Biodiversity Monitoring Framework for CLM-Second Edition 2012

The Certified Land Management (CLM) system is a whole-of-farm externally audited environmental and animal welfare certification system that verifies that participating landholders are continuously improving environmental and animal welfare outcomes and that the management system:

- operates across all activities operating on the land for which the certificate applies
- takes account of landscape-wide environmental considerations
- provides support for biodiversity conservation, and
- complies with the internationally accepted ISO14001 management standard

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1.0 Introduction

1.1 Background

The CLM certificate verifies that the land manager is continuously improving environmental and animal welfare outcomes and that the management system:

- operates across all activities operating on the land for which the certificate applies
- takes account of landscape-wide environmental considerations
- provides support for biodiversity conservation, and
- complies with the internationally accepted ISO14001 management standard

The ALM Group requires a user-friendly biodiversity monitoring framework, which participating landholders can apply to demonstrate performance against biodiversity objectives under the CLM. The framework needs to be applicable and adaptable across a range of rural ecosystems, enterprises and geographic regions, with current participation including landholders in South Australia, Victoria, New South Wales and southern Queensland. Where possible, the biodiversity monitoring framework should be linkable with and complement similar programs already in use by industry and NRM groups.

The proposed Biodiversity Monitoring Framework will provide a means by which landholders can select and justify appropriate biodiversity indicators that can be used to measure and demonstrate progress against biodiversity conservation objectives within the context of the CLM. The framework will provide guidance on indicator selection and use, including adaptation of indicators to particular regional, biogeographic and industry needs.

1.2 Scope

Five key questions were addressed in developing the biodiversity monitoring framework. These were:

1. What certification criteria should ALM Group select in relation to biodiversity for CLM?
2. How should spatial boundaries (i.e. CLM biodiversity regions) be defined given the presumption that selected indicators may need to be altered according to geographic location?
3. For which defined regions will biodiversity indicators be identified for the draft biodiversity monitoring framework?
4. What are the recommended indicators for each region and why were they chosen?
5. How should each indicator be monitored?

2.0 CLM Biodiversity Regions

The broad geographic extent of current and potential future CLM users means that the biodiversity components of CLM will need to cover a wide range of ecosystems, climatic zones and biodiversity management issues. A regionalisation approach is, therefore, required to ensure that biodiversity components can be tailored and targeted to particular user-groups and/or regions.

A number of regionalisation approaches are available for consideration in the further development of the CLM biodiversity components, the most relevant of which are:

- Ecoregions (DEWHA 2009);
- Biogeographic regions (Thackway & Cresswell 1995; DEWHA 2004); and
- Agro-ecological regions (Williams *et al.* 2002).

All of these approaches are based primarily on climatic zones and/or dominant landforms/soils/geology and/or dominant vegetation types; however, given their varied purposes, each presents a somewhat different regionalisation of Australia.

2.1 Ecoregions and biogeographic regions

The primary aim of ecoregions and biogeographic regions is to identify ecological zones and biodiversity resources for conservation purposes (e.g. for the National Reserve Network program of DEWHA). While both of these approaches make sense from an ecological standpoint, neither approach adequately accounts for regional similarities in the pattern of agricultural and other land-use development. They do not, for example, make any consideration of the clearing extent, settlement patterns, or production systems that further characterise particular geographic regions. These human-influence factors are all important additional considerations for any individual or organisation endeavouring to develop regionally appropriate systems for sustainable land management.

CLM takes account of the activities of the suite of land uses applying on the land for which the certification applies. Fundamentally, however, it is a land management EMS and is not aligned with any specific agricultural industry (or with any particular land-use sector). The landscapes within which it is applied, however, are largely occupied by primary production in a matrix of other land-uses (e.g. mining and conservation). From a regional perspective, therefore, CLM needs to take into account broad similarities in land-use and development patterns. Consequently, the ecoregion and biogeographic region approaches are considered inadequate for application to CM. Furthermore, the ecoregions approach is too broad with too few regions to be relevant to many land managers; and biogeographic regions are too complex to be applied easily to CLM.

