

# DECISION POINT

Issue 45 / December 2010

*Smart science for wise decisions*

*Connecting conservation policy  
makers, researchers and practitioners*

## What's in reserve

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## DECISION POINT

*Decision Point* is a monthly magazine presenting news, views and ideas on environmental decision making, biodiversity, conservation planning and monitoring. It is produced by AEDA – the Applied Environmental Decision Analysis CERF Hub. For more info on *Decision Point*, or AEDA, see the back page or visit our website at [www.aeda.edu.au](http://www.aeda.edu.au)

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By Hugh Possingham (Director, AEDA)

This is the last issue of *Decision Point* being produced under the auspices of AEDA. That's because the CERF funding behind AEDA has come to an end. Fear not, *Decision Point* will be back in 2011 under the banner of the ARC Centre of Excellence for Environmental Decisions (CEED). However, AEDA will cease to exist at the end of 2010. So what is there to say about this thing called AEDA?

AEDA is not a country, it doesn't have a flag and we are not planning a funeral for its demise. But that's not to say it's not something of value. Indeed, it has proved a very valuable vehicle for bringing together researchers with researchers, and researchers with end users. It has enabled a true partnership where managers and decision makers have provided the basic inspiration for our research.

Environmental decision science is young. Prior to AEDA there was no centre in which researchers and practitioners from all the relevant disciplines worked closely together to formulate and solve the pressing environmental problems of the day. The Federal government took a calculated risk investing in a multidisciplinary centre that was very different from traditional ecological science.

And what has been the return on that investment? Quite a lot if you consider our achievements (many of which have been presented in *Decision Point*, see the next page for just a few examples). It's important to note that all of these outputs appeared in the peer-reviewed literature (including some of the top journals like *Science* and *Nature*). We often forget that the CERF program is a research program, albeit applied research, and research must eventually be subject to peer review to be credible.

But, as with any good network, AEDA's value is much more than the sum of our parts. We're proud of the research we're doing but our contribution goes way beyond this.

The appearance of AEDA as a research hub served to focus the minds of busy, independent researchers on the question of how decisions are currently made, what is wrong with them, and how could they be made better? Prior to AEDA, many of the lead researchers in the hub were addressing small parts of the problem without linking all of the pieces together. AEDA has made us think about where our individual skills and research contributions fit into the overall aim of making good environmental decisions.

This has not only provided us with a better perspective on decision making, but has frequently changed the focus of our research. In addition to the collaborative and integrative functions, the existence of AEDA has also served to put the science of structured decision making in the forefront of the minds of policy makers and managers around the country. This point is reinforced by the increased role of AEDA members and 'AEDA-ways-of-thinking' in some very important public policy initiatives like the Caring for our Country program and the review of the EPBC Act.

However, influence has not been limited to 'big P policy'. Many AEDA projects have arisen through direct approaches from State Agencies, regional NRM bodies and NGOs like

**“Another enduring lesson arising out of my experience with AEDA is that the key to a successful research centre is low overheads and trust”**

## Environmental decision theory

*The Dpoint  
editorial*

Every mature human endeavour that involves money uses decision science – from engineering to health management. The environmental sciences have been slow to embrace rigorous tools for allocating funds and using the sciences of ecology, maths and economics to choose between management options. But things have changed – we now demand much more rigour and transparency when we're making decisions about investing in the environment – whether that be from public or private funds. This requires high quality applied ecology that enables us to predict the consequences of management options coupled with mathematical and economic tools designed to make choices in a world constrained by money and time.

Greening Australia. We've even helped the NZ Government prioritise spending on its threatened species program through the use of a project prioritization protocol (see *Decision Point* #29, p8), developed by AEDA researchers – an idea that is now spreading back to Australian agencies.

So, AEDA has helped put smart decision-making on the map through its research and its interaction with policy processes. But AEDA has also built a profile and an awareness of decision science beyond research and policy. Through seminars, workshops and our monthly magazine *Decision Point* we've created a receptive audience for decision science that has never before existed. We've done this by making decision science relevant, engaging and sensible.

And one consequence of this, and surely one of AEDA's legacies, will be a greater focus on good problem definition before attempting to solve the problem.

All of this is important but another enduring lesson arising out of my experience with AEDA is that the key to a successful research centre is low overheads and trust. We aimed to use the CERF resources provided to us for AEDA with minimum transactions costs in order to maximise our research outputs. To do this we didn't engage in an elaborate planning process where each KPI was carefully mapped out and delivered in triplicate. We simply spelt out our broad goals, enabled our people to come together to discuss how they would achieve these goals, and then trusted them to get on with the job and deliver. And they did – above and beyond all of the milestones we promised when we applied for the CERF funding in the first place.

Productivity is powered by passion, not pedantic planning. And because AEDA is built on a foundation of trust it has successfully tapped that productivity, and I think our legacy will be an enduring one as a result.

So, with the closing of 2010, the name AEDA will fade. But you can be certain its legacy will continue in the associations it helped create, the research it helped deliver and the people it helped train.

# αεδα

**Applied Environmental Decision Analysis**  
A Commonwealth Environment Research Facility

*Smart science for wise decisions*

# Ten things worth noting

Here is a short list of some of AEDA's research highlights. It's not a complete list by any means but it reflects something of the length, breadth and value of our outputs. Follow the *Decision Point* links if you'd like to follow up on any of the stories.

