

Biodiversity opportunities in Australian agriculture: a national view

Gerry Smith¹ and Philip Pritchard²

¹ Manager, Natural Resource Management Strategies,
Agriculture, Fisheries and Forestry — Australia

² Senior Policy Adviser, Natural Resource Management Strategies,
Agriculture, Fisheries and Forestry — Australia

Abstract

Society expects governments to engage with the community to achieve social and economic development, underpinned by a sustainably managed environment including biodiversity conservation. These expectations impose costs, and while some costs may fall on landholders, there are public benefits. It is therefore important to integrate an awareness of the value of biodiversity into our farming systems.

The solution is not a choice of biodiversity *or* agriculture, and conservation reserves are only part of the solution. The way ahead lies in recognising the values of biodiversity *and* agriculture and the importance of private landholders as managers of 60% of Australia's land. It ought to involve public debate and negotiations on property rights, on the responsibilities of landholders and on compensation that may be paid for costs that may have a public good outcome.

This paper outlines the role for government in addressing the challenges facing Australia's threatened ecosystems and ensuring a sustainable resource base. Managing biodiversity must be done in the broader context of managing natural resources. The paper canvasses the role of particular undeveloped policy instruments such as market based instruments and environmental management systems, and uses case studies to illustrate how biodiversity and agriculture can successfully coexist.

Keywords

agriculture, biodiversity conservation, economic development, environmental management systems, social responsibility, sustainability

Where we have come from

Each generation of Australians has defined its relationship with the bush in a way that is consistent with its own aspirations, understandings and technologies. To first European settlers the Australian native vegetation was unfamiliar, and it was often seen as something to be fought, tamed and displaced in order to 'civilise' the landscape into something familiar and productive. Our agricultural systems have evolved because natural systems are not optimised for providing food and fibre to meet consumers' needs. The introduction of exotic species broadens the range of fibre and foods available. Current agricultural systems concentrate intensive food and fibre production on a relatively small proportion of our landmass.

We need to be conscious of just how much public attitudes on biodiversity have changed, especially in recent times. In times past, farmers throughout Australia were encouraged to clear land. Often, the conditions of a farmer's lease agreement has been that clearing must take place. Our farmers of today should not be judged by the actions of their predecessors, nor be asked to bear the costs of remedying mistakes of the past, especially when the reality is that those past actions were entirely consistent with both public expectations and the laws of the time.

The degradation of natural capital carries a high economic and social cost to Australia. These costs are evident in lower agricultural yields, higher costs of production, damage to infrastructure from salinity, and expenditure on land rehabilitation. Increased consumer

expectations for improved natural resource management could also threaten Australia's market position as a producer of 'clean and green' goods.

Research for the National Land and Water Resource Audit (Commonwealth of Australia 2002) shows that 5.7 million hectares of Australia are at risk from dryland salinity or are already affected by it, and that up to one third of our rivers are in extremely poor condition and another 40% show clear signs of degradation. In addition, 26% of surface water and 30% of groundwater systems are approaching full allocation or are already fully allocated. Loss of native vegetation, soil erosion, soil acidification and loss of biodiversity are also serious issues.

A recent report by the Prime Minister's Science, Engineering and Innovation Council's Sustaining our Natural Systems and Biodiversity Working Group warned of the already high cost of repairing damaged ecosystems, estimating that the annual cost in lost agricultural production was around \$1.2 billion, and around \$2 to \$6 billion for environmental repair (Morton et al. 2002). Other reports have reinforced the importance of this issue. For example, the recent State of the Environment report for Australia reported declines in the condition and extent of wetlands and declines in soil health.

In this paper, 'biodiversity' is defined in the broadest sense to include the full variety of life. This includes *species diversity* (the variety of species), *genetic diversity* (variability in the genetic makeup among individuals within a single species), and *ecological diversity* (the variety of biological communities that interact with one another and with their non-living environments). It is important to note that biodiversity also describes 'the organisms in the natural environment, which provide the ecosystem services that form our natural capital: fresh water, clean air, soil fertility and biological pest control' (Commonwealth of Australia 2001). These ecosystem services support economic activities; for example, forested catchments provide clean water, native insects pollinate crops, and organisms in the soil play a significant role in nutrient cycling. In short, biodiversity is fundamental to the sustainability of the natural resource base. For this reason alone, the conservation of biodiversity must be seen as a critical element in building productive and sustainable Australian agricultural industries.

