Sustainability and Biodiversity Conservation

Opportunities and Challenges for Western Australia

A background paper prepared for the State Sustainability Strategy

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Section II

Opportunities and Challenges for Future Sustainable Biodiversity Conservation in Western Australia

The conservation of Western Australia's unique and internationally recognised, but critically threatened biodiversity, is fundamental to the sustainable development of the state. The WA State Government is also committed to conserving Western Australia's natural heritage under various legally binding agreements at an international and Commonwealth level.

The current critically threatened state of our biodiversity places Western Australia in a 'biodiversity crisis.' This situation illustrates that historically biodiversity conservation measures in this State have been underemphasised, largely ineffectual, and in some cases misguided. Therefore as a matter of urgency, the Government of Western Australia must simultaneously revise, and significantly strengthen biodiversity conservation measures within its jurisdiction.

In order to achieve the sustainable management of biological resources, the State Government of WA must develop integrated strategic actions which comprehensively address the threats to biodiversity, while also ensuring the needs of regional and indigenous communities are not compromised. This will require a revised interpretation of contemporary biodiversity conservation approaches, which must be tailored to produce ecologically, socially, and economically sustainable outcomes for the long term in the state of Western Australia.

An integrated approach to biodiversity conservation by the WA State government will need to include strong community involvement and capacity building initiatives, as well as recognition of indigenous culture and knowledge, and contemporary economic utilisation of biological resources as necessary components of biodiversity conservation. These approaches must be integrated with strengthened traditional legislative approaches to conservation, such as reserve development and legal mechanisms to promote conservation on all land tenures.

Introduction

Biodiversity generally means the variety of life in all its forms and combinations, including the diversity found among ecosystems, species, and the genetic makeup of these living things. Although self-sustaining and in that sense stable, these three levels of biodiversity are dynamic; the evolution of life involves the creation of new genes, species and ecosystems as well as the loss of others.[1]

Western Australia, particularly the South west corner, represents an area unusually rich in biological diversity. The South West Botanical province[2] has been internationally recognised as a biodiversity hotspot, one of only 25 in the world.[3] The area has been selected by scientists for its high level of species endemism;[4] however this criterion alone does not constitute a biodiversity hotspot. The second criterion is that the biodiversity in the area is experiencing exceptional loss of habitat, and is therefore being placed at great threat.

The 1996 State of the Environment Report found that the loss of biodiversity is the single most important environmental issue facing the nation. In more colourful terms, 'What we are doing now to biodiversity is like burning renaissance masterpieces to cook dinner.'[5] 'Extinctions are happening today at a greater rate than any time in the past 65 million years.'[6]

[1] Yencken and Wilkinson, 2001
[2] Explanation and further discussion appears in the next section.
[3] Myers, N. et.al. 2000.
[4] An endemic species is that which occurs nowhere else on Earth.
[5] Professor EO Wilson quoted in Environment Australia, 2000

Globally, the problem of loss of biodiversity is equally worrisome. Two thirds of the Earth's bird species are in decline, and 14 percent of mammals are vulnerable to extinction.[7] Plant diversity is also rapidly declining, with 14 percent of the World's plants threatened with extinction.[8]

Biodiversity is vital to our very existence, and the implications of this alarming loss of biological resources and systems are wide and varied. Ecosystems provide humanity with an absolutely indispensable array of services,[9] maintaining the health of our economy, our environment, our society, and ourselves. 'Biodiversity is our living heritage, providing us with food, clothing, housing, clean air and water, inspiration and spiritual renewal.'[10]

> The mass extinction of species, if allowed to persist, would constitute a problem with far more enduring impact than any other environmental problem. According to evidence from mass extinctions in the prehistoric past, evolutionary processes would not generate a replacement stock of species within less than several million years. What we do (or do not do) within the next few decades will determine the long-term future of a vital feature of the biosphere, its abundance and diversity of species.[11]

The conservation of biological diversity provides significant cultural, economic, educational, environmental, scientific and social benefits for al Australians,[12] and will therefore be fundamental to the sustainable development of the State of Western Australia.

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[6] Professor Harry Recher quoted in Environment Australia, 2000
[7] Brown, et. al. 1999.
[8] Ibid.
[9] Ehrlich quoted in Yencken and Wilkinson, 2001
[10] Environment Australia, 2000
[11] Myers, et. al. 2001
[12] State of the Environment Advisory Council, 1996

This paper discusses the present situation in Western Australia with regards to the condition of biodiversity and its management, and explores future directions for sustainable biodiversity conservation in this State. Background information is provided on the international and national context of biodiversity conservation, and the current condition of biodiversity in Western Australia is briefly documented. This information is used to inform discussion on the present and possible future sustainable biodiversity conservation activities within the jurisdiction of the State of Western Australia.

This is by no means a comprehensive paper. While effort has been made to provide a complete picture of international and Australian responses to biodiversity conservation, and the condition and pressures on biodiversity in the state of Western Australia, some aspects may be omitted or poorly covered in the interests of brevity. Similarly, many of the issues associated with the future sustainable conservation of biodiversity in this state have only been addressed briefly, some not at all. The paper is intended to generate discussion about the future of biodiversity conservation activities by the Government of Western Australia, and it should be taken as a discussion paper for this purpose only.

The Global Response - Australia's International Role

The degradation and irreversible loss of biodiversity is an issue which knows no political or geographic boundaries. Biodiversity is being severely threatened in all parts of the world,[13] necessitating a truly global

[13] Australian Academy of Science, 1992

approach to its conservation. For over fifty years Australia has played an important role in global multilateral cooperation to promote the conservation of biodiversity in various forms. As a party to a number of international and regional agreements with relevance to the conservation of biodiversity, Australian Governments have an international responsibility to facilitate the preservation of the diversity of the Earth's natural heritage. Australia's obligations under these agreements charge Australian governments to provide adequate measures to sustainably conserve our own biodiversity and ensure the sustainable use of biological resources. Australia is also obliged to contribute to the conservation and sustainable use of biological diversity on a global scale,[14] by 'ensuring that activities within their jurisdiction or control do not cause damage to the biodiversity of other States, or of areas beyond the limits of national jurisdiction.'[15]

In a significant step forward in international environmental law, the International Convention on Biological Diversity, which came into force in 1993, and to which Australia is a party, explicitly integrates the two objectives of conservation and the sustainable use of biological resources.[16] The objectives of the Biodiversity Convention are 'the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources' (Article 1).[17]

The importance of this integrated approach to biodiversity conservation was further emphasised at an international level by the Rio Declaration;

[14] Swanson, 1996
[15] Robinson
[16] Preece et.al., Commonwealth of Australia, 1995

Agenda 21: Earth's Action Plan.[18] Parties to these two conventions are required to integrate conservation and sustainable use of biodiversity through 'the implementation of national strategies, plans and programs for sectors such as agriculture, fisheries and forestry and for cross-sectoral matters such as land use planning and decision making.'[19] One important provision in the Convention on Biological Diversity which acts to facilitate this integration of preservation and utilisation of biological resources is the agreement that 'States have the sovereign rights to exploit their own biological resources pursuant to their environmental policies.[20]

The emphasis on integration of biodiversity protection measures and biodiversity utilisation practices in this context is not an endorsement of the rationale that biodiversity should only be preserved to the extent that it can be used, and is therefore economically beneficial. Rather, that planning and activities to promote biodiversity protection must be closely integrated with the human processes which act to threaten biodiversity, i.e. the utilisation of biological resources. Planning for sustainable use of these resources is therefore of paramount and international importance in the protection of the diversity of the worlds natural heritage.

Of all biodiversity, the least well known and described by scientists both globally[21] and in Western Australia[22] is that which occurs in marine and other aquatic environments. The Ramsar Convention on Wetlands of International Importance (1971), is an important agreement which

[17] Swanson, 1996
[18] Robinson, N. 1993
[19] Preece et.al., Commonwealth of Australia, 1995
[20] Lesser 1998, Robinson 1993, and others.
[21] Brown, L. et.al. 1998

specifically addresses the conservation of biodiversity in wetland areas, particularly those which form habitat for international migratory bird species.[23] Western Australia has identified 9 Ramsar wetlands.

Another important international convention which responds to worldwide concern over the fate of the Earth's cultural and natural heritage is the Convention for the Protection of the World's Cultural and Natural Heritage, or the World Heritage Convention. Australia was among the first nations to ratify this convention, which has now been ratified by more nations than any other environmental convention.[24] Australia has been very active in promoting the World Heritage Convention, until a stand-off over uranium mining in Kakadu National Park occurred in the Northern Territory. This situation then caused the Australian Government to attempt to prevent the deliberations and process of the Convention.[25]

While there is no prescriptive management standards for World Heritage sites, States which have signed the convention recognise that the sites located in their territory constitute a world heritage 'for whose protection it is the duty of the international community as a whole to cooperate.'[26] 'The Australian Government takes seriously its international commitment to protect Australia's World Heritage Areas and it's obligation to identify, conserve, present and transmit to future generations Australia's natural and cultural heritage.'[27] There are currently 13 Australian

[22] Environment Western Australia, 1998
[23] Ramsar Convention Bureau, 1993
[24] Environment Australia, 1999
[25] Angas Hopkins, Pers. Comm.21/5/2002
[26] World Heritage Committee, 1975
[27] Environment Australia, 1999

properties on the World Heritage list, with only one of these - Shark Bay - in Western Australia.

Below is a list of international conventions and agreements which support the conservation of biodiversity, and to which Australia is a party:[28]

United Nations Convention on the Law of the Sea (UNCLOS 1994)
United Nations Conference on Environment and Development, Conventions and Agreements (Rio Declaration and Agenda 21 1992)
Convention on Biological Diversity (1992)
UN Convention to Combat Desertification
UN Framework Convention on Climate Change (1992)
Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (1989)
Convention on the Protection of Natural Resources and Environment of the South Pacific Region (SPREP 1989)
China Australia Migratory Bird Agreement (CAMBA 1986)
London Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (1985)
Convention on the Conservation of Antarctic Marine Living Resources (1980)
Bonn Convention on Conservation of Migratory Species of Wild Animals (1979)
Convention on the Conservation of Nature in the South Pacific (Apia 1976)
Japan Australia Migratory Bird Agreement (JAMBA 1974)
Convention Concerning the Protection of the World Cultural and Natural Heritage (1974)
International Convention for the Prevention of Pollution from Ships (MARPOL 1973 / 1978)
Washington Convention on International Trade in Endangered Species of Wild Flora and Flora (CITES 1973)
Ramsar Convention on Wetlands of International Importance (1971)
International Convention for the Regulation of Whaling (1946)

The International Union for the Conservation of Nature and Natural Resources (IUCN) (Now the World Conservation Union) is an important international organisation which provides an internationally recognised framework for classifying protected areas based on their management status. All protected areas can be classified using this system which

[28] adapted from 1996 SOE Report; Environment Australia Website; Worboys, 2001

ranges from class 1 fully protected areas, which are managed under strict protection mainly for science or wilderness protection, to class VI protected areas, which are managed mainly for the sustainable use of natural ecosystems.

