Native vegetation condition in Australia: a synthesis of outcomes from pilot projects on national monitoring and evaluation indicators

Executive Steering Committee for Australian Vegetation Information

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Abstract

From 2003 to 2007, the Executive Steering Committee for Australian Vegetation Information (ESCAVI) coordinated a series of pilot projects to test the applicability of its interim approach to native vegetation condition monitoring, under the National Natural Resource Management Monitoring and Evaluation Framework. The pilots have resulted in increased familiarity with the approach and recognition of the necessity for benchmarks (or reference condition) in native vegetation condition assessment and monitoring. There is now general acceptance within ESCAVI of the merits of this approach as one which provides for national consistency while accommodating some variability to meet specific needs within each jurisdiction. The outcomes of the pilots include contributing towards improvements in reporting on native vegetation condition and providing an agreed conceptual basis for the establishment of nationally consistent indicators and protocols for reporting.

SECTION 1: INTRODUCTION

Vegetation assessment and monitoring

As a basic input to achieving sustainable native vegetation management, planners require knowledge on the extent and distribution of different types of vegetation across landscapes. In the intensive land use zone (ILZ), priorities for investment have been informed by an understanding of how much of each type of vegetation remains compared with what existed prior to intensive agricultural development (generally presented as the 'pre-1750' extent). With the phasing out of broad-scale land clearing, managers in the ILZ are increasingly interested in assessing and monitoring the condition of remnant native vegetation as an input to management decisions. Government and non-government agencies across Australia have moved rapidly to meet this need and establish assessment methodologies and information bases on native vegetation condition.

In the extensive land use zone (ELZ), or rangelands, the condition of vegetation has long been the focus of monitoring, for the purpose of assessing compliance with leasehold obligations as well as informing assessments of pastoral productivity.

The role of the ESCAVI

The Executive Steering Committee for Australian Vegetation Information (ESCAVI) sits within the arrangements of the Natural Resource Management Ministerial Council. The committee is chaired by the Australian Government and brings together all states and territories to develop consistent approaches to vegetation assessment and monitoring. The ESCAVI has responsibility for the ongoing development and improvement of the National Vegetation Information System (NVIS). The ESCAVI has been tasked with the drafting of nationally agreed indicators and associated protocols to allow for nationally consistent monitoring of *native vegetation communities' integrity* under the National Natural Resource Management Monitoring and Evaluation Framework (NRMMC 2002).

Indicators and protocols to standardise the assessment and monitoring of native vegetation extent and distribution have been agreed (see Appendix A). However, for the less established concept of condition, indicators and protocols remain in interim form.

The ESCAVI developed an 'interim approach' to native vegetation condition indicators in 2003. *The interim approach to the native vegetation condition indicator* is at Appendix A. The ESCAVI's key purpose in writing the interim approach paper was to encourage wide consideration of the applicability of the approach. To this end, over the period from 2003 to 2007, the ESCAVI has overseen a number of state/territory based pilot projects on the interim approach. Activities undertaken in these pilot projects and the key lessons learned are summarised here in chapters for each jurisdiction. In addition, it was recognised that a number of other organisations (government and non-government) with little or no connection to the ESCAVI have also been progressing assessment and monitoring protocols for native vegetation condition. Where available and considered relevant, information on these processes is included in the following chapters. However, this paper should not be considered

an exhaustive collation of current condition assessment activities outside the ESCAVI.

Reporting on native vegetation condition

This paper is primarily about methods for assessing condition as a component of monitoring *native vegetation communities' integrity* under the National NRM M&E Framework. However, the data collected and information products generated using these methods will have uses in monitoring for a range of other NRM themes.

The interim approach to indicators on native vegetation condition

While a number of attempts have been made in the past to develop national vegetation condition assessments, the agreement of all governments to the National Framework provided an important new focus for this work. In accepting the task of developing native vegetation condition indicators, the ESCAVI understood the purpose of developing indicators and protocols as supporting and informing target-based regional planning for native vegetation management, and providing a basis for ongoing reporting of progress against targets at a regional level. The development and adoption of a nationally consistent approach to regional monitoring is designed to allow meaningful national collation and reporting of information across all regions.

Most states and territories have in place activities or methods that can be used for reporting. The benchmark-based methods being developed and used in states such as Victoria and NSW were identified by the ESCAVI as being the most suitable for developing a nationally consistent method of reporting on native vegetation condition change. These methods involve assessing the condition of a given patch of vegetation by comparison with a documented benchmark (or reference condition) which describes the expected state for the vegetation type in a long-term undisturbed state. The patch can then be ascribed to a described condition class, relative to the benchmark.

Based on the benchmark concept, the ESCAVI's *interim approach* proposed two measures as follows:
– Measure A is the proportion of each native vegetation type in each Interim Biogeographic Regionalisation for Australia (IBRA) subregion that is estimated to be in each specified condition class based on a selected set of attributes
– Measure B is the proportion of each output from Measure A where management practices are being implemented which are improving, or reversing the decline of, the condition of native vegetation.

These two "measures" may be best seen as separate indicators. This is analogous to the three separate indicators for vegetation extent and distribution.

The intention of the ESCAVI in developing the interim approach was to encourage engagement and discussion by practitioners in vegetation condition monitoring, particularly at the regional level. ESCAVI is currently developing final indicators for native vegetation condition, drawing on the lessons learned through these pilot projects and feedback on the interim approach from stakeholders as documented by the National Land and Water Resources Audit (NLWRA).

SECTION 2: SUMMARIES OF PILOT PROJECTS AND OTHER RELEVANT MONITORING AND EVALUATION METHODS

New South Wales

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Condition assessment method and benchmarks

NSW developed BioMetric, a terrestrial biodiversity assessment tool for the NSW property vegetation plan developer, launched in 2005. Biometric is a benchmark-based assessment tool, and is well aligned conceptually with the ESCAVI's interim approach. For this reason, no pilot of the ESCAVI interim approach was conducted in NSW. However, an investigation is being funded into the appropriateness of different landscape units (eg vegetation types and/or biogeographical regionalisations) which could form the framework for reporting based on BioMetric assessments.

BioMetric was designed to assess the impacts on terrestrial biodiversity of applications for clearing and incentives under the NSW *Native Vegetation Act 2003* (Gibbons *et al*. 2005). It provides a quantitative assessment and is used in conjunction with GIS tools to develop a property vegetation plan. It records similar attributes to those in the ESCAVI's interim approach and includes refinements such as the estimation of cover of various life forms rather than just presence or species diversity.

Interim benchmarks have been developed for all of NSW. The benchmarks have been developed to notionally represent pre-European condition with a range of disturbance states. Benchmarks were derived using a combination of the best available data and expert opinion. The BioMetric manual and benchmarks are all available from a fairly comprehensive webpage.