**2** **Priorities for threatened spp**  
AEDA has developed a cost-effectiveness analysis (PPP) that allows managers to directly compare projects with each other.  
*Decision Point #29*

**4** **Cost effective pest surveillance**  
AEDA has developed a search method that minimises the costs of searching for an invader.  
*Decision Point #31*

**6** **When to declare extinction**  
Declaring something is extinct too soon or too late carries enormous costs. AEDA has developed a decision framework to help.  
*Decision Point #38*

**8** **Searching for threatened spp**  
How hard do you need to look to ensure a threatened species is present or absent? AEDA provides a guide.  
*Decision Point #34*

**10** **Offsets - for & against**  
AEDA presented compelling arguments for and against biodiversity offsets and how they should be best handled.  
For: *Decision Point #39*  
Against: *Decision Point #41*

**1** **Threatened species in the REDD**  
AEDA has helped demonstrate the enormous potential of REDD carbon money to save threatened species on Australia's doorstep.  
*Decision Point #30*

**3** **Multiple-use plans for parks**  
AEDA's work in developing Marxan with Zones enabling the design of multiple-use conservation areas that factor in economic & social values.  
*Decision Point #27*

**5** **Better strategic impact assessments**  
AEDA has been defining best practice for strategic impact assessments.  
*Decision Point #32*

**7** **Replacing under performing nature reserves?**  
AEDA questions a basic tenet of conservation, that reserves remain protected forever.  
*Decision Point #41*

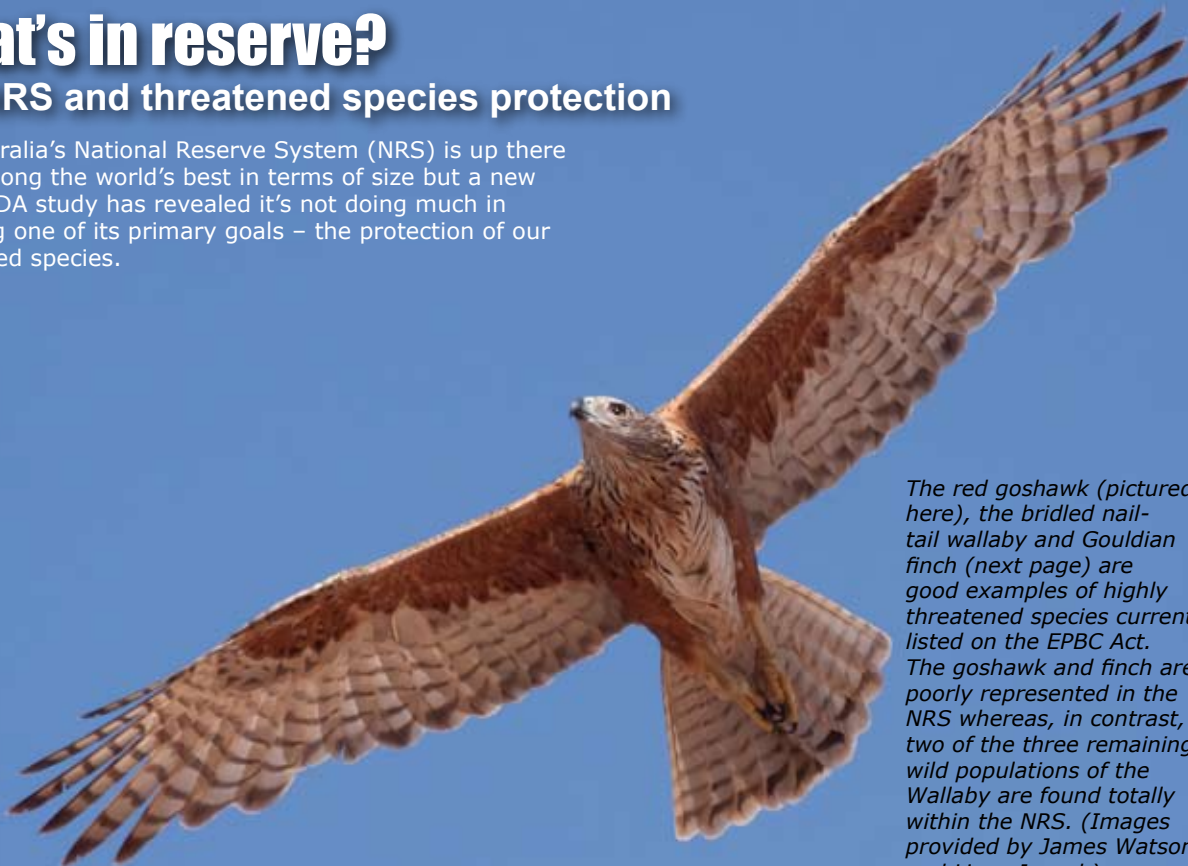
**9** **Are targets bad for biodiversity?**  
AEDA investigated claims that biodiversity targets are actually bad for biodiversity conservation.  
*Decision Point #33*



# What's in reserve?

## The NRS and threatened species protection

Australia's National Reserve System (NRS) is up there among the world's best in terms of size but a new AEDA study has revealed it's not doing much in achieving one of its primary goals – the protection of our threatened species.



*The red goshawk (pictured here), the bridled nail-tail wallaby and Gouldian finch (next page) are good examples of highly threatened species currently listed on the EPBC Act. The goshawk and finch are poorly represented in the NRS whereas, in contrast, two of the three remaining wild populations of the Wallaby are found totally within the NRS. (Images provided by James Watson and Liana Joseph)*

The study, just published in *Conservation Biology*, examined the level of protection the NRS afforded Australia's threatened species. It examined the distributions of 1320 nationally listed species on Australia's EPBC Act and assessed how well the nation's 9000 plus reserves (covering 11.6% of Australia) protects these species.

