Natural Resource Policies and Programs Committee
Biodiversity Decline Working Group

A NATIONAL APPROACH TO BIODIVERSITY DECLINE

Report to the
Natural Resource Management Ministerial Council

July 2005

EXECUTIVE SUMMARY

Over recent decades, all levels of government have been working to prevent the loss of native species and their habitats. Available evidence suggests there is a continuing decline in biodiversity. Species extinctions, secondary salinisation, soil decline, pest outbreaks, and declining native vegetation and water quality and quantity are among a range of symptoms of ecosystems losing the capacity to repair themselves. At the same time, Australians are recognising the environmental, economic and social values of biodiversity and ecosystem services.

The time is right for governments to review progress, policy directions and delivery mechanisms to focus investment and effort according to clear priorities addressing the underlying causes of biodiversity decline.

A wide-ranging review of past biodiversity conservation programs was undertaken by the Biodiversity Decline Working Group, covering 25 programs delivered within states and territories or nationally. Specific attributes of more and less effective programs were identified. Based on this review, the main challenges to achieving most effective delivery of outcomes to address biodiversity decline are considered to be defining clear program objectives and purpose, and improving program design. The Working Group also identified key elements of the most effective approaches for delivery, management interventions and approaches.

The Working Group reviewed key threats to biodiversity, the outcomes sought and the most effective interventions to address these threats. Outcomes and strategies were identified that would benefit from a national approach.

Based on these reviews, the Working Group has proposed a national approach to deliver a range of cost-effective national actions to reduce the impact of system-wide threats that are underlying causes of decline in biodiversity.

The approach focuses on three system-wide threats to biodiversity, where existing responses should be enhanced and where national scale attention is needed for new actions:

❖ Drivers of loss of habitat values and decline in ecosystem function

❖ Spread of invasive pests, weeds and diseases

❖ Climate change impacts on biodiversity.

The approach identifies the highest priority actions, actions that maintain natural systems, actions that advance ecologically sustainable natural resource management, actions that will improve institutional frameworks for delivery, and actions that will embed biodiversity conservation into the economic and social fabric of Australia. Twenty-six actions have been identified to address the three system-wide threats.

A national approach will aim to deliver the following primary outcomes:

❖ More effective management that will reverse the decline in extent and condition of populations and habitat of species and communities

❖ Reduction in the impact of invasive species on biodiversity

❖ Improvement of our preparedness for the impact of climate change on biodiversity

❖ A national network of continental scale ecological linkages, including conservation reserves surrounded and linked by sympathetically managed lands, where conservation is incorporated into integrated land use which protects biodiversity *in situ* and maximises the opportunity for biodiversity to adapt to climate change

❖ Improved knowledge of biodiversity condition and status, and better decision-making for biodiversity conservation

❖ Engagement of the full capacity of governments, landholders, industries, non-government organisations and communities to conserve Australia's biodiversity assets.

The key policy directions proposed to achieve these outcomes and improve the overall effort to address biodiversity decline are:

• Establishment of institutional and governance arrangements that clarify roles and responsibilities and ensure integrated outcomes, including promotion of joint ownership of the problems and solutions

• Defined landholder duty of care for government managed, leasehold and freehold lands to enable better targeting of investment for conservation activity

• Establishment of intergovernmental mechanisms to identify and conserve an Australia-wide network of conservation lands and ecological linkages

• Effective market based mechanisms to deliver biodiversity conservation

• Continued investment in knowledge creation and social and institutional capacity for effective conservation of biodiversity.

Biodiversity is a simple concept, but its conservation is a complex issue involving multiple stakeholders at a range of scales and across a number of natural resource management and environmental sectors. Arresting the decline in biodiversity will require a range of institutional changes to provide adequate planning and management frameworks and integration of effective delivery mechanisms.

Implementation of a national approach to biodiversity decline requires the cooperation and commitment of all governments. The 26 actions contained in this report will provide more integrated and long-term solutions. Implementation requires further development of a detailed work plan and a collaborative will to adopt these recommendations into the various jurisdictional policy and operational frameworks.

CONTENTS

INTRODUCTION AND CONTEXT

Australia has a history of significant and critical progress in preventing biodiversity decline. Initiatives have included:

- Improvement of our knowledge and understanding of species, habitats, ecosystems and the characteristics of Australia's natural biodiversity

- Education about and extension of biodiversity science and knowledge through public institutions and teaching and learning networks

- Regulation of use, trade and development impacts on Australia's natural biodiversity

- Establishment of quarantine practices to minimise the occurrence and impact of invasive and destructive pests, diseases and weeds

- Establishment of a national system of public and private reserves set aside as core areas for the protection of natural biodiversity

- Engagement of industry and landholders in management practices that are sympathetic to protection of biological systems within production environments

- Planning and implementation of management regimes to reverse the decline in critically threatened species and ecological communities

- Engagement of regional communities in integrating biodiversity planning and management into natural resource management decisions.

These achievements have been significant, but concern remains over the continuing decline of naturally occurring biodiversity at a global, national and regional level.

Natural Resource Management Ministerial Council (meeting 5 October 2003) Resolution 3C(f) requested:

> *"NRMSC to develop for Council's consideration a national program to address the identified biodiversity decline, focusing on high priority, system-wide threats and the most cost-effective measures that will lead to long-term improvements to biodiversity assets, taking into account existing programs and the need to avoid duplication."*

At their initial planning workshop, the Natural Resource Policies and Programs Committee (NRPPC) (Hobart, March 4-5) discussed the case study 'Underlying causes of the loss of native species and ecological communities', along with the NRM case studies on soil acidification, soil erosion and water quality. NRPPC agreed

> *"That development of the national (approach) should include:*
>
> - *Evaluation of the effectiveness of current and past programs*
>
> - *Identification by each jurisdiction of its priority biodiversity outcomes and the most cost-effective means for government to address system-wide threats to biodiversity, drawing on the National Land and Water Resources Audit Terrestrial Biodiversity Assessment*
>
> - *Assessment of the potential of a national (multi-jurisdictional) scheme for biodiversity conservation stewardship payments for owners of private land, including determination of baseline NRM requirements of landholders, above which conservation payments would be made."*

At their first meeting (21 May 2004), the NRPPC considered developing a national approach to biodiversity decline and agreed to three analyses to inform the development of the approach:

- Evaluating effectiveness of previous programs

- Identifying, on a jurisdictional basis, priority biodiversity outcomes, major pressures and the most cost-effective public policy interventions

- Assessing the feasibility of a multi-jurisdictional scheme for biodiversity conservation stewardship payments for owners of private land.

The NRPPC agreed to convene a working group to undertake these tasks. The outcomes of the Biodiversity Decline Working Groups deliberations are presented in this report.

SCOPE OF THE REPORT

The report considers terrestrial and freshwater aquatic biodiversity and the impact on biodiversity from land based activity and influences, including climate change. The report does not explicitly consider marine biodiversity.

'Biodiversity' Defined

Biodiversity is defined in Article 2 of the United Nations Convention on Biological Diversity as:

The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

Section 1: DEFINING THE ISSUE

Seventeen countries are recognised worldwide as 'megadiverse'. These countries collectively hold around two thirds of the world's biodiversity (World Conservation Monitoring Centre 2000). Australia is one of these countries, and one of only two developed countries among the seventeen.

Australia, the only country which spans an entire continent and its biota, has a unique opportunity to conserve a significant part of the world's biodiversity. The 2001 State of the Environment report summarises the unique features of Australia's biodiversity. We have more species of higher (vascular) plants than 94% of countries on earth, and more non-fish vertebrate animals (mammals, birds, reptiles and amphibians) than 95% of the world's countries. We have more species of mammals than 93% of countries, more birds than 79% of countries, more amphibians than 95% of countries, and more reptiles than any other country on earth. Even more impressive are the number of endemic species in Australia - species that occur nowhere else on earth. Australia has more endemic plants than 98% of the world's countries, and more endemic non-fish vertebrates than any other country.

For some decades, all levels of government have been working to conserve these globally significant biodiversity values. Available evidence suggests there is a continuing decline of biodiversity and ecosystems. Strategies to target existing effort better, accelerate action and significantly increase investment are needed to reverse current trends in biodiversity decline.

1.1 Evidence of biodiversity decline

> *"There has been a massive contraction in the geographical ranges and species composition of Australia's indigenous mammal fauna over the last 100+ years. One third of the world's extinct mammals since 1600 AD are Australian. Such a record is unparalleled in any other component of Australia's biodiversity, or anywhere else in the world."*[1]

The last 200 years have seen a dramatic change in Australia's natural ecosystems (see for example Figure 1). The decline of biodiversity has many causes. The multitude of actions taken daily by individual land managers, industries, communities and governments contribute to the loss of native species and their habitat, reduce soil condition and water quality, and modify ecosystems so that they no longer function as they should. Many of these actions are taken without any real understanding of the longer-term environmental costs.

We are now experiencing the evidence of the cumulative effects of these actions in the loss of native species and a significant reduction in the capacity of natural systems to support our requirements (for example Figure 2). Our actions today will determine the degree to which these trends can be reversed.

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[1] National Land and Water Resources Audit (NLWRA) *Australian Terrestrial Biodiversity Assessment 2002*

Legend

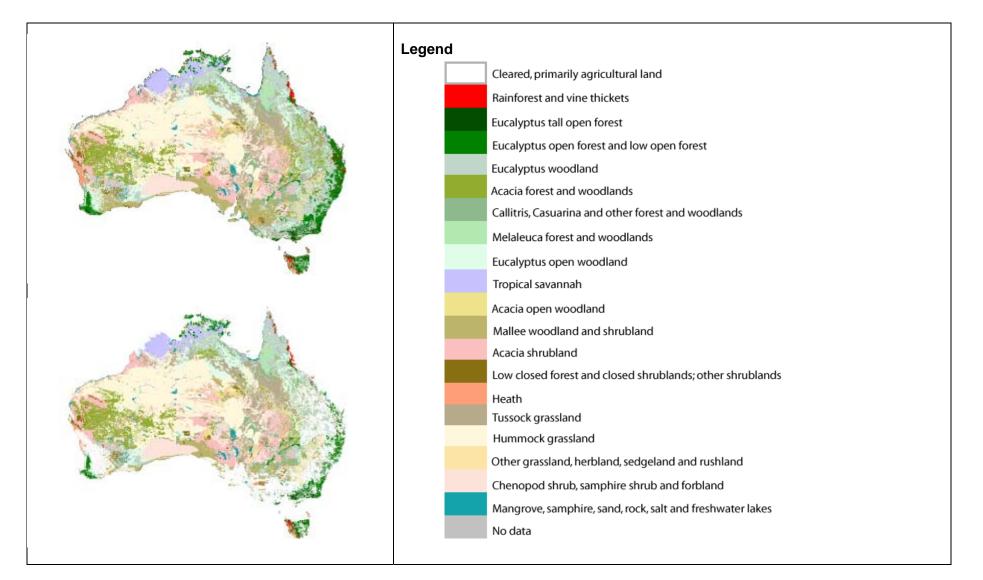|	
	Cleared, primarily agricultural land
	Rainforest and vine thickets
	Eucalyptus tall open forest
	Eucalyptus open forest and low open forest
	Eucalyptus woodland
	Acacia forest and woodlands
	Callitris, Casuarina and other forest and woodlands
	Melaleuca forest and woodlands
	Eucalyptus open woodland
	Tropical savannah
	Acacia open woodland
	Mallee woodland and shrubland
	Acacia shrubland
	Low closed forest and closed shrublands; other shrublands
	Heath
	Tussock grassland
	Hummock grassland
	Other grassland, herbland, sedgeland and rushland
	Chenopod shrub, samphire shrub and forbland
	Mangrove, samphire, sand, rock, salt and freshwater lakes
	No data

Figure 1. Pre-European and current (circa 1997) major vegetation groups in Australia[2]

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[2] NLWRA 2001 *Australian Native Vegetation Assessment 2001*

We now realise that the cost of repairing damaged ecosystems and restoring the services they provide is very large.

