style-type: none"> • align land uses with land systems with which they are most suitable. • strategies to minimise the risk of land degradation through land use intensification • soil condition monitoring framework based on a combination of on-ground field assessments, remote sensing and GIS to detect changes in soil condition • control measures to rehabilitate degraded soils and to prevent further soil degradation • No net increase of bare soil patches and groundcover maintained well above 40%. • Limit clearing on landscapes susceptible to erosion and with low nutrient soils. • strategies consistent with state and national policy and incentives to encourage PMP including drought management to minimise areas of bare soil. |

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| 22. | Pasture condition and health are maintained | <p>Within semi-arid tropical ecosystems, perennial grasses control the distribution of scarce resources such as water and nutrients and hence, the productivity of the landscape. Pasture condition within the region needs to be known to identify whether remedial action is necessary and to identify appropriate management tools for the continued management of the pastures. Monitoring of pasture condition at the regional level is essential to recognize broad scale changes in pasture productivity.</p> <p>The level of pasture utilisation needs to be considered to be able to calculate sustainable stocking rates. A 'safe' level is the amount of pasture that can be utilised before degradation of the soil and pasture resource occurs. The calculation of 'safe' carrying capacities allows identification of the grazing pressure that can be sustained before deterioration of production or land condition. If actual stocking rates are maintained above the safe carrying capacity then degradation of the pasture resource will occur</p> | <p>Assessment:</p> <ul style="list-style-type: none"> • assessment, tables and maps of the key pasture attributes (including desirable pasture species, species type and composition, and perennial plant cover) within the region • analysis of land capability of current and potential land use interests in region • maps and tables detailing the current condition of the regions pasture resources. • assessment of trends in pasture degradation (including changes in cover and species composition of desirable native perennial grass patches, changes in number of property management plans that include drought management considerations). • assessment of 'safe' pasture utilisation levels according to land systems and key resource attributes (threshold for pasture utilisation less than 25-30% during the late summer period). • analysis and assessment of the 'safe' stocking rates and carrying capacity for different land systems <p>Actions:</p> <ul style="list-style-type: none"> • strategies to minimise the risk of land degradation through land use intensification (i.e. water point intensity) • monitoring framework to detect changes in pasture condition and to review trends in pasture condition. • control measures to rehabilitate degraded pastures and to prevent further pasture degradation based on review of best available information and specific to land type. • pasture management strategies (including drought management) to encourage 'safe' pasture utilisation levels according to land type including protection of land types particularly vulnerable to excessive grazing. • 'safe' stocking rates based on calculated 'safe' pasture utilisation • control measures for the control of density of woody weeds |

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| 23. | Effective resource capture and retention (minimisation of soil, soil nutrient and water loss) | Highly dysfunctional landscapes lose resources to runoff and winds. The maintenance of groundcover is crucial to ensuring the capture and retention of vital resources and hence, maintenance of the productivity of the ecosystem. Without the retention and capture of these resources, significant decreases in productivity of the soil and pasture occur. Changes in condition and trends in condition of water quality can indicate the leakiness of the land systems. Through various measurements of the trends in water quality it can be determined and monitored what resources are being lost in excess from the land systems. | <ul style="list-style-type: none"> • Assessment and analysis of the potential risks of resource loss (including loss of soil, nutrients, and water) from the land systems including causes of resource loss • Strategies outlining specific measures to reduce the loss of resources within various land systems including identification and implementation of measures to ensure the maintenance of groundcover and tussock grass patches. • Groundcover maintained well above 40% to minimise soil loss and runoff. • Monitoring framework to assess changes in water quality including changes in sediment load, pH, nitrogen and phosphorous. |
| 24. | Appropriate fire management regimes are maintained. | Frequency and intensity of fire partly shapes the structure of savanna vegetation and thus fire can be used as a management tool to improve pasture and soil productivity and to manage some weed populations. However, it is essential to understand the effects of fire on these resource attributes to understand how fire can be used to most efficiently manage them. | <p>Assessment:</p> <ul style="list-style-type: none"> • Maps and tables detailing the frequency and intensity of fires across the region • Review and assessment of the effects of fire intensity, frequency and seasonality on soil, and pasture and woody weed species in varying conditions <p>Actions:</p> <ul style="list-style-type: none"> • Management strategies to enhance the effectiveness of fire as a management tool for weed management, and soil and pasture maintenance • Regionally-specific fire education programs which aim to link research knowledge with fire management behaviour in the savannas • Direct monitoring of fire regimes at a property and regional scale to ensure proposed improvements in timing and intensity of burns are achieved; <ul style="list-style-type: none"> ▪ Monitoring of ecological values (e.g., vegetation composition and structure) which are impacted on by fire regimes to ensure proposed management actions are effective |

Further Information and contacts

This guide has been developed as part of a collaborative project including regional community and government planning organisations. The authors welcome any comments or feedback on this guide and the framework itself.

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