Another more recent international initiative to aid the conservation of biodiversity has been instigated among the world's scientific community. The identification of international biodiversity 'hotspots' by scientists is a response to the realisation that

> The number of species threatened with extinction far outstrips available conservation resources, and the situation looks set to become rapidly worse. This places a premium on identifying priorities. How can we support the most species at the least cost? One way is to identify 'biodiversity hotspots' where exceptional concentrations of endemic species are undergoing exceptional loss of habitat. As many as 44% of all species of vascular plants and 35% of all species in four vertebrate groups are confined to 25 hotspots comprising only 1.4% of the land surface of the Earth. This opens the way for a 'silver bullet' strategy on the part of conservation planners, focussing on these hotspots in proportion to their share of the world's species at risk.[29]

The South West Botanical Province in Western Australia has been identified as such a biodiversity hotspot,[30] the only one in Australia.[31] The botanical province covers an area of approximately 309 840km2 running from Shark Bay to Point Culver. This area is biogeographically an island, which has been isolated from the rest of the landmass by desert, giving rise to a high level of endemism among the biota of the region.[32] Diversity, including the presence of relict Gondwanan flora and

[29] Myers, N. et.al. 2000
[30] Conservation council of WA 2001 (b); Myers, N. et.al. 2000
[31] Myers, N. et.al. 2000
[32] Environment Western Australia, 1998

fauna, is also high in the province - a result of it's temperate and relatively humid climate and ancient soils.[33]

There also exist a number of institutions in Western Australia where internationally important biodiversity research is being conducted. The Perth Zoo, as well as CALM, Kings Park and Botanic Gardens, and a number of WA universities are internationally recognised as providers of high quality scientific research which contributes to conservation of biodiversity both in Australia and overseas. Breeding programs at the Perth Zoo have allowed hundreds of individuals representing endangered species to be re-introduced in conservation reserves throughout Australia, while other conservation research has aided biodiversity preservation efforts overseas, particularly New Zealand.[34]

[33] Conservation Council of WA, 2001 (b); Environment Western Australia, 1998
[34] Perth Zoo Website available at www.perthzoo.wa.gov.au

The Commonwealth Response

International obligations to preserve biodiversity, and scientific data indicating that an alarming loss of biodiversity is occurring on the Australian continent and surrounding waters has led to a variety of responses from the Commonwealth of Australia.

The National Strategy for the Conservation of Australia's Biological Diversity, and the National Strategy for Ecologically Sustainable Development together form a policy basis for the conservation of biodiversity, and the sustainable utilisation of Australia's biological resources. A legislative framework for biodiversity conservation at a national level is provided by the *Environmental Protection and Biodiversity Conservation Act 1999,* and the *Australian Heritage Commission Act.*

Although now largely ignored by the Commonwealth Government,[35] the National ESD Strategy holds the protection of biological diversity and the maintenance of essential ecological processes and life-support systems as one of its three core objectives. The other core objectives of this strategy are to enhance individual and community wellbeing and welfare by following a path of economic development that safeguards the welfare of future generations, and to provide for equity within and between generations.[36]

[35] Angas Hopkins, Pers. Comm. 21/5/2002
[36] Commonwealth of Australia, 1996, National Strategy for the Conservation of Australia's Biological Diversity

The goal of the National Biodiversity Strategy is 'to protect biological diversity and maintain ecological processes and systems.' It provides an integrated framework of actions to achieve this goal and to strengthen conservation efforts across Australia.[37] The strategy covers six main areas:

- Conserving biological diversity across Australia
- Integrating biological diversity conservation and natural resource management
- Managing threatening processes
- Improving our knowledge
- Involving the community
- Australia's international role

The Strategy acknowledges that 'Australia needs a comprehensive approach to bridge the gap between current efforts, and the effective identification, conservation and management of Australia's biological diversity,' and also that 'of fundamental importance to the successful conservation of biological diversity is incorporation of the concept in all relevant decision making and management processes.'[38]

More recently, many of the Strategy objectives are being addressed through the Natural Heritage Trust. 'The Trust is a major Commonwealth Government initiative to conserve, repair and replenish Australia's natural Capital Infrastructure. The Trust aims to facilitate practical on-ground biodiversity conservation in Australia.'[39] The Trust was

[37] State of the Environment Advisory Council, 1996
[38] Commonwealth of Australia, 1996, National Strategy for the Conservation of Australia's Biological Diversity
[39] ANZECC, 2001

established under the *Natural Heritage Trust of Australia Act, 1997*, and $1.5 billion will be provided for the conservation of Australia's natural capital over six years from 1997.[40]

The Trust focuses on five key environmental themes with funding provided for various programs to support each theme: (only those programs with relevance to Western Australia are mentioned)

- Biodiversity;

  - The National Reserve System Program
  - The Endangered Species Program
  - The World Heritage Areas Management and Upkeep Program

- Land and water degradation;

  - The National Landcare Program
  - The National Land and Water Resource Audit
  - The National Forest Inventory
  - The National Feral Animal Control Program
  - The National Weeds Program

- Vegetation;

  - The National Bushcare Program
  - The Farm Forestry Program

- Rivers and Wetlands;

  - The National Rivercare Program
  - The National Wetlands Program
  - The National River Health Program
  - Waterwatch Australia

- Coasts and Oceans; (programs provided by Coasts and Clean Seas)

  - The National Clean Seas Program

[40] ibid.

- The Coastcare Program
- The Marine Species Protection Program
- The Coastal and Marine Planning Program
- The Marine Protected Areas Program
- The Introduced Marine Pests Program
- The Fisheries Action Program
- The Marine Waste Reception Facilities Program

Although many of these programs are examples of well-conceived partnership agreements between the Commonwealth and State/Territory Governments under the Natural Heritage Trust and the National Biodiversity Strategy, most of the Commonwealth investment has been non-strategic, and based on perceived political advantage.[41] Other Commonwealth Government Strategies with relevance to the Conservation of biological diversity are:

National Reserve System Program (NRSP)
National Rangelands Strategy
National Weeds strategy
National Ecotourism Strategy
Intergovernmental Agreement on the Environment
National Forestry Policy Statement
Commonwealth Ocean Rescue Program

There is also a variety of legislation at the commonwealth level which pertains in some way to the conservation of biodiversity:

Environmental Protection and Biodiversity Conservation Act 1999
Natural Heritage Trust of Australia Act, 1997

[41] Angas Hopkins, Pers. Comm. 21/5/2002

Endangered Species Protection Act, 1992
World Heritage Properties Conservation Act, 1983
Protection of the Sea (prevention of pollution from ships) Act, 1983
Wildlife Protection (Regulation of Exports and Imports) Act, 1982
Antarctic Marine Living Resources Conservation Act, 1981
Whale Protection Act, 1980
Antarctic Treaty (Environmental Protection) Act, 1980
National Parks and Wildlife Conservation Act, 1975
Great Barrier Reef Marine Park Act, 1975
Australian Heritage Commission Act, 1975
Environmental Protection (Impact of Proposals) Act, 1974

Greening Australia, and the One Billion Trees (now incorporated into Landcare Australia) campaigns, together with the Farm Forestry Program are Commonwealth Government initiatives which have arisen in direct response to loss of vegetation. These capacity building campaigns aim to facilitate collaborative projects between government, conservation groups and the community.[42] Australia has also developed a range of policy initiatives to encourage and build capacity in communities to address land degradation. The Australian 'Landcare' model of community based action has been successful in many areas, and is being internationalised through the International Secretariat for Landcare based in Victoria. Impartial commentators have noted however, that although there has been substantial public investment in Landcare in Australia which has improved public understanding and media coverage of the land degradation issue, the program has barely made a difference to land

[42] State of the Environment Advisory Council, 1996

management in the intensive agricultural or pastoral landuse regions.[43] Despite this, the Australian Landcare program has been adapted in establishing 'Landcare South Africa' and interest in the movement from many other countries is growing.[44]

[43] Angas Hopkins, Pers. Comm. 21/5/2002
[44] Nat report on desertification convention (need REF)

The WA response

Policy, Strategy, and Legislation

Until recently, the West Australian State Government has responded to the biodiversity crisis in a relatively ad-hoc way. The main Government Department which oversees the conservation and management of biodiversity is the Department of Conservation and Land Management, formed under the *Conservation and Land Management Act of 1984* (WA). This Act, as well as the *Wildlife Conservation act of 1950* (WA), and the *Environmental Protection Act of 1986* (WA) currently provide the primary legislative basis for the State's management of biodiversity.[45]

Other Western Australian legislation with relevance to biodiversity conservation includes:
Fish Resources Management Act,
Waterways Commission Act,
Sandalwood Act 1929,
Soil and Land Conservation Act 1945,
Agriculture and Related Resources Protection Act 1976,
Local Government Act, 1995,
Land Administration Act 1997,
Forest Products Act.

The Department of Conservation and Land Management (CALM) manages more than 8.5 per cent, or 23 million hectares of the Western Australian land area in the form of various reserves including national

[45] Environment Western Australia 1998

parks, conservation parks, regional parks, nature reserves, State forest and timber reserves which are vested in the Conservation Commission of Western Australia, and marine parks and marine nature reserves which are vested in the Marine Parks and Reserves Authority[46]. This reserve system plays a vital role in the conservation of biological diversity in this State. The Department of CALM manages lands and waters for the conservation of biodiversity at ecosystem, species and genetic levels, including management for the renewable resources they provide, and for the recreation and visitor services they can sustainably support.[47] Under the *Wildlife Conservation Act,* CALM also has responsibility for biodiversity conservation across all land tenures.[48]

In 1992, The WA State Government produced a draft Nature Conservation Strategy. This draft was made available for public comment, but soon afterwards the strategy was shelved by Syd Shea, then the head of CALM.[49] Currently, implementation of the National Biodiversity Strategy in Western Australia also involves a range of policy and program initiatives. These include: the Managing the Rangelands and New Horizons policies, which include commitments to comprehensive, adequate and representative (CAR) reserve systems on the rangelands and marine waters respectively; the State Salinity Strategy, with biodiversity conservation as a goal, and emphasis on vegetation protection and revegetation, and the Western Shield and Western Everlasting programs which address threatened fauna and flora

[46] CALM website
[47] ibid.
[48] Angas Hopkins, Pers. Comm. 21/5/2002
[49] ibid.

recovery respectively, as well as the Wetlands Conservation Policy for WA, Perth's Bushplan, and the Bush Forever strategy [50]

'Bush Forever is an implementation plan and whole-of-government initiative designed to identify, protect and manage regionally significant bushland in order to achieve a sustainable balance between conservation of our bushland and development in metropolitan Perth. [This strategy] fulfils the government's commitment to prepare a strategic plan for the conservation of bushland on the Swan Coastal Plain portion of the Perth Metropolitan Region, as identified in the Urban Bushland Strategy (Government of Western Australia, 1995).'[51] The WA Government has committed up to $100 million over ten years from 2000 to achieve this aim.[52]

In line with other States and Territories in Australia, and requirements under the National Biodiversity Strategy, the Government of Western Australia is currently preparing a State Biodiversity Strategy to provide a comprehensive framework for the conservation of biological resources in the State. Also currently under development is new biodiversity conservation legislation to replace the ageing *Wildlife Conservation Act 1950 (WA).* This new Biodiversity Conservation Bill is due to be introduced to parliament in 2003, and will become a Biodiversity Conservation Act when passed and proclaimed.[53]

Conservation Research

[50] Australia and New Zealand Environment and Conservation Council, 2001
[51] State of Western Australia, 2000
[52] ibid

Western Australia has a number of active research institutions where ongoing research into the various faculties associated with biodiversity conservation takes place. In the main, the research being done in this State is scientific in nature, and directed towards identifying and filling the gaps in our scientific understanding of Western Australian biodiversity. The primary biodiversity research effort is conducted through CALM, while other prominent institutions for biodiversity research include the Perth Zoo, the WA Museum, and the Botanical Gardens and Parks Authority combined with Kings Park and the Herbarium.