> *"Now it is becoming clear that the cost of repairing damaged ecosystem services is very large indeed…, Australia is investing $1.5 billion per annum in biodiversity and natural systems, $1.2 billion of it from government, mostly in an effort to repair damage... The annual costs to agriculture of lost production (around $1.2b) and of environmental repair ($2-6b) are already eating into annual production value ($25b)."[3]*

Lack of knowledge about the status of biodiversity and the most effective management responses is also a driver of biodiversity loss. Lack of knowledge can lead to decisions that compound other pressures. Information is needed to allow better targeting and choice of remediation activities, and to form the basis for developing a better understanding of the ecosystems that support species and ecological communities.
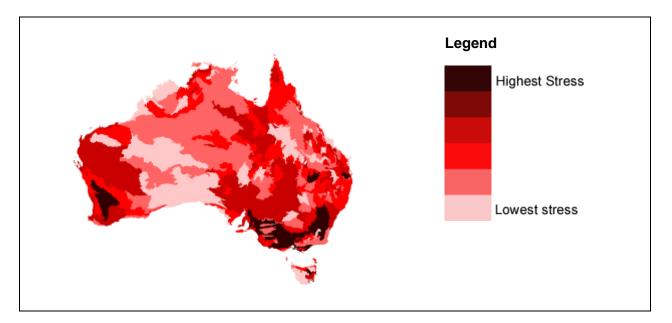

Figure 2. Continental landscape stress[4]

Loss of biodiversity and the ecosystem services will affect the quality of life of Australians dramatically, and is indicative of the broader decline in life support systems and natural resource condition across the country. Ironically, this is occurring at a time when the economic and social value of these assets and services are being increasingly recognised (eg parks system and tourism, clean water, amenity value in landscape).   A broad range of conservation mechanisms will be needed to address biodiversity decline issues across different tenures and land uses (for example figures 3 and 6) and at various scales.

1.2 The way forward

There is a high level of interest within the community in a healthy environment and in conservation of native species, ecosystems and landscapes. Many land managers and natural resource industries have embraced the concept of ecosystem management, but translating this concept into ecologically sustainable management practices remains a challenge across the landscape.

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[3] Prime Ministers Science, Engineering and Innovation Council *Sustaining Our Natural Systems and Biodiversity* 2002
[4] NLWRA 2001 *Landscape Health in Australia*

Priorities for action should be to ensure that ecosystems in good condition stay that way, to prevent further loss of species, and to restore damaged ecosystems to prevent ongoing decline and loss of species.
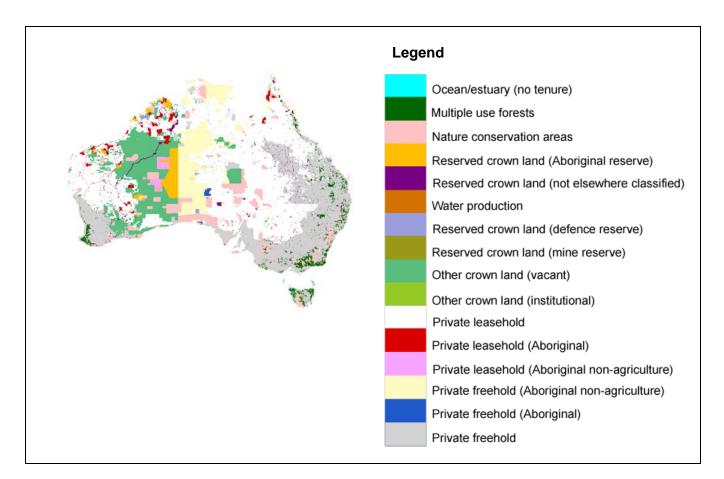

Figure 3. Tenure in Australia[5]

Some long-standing conservation programs, particularly development of a national conservation reserve system and invasive species control, remain key components of the current focus, though progress is limited due to competing priorities and the scale and complexity of threats.

The impacts of climate change may make retention, let alone restoration, of biodiversity and ecosystem function an even greater challenge. Modelled changes on the composition and extent of ecosystems mean that even established reserves may require adaptive management to minimise impacts and retain their functionality into the future.

Improving the outcomes from our efforts to conserve and restore biodiversity will necessitate some changes in the way we live and do business. The need for change is also emerging as a key issue in other areas of natural resource management, including rural land use, urban development, energy, water supply and transport. Some of the changes required will be relatively painless and cause minimal disruption to existing arrangements. Others will require more substantive modifications to our activities, business approaches and institutions. Not taking action might delay some of the more difficult decisions, but will inevitably lead to greater challenges in the future.

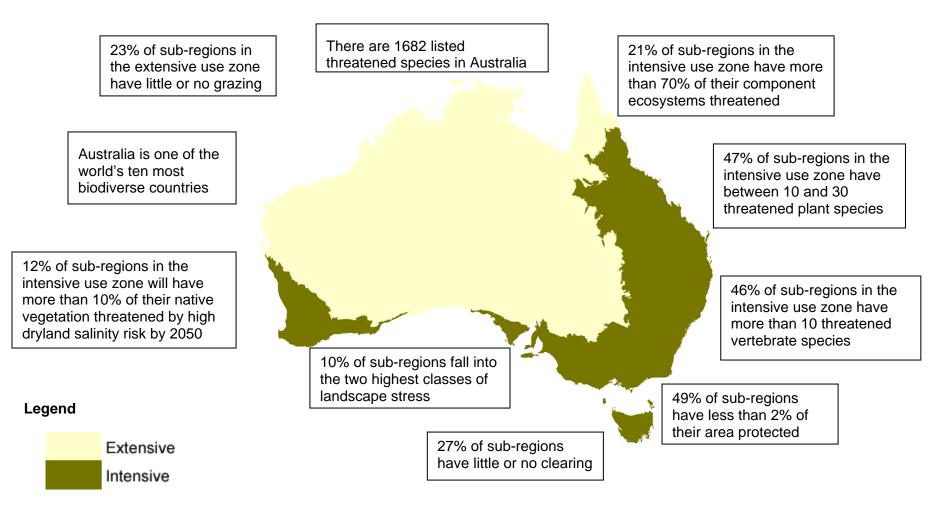[5] Bureau of Rural Sciences 1997 '1997 Australian Land Tenure Data Set'

23% of sub-regions in the extensive use zone have little or no grazing

There are 1682 listed threatened species in Australia

21% of sub-regions in the intensive use zone have more than 70% of their component ecosystems threatened

Australia is one of the world's ten most biodiverse countries

47% of sub-regions in the intensive use zone have between 10 and 30 threatened plant species

12% of sub-regions in the intensive use zone will have more than 10% of their native vegetation threatened by high dryland salinity risk by 2050

46% of sub-regions in the intensive use zone have more than 10 threatened vertebrate species

10% of sub-regions fall into the two highest classes of landscape stress

49% of sub-regions have less than 2% of their area protected

Legend

Extensive

Intensive

27% of sub-regions have little or no clearing

Figure 4 Boundary between the intensive and extensive land use zones [6]

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[6] Data sourced from: *NLWRA Australian Natural Resource Atlas: Landscape Health in Australia* and based on Interim Biogeographic Regionalisation for Australia (IBRA) v.5.1 sub-regions; NLWRA 2001 'Landscape Health in Australia. A rapid assessment of the relative condition of Australia's bioregions and subregions'; Convention on Biological Diversity: *Global Biodiversity Outlook*. Based on an Index that estimates country richness and endemism (refer to http://www.biodiv.org/gbo/); EPBC Act (1999) list of threatened species, Department of the Environment and Heritage (29 June 2005).

Australian landscapes are constantly changing as a result of economic, demographic and ecological drivers. These changes, usually, have degraded our natural assets. The imperative now is to ensure positive outcomes for biodiversity conservation are built into the processes of change. Conservation of biological systems and diversity needs to be factored in to economics and planning more effectively if we are to build ecologically sustainable landscapes.

Education and science are key elements to responding to current challenges. An Australian 'sense of place' is emerging, based on our landscapes and the native species and ecosystems they contain, and we now realise that the cost of repairing damaged ecosystems and restoring the services they provide is very large. Therefore, prevention is more cost effective than cure.

Arresting the decline in biodiversity is a challenging issue. It involves all land tenures and will require a range of legislative, policy and conservation strategies that are flexible and adaptive.

National Strategy for the Conservation of Australia's Biological Diversity

The *National Strategy for the Conservation of Australia's Biological Diversity* (the Strategy) was endorsed by the Council of Australian Governments in 1996 and provides an overarching framework for effectively conserving Australia's biodiversity. A review of the Strategy in 2001 recommended the development of practical targets and measures to support its ongoing implementation.

The *National Objectives and Targets for Biodiversity Conservation 2001–2005* sets objectives and targets for ten priority biodiversity conservation outcomes to help implement the Strategy. The following priority actions are of particular relevance to a national approach addressing biodiversity decline:

- Protect and restore native vegetation and terrestrial ecosystems;
- Control invasive species;
- Promote ecologically sustainable grazing;
- Minimise impacts of climate change on biodiversity;
- Improve scientific knowledge and access to information; and
- Introduce institutional reform.

The *National Strategy for the Conservation of Australia's Biological Diversity* and the *National Objectives and Targets for Biodiversity Conservation 2001–2005* will be reviewed in 2006.

Ecosystem Services

The products of natural systems that benefit people:

Goods	*Ecological processes*	*Intrinsic Value*
timber	pollination	tourism
pasture	climate regulation	recreation
fish	pest control	aesthetic beauty
plant breeding material	genetic resources	lifestyle
clean water	habitat	inspiration
healthy soils	shade and shelter	sense of place
	erosion prevention	national identity
	soil fertility	ethical value
	water regulation	scientific discovery
	waste breakdown	

Adapted from PMSEIC "*Sustaining our Natural Systems and Biodiversity*" May 2002

This report provides summary findings of a review of the effectiveness of previous and existing biodiversity programs, including regulatory and incentive programs, and identifies principles for effective programs. It identifies key system-wide threats to address and priority actions required to deliver a national approach. The recommendations in Section 3 take into account the significant contribution other NRMMC initiatives have to make in relation to addressing biodiversity decline, such as the work on the Framework for the Management and Monitoring of Australia's Native Vegetation, National Invasive Species Framework, Climate Change Action Plan and New Directions Statement for a National Reserves System. This report builds on and puts into context the work of those groups and complements the actions proposed or likely to be proposed.

Section 2: RATIONALE FOR A NATIONAL APPROACH

2.1 Review of effectiveness of previous programs in addressing decline

A wide-ranging review of past biodiversity conservation programs was undertaken by the Biodiversity Decline Working Group, covering 25 programs across all states/territories and the Australian Government. Specific attributes of more and less effective programs were identified. A summary of the programs reviewed, their key achievements and factors contributing to their effectiveness is provided in Annex 1 - Evaluation of Programme Effectiveness.

Based on this review, the major constraints to achieving more effective delivery of outcomes concerned the clarity of objectives and purposes and the design of the programs:

Clarity of objectives and purpose
- Lack of transparency in investment decisions between public and private good

- Programs being too ambitious

- Lack of strategic targeting to priorities (eg reactive grants programs)

- Long time-frames to achieve outcomes, compared to short-term programs

- Inadequate capacity to monitor progress and apply adaptive management

Program design
- Slow to develop emergent market mechanisms

- Lack of framework for defining success (no common benchmark for assessment or agreed quantifiable measures or metrics to monitor)

- Lack of coordination and consistency with other policies and programs

- Limited engagement with business and industry and their research and development initiatives

- Inadequate investment (in both levels and duration) for the scale of the problem

- Lack of skills and advice directly applicable to biodiversity conservation

- Lack of strategic or adequate research capacity and inadequate information base

- Inadequate consideration of external factors (bushfire, drought, pests, development pressures, tourism, economic and social drivers)

2.1.1 Key elements of effective approaches

Despite limitations identified in some of the programs reviewed, the Working Group identified key elements of the most cost-effective approaches, interventions and mechanisms. These were programs that:
- had well defined and achievable outcomes

- incorporated sound technical design, taking account of the complexity of ecosystems

- were underpinned by sound data/information, specific to the region and at the appropriate scale

- targeted areas of high biodiversity value and high threat

- focused on return for investment

- developed robust ways of assessing the condition of biodiversity assets metrics (or direct measures) to assess the condition of the assets

- prioritised action based on assets, threats, expected outcomes and value for money

- identified and promoted good practice management activities

- had strong support from stakeholders

- had complementary legislation, policies and programs

- achieved long-term, secure management of and funding for conservation

- included an evaluation framework for monitoring outcomes.

2.2 Review of outcomes and system-wide threats

Each jurisdiction provided information on key threats to biodiversity conservation, the outcomes sought and the most effective interventions to address these threats. They also identified where a national approach would improve the achievement of outcomes.

Based on this information, the Working Group identified three system-wide threats to biodiversity where existing responses can be improved through national attention. These are:

- Threats driving loss of habitat values and ecosystem function

- Spread of invasive pests, weeds and diseases

- Climate change.
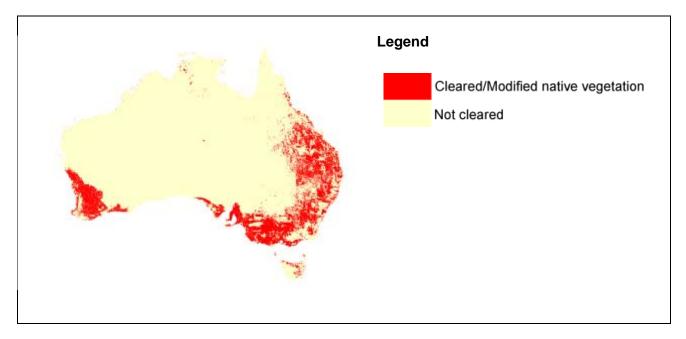
Each is discussed in turn in the following sections.