"While a few species have a large level of protection, over 80% of the species we analysed were inadequately protected," says Dr James Watson, the lead author on the report. "One hundred and sixty six species exist completely outside the protected area network. That's 12% of our threatened species getting no protection from the NRS at all!

"The outcome is even worse for our most endangered species. We found that one-fifth of species considered critically endangered have no formal protection, an incredible finding considering these are the species most vulnerable to extinction.

"Indeed, our analysis shows that the current placement of the protected area network is not much better than a completely random placement of reserves, which is a poor outcome."

So how has this come about? Is it simply poor design? Actually it's a mix of history, the difficult nature of protecting endangered animals through land acquisition and never having closely examined how well our reserves are serving endangered animals. As was discussed in *Decision Point #41*, nature reserves were historically established on parcels of land that weren't valuable for other uses. It was more about not locking up economically or agriculturally valuable land than maximising natural values. However, faced with an appalling record of protecting our biodiversity (see box), the Australian

**“One-fifth of species considered critically endangered have no formal protection.”**

government has actively sought to increase the size of the terrestrial protected area network (the NRS) to reverse trends of species decline and extinction.

Since 1995 the Australian Government has applied systematic planning criteria to guide expansion of the NRS based on 85 bioregions defined by similarities in geology, landform, climate and ecology. The criteria prioritise bioregions with low levels of representation in the current NRS and high levels of threat to native species, as gauged by past land-use change, known extinctions and invasive plant abundance. Since implementation of this framework began in 2000, the NRS increased in size from 65 to 89 million hectares and its practice of selection is regarded as a benchmark of international best practice.

Despite the substantial growth of Australia's protected area system, however, little was known of the extent to which this network protected highly threatened species – which was the impetus for this just released analysis. Watson and colleagues assessed how the spatial coverage of the

### An appalling legacy

Australia is globally significant for its biodiversity but much of the continent has been transformed by human activities. Most obvious is the extensive destruction of natural vegetation in southern Australia through agriculture, urbanization and forestry. However, even where native vegetation remains, ecosystem function has been altered by invasive species and inappropriate management. As such, Australia is a leading contributor to the human-induced mass extinction event that is currently occurring across Earth.

Close to half of all known mammal extinctions in the last two centuries have occurred in Australia, while three bird species, four frog species and 61 species of flowering plant have become extinct since European settlement. Australia's biodiversity is now characterized by a high number of native species that have collapsing ranges and declines in abundance. Nearly 13% of all Australia's known terrestrial vertebrate species are listed nationally as Critically Endangered, Endangered or Vulnerable.

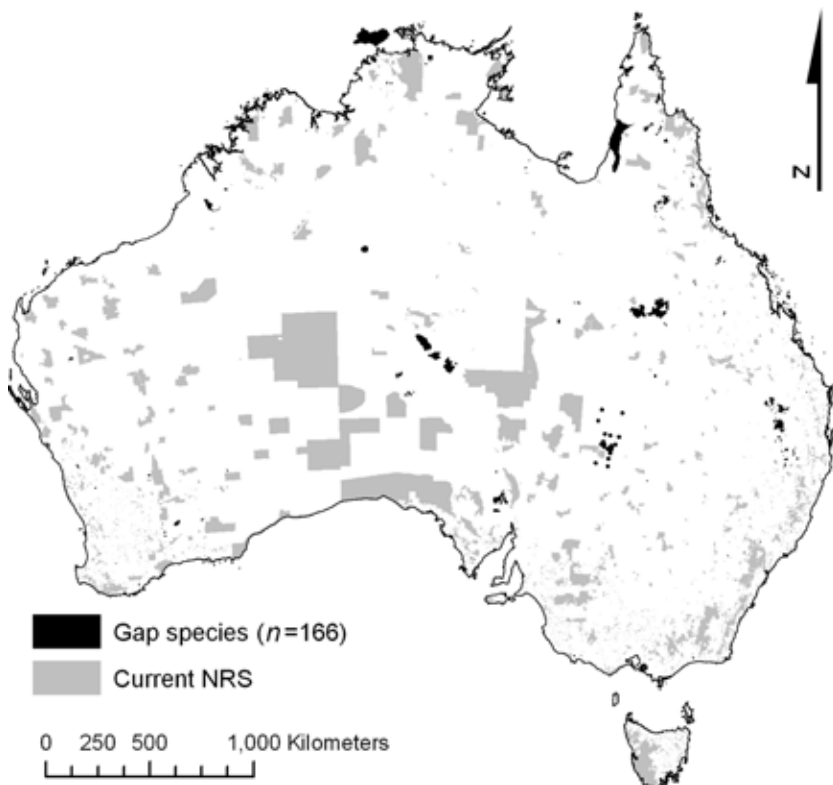


Figure 1: The geographic distributions of the 166 species with ranges that are not represented in Australia's protected-area system (ie, gap species) overlaid on the National Reserve System.



The bridled nail-tail wallaby and the Gouldian finch. (Images by Liana Joseph)

NRS protected threatened species with different geographic range sizes. They then compared Australia's existing NRS to a hypothetical NRS that was drawn up randomly. They also 'designed' a third reserve network, an 'optimal' NRS. Using Marxan they devised a reserve system that protected threatened species for the least cost (an 'optimal' solution).