Various universities also contribute significantly to the biodiversity research taking place in the state. The most active of these are the University of Western Australia, Murdoch University, and Curtin University, each with strategic links to Marsupial Cooperative Research Centre at the Perth Zoo.

Privately Owned Protected Areas: Two Western Australian Working Models

Privately owned conservation estates also play an important role in the protection of Western Australia's biodiversity. Two unique WA initiatives showcasing very different approaches to private conservation estates are the Australian Wildlife Conservatory, and the Bush Brokers scheme.

[53] Angas Hopkins, Pers. Comm. 21/5/2002

The Australian Wildlife Conservatory (AWC) is a non profit independent organisation which is committed to saving Australia's wildlife from extinction. The AWC was set up by environmental philanthropist Martin Copley, and currently the conservatory owns or leases 450 000 hectares across six properties which are managed for the primary aim of conservation of native Australian Wildlife. [54] The Principal objective of the organisation is 'To make a practical on-the-ground contribution to the conservation of Australia's natural heritage, in particular to the conservation of native fauna in the wild.'[55] To achieve this objective, the AWC creates reserves to protect habitat and threatened species, and establishes new populations where threatened species have become locally extinct. Five reserves have been created in Western Australia under this plan, where public access is encouraged. Karakamia in the Perth hills; Paruna, linking the Walyunga and Avon National Parks; Faure Island in the Shark Bay World Heritage Property; Mount Gibson in the Murchison catchment, and Mornington Station in the Kimberley. In addition to these reserves, the AWC also have management control of part of the Ningaloo Station South of Onslow.

A very different approach to private conservation is taken by the Bush Brokers scheme. This scheme to protect bush on private land has involved collaboration between the Soil and Water Conservation Council, Worldwide Fund for Nature (WWF), and the Real Estate Institute of Western Australia. The scheme facilitates transactions whereby areas of native bushland are procured, and then sold to buyers who are interested in conserving the ecology of the areas. Properties where buyers can establish dwellings and live are favoured as this

[54] Australian Wildlife Conservatory website.

provides a management presence in the areas. 'It's all about marketing bush for it's conservation values and selling it to green buyers ... We give people nice big gardens to tend - right where we need a bit of gardening done'[56]

Other States and Territories

States and Territories in Australia who have developed their own Biodiversity Strategies or similar initiatives are outlined below: [57]

- **Australian Capital Territory** - The ACT Nature Conservation Strategy (ACT Government, 1998), provides a framework for biodiversity conservation and the maintenance of ecological processes.

- **Victoria** - The strategy Victoria's Biodiversity (Department of Natural Resources and the Environment 1997) takes a bioregional approach, and emphasises systematic prevention or reduction of the causes of biodiversity loss. It focuses on direct, ecologically sustainable management of public lands and waters by government agencies in association with resource-based industries, and on cooperative management of biodiversity on private land in partnership with landholders, the community, and local government. The Victorian State Government have also provided funding for a revolving fund program Victoria's Trust For Nature. Under this program, bushland is bought and then protected through covenants preventing clearing, before being on-

[55] ibid.
[56] Kieth Bradby, Soil and Water Conservation Council, quoted by Australian Broadcasting Commission, 1999
[57] This information on Australian States biodiversity planning activities has been summarised and appropriated from ANZECC, 2001.

sold. This Trust for Nature also accepts gifted land, and this has become an important part of the program.

• **New South Wales** - The NSW Biodiversity Strategy (NSW National Parks and Wildlife service 1999) commits all New South Wales Government agencies to working cooperatively towards conserving the States terrestrial biodiversity. An aquatic biodiversity strategy is also being prepared to complement the existing State strategy. Under this biodiversity strategy, the NSW State Government has provided funding of $5.268 million over three years from 1998 for new projects to implement the priority actions in the strategy.

• **South Australia** - The South Australian Government, with assistance from the Commonwealth Government through the Natural Heritage Trust, is producing a series of regional biodiversity plans to assist in the management and rehabilitation of habitats. The plan aims to integrate with other natural resource management plans to provide a regional context for conservation; provide guidance for management and conservation programs; increase community understanding and action, and provide a regional framework for assessing proposals.

• **Tasmania** - The Tasmanian State Biodiversity Committee has guided the development of a whole-of-government Nature Conservation Strategy to protect Tasmania's natural diversity and maintain ecological processes and systems. An aim of the strategy is to establish a way of doing business that ensures our social and economic needs go hand in hand with the needs of our natural systems.

• **Northern Territory** - The following strategies have been developed by the Northern Territory Government in response to loss of biodiversity and other ecological issues. The Northern Territory Parks Masterplan, the Strategy for the Conservation Through the Sustainable Use of Wildlife in the Northern Territory of Australia, the Strategy for the Conservation of Species and Ecological Communities Threatened With Extinction in the Northern Territory of Australia, and the Strategy for the Conservation of Biological Diversity of the Wetlands of the Northern Territory of Australia.

The Condition of Western Australia's Biodiversity

As has been discussed in previous sections of this report, the South West Botanical Province in Western Australia, occupying nearly 310 million hectares and extending from Shark Bay in the North to Point Culver in the South has been internationally recognised by scientists as containing some of the most severely threatened biodiversity on Earth.

The problem of this alarming and irreversible loss is closely related to our lack of understanding of the biological diversity that occurs in Western Australia. 'Our Knowledge of the biodiversity in Western Australia is limited. Many species have not been scientifically described or named and the conservation status of many species is unknown. There is no comprehensive catalogue of ecosystems or ecological communities or of their conservation status. Knowledge of the genetic diversity within species is almost non-existent.'[58]

Due to the lack of scientific and other knowledge about the condition of biodiversity among ecosystems and subspecies genetics, especially in marine and other aquatic environments, we must to some extent rely on what we know about terrestrial species as an indicator of biodiversity in general. This indicator points to the severity of the biodiversity crisis in this state. **25 plant species are presumed extinct, and 321 plant species are currently classified as threatened in Western Australia. 'Among the 149 known species of terrestrial mammals, 10 species are extinct and 31 taxa are threatened.** The greatest number of extinctions has

[58] Environment Western Australia, 1998

occurred in the Wheatbelt region.'[59] This situation with respect to mammal extinctions is probably the worst in the world.[60] Ecosystems are also threatened or have already been lost, particularly in the Wheatbelt and Swan Coastal Plain regions, where vegetation communities, wetlands, and riverine ecosystems are under greatest threat.[61]

With the exception of vertebrates, the biodiversity of Western Australian inland waters, some of the most biologically rich and ecologically important habitats on Earth,[62] is particularly poorly known.[63] Western Australia's wetlands provide a number of vital ecological, economic, and social functions, such as acting as biological filters for increasingly polluted runoff waters, providing habitat for a great diversity of fauna and flora, as well as allowing a range of other cultural uses such as leisure, irrigation, and fire fighting.[64]

Nearly ten years ago, an assessment done by Western Australian wetland ecologists recognised that land use changes such as land filling, clearing and development, and altered hydrologic regimes associated with changes in drainage patterns and groundwater abstraction had severely affected approximately 70 percent of the wetlands on the Swan Coastal Plain.[65] Today the situation is even more desperate for the biodiversity of wetlands in the state. 'Up to 80 per cent of wetlands on the Swan Coastal

[59] ibid.
[60] Angas Hopkins, Pers. Comm. 21/5/2002
[61] Environment Western Australia, 1998
[62] Balla, S. 1994; Boulton and Brock, 1999
[63] Environment Western Australia, 1998
[64] Boulton and Brock, 1999
[65] Balla, S. 1994

Plain have already been destroyed and what remains is often degraded or under threat.'[66]

If we move our focus from the coastal plain into the wheatbelt and rangelands of Western Australia, we are confronted with an equally bleak outlook on the condition of wetlands and watercourses. Over 70 percent of Australia's reported dryland salinity occurs in Western Australia;[67] the net affects of replacing deep rooted native vegetation with shallow rooted crops throughout the West Australian wheatbelt resulting in rising groundwater, and causing nearly all wheatbelt watercourses[68] and approximately one third of the states rivers to be severely degraded as a result of salinisation.[69]

The reserve system is currently far from sufficient to effectively protect the state's terrestrial biodiversity. **'Currently 56 per cent of vegetation types identified in Western Australia are not represented in existing conservation reserves. A further 31 per cent are poorly represented in the reserve system.'**[70] Many vegetation types occur primarily on private land tenures, where weak legislation and increasing socio-economic pressures in rural areas place these remaining ecological communities at great threat of land clearing.[71]

Marine biodiversity is even more poorly represented in Western Australian reserves, with only one marine nature reserve, and 6 marine

[66] The Labour Party of Western Australia
[67] ibid.
[68] Environment Western Australia 1998
[69] The Labour Party of Western Australia
[70] Hopkins quoted in Environment Western Australia, 1998
[71] The Conservation Council of Western Australia, 2001.

parks, compared with 1217 terrestrial protected areas of various forms.[72] The situation with marine biodiversity is critical;[73] a combination of lack of knowledge and lack of reserves leading to the severe degradation of many vital marine habitats.

Many Southwest reserves are also severely affected by 'dieback' (*Phytophthera spp.)* This plant disease represents possibly the most severe threat to biodiversity in the Southwest Biodiversity Hotspot.[74] Approximately 15 percent of the forested region of the South-West Land Division is infested, with some national parks having between 60 and 70 percent of their area infested.[75]

[72] Worboys, 2001
[73] Angas Hopkins, Pers. Comm. 21/5/2002
[74] ibid.
[75] Environment Western Australia 1998

Causes of Biodiversity Loss in Western Australia

Industrialised societies impose various different pressures on the biological systems that support them. Many of these pressures are causes of the extreme loss of biodiversity that Western Australian ecosystems are experiencing today. Some of the causes, such as clearing of native vegetation, and feral and introduced species have remained the same for two hundred years, or since European settlement. Today however, we also face new and poorly understood threats to biodiversity such as genetically engineered species and human-induced climate change, as well as an increased ecological footprint or pressure on the remaining natural systems.