2.2 Agro-ecological regions

The agro-ecological regionalisation approach of Williams *et al.* (2002) was developed from the perspective of ecologically sustainable development for the Australian agricultural sector and takes into account "…the major farming systems and environmental regions in Australia where:

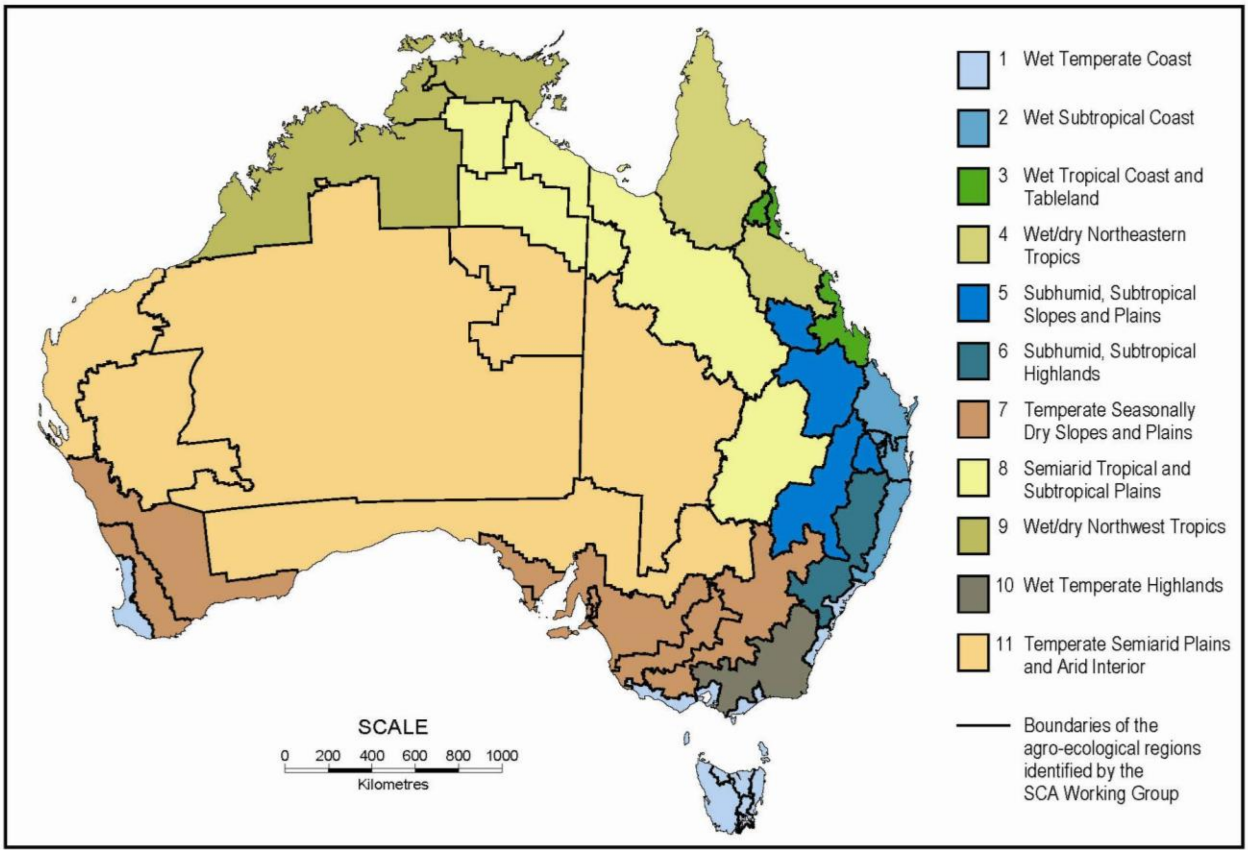
- each farming system is characterised by a combination of major variables such as management practices, marketing systems, infrastructure (e.g. transport) and services provided by government agencies (e.g. research, water supply); and
- each region is relatively homogeneous with respect to climate, landscape, geology, soil type and vegetation."

This regionalisation process derived 46 agro-ecological regions across Australia, which were later aggregated into 11 regions (**Figure 2.1**), and identified the major natural resource management issues for those regions (Williams *et al.* 2002).