Extent of use within the state

The production of a property vegetation plan is required for all clearance applications in NSW. BioMetric is available for uptake by regions for incentive based schemes and is being used by most regions.

Victoria

Contact
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Condition assessment method and benchmarks
There was no pilot project for Victoria as the Habitat Hectares method (the basis of the ESCAVI's interim approach) was developed in Victoria, and the technical coordination of all pilot projects in other states/territories has been provided by Victoria.

The Habitat Hectares method was developed as part of the Victorian Native Vegetation Management Framework. Habitat Hectares is used to assess the current condition of native vegetation for consideration in assessing applications for incentive-based schemes and determining the value of offsets. Initial assessments are carried out by a regionally based technician. The Habitat Hectares method also has potential for tracking the value of investments over time.

Victoria developed a vegetation classification system combining floristic homogeneity and biogeographic factors, called ecological vegetation classes. Ecological vegetation classes have been developed for the whole state. Benchmarks have been developed for all of the ecological vegetation classes in Victoria. Victorian benchmarks are based on the average characteristics of a mature and apparently long-undisturbed state of a vegetation type. Benchmarks exist for both wetland and terrestrial vegetation types.

Extent of use within the state
The Department of Sustainability and Environment developed Habitat Hectares to underpin a new direction in native vegetation management under the Victorian Native Vegetation Management Framework. The statewide application of new mechanisms, such as Bush Tender and Bush Broker, have seen substantial uptake of the Habitat Hectares method in Victoria. Habitat Hectares has been well promoted and has attracted considerable interest from regional groups as well as non-government organisations. For example, Land for Wildlife use Habitat Hectares in assessing the merits of investment proposals for improved vegetation management.

Queensland

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Brief overview

The ESCAVI pilot project in Queensland was carried out during the 2004–05 financial year. It was primarily a desktop study focused on application of the Queensland BioCondition methodology in the Southern Desert Uplands bioregion, a relatively intact semi-arid landscape. The region is data rich with some vegetation benchmarks already developed for some regional ecosystems. Site data from three studies/programs (the CORVEG vegetation mapping program, land units and fauna surveys) were collated and evaluated for their applicability to ESCAVI's interim approach for condition assessment. The CORVEG dataset appears most suitable, but will require collection of some additional attributes.

Key findings

The pilot project found that pre-existing site data from the vegetation mapping program (CORVEG) provided a reasonable basis for assessing condition using the BioCondition method. It contains sufficient information for the floristic attributes but lacks data for number of large trees, number of dead trees and assessment of woody debris.

Other datasets were assessed, but were found less useable. Land unit data were not comprehensive for floristic or structural attributes. A condition rating was determined using available data but it was inconsistent. Data from existing fauna datasets contained details for structural information but were limited for floristics and in extent.

The pilot recommended that size and structure of canopy trees, number of dead canopy trees and hollows, and the amount of coarse woody debris be added to the CORVEG methodology to enable it to be used for BioCondition assessments. These features may be added to existing datasets with supplementary sampling to finalise benchmarks and develop condition assessments.

Landscape attributes can be readily applied to Queensland vegetation mapping coverages. Seasonal variation in the percentage of bare ground and recruitment of woody species were found to be important condition attributes. The distance from water was also considered an important attribute that should be considered in the landscape context features, particularly in non-fragmented landscapes (rangelands).

Benchmarks

The pilot project found that further sampling of missing attributes would be required to establish benchmarks based on the existing data. Benchmarks for the Southern Desert Uplands and other bioregions are now available on the internet.

The Queensland Murray–Darling Committee (QMDC) program (Biodiversity Values Assessment) has not got to the stage of establishing benchmarks but it is expected that the raw scores recorded for each attribute can be compared to benchmarks being developed by the Environmental Protection Agency. Some of the current

benchmarks developed by the agency are relevant to vegetation groups within the QMDC's regions.

The Burnett Mary Regional Group assessment is not benchmark based.

Potential for uptake within the state
There are three vegetation condition assessment methods currently being used in Queensland. BioCondition was developed by the Queensland Environmental Protection Agency (EPA) based on Habitat Hectares (Parkes *et al* 2003) and BioMetric (Gibbons *et al.* 2005). Recommendations emerging from the pilot project have also been used to refine BioCondition. The Queensland Murray–Darling Basin Committee also created a simplified method called Biodiversity Values Assessment for use by landholders. A third method called the Biodiversity Rapid Assessment Tool has been developed by the Burnett Mary Regional Group for use within their region.

The EPA is working towards statewide consistency in monitoring vegetation condition. A draft BioCondition manual has been developed for use as a benchmark-based site condition assessment tool in Queensland. Previously unmeasured attributes are being incorporated into existing state vegetation monitoring programs to facilitate BioCondition assessment. The EPA is supporting and promoting the statewide use of BioCondition as a condition assessment tool. In the western part of the state, landholders and NRM managers are being trained and field demonstration sites are being developed. Some regions are interested in BioCondition as a tool for measuring progress towards targets for biodiversity conservation.

The QMDC works in two NRM regions (Border Rivers and Maranoa Balonne). Their Biodiversity Values Assessment method was developed from existing methods (predominantly Habitat Hectares) to assess vegetation condition and habitat attributes in a simplified manner. Ultimately, it is intended that the method be used by landholders with limited expertise, but it is currently used predominantly by biodiversity technical staff of the QMDC.

Biodiversity Values Assessment has recently been refined and trialled in parallel with both BioCondition and BioMetric. Findings from this exercise suggest that the simplified Biodiversity Values Assessment method compares favourably in terms of comparative scoring with the other more detailed (and time-consuming) methods. Preliminary data collected by Birds Australia Southern Queensland for bird species richness on stock-route reserves in the Border Rivers region suggest that Biodiversity Values Assessment scores relate reasonably well to fauna attributes (for birds) at site scale and may be applicable to prioritising investment in conservation activities on public lands.

Currently Biodiversity Values Assessment is used largely for sub-catchment planning to inform and prioritise property and sub-catchment scale planning for NRM outcomes. In this context, it provides an assessment of the overall condition of remnant vegetation within the area, helps guide on-ground investment decisions, and has been valuable in educating land managers within the sub-catchment about vegetation condition and its importance for biodiversity and land condition. It has also been applied in a competitive tender process (with some modification), to compare relative merits of proposed investments.

Incorporation of Biodiversity Values Assessment data into monitoring and evaluation processes at a regional level is desirable, but exactly how that will occur has not yet been established. At present data are held by technical officers in catchment centres. It is envisaged that the data will be aggregated up to catchment and regional scales, but currently no procedures are in place.