On a broad level, there are a number of fundamental aspects of our society that act to threaten the survival of biological systems. These are highly complex issues such as human population size, affluence and technology, as well as economic growth and globalisation, poverty, and knowledge deficiency. It is vital that we tackle these broader issues to achieve sustainable relationships between society, our economy, and the environment, however, for the purposes of biodiversity conservation, we must begin to examine and confront the more direct causes of the current biodiversity crisis.

Habitat Loss, Degradation and Fragmentation

Habitat loss and degradation together with habitat fragmentation are the main processes which are placing biodiversity under severe threat all

over the world.[76] In Australia, at a national level, land clearing is the single process which is causing the most habitat loss, degradation and fragmentation and for this reason, clearing of native vegetation has been recognised as the single greatest threat to Australia's terrestrial biodiversity.[77] Western Australia is no different from the rest of the continent in this respect. Land clearing is still taking place in many Western Australian rural areas. This clearing includes the burning and overgrazing of vegetation leading to desertification and salinisation over an alarming area.[78] Many illegal land clearing activities in this State remain unreported, making an accurate assessment of the rate of land clearance in the state impossible. 'Many reports of unnotified clearing come from the Shires of Gingin, Three Springs, Harvey, and Mullewa. Often these illegal acts occur in areas of low agricultural viability, where biodiversity values are often highest.'[79]

Introduced Species

Another issue causing significant threat to biodiversity is the release and spread of introduced plants and animals into biological systems. A large number of alien species of plants, animals, and microorganisms that have been introduced into Western Australia over the years have caused significant damage to biodiversity.[80] Uncontrolled populations of feral goats, rabbits, and horses pose a particularly severe threat to the biodiversity of pastoral regions in Western Australia. 'Pastoral activities, particularly the increase in watering points, and pastoral modification

[76] Myers. et.al, 2000; Alpin et.al. 1995
[77] Yencken and Wilkinson, 2001
[78] Environment Western Australia, 1998
[79] Conservation Council of Western Australia, 2001
[80] Commonwealth of Australia, 1996

have increased the suitability of pastoral lands for feral goats, rabbits, and horses.'[81] There are now more feral goats in Western Australia than there are people, with an estimated 2 million goats in the Gascoyne and Murchison catchments in addition to sheep and cattle at approved stocking rates.[82] In some pastoral areas, farmers encourage these animals as they can be sold on overseas markets for a higher price than sheep. Goats however, have a far greater environmental impact than sheep, posing severe threats to biological diversity in the West Australian rangelands.

Some of the most serious threats from feral animals are from introduced predators, particularly foxes and feral cats. 'European foxes can sustain relatively high numbers by preying on rabbits, carrion, or invertebrates while driving indigenous species to extinction.'[83] The distribution of mammal extinctions in southern Western Australia are consistent with the distribution of the red fox, and feral cats which can occur as self-sustaining wild populations.[84] Also, almost all extinct or endangered native Australian mammals occur in a 'critical weight range' of between 35g and 5500g.[85] This range is consistent with the preying range of cats and red foxes.

Another introduced species; the fungus ***Phytophera spp.*** or 'dieback' is having a devastating effect on the species-rich shrublands and jarrah forest in the south of Western Australia.[86] 'The arrival and spread of ***P. cinnamomi*** in Western Australia is now seen to be a biological disaster of

[81] ibid. see also Landsberg, et.al. 1997
[82] Angas Hopkins, pers.comm.
[83] Environment Western Australia, 1998
[84] Burbidge and Friend, undated, Environment Western Australia, 1998
[85] Burbidge and Friend, undated

global significance given the richness and high degree of endemism of the flora of south-western Western Australia.'[87] Other plant diseases affecting biodiversity in the south west include *Armillaria inteobubalina,* and *Cryptodiathrorthe melanocrespida*.[88] Little is known about the extent or severity of these diseases.

Genetically Engineered Species

The spread of genetically engineered (GE) organisms into the natural environment is also a serious threat to biological diversity.[89] Genetically modified organisms bring great potential risks to biodiversity, particularly the displacement or genetic modification of unmodified species.[90] 'Many scientists are concerned about this emerging technology since the insertion of foreign genes into the host genome disrupts the genetic blueprint of that host organism with unpredictable consequences.'[91] It is estimated that the majority of future canola, cotton, lupin and pea crops will be genetically engineered so that they are insect or herbicide resistant.[92] This situation could have a potentially devastating effect on the biodiversity of Western Australia, where many of these crops are grown. The threat of 'super pests' and 'super weeds' as a result of evolutionary and genetically engineered resistance to pests and pesticides is a very real threat to biodiversity.[93] Already a problem of this nature exists on the agricultural plains behind Roebuck Bay, where

[86] Commonwealth of Australia, 1996
[87] Environment Western Australia, 1998
[88] ibid.
[89] Commonwealth of australia, 1996; Krockenberger, 2000; Yencken and Wilkinson, 2001
[90] Commonwealth of Australia, 1996.
[91] Yencken and Wilkinson, 2001
[92] ibid.
[93] ibid; Krockenberger et.al. 2000

genetically modified cotton has escaped from experimental crops into the wild.[94]

Climate Change

Human-induced climate change is also beginning to take its toll on biological systems of Western Australia. Climate change is predicted to have severe implications for some terrestrial ecosystems where relatively small temperature changes may result in extensive loss of habitat and consequently extinction of species.[95] These effects are likely to be particularly severe in the Southwest, where ecosystems are highly fragmented, preventing migration of species as temperature and rainfall zones move south.[96] Aquatic and marine ecosystems are also likely to be directly affected by sea level rises associated with climate change, causing loss of habitat and affecting breeding grounds for birds.[97]

Altered fire regimes

Fire is one of the most significant modifiers of habitat in Australia. 'Research has shown that the disappearance of mammals from the deserts of Western Australia coincided with the depopulation of the area by Aborigines, and the subsequent change in the fire regime.'[98] Fire is a necessary part of many Western Australian ecosystems, however it can also be very damaging if areas are subjected to inappropriate fire regimes. 'Fires of high or low intensity that are either too frequent, of

[94] Angas Hopkins, Pers. Comm. 21/5/2002
[95] Commonwealth of Australia, 1996
[96] See Also Odile Young, ISTP.
[97] ibid; Yencken and Wilkinson, 2001
[98] Burbidge and Friend, undated

insufficiently frequent can lead to loss of native species, communities and ecosystems.'[99] In terms of biodiversity, regular fuel reduction burning in the south west forests has in many cases been inappropriate in frequency and intensity, causing alterations to the biodiversity of the only wet sclerophyll forest remaining in the world, particularly the soil-borne organisms such as fungi.[100]

Industry and Settlement Pressures

Industry and settlement in various forms also have adverse impacts on biodiversity. While those industries which directly use biological resources such as farming and fishing and tourism have the greatest direct affect, most other industries as well as urbanisation contribute to a serious pressure through pollution, habitat destruction and modification, resource extraction etc.. The uncontrolled spread of urbanisation and its effect on wetlands of the swan coastal plain through land filling and pollution has already been discussed in this paper. Widespread use of pesticides associated with agriculture and other industries is another example of industrial pressure on biodiversity.[101]

Opportunities and Challenges for Future Sustainable Biodiversity Conservation in Western Australia

A Sustainability Approach

[99] Commonwealth of Australia, 1996
[100] Syme and Bougher, 1998, Tony Pedro, South Coast Environment Group (SCEGS) pers.comm. Angas Hopkins, pers.comm.
[101] Yencken and Wilkinson, 2001

As we review various biodiversity conservation initiatives on an international, national and State level, we begin to see some common themes emerge. Although not all of these themes are present in all policy initiatives, together they form a conceptual framework for the approach taken in contemporary biodiversity conservation. The themes are:

- Integration of biodiversity conservation and natural resource management,
- Bioregional planning,
- Community, especially indigenous involvement,
- Conserving biodiversity ‘in situ’,
- The development of comprehensive adequate and representative reserve, (CAR) systems,
- Equitable sharing of the benefits arising out of the utilisation of genetic resources,
- Improving our knowledge of biological systems.

While these well-established concepts provide a useable framework for strategic planning for biodiversity conservation, it is felt that the successful and sustainable preservation of biodiversity requires a fundamental shift in the interpretation of some of these themes by planners. Sustainability planning involves identifying and challenging those ethics and discourses that underpin and perpetuate unsustainable relationships between humans and the non-human world. These ethics and discourses are often intrinsic to our perceptions of the world, and are therefore difficult to identify.

The development of the Western Australian biodiversity strategy should be seen as an exciting opportunity to begin a process of reinterpreting and redefining the established mechanisms of contemporary biodiversity conservation to work towards truly sustainable and equitable outcomes for the communities and biodiversity of Western Australia.

Reinterpretation 1: Increasing our Knowledge

One redefinition which is particularly important is that of the goal that we must improve our knowledge of biodiversity in order to best facilitate its conservation. This statement itself is not brought into question; however the interpretation of this objective in contemporary biodiversity conservation initiatives has been consistently mono-disciplinary and dogmatic. Contemporary biodiversity conservation theory has largely been informed by an incomplete and solely scientific understanding of biological systems, superimposed by a fundamental mismatch between the way natural systems function and the way governmental systems are designed to manage them.[102] This situation has produced biodiversity conservation initiatives which in some instances can act to perpetuate the very processes which threaten our biological heritage[103].

If we are to conserve our biodiversity in the most sustainable manner, we must improve our knowledge of that which we wish to conserve. To achieve this end, the Australian and New Zealand Environment and Conservation Council (ANZECC) last year[104] released the document *Biodiversity Conservation Research - Australia's Priorities* 'to act as a

[102] Sandlund, 1992.
[103] Newkirk 1994; Shiva 1997
[104] 2001

guide to research and funding bodies throughout Australia.' Two thirds of the highest priority research areas were areas of purely scientific research. The remaining priority research areas were identified using scientific knowledge as the basis for determining where other forms of research, such as social and economic enquiry are required.

While a comprehensive scientific understanding of ecological systems is of importance, it should be recognised that a solely scientific understanding of the natural world - an incompletable one at that - forms only one component of the knowledge required for the sustainable conservation of biological systems. The reductionist[105] and anthropocentric[106] viewpoint which is modern western science is one which offers at best an incomplete understanding of natural environments and the relationships between human culture and environmental nature. Any discourse which is solely informed by such a limited understanding necessarily embodies the fundamental precepts of western anthropocentrism, and mechanistic reductionism, and thereby in some cases will act to perpetuate the unsustainable relationships which are informed by these precepts, and currently exist between industrialised societies and the natural environment.

