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20 million hectares by 2020

Protected areas, green infrastructure and green jobs for Queensland

A WWF-Telstra *Building Nature's Safety Net* Report

Martin F.J. Taylor ¹

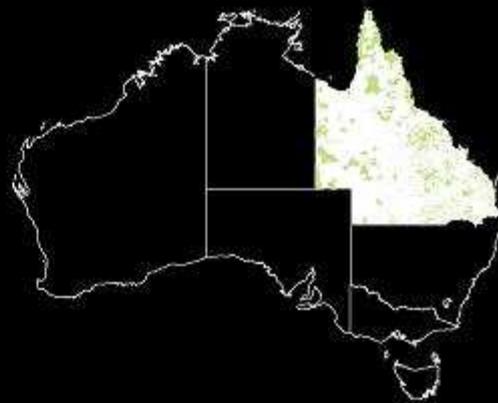
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Foreword

This WWF-Australia report is timely as Queensland has committed to a major expansion of the protected area system, including the addition of 4.35 million hectares of new national parks, at a time when the state faces difficult economic times. This long overdue parks expansion was a significant Bligh Government commitment before the recent Queensland election.

Queensland contains the greatest biodiversity of any state in Australia but has lagged behind in terms of the extent of its park system. Its spectacular natural heritage is fundamental to the state's economy, through tourism, and in protecting an array of ecosystem services.

The concept advanced in this report – that funding the expansion of the park system should be considered part of building the green infrastructure of the state – is a sound strategy which recognises that protecting our natural areas underpins much of our economic activity and societal values.

This report assesses the likely cost of consolidating the protected area system by examining land valuation data across Queensland and then analysing it for least-cost solutions.

This analysis supports the Queensland Government's own estimates that a \$12 million a year capital budget is required, as a minimum, to meet the 2020 goal in today's dollars, provided matching funds are also available. A truly comprehensive protected area system in Queensland that better samples all of the state's regional ecosystems will ultimately require a greater commitment.

Importantly, after many submissions by WWF and others, the Australian Government has made \$180 million available as part of the National Reserve System program. These funds can be accessed on a 2:1 basis, recognising that significant ongoing park management costs are borne by the State Government or other partners.

A number of suggestions are made in this report as to how Queensland can avail itself of this funding. While natural heritage protection should be a fundamental obligation of governments, and funded from consolidated revenue, current economic circumstances dictate that all options be considered.

The calls to complete Queensland's protected area system date back a number of decades, so this current government commitment should be applauded. Failure to fund the expansion adequately, however, would be a tragedy not only for the environment but also in terms of fulfilling a significant commitment to protect the state's natural assets.

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Executive Summary

In March 2008, the Queensland Government committed to expanding its national park network from 5% to 7.5% of the state's area by 2020 and expanding all protected areas to 20 million ha by 2020, representing 11.6% of the state's land area.¹

This significant, long overdue initiative recognises that Queensland is the state with the lowest percentage of land area protected and that expanding its reserve system is the highest priority of any Australian state or territory.²

However, the failure to fund new national park purchases in the 2008-9 budget has meant that the Queensland Government has essentially foregone as much as \$12 million in \$2 for \$1 funding that could have been leveraged as grants from the Australian Government NRS program to buy land for new national parks.

The State Government estimated that its parks promise would cost \$120 million, or approximately \$12 million a year in 2008 dollars over the 10 years to 2020. This would be financed through Eco Fund Queensland – a State-run fund that acts as a clearing house for carbon and environmental offsets. However, Eco Fund has no general revenue or budget dedicated to this task.

This study shows, through property-by-property simulations of protected area additions, that the government's projected \$12 million a year would be sufficient to achieve its 2020 parks commitment, provided the state obtains matching Australian Government grants and follows the most cost-efficient approach. We also show that this level of investment could be met through the GST collected from tourists visiting new parks, estimated at more than \$18 million annually.

However, these funding sources would not be sufficient to meet earlier State Government commitments to develop a fully comprehensive protected area system by 2015 that secured every regional ecosystem to at least 8% by area and over 80% of ecosystems to at least 10% by area. Significantly greater investment, in the order of \$52 million a year, likely to be split into \$40 million a year from the state and \$12 million in matching grants from the Australian Government, would be necessary to meet such comprehensiveness targets.

The current commitment to expand Queensland's protected areas is an essential first step in expanding the parks system and a means for providing the green infrastructure and jobs necessary for the state's development. The initiative would also significantly reduce the threat of extinction for many native species; halve erosion, soil loss rates and water pollution in the areas added; conserve highly valuable genetic resources; and enhance Indigenous development, depending on concurrent policy reform.