The Burnett Mary Regional Group have developed their own Biodiversity Rapid Assessment Tool for use within their region. Assessments are carried out by consultant botanists and the data are used to prioritise investment and assess resource condition trends. The assessments do not measure against benchmarks.

The Fitzroy Basin Regional Group uses the BioCondition method to provide a general overview of vegetation condition to technical panels for investment priorities in incentive schemes. The assessments are conducted by technical staff with simplified follow-up monitoring by landholders. At present benchmarks are not completed for this region. Raw data are being collected to be compared with benchmarks once these are developed by the EPA .

Collation of data across the state may be difficult if some regions are not using benchmark-based assessments. However, they may be comparable if the raw data values are compatible and can be compared to benchmarks later (as is the case for the Biodiversity Values Assessment method).

Potential for outputs to be collated at the national level
If common attributes are measured across the condition assessment methods being used in Queensland, the results of the site-based assessments should be able to be collated across different regions, albeit with a need for some reinterpretation (eg post hoc application of benchmarks). However, a more detailed assessment of the commonality of attributes under each method is required.

The ability to translate site-based condition assessment results to broad spatial scales is still being addressed. Until this is resolved Queensland, like all other jurisdictions, will have difficulty mapping condition from site-based data. At present there are no channels for collation of condition data across the state.

Publicly available methodology (overview and website)
The BioCondition manual is available on the EPA website www.epa.qld.gov.au.

The Biodiversity Values Assessment is currently an 'in-house' program of the QMDC, but is intended to be made more broadly available for landholders throughout the Queensland Murray–Darling Basin. A similar method has been included in a monitoring toolkit (currently in preparation) for woolgrowers in the Traprock region.

Western Australia

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Brief overview
The pilot project was conducted in an area east of Perth comprising two NRM regions and three IBRA subregions. The project area contained a range of vegetation types that occur in south-west Australia and there were a range of land uses in the surrounding area. Sites for benchmarking were chosen at the desktop and measured for benchmark features in the field. Twenty-one sites were assessed for condition using ESCAVI's interim approach. The extent of native vegetation in the project area was calculated using existing data (state National Vegetation Information System (NVIS) dataset). Pre-existing datasets were used to determine land use within the project area. Extent of vegetation type and land use was assessed. The area within different vegetation condition classes under different land uses was also determined.

Key findings
Sites initially chosen as benchmarks at the desktop were actually in poor condition when assessed in the field (mainly due to weed invasion and repeated heavy burning), supporting the need for field validation in selecting benchmarks and assessing condition. Recruitment and weed features appeared to have the largest influence on the overall interim approach scores. Treeless sites were successfully assessed using dominant or consistently emergent shrubs to record tree type data.

A method was developed to determine the extent of native vegetation under each land use in a broad condition category (high, medium or low). Generally land managed for conservation purposes scored in the medium to high condition category, agricultural land varied and light urban uses scored low to medium. To determine the proportion of each vegetation type (using vegetation system-based associations from the state NVIS-compliant database) in each condition category under preferred land management (i.e. Measure/Indicator B in the ESCAVI's interim approach) was beyond the agreed scope of this project.

Benchmarks
A total of 63 NVIS vegetation types occur in the project area. Benchmarks were not developed for each of these. Rather, logical groupings of similar types (based on structure/floristics) were used to identify 11 'benchmark types' across the project area.

A number of methods are being used for vegetation condition assessment in WA, and none of these methods uses a benchmark approach. The WA Department of Environment and Conservation biological survey data include floristic data that could be used to develop benchmarks, but few structural data. There is concern that many vegetation types no longer have extant sites with vegetation in benchmark condition (using long-term undisturbed condition as the criterion for benchmarking). There is potential for benchmarks to be created synthetically as has occurred in other states. However, this requires further investigation.

Potential for uptake within the state

At present there is no single agreed method for assessment of native vegetation condition in WA; different organisations have developed different methods for their own use. The need for a single consistent method has been identified by regional groups and major state NRM agencies. Prior to this pilot study of the ESCAVI's interim approach, two other methods of assessing vegetation condition have been used in WA.

The most extensively used method was developed by Keighery (1994) for the WA Wildflower Society. This method involves a quantitative assessment of floristic and structural characters and the degree of disturbance. Assessment is conducted by an experienced assessor and uses a six-tiered rating for condition, from completely degraded to pristine. Conceptually, the experience of the assessor provides a de facto, if not explicitly documented, benchmark.

Remote sensing has also been trialled in WA. Work has been undertaken to develop algorithms for vegetation condition, including change and trend, where good GIS data are available. The advantages of remote sensing/GIS based methods are the relative ease and low cost, which enable frequent sampling. However there are some concerns about what changes detected using this method actually relate to on the ground.

Potential for outputs to be collated at the national level

The potential adoption of an agreed consistent method across the state would be beneficial for collating outputs at a national level, providing national indicators, broadly consistent with ESCAVI's interim approach, are finalised.

Publicly available methodology

None of the methods discussed above are publicly available.

Northern Territory
Contact
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Brief overview
The ESCAVI pilot project applied four methods to assess vegetation condition at a number of sites in *Eucalyptus tetrodonta / E. miniata* forest and compared the results with a visual assessment by an expert. The vegetation assessment methods used were Habitat Hectares (Vic.); Site Value Plotting, from BioMetric (NSW); A Land Manager's Guide for Assessing and Monitoring the Health of Tasmania's Forested Bush (Tas.); and relevant parts of the Tropical Rapid Assessment of Riverbank Condition (TRARC).

In addition, a range of ways of developing benchmarks were examined and/or trialled. This scrutiny included analysing existing vegetation survey site data from the Top End and assessing their suitability to the development of benchmarks.

A workshop held in June 2006 brought together technical expertise from within the Northern Territory to discuss the ESCAVI's interim approach, its limitations, potential applications and how it could be improved.

Key findings
The condition assessment methods tested were developed around similar themes and provided similar results. The results generally agreed with the visual assessment by an expert (ie the better sites returned a higher rating, the poorer sites a lower rating). The criteria and weightings used in these methods require modification for the NT, particularly for the ground layer features. Heavily weighting regeneration is not appropriate for NT systems, because regeneration of plants below one metre is often common due to the prevalence of seasonal fires. The issue for the NT is that the juvenile growth stage (one to three metre trees) is often lacking for sites in poorer condition due to inappropriate fire regimes. The condition assessment method for the NT should recognise the presence/absence of this juvenile stage. A proforma was developed to trial using frequencies of different stem diameters, but proved time consuming in the field.