Since this approach accounts for bioclimatic, and biogeographic factors as well as patterns of land development , it is recommended that ALMG adopts the eleven agro-ecological regions for the biodiversity components of ALMCS. The 46 sub-regions may later be used if deemed appropriate as the ALMCS evolves.

FIGURE 2.1 AGRO-ECOLOGICAL REGIONS OF AUSTRALIA (SOURCE CSIRO; WILLIAMS *ET AL.* 2002)

Refer Appendix A for larger version of this map



3.0 Biodiversity Certification Criteria

CLM complies with internationally recognised environmental management standards (ISO 14001) and, among other environmental objectives, requires *"…continuous improvement in support for biodiversity conservation…"*

Biodiversity is a somewhat all-encompassing term for the enormous range of biotic elements that exist in the natural environment. It includes everything from genes to species and communities, as well as referring to the habitats that species depend upon and the ecological processes that support the natural environment and, ultimately, human life.

Whilst not predetermining priorities for particular land managers, CLM requires compliance with internationally accepted management processes, consideration of landscape-wide priorities and demonstrated continuous improvement in environmental outcomes, including improvement in support for biodiversity conservation. Biodiversity was selected because it is such a central concept to ecologically sound land use, it applies across all landscapes and it is important for both conservation and production.

Several criteria may be recognised as integral to biodiversity management and conservation in the context of environmental management systems (EMS) and regional natural resource management (NRM). These criteria require natural resource managers to:

- Demonstrate an understanding of the biodiversity assets present in their local and regional landscape;
- Demonstrate an understanding of direct and indirect impacts of their enterprise/s on biodiversity; and
- Demonstrate continuous improvement in protection and management of biodiversity assets.

The last of these criteria is probably the most critical criterion to adopt within the continuous improvement framework of CLM; however, in order to achieve continuous improvement in biodiversity management, landholders need to first understand their biodiversity asset base and the impacts afforded upon those assets by their production system.

Given the need to couch criteria in positive terms and to focus on continuous improvement in on-site management (as opposed to the assets *per se* or the knowledge base of the manager) demonstration of continuous improvement in the management of impacts on biodiversity was proposed as a certification criterion for biodiversity. However after due consideration the ALMG Board resolved that the biodiversity conservation certification criterion would be that the environmental manager **provides support for biodiversity conservation.**

4.0 Performance Criteria

For biodiversity to be adequately incorporated into CLM, and in order to adequately address the certification criteria, performance criteria need to be derived from the plethora of available biodiversity parameters. These biodiversity performance criteria will, when adopted by producers and effectively monitored, be a valuable marketing tool to provide credible evidence of the producer's progress against the certification criteria.

4.1 Guiding Principles

4.1.1 Protection and Restoration of Biodiversity

One of the objectives of CLM is to encourage landholders to align their environmental management objectives and actions with the biodiversity targets set down by catchment and regional natural resource management groups. In most cases, these targets (along with those of most State conservation agencies) fall into two main categories:

- No further negative impact on biodiversity (often stated in terms of "no net loss" of native vegetation or species or ecosystem services); and
- Restoration of degraded biodiversity (often stated in terms such as "net gain" of native vegetation, "rehabilitation" of habitats, "increase" in rare species populations or "restoration" of ecosystem services).

Anderson *et al.* (2001) point out that for an EMS to be truly "biodiversity friendly" it should address both protective (no negative impacts) and restorative aspects of biodiversity management. As such, the above categories should be considered as primary guiding principles for the selection of performance criteria that can be managed and monitored at property scale in order to address the key CLM certification criteria.

4.1.2 Key Components of Biodiversity

Given the difficulty of accurately defining what biodiversity is and, therefore, the improbability of finding reliable indicators for biodiversity in its broadest sense, it is pertinent to break down the concept of biodiversity into a number of key components.