Putting biodiversity into a larger context

Farmers can play a very important role in biodiversity conservation, and need to do so if we are to be successful in conserving some of our key ecosystems. Farmers manage over 60% of the land area of Australia. While we can be proud of our conservation reserves, not all of our ecosystems are well represented in reserves (public land). Typically, the open woodlands and grasslands that are suitable for cropping and grazing are poorly represented in the reserve system, and it is here that we find many of our threatened and endangered ecological communities. Our present system of conservation reserves can only ever be successful in protecting part of our biodiversity assets, albeit a significant part.

If we want to enhance the natural biodiversity values found in the ecosystems where our cropping and grazing industries are located, then we need to look to private land and we need farmers to come along willingly. Many farmers recognise there are benefits in protecting areas of remnant bush on farms for biodiversity, shelter, pollination and erosion prevention. There are also benefits from enhancing soil and water quality for biodiversity and production values. However, most of these benefits are 'public benefits'; that is, the main beneficiaries are the public at large, rather than the farmers on whose land the action needs to be taken. The key issues then become who pays and how we make trade-offs between enhancing these ecosystem services (including biodiversity) and other social and economic costs and benefits, both public and private.

Consequently, we should be looking more critically at ecosystem function and its interaction with land use management at a much broader scale. The key questions will be how much area is required to deliver these services, where the highest priorities are, and what level of 'protection' or conservation management is required. We need to consider the following:

- Public land will have provided the largest and most intact nature reserves.
- Private lands will need to make further contributions to biodiversity outside the traditional reserve model.

- The level of this contribution may be significant in some regions where private land contains ecosystems not present in sufficient abundance on public land.
- There will inevitably be trade-offs between competing land uses in some areas, where getting the balance of the right incentives will be challenging.

The current generation of pastoralists and farmers is starting to meet the challenge of developing more sustainable ways of managing the remaining native vegetation and improving soil and water to maintain and enhance biodiversity where possible. An indication of this is that in 1986 only 64% of farmers surveyed in the wheatbelt of Western Australia said they had replanted trees and shrubs on their farms, but in 1996 some 84% reported doing so (Jenkins 1998).

Case study: agroforestry

Back in 1956, John and Cicely Fenton's farm 'Lanark', near Branxholme in Victoria, was a traditional wool and lamb production farm cleared of all remnant vegetation. But over the last 40 years the Fentons and their family have revegetated the farm with trees and shrubs, providing shelter for livestock, habitat for wildlife. They have beautified their property, and more recently produced commercial timber.

A stunning feature of the property is the extensive reconstituted wetlands. Keeping stock out and reintroducing native plant species has led to an explosion of bird life to more than 120 species, including an ibis rookery. The wetlands also improve pest control by native birds.

The Fentons' style of farm forestry emphasises holistic farm planning, which involves creating a balance between the farming enterprise and the environment.

(Adapted from Guiljt and Race 1998)

If biodiversity is singled out for special and separate treatment, we will fail. The management of biodiversity needs to be integrated with all the aspects that impact upon it: social, economic, environment and technological. Healthy and strong regional communities that are viable and self-sustaining, and are based on profitable and competitive industries, are critical. Production should be a result of a healthy resource base that is managed sustainably. Strong industries and communities with the capacity to implement sustainable practices and effect change are critical to safeguarding the resource base, including biodiversity.

Communities expect:

- healthy catchments and ecosystems in which the integrity and functional processes of soils, water and vegetation, is maintained or enhanced in line with land management objectives
- innovative and competitive industries that make use of natural resources within their capability to generate wealth for social and economic well-being
- self-sustaining, viable regional communities.

Integrating biodiversity and recognition of ecosystem services into natural resource management planning creates new opportunities for a 'Sustainable Australia', and access to markets for agricultural, forestry and fisheries products in the future.

The role of government

The role of government in natural resource management is to set the policy and regulatory parameters, to establish the necessary decision-making and institutional structures and arrangements, to contribute to the capacity of landholders and other natural resources managers

for informed decision-making, to facilitate change, and to invest effectively to counter market failure in order to optimise social, economic and environmental outcomes.