It is therefore necessary that we must diversify both the types of knowledge and the subjects of the knowledge which we use to inform our methods of biodiversity conservation. 'Sustainable management of living natural resources demands that the scientifically derived biological and ecological information is combined with profound knowledge of local

[105] Western Science seeks to reduce systems into their component pieces in order to understand them; see also Newkirk, 1994
[106] Human-centered, See also Zimmerman et. al. eds, 1998

socio-economic and cultural structures. The output from scientific work may be more easily applicable in practical management if scientists evaluate their results in a wider social and cultural context.'[107]

'Political systems must also be incorporated into our attempts to understand the ways in which we deal with the environment, as politics and political systems are a crucial element in our framework for exploring the interaction of human and biophysical systems.'[108] This will require a multi-disciplinary approach to improving our knowledge of biodiversity conservation. 'The many aspects involved in conservation and sustainable management demand holistic approaches and collaboration between professions...'[109] Therefore, policy makers need to include economists, political, natural and social scientists as well as indigenous knowledge in planning and management teams. This will require multi-disciplinary and multi-sectorial teamwork in the development of biodiversity conservation projects and programs. Dr. Pouliquin-Young adds that 'conservation biology needs to develop a sound political ethos, and in particular needs to direct some of its efforts into the development of community science, rather than relying solely on a traditional scientific framework.'[110]

One alternative mechanism for understanding the nature of biological systems including the interaction of human culture with them is that of indigenous knowledge systems. Unfortunately however, as Professor Marcia Langton, from the Centre for Indigenous Natural and Cultural

[107] Sandlund et.al., 1992
[108] Alpin et.al., 1995
[109] Sandlund et.al., 1992
[110] Pouliquin-Young, 1995

Resource Management (CINCRM), and foundation professor of Australian Indigenous studies at the University of Melbourne notes:

> 'Aboriginal people and their land management traditions have been rendered invisible in Australian landscapes by 'science fictions' that arise from the assumption of superiority of Western knowledge over indigenous knowledge systems, the result of which is, often, a failure to recognise the critical relevance of these latter to sustainable environmental management.'[111]

Indigenous knowledge and cultural understanding of the Australian environment should form an indispensable element of biodiversity conservation knowledge, and the way that knowledge informs biodiversity management techniques. Aboriginal culture has been an intrinsic and interactive component of Australia's ecological systems for thousands of generations,[112] this culture, and the knowledge associated with it therefore forms an essential component of that which must be protected and drawn upon to inform the development of sustainable protection mechanisms.

Langton, on biodiversity conservation explains;

> '[Aboriginal knowledge] brings different and applicable views of the world to the task of conserving biodiversity. Indigenous knowledge exists wherever there are living Aboriginal customary systems, and wherever this is the case, Aboriginal and western systems knowledge are parallel, co-existing, but different, ways of knowing. Scientific descriptions of nature and precepts of the natural world cannot subsume traditional ways of knowledge.'

Collaborative projects between Aboriginal people and colonial conservationists are not merely annexing traditional systems of knowledge, but rather, interacting with them, and thus the outcomes are

[111] Langton, 1998
[112] see also, ibid.

neither absolutely the result of scientific thought nor that of Aboriginal thought.[113] Dodson, who served as the first Aboriginal and Torres Strait Islander Commissioner,[114] explains this concept clearly:

> 'What I am suggesting is the need for integrating the views, approaches, and experience of indigenous peoples into national strategies for environmental and conservation management. What I am suggesting is a partnership ... between Western knowledge and 'scientific' approaches to land and environmental management, and indigenous knowledge and approaches. Such a partnership, I suggest, should provide the basis for sound, sustainable environmental management and protection'[115]

Therefore, the objective of increasing our knowledge for better biodiversity conservation should be redefined to mean:

- Diversifying the types of knowledge that we use to inform biodiversity management activities to include indigenous forms of knowledge and academic disciplines other than that of the biological and environmental sciences. Conventional science will still be a necessary part of our understanding of biological systems, but this needs to become more systems orientated to take a holistic approach to the understanding of whole ecosystems as functioning units.

- Diversifying the subjects of the knowledge we use to inform biodiversity management activities to include, in addition to scientific or other knowledge of biological systems and their components, the study and better understanding of the relationships between ecological systems, economic systems and social systems, particularly the understanding of indigenous culture as an inseparable component of ecological systems.

[113] ibid.
[114] ibid.

Reinterpretation 2: Bioregional Planning

It is widely held that the best way to manage ecological systems for biodiversity conservation is to divide them into 'Biogeographical regions' or areas defined by the ecological communities that exist within them.[116] 'Regional Planning in which environmental characteristics are a principal determinant of boundaries is considered to be of major importance if biological diversity conservation is to succeed.'[117]

In recent years a significant effort has been made to describe and classify more precisely the main bioregions of Australia. The mechanisms for achieving this have been the Interim Biogeographical Regionalisation of Australia (IBRA), a classification of terrestrial bioregions, and the Interim Marine and Coastal Regionalisation of Australia (IMCRA), a classification of marine bioregions. The IBRA system identified 80 bioregions,[118] with 26 appearing in Western Australia.[119]

The spatial regionalisation of ecological systems into discrete bioregions is a management tool used for the purposes of conservation. While in some cases the identification of bioregions can be an excellent guide for the development of management plans with the objective of biodiversity conservation, in many cases a bioregional analysis will fail to provide the most appropriate basis for the spatial organisation of biodiversity management. This is the case for the following reasons.

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[115] Dodson, 1996
[116] Yencken and Wilkinson, 2001; ANZECC, 2001; Commonwealth of Australia, 1996; Swanson, 1996, and others
[117] Commonwealth of Australia, 1996
[118] Yencken and Wilkinson, 2001

Areas defined primarily on environmental characteristics usually do not reflect the spatial characteristics of the cultures and cultural processes which affect those regions. For example, the indigenous peoples of Australia had, and in some places still have a relationship with the landform of Australia which is in most cases fundamentally mismatched with scientifically described bioregions. These peoples see themselves and their culture as a part of the ecology, part of the geology, part of the landscape.[120] In western scientific terminology; a keystone species. But the range of this 'keystone species' which is Aboriginal culture, and the ecological and evolutionary effect of the land stewardship so intrinsic to this culture is not bounded by the edge of the mallee scrub bioregion, or the high water mark, or the Swan Coastal Plain, or any other scientifically described regionalisation of the natural environment. Dodson elaborates succinctly;

> There is another dimension that invests land with meanings and significance - which transforms land and environment into landscape, and into 'country'. That other dimension is culture. Culture is what enables us to conceive of land and environment in terms that are different to conventional European notions.[121]

Contemporary Australian colonial landuse patterns and socio-spatial associations are similarly ignored by such environmentally determined regionalisation. Landuse patterns requiring integrated biodiversity planning such as the West Australian Wheatbelt Region or the WA salmon fishing industry transcend the boundaries of various bioregions and their correspondently different management regimes. Conversely, intensive landuses such as mining and settlement would increase the

[119] Environment Western australia, 1998
[120] Langton, 1998

variation of environmental impact within a bioregion to a level where an overall bioregional approach to conservation in the area would be problematically generalised in its application.

More layers of spatial planning which are not recognised by the identification of bioregions, are areas of local government jurisdiction, and land use planning based on areas defined by catchments. Many councils are already actively involved in biodiversity conservation, using a variety of mechanisms including Local Agenda 21 Plans and integrated environmental management programs, often in rural areas on a basis defined by catchments.[122] The *National Local Government Biodiversity Strategy*[123] argues that 'local government, either as regional groupings or as individuals, is the most appropriate level of government to deliver the best outcomes for biodiversity conservation at the lowest cost with the highest level of community involvement and support.' Regionalisation of lands for the purposes of State Government biodiversity conservation activities needs to be sympathetic to these forms of landuse planning. A purely bioregional analysis is not.

The problem of loss of biodiversity is not simply an environmental problem, it includes economic, cultural and societal issues, thus the classification of management areas on environmental grounds alone is incompatible with the goal of integrating the management of all of these aspects. Therefore, it is felt that bioregional planning for biodiversity conservation should be redefined to reflect the spatial arrangements of landuse and other cultural elements of the environment: Bioregionalism

[121] Dodson, 1996
[122] Australian Local Government Association, 1999
[123] ibid.

should become *bioculturalism*. *Biocultural* regions need to be flexible, and reflect that there are no specific boundaries to ecological systems, or indigenous cultural systems based on tribal territories, while specific legislative boundaries do exist in the case of local government jurisdiction and modern patterns of land tenure and usage. Any regionalisations therefore need to be treated as flexible and potentially variable, to be used for some purposes, but not others.[124]

Reinterpretation 3: Comprehensive Adequate Representative (CAR) Reserves

The high conservation value of CAR reserve systems is well established,[125] and there is no contention that this approach to biodiversity conservation is a valuable model. A lengthy discussion of the well established benefits of the development of CAR reserve systems is not possible or intended here; suffice to say that the systematic identification and protection of CAR reserve areas should remain an important focus for biodiversity conservation initiatives in Western Australia. Some assessments have shown protected areas to be the most cost-effective solution to the problem of biodiversity maintenance,[126] while the Biological Diversity Advisory Council[127] disagrees, advocating regional natural resource planning at local government level as the lowest cost biodiversity conservation measure, with the highest level of

[124] see also Yencken and Wilkinson, 2001
[125] Yencken and Wilkinson, 2001; Worboys et.al. 2001; Krockenberger, 2000; Alpin et.al. 1995 and others.
[126] Krockenberger 2000.
[127] in conjunction with the Australian Local Government Association, and supported by Environment Australia with disclaimer: 'The views and opinions... are not necessarily those of Environment Australia' No other information could be found on the 'Biological Diversity Advisory Council'

community involvement.[128] In any case, Western Australia's contribution to the National Reserve System needs to be completed, and the marine reserve system in this State, which compared to its terrestrial counterpart is in its infancy, must be greatly expanded.[129]

CAR reserve systems should not however be viewed as the holy grail of biodiversity conservation in Western Australia as they have been the focus of such initiatives in other areas. The concept of a CAR reserve system providing a 'silver bullet' solution for conservation planners is flawed for a variety of reasons.

Firstly, the idea that we can define one area which represents the biodiversity of a much larger area is ecologically naive. All ecosystems are unique, even if some of them appear very similar from an incomplete scientific perspective. Indeed even a scientific perspective tells us that if vegetation assemblages and soil associations are similar over wide areas, the genetic diversity of species within those areas may be enormous, and cannot be captured in a 'representative' section of the landscape. Witness the examples of Rock Wallabies, Velvet Worms, and Barramundi cited in *Australia: State of the Environment 1996*[130] for their enormous genetic diversity found within ecologically similar areas. This variation in genetic diversity is what provides resilience in ecosystems,[131] so concentration of conservation effort on 'representative' areas at the expense of other areas will act to further erode the resilience of the ecosystems we wish to protect.

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[128] Australian Local Government Association in conjunction with Biological Diversity Advisory Council, 1999
[129] Krockenberger, 2000
[130] State of the Environment Advisory Council, 1996 (ch.4 p38)
[131] Environment Western Australia 1998; Knox et.al. 1995 and others (after Krebs, 1985)

Secondly, the places where we most need our biodiversity conserved, i.e. where it provides us with the services which we most depend on such as air and water purification, are diffuse and decentralised. Witness the vegetation fringing the creeks in the Peel-Harvey region protecting the estuary from eutrophication by effecting nutrient removal, the remnant vegetation in the wheatbelt mitigating salinity by lowering groundwater and providing refuge for the insects that pollinate our crops, and the seagrass beds in our bays and estuaries proving breeding grounds for our local fisheries. None of these examples of biodiversity can be captured in representative areas, by nature and necessity their distribution is scattered. These examples represent keystone ecosystems which form a crucial part of the interface between human activity and environmental functionality, thus we require a different framework from that of environmentally determined representation to best approach their protection.