The three key components of composition, structure and function that are now widely used, particularly in the context of monitoring framework development, were described by Noss (1990) as follows:

> *"Composition, structure, and function...determine, and in fact constitute, the biodiversity of an area.* ***Composition*** *has to do with the identity and variety of elements in a collection, and includes species lists and measures of species diversity and genetic diversity.* ***Structure*** *is the physical organization or pattern of a system, from habitat complexity as measured within communities to the pattern of patches and other elements at a landscape scale.* ***Function*** *involves ecological and evolutionary processes, including gene flow, disturbances, and nutrient cycling."*

4.2 Key Performance Criteria

4.2.1 Protection and restoration of remnant native vegetation

It is widely accepted that the protection and restoration of remnant vegetation is a more efficient and effective way to conserve biodiversity than recreating habitat through revegetation. On this basis, it is suggested that the protection and management of on-farm remnant native vegetation is a key performance criterion for the CLM biodiversity framework.

Management objectives for addressing remnant vegetation protection and restoration may include:

1. Exclusion and/or improved management of total grazing pressure;
2. Placing remnant areas under a covenant or other management agreement;
3. Promoting native species regeneration and increased native species richness;
4. Promoting improved structural diversity and age-class diversity of vegetation; and
5. Reducing and/or eliminating invasive species, weeds, pest animals and feral predators.

Measurement of performance against this criterion would best be done in the context of locally-derived benchmarks for like vegetation types in sound ecological condition. Improvement in management is based on the condition of on-site vegetation moving along a trajectory towards the benchmark condition. Vegetation condition would be measured in terms of structural integrity, species composition and functional aspects such as regeneration of critical species or life-forms (e.g. canopy trees).

4.2.2 Protection and restoration of native species populations

The protection and management of native flora and fauna species in order to avoid further extinctions is a primary concern of State and Commonwealth conservation agencies and is usually also incorporated into regional biodiversity strategies. While much of the (publicly visible) focus for this is on rare and threatened species, it is important to remember that all species need to be protected to avoid more species moving into the threatened category.

The protection and restoration of native species populations will, to a large extent, result from the protection and restoration of native vegetation as described in the previous section. Consequently, this performance criterion may be considered redundant for most species and its inclusion debatable. If, however, rare, threatened or other locally-prioritised species are known to occur on-site, or in the local district, CLM should provide an avenue for addressing their protection and management as part of the land manager’s contribution to achieving CLM certification criteria.

Important management objectives for addressing species protection and management include:

1. on-farm habitat areas for threatened and/or of-concern species are protected;
2. threatened and/or of-concern species populations remain stable or increase in the local context; and
3. threatening process (e.g. predators, habitat loss) are not introduced or spread to habitat areas for threatened and/or of-concern species on farm.

Measurement of performance against this criterion could be based on direct evidence of presence and abundance of rare and/or threatened and/or local priority flora and fauna species or on indirect measures of the abundance and/or condition of critical habitat resources (e.g. tree hollows, wetlands).

4.2.3 Protection and restoration of ecosystem services

Ecosystem services are often overlooked in biodiversity strategies in favour of the preservation and restoration of native species and communities. This focus, albeit important from a conservation perspective, fails to take into account the valuable ecosystem services provided through the maintenance of biodiversity and ecological function in all areas of the farm or local landscape rather than just those areas with remnant native vegetation.

Biodiversity maintenance in native pastures, for example, is particularly relevant here because high plant species diversity, plant vigour and high ground cover can indicate both healthy biodiversity and strong productivity. Similarly, high soil biodiversity, as indicated through microbial activity and the abundance and diversity of soil biota (e.g. worms, ants, beetles, fungi) is a primary contributor to soil health (e.g. see Lobry de Bruyn 1999; Barrios 2007; Brussaard *et al.* 2007) and therefore a key driver of crop and pasture productivity. Furthermore, biodiversity encompasses the beneficial animals (particularly invertebrates) that assist in vital ecosystem services such as pollination and natural pest control.

Ecosystem services (and ecological functions) of biodiversity include (but are not limited to):

- maintaining and improving nutrient cycling;
- maintaining and improving soil health;
- reducing soil erosion and sedimentation;
- maintaining healthy and productive native grasslands/pastures;
- pollination and natural pest control in crops, pastures, production forests and native ecosystems;
- providing connectivity (e.g. corridors) between habitat patches for native species;
- buffering of waterways to reduce sedimentation/nutrification and maintain high water quality; and
- buffering of important habitat areas from disturbance.