Governments — Commonwealth, state, territory and local — together with regional communities and catchment management bodies, must ensure that their natural resource management policies and programs are aligned. Each party has a responsibility to remove policy, legislative or regulatory barriers to improved natural resource management practices by landholders and regional communities. This also means a respect for the key responsibilities of each level of government.

The Commonwealth sees its role as providing leadership and bringing together a national approach to natural resource use and management. The Commonwealth has identified a key role in working within the partnership framework developed for the National Action Plan and Natural Heritage Trust Extension.

State and territory governments have primary legislative and regulatory responsibility for sound natural resource management: they hold constitutional responsibility for the management of natural resource management planning and implementation, and have a key role in establishing the necessary decision-making and institutional structures and arrangements.

Local government has an important and often underrated role in natural resource management through its responsibilities for land use planning, development approvals, rates, and a variety of services such as road construction and maintenance, fire management, water supply and the disposal of wastewater. Local councils also own and manage large areas of land in rural Australia and so can affect the natural resource base in their districts, and in a number of cases are key players in biodiversity conservation on private land.

The role of regulation

Clearly defined access rights to natural resources such as water and vegetation are fundamental to the sustainable and efficient management of resources. The challenge for governments is to implement property rights and resource access systems for these resources that will allow an efficient market to flourish and sound business investments to be made, while also providing certainty that the integrity of the resources will be protected.

Black-letter law is appropriate for providing the minimum standards of custodianship expected of landholders. State-based regulation and vegetation planning establish processes to protect important vegetation communities, and have been important in addressing the response to concerns about land clearing as governments have responded to the community's desire for defining and meeting reservation goals.

Responsibilities for regulation of matters of national environmental significance are delivered through the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). At the referral stage of the EPBC Act (Section 74), proposals will trigger the Act if they are likely to have an adverse impact on any of the following matters of national environmental significance: World Heritage properties, Ramsar wetlands, nationally threatened species and ecological communities listed under the Act, migratory species, Commonwealth marine areas, or nuclear actions including uranium mining. Such proposals become controlled actions and require assessment under the Act.

This is the Commonwealth's role, but at the state and territory level there is legislation to protect biodiversity. States and territories have an extensive regulatory role in protecting biodiversity and regulating land use on public and private land.

Land clearing in salinity risk areas is a primary cause of dryland salinity and a threat to biodiversity assets, and it is recognised that effective controls on land clearing are required in each jurisdiction. The Commonwealth is working with the states to ensure that bilateral agreements reached with the states and territories under the National Action Plan for Salinity and Water Quality have the effect of prohibiting land clearing in areas where it would lead to unacceptable land or water degradation.

A national approach in partnership with stakeholders

In 1999, the Commonwealth, state and territory governments outlined a new national approach for natural resource management through the discussion paper title *Managing Natural Resources in Rural Australia for a Sustainable Future*. This paper recommended a strategic, regional and partnership approach to build on the existing land-care ethic and address the ongoing challenges facing Australia's threatened resource base. Specifically, it suggested investing funding at a regional scale and devolving greater authority to regional bodies. The discussion paper generated wide public interest. The public feedback was consolidated in a report to Australian governments.

The National Action Plan for Salinity and Water Quality is built on the policy framework promoted by the discussion paper, and on similar policy analyses undertaken by a number of states and the Murray–Darling Basin Commission. The National Action Plan is the first comprehensive national initiative to address salinity and water quality problems. Arrangements between governments have been established in an overarching Intergovernmental Agreement and are further detailed in Bilateral Agreements between the Commonwealth and each state or territory. In addition, the Commonwealth recently announced the extension of the Natural Heritage Trust for a further five years, with funding of over \$1 billion (the Natural Heritage Trust Extension). This takes the total Commonwealth commitment to natural resource management (under the extension of the Trust and the Action Plan) since the Coalition Government was elected in 1996 to \$3.2 billion over 11 years.

The NHT extension aims to follow the National Action Plan's lead in approaching natural resource management at three levels: national, regional and local (through the Commonwealth Government Envirofund). Four overarching programs (Landcare, Bushcare, Rivercare and Coastcare) will direct the NHT extension investments towards achieving a specific set of outcomes. Through these initiatives, natural resource management in Australia is now focusing on targeted action, to be delivered through partnerships between landholders, regional communities, industry and governments.