We've already mentioned the bad news – that our existing NRS offers little more protection than a randomly created set of reserves in terms of protecting protected species. However, the investigation also revealed some positive findings.

"We looked at how much additional land needs to be placed in the protected area estate to overcome its current shortcomings," says Dr Richard Fuller, a co-author on the paper. "The good news is that if the protected area estate is planned efficiently from now on, we would only need to place 17.8% of Australia, around 6% more than is currently in the NRS, in protected areas to secure threatened species. This is not a large increase. Countries like Israel have 20% of their country protected."

## Beyond buying land

Inclusion in a protected area may not be the only, or even the most important, conservation action required to recover many threatened species. Local endemics in small areas of specialized but commercially unproductive habitat may have no imminent threats and thus be a lower priority for reservation. For some other threatened species, simple management actions can provide effective security across a large portion of a species geographic range at a fraction of the cost of land acquisition. For example, a major threat to the Kangaroo Island population of the threatened glossy black-cockatoo was mitigated by the placement of metal collars around nesting trees in order to prevent egg predation by brush-tailed possums, which proved to be an extremely cost-effective abatement action. Moreover, acquisition of a protected area alone may not abate threats to species' persistence. The major threatening processes for artesian mound springs in arid-lands (containing large concentrations of endemic, threatened species) is loss of groundwater supply, which needs to be addressed by water conservation measures involving landholders throughout the areas overlying the aquifer.

The investigators also demonstrated that if our protected area system had been formulated in the beginning with an explicit objective of protecting threatened species then we could have achieved it with much the same area as currently lies in the NRS.

"If we were to completely ignore the current reserve system's contribution to biodiversity conservation and assume all land in Australia was available for acquisition, we found that approximately 11.9% of Australia's land area would be required to be placed in a protected area for the adequate protection of all threatened species," says Fuller. "In this efficient solution, we found that 16.7% of the current NRS was captured."

The investigators stressed that while land acquisition for the enlargement of the NRS was an important strategy for protecting endangered species, it wasn't the only action that government's needed to invest in (see the box on beyond buying land). Indeed, the costs and the benefits of different actions needed to weighed up in order that the limited resources available were invested for the best biodiversity outcome.

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### Reference

Watson JEM, MC, Evans, J Carwardine, RA Fuller, LN Joseph, DB Segan, MFJ Taylor, RJ Fensham & HP Possingham (2010). The Capacity of Australia's Protected-Area System to Represent Threatened Species. *Conservation Biology*, DOI: 10.1111/j.1523-1739.2010.01587.x

**“The current placement of the protected area network is not much better than a completely random placement of reserves.”**



“Yolŋu’s relationship with the sea and its resources is fundamental to their religious, social, and economic life and wellbeing.”

Photo courtesy of Dhimurru

## Incorporating culture in conservation planning

### Planning sea country in North East Arnhem Land

The Yolŋu people are the traditional owners of land and sea estates in the Gove Peninsula region of North East Arnhem Land. The Yolŋu have a strong cultural and spiritual relationship with the land and the sea. This relationship is not necessarily confined to where Yolŋu live, they can have obligations for country very distant from their place of residence and in fact feel responsible for sea country from the coastline to the horizon.

Yolŋu traditional owners established a community based natural and cultural resource management agency, the Dhimurru Aboriginal Corporation (see box), to manage the sustainable use of land and sea. In 2000, Dhimurru declared an Indigenous Protected Area over Yolŋu land and

sea. In 2006 it prepared a vision and plan for management of sea country next to and within the Dhimurru Indigenous Protected Area.

Dhimurru is unique in that it is the only Indigenous Protected Area in Australia that incorporates a marine estate (of some 9,000 ha) within its boundaries. These areas are mostly registered sacred sites which are annexed by Dhimurru’s Indigenous Protected Area.

The Yolŋu marine estate includes island, rocky and coral reefs, inlets, bays, estuaries, mudflats, underwater springs, sea grass meadows, mangrove forests, the sea bed and open ocean. They share their sea country with marine creatures including fish, dolphins, crustaceans, corals, dugongs, turtles, shellfish, crocodiles and birds.

## Indigenous Protected Areas

The Indigenous Protected Areas Program is a shared Commonwealth Government initiative encouraging indigenous participation in the national conservation effort. The purpose of the Program is to assist the Commonwealth, States, and Territories to achieve a comprehensive and representative national reserve system of protected areas by voluntary declarations from indigenous landholders. In 2000, the Yolŋu community made a voluntary conservation declaration over 92,000 hectares of land and 9,000 hectares of adjacent marine areas. The Dhimurru Indigenous Protected Areas was the first indigenous protected area in the Northern Territory.



Wanuwuy Seascape, part of the marine conservation study region. (Photo courtesy of Dhimurru)

Yolŋu’s relationship with the sea and its resources is fundamental to their religious, social, and economic life and wellbeing. They have an intimate knowledge of the environment and ecology in the area. However, it is becoming increasingly difficult to manage because of pressures on the marine environment from recreational and commercial fishing, and the large industrial mining project operating in the region.

To address these issues, they have developed a Moŋuk Gapu Wāŋa, or Sea Country Management Plan. As part of this plan, Dhimurru is exploring its options for the sustainable management of sea country surrounding its existing Indigenous Protected Area over the long term. Systematic conservation planning with a view to undertaking a multiple-use zoning model is one of those options.