Management objectives for the protection and maintenance of ecosystem services may include:

1. maintain permanent vegetation cover to buffer streams and remnant vegetation patches;
2. increase the size of small habitat patches by allowing regeneration of native vegetation on their perimeter;
3. provide and maintain wildlife connectivity between major habitat patches;
4. maintain diverse native pastures with a high level of perenniality;
5. maintain high ground cover (plants and litter) in cultivations and pastures;
6. maintain habitat and populations of beneficial animals in and around productive zones;
7. maintain healthy levels of soil organic matter; and
8. maintain soil biodiversity in crop and pasture lands.

Measurement of performance against this criterion is not as straightforward as for the other two performance criteria; however, a range of indirect measures are available and focus on aspects of ground cover and vegetation permanence.

5.0 Indicators

Indicators for each of the performance criteria are addressed in terms of the key biodiversity components of composition, structure and function. Rather than providing a prescriptive set of biodiversity indicators, this section provides a list of key indicators for each performance criterion that can be used as a guide for selecting appropriate indicators and monitoring tools from sources relevant to the region/district in which the CLM certified producer operates.

5.1 Protection and restoration of remnant native vegetation

For a given patch of remnant native vegetation, performance against this criterion is, ideally, measured against vegetation condition benchmarks for like vegetation type in good ecological condition within the local landscape. Such benchmarks are already available in some regions (e.g. Victoria, see Straker & Lowe 2004; Queensland, see Kelly & Eyre 2007).

If on-site vegetation condition is somewhere below benchmark condition, then restoration is demonstrated when critical indicator measurements increase towards the benchmark 'score'. If the on-site vegetation is in benchmark condition, then on-going protection and management will result in the benchmark condition being maintained.

The main indicators for protection and restoration of remnant native vegetation include:

Composition species richness of native plants; diversity of life forms (e.g. trees, shrubs, grasses, ferns); presence/abundance of exotic plant species; presence/abundance of noxious weeds

Structure number, height and cover of layers; cover of life forms; abundance of hollow and/or dead trees; cover/abundance of logs; cover of litter; cover of rocks

Function presence of regeneration (i.e. seedlings/saplings); canopy dieback; cover of bare ground and litter; cover or basal area/cover of perennial plants; soil condition (e.g. surface stability, compaction); presence/abundance of weeds

5.2 Protection and restoration of native species populations

Measurement of performance against this criterion may be based on direct evidence of presence and abundance of rare and/or threatened and/or local priority flora and fauna species. In some cases, this may be relatively straight-forward (e.g. for highly visible and distinctive species like some threatened birds); however, it is likely to require expert input in the case of more cryptic and hard-to-identify species (e.g. small reptiles and plants).

Since the protection and restoration of habitat for priority species is likely to be the primary management intent to meet this criterion, measures of the abundance and/or condition of critical habitat resources (e.g. tree hollows, wetlands) are likely to provide the best indirect evidence of protection/restoration of species populations.

The main indicators for protection and restoration of native species populations are:

Composition	Direct: presence and/or abundance of priority species Indirect: presence and/or abundance of associated species (e.g. food trees); presence and/or abundance of known competitors and/or predators
Structure	Indirect: abundance of hollows and/or logs; cover of litter; cover of rocks; presence/cover of life-forms or layers
Function	Indirect: cover of bare ground and litter; soil condition; presence/abundance of weeds; regeneration of associated plants (e.g. food and shelter trees)

5.3 Protection and restoration of ecosystem services

Ecosystem services are difficult to quantify and, therefore, provide a significant monitoring challenge. It is, however, possible to select a range of indicators that would provide indirect evidence for the ongoing improvement of ecological functioning and provision of ecosystem services.

The main indicators for protection and restoration of ecosystem services include:

Composition	species richness in native pasture; presence/abundance of weeds and pest animals; presence/abundance/richness of soil fauna (e.g. worms, insects, larvae)
Structure	presence and cover of corridors or other connectivity elements; presence and width of riparian buffers; presence and abundance of logs and hollow trees
Function	basal area/cover of perennial plants; soil condition (e.g. surface stability, compaction); evidence of soil biotic processes (e.g. worm holes, roots, decaying organic matter)

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APPENDIX A **AGRO-ECOLOGICAL REGIONS OF AUSTRALIA (SOURCE *CSIRO; WILLIAMS ET AL. 2002*)**