We recommend that the Queensland Government:

- recognise national parks as critical green infrastructure, providing significant returns on investment in terms of jobs and revenue from tourism as well as other public benefits;
- recognise that GST revenue collected from spending by national parks visitors exceeds that reinvested in expanding parks;
- use these GST revenues to underwrite a minimum \$12 million annual capital budget for acquisitions of new national parks to 2020;
- take immediate advantage of the \$180 million in \$2 for \$1 matching grants presently on offer from the Australian Government to buy new national parks; and
- adopt other policy measures as recommended below.

Recommendations

Recommendation 1:

The Queensland Government should recognise national parks as priority green infrastructure and budget at least \$12 million annually (in 2008 dollar terms) for the purchase of new national parks. A range of new revenue options could be considered to fund the purchases, including:

- drawing from the \$18.6 million in GST collected annually on tourism spending likely to be generated by new national parks;
- savings from cancelling the Traveston Crossing dam;
- establishing a national parks lottery; and
- carbon offsets, where feasible.

Recommendation 2:

The Federal Government should enhance and extend the National Reserve System (NRS) grants program past 2013 and ensure that funding is directed to the purchase of properties with priority ecosystems in priority bioregions.

Recommendation 3:

The Queensland Government should identify levels of management funding needed to sufficiently and sustainably abate threats to protected areas on all State-protected areas and provide incentives for the management of protected areas on other tenures.

Recommendation 4:

The Queensland Government should create a new class of strictly protected nature refuges equivalent to a private national park that are closed to all extractive and other degrading land uses, with a budget to assist in the management of such refuges to at least national park standard.

Recommendation 5:

The Queensland Government should ensure that all new nature refuges strategically advance long-standing state commitments to develop a Comprehensive, Adequate and Representative (CAR) reserve system and that the effectiveness of all protected areas be monitored to meet environmental outcomes.

Recommendation 6:

The Queensland Government should settle pending Native Title claims concurrent with the creation of all new protected areas, where applicable, and support Traditional Owners in their aspirations to look after their country within new protected areas.

Recommendation 7:

The Queensland Government should add conservation protection to high conservation value inactive stock route reserves and bring them into the protected area network while still allowing for the controlled movement of stock under special circumstances.

Recommendation 8:

The Queensland Government should stop the disposal of unallocated state land (USL) with high biodiversity values and start a systematic process, with public input, for transferring all suitable USL to national parks at the same time as Native Title claims are resolved.

Recommendation 9:

The Queensland Government should transfer areas of state forest into national parks, as required, to build the CAR reserve system and halt any further approvals or renewals of mining exploration permits and grazing permits or leases in these areas.

Recommendation 10:

The Queensland Government should review policy settings for mining and petroleum exploration arrangements to enable its commitments to protected area expansion to proceed unimpeded.

Meeting protected area commitments

Commitments made

For Queensland's National Parks Centenary on 28 March 2008, the Queensland Government announced a commitment to:

- “increase our national park estate by 50 per cent by 2020”, i.e. from 5% of the state's area – 8.65 million ha – to 7.5% of the state, representing 13 million ha; and
- “grow the total area under conservation tenure to 20 million hectares” by 2020 – that is, increasing all protected areas, including nature refuges, to cover 11.6% of the state.³

In addition, Queensland is committed to the targets adopted by the cross-jurisdictional Natural Resource Management Ministerial Council in 2005, as laid out in *Directions for the National Reserve System*.⁴ Direction 1, the comprehensiveness target, commits Queensland to achieving representation in the protected area system of at least 80% of all regional ecosystems in each Interim Biogeographic Regionalisation of Australia (IBRA) bioregion by 2015.

In recent WWF-Australia analysis of progress, Queensland was identified as the state with the lowest proportion of total land area protected. Nevertheless, Queensland reported that it would be able to move from below 33% of bioregions protected to reach the comprehensiveness target of over 66% protected by 2015.⁵

In this paper we compare the current Queensland Government's 2020 commitment with the expansion of protected areas needed to ensure at least 8% by area of every mapped regional ecosystem is represented in protected areas in Queensland, using a cost-effective mix of new national parks and nature refuges over private land. We compare this comprehensive, least-cost solution with the government's 2020 commitment.

This analysis reinforces the absolute necessity of the Queensland Government to fund the current 2020 parks commitment.