In relation to biodiversity conservation, the Trust extension will concentrate on the following activities:

- protecting and restoring the habitat of threatened species, threatened ecological communities and migratory birds
- reversing the long-term decline in the extent and quality of Australia's native vegetation
- protecting and restoring significant freshwater, marine and estuarine ecosystems
- preventing or controlling the introduction and spread of feral animals, aquatic pests, weeds and other biological threats to biodiversity
- establishing and effectively managing a comprehensive, adequate and representative system of protected areas.

A regional model

The regional model is based on the five key elements of the approach that the Commonwealth, in partnership with all governments, is taking to improve natural resource management:

- integrated action at the regional scale
- strategies developed and implemented by landholders or regional communities
- strategic efforts and investments with clearly defined targets
- better monitoring, evaluation and assessment tools
- improved governance framework to secure investments and institutional frameworks for natural resource management.

The centrepiece of the Action Plan and the Trust are regional bodies that will develop and participate in implementing targeted actions through outcomes-focused and integrated regional natural resource management plans. Significant authority and decision-making capacity for natural resource management issues has been or will be devolved to these regional bodies. Governments will fund strategic actions outlined in the plans, and provide policy direction, technical assistance, skills training, national frameworks, information and data. Support will

also involve the development of pilots for market-based instruments to encourage best management practice, assistance for research and development, and progressing land and water resource policy reform.

The regional approach is designed to enable local communities to determine the mixture of mechanisms — such as on-ground action, economic instruments or appropriate planning and regulation — that are most appropriate for addressing the natural resource management issues in the region. Addressing natural resource management problems requires economic, social and environmental trade-offs. People in the regions have the local knowledge and enthusiasm to decide how best to tackle the issues their region faces. Trade-offs will vary from region to region, but a prime example may be between resource allocations for agricultural production and resource allocations to maintain environmental values. This may, for example, lead to impacts on rural output, employment levels or the overall viability of regional towns. These issues are most appropriately considered at the regional level.

The regional natural resource management model has a number of key elements that are critical for biodiversity conservation. Some of these are outlined below.

Monitoring and evaluation

Comprehensive, ongoing monitoring and evaluation is a key element of the regional approach. The Commonwealth, states and territories will jointly accredit regional plans to ensure they will deliver the agreed outcomes, and assess the timetables, performance measures, accountability and reporting arrangements in the plans. Targets and milestones contained in the plans (for example outcomes for water quality and salinity) are agreed between the Commonwealth and state or territory in consultation with regional communities. Regional bodies will then report to governments on progress against the agreed outcomes. This monitoring will provide a clearer understanding of successes and areas for improvement. Regional bodies must also be accountable for the expenditure of public funds and report against delivery requirements.

Information, extension and R&D

The importance of reliable information for effective natural resource management decision-making is well recognised. The recently completed first stage of the National Land and Water Resources Audit compiled information on Australia's water, salinity, vegetation, and soils, with analyses and reports on the status of agricultural production and rangelands and the condition of estuaries, streams and catchments throughout the intensive land use zone. This information provides a valuable context for identifying and prioritising resource management issues at the large region, state and territory, and national levels. However, in the main it does not provide the detail needed by regional and catchment groups to prioritise their management actions.

As a part of the regional planning process for the NAP and Trust extension, regional groups are required to undertake an inventory and critical review of all data and information that is currently available, including reports, databases and the knowledge held by local land managers, government agencies and scientists. Using this inventory and review, their plan must identify regional priorities for action to prevent or remediate damage, or enhance, their natural resources. The states and territories and the Commonwealth have together prepared a guiding framework for nominating the key natural resource matters that each region should consider and, where appropriate, set a target or goal to achieve. There are eight essentially aspirational outcome statements, which reflect the integrated nature of natural resource management and the critical role of biodiversity outcomes as a part of sustainable agriculture. For example, the first of these outcomes is: 'The impact of salinity on land and water resources is minimised, avoided or reduced'.

Regional communities are being asked to establish specific targets (or performance measures) that they believe are achievable. These targets could include:

- the area threatened by shallow or rising saline water tables
- the extent of native vegetation
- surface water quality
- sediment or suspended solids (in waterways)

- nutrients (reduced level of excess)
- water allocation plans (proportion of resource covered by)
- the extent of critical assets identified and protected from salinity and degraded water quality.