And thirdly, the existing system of conservation reserves is inadequate in its ecological representativeness due to the influence of political and social considerations surrounding the creation of reserves, and the 'worthless land' approach to reserve creation by Western Australian Governments.[132] 'The conservation-through-reserve strategy has thus been an opportunistic process which has led to the creation of a large but disjunct system of reserves, and which has not halted the loss of biodiversity.'[133] This opportunistic method of land acquisition for reserves has been informed by a reserve creation approach of the reservation for conservation purposes of otherwise worthless land. This

[132] Pouliquin-Young, 1995

approach has led to a system of reserves in Western Australia which is characterised by particularly poor representation of the biological systems which once existed in agricultural and other land use areas. 'A very uneven network of reserves has resulted in a low coverage in the areas of the State where land uses have been more extensive.'[134] This method of land acquisition for reserves has also resulted in a large number of very small reserves of less than five hectares, and a few very large reserves of more than 50 000 hectares.[135] 'The problems created by the opportunistic method of land acquisition have led to an incomplete ecosystem coverage which, when compounded by issues of reserve management, has been partially responsible for the continual loss of biodiversity in the State.'[136]

Therefore, we must broaden the framework that informs our decisions on how to most effectively allocate biodiversity conservation resources. Of course a simplistic economic assessment will tell us that due to resource limitations we can either - choose one - conserve the biodiversity within small areas very effectively, or conserve the biodiversity within large areas rather less effectively. To continue with this (oversimplified) approach, it is suggested that we need to try to strike a balance between these extremes, rather than simply focusing on the small areas. Yencken and Wilkinson, in their recent book *Resetting the Compass - Australia's Journey Towards Sustainability* write:

> Historically, Australian governments have sought to achieve nature conservation through the establishment and expansion of national Parks and Reserves. This continues to be a necessary and important action. It cannot however be the only action since approximately

[133] ibid.
[134] ibid.
[135] ibid.
[136] ibid.

> 500 million hectares, or two-thirds of the continent is managed by private landholders and most of the rest of the publicly owned land is not managed primarily for conservation.[137]

Finally, there will be a need to expand the CAR reserve system in the light of climate change. Pouliquin-Young and Newman[138] show how plant species will move south as temperatures rise, and hence some species will disappear unless land is made available, as their habitat will be outside their reserve areas. Management of the matrix, or the parts of the landscape between individual reserve areas will be required to provide this land, as well as to maintain some connectivity and corridors between reserve areas, and to minimise edge effects such as weed invasion.[139]

Reinterpretation 4: Integration of Biodiversity Conservation and Natural Resource Management

It has been recognised and supported at international, national, and state levels, that the successful integration of biodiversity conservation with sustainable economic development of biological resources will be vital in the sustainable conservation of the biodiversity of this state.[140] This is a complex goal in itself, but one that is intrinsic to the achievement of a sustainable relationship between Australian people, our economy, and the environment.

One interpretation of how this objective can be met is simply by finding new uses for ecological resources. 'Developing new approaches to using wild biological resources can help ensure their survival.'[141] It may seem

[137] Yencken and Wilkinson, 2001 after Young et.al., op.cit; Commonwealth of Australia, 1996
[138] Not yet published, reference available from ISTP.
[139] Angas Hopkins, Pers. Comm. 21/5/2002
[140] Biodiversity Convention and Rio Declaration; National Biodiversity and ESD Strategies; Environment Western Australia.
[141] Sandlund, et.al. 1992

strange to attempt to conserve biological resources by finding new ways to use them, but on the other hand, people and the economic frameworks that guide them tend to value the parts of the environment that they derive economic gain from, or otherwise use. So if sustainable uses can be found for biological resources, particularly economically beneficial sustainable uses, it follows that those resources should be better conserved. This simplistic and economically determined argument is however variously flawed within the context of growth-imperative globalised economies such as that of Western Australia.

While in some cases commodifying aspects of the environment can prompt increased natural area conservation and promote increased economic independence of regions, in many cases, particularly where there is a lack of legislative control and/or ethical consideration associated natural resource exploitation, the reverse situation can arise. Historically the latter has been the rule rather than the exception; the exploitation or utilisation of natural resources under developed economies has very rarely seen the conservation of those resources. The resources have been unsustainably depleted as a result of uncontrolled and in many cases unethical exploitation of nature, and commonly also culture. Furthermore, as Clem Tisdell, Professor of Economics at The University of Queensland argues in his recent book *Biodiversity, Conservation, and Sustainable Development* that:

> Commercial use of species, in a system designed to reflect economic values fully, is selective. It favours survival species and varieties of greatest commercial value, to the detriment of those of smaller or of no apparent economic value. Interference in natural systems is designed solely with commercial ends in mind. Such an approach to nature conservation is likely to be at odds with the land ethic, the

> ethical responsibility of humankind to conserve ecosystems as a whole [for their intrinsic value].[142]

Nevertheless, it is a well documented theory that the development of uses for environmental resources, if managed correctly, could lead to their conservation.[143] Western Australian resource management however will have to undergo a paradigm shift if governmental facilitation of environmental utilisation is to produce a culturally respectful means of protecting our environment. A reversal of the idea that conservation is best achieved in areas which are 'protected' from development, and that economic development of our environment necessarily leads to it's deterioration, is a difficult concept given the legacy of destructive exploitation and culturally displacing relationships between our environment and economy. This is an ecologically and culturally problematic legacy which continues to inform corporate behaviour and governmental management in this state, and if not confronted will continue to do so.

Another less controversial interpretation of the objective of integrating biodiversity conservation and natural resource management is that we must incorporate biodiversity planning into our existing natural resource management activities. This is a much more important goal for the State of Western Australia to achieve, as this successful and complete integration of an industry as well as individual impact level will be vital in achieving sustainable natural resource management practices in this State. It may be argued that the successful achievement of this should be

[142] Tisdell, 1999
[143] Yencken and Wilkinson, 2001

a precursor to the development of new uses for biological resources with the aim to conserve those resources.

Environmental Impact Assessment (EIA) for development proposals is one tool that may be used by the government to integrate conservation objectives into natural resource based industries from the very start of their operations. EIA assessment can be a useful tool for screening development proposals for compatibility with the goal of biodiversity conservation, however critics argue that insufficient attention is paid to ecosystem protection and preservation in EIA processes, and frequently question the reliability of EIAs to predict the full environmental impacts of development, especially where cumulative impacts and interactions of projects occur. 'A project-by-project assessment can easily fail to predict indirect impacts caused by other sectors.' [144] This is especially important for the sustainable management of natural resources, since sustainability depends on remaining within prescribed limits of resource tolerance and standards of ecological integrity. 'Overall, therefore, EIA processes are valuable and perhaps necessary in conserving biodiversity, but far from sufficient.'[145]

Many West Australian natural resource industries have made attempts on various levels at incorporating biodiversity conservation into their activities. One of these industries is the bauxite mining and alumina smelting industry which Alcoa is engaged in this State. Mining leases cover a large proportion of the jarrah forest, and the industry is dealt with under the Mining Act, and State Agreements Acts (ALCOA, 1961;

[144] Preece, et.al. 1995
[145] Buckley, 1993 quoted in Preece, et.al. 1995

Worsley, 1973).[146] 'Working arrangements' developed between CALM and mining companies have seen the integration of CALM biodiversity conservation objectives into the mining operations, particularly the rehabilitation of mine sites. While this represents an integration of biodiversity conservation objectives into the management of bauxite mining, the integration has not been holistic in its application, as it primarily influences Alcoa's mine rehabilitation, with a much lessened influence on the company's other operations and emissions (notwithstanding Alcoa's ISO 14001 accreditation), or that of other components of the Alumina smelting industry

Bioprospecting

The emerging industry of 'bioprospecting,' the search for new chemicals or genetic material in living things that will have some medical or commercial use,[147] is an example of a new use of biodiversity which could lead to it's conservation. Western Australia's high biodiversity and level of endemism means the region has huge potential for bioprospecting. Advocates claim bioprospecting can lead to the protection of biodiversity by merit of the fact that otherwise unprotected biodiversity may contain genetic material highly valuable to the bioprospecting industry. The activity of bioprospecting in some areas, particularly developing economies, is also seen as an opportunity for the sustainable generation of income and funding for purposes such as conservation and health care.

[146] Commonwealth of australia, 1999
[147] McGhee, 2000

Pharmaceutical companies and agribusiness involved in bioprospecting use indigenous knowledge about the properties of native plants as a precursor to screening, and this is happening with little regard for the protection of indigenous intellectual property, and with no equitable sharing of profits.[148] One potentially lucrative foray of the bioprospecting industry into Western Australia that has already taken place, is the discovery by American researchers of a substance in the root of the Western Australian Smoke Bush which has killed some HIV strains in the laboratory. However, '...the rights to this plant have been sold with no regard for the traditional owners of the knowledge of this plant.'[149]

It is intended that indigenous intellectual rights are protected under the International Convention on Biological Diversity, Article 8J, which states that signatories will 'Subject to national legislation, ... encourage the equitable sharing of the benefits arising out of indigenous knowledge.' The key clause here is 'subject to national legislation,' referring to legislation which upholds indigenous rights over traditional knowledge. Presently Australia has no such legislation, a situation which effectively prevents implementation of this article of the biodiversity convention.[150] Thus, as a matter of urgency, Australian governments should seek to develop legislative protection for indigenous intellectual property rights.[151]

Another issue associated with bioprospecting is the potentially ethically and environmentally problematic nature of the genetic engineering industry which uses genetic resources 'mined' from ecological systems.

[148] McGhee, 2000; Fraser, 2000; Agarwal, 1996; McAfee, 1996 and others
[149] McGhee, 2000.
[150] Lesser, 1998.

A lengthy debate on genetic engineering is inappropriate at this juncture; however the following should be noted. Many of the genes discovered through bioprospecting find their way into food or other crops such as cotton, soy products, rice etc...[152] It has been widely recognised, as noted earlier, that release of genetically engineered organisms into the environment poses a serious threat to biodiversity. Thus, it seems counterproductive, and indeed counterintuitive to support an industry on the basis that it *may* contribute to the conservation of biodiversity, when the products of that industry pose a serious threat to that which we must conserve. The precautionary principle should therefore be immediately invoked by WA Governments to inform the development of genetically engineered agriculture in this State.

Therefore, if the West Australian Government is to support bioprospecting, a workable and ethical model must be developed which recognises indigenous intellectual rights and ensures the equitable distribution of any benefits arising from the use of indigenous intellectual property. There must also be adequate protection from overexploitation of bioresources, or the degradation of environments in the extraction of those resources, especially on public lands. The precautionary principle should be closely adhered to in any such development planning. Such a model would have to ensure maximum benefit to local communities, and could take the form of agreements between local communities, bioprospectors, and conservation authorities.