Figure 5: Extent of native vegetation in Australia[7]

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[7] NLWRA 2001 'Australian Native Vegetation Assessment 2001'

2.2.1 Threats driving loss of habitat values and ecosystem function

The major threats driving loss of species habitat and/or ecosystem function include:

- Inappropriate grazing and fire management regimes

- Introduced plants, animals and diseases

- Broad scale land clearing (Figure 5)

- Intensification of natural resource use for agriculture, infrastructure and development projects, especially on the more fertile soils and in coastal areas or high human population areas (see for example Figure 6).

Coupled with these system-wide threats and their interactions is the emerging threat of climate change and its effect on biodiversity.
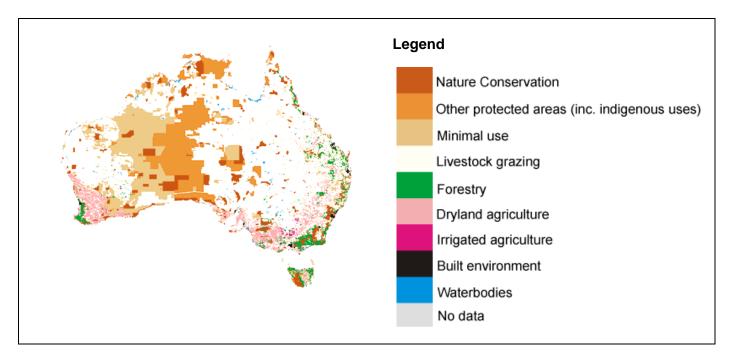

Figure 6: Landuse in Australia[8]

There is a range of primary conservation strategies employed to achieve the protection and conservation of ecosystems and species, including the formal reservation of lands for the conservation reserve system, off-reserve conservation and more indirect measures through investing in sustainable industries. A range of measures will be needed to address biodiversity decline effectively. Those considered most important are discussed below, along with challenges in their delivery.

The establishment and management of the conservation reserve system that meets the criteria of CAR[9] is regarded as a cornerstone strategy to achieve biodiversity conservation and address the decline in biodiversity. It provides for the formal protection of viable samples of ecosystems and long-term security of tenure and management. The system of parks and reserves also plays an important role in the nation's economy, provision of community well-being and in public education and awareness of biodiversity and environment related matters. In addition, the conservation reserve system will play an increasingly significant future role to ameliorate climate change

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[8] NLWRA 2001 '1996/97 Land Use of Australia'
[9] A conservation reserve system that meets the CAR criteria is one that includes the full range of ecosystems (*comprehensive*), maintains viability of species and ecosystems (*adequacy*) and reflects the biodiversity of the ecosystems from which they are derived (*representative*)

impacts on biodiversity by allowing continental scale networks or pathways for flora and fauna to move and adapt.

Governments, industry and non-government organisations have been involved actively in the investigation of a range of market based mechanisms, some of which have been remarkably successful in practice though implemented on a limited scale. Many of these can be adopted to deliver multiple NRM outcomes with a focus on biodiversity conservation, including price based (auctions), quantity based (cap and trade) and market friction mechanisms (that apply conditions to market transactions). Market based instruments usually rely on a regulatory framework and/or establishing a market, both of which would be required for delivering a nationally consistent approach.

Biodiversity in the rangelands is in decline - rangelands are extremely vulnerable to invasive species and inappropriate grazing and fire management practices. The rangelands have a naturally low productivity (compared to the intensive land use zone - refer to Figure 4) and can suffer significant degradation from production or extraction based land use activities. In some of the more remote regions, ecosystems are still relatively intact and major conservation gains can be made for relatively small investments. Opportunities exist to improve conservation in the rangelands, including shifting to more sustainable land uses on leasehold land, improving the capacity of land managers to incorporate biodiversity considerations into their management, reservation of intact landscapes, and management of public lands in relatively good condition.

Regulatory frameworks have common features (as described by the Productivity Commission 2004) but, before introducing new regulatory instruments, it is important to consider whether existing government policies or programs are having unintended consequences for biodiversity. Otherwise, there is the risk of introducing new measures that place bandaids over existing measures.

Economic and social causes or drivers
The following specific economic and social causes or drivers may result in habitat loss and decline in ecosystem function:

- Greater short-term social and economic benefits resulting from development of land or resources, and lack of knowledge or value attached to the ecological, social and economic values of biodiversity and ecosystem services

- Greater economic benefits for landholders of clearing native vegetation than retaining and managing that vegetation

- Falling commodity prices putting increased economic pressure on landholders, leading to intensification of grazing and conversion to cropping to maintain short-term financial viability

- Provision of perverse incentives (such as 'drought' relief) that encourage unsustainable land management practices including overstocking during periods of relatively good years

- The cost of conservation activities (such as fencing remnant vegetation) creating an obstacle to implementing more sustainable systems. Landholders may be unaware of incentives available to assist them to undertake these activities, or the costing structures may not be acceptable to them

- Increasing pressure to clear land for urban and other development and infrastructure in coastal areas. Development applications may be assessed with little reference to landscape-wide biodiversity requirements. Local governments have pressures to generate rate revenue that may decrease their willingness to set aside land for conservation

- The social tradition of farming and the strong identification with the industry and maintaining traditional lifestyles. For some farmers there may be considerable social issues associated with exiting the industry. Older farmers, in particular, may lack the confidence to undergo retraining for an alternative occupation.

Case Study – Conserving habitat values and ecosystem function

Challenges in achieving the Conservation Reserve System

While there have been some significant gains in establishing the conservation reserve system, opportunities for the consolidation of the terrestrial conservation reserve system are diminishing due to development pressures (competing land uses) and decline in habitat quality from a range of threats. There needs to be a greater focus on reserve acquisition in the short term to reach the international and nationally recognised target of achieving a minimum representation of 15 per cent of ecosystems or biomes under suitable legislative protection (equivalent to IUCN management categories I to IV).

Progress towards this target varies across jurisdictions. In WA, for example, significant advances have been made over the past 5 years. Of the 54 IBRA sub-regions in WA, only 10 currently have greater than 15 per cent of the area under reservation. The total area of the formal conservation reserve system equates to about 6.8 per cent of WA's land area (which is around one third of the Australian continent). This area is expected to increase to 8.8 per cent when recently purchased lands become fully protected.

Further research is required to refine design methodology tools and surrogates for biodiversity representativeness, and determine adequacy (size) of functional ecosystems.

Reservation of land often comes with a legacy of threats as a result of past land uses, such as introduced animals and weeds, and degradation problems from over-grazing. Long-term management of the reserve system is needed to prevent further decline and promote recovery and maintenance of healthy ecosystems. In some instances, allowing ecosystems to 'naturally heal' after removing pressures from past land uses, such as domestic animal grazing and closing of artificial waters, will be required over very long periods.

Case Study – Conserving habitat values and ecosystem function

Market Based Instruments—Bush Tender

Under Victoria's BushTender approach, landholders establish their own price for the management services they are prepared to offer to protect and/or improve their native vegetation. This price is submitted as their bid, which is compared with the bids from all other participating landholders. Successful bids are those that offer the best value for money on the basis of conservation value, management outcomes and cost. This does not necessarily equate to always the lowest cost.

Successful landholders receive periodic payments for their services under management agreements signed with the government. Under the management agreements, landholders report each year on their vegetation management activities and their progress towards the agreed objectives.

The main features of BushTender are: metrics for measuring vegetation condition and improvement (habitat hectare approach), cost-effectiveness, equitable cost-sharing between landholders and the community, targeting of state and regional biodiversity priorities, and program accountability. The program methodology has been highly successful and has produced innovative programs.

Case Study – Conserving habitat values and ecosystem function

Pastoral Lease Reform

Queensland's proposed State Rural Leasehold Land Strategy will be used to encourage leaseholders to adopt better land stewardship and, in doing so, provide better protection of biodiversity and natural resources. An important element will be use of a land management agreement as a standard new lease requirement. This helps lessees to meet duty of care responsibilities and clarifies rights and responsibilities.

A different, more prescriptive approach in south-western NSW has seen a program developed by government agencies, researchers and pastoral leaseholders that allows up to 30 per cent of grazing leases to be cleared for intensive agriculture in exchange for a set ratio of lease area protected on title and managed for conservation. This allows some gains for lessees and concrete gains for conservation.

Benefits from a national approach

Loss of habitat values and ecosystem function is a continuing threat that requires a greater scale of action and investment. While a number of targets have been identified by governments in the past, a clear gap remains between the action needed to arrest biodiversity and habitat loss and that which has been agreed by governments and is currently being delivered. There would be benefits in a nationally coordinated approach to developing policies, and in implementing a national approach including national priorities for action. These actions should focus on:

- Reducing unintended consequences of government policies and programs

- Accelerating expansion of the formal reserve system that meets CAR principles, while opportunities still exist

- Providing support for the development of technical modelling and decision support tools to improve reserve and planning and implementation of effective ecological linkages (eg biolinks)

- Identifying biodiversity management services to meet national objectives for reversing the decline in the extent and quality of native vegetation and reducing biodiversity loss (especially where it is considered beyond landholders' duty-of care obligations to manage land sustainably and not contribute to off-site impacts)

- Developing appropriate market based measures that can be used to effectively deliver payments for biodiversity management services in regions with varied pressures on species, land use intensity, land value and/or land use, and demographic change

- Developing governance arrangements to maintain biodiversity and ecosystem function in areas where (i) there are on-site economic benefits of retaining biodiversity; or (ii) there is no economic benefit from clearing native vegetation

- Improving the extent and quality of Australia's native grassy ecosystems currently under pressure from some grazing practices, conversion to cropping or inappropriate fire regimes

- Identifying research and other investigative needs for improving our understanding of biodiversity and conservation requirements, thus bringing about a substantial and cost-effective improvement in management at the appropriate scales needed to address threatening processes.
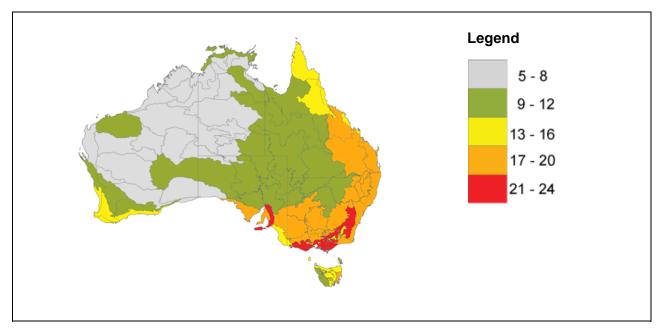
2.2.2 Spread of invasive pests, weeds and diseases

The 2001 State of the Environment Report identifies invasive species as a major threat to biodiversity. Invasive species are causing increasing impacts on production and environmental assets. All jurisdictions have identified this as a priority and one that will be exacerbated by climate change. Preventing introduction, establishment and spread of invasive species is a very cost-effective investment compared with control actions once they have established.

Eleven of the most significant invasive animal species have environmental, economic and social impacts conservatively estimated to cost $720 million annually.[10] Of this total, foxes, rabbits, feral pigs and feral cats accounted for 83 per cent of all costs. In total, 25 exotic mammals, 20 birds, one amphibian and four reptiles have become established in Australia (see for example Figure 7). The potential impact of future introductions is also substantial. For example, the introduction of an exotic pest, such as the stoat *Mustela erminea*, could generate economic losses in the order of $39 million per year.[11]

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[10] *Counting the cost: Impact of invasive animals in Australia* Pest Animal Control CRC 2004
[11] *Counting the cost: Impact of invasive animals in Australia* Pest Animal Control CRC 2004

Fig 7: Number of terrestrial non-indigenous vertebrate and invertebrate invasive species per IBRA based on a list of about 30 species considered to have a major effect in Australia. (SOE 2001, Clarke et al 2000)

The National Weeds Strategy states that weeds are among the most serious threats to Australia's primary production and natural environment, costing the Australian economy $3.3 billion each year in lost agricultural production and control costs. Some 370 weed species in Australia have been declared noxious by state/territory governments. The State of the Environment Report 2001 reports that competition by weed species is likely to have been responsible for the extinction of 4 native plant species and presents a continuing threat to another 57 species.

Trends in globalisation, trade and travel present a particular challenge in addressing biosecurity issues related to protecting biodiversity. Increased investment in this area is inevitable in the face of increasing pressures. While border controls and response to new incursions are critical, it is also important to recognise that one of the most significant threats causing biodiversity decline is from established pests and diseases.