A comprehensive solution to protect all ecosystems

We simulated future property-by-property additions to Queensland's protected area estate as either national parks or nature refuges using:

- actual sales and valuation data (see Simulation of a comprehensive, least-cost protected area solution for Queensland p 23);
- a conservative rule of 75-80% preference for nature refuges over purchases to secure a targeted property as a protected area; and
- a target of sampling at least 8% of every mapped regional ecosystem in Queensland.

We estimate this comprehensive solution would require the state to spend \$516 million (in 2008 dollars) purchasing 3.27 million ha of new national parks (Table 1).

These new national park purchases, together with transfers of 4.1 million ha of state lands and 12.8 million ha of nature refuges, would represent every single mapped regional ecosystem in the protected area system with at least 8% of the original extent and would also meet the 2015 comprehensiveness target to have 80% of regional ecosystems in each bioregion represented in the reserve system (Table 1).

Table 1: Areas and costs, in 2008 dollars, of new protected areas needed to include at least 8% by area of all mapped regional ecosystems at least-cost and 75-80% preference for adding nature refuges over new national parks: the “comprehensive solution”.

Pathway	Area added (m ha)	Purchase cost (2008 \$m) ¹	Annual management cost added (2008 \$m pa)	Tourism spending added (2008 \$m pa) ²
<i>New national parks from ...</i>				
Freehold (FH) purchase	0.59	\$235.19	\$4.84	
Leasehold (LH) purchase	2.68	\$281.22	\$21.93	
LH Future Conservation Area	0.67	<u>\$70.31</u> ³	\$5.48	
State land/forest transfer ⁴	3.44		\$28.13	
<i>All new park additions</i>	<i>7.38</i>	<i>\$516.41</i>	<i>\$60.38</i>	<i>\$406-\$606</i>
<i>New nature refuges over ...</i>				
Freehold land	2.71		\$10.35	
Leasehold land	10.05		\$38.40	
<i>All new nature refuges</i>	<i>12.76</i>		<i>\$48.75</i>	
Grand total⁵	20.14	\$516.41	\$109.13	\$406-\$606

1. Includes transaction costs as detailed in Table 3 below. See p 23 for methods.
2. Projected extra spending by tourists that is entirely attributable to the new national parks as estimated in Table 2 below.
3. Cost estimate is indicative only and not included in totals. Upon total or partial non-renewals of term leases with FCAs the state is required to compensate the cost of improvements. This was crudely estimated in 2008 dollars as the difference between market and unimproved land values. The future cost of payouts for improvements forms a contingent liability for government, but one that is very difficult to forecast accurately over the 30-year time frame of terminating FCA leases. While some leases have extensive and valuable improvements, others have little and thus costs are highly variable.
4. Such conversions are not cost free and entail indirect investments by the state in alternate resource bases for existing state forest users, such as new timber plantations. These costs cannot be estimated in any regular way. Like FCAs, the conversion of state forests also takes place over a long time frame. Under the South-East Queensland Forest Agreement, some forests will not be transferred to national parks until 2024.
5. The upper range of all simulated purchase costs was \$3.4 billion, since some solutions require a very different mix of property purchases of different land values to meet the same targets. Only the least-cost simulated solution is shown here. The least-cost solution for a mix without any FCA transfers was higher, but not by a large percentage.

This analysis assumes that purchases are confined to high-priority ecosystems with subdivision or disposal of surplus areas, if necessary, estimated in this analysis to amount to 30% by area of properties acquired on average (see p 23). It also assumes that all other costs of the non-renewal of FCAs containing leases, conversion of state forests and other state lands, or the establishment of nature refuges is covered by base-level agency budgets.

Even this more ambitious commitment to meet the 2015 comprehensiveness target could be funded entirely from GST receipts from parks-generated tourism. New parks could generate from \$406–\$606 million in new tourism spending in 2008 dollars based on recent survey data and GST receipts from this spending could repay the capital investment of \$516 million in 10 years (Tables 1-2).

Similar studies in other states have produced comparable estimates for meeting protected area targets. A 1995 NSW study predicted that it would have cost \$225–\$842 million to purchase land to sample 10% by area of all of the fine scale vegetation associations in the state.⁶

The 8% by area minimum target for each regional ecosystem is used in this study as a notional cut-off to calculate costs in meeting the comprehensiveness commitment and to put the current funding needs for the government’s 2020 target in perspective. It still may not prove adequate for some regional ecosystems.