Dhimurru, in conjunction with the Marine Biodiversity Group of NRETAS (the Northern Territory Department of Natural Resources, Environment, the Arts and Sport), embarked on a project to explore marine conservation planning. The project’s main objective is to address problems of overfishing, habitat damage and disruption of the coastal communities, while keeping costs to a minimum.

The short-term objectives of this project are to 1) undertake consultations with traditional owners to investigate the potential for the development of management zones in waters adjacent to the Dhimurru Indigenous Protected Area; 2) compile traditional ecological knowledge on the Dhimurru

marine estate; 3) compile existing marine biodiversity and biophysical data; and 4) trial Marxan as a systematic conservation planning tool for the Dhimurru sea country.

It was discovered during the course of the project that, although Dhimurru had some of the necessary scientific ecological data, they required assistance in the collection of Yolŋu traditional knowledge in a systematic and Marxan-friendly mode.

A team of anthropologists was engaged to undertake a short preliminary exploration of the traditional occupancy and use of sea country. In particular, the project investigated 1) spatial extent of the sea country and the mapping exercise; how far along the coast north and south the mapping project should cover and how far out to sea to extend zoning recommendations; 2) significant areas and places; 3) Yolŋu resource usage and activities; and 4) significant management issues and or perceived problems.

This is one of the first projects in Australia where a combination of cultural data and western science has been merged to drive the systematic marine planning process and be included in the Marxan planning tool. The challenges are many when attempting to quantify cultural information in a spatial and temporal setting: the information is often difficult to define in western terms; the information is dynamic as boundaries often shift; it covers an area that is difficult areas to map spatially. A particular challenge is the movement of ocean currents. These shift over a calendar year and interact with one another in different ways.

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#### Reference

Dhimurru (2006) *Yolŋuwu Moŋuk Gapu Wāŋa Sea Country Plan: a Yolŋu Vision and Plan for Sea Country Management in North-east Arnhem Land, Northern Territory*. Dhimurru Land Management Aboriginal Corporation

**“Dhimurru is exploring its options for the sustainable management of sea country surrounding its existing Indigenous Protected Area over the long term.”**

## Dhimurru Aboriginal Corporation

Dhimurru Aboriginal Corporation is a community based natural and cultural resource management agency established in 1992 by the traditional Yolŋu owners of land and sea estates in the Gove Peninsula region of north-east Arnhem Land in the Northern Territory. They undertake natural and cultural resource management to ensure the protection and sustainable use of their land and sea country within and adjacent to the Dhimurru Indigenous Protected Area. Dhimurru is governed by a Board of Directors who action and articulate the wishes and aspirations of the Yolŋu traditional owners.

More info: <http://www.dhimurru.com.au/>

## Marxan in Nhulunbuy

In September, AEDA held a marine conservation planning workshop in the town of Nhulunbuy, north-east Arnhem Land, with the Dhimurru Aboriginal Corporation (Dhimurru). The workshop was led by AEDAites Carissa Klein and Josie Carwardine, in collaboration with Dr Kiki Dethmers (a marine ecologist with the Northern Territory Government) and Dr Nancy Williams (an anthropologist at the University of Queensland).

The workshop was part of an ongoing planning project, conducted by the Dhimurru Aboriginal Corporation. The project is investigating the potential for the development of management zones in waters adjacent to and within the Dhimurru Indigenous Protected Area. The project aims to use Marxan and Marxan with Zones to conduct transparent, science-based conservation planning and zoning of “Sea Country” for multiple uses.

Attending the workshop were Dhimurru staff, including several Yolŋu rangers, and even a few secondary school students participating in work experience. Conservation planning can sometimes appear to be a rather dry process but this workshop was a fun-filled and productive 2-days of planning games, goal setting, data discussions, and Marxan analysis! (Who’d have thought Marxan would appear with the word ‘fun’?)

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A beach cleanup in Wanuwuy, one of many ‘ghost’ nets that wash up on shore in this area. (Photo courtesy of Dhimurru)

Research priorities for a little understood ecosystem

# The Coffs Harbour Subtropical Reefs Declaration

By Maria Beger (University of Queensland, AEDA) and the SuSRA\*

\*SuSRA stands for the Sustainable Subtropical Reefs Alliance. The alliance is a consortium of research and management experts working to promote the long-term viability of subtropical reefs.

Conservation and management of reefs and associated ecosystems is currently considered the most promising way to ensure their persistence under climate change. While there is considerable information on the processes and likely impacts of climate change on tropical coral reefs and temperate rocky reefs, very little is known for subtropical reefs.

The eastern and western coasts of Australia are amongst the longest latitudinal tracts of subtropical coastal marine habitat in the world, encompassing beaches, rocky foreshores, offshore islands, shoals and reefs.

Subtropical reefs form a transition zone between temperate and tropical bio-geographic provinces and are characterised by an overlap of tropical and temperate species, high rates and magnitudes of fluctuation in environmental conditions, and significant seasonal variation in species assemblages.

Climate change induced alterations in environmental parameters are likely to re-define the characteristics of subtropical communities, partly by range shifts of tropical and temperate species, but also through changing habitats and trophic interactions. Indeed, with increasing water temperatures there has already been a pole-ward shift in the establishment of viable populations of some tropical fish species along the subtropical east Australian coast.