Economic and social causes and drivers

The following economic and social causes and drivers may result in biodiversity decline due to the spread of invasive plants and animals:

- Limitations on quantifying costs and benefits of management. Where invasive species are not causing a reduction in profitability, or where the cost of control outweighs the short-term economic returns, there is limited economic incentive to reduce the spread of invasive species. Land managers of public land may not have sufficient funding for management.

- Commercial interests. Some nurseries and garden centres sell recognised weeds legally, with some 860 plants available from nurseries being recognised as invasive and used widely as garden plants.[12] The pet trade imports millions of live fish each year. Exotic aquarium fish, plants and snails have entered our waterways from inappropriate disposal. Issues such as this are exacerbated due to insufficient consumer knowledge of the threats posed by invasive species.

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[12] State of the Environment Report 2001

Case Study – Managing the spread of invasive pests, weeds and diseases

Eradicating Fire Ants

Red imported fire ants (Solenopsis invicta Buren) were detected in Brisbane on 22 February 2001. Fire ants are a major pest overseas, especially in the USA. To address this threat, the state and federal governments committed $175 million in an attempt to eradicate the species over a period of five years.

Potential environmental impacts of fire ants include: maintenance of biodiversity in affected areas, especially invertebrates such as native ant species.

The eradication campaign commenced in September 2001. The most recent infested-property survey by Queensland Department of Primary Industries found that 99.4 per cent of all known fire ant infestations have been destroyed. The final two years of the program will be spent monitoring the treated areas and eradicating any remaining infestations.

A cost–benefit analysis of the proposed eradication campaign found that a potential net present value of impacts of more than $2.8 billion over 30 years justified the jointly funded state and Commonwealth campaign. Social and environmental implications were also considered during this assessment process, and in planning the eradication campaign.

- International trade. Despite stringent quarantine requirements and protocols, species may still enter via vessel traffic. Dangers include ship ballast water, barnacles dislodged from hulls, and insects, spiders and reptiles transferred via cargo crates.

- International and domestic travellers inadvertently hosting invasive species in their clothing or equipment (eg seeds in clothing or dirt). Those travelling within Australia may move native and non-native species around on dirty vehicles and equipment.

Benefits from a national approach

Coordinated national and state/territory action could help prevent entry and spread within Australia through consistent approaches to regulation of trade, domestic quarantine and surveillance for invasive species, as well as research and development of control techniques, and national priority setting.

Currently, there are gaps in national approaches to dealing with invasive species, particularly in the detection and coordinated response to species with predominantly environmental impacts. Progress in identifying approaches to addressing these gaps is the subject of a separate agenda item for Ministerial Council – 'National Invasive Species Framework'. The Framework paper proposes the development of a national system for addressing invasive species with agricultural, environmental, social and other economic impacts, using an explicit risk-based approach for determining response actions. The system would fill current gaps in our capacity to manage invasive species, including by ensuring that national institutions and infrastructure are enhanced to deal with invasive species, particularly those with environmental impacts.

The actions recommended in this report are consistent with those proposed in the National Invasive Species Framework.

2.2.3 Climate change

The Natural Resource Management Ministerial Council has recognised climate change as a key national issue and emerging threat, with potential impacts on biodiversity across Australia. The Council has endorsed a National Biodiversity and Climate Change Action Plan to help coordinate the response and adaptation activities of the various Australian governments. Actions will include gathering knowledge, minimising impact on biodiversity and incorporating knowledge and harm

minimisation strategies into the management of natural resources and land use. It can be argued that climate change represents the major challenge to biodiversity in the 21st century.

The distribution of many species and ecosystems is likely to change as the climate changes. This will alter how we manage Australia's conservation and production landscapes. For example:

- The status of protected areas may change as climatic envelopes for species move and pressures such as changed fire regimes and invasive species (exacerbated by climate change) alter the function of the landscape and the structure of ecological communities

- The extent and distribution of viable/marginal agricultural land may change with increases in some climatic extremes (as a result of climate change).

Given the potential scale of climate change and the possible social, ecological and economic impacts, it is important that integrated management options are explored and that solutions address the whole production and conservation landscape.

Economic and social causes and drivers

The following economic and social causes and drivers may result in biodiversity decline due to climate change:

Economic disincentives

- Short-term financial benefits resulting from a reliance on fossil fuels (rather than less harmful alternatives)

- Greater financial benefits to landholders of clearing native vegetation rather than retaining and managing that vegetation

- The often high economic cost of activities aimed at reducing climate change and its impacts (eg land acquisition for reforestation) creating an obstacle to their implementation

Inadequate alternatives

- Fossil fuel based activities being currently significantly more financially viable than their alternatives (eg petrol operated vehicles versus electric vehicles). Conversely, biofuels (or other biotechnology) may have scope for biodiversity gains

- Land clearing for development and logging remaining a financially viable activity because it fails to reflect adequately the long-term costs (eg through carbon sequestration)

Increasing development and climate consequences

- Globalisation and rapid growth of off-shore markets (eg for oil and gas) resulting in an ever-increasing demand for products derived through processes causing climate change

- Increases in living standards, particularly of developed countries, resulting in a per capita increase in the demand for fossil fuels and their products

Lack of understanding

- Uncertainties about the future socioeconomic drivers of climate change and their impacts on biodiversity resulting in a lack of public pressure for action

- A lack of understanding about the ecological value of native vegetation in offsetting climate change (ie through carbon sequestration)

- A lack of knowledge of the impacts of climate changes on biodiversity resulting in inertia in the political system as decisions are put on hold until more certainty is produced

- The generally lower priority placed on biodiversity protection versus commercial objectives by the majority of land managers

- Social resistance to rural readjustment and an intrinsic desire to follow traditional land use practices

- Limited incentive to modify activities (ie benign neglect) where climate change does not appear to cause any clear and tangible social impacts

Benefits from a national approach

The National Biodiversity and Climate Change Action Plan outlines a range of measures across Australia to address the impacts of climate change on biodiversity. States have identified system-wide issues of concern that would be helped by a national approach. These include the need to better understand and predict/model the impacts of climate change on biodiversity, development of drought policies and programs that incorporate biodiversity conservation, assessment of likely changes in the extent and distribution of viable/marginal agricultural land and associated pressures on areas of high biodiversity value, and incorporation of the impacts of climate change into existing biodiversity conservation programs, such as conservation reserve system design. Actions to address biodiversity decline in coastal, agricultural or pastoral landscapes must consider the need to develop ecological linkages at appropriate scales to accommodate possible future change due to climate change.

A series of pilot studies in NRM regions is proposed to accelerate implementation of the Plan. Through case studies in different biomes, the approach will:

- Develop regional climate projections linked to a set of prepacked tools to model potential impacts of climate change on species and ecological communities

- Assess changes in the extent and distribution of viable or marginal agricultural land

- Explore options to incorporate actions to adapt to the impacts of climate change into existing biodiversity planning and recovery programs, and rural adjustment programs.

Ecological linkages on a continental scale should complement the approach.

There are a number of tools currently used by farmers to manage climate variability (eg Rainman, Rainman-streamflow, AussieGRASS), and research based biodiversity-modelling tools (eg Bioclim, Climex) could be extended to model the impacts of climate change. The Bureau of Meteorology and the CSIRO are developing tools, within the Australian Greenhouse Office's National Climate Change Adaptation Program, that will assist in managing with climate change. This approach is also looking at piloting regional adaptation case studies to explore possible integrated solutions for addressing climate change impacts at a regional level.

2.3 Key elements in a national approach

The Working Group identified a number of principles that will need to be incorporated into the design of a national approach to addressing biodiversity decline. These principles are summarised below and considered in more detail in Annex 2 - *Key elements of effective programs.*

Programs currently available are diverse and numerous. Many have identified challenges in effectively addressing biodiversity decline. Some of these challenges can be taken up with changes to existing programs, while others need a new approach.

An effective response will:

- Identify specific conservation goals that coordinate with regional, statewide and national conservation goals, plans and priorities

- Have a strategic and inclusive approach that targets high priority needs, while also identifying opportunities to achieve outcomes at the landscape scale and address threats that cross administrative boundaries

- Encourage partnerships between decision makers and stakeholders to identify shared conservation goals, coordinate program delivery, coordinate management activities, and pool resources

- Have a stable, long-term funding base within government and encourage co-investment from the private sector

- Monitor ecological outcomes at a regional or statewide scale to evaluate progress toward conservation goals, with results tied to individual interventions whenever possible

- Be modified as needed to improve effectiveness.

The approach should focus action on:

- Highest priority needs and targeted investment that will produce a noticeable or measurable biodiversity benefit

- Maintaining natural systems and biodiversity because these return far more benefits per dollar invested compared to remediation

- Achieving advances in sustainable natural resource management through better understanding of the trade-offs between immediate resource use and longer-term flow of ecosystem services

- Improving legislative, planning and institutional delivery frameworks.

Section 3: OBJECTIVES AND PRIORITY ACTIONS FOR A NATIONAL APPROACH

3.1 Objectives for a national approach

The national approach will deliver a range of cost-effective national actions to reduce the impact of system-wide threats that are underlying causes of decline in biological diversity. The outcomes sought through the approach are:

- More effective management that will reverse the decline in extent and condition of populations and habitat of species and communities

- Improvement of our preparedness for the impact of climate change on biodiversity

- A national network of continental scale ecological linkages, including conservation reserves surrounded and linked by sympathetically managed lands, where conservation is incorporated into integrated land use which protects biodiversity *in situ* and maximises the opportunity for biodiversity to adapt to climate change

- Improved knowledge of biodiversity condition and status, and better decision-making for biodiversity conservation

- Engagement of the full capacity of governments, landholders, industries, non-government organisations and communities to conserve Australia's biodiversity assets.

The key policy directions proposed to achieve these outcomes and improve the overall effort to address biodiversity decline are:

- Establishment of institutional and governance arrangements that clarify roles and responsibilities and ensure integrated outcomes, including promotion of joint ownership of the problems and solutions

- Defined landholder duty of care for government managed, leasehold and freehold lands to enable better targeting of investment for conservation activity

- Establishment of intergovernmental mechanisms to identify and conserve an Australia-wide network of conservation lands and ecological linkages

- Effective market based mechanisms to deliver biodiversity conservation

- Continued investment in knowledge creation and social and institutional capacity for effective conservation of biodiversity.

The approach will focus on three system-wide threats where existing responses can be improved through national attention:

- Drivers of loss of habitat values and decline in ecosystem function

- Spread of invasive pests, weeds and diseases

- Climate change impacts on biodiversity.

3.2 Actions that will deliver multiple benefits in reducing biodiversity decline

Statutory and institutional frameworks

1. All governments commit to having in place a 25-year biodiversity conservation program for each jurisdiction, incorporating statute-based actions, that will provide the planning framework to address biodiversity decline, promote biodiversity conservation in operational plans and deliver biodiversity gains, by 2010.

2. To address the unintended or adverse consequences for native species and ecological communities from current government programs and policies, all jurisdictions agree to:

   o A national scale, broad and systematic assessment of policies and programs undertaken in accordance with agreed terms of reference

   o Undertake a reform agenda to remove or reduce the adverse impacts or perverse incentives in policy instruments that are contributing to biodiversity decline, by 2012.

3. Governments agree to:

   o Better align methodologies for measuring spatial extent and condition of biodiversity at a bioregional scale

   o Establish high level independent audits to develop standards and report on these measures

   o Establish targets for conservation.

4. All governments have in place, by 2009, rolling biodiversity research plans that incorporate a five-year review and identify and address critical knowledge gaps for ecological and social requirements, including:

   o Establishing institutional arrangements to support the implementation of the 'Biodiversity Conservation Research—Australia's Priorities' and focus investment and coordination in this area

   o The acceleration of a systematic biological survey program that determines components, their status, and patterns of biodiversity

   o Development of capacity to report on trends in biodiversity and ecosystem function

   o The continuation and expansion of taxonomic research to include lower order plants and animals, and fungi

   o Continuation and expansion of research on threatening processes and development of technologies for their control, and landscape restoration

   o Development of management systems that provide information and modelling to support management at appropriate landscape scales and sharing of and accessibility of information.

Valuing biodiversity and ecosystem services

5. Governments agree to investigate, develop and implement a nationally consistent study for estimating the environmental, social and economic values of biodiversity and ecosystem services, by 2008.

6. Governments clarify landholder duty of care in relation to biodiversity on all tenures, to establish a baseline to inform public investment decisions, by 2007, and work towards establishing a statutory framework for duty of care, by 2010.

7. Under relevant biodiversity conservation acts, governments agree to continue to refine and improve listing processes for threatened species, communities and threatening processes, and better align state/territory and national lists, by 2008.