The JANIS criteria used in Regional Forest Agreements, for example, considered 15% by area the minimum adequate area for inclusion, with higher minimum percentages for threatened, old-growth and wilderness forests.⁷ The agreed adequate sampling targets for Marine Protected Areas are even greater, at 20-30%.⁸

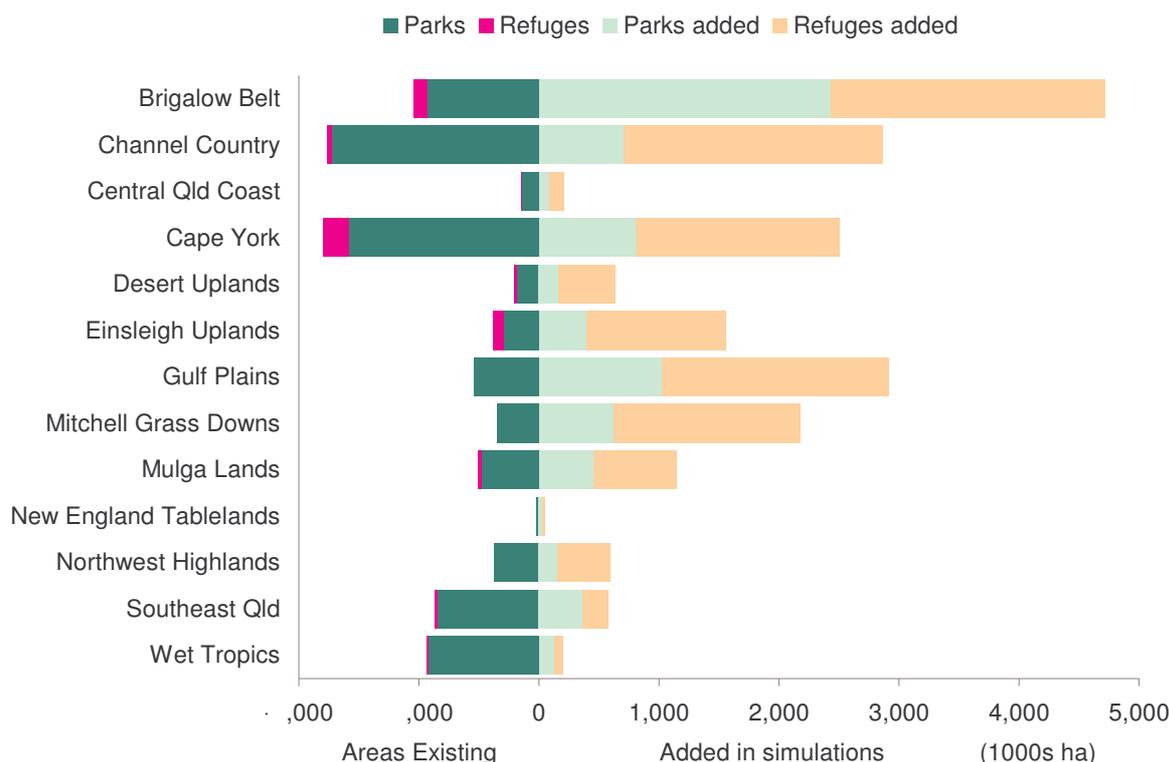


Figure 1: Areas of national parks (including all State-managed protected areas) and nature refuges existing and added in each bioregion in the comprehensive solution.

The 2015 target of 80% comprehensiveness, agreed to by all states and territories in 2005, set no minimum percentage of area for ecosystems to be counted towards the target.⁹

In the simulated comprehensive solution, based on including 8% minimum area of all regional ecosystems:

- 83% of regional ecosystems were sampled to a minimum of 10% by area; and
- 72% were sampled to at least 15% by area (see p 25).

In the comprehensive solution developed here, total costs were reduced by excluding areas surplus to requirements.

Most of the area added in the simulated comprehensive solution was in regions dominated by extensive livestock production: the Brigalow Belt, Outback and Cape York Peninsula (Table 1 and Figure 1).

Almost all park acquisitions in this solution took advantage of existing state lands, state forests, USL or non-protected area reserves. Prioritization of the inclusion of state land areas is required to balance CAR targets with competing land uses.

\$120 million can fulfill 2020 national parks promise

The government estimated that its protected area target to add 4.325 million ha of new national parks by 2020 would cost approximately \$120 million, or \$12 million a year in 2008 dollars to be financed through the new Eco Fund Queensland.