Overall, field assessment based on the ESCAVI's interim approach appeared valid with some modification. The development, promotion and use of benchmarks for different vegetation types remains a key challenge to the wider uptake of the ESCAVI's approach in the NT.

Benchmarks
Several different methods for the development of benchmarks were considered. The first involved analysing information from pre-existing data sets for 8 000 vegetation sites to identify distinct 'groups' in the data that might provide a basis for 'benchmarks'. However, this exercise generated a very large number of groups, and was considered impractical. A second method involved creating benchmarks synthetically. This was attempted at the site scale as part of field assessments, as well as by using computer models (including the FLAMES model being developed by CSIRO and the Cooperative Research Centre (CRC) for Tropical Savannas) to predict the characteristics of long-term undisturbed communities. These synthetic methods appear to have potential, although there was useful discussion with expert

stakeholders in the NT concerning the need to incorporate multiple disturbance states (principally fire related) across a given vegetation type in any concept of optimal or desirable condition for describing a benchmark.

The NT is also developing definitive vegetation types for the whole territory, which may be used as a basis for future benchmark development.

Potential for uptake within the state

At present the NT is working on developing benchmarks for forest and woodland condition mostly in the Top End.

Riparian condition indicators are being developed under the Tropical Rapid Assessment of Riverbank Condition (TRARC) project run by the Tropical Savannas CRC in collaboration with the NT Department of Natural Resources Environment and the Arts, Greening Australia, NT Water for Life and the CRC's Riparian Health Project. A manual has been developed and training for stakeholder groups commenced in 2005. It is likely that the TRARC collaborators will continue to assess riparian condition using this method. Relevant aspects of TRARC were applied to the pilot project in the NT. TRARC is still being refined, particularly in terms of interpreting the final scores. The use of benchmarks for particular river-reach or vegetation types would seem to be potentially powerful in allowing comparison of condition across different types, and would complement the ESCAVI's approach.

Considerable work is currently being undertaken on biodiversity monitoring within the rangelands. Rangeland condition assessment has traditionally involved tracking changes in attributes considered important to indicate pastoral potential. The broadening of this approach to provide better insights into condition for biodiversity is a key challenge for the Australian Collaborative Rangelands Information System (ACRIS) in which the NT is involved. A similar challenge presents within the NT itself: there is a need to bring together pastoral productivity monitoring (which relies on remote sensing at frequent intervals) and native vegetation condition assessment work coupled with biological surveys and mapping, which is strongly site-based and takes place over longer time frames. These issues are discussed further in Section 3 below.

The trialling of the ESCAVI's interim approach in the NT has prompted significant engagement by practitioners within the NT Government, and this has been a valuable contribution to improving the ESCAVI's approach. There appears to be good potential for the approach to be applied within NT landscapes and institutional arrangements. The NT Government is continuing its engagement with the ESCAVI's approach with a view to incorporating it as far as possible into its biodiversity survey and vegetation mapping work. Early indications are that the extra work required to develop benchmarks and assess corresponding attributes for vegetation types within existing survey/mapping programs may be acceptable, given the potential benefits to NT-wide and national reporting. Over time, this would generate condition information in accordance with the ESCAVI measures/indicators together with the growing information base on the extent and distribution of vegetation types within the NT.

Potential for outputs to be collated at the national level

The whole of the NT is within one natural resource management (NRM) region so collation by one jurisdictional body for national reporting should not be an issue.

Publicly available methodology (overview and website)

The NT has not reached this stage at present. However, it is anticipated that a manual would ultimately be made available in hard copy and online. Some benchmark types would need to be developed to give the manual context. Native vegetation condition assessment is expected to become a routine part of field surveys when describing vegetation for normal mapping purposes.

South Australia

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Brief overview

The Nature Conservation Society of SA developed Bushland Condition Monitoring as a monitoring tool for land managers in the southern Mount Lofty Ranges (see background section at the end of this chapter for further information). The SA pilot project compared Bushland Condition Monitoring (BCM) with the ESCAVI's interim approach at 14 sites (containing six land management types) in the southern Mount Lofty Ranges. Attributes for both methods were summarised under four broad categories (diversity, growth stages, litter and weeds) to allow comparison. Additional attributes scored by Bushland Condition Monitoring were excluded. Pre-existing data from the SA Biological Survey (18 000 sites) were also evaluated for use with the two condition assessment methods. Landscape context attributes scored for the different methods are for different purposes and thus were not compared. Landscape context attributes from ESCAVI's interim approach were mapped across the 14 sites to show the value of vegetation at the pilot project sites in a landscape context.

Techniques for developing benchmarks and testing applicability of SA Biological Survey and National Vegetation Information System (NVIS) data to the benchmarking process were also assessed. Land use, vegetation type and condition (based on results of site assessments) were also used to map condition throughout the pilot project sites.

Key findings

The ESCAVI interim approach and BCM outcomes were relatively comparable for site assessments using related attributes. Assessment areas are different: Bushland Condition Monitoring uses 30m x 30m areas whereas the interim approach uses larger, subjectively defined areas of like vegetation and management. Overall scores generated by the different methods were generally within 7 per cent and were not significantly different. Attributes that were significantly different were tree health (used by BCM) and tree canopy cover (used by the interim approach), and tree habitat (BCM) and large trees (interim approach). These differences were due to variations in methodology and did not largely influence the overall score.

The sampling methods differed and the value of each lies in the purpose of the assessment. BCM was developed for landholders to include an educational objective, and attributes were scored to illustrate their contribution to condition. BCM records raw data in the field and compares them to a benchmark afterwards (the ability to identify a benchmark is therefore not a prerequisite for the observer), whereas the interim approach attributes are scored in direct comparison to a benchmark in the field. The collection of raw data rather than matrix style scoring allows temporal comparison of features contributing to condition individually. Categorical attributes measured in the interim approach reduce the margin for error and variability between (and perhaps within) observer variations. The interim approach was also slightly faster in the field.

Further findings from the pilot project included the need for minor alterations to BCM attributes and further research into the SA Biological Survey data to determine if certain components indicate the condition of vegetation at the sites.

The South Australian pilot also attempted mapping of condition using interpolation of site assessment data across the landscape.

Benchmarks

Eight vegetation benchmarks have been developed for the Southern Mount Lofty Ranges under the BCM program. Benchmarks also currently exist for the Upper South East NRM Region and will soon be published for the SA Murray–Darling Basin. They are also being investigated in the northern Yorke NRM region. These benchmarks apply to vegetation associations or sub-associations (ie levels 5–6 in the National Vegetation Information System data hierarchy).