8. Governments agree to review effectiveness of current mechanisms and develop a good practice approach to delivering threatened species and significant ecosystem conservation programs (such as Ramsar, wetlands, World Heritage), by 2009.

Industry engagement

9. Governments provide assistance, through support for development of 'green' markets, to assist land managers and industry to identify opportunities to diversify farm production at the enterprise level, by 2009.

10. Governments work with industry peak bodies to put in place management systems that will assist to conserve biodiversity and work with financial and insurance institutions to recognise and support this management, by 2010.

3.3 Actions to reduce threats driving decline in habitat values and ecosystem function

Conservation reserve system

11. Governments agree to accelerate the establishment of a national reserve system that achieves the criteria of comprehensiveness, adequacy and representativeness through protecting examples of at least 80% of the number of extant regional ecosystems in each IBRA subregion, by 2015-2020.

12. Governments report on the development and implementation of good practice management systems to maintain and recover biodiversity in the public conservation reserve system, and establish national management protocols, by 2009.

Off-reserve and private land management

i) Intensive land use zone

13. Governments ensure state/territory planning policies fully integrate biodiversity and ecosystem conservation in land use and development decisions that will result in change or intensification of use, by 2010.

14. Governments agree to take action to stop broad-scale clearing for new or intensified agricultural development in the intensive land use zone, by 2015.

15. Governments establish a stewardship program in the intensive land use zone by developing and implementing a national program using market based instruments to deliver targeted biodiversity outcomes, by 2007.

ii) Extensive land use zone

16. Governments commit to developing and implementing a biodiversity conservation incentives program that provides a range of instruments to bring about desired changes for maintaining or recovering biodiversity, by 2008.

17. Governments agree to secure biodiversity conservation outcomes as a fundamental component of the pastoral/rural lease review/renewal process, according to the timeframes/processes required under their relevant legislation.

18. Governments review existing incentives for bringing about biodiversity management on Indigenous lands and put in place an incentive scheme where investment is aimed primarily at maintaining and recovering biodiversity and linked to security of tenure, by 2010.

iii) Public land management[13]

19. In exercising public land custodial responsibilities, governments ensure high biodiversity values are identified and managed appropriately, by 2010.

3.4 Actions to reduce the impact of invasive species on biodiversity

Biosecurity

20. Governments ensure that the implementation of the National Biosecurity Strategy and subsidiary elements, including a risk assessment, considers threats to biodiversity equally alongside trade and agriculture.

Species management and planning

21. Governments agree to develop a nationally networked information system on existing invasive species, providing access to information on their identification, their invasiveness and current national and international distributions, by 2008.

22. Governments agree to develop and support a national collaborative research and development program to deliver more effective control, particularly biological control, methods for priority invasive species, by 2008.

23. Governments agree to identify national lists of priority invasive species and the priority species/communities they threaten, and develop a program to eradicate or control them, by 2008.

24. Governments agree to remove from sale plants on the national list and then conduct an investigation into the benefits of a national labeling[14] program to minimise the risk of further establishment in the wild of invasive garden nursery and pet animal species, by 2008.

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[13] In this context, public land management covers unallocated and unmanaged Crown land and state forest, but excludes the conservation reserve system and pastoral leases (see other sections for recommendations relating to these areas).
[14] 'Labeling' in this sense means information to be provided at the point of sale to assist consumers in dealing responsibly with the nursery plant or pet animal (including aquarium species).

3.5 Actions to reduce the impact of climate change on biodiversity

25. Governments commission research to develop modelled climate change scenarios, biodiversity responses and potential adaptation strategies at the bioregional scale to improve capacity to assess the impacts of climate change on biodiversity, by 2010.

26. Governments ensure that ecological connectivity between reserves and refugia is based on research and ecological modelling, at the continental, state/territory and regional scales, by 2015.

Annex 1: REVIEW OF EFFECTIVENESS OF PREVIOUS PROGRAMS

The programmes ranged in size from around $0.03 to $56 million per annum. They addressed issues from a variety of perspectives, including programmes targeted at particular threatened or high profile species (such as the Gould's Petrel, the Koala), pest species (foxes, starlings, *Phytophthora*) or particular geographic areas (NSW Macquarie Marshes and Northern Rivers, WA Wheatbelt and Western Shield), and others addressing broader conservation issues. The programmes used a range of approaches including direct action, acquisition, grant schemes, incentives, regulation or legislation, capacity-building and data collection. They have been categorized into eight programme types.

Many of these programmes provided a platform for biodiversity conservation – putting in place research, planning, capacity-building, public support and changes in land management – but with limited on-ground improvements to biodiversity conservation as yet. Where there have been positive impacts on conservation, these outcomes were very localised, rather than at a landscape scale. In many cases, inadequate arrangements are in place to monitor the impact or success of these programmes.

Increasingly, programmes are being aimed at avoiding or reducing future degradation (eg. covenanting or attempts to prevent pest establishment) and so may prove to have substantial and cost effective long-term biodiversity value even though no short-term improvements may be achieved.

Many jurisdictions have dealt or are dealing with broad-scale clearing and this is making a very significant contribution to addressing biodiversity decline in those States.

Programme Category	Number assessed	Achievements	Factors contributing to effectiveness	Factors limiting effectiveness
Incentive schemes for conservation on private land - reactive or voluntary mechanisms	7	Improved awareness and engagement Covenants / agreements for changed management Long-term security Fencing & revegetation Community (eg Landcare)	Public awareness and support Voluntary contributions Choice of mechanisms Specific technical extension Engagement with landholders Good science Targeting Long-term security of outcomes	Limited financial and legal advice available Complexity of institutional arrangements Personal financial constraints of landholders Lack of landholder knowledge/ understanding Uncertainty and costs associated with stewardship arrangements Lack of scientific data resulting in costly and time consuming on-ground assessments
Incentive schemes for conservation on private land - market-based mechanisms	1	BushTender Specific & transparent linking of best science and on-ground decisions Auction system Cost-effective and equitable Broad engagement of landholders	Engagement across full attitudinal spectrum High participant satisfaction Clear metric of measurable improvement Highly-specific technical extension Landholder choice of management commitments	Not suitable for all situations
Species conservation or recovery	3	Planning Education & awareness Public support Monitoring Habitat protection & threat abatement Some population outcomes	Public support Development of conservation techniques Addressing threats Packages of initiatives Sound planning and action	Inconsistent monitoring/ measurement Unfocused effort in managing threatened species Inadequate investment for the scale of the problem Insufficient community involvement Inadequate consideration of external factors Lack of framework for defining success
Compliance with regulation	1	More effective conditions Demonstrates community expectations	Landscape approach Clearer expectations on resource users Seen "level playing field [see text be consistent]	Inconsistent cross-border approach Limited landholder consultation Limited enforcement capability
Protected areas establishment and management	2	Retention of options Improved management Indigenous involvement All jurisdictions increasing	Focus on priorities Secure management Building capacity	Insufficient investment in land acquisition and long-term management Land tenure and fragmentation limiting available land for reserve establishment

		protected area Increasing seen as an economic asset		
Threat management	7	Prevention of population establishment (invasive sp) Development of techniques Better information and awareness Improved management Increases in native species Best practice is adaptive management	Prevention rather than treatment Monitoring techniques Targeting priorities Good science, use of research Partnerships between governments Landscape is best.	Slow detection of significant pest incursions Unfocused effort in threatened species management Inadequate investment for the scale of the problem Inconsistent monitoring Uncoordinated cross-border approach Effort focussed at inappropriate scale Lack of coordination with other programmes Inadequate research capacity & information base
Information for management	1	Better decision-making, planning & project design Improved targeting	Better science Improved targeting and monitoring	Decision-making based on unsound science or poor research base Measurement inconsistencies
Conservation network and technical assistance	2	Networking & awareness Capacity & skills Seed supplies Improved management	Coordination of action Local expertise Practical support	Uncoordinated cross-border approach Insufficient investment in establishing and maintaining communication linkages Inappropriate use of regional approach vs. landholder engagement Lack of skills directly applicable to biodiversity conservation
Vegetation conservation and restoration - small grants	1	Awareness Capacity building Remnant protection & rehabilitation, revegetation	Joint implementation Building local and regional capacity	Inadequate investment for the scale of the problem Permanent protection expensive Measurement inconsistencies and a lack of outcome communication across programmes Lack of skills directly applicable to biodiversity conservation Lack of framework for defining success

Programs considered in review:

Programs considered in the review were selected on the basis that they:

- Explicitly address biodiversity conservation, and/or
- Explicitly address market instruments, and/or
- Have outcomes that are of such consequence to biodiversity conservation that they should be included, and/or
- Are significant in addressing key threats to biodiversity (as identified in the case the case study)

Australian Capital Territory

Rural Conservation Fund	Incentive schemes for conservation on private land

New South Wales

Conservation Partners Program	Incentive schemes for conservation on private land
Conservation and recovery of Gould's Petrel	Species conservation or recovery
Grassy Box Woodland Conservation Management Network	Conservation network and technical assistance
Audit and compliance for Threatened Species Licences	Compliance with regulation
Conservation of NSW Koalas	Species conservation or recovery
Conservation of Macquarie Marshes through reservation	Protected areas management
Northern Rivers CMA Integrated Conservation Management Project	Incentive schemes for conservation on private land
Designation and management of off-reserve Ramsar wetlands in NSW	Incentive schemes for conservation on private land

Tasmania

Tasmanian Fox Eradication Program	Threat management - Invasive species
Tasmanian Land For Wildlife Scheme	Incentive schemes for conservation on private land
Protected Areas on Private Land	Incentive schemes for conservation on private land
Tasmanian Private Forest Reserves Program	Incentive schemes for conservation on private land

Victoria

'Project Deliverance' and 'Southern Ark'	Threat management - Invasive species
BushTender trials	Incentive schemes for conservation on private land

Western Australia

Western Australia Biological Survey Program	Information for management
Natural Diversity Recovery Catchments Program Wheatbelt of Western Australia	Threat management - Salinity
Starling Management Project: Nullarbor Plain	Threat management - Invasive species
Western Shield – Fauna Recovery Program	Fauna recovery and reconstruction, inc. Threat management - Invasive species
Phytophthora Dieback Management in the SW of WA	Threat management - Disease

South Australia

Development Act Processes	Regulatory
Environment Protection Act Programs	Regulatory
Natural Resource Management	Regulatory/Landholder Involvement
Native Vegetation &Clearance Controls	Regulatory
Pastoral Land Management and Conservation Act Programs	Regulatory
Reserve System	Direct Action/Regulatory

Private Land Conservation System	Landholder Involvement/Grants
Heritage Agreements	
Sanctuaries	
NatureLinks, No Species Loss and Large-scale Eco-Restoration Programs	Direct Action/Landholder Involvement
Coast Protection	Direct Action/Regulatory
Wetland and freshwater aquatic programs	Direct Action/Regulatory
Threatened Species and Ecological Communities	Regulatory
Wildlife Regulations, Wildlife Trade and Take from the Wild	Regulatory
Exotic Animal Species	Regulatory
Invasive Plant Species	Regulatory
Pathogens, Feral Invertebrates etc	Direct Action
Biological Survey of South Australia	Direct Action
Regional Biodiversity Planning	Direct Action
Botanic Gardens and State Herbarium	Direct Action/Regulatory
South Australian Museum	Direct Action/Regulatory

Queensland

Vegetation Management Act (VMA) Nature Conservation Act (NCA) Environment Protection Act (EPA) Integrated Planning Act (IPA) Coastal Protection and Management Act (CPMA) Land Act (LA) Water: • Water Act (WA) • River Improvement Trust Act (RITA) • Wild Rivers Act (proposed) Land Protection (Pest and Stock Route Management) Act	Regulatory Mechanisms
Nature Refuges Tax & transfer duty cost support Trust for Nature Vegetation Incentive program Sustainable Land Management Program Great Artesian Bores	Cooperative Management Mechanisms - Property level agreements
NRM planning (NHT2 program) Wetlands program (NHT2 & Reef Plan) Regional nature conservation strategies (RNCS) Information, research, education & extension; • RE & wetland mapping • Biodiversity planning assessments • Agricultural Performance Framework • SLATS • Industry codes	Regional Planning Mechanisms

Australian Government

Bushcare program (NHT1)	Vegetation conservation and restoration
Endangered species program (NHT1)	Species conservation or recovery
National Reserve System program (NHT1)	Protected areas management
National Feral Animal Control program (NHT1)	Threat management - Invasive species
Bushcare Support	Conservation network and technical assistance

Annex 2: KEY ELEMENTS OF EFFECTIVE PROGRAMS

In reviewing existing programs and policy approaches, the Working Group identified a number of features that characterise successful programs or should be further explored in future program development. Funding for programs to address biodiversity decline, even if doubled or tripled in the years to come, will never be enough for long-term protection of all biodiversity elements and ecosystem protection, hence we need to be more strategic and targeted in our approaches.