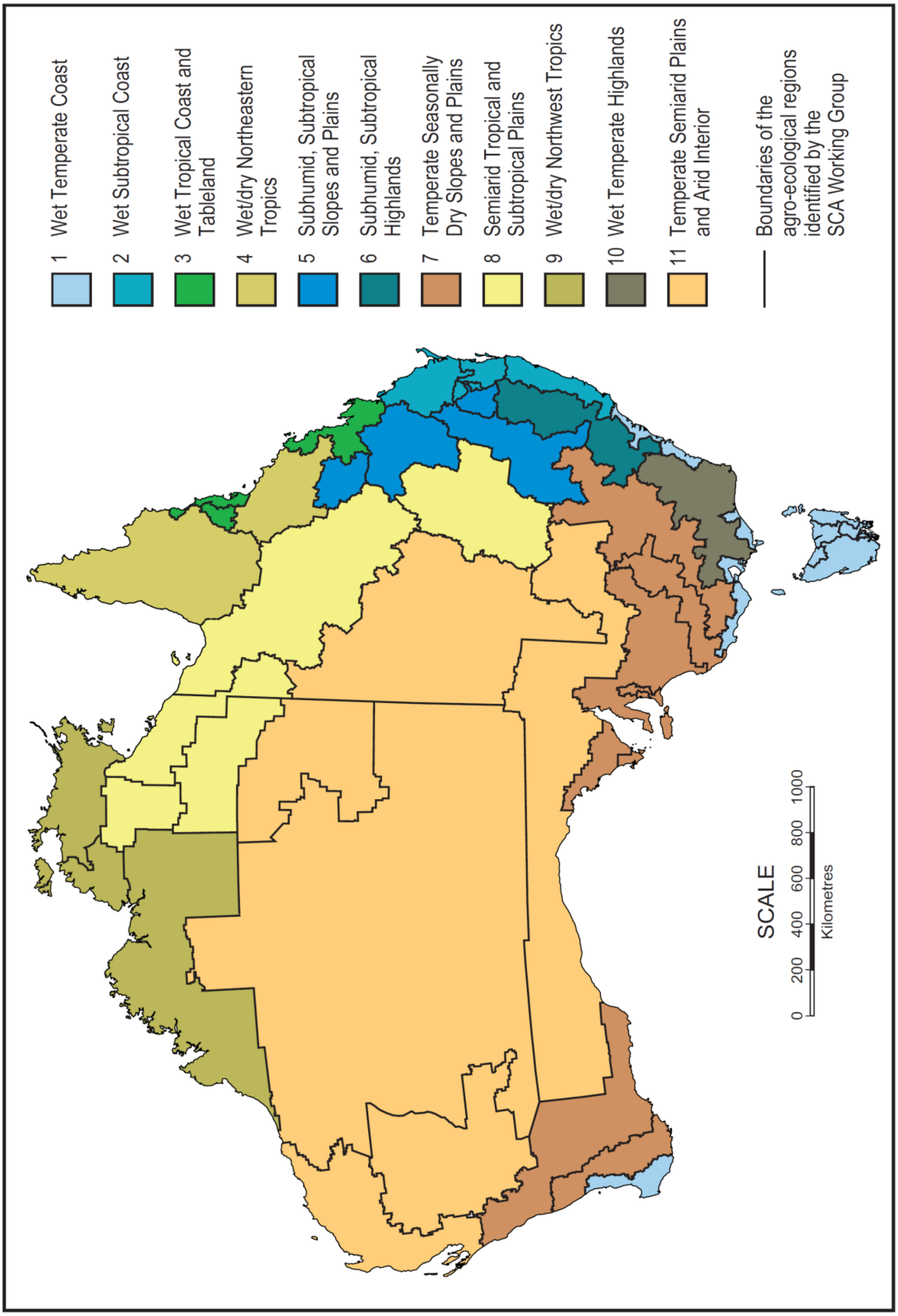

Figure 2.3 The eleven agro-ecological regions adopted for the National Strategy on Ecologically Sustainable Development in agriculture in relation to the forty-six regions identify by the SCA Working Group

Agro-Ecological Regions of Australia
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