Potential for uptake within the state

BCM has been adapted to develop a biodiversity significance index for use in the Upper South East Drainage Levy Scheme and Bush Bids funds allocation. This modification includes landscape attributes similar to those for the interim approach. This adapted methodology is proposed for use by the Northern Yorke NRM region and SA Murray–Darling Basin NRM region for monitoring regionally funded on-ground works. The SA Department of Water, Land and Biodiversity Conservation (DWLBC) has developed a GIS tool for mapping and storing condition information to calculate the biodiversity significance index mentioned above. The SA Department for Environment and Heritage (DEH) is currently in discussion with the DWLBC about the future storage of this condition information.

The SA DEH is currently liaising with the regions through a questionnaire to document regional requirements for vegetation condition assessment.

Arid and semi-arid rangelands constitute a large area of northern SA. The condition assessment methods discussed here have not been trialled in the SA rangelands. However, the SA DWLBC has an ongoing monitoring program in the pastoral lands under the *Pastoral Land Management and Conservation Act 1989*. This monitoring work has been evaluated for potential inclusion in the Australian Collaborative Rangelands Information System (ACRIS) as discussed under Section 3. As with the other ACRIS work the department is assessing land condition (as distinct from vegetation condition for biodiversity). The department has collected baseline information and will be comparing this with later results using the same monitoring methodology to assess change in condition rather than using a benchmark-based approach.

Potential for outputs to be collated at the national level

BCM is comparable with the ESCAVI's interim approach and the overall scoring system developed for BCM should be directly comparable with outputs from other states. The pilot project's report noted a potential benefit of a national set of weightings for attributes; however this contrasts with pilots in other states where it was found that weightings could and should be tailored for different ecological systems.

The extent of native vegetation condition monitoring within SA is currently limited. Collaboration with the pastoral monitoring program may assist in covering larger areas of the state.

Publicly available methodology (overview and website)

BCM is coordinated throughout the regions and is implemented by the Nature Conservation Society of SA. The program includes a training component. There are plans for the data to be stored in a centralised database; however this is still being discussed at this stage.

Background on the Bushland Condition Monitoring methodology.

BCM was developed to address requirements for monitoring on-ground work under state and Bushcare programs. It combines a comprehensive manual with training to ensure effective, comparable and repeatable monitoring of sites. The program was also designed to operate as a learning tool for land managers to see how measured attributes contribute to the vegetation community and condition, and how these attributes respond to change. A generic benchmark is used by assessors.

BCM was implemented in the Mount Lofty Ranges in 2005, and over 200 people have been trained to date in this region. The manual and training produced thus far are specific to the southern Mount Lofty Ranges; however there is scope and intention for the program to be applied to other regions. Each attribute is scored individually against a benchmark value for that attribute (classified as very poor, poor, moderate, good and excellent). Classes of benchmark values for specific vegetation associations are also provided in the manual. Unlike with Habitat Hectares, BCM does not generate an overall index score based on weighted aggregations of attribute values. The rationale for not doing this is to avoid masking individual attribute scores, which better serves the goal of maximising the feedback to vegetation managers on what has been achieved through their management action.

Tasmania

Contacts
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Brief overview

The pilot project in Tasmania began with a review of nine vegetation condition assessment methods that had been devised or applied in Tasmania, to determine their strengths, weaknesses and applicability for Tasmania. The pilot project then proceeded with a review of the ESCAVI's interim approach as a potential method applicable to Tasmania. This involved the assessment of TASVEG, the Tasmanian Vegetation Map, as a suitable basis for developing benchmarks.

Key findings

Measures for assessing vegetation condition in Tasmania are likely to be required for four main purposes:

1- reporting on NRM indicators (monitoring vegetation condition over time)
2- estimating the relative worth of patches of bush proposed for development in order to calculate offsets and for market-based incentive schemes
3- assessing the relative values of restoration or regeneration against other conservation measures
4- strategic planning.

The project concluded that reporting on the NRM indicators would be best served by regions relying on information gathered statewide then interpreted and collated for regional reports in a consistent manner.

A new method for site-based assessments against benchmarks, the TASVEG vegetation condition assessment, has been developed based on assessment of the ESCAVI's interim approach. The TASVEG method aims to fulfil most site level vegetation condition assessment requirements.

Benchmarks

Benchmarks have been identified and documented for all vegetation communities in Tasmania. The method is initially 'synthetic' using pre-existing datasets and expert knowledge. Workshops were held with groups of specialists for different vegetation types to define benchmark features. Field data were collected to supplement synthetic benchmark reference values and fill gaps in knowledge.

Benchmarks are based on vegetation communities developed for TASVEG. A total 115 benchmarks have been created, each identified as either forest or non-forest.

The benchmark attribute values provided for each of the site components for a vegetation community represent the average characteristics of a mature and apparently long-undisturbed vegetation community. This is not a 'prescribed ideal' or a 'climax' state but is a reference point against which change in condition is quantified.

Potential for uptake within the state

Tasmania has developed a consistent method for assessment of vegetation site condition throughout the state. Following the pilot, the NRM regions in Tasmania have been funded for condition assessment work. A TASVEG vegetation condition

assessment manual and benchmarks for priority vegetation communities have been prepared. Regional bodies are promoting TASVEG to other groups and a program to train assessors has commenced. Assessors need to be able to identify common plant species, particularly those common for the ecological vegetation classes in their regions, and to identify the number of species within each life form and identify high threat regional weed species. The plan is that data will be collected by trained people such as NRM facilitators or technical officers. NRM working groups such as Landcare may have trained assessors. The assessment methodology is intended to also be used by staff in off-reserve conservation programs.

There is widespread support and acceptance of the TASVEG vegetation condition assessment. Presently, assessments are recorded in reports but no database exists. A proposal for a database containing vegetation site condition attributes is being investigated.

The issue of using site-based data for regional planning remains unresolved, but NRM condition monitoring will continue to be investigated through the work program of the ESCAVI.

Potential for outputs to be collated at the national level
The use of a consistent condition assessment method (TASVEG) in all regions across the state will be an asset in collating data at a national level, particularly with data being stored at a centralised point. The use of benchmark-based condition assessment using a method based on the interim approach, with modifications suitable to Tasmania, makes the TASVEG method ideal for collation at the national level.

Publicly available methodology (overview and website)
The vegetation condition manual and benchmarks will be made available on the Department of Primary Industries and Water website.

Australian Government

The Australian Government (AG) Department of the Environment and Water Resources (DEW) has led the ESCAVI's consideration of how best to progress towards nationally agreed indicators/protocols for native vegetation condition. While technical coordination of the pilot projects has been provided by Victoria, DEW has had an integral role in directing funding through the Natural Heritage Trust for the pilots and in drafting this synthesis report. This is in accordance with DEW's co-sponsorship (together with the Department of Agriculture, Fisheries and Forestry) of the native vegetation theme (or 'matter for target') of the National Framework.