TECHNICAL DESIGN

Identifying priorities for national focus
Conservation of Australia's biodiversity is now well established as a national issue, given both our international obligations and national recognition of the need for collective action to halt the current decline. In developing a national program, we need to recognise that the available resources will never match the need, so our interventions need to be better targeted and cost-effective. They need to focus on conserving those areas of highest biodiversity value, and addressing high priority, system-wide threats to those values.

The following principles should guide the development and implementation of the program:
- Investment and action should be targeted at achieving broad-scale change in the way our biodiversity assets are managed across all tenures;
- The focus should be on urgent actions that could make major contributions to the protection of Australia's biodiversity and put in place a stronger foundation for enduring and resilient conservation outcomes that take account of climate change;
- We should focus on prevention rather than cure - it is more cost-effective to protect and manage intact ecosystems, compared to rehabilitating and restoring damaged ones (while recognising the value and importance of specific recovery plans and programs).
- Interventions should be innovative, using a range of market- and non-market-based techniques to achieve change as well as improving traditional conservation programs such as reservation;
- We should seek long-term secure and enduring conservation outcomes;
- Expenditure should be strategic and proactive, rather than reactive to funding requests;
- Conservation actions need to be technically and socially feasible;
- Action needs to be coordinated nationally between the different levels of government, and to be complementary to other initiatives;
- National investment in other NRM programs should not exacerbate the loss of biodiversity and should contribute to regional biodiversity priority outcomes where possible.

Priorities for a national program are:
- To identify, protect and manage areas of high national, State/Territory and regional conservation value, including areas of high species richness and endemism, wetlands of national significance, endangered and vulnerable vegetation communities, important habitats for threatened species, habitats of migratory species and important migration linkages, areas with World Heritage or national heritage values, and to restore landscape connectivity and ecological resilience to facilitate natural biodiversity adaptation to climate change.
- To address national level threats to biodiversity, including land clearing, weeds and pests, water quality decline, loss of environmental flows, and dryland salinity.

Targeted delivery
It is important that the scale of program development is consistent with the geographical scope of the issues being addressed, and the temporal scales required to maintain and recover biodiversity. Investment should be based on a sound comparative analysis of significance of biodiversity, threats, likelihood of success in maintaining or improving biodiversity values on the ground (and recovery time needed, as well as institutional capacity to deliver long term outcomes).

There are a number of major conservation programs that should be designed and managed at the State/Territory level with regard to national objectives. These include the continual expansion of the National Reserve System, invasive species control including quarantine measures, threatened species recovery planning and implementation, World Heritage and Ramsar sites identification, management planning and management actions.

There are a number of programs which should be designed at a statewide or cross regional scale but may be delivered at the regional or catchment scale in accordance with priorities defined at the larger scale. These include aspects of threatened species recovery actions, particularly if contained in a region [note the accountability still rests with the Commonwealth and States], invasive species control, maintenance and restoration of habitat and native vegetation. In each case, the overarching question should be to identify in which regions the greatest lasting gains for biodiversity could be achieved for a given investment. Regional capacity, the scientific basis for investment and long term monitoring, and a clear basis for assessing the likelihood of significant, successful and sustainable outcomes need to be factored into program development and delivery mechanisms.

Individual actions within a region are at risk of failure if they are planned without an analysis of priorities in the context of the likely impacts of climate change natural systems and biodiversity in different regions. A broader cross-regional framework for analysis, recognition of the factors that may confer or increase resilience to climate change impacts and of risky actions, are all required.

Funding is likely to be more effective if it is adequate for the duration of project and program needs and is not spread too thinly. Currently the split in program funding between national, state and regional delivery does not match the potential benefits for biodiversity, even though it may suit other natural resource investment needs which maybe greatest at the regional program scale. There is, however, a continuing need for some local scale funding though for very limited purposes. Local projects to monitor the longer-term outcomes of a major regional recovery project or restoration project should be eligible for funding beyond the life of the major projects. In situations of very high biodiversity value and low capacity, local funding should be available as part of an explicit long-term strategy to build capacity over one or two years.

In order to successfully manage change and innovation to arrest biodiversity decline, programs require a strong focus on land-managers needs and improved regional capacity building. The diversity of their communication and extension needs must be recognised and programs must be tailored and targeted to specific public land managers, community and industry segments. For example programs to protect wetlands affected by irrigation practices will need to be targeted specifically to irrigators while programs to improve biodiversity in the rangelands will need to be targeted to pastoralists, industry groups, Aboriginal people and conservation managers. Partnerships and alliances with industry groups and the private sector will play an increasingly important role in the in the delivery of biodiversity conservation products and services. The outputs from research investment need to be integrated into extension and management programs. A major element needs to be the encouragement of a culture of innovation, learning and continuous improvement amongst land-managers.

Prevention versus cure
In developing a national program to address biodiversity decline, priority should be given to developing governance systems, planning approaches, management strategies and technology aimed at preventing further decline in relatively intact habitats and ecosystems. The following principles should be applied:
- It is generally more cost-effective to protect and manage intact ecosystems, compared to rehabilitation or restoration of significantly degraded systems (for a minimal investment in intact landscapes there is often a much higher return for biodiversity conservation, than in highly degraded and fragmented landscapes)
- The focus should be on identifying and anticipating potential threats to biodiversity, and preventing their development and/or establishment;
- Where threatening processes have become established, the focus of investment and action should be on minimising the impact of the threat, and thus preventing further ecosystem decline and restoring the viability and resilience for species and ecological communities vulnerable to humanly caused extinction;
- Repair and rehabilitation of degraded areas may be a priority where a habitat or ecosystem type is poorly represented in the conservation reserve system at a national and State/Territory scale, highly significant species occur (such as those listed as threatened) or there will be a demonstrable benefit to maintaining nearby intact habitats and ecosystems and facilitating natural adaptation to climate change.

Priorities for the national program should include:
- Redirect investment and activity from repair and rehabilitation of degraded areas to preventative measures;
- Evaluate the condition of habitats and ecosystems and identify and focus investment in those

a) Intact and without the need for significant remediation, but vulnerable to various causes of biodiversity decline
b) Partially degraded by threatening processes which can be controlled to prevent further loss of biodiversity
c) Significantly degraded and in which remediation is justified.

Identify potential causes of biodiversity loss, anticipate their likely impact and implement strategies to prevent their development and/or establishment.

Landscapes and ecosystems

Programs aimed at conserving biodiversity can target individual species and communities, or focus investment at a broader scale (such as landscapes or ecosystems). Broad-scale programs are often a more cost-effective means of achieving multi-species conservation outcomes.

The following principles should be applied:

- For multiple species outcomes it is generally more cost-effective to invest in the conservation of large areas of land, (e.g. landscape or ecosystem scale)
- Management of biodiversity is generally more effective at a bioregional basis (using natural boundaries);
- Investment and activity should focus on identifying and conserving ecosystems and landscapes which are viable examples and representative of the range of regional biodiversity
- Species threatened with extinction typically require focused activities to improve their conservation status. Autecological programs should be recognised as a necessary tool to reverse the decline in population or extent of such species within the context of reducing system wide threatening processes;
- Investment and communication focused on flagship species can result in a conservation benefit at an ecosystem or landscape scale, indirectly ameliorating processes that threaten other species and communities at a broader scale.

Securing management intent

Many conservation programs outside the public reserve system are targeted at individual farmers or the family farm unit. There are also many other organisations and people with responsibility for land management, including local governments, industrial companies such as mining and forestry companies, agribusiness companies, government agencies such as pasture protection boards, state road and rail services, Aboriginal and Torres Strait Islanders and lifestyle farmers. Each of these land managers has significantly different motivations for land management and different programs will encourage different types of organisations. For example some will be willing to protect land under covenants and management agreements, others will not. Efficient delivery will be achieved when the objectives of differing groups are recognised and the mix of incentives available tailored to each combination of circumstances.

An important consideration in developing programs that deliver incentives for biodiversity conservation is that core investments where possible should provide secure protection for biodiversity in the long term through conservation covenants and management agreements. For these agreements to be successful, a high level of support and information on the value, status and management actions is required to successfully build a coordinated public/private partnership in conservation.

The need for long term security raises the issue of ensuring the programs themselves are maintained in the long-term as landholders are more likely to take up programs if they have a long-term funding commitment.

Ecosystems and the services they provide are in decline. The important role of these natural services is currently not recognised adequately in economic markets, government policies or land management practices. Programs need to be developed that encourage communities to recognise the importance of and deliver environmental services and public good benefits.

Trajectories of future landscapes

A national program to arrest biodiversity decline needs to be both anticipatory and adaptable given that changes in land use will be on-going. Historically, a range of social, economic, technological and demographic influences have driven land-use change across Australia. Similar drivers will continue to operate in the future but their manifestations will be different across landscape with some trends already in evidence (see Barr 2005). Re-adjustment of the dairy industry, increased prices for agricultural land in high amenity landscape (e.g. coasts), changes from pastoral to cropping, pastoral to mining are current examples

of on-going change. The trajectories of change will be different across the landscapes of Australia. Some of these changes may be amenable to building in improved biodiversity outcomes (e.g. from agriculture to amenity, large pastoral leases to mining) whilst in others natural capital loss may be intensified unless appropriate mechanisms are in place (e.g. continued agricultural intensification of grassland grassy woodlands, sub-clover and fertiliser, expansion of cropping area, pivot irrigation). Biodiversity conservation programs must be tailored with an understanding of the direction of change in each broad landscape in order to most effectively influence and lever the drivers of change.

The effective use and range of available tools to achieve conservation outcomes must be informed by the trajectory of future landscape change and the demographic and economic drivers of these changes. For example, "aging" of the farming population and the economic squeeze on the medium sized family farm (Barr, 2005). Understanding these factors will ensure that the "Fit for purpose" program is implemented for the future and not always determined by the past. A focus on the drivers of change will also mean seeking solutions that address the causes rather than the symptoms. Anticipating the drivers of change has the potential to lead to 'win-win' outcomes.

As well as identifying drivers of land use change at the landscape level, Victoria's Drivers of Land Use Change project for example also placed emphasis on how landholders are responding. Landholders are the ultimate decision-makers, and trends in land use reflect the aggregate decisions of many individual landholders. An external driver represents either an opportunity or a constraint to the landholder. Understanding the motivations that influence how landholders respond to the available opportunities and constraints is critical to identifying appropriate policy solutions.

In the past, the value of biodiversity and ecosystem services have been not been recognised in the economic system. Trends are now emerging to address this (e.g. EMS, carbon credits, improved specification of legislated responsibilities, payments for conservation services over and above these responsibilities, R&D focusing on production opportunities linked to ecosystem services). As landscapes, management and ownership change, knowledge of the future trajectories may facilitate this process and assist in achieving improved biodiversity outcomes. Critically, in looking for solutions by addressing the causes of land use change at the landscape level, landholders are not the only stakeholders. Much can potentially be achieved by focusing on what agribusinesses, R&D agencies, regional planning agencies and others can do.

Not clear how enduring gains can be obtained in this dynamic and unstable context or how to maximise opportunities cost effectively. This may be a specific example of socio-economic research that should be added, as Vic suggested above, but in abbreviated form, to the research section. Also, the passive mood of the text downplays the importance of the environment for long-term sustainability and societal well-being.

Reserve creation and management
The establishment and management of the conservation reserve system is a central plank to conserve biodiversity, and fundamental to addressing biodiversity decline. It provides a comprehensive mechanism for the long-term security of tenure and management of representative and adequate samples of all Australian ecosystems. It also, in many instances, provides protection of threatened species and ecological communities, refugia and centres of species richness and endemicity.

The National Reserve System is an expanding program but the slowness of expansion means that more and more opportunities to represent the diversity of Australia's biodiversity and to ensure that it can persist for the long term in adequately designed reserves will be compromised.

The formal conservation reserve system also provides an important role for public access, education and understanding of biodiversity and related conservation issues, and promotes community wellbeing through a range of services, including substantial contribution to regional, State/Territory, and national economies through activities such as sustainable tourism, and enhancement of ecological services on which primary industries and all Australians depend - for example, provision of clean water and fertile soils control of pests, pollination of plants, flood control, pollutant breakdown and contributes to climatic stability - all of which are at some risk now given climate change.

The relatively good condition and quality of many ecosystems that are in the conservation reserve system, also provides useful reference sites to gauge changes to and determine trends in biodiversity in comparison to production dominated landscapes, where fragmentation of habitat coupled with other secondary factors (particularly weeds, inappropriate grazing and fire management regimes, introduced animals) has occurred more proximately. In addition, in terms of biodiversity conservation, maintaining and recovery of biodiversity

in the conservation reserve system is generally more cost-effective than investing in developed or landscapes.