Subtropical coasts are also experiencing a major human population increase, with consequent increase in anthropogenic stress on adjacent marine environments. However, the viability of these expanding coastal human communities is inexorably tied to the natural values of the neighbouring marine environment which provides the economic basis for their survival through services such as tourism, recreation, human health and a range of fisheries. These natural values underpin many of reasons which draw people to live along the coast.

Climate change makes it imperative that we both re-evaluate existing conservation efforts while generating new strategies that will adequately address the threats facing subtropical reefs. The present dynamics of processes on subtropical reefs, and their transformations associated with climate change are largely unknown and are an urgent research priority.

The adaption of current management strategies is crucial to ensure the survival of subtropical coastal ecosystems and human communities which depend on them. However, it is currently difficult to make good decisions about where, when and how to apply scarce conservation resources given the paucity of even basic information on the marine resources in these transition zones, the uncertainty of climate change predictions, and the constraints of the political framework under which decision makers operate.

**“The present dynamics of processes on subtropical reefs, and their transformations associated with climate change are largely unknown and are an urgent research priority.”**

In order to create an effective management framework that achieves meaningful conservation outcomes in subtropical marine environments, we must find ways to promote close interactions between managers and researchers, transforming science into action.

Meeting at Coff's Harbour NSW on 13 September 2010, experts actively involved in the research and management of subtropical reefs identified seven priority areas that should be targeted to improve the basis for decision making to address current and future challenges in the management and conservation of subtropical reefs. These priorities are outlined on the next page.

A list of topics of studies underway or recommended, is available on request.

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<http://www.susra.org/>**



Photos by Maria Beger

# A declaration of priorities

We call upon practitioners, managers, researchers, funding bodies and governments to recognise that these priority areas require urgent attention & investment to enable effective and efficient decision making for the future of subtropical reefs.

## 1. Integrate research and management activities across local government, state, and bioregion borders

The purpose of much research is to provide information to resource managers and politicians who make decisions about where, how and when to invest conservation dollars to maintain marine biodiversity and productivity (and thereby maintain the associated benefits to humans). Managers and researchers must communicate with each other in participation with key stakeholders, and straddle political and administrative boundaries to allow an integrated regional approach to conserving and managing subtropical reefs along the spatial gradients relevant to climate change. To tackle climate change, research and management needs to focus on understanding patterns and processes required to maintain natural ecosystems and connectivity, rather than fragment these through superimposition of artificial boundaries.



## 2. Quantify socio-economic factors and ecosystem services

Management decisions are constrained by social, economic and political factors. Managers of subtropical marine environments require information on the extent and monetary value of human use practises, including distribution, and rates of change of: recreational and commercial fishing catch and effort; tourism; commercial research; and other uses. Quantitative or even qualitative information on environmental values and associated values of ecosystem services is urgently required. Methods of incorporating this information into a transparent cost-benefit driven management decision making framework are also needed.



## 3. Habitat mapping and ecological research

The extent, distribution and structure of habitats and their species composition are still not fully understood in subtropical regions. These gaps need to be filled by continued broad-scale and fine-scale habitat mapping, modelling and ecological research in subtropical marine environments.



## 4. Benchmark cross-realm connectivity

With increasing urban and rural development in subtropical catchments, there is a critical need to evaluate and quantify threats to marine habitats derived from terrestrial sources, and determine and implement mitigating management actions to safeguard water quality on subtropical reefs. Integrating cross-realm connectivity into management and conservation decision making is crucial. While good non-statutory examples of integrating and implementing management and science to reduce terrestrial impacts on coastal ecosystems exist (eg, Healthy Waterways Partnership, [www.healthywaterways.org](http://www.healthywaterways.org)), management models such as this need to be more widely adopted.



## 5. Know marine population connectivity

There is an urgent need to understand the processes that are predicted to transform as a response to climate change, such as pathways of tropical "invaders" and the role that Australia's subtropical reefs may play in providing refuge for tropical species. The southward flow of the major boundary current systems in Australia provides the opportunity for many species to shift from threatened tropical systems to subtropical (and even temperate) systems. A multi-disciplinary approach integrating near-shore hydrodynamics modelling, larval tracking models, and genetics is required. Similarly, cross-shelf connectivity between estuarine, non-reefal, near-shore, and offshore reef environments warrants investigation.



## 6. Determine refugia

Sites that are resistant to or better able to recover from disturbance are key areas on which to focus strategic conservation or other management efforts, as these reefs will be the last refuges of biodiversity and other ecosystem values. Targeted research is required to better understand the ecosystem processes that underpin ecological resistance and resilience, as well as vulnerability, in Australia's subtropical coastal marine ecosystems.



## 7. Understand natural variability of environmental conditions

Subtropical reefs are marginal habitats for both tropical and temperate organisms (eg, reef corals and kelp). They experience high levels of natural spatial and temporal variability in environmental parameters that are poorly understood. Quantifying the dynamics in environmental parameters and the corresponding variability in biological characteristics and processes is crucial in order to detect, predict and adapt to climate-change related shifts in key ecosystem components. In particular, little is known of how the productivity of subtropical reef system may decline or improve with climate change and perturbations (eg, storms).



# Counting birds in the hills

## The Mount Lofty Ranges Woodland Bird Monitoring Program

By Patrick Oconnor (University of Adelaide)

The native woodlands that once covered the Mount Lofty Ranges landscape have been reduced to a tenth of their former extent. This dramatic loss of habitat has devastating implications for the many native birds that depend on it for survival. The Mount Lofty Ranges Woodland Bird Monitoring Program provides a way to observe and understand the changes happening now across the landscape. With this information we have



*"It seems unthinkable to suggest that your grandchildren will not be able to find a Superb Fairy-wren, but this data suggests it is conceivable," says project manager Dr Tim Milne.*

the best chance of taking action to reduce the decline of woodland birds in the region.