The National Land and Water Resources Audit (NLWRA) has produced two national condition assessments: Landscape Health in Australia (NLWRA 2001) and the Australian Terrestrial Biodiversity Assessment (NLWRA 2002). These assessments used national and state data together with expert knowledge to develop a national picture of land and biodiversity condition based on the Interim Biogeographic Regionalisation for Australia (IBRA) bioregions and subregions. Landscape-scale attributes such as proportion in conservation reserves, extent of salinity and distribution of threatened species were reported across regions. Threatening processes such as clearing rates and spread of invasive species were also used to develop a representation of trends in landscape/biodiversity health related to these attributes. Although useful in developing an indicative national picture, these 'top down' condition assessments were limited by a lack of repeatability, large gaps in data availability, difficulties in making comparisons between states, and difficulties in showing trends (NLWRA 2001).

It is envisaged that the ESCAVI's development of agreed indicators and associated protocols for native vegetation condition will provide clear guidance to regional groups in setting and working towards targets for native vegetation condition. Over time, it will be possible to collate data collected at the regional level, in accordance with these indicators, to provide a national picture that is more 'bottom up'. While the states and territories are increasingly focusing attention on how to support regional approaches through statewide monitoring programs, there is recognition that in the short term, the limited availability of data will necessitate reporting either by national collations of state/territory data, or by approaches which borrow heavily from the previous NLWRA work discussed above.

In addition to the work on native vegetation indicators under the National Framework, the AG Bureau of Rural Sciences has developed and is promoting the Vegetation Assets States and Transitions framework (VAST) as a potential framework for reporting on vegetation condition across the landscape (i.e. non-native as well as native). VAST is a flexible framework that allows data from a variety of sources to be interpreted into maps. There are no strict criteria for the information used to populate VAST mapping. For example, a future VAST map could potentially reflect data collected using the ESCAVI's approach for the native vegetation polygons, while the non-native component might potentially be based on land use data. In this respect, the VAST framework is compatible with the ESCAVI's approach to indicators but it should not be misinterpreted as an alternative method for condition assessment.

SECTION 3: SYNTHESIS OF PILOT PROJECT OUTCOMES

The pilots collectively have demonstrated that the conceptual basis of the ESCAVI's interim approach to native vegetation condition indicators has clear potential for application at the regional level across Australia. In relation to what works and what needs improving in the interim approach, a number of common themes emerge. These are described below.

Using benchmarks is a critical requirement

Using benchmarks (or reference conditions) in native vegetation condition assessment is relatively simple. Making a 'benchmark' involves documenting, and thus making explicit, the expected condition (in terms of values for a number of attributes) for a given vegetation type. In reality, almost anyone assessing vegetation condition at a given site has some notion of how the attributes they are assessing compare to what they would expect to see if the site was in 'optimal' condition. However, notions of 'optimal' can and do vary between assessors. Without an explicit benchmark to standardise a reference condition, data from different assessors, with different inherent references in mind, are difficult or impossible to collate.

A benchmark not only standardises the assessment of individual attributes, but also standardises what attributes should be assessed for a given type, and how these attributes should be weighted in a simple index, or overall score, for condition at a site. In this way, benchmarks provide a simple basis for condition assessment for many assessors across a range of organisations. This is not to diminish the role of assessment by scientific experts – in particular the development and refinement of benchmarks should be based on best available ecological understanding. In addition there are fundamental assumptions underpinning benchmark-based assessment that require testing in order to improve condition assessment over time. In this respect, the assessment and monitoring of vegetation condition is no different from the assessment and monitoring of vegetation extent and distribution.

While most states and territories have processes looking at tracking changes in particular attributes relating to the condition of vegetation, framing this kind of assessment against benchmarks specific to the vegetation types being assessed was new to some. The concept of benchmarks was meaningfully applied in all pilots and generally proved to be a powerful way of arranging and reporting on data from site assessments for particular attributes. One of the greatest advantages of benchmarks is the capacity they provide to compare condition between very different vegetation types. This underscores the relevance of the concept to consistent regional, statewide and national assessment and reporting.

Most of the pilots successfully tailored the benchmark concept to the circumstances (both ecological and institutional) of the state or territory concerned. In some cases this involved giving different weightings to different attributes or groups of attributes. There was also some investigation of redefining benchmarks as 'average' condition rather than 'long undisturbed' as set out in the interim approach. Such tailoring of the concept is inevitable given the primary responsibility of state/territory agencies to serving the requirements of their own legislation and policies. While it may provide some added complexities in interpreting assessment results at higher levels (eg for

national reporting), these are not considered critical to the potential effectiveness of indicators.

Interpretation will be a critical step in reporting

The purpose of the indicator is to allow target setting and reporting. The five-way classification against a benchmark, as outlined in the ESCAVI's interim approach, is powerful in its simplicity, but is not sufficient in itself for reporting. Interpretation of the scores is critical to using the results of assessment in sound decision making.

If no interpretation is offered, practitioners will inevitably make their own. They might logically conclude that the highest score (ie meets the benchmark) represents a 'desired state' for all vegetation all the time. However, benchmarks as set out in the ESCAVI's interim approach represent how this vegetation would look if it was 'long undisturbed'. Having all vegetation across a landscape meeting the benchmark all the time is unlikely to be optimal for biodiversity conservation. Natural disturbances and recovery processes, distributed heterogeneously across landscapes, are part of the natural functioning of most ecosystems. Therefore, careful and considered interpretation of the results is required to see them appropriately applied to better decision making for native vegetation. It is also inevitable that those involved in this interpretation will have different values and perspectives on what mix of condition states is desirable.

Attribute data are important and should be stored and maintained

Benchmark-based reporting will not be sufficient to answer all possible questions in relation to monitoring native vegetation condition. For example, at an individual site, managers or researchers may be interested to know how particular attributes respond to management actions (eg the development of hollows, or recovery of understorey). Databases established in relation to condition assessment using benchmarks should therefore also store, maintain and provide accessibility for the detailed attribute data for sites.

There may be potential to apply benchmarks to existing data

Pre-existing datasets in most states had suitable floristic data that could be applied retrospectively to a vegetation condition assessment, and landscape-scale attributes could be determined by various GIS datasets. However, structural components of the vegetation were generally not consistently available. In some vegetation types, the absence of this information will mean it is impossible to meaningfully assess condition, unless such data are gathered by field survey. However, there may be some vegetation types where usable surrogates for the structural information, such as disturbance layers based on remote sensed data, can be identified.