Conservation reserves should form the core areas in the identification of ecological networks across the landscape designed to maintain the viability of individual species in the region and assist in adapting to climate change.

The *Australian Terrestrial Biodiversity Assessment 2002* found that only 6.6% of the Australian continent was protected in the formal conservation reserve system (IUCN management categories I-IV), and 71 of the 384 subregions have no reserves. At the continental scale, it was determined that over 1500 ecosystems Australia-wide required reservation to achieve the accepted benchmark of at least 15% of pre-1750 distribution of each terrestrial ecosystem formally protected. In some instances, where ecosystems are naturally restricted or rare, 100% reservation is desirable. Hence, there are significant gaps in the conservation reserve systems comprehensiveness and representativeness. Further, the Assessment also recommended that there is a need to accelerate the establishment of the conservation reserve system in order to protect ecosystems that are under development pressures before they disappear, as well as set aside areas that are still in relatively good condition.

Once areas are established under the conservation reserve system, it is important to maintain appropriate management standards and accountability, and monitor progress and effectiveness of management. National standards of management and consistency in monitoring the effectiveness of management and trends in biodiversity are required.

INFORMATION TO SUPPORT DECISION MAKING

Baseline research underpinning investment
Improving our knowledge and understanding of biodiversity is fundamental to underpin good decision-making and bring about effective management. Lack of knowledge, along with other pressures, tends to lead to decisions that drive biodiversity loss.

It is important to recognize that biodiversity is not a static entity but is ever changing and evolving in response to environmental conditions, and changing due to the affects of human-induced impacts. Hence, our knowledge base needs continual improvement to keep step with these influences and disturbances, and help predict the consequences for biodiversity decline. In other words, research should be viewed as an on-going concern and an integral component of decision-making that surrounds planning for biodiversity and its management, rather than a one-off investment. Research is vital in determining what management regimes are needed, including the appropriate scale of management responses to address biodiversity decline effectively, and how to achieve better management and protection of Australia's biodiversity. It is also vital in providing guidance when the components of biodiversity are no longer likely to persist or are not responding to intervention, and minimising ineffectual investment.

The following basic questions require on-going investigative effort to guide planning and inform management and investment decisions:
1. What is the composition of biodiversity, where does it occur (or patterning) and what state is it in;
2. What is changing in terms of condition of biodiversity and why is it changing;
3. How does biodiversity function and what services does it provide;
4. What are the risks or threats to biodiversity and management options to bring about desired changes in condition and status; and
5. What are the economic, social and environmental values and services of biodiversity in order to inform resource development decision-making.
                    Adapted from Biodiversity Conservation Research: Australia's Priorities 2001.

There are significant gaps in our knowledge and understanding of biodiversity, especially its composition and conservation status at a species and ecological community or ecosystem level, and some of the key threatening processes affecting it. For example in terms of composition and status, terrestrial and aquatic invertebrates, non-vascular plants, micro-organisms and marine organisms are poorly known in comparison to higher order plants and vertebrate animals that have principally been the focus of research over the past few decades. There is a need to invest in research aimed at taxonomic work to gain a better understanding of the breadth of species and the variability within these species, because we cannot conserve what we don't know. It is equally important to determine the type and scale of any threats acting on biodiversity.

In 1996, the Salinity Statement for Western Australia noted that 11 species of threatened flora occurring in the south western agricultural had at least one population considered to be at threat from salinity, and at least one species was likely to disappear unless remedial action was not undertaken at a landscape scale. However as a consequence of the systematic biological survey of the WA Agricultural Zone (Wheatbelt) that was conducted between 1997-2001, it is now estimated that around 450 plant species and 400 animal species, including aquatic invertebrates, are at increasing risk from extinction from salinity. Similarly, prior to the WA Agricultural Zone survey, there were only 200 aquatic invertebrate species known in the region but after the survey there are at least 1,000 known.

Similarly as a basis for biodiversity management planning, there is a need to identify, describe and map ecological communities and ecosystems at appropriate scales and determine their conservation status. This will provide information to guide investment into landscape scale recovery programs and establishment of the national conservation reserve system, as well as help identify off-reserve areas where investment will achieve the greatest returns, for example biodiversity hotspots and drought refugia.

Data and information on biodiversity needs to be readily accessible for planning and management purposes. The Australian Terrestrial Biodiversity Assessment 2002 under the National Land and Water Resources Audit provided a useful framework that gave details on many of the biodiversity assets and trends in condition and threats that occur at the continental and bioregional scale, and outlined appropriate conservation activities and direction. However, there is a need to up-date and refine and broaden the capability of this tool to better encompass a fuller range of biodiversity assets, as well as develop a similar planning and monitoring instrument that captures information on marine biodiversity assets at similar scales.

Biodiversity provides a range of ecosystem services, such as purification of water and control of agricultural pests and diseases, which are often not fully appreciated or taken into account in land use planning or in resource development because the cumulative impacts are not accounted for and cannot be priced effectively. If we could improve our capacity to describe and account for the social, economic and environmental values of biodiversity, we might be able to make better decisions and trade-offs at regional land use and natural resource planning scales. This will require the development of methods and tools for accounting of these benefits

At a national scale, there is a need to take a strategic approach to research to provide appropriate knowledge and data for targeted protection and better management of biodiversity, and to predict the consequences of biodiversity decline. There is also a major requirement to evaluate the effectiveness of past programs (national and state) and the complexity of the threats acting on biodiversity now given lag effects, such as from climate change, secondary salinisation, dieback etc, and the changes to biodiversity over the long-term. It is important that a strong technical understanding and assessment capacity in designing and adaptively managing future programs is developed.

Research is also needed into the processes by which changes in management practices influence ecosystem processes and hence biodiversity outcomes.

Research into the human and economic dimensions of biodiversity conservation can also contribute greatly to achieving the desired outcomes.[15]

Central to improving outcomes for the nation's investment in arresting biodiversity decline is research and development that addresses both the short term needs for technical innovation and the long term requirement to understand the nature, resilience and appropriate intervention strategies for ecosystems.

Australia's biodiversity research is poorly coordinated and hence difficult to focus on the issues that are most pressing. This research is funded by a large number of institutions with contributions from all levels of Government[16]. A mechanism is required to provide direction and better coordination of the efforts of different investors and providers. Development of an outcome based research framework would identify common goals and provide direction and coordination to research institutions, funding providers and Government agencies without limiting the scope or innovative pressure exerted by researchers and research users.

The limited information on the status of biodiversity and the most effective management responses is a serious impediment to informed investment in biodiversity decline. Improved baseline data and research is required to improve the choice and outcomes of remediation activities, and to form the basis for ecologically sustainable management of natural resources. A major challenge for conservation and management of

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[15] Human means more than just social, it covers broadly the 'people' side of things, including psychological
[16] LWBC Case Study: Measures available to address economic and social drivers of species loss.

biodiversity is providing quantitative criteria and trend information on which to base protection and management strategies for priority ecosystems.

One such framework that could provide guidance to researchers, funding bodies and policy makers is the Global Strategy for Plant Conservation (GSPC) developed by the Secretariat of the Convention on Biological Diversity. Adaptation of this framework to cover broad biodiversity and ecosystem goals appropriate to Australia will provide an outcome-based framework that can usefully guide public and private research funding bodies. Such a framework would also assist in reporting progress and more accurately assessing need.

Vegetation condition metrics
The decline in the extent and condition of native vegetation is a key element in biodiversity loss and decline and is recognised in the National Strategy for the Conservation of Australia's Biological Diversity. Although extent can and has been relatively easily measured (eg. satellite imagery, Graetz et al. (1995)) the change in condition has been more difficult to measure despite its obvious relevance to a primary biodiversity asset (vegetation and habitat).

A condition metric has to be broadly comparable between vegetation across all landscapes and implies variance from a defined point or ideal (benchmark). Parkes et al (2002) developed such a conceptual framework (habitat hectare) and it is being used in Victoria, recently being proven to be amenable to modeling and mapping (satellite imagery) at the Statewide level (ARIER, 2004). Commonwealth and Sates are working together to achieve a national approach where results will be comparable.

The advantage of a uniform metric is that the costs of improvement, the environmental costs of certain management regimes, the cost benefit between alternatives can be articulated, modeled, progress quantified and verified. The latter is critically given in the Auditor General's critique of NHT-1.

Cross border cooperation and information sharing
There is general consensus in Australia that there is a need for cooperation of approaches across borders to develop a better understanding of ecosystems and of how to manage them better. Examples of the cross-border approach include the Murray-Darling Basin Agreement and the Lake Eyre Basin Agreement. This cross-border cooperation and information sharing covers a range of areas in which greater compatibility and the adoption of best-practice approaches to system wide threats management brings substantial national benefits.

Fifty-six regions have been identified across Australia for the purposes of determining natural resource management (NRM) priorities and an integrated natural resource management plan will be developed for each. There is a risk in the establishment of regional NRM mechanisms that cross border differences will grow.

A range of cooperative structures need to be established both across State/Territory jurisdictions and at a regional level to ensure collaboration and cooperation

STAKEHOLDER ENGAGEMENT

Cultural Engagement and Education
Evolution of culture and cultural beliefs are heavily influenced by public institutions and educational messages about what it means to live in the Australian environment and the challenges that emerge from our relationship with that environment. Conservation and restoration of biodiversity will succeed if the general public is not only informed about biodiversity issues but is passionate about them and encouraged and supported to participate in or pay for conserving biodiversity.

Public institutions preserve, research and communicate Australia's cultural and natural heritage to a range of audiences. The earliest public institutions were founded on the premise of science and education to raise the level of public understanding. In recent decades there has been a move away from community funding for these institutions in favour of direct action.

In operating at both a local and global level through collaborations and through the development and use of new technologies, museums, botanic gardens and national parks are important institutions that can link local action with global thinking. Importantly they can reflect challenges and achievement back to a highly urbanised community and be leaders in developing scientific debate.

Within our cultural mix, indigenous people hold a special place based on strong cultural, social and spiritual links to the land and associated biodiversity. Since the early 1990's, Aboriginal and Torres Strait Islander communities, government agencies and local government have been working together in partnership to develop biodiversity conservation within a culturally relevant framework on Aboriginal and Torres Strait Islander managed lands in Australia. Much has been learned and the process continues to evolve. Biodiversity conservation on indigenous lands will have critical social and economic benefits. The traditional knowledge and experience of Aboriginal and Torres Strait Islanders can be a valued input into biodiversity conservation.

Finance industry or providers of financial services

Financial drivers of biodiversity decline on farmlands are complex and interrelated, with financial pressures related to climate conditions (notably drought), declining terms of trade, taxation and low margins from the major retailers.

Essentially, the reason that financial markets do not adequately reflect environmental considerations is due to what is often called "Market Failure". This occurs because the market does not recognise or protect socially desirable or public good values. Protecting biodiversity above duty of care is a public good activity for the most part, even though individuals can profit from its existence and the services it provides. These services, and the underpinning ecological processes, are generally unable to be quantified or valued in monetary terms and are therefore under-valued in the decision-making process and ignored in market transactions. This has led to degradation of the environment and natural resources including biodiversity in many countries throughout history and leads to landholders under-investing in areas such as biodiversity, water quality, native vegetation, amenity, and a host of other environmental concerns.

It is questionable, as to whether the finance industry is a major driver in biodiversity decline due to pressure to repay loans. A survey conducted in 2003 on behalf of the National Farmers Federation showed that only 3% of respondents reported financial pressures from banks as the most important issue currently facing rural and regional Australia and farmers. The most important financial issue was the need for more financial support and money for the country.

The finance industry's impact on biodiversity decline is more likely to stem from pressure for the banks to grow loan portfolios and therefore 'encourage' farmers and other land managers to develop all their productive lands.

The lack of monetary value for biodiversity and natural resource condition generally does not significantly influence land value, though serious salinisation of agricultural land is recognised by lending institutions, and in some regions there is a premium attached to residential land value because of adjacent natural landscapes. Generally, however, the prospects for integrating biodiversity into land value and property markets are low.

For this to be rectified, the factors that are causing market failure (in this case the exclusion of impacts on biodiversity from private and commercial decisions and the undervaluing of environmental services) need to be internalised into the decision making process. This can be addressed in a number of ways such as through legislation, the creation of a market for environmental services, and the offering of various incentives.

The creation of markets for some environmental services e.g. Carbon Credits enables the finance sector to invest in actions that can benefit biodiversity and natural resources more broadly.

The Government (and industry) is working towards internalising some of these factors through the creation of markets (salinity credits, carbon credits, water trading markets, etc). This is a slow process, and until the markets operate effectively, regulation may be a necessary requirement. Attaching conditions to loans to farmers is likely to be viewed as a non-market and heavily regulatory solution. Using other regulatory bodies, such as APRA, whose primary goal is prudential regulation, could be viewed as inefficient, as land management and biodiversity will be outside APRA's ambit and area of expertise.