In order to set and work towards a target it is necessary to know the present status or 'baseline' condition, and in order to know if it is improving the condition must be monitored by measuring things that indicate change. Again, to assist monitoring, a set of indicators has been selected and agreed nationally to help regions to monitor change.

The data collected to monitor change will need to be compiled and evaluated. In natural resource management, proving 'cause and effect' can be very elusive because of the complex interrelationships between landscape components. For example, can it be proved that planting a certain area with deep-rooted perennials will stop or reverse rising saline groundwater somewhere else? Intuitively such an effect may seem reasonable, but gaining sufficient confidence to invest may require trials with appropriate research to confirm such a likelihood. Similarly, will an action have the desired effect for one issue but cause other problems? Stream bank revegetation may prevent erosion and enhance biodiversity, but it may also reduce rainfall run-off and reduce stream flows, thereby causing in-stream salt concentrations to rise. Ongoing monitoring, evaluation, research and development are crucial, and their coordination is a key role of the next stage of the National Land and Water Resources Audit.

Ultimately, regions will be able to build information systems, linked with supporting research to provide superior certainty about the causes and effects and what is needed to achieve effective natural resource management, with complementary outcomes for agricultural production and environmental biodiversity.

Environmental management systems

Environmental management systems (EMSs) are potentially useful management tools for improving natural resource management, assisting industry competitiveness, and assisting primary producers to meet emerging market demands for quality and environmental assurance. An EMS is a systematic approach that helps an enterprise to identify and manage its impacts on the environment, while providing opportunities for improved business performance. A manager can use the system to identify the environmental impacts of their agricultural production system and any legal responsibilities, then implement an action plan and review changes and improvements in a structured way. To provide credibility for external stakeholders, managers may decide to have their EMS externally audited and may become certified to the international ISO 14001 standard. ISO 14001 is the internationally accepted process standard for EMS, developed and agreed by the International Standards Organisation. Australia and New Zealand adopted the standard in 1996 as AS/NZS ISO14001:1996.

The National Framework for EMS in Agriculture is being developed jointly by the Commonwealth, states and territories, in consultation with stakeholders, to ensure a consistent approach to EMS in agriculture across Australia and to support necessary government/industry/community/landholder partnerships. The Commonwealth has established an EMS Incentives program that will provide \$25 million over five years to help primary producers to develop and implement an EMS for their enterprise. The program provides a maximum \$3000 cash reimbursement to primary producers with a taxable income of less than \$35 000 to reimburse up to 50% of eligible EMS-related expenditure. In addition, up to 15 regional pilots will be established across Australia to assess EMS as a tool for achieving improved natural resource management. Expressions of interest will be sought later this year and it is hoped that pilots will be operational before mid next year.

Case study: Abbotsleigh Citrus

Abbotsleigh Citrus, in Gin Gin, Queensland, has been able to combine sustainable agriculture with major contributions to a healthy ecosystem.

The enterprise's operations are based first and foremost on the concept of sustainable production, which includes the protection and enhancement of the environment. To this end, Abbotsleigh used the ISO 14001 Environmental Management System (EMS) standard as a management tool to assist the company achieve its environmental objectives. The property holds nearly 50 000 citrus trees but utilises less than 50% of the available arable land. The rest of the land is being returned to its natural state. Feral animals have been eradicated, gullies and other erosion have been ameliorated, and much of the property (particularly riparian zones and wildlife corridors) has been revegetated to provide habitat, improve biodiversity and protect stream banks. More than 120 different bird species now call Abbotsleigh 'home'.

The EMS process has also led to improved economic performance. For example, less water is required for each citrus tree because of increased irrigation efficiencies. The increasing success in Abbotsleigh's biological control of citrus pests has led to less need for chemical pesticides, which also has financial benefits: \$41 000 less was spent on this category in the 2001 financial year than in the 1997 year when there were one-third the number of citrus trees under management.

'The success of the operation to date and potential for increased market access due to quality and environmental assurance has encouraged Abbotsleigh to purchase adjoining properties and to expand its operations. The enterprise has achieved certification against ISO 14001 (EMS) and ISO 9002 (Quality) international standards, SQF 2000 quality assurance and HACCP within Australia as well as achieving certification against Japanese quality assurance standards. The enterprise won a Banksia Environmental Foundation Award in 2001.'