From Table 1, the average price per hectare acquired in the comprehensive solution was \$157.92. Thus \$120 million of state money, matched by \$120 million in Federal Government grants, could acquire 1.52 million ha of new national parks if applied using the same rules to develop the comprehensive solution.

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Thus the proposed State Government investment, if actually implemented, could meet the government's promise, and deliver a highly representative parks system by funding the addition of 1.52 million ha of new national parks, provided that:

- the Australian Government invests a matching \$12 million a year in the purchase of new national parks and the current program is extended past 2013 (see Australian Government matching grants below);
- the purchasing strategy follows a cost-minimisation approach, confined to high-priority ecosystems, with excisions of surplus areas where feasible;
- the balance of 2.8 million ha required to meet the government's national parks promise is achieved by state land transfers and FCAs over leasehold land;
- all other additions to reach 20 million ha by 2020 take the form of nature refuges, with reforms to strengthen security (as discussed below); and
- all other costs of the non-renewal of FCAs containing leases, transfer of state forests and other state lands, or establishment of nature refuges can be covered by base-level agency budgets.

Pro-rating the estimated tourism return on investment in the comprehensive solution (Tables 1 and 2), the \$120 million investment proposed by the State Government, if applied as indicated, is forecast to return an extra \$186 million a year in tourism spending generated by the new parks acquired. This represents about \$18.6 million a year in extra GST and about 4,640 new jobs.¹⁰

\$120 million goes halfway to a comprehensive system

A \$120 million investment by the State Government, if matched by another \$120 million of Australian Government funds, could go roughly halfway to building the comprehensive solution in Table 1 by adding 1.52 million ha of the 3.27 million ha of properties flagged for purchase as new national parks (Table 1).

The gap could potentially be filled by nature refuges negotiated with willing landholders, but the return on investment from tourism to the resulting smaller parks estate is likely to be proportionally less, as discussed below.

Nature refuges may also not be the most secure option for protecting highly-critical biodiversity assets, even if reforms are put in place to improve security, as discussed below.

Financing options

Protecting our natural heritage is a fundamental obligation of governments and funding should come directly from consolidated revenue.

As discussed, projected GST receipts on parks-generated tourism spending, alone, could be sufficient to finance the expansion of parks (Tables 1 and 2).

However, given current economic conditions, complementary measures are suggested to help meet the identified financial need.

Australian Government matching grants

The Australian Government recently increased the grant budget for parks acquisitions by state, territory and non-government applicants to \$180 million, or about \$36 million annually until 2013. Additional Australian Government funds will also be necessary after 2013, but have yet to be allocated in forward estimates. These funds can be accessed on a 2:1 basis in recognition of the significant ongoing management costs borne by states and other partners, beginning with the 1993 parliamentary standing committee inquiry.¹¹

From 2006 Collaborative Australian Protected Areas Database (CAPAD) data we estimated the areas needed to bring each sub-biogeographic region in Australia up to 10% by area protected, and therefore meet the 2015 comprehensive target. This would require 33.8 million ha across Australia. Of this, Queensland had the largest land shortfall to be met of 11.6 million ha, which represents approximately one-third of the national protected area gap to reach this target. Queensland might, therefore, reasonably expect to be awarded one-third of this program budget, or about \$12 million a year until 2013.

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The enhanced NRS program presents a major opportunity for Queensland to meet its national parks commitment.

It has been many years since the Australian Government has committed a significant level of resources to this program. The Queensland government must, therefore, allocate its own capital budget for parks purchases as soon as possible to take advantage of this scheme.

Savings from greening infrastructure priorities

If green infrastructure were considered as critical to society and the economy as built infrastructure, budget priorities would be very different. The inclusion of green infrastructure as a fundamental component of planning is comparatively well advanced elsewhere.¹²

Green infrastructure brings both direct income benefits, primarily from nature-based tourism, but also a wide range of ecosystem service benefits, as discussed below. In particular, national parks are already a major and indispensable component of tourism industry infrastructure, as much as built infrastructure like airports, freeways and hotels.

Although the present government promised \$36 million for tourism marketing, it has no budget for building the fundamental asset of the tourism industry, the national parks system.¹³

The financial cost of establishing new national parks estimated here represents a fraction of the state budget for built infrastructure. The 2008-9 state budget provided for \$107 billion dollars for built infrastructure in South-East Queensland, alone, over the period 2008-2026; almost 900 times more than the \$120 million the Queensland Government says is needed to achieve the 2020 national parks target.¹⁴

In comparison, Queensland has allocated no budget to meet its promise to build the national parks system,¹⁵ even though its national parks are associated with up to 33,320 jobs and generate up to \$4.43 billion a year in spending by park tourists. These figures exclude the Great Barrier Reef, which accounts for an additional \$4.5 billion a year and 63,000 jobs.¹⁶

One very significant way that Queensland could start greening its infrastructure priorities and achieve enormous savings is by cancelling the Traveston Crossing Dam project.