One such model exists in Costa Rica, where the National Institute of Biodiversity (a private non profit), Diversa (a San Diego biotech firm),

[151] see also Krockenberger, 2000.

and the Ministry of Environment and Energy (the Costa Rican government agency that oversees biodiversity) signed multiple agreements. This arrangement has seen Diversa invest in DNA analysing labs in Costa Rica, and train locals to use the equipment, which is also being used as a research tool for a biodiversity inventory for conservation purposes. The Ministry of Environment and Energy receives 10 percent of the bioprospecting budget and 50 percent of any royalties, and this revenue can only be used for conservation. Intellectual property rights were not an issue in Costa Rica, perhaps because Costa Rica has few indigenous peoples.[153]

Nature-Based and Ecotourism

The tourism industry, Australia's largest and fastest growing industry, is one which is increasingly becoming a major user of biological resources.[154] Therefore, strategically integrating biodiversity conservation with the future needs of the nature-based and ecotourism industry will be vital in achieving the sustainability of this sector. The Western Australian environment has been recognised as the drawcard for tourism in the state, and the biodiversity of the state is considered to provide Western Australia with a distinct advantage for tourism.[155] It is suggested that conservation can benefit from tourism, through information and experiences which lead to better understanding, and through generation of additional funds.[156] From a purely conservation-economics perspective, the main goal of nature-based and ecotourism on

[152] McAfee, 1996.
[153] Pw, 2000
[154] Preece, et.al. 1995
[155] Western Australian Tourism Commission, 1994
[156] Newsome et.al. 2002; Preece, 1995; WA Tourism Commission, 1994

protected lands and national parks is to recoup the management costs of those areas from tourism dollars earned.[157] In addition to this though, 'A properly managed reserve system offers sustainable sources of income and employment in regional Australia.'[158]

It has also been recognised however, by the 1996 Australian State of the Environment Report, that

> Tourism has significant effects - both positive and negative - on many natural and cultural places. It can lead to better management, renewed cultural activity and increased understanding, but it can also result in pollution, vandalism, and cultural exploitation and debasement.[159]

Preece, et.al. (1995) in *Two Way Track*, a report to the Biodiversity Unit of the Department of Environment, Sport and Territories maintains:

> All of tourism must be ecologically sustainable, and that, for this to be successful, it must contribute to the long-term maintenance of ecosystems and species. Simply to 'minimise impacts' is not enough since, with tourism growth, this will result in incremental damage and inevitable environmental deterioration. There can be no environmental deterioration if the industry is to be ecologically sustainable.

Puckridge and Ried offer that:

> All resource utilisation, however well managed, imposes environmental costs. In practice, such costs are most effectively minimised by separating exploitative activities and sites of high conservation value. The multi-use concept rejects this simple and effective approach.[160]

Therefore, if the inevitable expansion of nature based and ecotourism is to be sympathetic and indeed facilitative to the conservation of

[157] Tisdell, 1999
[158] Krockenberger, 2000.
[159] State of the Environment Reporting Council, 1996
[160] Puckridge and Reid, 1992 quoted in Figgis, 1999.

biodiversity in Western Australia, there must be integrated and multilateral management of this industry by government. Also, 'given that tourism in Australia is largely dependant on and a major user of natural resources and biodiversity, it is recommended that it be identified specifically as a sector in policies that deal with biodiversity, conservation, ESD and the environment, where it is not already identified.'[161] The tourism industry has significant potential for delivering the requisite funding for conservation activities; however the challenge for government lies in developing mechanisms which act to channel these tourism dollars into the provision of conservation outcomes. It is recommended that innovative funding mechanisms be investigated to cover conservation costs, as well as the costs of research, market analysis and environmental management of nature based and ecotourism operations.

Required accreditation of tourism operations is a powerful tool at the disposal of the government for promoting sustainability among this industry. The 'Green Globe' Accreditation system is perhaps the most widely recognised and credible accreditation system for nature based and ecotourism, ideally however, all tourism activities should be accredited for their efforts to minimise the ecological impact of their operations.

Developing a Western Australian Biodiversity Strategy

It is important that the Government of Western Australia has a clear and well defined strategic plan for it's response to the biodiversity crisis in the state. The development of the West Australia Biodiversity Strategy

[161] Preece et.al. 1995

needs to become a priority for government, and this can be seen as an opportunity for the development of an innovative and powerful strategic direction for biodiversity conservation and the management of industries which utilise West Australian biological resources.

Western Australia is in one respect in a fortunate position to be developing its biodiversity strategy at this time. The experience of other States in implementing their biodiversity strategies should be drawn upon to inform the most appropriate strategic approach for Western Australia.

It is vital that the future West Australian Biodiversity Strategy has a strong legislative support framework that allows for substantial powers of prosecution for environmental offences committed by individuals as well as organisations. The legacy of failed or ineffectual environmental prosecutions that have taken place in Western Australia under *The Environmental Protection Act* (WA) is testimony to the inadequacies of this legislation for the sustainable protection of biodiversity in this State. The Commonwealth of Australia add that 'Western Australian [environmental] legislation lags behind both the current state of knowledge and national and international government agreements.'[162]

Therefore, the new legislation which is currently being developed by the Western Australian State Government to replace the *Wildlife Conservation Act of 1950* (WA) should be closely linked to the objectives of the future Western Australia Biodiversity Strategy, and must provide for significant prosecutions for the committal of environmental offences. The present proposal is to develop the State

[162] Commonwealth of Australia, 1999

Biodiversity Strategy after the new Act is in place. As the Act will not be passed for at least two years,[163] the Strategy will not be developed for a long time using this approach. A more integrated and faster approach would be for the Biodiversity Act and Strategy to be developed together. This would also ensure a more complete integration of the Strategy objectives into the Legislation that will be used to uphold them.

Improving Reserve Management

Reserve management could be improved in many parts of Western Australia. Most of the protected areas in this State are managed according to International Union for the Conservation of Nature (IUCN) category I, II, or III protected areas, meaning that they are managed with the primary objectives of, respectively, science and wilderness protection, ecosystem conservation and recreation, and the conservation of specific natural features.[164] 'As an agency with integrated responsibilities, [CALM] manage lands and waters for the conservation of biodiversity at ecosystem, species, and genetic levels...'[165]

CALM management of protected areas has frequently come into question by scientists and conservation organisations, maintaining that management activities, especially those relating to prescribed burning in Southwest National parks such as the Fitzgerald and the Shannon, are incompatible with the management objectives of biodiversity conservation.[166] Management plans for CALM managed areas are widely

[163] Angas Hopkins, Pers. Comm. 21/5/2002
[164] Yencken and Wilkinson, 2001
[165] CALM website, accessed 3/4/2002
[166] Tony Pedro, South Coast Environment Group (SCEGS) pers. comm. Angas Hopkins, pers. comm. also see Langdon, 1998

varied in their levels of commitment to biodiversity conservation by merit of the fact that they vary widely in their ages and levels of review, and very different people with different objectives have been involved in their development, reflective of various community involvement in different regions and at different times.

CALM also have policy statements that inform the management of protected areas. These policies evolve over time in response to newly acquired scientific knowledge. 'CALM Policy is continuously developed and modified in light of an informal process [which involves] CALM staff working closely with their counterparts in other State Government Departments. ... The present informal process should be formalised with formal review.'[167] CALM policy statements have also been criticised by the Commonwealth of Australia for the fact that they 'separate ecosystem components such as water, soil, flora and fauna. [CALM] should develop policy statements on the ecosystem level.'[168]

A system of accreditation for protected area management practices is recommended. This could be used both for CALM managed lands, and for privately managed conservation reserve, and would incorporate a regular public review process. A relatively long phase-in period would be required as the large number of CALM management plans would have to be reviewed with the objective of strengthening biodiversity conservation management objectives. The Department of CALM itself may also require significant structural changes to further the objective of biodiversity conservation on reserved land.

[167] Commonwealth Of Australia, 1999

Biodiversity Conservation Outside the Reserve System

For the reasons outlined earlier, as well as the fact that 'Conservation Reserves, comprising just over 5% of Australia (less than 5% in Western Australia), are insufficient to provide an adequate representation of this country's biological diversity,'[169] 'Conservation outside the reserve system will need to increase substantially if many species and plant communities are to survive.'[170] This will require a comprehensive effort to identify important ecological habitats outside current and planned future reserve systems. Identification of these areas should be based on a broadly defined framework as described above. Conservation outside reserves is a complex enterprise from a management point of view, as it involves all types of land tenure which support all forms of landuse. Land tenures in Australia include freehold, perpetual lease, pastoral lease, town reserve, State forest, Aboriginal reserve, and recreational reserve, in addition to national park, and nature reserve[171].

Legislative Approaches

In the past, freehold landholders have enjoyed extensive rights, and had few responsibilities with respect to environmental conservation on their properties. This has changed during the past few decades, as dramatic restrictions in some jurisdictions have been placed on landholders' rights with respect to the clearing of native vegetation.[172] These legislative

[168] ibid.
[169] Worboys et.al. 2001 after CSIRO, 1996
[170] Environment Western Australia, 1998
[171] Commonwealth of Australia, 1999.
[172] Worboys et.al. 2001

government interventions into landholders' property rights have been based on two foundations;[173]

First, land management practices on one property can have serious environmental consequences on other properties, i.e. land clearing causing down-catchment salinisation.

Second, Environmental impact such as clearing of native vegetation causes a loss of public benefits associated with biodiversity and amenity values.

Recently, new provisions have been made under the *Environmental Protection Act* (WA), to prevent the clearing of native vegetation on private property

This action alone could significantly increase the level of biodiversity conservation possible outside reserve systems. If areas of remnant vegetation are legally protected from clearing, then the investment of effort in their restoration under community-based initiatives such as Landcare is far more attractive to governmental support. The Conservation Council noted before the new changes were made to the EP act. that 'It is a Matter of Serious Concern that WA may miss out on funding for Landcare Projects under the Commonwealth's National Action Plan on Salinity and Water Quality. Under this plan, funding is contingent on each state having in place legislation that prohibits clearing of native vegetation.'[174]

Another legislative approach that can be taken to effect environmental conservation on private land tenures is the introduction of a 'duty of care' for landholders. Western Australia, South Australia, Victoria, and

[173] ibid.

Queensland have enshrined in legislation the notion that a landholder has a duty of care, and that this duty of care provides the foundation for acceptable land stewardship.[175] It has been recommended by the Parliament of the Commonwealth of Australia that this duty of care be defined as follows; '...landholders have a duty of care to manage the land in their charge in a way that is ecologically sustainable, given the particular geographic location, and based upon latest scientific information.'[176]

In a legislative sense, this duty of care defines the point where the responsibility for private investment in public good conservation activities may end, and public responsibility for investment should begin. This means that financial assistance for conservation activities on private land would normally only be available for environmentally necessary activities that go beyond the landholders duty of care. 'Financial assistance would not be paid to landholders to meet their duty of care for sustainable land management.'[177]

Legislative restrictions which seek to minimise the environmental impacts of landholders on their lands can be an effective tool for biodiversity conservation on private lands, however, in many cases this approach can be very difficult to police, and can be met with staunch opposition from landholders who believe that such restrictions constitute an erosion of what they have been led to believe are their property rights[178].