The Mount Lofty Ranges of South Australia are nationally recognised for their ecological significance. They support a remote island of native woodland with endemic subspecies that is separated by hundreds of kilometres from similar habitat in south-eastern Australia. Not only have we lost vast areas of woodland habitat in the Mount Lofty Ranges, but the health of the remaining patches is under increasing threat from introduced species, unsustainable use and the

**“The Mount Lofty Ranges is like a canary in a coal mine for Australia’s woodland landscapes—what happens here is an early warning for Australia’s other landscapes”**



impacts of climate change.

The rapid and dramatic loss of woodlands has devastating implications for the native birds and other animals that depend on this habitat for survival. Our best chance to ensure that this woodland wildlife is not lost forever is to understand the changes that are occurring and use this knowledge to protect and restore the region’s natural habitats.

“The Mount Lofty Ranges is like a canary in a coal mine for Australia’s woodland landscapes—what happens here is an early warning for Australia’s other landscapes,” says Professor Hugh Possingham from the University of Queensland, who instigated the monitoring program 12 years ago.

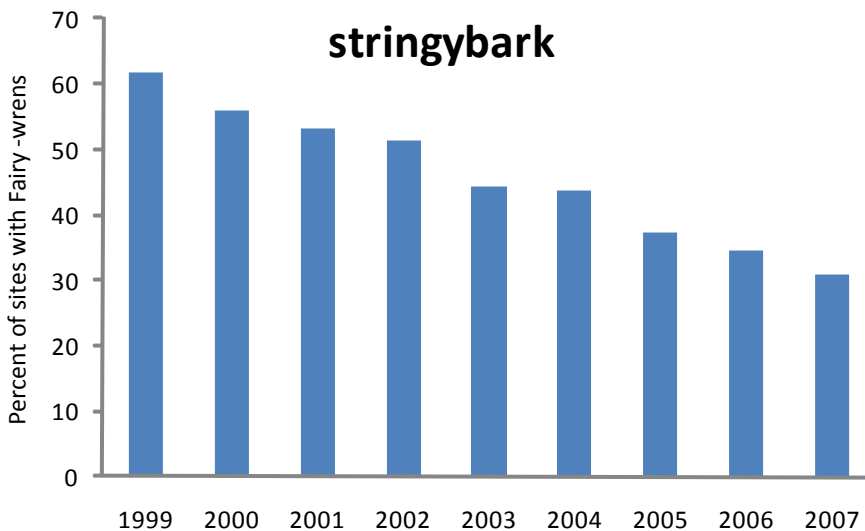


Figure 1 shows the decline of superb fairy-wren numbers in stringybark woodlands over the past decade.

### A world-class program for monitoring

“The Mount Lofty Ranges Woodland Bird Monitoring Program is the first long-term study in Australia that is able to tell which birds are becoming more or less common in the landscape over an entire region,” says Possingham.

The monitoring program design and methods for data analysis were developed by a large research project undertaken by the University of Queensland, supported by the Australian Research Council (ARC) and AEDA

Monitoring data is collected annually by a team of expert and volunteer ornithologists currently funded by the Mount Lofty Ranges NRM Board and co-ordinated by the Nature Conservation Society of South Australia

(NCSSA). It is subject to a rigorous quality assurance process before being added to a central database. Monitoring data has been collected every year since 1999.

Habitat condition information is also collected at monitoring sites and can be used to further our understanding of habitat quality and its influence on woodland birds.

## What is the future for our birds?

Small birds that feed in the shrub layer are feeling the pinch, while some large aggressive birds are becoming more common. Many bird watchers have suspected this is happening, but the Mount Lofty Ranges Woodland Bird Monitoring Program provides strong evidence of these changes.

Some birds may be becoming less common as a result of past habitat destruction.

"Now that we have 10 years of baseline monitoring data, we will be able to see whether efforts to control weeds and foxes and to revegetate some cleared areas is helping some of the birds to recover," said Dr Tim Milne, project manager for the NCSSA. "The results of monitoring can also be used to influence government policies and laws to protect our native species."

The birds of the Mount Lofty Ranges are also a barometer for what is happening in other regions. As the monitoring program develops, it will provide useful information for conservation in other parts of South Australia and across the rest of southern Australia.

"Ten years of good data provides a solid baseline for measuring future changes in bird numbers. Some rare birds will require monitoring to continue for more years just to establish a baseline for their numbers," says Professor Possingham.

The Mount Lofty Ranges Woodland Bird Monitoring Program becomes more powerful the longer it continues. "With more years of data we will be able to detect smaller changes in bird numbers and a greater range of environmental influences on more bird species," said Dr Judit Szabo, one of the ecologists working on the project.

Some questions the monitoring will help us answer in the future are:

- Why are small birds decreasing, and what can we do about it?
- Can the effects of past changes to the landscape be repaired? Are revegetation, weed and fox control programs a good investment?



The silvereye (left) and the sacred kingfisher, two species in decline in the Mount Lofty Ranges.

## The hills are alive...

A unique collection of colourful birds live in the Mount Lofty Ranges. Many birds, like the enigmatic Mount Lofty Ranges Southern Emu-wren, are found only in this area because it is an isolated area of hilly country with high rainfall.