Documented, consistent site assessment methods are a key requirement

Most states/territories have, or are in the process of developing, methods for site-based native vegetation condition assessments. There is a need to ensure agreed methods are available and widely accessible for use in improved vegetation management and monitoring.

States with established methodologies for vegetation condition assessment are all using methods which generally align with ESCAVI's interim approach. For example, methodologies for collecting raw data at the site level all have a measure of species composition, cover, life history, weeds and litter. Some methods may include more

detailed habitat components such as presence of tree hollows and some recorded other modifying processes besides weeds (eg presence of introduced grazing animals).

Where variability exists between methods used by different states, this often relates to their purpose. For example, some are used for single property (rather than regional level) monitoring and have the purpose of educating the person conducting the monitoring (in addition to assessing progress and improving decision making).

There appears to be excellent potential for data based on existing state methodologies to be collated at the national level. In this respect it is not expected that these jurisdictions would need to make major changes to their existing methods as documented, However the outcomes and lessons learned from the pilots, once incorporated by ESCAVI into final indicators, may necessitate some improvements in existing methods. For example, it may be necessary to record or quantify the presence of threats/modifiers at a site scale to allow predicted trends (improving, stable, declining) to be determined. Such a change would be a minor amendment to existing protocols.

Landscape components provide important context and should be assessed
Landscape attributes are usually not scored at the site level and generally require mapping/GIS layers for assessment.

In the intensive land use zone (ILZ), landscape scale assessment generally involves some measure of connectivity and relative size for a particular patch of vegetation. Such assessment is useful in estimating conservation significance and potential resilience.

In the extensive land use zone (ELZ), or rangelands, landscape-scale assessment is potentially powerful in incorporating heterogeneity attributes in the benchmark for a given vegetation type. This relates to the desirability, for biodiversity conservation, of a spatial mix of disturbance states at a 'landscape' scale. Further work is needed in developing appropriate landscape attributes for rangeland benchmarks, and resolving how they would be weighted against site components. However the concept has good potential, particularly as it may be well served by remote sensing tools which are a substantial part of current rangeland condition assessment methods (see rangelands section below).

Landscape scale attributes were not considered in all of the pilot studies. However all states that have endorsed condition assessment methods under their vegetation management policies do include landscape assessments as they provide critical context for site assessments in the ILZ.

Data storage and retrieval systems should ensure that landscape attributes can be excluded or included as required for particular assessment and analysis purposes. For reporting, landscape attributes should be included within benchmark-based scoring and classification.

The ESCAVI's interim approach appears suited to regional target setting and reporting

The pilots have demonstrated the effectiveness of benchmarks for assessment and reporting, particularly at a site level. Regional target setting and reporting should ultimately be carried out using spatial information, as required in the ESCAVI's interim approach. Moving from the site scale to interpolation across whole landscapes to provide 'maps' of condition was not attempted in all pilots. Where this has been attempted, it has proved most useful for communicating the concept of condition reporting, but there are important risks to be aware of in applying such maps directly to decision making, at this stage. These risks relate to the reliability of modelling processes, as well as to the interpretation of maps of condition.

Reliable maps of condition, either as baselines or for reporting change, are unlikely to be available in the short term for most regions. Despite this, there is merit in regional groups collecting site level data and reporting using benchmarks on the condition of the vegetation at those sites. Such site data could be used to develop a de facto baseline of condition against which targets could be set and future change assessed and reported. The absence of reliable condition maps therefore should not preclude regions engaging in setting some targets for vegetation condition for some significant vegetation types.

The ESCAVI's interim approach also recommends estimation of areas for each vegetation type where management is considered likely to result in improvement, decline or no change in condition. A simple way to achieve this might be to include 'estimated trajectory' as a separate (i.e. outside the benchmark) attribute to measure as part of site assessment. The resultant data across sites and potentially in modelled mapping will significantly assist the identification of management priorities as part of target setting.

Comprehensive regional reporting is still a distant goal for most regions

The development of a statewide set of benchmarks for all vegetation associations is progressing rapidly in a number of states. This is an important first step in establishing site survey and assessment programs for vegetation condition to support target setting and monitoring. In the short to medium term however, most regions will do well to achieve some target setting for some sites within some vegetation types. Some reporting on change at the site level may be possible in the medium term. The kind of reporting envisaged in the ESCAVI's interim approach should be considered a long-term goal.

National collation is conceptually feasible but remains a far-off goal

The pilots have demonstrated that information bases on native vegetation condition to assist regional target setting can be established over time. It is also evident that minor differences between jurisdictions in the way this information is collected and reported should not be problematic for drawing together information at higher levels. However, the absence of benchmarks, corresponding site data and regional reporting means it is unrealistic to expect national collations of regional information in the short to medium term. In addition to the need for condition data, there are ongoing challenges in resolving inconsistencies across state/territory borders in the vegetation type mapping of the National Vegetation Information System (NVIS). These inconsistencies need to be addressed in pursuit of improved capacity for national reporting on all of the vegetation indicators (extent and distribution, and

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condition). In response to this, the ESCAVI has placed high priority on addressing 'equivalency' and 'spatial edge matching' issues in the NVIS.

There may be potential to incorporate benchmarks into current national assessment methods

The first National Land and Water Resources Audit (NLWRA) provided national maps and assessments of condition in its Landscape Health in Australia report (Morgan 2001) and again in the Australian Terrestrial Biodiversity Assessment (NLWRA 2002). These assessments used national and state data, and expert knowledge, to develop a national picture of land and biodiversity condition built on the Interim Biogeographic Regionalisation for Australia (IBRA) regions and subregions. There may be potential to incorporate benchmarks for major vegetation groups by IBRA regions into such reporting. While this would not address the lack of data, and consequent need for expert opinion, benchmarking major vegetation groups by IBRA regions might provide for greater transparency and consistency in the application of expert opinion. It may also provide a useful signal from a national level on the importance and value of benchmarks in condition assessment.

There is a need to better link the condition work of the ESCAVI with the work of the Australian Collaborative Rangeland Information System's management committee

More than 75 per cent of Australia is broadly defined as rangelands. *Tracking changes: Australian Collaborative Rangeland Information System* (NLWRA 2001) reported that the rangelands include a diverse group of relatively undisturbed ecosystems such as tropical savannas, woodlands, shrublands and grasslands. Rangelands extend across low rainfall and variable climates, including arid, semi-arid, and some seasonally high rainfall areas. Extensive grazing on native pastures occurs across the rangelands while broadscale cropping and cultivation generally do not take place. The term extensive land use zone (ELZ) has been used to distinguish Australia's rangelands from the intensive land use zone (ILZ) where human populations are generally greater and landscapes have been more significantly altered for intensive agricultural and urban development.