Further research is required to understand how the finance industry could influence private land management and biodiversity. The finance industry could be encouraged to fund such research through universities, with a particular focus on how improved land management, water quality and biodiversity outcomes influence loan repayments and reduce insurance risk. Furthermore, understanding the drivers of lending behaviour and farmers' repayment rates in relation to the complex and dynamic factors of climate (drought) and terms of trade would be useful. This may also provide a framework of understanding how the financial side of farm businesses will respond in the future to the impacts of climate change.

The financial industry provides funding to industry and individual businesses for natural resource development. Sustainability measures and triple bottom line reporting is now being increasing adopted by this industrial sector, with the recent evolution of ethical investments, part of which includes the environment yet the issues of biodiversity are generally not well articulated. A metric needs to be developed to inform the market as to the investments that abet biodiversity decline and those that are benign or beneficial.

COMPLEMENTARY LEGISLATION, POLICIES AND PROGRAMS

Institutional responsibility
Biodiversity conservation is everybody's responsibility. However, landholders, community organisations, industry and the various levels of government, including public land managers each have particular responsibilities. The respective roles and responsibilities of each of these players needs to be better understood by each other, and better clarification to determine a benchmark for land managers' duty of care. The following are broad statements of these responsibilities.

Landholders – Private, Commercial & Government
- Voluntary actions and community supported actions to achieve positive NRM outcomes above duty of care responsibilities.

Local Governments
Among their other responsibilities, local governments have a responsibility:
- To exercise planning powers to provide a strategic planning framework and development control system to achieve biodiversity conservation outcomes;
- To minimise the impacts of land use and development on natural resource values;
- To manage lands vested in local authorities; and
- Local governments also have responsibility to ensure local service and infrastructure delivery cause minimal impacts on natural resource values and to promote best practice management.

State/Territory Governments
State/Territory Governments' role needs to reflect a responsibility to:
- Provide a legal framework that establishes a general environmental duty of care, achieves ecologically sustainable use and development, and requires the adoption of best practice natural resource management standards;
- Ensure that management of publicly controlled lands and waters puts is consistent with the best available information about sustainable use/extraction and supports rigorous and ongoing information gathering to evaluate and adapt resource use/harvesting;
- Promote and manage threatened species and ecological communities;
- Generate the data, statewide priorities and technical capacity to support state and regional NRM and landuse planning, and encourage its potential, to deliver effective and targeted biodiversity outcomes (*Other States – do you think this is relevant here? Is more discussion needed?*);
- Make information publicly available about the extent, significance and condition of biodiversity and identifying and addressing threatening processes;
- Establish programs to reserve or otherwise protect areas of international and State-significance ; and
- Establishing extension and support programs to encourage public and private land managers to protect and maintain biodiversity values beyond their general environmental duty of care responsibilities.

Australian Government
The Australian Government's role needs to reflect its responsibility:
- To maintain a legal framework and develop and deliver programs that identify and protect biodiversity values of international and national significance;
- To facilitate consistency across jurisdictions in relation to biodiversity significance assessment, condition assessment, threat significance and program priorities; and

- To develop programs to assist governments, industry and landholders achieve biodiversity conservation objectives
- As a land manager (for example of national parks and defence land)
- Promote and manage threatened species and ecological communities;

Coordinated Research and Development

Central to improving outcomes for the nation's investment in arresting biodiversity decline is research and development that addresses both short term needs for technical innovation and long term requirements to understand the nature, resilience and appropriate intervention strategies for ecosystems and species.

Australia's biodiversity research is poorly coordinated and hence difficult to focus on the issues that are most pressing. Current research is funded by a large number of institutions with contributions from all levels of Government[17]. A mechanism is required to provide direction and better coordination of the efforts of different investors and providers. Development of an outcome based research framework would identify common goals and provide direction and coordination to research institutions, funding providers and Government agencies without limiting the scope or innovative pressure exerted by researchers and research users.

One such framework that could provide guidance to researchers, funding bodies and policy makers is the Global Strategy for Plant Conservation (GSPC) developed by the international Secretariat of the Convention on Biological Diversity. Adaptation of this framework to cover broad biodiversity and ecosystem goals appropriate to Australia would provide an outcome-based framework that can usefully guide public and private research funding bodies. Such a framework would also assist in reporting progress and more accurately assessing need.

An outcome based research framework, based on the Global Strategy for Plant Conservation needs to be developed to provide direction to all research institutions, funding providers and Government agencies across Australia.

Land marginal to production

The retirement of land marginal to production for biodiversity conservation is a complex policy issue that requires significant cross portfolio negotiation.

Unsustainable land use often results in environmental degradation over time and declining financial returns. It is often characterized by dependence on government funding support (particularly drought assistance). Land use may also become financially marginal because of the failure of markets, rendering the particular industry unviable, at least for a period – for example, the collapse of the coarse wool market.

Where marginally productive lands have potentially high conservation value, there may be scope to change to conservation management, possibly through structural adjustment or conservation management incentives.

In its case study of the Desert Uplands bioregion in Queensland, the NLWRA Australian Terrestrial Biodiversity Assessment highlights the opportunities which exist for regional communities to consider the relative value and costs of pastoral production versus provision of an extensive range of ecosystem services. The Assessment supports the case for the development of a national policy initiative to retire the most significant and threatened low capability lands from production, to enable them to be managed for biodiversity conservation. The savings from removal of perverse incentives such as prolonged drought assistance could offset conservation management payments.

Market Based Instruments

The three types of MBIs currently being trialed all have their place in the toolbox of conservation mechanisms.

i) The value of price-based MBIs, such as auctions of land management contracts, in a biodiversity context has been demonstrated. Evaluation in the Bush Tender program shows that the program is very effective in achieving increased value for money, greater accountability, high satisfaction levels amongst participants, and improved biodiversity outcomes.

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[17] LWBC Case Study: Measures available to address economic and social drivers of species loss.

ii) Quantity-based MBIs in the form of cap and trade mechanisms have also shown their value in water trading and control of nutrient discharge. Offset programs have also demonstrated their value in native vegetation retention schemes, but need to be based within bioregions and trade 'like for like' - trade-offs involving non-substitutable natural capital are unacceptable. Biodiversity is not the focus of the national pilots of quantity-based MBIs, which are all water or salinity focused, but there are potentially significant collateral benefits for the health of aquatic ecosystems.

iii) Market friction mechanisms that seek to improve the operation of existing markets are the least certain in terms of biodiversity outcome. However, they hold high promise because of potential value for effort. Unlike some other MBIs they do not require one-to-one dealings with landholders. They may potentially have large leverage effects, with the actions of a few key players such as insurers, financial institutions, and food processors influencing the actions of many landholders. In addition to the national pilots, further possibilities include:
− a requirement for land sales to require statements as to the state of biodiversity or NRM,
− conditions on the supply of capital to agriculture, and
− accreditation of farmers, contractors and consultants/advisors.

A significant learning from the pilot program is that MBIs are best targeted at specific problems for which a particular outcome is sought (MBIWG 2004). This point shows the potential for dealing with intractable problems if they are well specified. It also shows realism about the extent of the gain that can be achieved using MBIs.

Realistically, MBIs are only one tool out of many that will be required. Biodiversity decline will require a multi-faceted approach that includes education, capacity building, regulation etc. It should be noted that MBIs usually rely on a regulatory framework to operate effectively. A parallel policy direction to using MBIs to reduce market failure would involve comprehensive action to review/modify institutional mechanisms that subsidise environmentally harmful activity (via underpricing of resources, distorting product prices, and reducing input costs) (NIEIR 1996, OECD 1998).

As with other mechanisms, the place of MBIs will vary with the biodiversity problem. It may be the case that different MBIs suit different landscapes. Instrument choice should be based on careful consideration of the future trajectory of each landscape, the social and economic drivers that are operating, and the biodiversity objectives. The following suggestions are purely speculative, and designed to stimulate further thought. It may be that in landscapes where commercial agriculture is likely to continue as the main land use, cap and trade, offsets and environmental labelling and EMS may be most relevant. In landscapes where the trajectory is away from commercial agriculture to amenity landholding, it may be that contracts for land management are most relevant.

Clearly advancing solutions to Australia's biodiversity decline requires input from diverse sources, and professions including the biophysical sciences, economics as well as the other social science disciplines. All of these disciplines have valid interpretations of environmental issues. The unique contribution of economics is in the design of instruments that seek to influence the operation of markets.

Markets and Biodiversity
Increasing the involvement of markets in arresting biodiversity decline is a desirable objective. The NRM Market Based Instruments Pilot Program has demonstrated the immediate advantage of adopting a number of market based and market-like instruments to promote biodiversity conservation or to make more efficient use of government grants to facilitate biodiversity conservation. However, there remains a significant challenge to engage the forces of markets to shape biodiversity conservation efforts independently of government intervention, and determine the long term effectiveness of such mechanisms.

Biological Corridors or Linkages
Many positives have been achieved in relation to addressing biodiversity decline such as establishment of public estate protected area networks complemented by private efforts, engaging the capacity of private landholders in protecting biodiversity and development of individual species conservation measures. However, integrating these to achieve positive outcomes in the face of ongoing habitat loss, invasive species and climate change requires further integration and connection of efforts across the landscape. The scale of conservation planning and management in space and time needs to be set at the scale of landscapes with timelines that extend from a few years to hundreds or even thousands of years. Retaining and protecting the best of what remains needs to be linked to sympathetic land management buffers and widespread ecological

restoration. Climate change, and probability of mass changes in distribution of biodiversity assets, suggests trans-state movement and the need for a national perspective in planning and implementing required land-use change.

Establishing large-scale biodiversity corridors or linkages provides a bold vision for biodiversity conservation across Australia to enable species and ecosystems to survive, evolve and adapt to environmental change. Biodiversity corridors provide a vision for an ecologically sustainable future by integrating proactive biodiversity management with regional development and natural resource management. Corridor concepts allow us to plan at a landscape scale and implement at a local level.

EVALUATION FRAMEWORK

Achievable outcomes
While recognising that the challenge is ecological complexity and that our incomplete understanding of ecological processes and biodiversity components place on setting and achieving conservation outcomes, biodiversity conservation programs would achieve greater results and would be generally more cost-effective if the outcomes sought are pragmatic and achievable.

Guiding principles should include:
- Achievable outcomes need to be distinguished from program aspirations, and investment and activity focused accordingly;
- Outcomes should only deal with matters that can be directly influenced;
- Outcomes need to reflect available funding and be deliverable within the governance arrangements and funding profile agreed for the program; and
- Outcomes need to be quantifiable in a simple and robust fashion.

Defining and monitoring outcomes
Environmental outcomes are challenging to define given the inherent complexity of biodiversity, the interconnections within ecosystems, and the need to consider multiple spatial and temporal scales. Monitoring changes in outcomes faces the further challenge of discriminating between short-term fluctuations in condition (e.g. climatic cycles, stochastic disturbance events) and the longer-term trends that are the focus of program activities. Monitoring of a wide range of species is indispensable in understanding what is actually happening to our biodiversity and to test the assumptions involved in the use of surrogates and landscape scale conservation programs.

A practical response to these challenges is to base monitoring / evaluation / reporting on a combination of information types / sources:
- comprehensive but generalised models of condition at the landscape or regional scale
- standardised site assessments of locations where planning decisions or management changes are being made
- on-ground monitoring of the status and trends of a wide range of species, sampling a wide range of habitat types
- research data collected with the appropriate design to clarify particular responses or issues
- estimates of the likely trajectory of change in condition associated with particular vegetation type / current condition / current land management scenarios

An approach based on this logic of "snapshots" of current condition and current estimated trajectory is being developed to provide guidance to the Matters for Target process.

Ecosystem targets
Each jurisdiction faces a different set of biodiversity conservation issues and socio-economic pressures and these are operating at a range of scales. Where ecosystems are in good condition and are well-represented, targets will be structured around maintaining ecosystem integrity and functionality. Where the challenge is to secure biodiversity in rapid decline and restore natural services required for sustainable, healthy ecosystems, targets are likely to be set around this restoration challenge. Matters for Target established through the NRM Monitoring and Evaluation Framework do not specifically consider the individual development needs of jurisdictions or guiding development assessors, industry and individual land managers. There is now a need for high level, regionally tailored ecosystem targets to be developed and incorporated into all levels of policy, planning, research and delivery affecting those regions. Ecosystem

targets must be outcome based and capable of guiding, developers, industry and community programs for on-ground works in the medium and long term. Measurable ecosystem targets are essential for guiding the development of market-based mechanisms delivering biodiversity services.