- Around 90% of the woodlands in the Mount Lofty Ranges have been cleared, severely changed, or broken up into small patches, and most of this has happened in the last 60 years.

- We know that many birds disappear when more than 70% of the woodland is destroyed. Bird diversity can rapidly decline if 90% of the habitat is destroyed.

- Curiously, animals do not disappear the instant their habitat is destroyed. Instead, they tend to hang around in ever-decreasing numbers for many years. This time-lag is known as the 'extinction debt'. We are seeing a decrease in some woodland birds now because of extinction debt from past land clearing.

- The vegetation at all the bird survey sites is being assessed, as part of an integrated monitoring program being run by the Nature Conservation Society of South Australia. The integrated monitoring will help us understand whether habitat restoration and management programs are reversing any of the extinction debt.



Woodlands in the Belair National Park in the Mount Lofty Range.

- What is climate change doing to our bird species?
- What are the priorities for protecting and restoring our woodlands?

To answer these questions the NCSSA is establishing habitat monitoring to complement the bird monitoring program. The data collection and analysis, and the goodwill developed over a decade, continue through a strong partnership between the NCSSA and the University of Queensland with support from the Adelaide and Mount Lofty Ranges NRM Board and the South Australian Department of Environment and Natural Resources.

**More info: [www.ncssa.asn.au](http://www.ncssa.asn.au)**

**Scientific papers and data downloads are available from the The Ecology Centre, The University of Queensland at <http://uq.edu.au/spatialecology/mlr-birddata-66440>**

*This is an edited excerpt from the pamphlet 'What is happening to the woodland birds of the Mount Lofty Ranges'. To see the whole pamphlet, please visit The Ecology Centre at [http://www.uq.edu.au/spatialecology/docs/Hughs\\_Bird\\_Files/POC868-Pamphlet.pdf](http://www.uq.edu.au/spatialecology/docs/Hughs_Bird_Files/POC868-Pamphlet.pdf)*

# Decision Point in 2011?

## An Editor's note

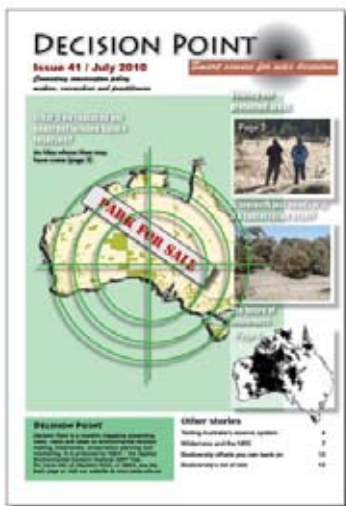
As we go to press with this, the last issue of *Decision Point* under the banner of AEDA, we're still not 100% sure about what will happen to the publication in 2011. Rest assured, our aim is to continue producing *Decision Point* (and you can expect the next issue to appear early in February), but nothing stands still so we are contemplating change. And it's a good time to consider change; *Decision Point* has consolidated its approach in the three years its been operating, and it's always good to twiddle the knobs, and now it'll be coming to you in association with a new ARC Centre of Excellence - CEED.



What that change will be, we're still working on. It'll involve some cosmetic alterations in appearance, maybe some new story elements and there'll definitely be stories coming from a wider range of researchers as CEED covers a wider base. (Though keep in mind that *Decision Point* will consider

stories on environmental decision making from all quarters (not just CEED researchers).

Maybe you like *Decision Point* just as it is. Maybe you'd like to see more of it (but less often) or less of it (more often). Or maybe you'd



rather see a different cross section of topics being covered. We've received some excellent feedback from readers over the past few years (and some of it has made a big difference to how we do things).

Whatever your preference, we'd love to hear them. And

to help you tell us, we've set up a very short and simple *Decision Point* survey at [http://www.surveymonkey.com/s/dpoint\\_survey](http://www.surveymonkey.com/s/dpoint_survey)

Please tell us what you think.

## Fertile in Oz

A total of 295,700 births were registered in Australia in 2009. Here's what the ABS has to say about it.



In 2009, Australia's total fertility rate was 1.90 babies per woman, a small decrease from 1.96 babies per woman in 2008 and 1.92 babies per woman in 2007.

Fertility rates for all states and territories decreased in 2009, except for Queensland. Tasmania had the highest fertility rate, with 2.18 babies per woman, while the Australian Capital Territory had the lowest at 1.74.

Women in Tasmania were also having their children at younger ages than women in the rest of Australia; with fertility rates highest for women aged 25-29 years. For the rest of Australia, fertility rates were highest for women aged 30-34 years.

The median age of all mothers for births registered in 2009 was 30.6 years, while the median age of fathers was 33.0 years, both slightly younger than in recent years.

More info: <http://www.abs.gov.au/ausstats/abs@.nsf/latestProducts/3301.0Media%20Release12009>

## DECISION POINT

*Decision Point* is the monthly magazine of the Applied Environmental Decision Analysis (AEDA) research hub (see below). It's available free from our website. You can also subscribe to an email alerting you to new issues as they are released at <http://www.aeda.edu.au/news>

*Decision Point* is written and produced by David Salt. If you have news or views relating to AEDA or of interest to AEDA members, please send them to David at [David.Salt@anu.edu.au](mailto:David.Salt@anu.edu.au)

When we print out *Decision Point* we use recycled paper. We hope you will too.

# aeda

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AEDA's members are primarily based at the University of Queensland, the Australian National University, the University of Melbourne and RMIT.



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