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[174] Conservation Council of Western Australia, 2001 (a).
[175] The Parliament of the Commonwealth of Australia, 2001.
[176] ibid.
[177] ibid.
[178] ibid.

Other Approaches

While the top down command and control approach is one component of the conservation of biodiversity on private land, another model that can be very successful in influencing landholders to abate the environmental impacts of their landuse is based on the formation of working relationships between landholders and government. These types of relationships can take on various forms, for example funding arrangements that help landholders meet the costs of fencing off bush remnants or creek lines from stock. There has been an increasing emphasis on cost sharing and providing landholders with incentives to adopt best-practice land management.[179]

Community based and capacity-building partnerships such as Landcare can be powerful mechanisms for effecting biodiversity preservation across catchments and regions. Moderate funding has been provided for a number of landcare programs by state and federal governments, and all have received very strong community support. In his 1995 publication, Alpin ***et.al.*** estimated that about 30 percent of all farmers were involved.[180] He explains:

> 'The principles of Total Catchment Management are fundamental to landcare, and plan, preparation and action has come from the bottom up. Landcare involves education as well as action... Perhaps the single most important achievement of all the activities under landcare is not the millions of trees planted or the square kilometres of soil erosion controlled, but the tens of thousands of ordinary Australian's who have volunteered to take action for the environment.'

[179] Worboys, et.al. 2001
[180] Alpin et.al. 1995

The accreditation of pastoralist environmental management systems under ISO 14001 or similar is another avenue currently being investigated for encouraging landholders to integrate the conservation of biodiversity into their management practices.[181] ISO standards tend to be based on qualitative measures of minimum environmental performance, without providing prescriptive solutions to meeting environmental performance criteria. This does not act to empower pastoralists, who often require guidance on how to interpret and achieve set environmental targets.[182] It is considered that environmental management accreditation of some form for pastoralists is an area well worth further consideration by the Western Australian government.

Private Reserves

Privately owned conservation reserves such as the Australian Wildlife conservatory and the Bush Brokers models should also be actively encouraged by government for their potentially valuable contribution to biodiversity conservation in the state. No single model exists for privately owned protected areas. Internationally, these lands vary dramatically, filling a wide variety of conservation niches.[183] The benefits from these diverse areas can also be substantial, the most appealing economic attribute of private reserves being their potential profitability. 'Especially when engaged in ecotourism, [private] reserves represent a livelihood strategy capable of both economic and ecological

[181] Angas Hopkins, pers.comm.
[182] ibid.
[183] Langholz, 2001

viability'[184] Economic benefits from private reserves are not confined to landowners, but also extend to governments in the form of costs avoided

A variety of mechanisms exist which can be used by governments to facilitate such enterprises. Economic measures include direct financial assistance such as fund sharing arrangements, as well as providing relief from tax, shire rates, stamp duty and land tax for those organisations or individuals who can demonstrate their commitment to conservation objectives. It is suggested that the accreditation of management systems would be appropriate for this purpose. Many internationally recognised accreditation systems exist for ecotourism operations[185] and for environmental management in general[186] which could be adopted for the purposes of assessment of private reserve management.

The Western Australian Wild Country Project

One initiative, which aims to comprehensively increase biodiversity conservation on land outside reserve systems, is the Western Australian Wild Country Project, a current initiative of the Wilderness Society. The Wild Country idea is based on a similar and highly successful initiative developed in North America called the Wildlands Project. The Wildlands manifesto states:

> 'The Idea is simple: to stem the disappearance of wildlife and wilderness we must allow the recovery of whole ecosystems and landscapes in every region of North America. Allowing these systems to recover requires long-term design. The design must rest on the spirit of social responsibility.'[187]

[184] ibid.
[185] Green Globe, Green Leaf etc.
[186] ISO 14001 series of standards, and others.
[187] The Wilderness Society, 2000

The Wilderness Society have developed this concept into a vision for protecting Australia's wilderness plants and animals 'into - and beyond - the 21st. centaury.'

> Like it's American Counterpart, it is big-picture thinking: an audacious, positive and visionary environmental plan beyond any previously attempted in Australia. this is a unifying program to protect and link Australia's wilderness and restore degraded lands.
>
> It offers a vision for whole-of-environment land management systems, embracing all land tenures. It is about finding a path for restoring large areas of the Australian continent to healthy self-perpetuating natural systems where human activity is compatible with the health of the land.
>
> It offers a way of restoring and maintaining the inalienable links between Australia's indigenous inhabitants and the land, and will involve a significant shift in the relationship between many non-indigenous Australians and the environment.[188]

The first phase of the wild country project in Western Australia is still in its very early stages of development. It is proposed to include a large area of land extending from the South East of the state where a large tract of unreserved bushland has been identified, through to the established South West National Parks and the Walpole Wilderness area. The Wild Country project would join these areas by protecting and restoring ecological communities on all land tenures, based on community support and indigenous participation. The State Government of Western Australia should support this exciting project as much as is possible. It represents a holistic approach to biodiversity conservation that has been lacking in this state.

[188] ibid.

The Southwest World Heritage Biodiversity Hotspot and Ecoregion

The International recognition of Western Australia's Southwest Botanical Province as a biodiversity hotspot containing an 'exceptional concentration of endemic species undergoing an exceptional loss of habitat'[189] should be seen by Australian Governments as an excellent opportunity to increase our Australian World Heritage by recommending the site for World Heritage listing.

The South West region, including the human and ecological communities within it, stands to benefit from such an initiative. In the case of other Australian World Heritage sites such as the Tasmanian Wilderness, Kakadu National Park and the Great Barrier Reef, World Heritage Listing and the promotions associated with it has resulted in greatly increased tourist visitation to the area from overseas and within Australia.[190] Increased tourism, if managed sustainably, would lead to sustainable employment opportunities, and increased income for the area.

Planning and Management for the region would also be improved with assistance from the Commonwealth Government. The protection and management of many of Australia's World Heritage properties has involved a cooperative approach between the Commonwealth and State Governments; 'A major focus of Commonwealth Government assistance for World Heritage Properties has been the provision of resources for

[189] Myers, N. et.al. 2000
[190] Environment Australia, 1999

strengthening management and improving interpretation and visitor facilities.'[191]

The establishment of the Southwest botanical Province as a World Heritage property for its outstanding biodiversity values also protects the area under the *Environment Protection and Biodiversity Act, 1999* (EPBC act). The EPBC act imposes substantial civil and criminal penalties on a person who commits an unlawful action, and provides automatic protection for World Heritage Properties by ensuring that environmental impact assessment processes are undertaken for proposed actions that will or are likely to have a significant impact on the World Heritage values of the property.[192]

The EPBC Act also gives the Commonwealth Minister for the Environment and Heritage the power to declare other properties as 'Declared World Heritage Properties' even if they have not been World Heritage Listed, thus granting them protection under the EPBC act. This can occur where:

- The property has been nominated for, but not yet inscribed on the World Heritage List; or

-the property has not been nominated for World Heritage Listing but the Minister believes that the property contains World Heritage values that are under threat.[193]

This being the case, in the event that the South West Botanical Province is not nominated for World Heritage Listing, it is suggested that the area

[191] Environment Australia, 1999
[192] ibid.
[193] Environment Australia 1999

should be at least recommended to the Commonwealth Minister the Environment and Heritage for inclusion as a 'Declared World Heritage Property' on the basis that the area contains World Heritage values that are under threat. This would afford protection of the area under the *Environmental Protection and Biodiversity act 1999*.

The Worldwide Fund for Nature (WWF) have also recognised the southwest biodiversity hotspot 'ecoregion' for its unique and endangered biota. An ecoregion is a relatively large area of land or water that harbours a characteristic set of species, communities, dynamics and environmental conditions.

> WWF has identified the most outstanding terrestrial, freshwater and marine ecoregions to focus its conservation efforts. These ecoregions are known as the Global 200, and South west WA is one of them. In recognition of this, WWF Australia has been funding projects in the ecoregion for the last 22 years. Our presence here now builds on that early investment by integrating our efforts into an ecoregional program, combining conservation goals with socio-economic objectives. Essential to this are building partnerships, developing a shared vision for the landscape and providing a strong foundation for sustainable development through education, institutional reform and financial stability.[194]

This ecoregional approach to biodiversity conservation planning covers all land tenures, and thus provides governments with a useful model for biodiversity conservation planning.

[194] WWF Australia, undated

Conclusion

The State of Western Australia is presented with a number of opportunities and challenges by the biodiversity crisis now affecting Western Australian ecosystems, industry and community. The current situation with regards to the loss of biodiversity in the state is desperate. Western Australia's unique biodiversity is internationally exceptional in its variety and endemism; however our biological species and systems are also some of the most threatened in the world. The 1996 State of the Environment Report found that the loss of biodiversity is the single most important environmental issue facing the nation.

Biodiversity loss is not only an environmental issue. Many aspects of the Western Australian economy and social fabric are fundamentally dependant on biological resources. One increasingly important example is that Western Australian biodiversity is considered to provide the State with a distinct advantage for tourism, Australia's biggest and fastest growing industry. The agriculture, fisheries and biotechnology industries are also directly dependant on the biological resources of this state, as is human health and wellbeing.

Biodiversity is lost or threatened by a wide variety of processes. Some of these processes such as feral species, or habitat destruction through land clearing have been occurring since European settlement. Other processes which affect biodiversity today, such as climate change and the effects of genetically engineered species, are contemporary issues which are poorly understood and unfamiliar to traditional biodiversity conservation planning.

The complex interplay between the processes of social, economic, and ecological systems has historically been difficult to govern. To develop a sustainable response to the biodiversity crisis, it will be necessary for the State of Western Australia to adopt a committed and integrated approach to biodiversity conservation, which addresses each of these processes, and the relationships between them.

This integrated approach must be informed by the evolving principles of sustainable development and an increased multidisciplinary understanding of biological systems, particularly the relationships between those systems and the Western Australian economy and society. Development of such a response will take time, and will require many of the precepts of traditional and contemporary Australian biodiversity conservation to be redefined in the context of continuing development of sustainable, equitable and workable solutions to the biodiversity crisis.

Significant international and Australian responses to the loss of biodiversity have set the stage for a committed approach to biodiversity conservation from the Western Australian Government. Most other Australian States and Territories have developed biodiversity strategies to meet their international and national obligations under the International Convention on Biological Diversity and the National Strategy for the Conservation of Australia's Biological Diversity. The Government of Western Australia must therefore begin a strengthened and reviewed approach to biodiversity conservation in this state by developing the Western Australian Biodiversity Strategy to define an

innovative and sustainable approach to the conservation of Western Australia's biological heritage.

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