— Clive Roydhouse, Abbotsleigh Citrus

Market-based instruments

One approach aimed at increasing the incentives for landholders to address public good outcomes is market-based instruments (MBIs). MBIs create markets for environmental services such as enhanced biodiversity, reduced salinity and soil loss. The result is that the landholder receives additional income for the provision of that environmental service, and a public good is achieved at a more affordable cost to the community.

Governments are looking to expand the options for encouraging behavioural change beyond the traditional approaches such as regulation and education. MBIs offer this potential. However, most schemes to date are either still in the design phase or have only recently moved into implementation.

To improve our knowledge of the potential of MBIs, the Commonwealth, in partnership with the states and territories has allocated up to \$10 million in a national program to support a range of MBI pilots, addressing issues such as biodiversity, salinity and water-use efficiency. The 10 pilots supported under the first round of the program were announced in April 2003. They will examine a range of instruments to encourage improved natural resource management through market signals, rather than only through legislation or regulation.

For example some of the pilots involve designing and trialling an auction to provide incentives for diffuse-source salinity and biodiversity outcomes, testing on the ground the effectiveness of trading schemes for managing salinity in existing irrigation areas, and setting up a fund to leverage private sector investment to deliver natural resource management outcomes and private returns to investors.

Market-based instruments use trading mechanisms, auctions and price signals to change behaviour to address important natural resource issues and fill knowledge gaps across

jurisdictions. They can be used to conserve biodiversity, reduce salinity and manage water allocation within environmental limits.

Conclusions

‘Will biodiversity be OK?’ Probably, but only if we get the bigger issues of ecosystem services ‘right’.

We can be positive about the steps we are taking to respond to the significant challenges posed. The Commonwealth, in partnership with all governments and regional communities, has a framework in place which is based on a regional approach to natural resource management. The building blocks are being established right across Australia, and if biodiversity is to be OK it must be addressed in the context of the whole, and not singled out.

To be effective we need to engage with the community and industry and recognise that expectations about biodiversity have changed; not only with respect to an increasing recognition that some values may not be adequately protected by current arrangements but also in regard to the contribution that landholders can make to the public good.

This reinforces the central notion of this paper that biodiversity *and* agriculture can coexist and must be addressed in partnership with the agricultural community.

References

- Binning, C. and Young, M. (1997) Motivating people — using management agreements to conserve remnant vegetation. Paper 1/97, National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation.
- Cary, J.W., Webb, T.J. and Barr, N.F. (in press) Understanding landholders’ capacity to change to sustainable practices. Insights about practice adoption and social capacity for change. Bureau of Rural Sciences: Canberra.
- Clarke, D. (2002) *Sustainable Landuse in Dryland Regions of the Murray–Darling Basin — a policy discussion paper*. A discussion paper produced as part of the Landmark Project for the Murray–Darling Basin Commission.
- Commonwealth of Australia (2002) *Australia’s Natural Resources: 1997–2002 and beyond*. Rreport prepared by the National Land and Water Resources Audit: Canberra.
- Denys Slee and Associates (1998) Remnant native vegetation — perceptions and policies: a review of legislation and incentive programs. Research Report 2/98, National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation.
- Guiljt, I. and Race, D. (1998) *Growing Successfully: Australian Experience with Farm Forestry*. Department of Forestry, Australian National University: Canberra.
- Jenkins, S. (1998) Native vegetation on-farms survey — a survey of farmers’ attitudes to native vegetation and landcare in the wheatbelt. Research Report 3/98, National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation.
- Morgan, G. (2002) *Landscape Health in Australia. A Rapid Assessment of the Relative Condition of Australia’s Bioregions and Subregions*. Report prepared for Environment Australia and the National Land and Water Resources Audit: Canberra.
- Morton, S., Bourne, G., Cristofani, P., Cullen, P., Possingham, H. and Young, M. (2002) *Sustaining our natural systems and biodiversity: an independent report to the Prime Minister’s Science, Engineering and Innovation Council*. CSIRO and Environment Australia: Canberra.
- Possingham, H. (2001) *The Business of Biodiversity: applying decision theory principles to nature conservation*. Sponsored by Australian Conservation Foundation and the Earthwatch Institute. Published in ‘Tela’, ed. by D. Yencken, The University of Melbourne.