Native vegetation management in the rangelands often faces a different suite of challenges from those facing native vegetation managers in the ILZ. Given that the ESCAVI's interim approach to condition measures (or indicators) was based on methodologies developed for applications in the ILZ, special consideration is required for the indicators to apply in a rangeland context. Characteristics of the rangelands which necessitate this special consideration include:

– the extensive nature of land management practices with extremely large areas of land being managed as low input/output systems by relatively few people. This limits the relevance and application of site-based assessment and monitoring methods and necessitates a greater reliance on remote sensing to monitor changes to resource condition
– the paucity of detailed maps of native vegetation which adequately describe the variety of vegetation types and habitats that may exist across rangeland landscapes
– the strong focus of existing rangeland monitoring approaches on monitoring attributes important for pastoral productivity, rather than for reporting on biodiversity

- the fluctuating nature of many rangeland vegetation types, which respond markedly to natural factors such as rainfall, drought and fire events, as well as unnatural disturbance such as inappropriate fire regimes and grazing pressure from stock and feral animals.

There is a large body of existing and ongoing work on resource condition being conducted across the rangelands. All mainland states and the Northern Territory monitor rangeland condition, using a variety of methods including photopoints, site assessments of vegetation cover composition and soil surface characteristics, and remote sensing techniques. To date, the focus has been on land condition for productivity rather than for biodiversity habitat. More recently, measuring biodiversity has become a significant consideration.

The Australian Collaborative Rangeland Information System (ACRIS) was established to collate rangeland information from state, Northern Territory, Australian Government and other sources. ACRIS is coordinated through the Cooperative Research Centre for Desert Knowledge. A pilot project was run in five IBRA regions to determine ACRIS' capacity for reporting change from the information available. The pilot measured productivity for stock forage, native plant species presence, landscape function, cover and a social measure of capacity for change. The ACRIS methodology for rangelands biodiversity monitoring uses faunal and floral components in addition to the traditionally measured attributes.

The underlying concept of the ACRIS method is that trajectory of change for a given attribute is the key to understanding condition, provided seasonal effects are accounted for. For example, an improvement in a given attribute despite poor rainfall would indicate highest condition, while a decrease over a period of good rainfall would indicate poorest condition.

Links have been made between the ESCAVI's work on native vegetation condition and the emerging ACRIS method, but further work may be required here. The ESCAVI considers that the benchmark-based interim approach may be an applicable and valuable add-on to the ACRIS method. Likewise, there are likely to be valuable lessons from the ACRIS work that can inform the ESCAVI's work on indicators and protocols.

One such lesson is the importance of accounting for seasonal variations. Overcoming the high background variability in rangelands systems is critical to identifying condition changes due to management effects. The Queensland BioCondition site assessment method deals with seasonal variability in arid, semi-arid and tropical systems in the rangelands by recommending that condition assessment is not carried out during the peak of summer or following a period of drought (due to reductions in plant diversity). Generally, north of the Tropic of Capricorn assessment is recommended after the wet season, ideally from February to May, to ensure adequate sampling of ground cover species. South of the Tropic of Capricorn site assessments are recommended in May or June following the wetter summer months. In the event of unseasonably wet winter, assessments might take place in spring when plants are flowering. Assessments are not recommended during or immediately after rain events, due to the potential for over-domination of some life form groups e.g. cryptogams. However, the BioCondition manual specifies

that this is a general rule and local climate and knowledge should guide decisions about when to monitor.

The BioCondition site assessment method has been applied to a semi-arid system in the rangelands (see the Queensland pilot project report). BioCondition differs from the Victorian Habitat Hectares method by allowing for vegetation thickening as a negative effect when shrub cover is under- or overabundant when compared with a benchmark (as does BioMetric). BioCondition also differentiates between sites in intact (ie rangelands) and fragmented landscapes. Sites in intact landscapes also include distance from watering points in the landscape attributes for the site assessment. Including such attributes in benchmark and classification methods may appear to be at odds with the ESCAVI's interim approach. However, they are entirely suitable when applying the interim approach in the landscape contexts concerned. Accommodating the tailoring of the benchmarks to context should be a feature of ESCAVI's final indicators.

There are a number of other projects related to land condition monitoring in the rangelands and how it relates to, or can be modified to include, biodiversity features. These projects may add value to vegetation condition monitoring for biodiversity within rangelands either by clarifying (and improving) the relationship between current measurements of land condition and biodiversity or by developing/improving assessment methods and surrogates for condition for biodiversity within the rangelands. These projects include the following:

– The ABCD Framework is a joint Queensland, NT and Meat & Livestock Australia project to develop an education package for land managers to promote assessment of land condition as a key part of sustainable land management. A new project is being developed to include a biodiversity component in the framework. The project will select and test the surrogacy and assessment of simple indicators of biodiversity condition in two rangeland regions in Queensland.

– The CRC for Tropical Savannas is currently completing a project on incorporating biodiversity monitoring in rangeland condition assessment. Sites classified as poor, intermediate and good by land condition monitoring methods were further sampled for biodiversity and habitat features. Preliminary results show that current assessments of land condition in savanna rangelands do not adequately monitor biodiversity (Fisher *et al.* 2006).

SECTION 4: CONCLUSIONS

1. Based on the outcomes reported here, there is a need to refine the ESCAVI's interim approach.

2. The ESCAVI recognises that regional NRM groups require clear guidance on target setting for vegetation condition, and most member jurisdictions of ESCAVI have already responded to this need, as outlined in Section 3.

3. The achievements of ESCAVI in engendering national consistency in this rapidly emerging area are significant.

4. The ESCAVI will now prepare a refined set of indicators and protocols for native vegetation condition monitoring under the *native vegetation condition* indicator heading (National Framework). Based on outcomes of the pilots and subsequent discussion within ESCAVI, the indicators (and associated protocols) are likely to include one on 'current condition' and one on estimated future changes.

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Glossary	
ACRIS	Australian Collaborative Rangelands Information System
BCM	Bushland Condition Monitoring
CRC	Cooperative research centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEW	Australian Government Department of the Environment and Water Resources
ELZ	Extensive land use zone
ESCAVI	Executive Steering Committee for Australian Vegetation Information
GIS	Geographic information system
IBRA	Interim Biogeographic Regionalisation for Australia
ILZ	Intensive land use zone
National Framework	National Natural Resource Management Monitoring and Evaluation Framework
NLWRA	National Land and Water Resources Audit
NRM	Natural resource management
NVIS	National Vegetation Information System
TRARC	Tropical Rapid Assessment of Riverbank Condition
VAST	Vegetation Assets States and Transitions framework

Appendix A: *An interim approach to the native vegetation condition indicator*