If allowed to proceed, this dam would cost \$1.7 billion¹⁷ and adversely modify the habitats of at least four threatened freshwater species – the Queensland lungfish, giant barred frog, Mary River turtle and Mary River cod.

Due to anticipated difficulties in obtaining Federal Government approval, the State Government postponed construction by four years in late 2008 but has yet to definitively cancel the project.

The Australian Senate Inquiry in 2007 identified more cost-effective alternatives to the proposed dam to meet projected water demand, such as enhancing existing dams, demand management and rainwater tanks.¹⁸

Cancelling this dam, and using the savings, in part, to fund the state's parks commitment, would establish a major landmark in greening state infrastructure priorities.

Eco Fund

The State Government established Eco Fund as the principal funding mechanism for the promised expansion of the protected area system. The government envisaged carbon offsets as its major revenue stream.¹⁹

Unfortunately, Eco Fund will not be fully operational until July 2009 and cannot secure the no-strings-attached revenue stream needed for purchases of new national parks by leveraging the \$2 for \$1 Australian Government funding currently on offer.

According to Eco Fund, offsets require the protection of regenerating vegetation, which can either absorb carbon in plant growth or can grow back to remnant status, thus providing an offset for the equivalent remnant vegetation or for carbon emissions elsewhere. However, offsets do not involve the protection of intact remnant ecosystems.

Any no-strings-attached monetary offset is only possible for unavoidable and irreplaceable losses, once all other mitigation options are exhausted. The disposition of such payments for state development projects is at the discretion of the Coordinator General and is not required to flow into Eco Fund under current policies.²⁰

Over the longer term, however, Eco Fund should look for ways to use parks and protected areas as revenue-yielding deforestation and reforestation offsets within the developing national greenhouse gas regulatory scheme (see Storing carbon p 18).

Lotteries and gambling taxes

Although Queensland annually raises \$221 million in taxes on lotteries and \$931 million on all gambling-related revenue streams, none of this is applied to protected areas.²¹ A 1.2% increase in these taxes could provide \$12 million annually to purchase new national parks.

Opinion polls suggest significant support for a specific lottery capable of raising large amounts of revenue to finance new national parks. In a recent poll, 79% of Queensland voters agreed or strongly agreed with the statement that: “The government should buy new national parks to protect wildlife habitats”. Some 78% of voters also said that: “Creating more parks and reserves to save our wildlife” would be a strong or very strong influence on deciding how they would vote in the 2009 state election.²²

Recommendation 1:

The Queensland Government should recognise national parks as priority green infrastructure and budget at least \$12 million annually (in 2008 dollar terms) for the purchase of new national parks. A range of new revenue options could be considered to fund the purchases, including:

- drawing from the \$18.6 million in GST collected annually on tourism spending likely to be generated by new national parks;
- savings from cancelling the Traveston Crossing dam;
- establishing a national parks lottery; and
- carbon offsets, where feasible.

Recommendation 2:

The Federal Government should enhance and extend the National Reserve System (NRS) grants program past 2013 and ensure that funding is directed to the purchase of properties with priority ecosystems in priority bioregions.

Subdivision required to contain costs

In practice, the addition of approximately 20 million ha in the comprehensive solution (Table 1) would require buying, converting or placing nature refuges over properties constituting more than 30 million ha in total area.

This includes areas that are surplus to requirements, consisting of non-remnant vegetation and non-targeted vegetation, such as portions of not-of-concern regional ecosystems already well protected in reserves.

It was not practicable to simulate a process of subdivision to excise such surplus areas from the comprehensive solution. However, we were able to estimate that surplus areas comprised about 30% of the total area of properties acquired on average. Such areas would, in practice, be excised and either excluded from purchase or on-sold after purchase (see p 23). The areas and costs shown reflect what was retained in the comprehensive solution after disposal or excision of this surplus land.

There are, however, potential benefits in retaining some non-targeted “surplus” areas. They can serve as:

- buffers and link regional ecosystems;
- reduce management costs through boundary consolidation; and
- possess potential carbon offset value.

Subdivision or equivalent is already practiced and provided for in legislation.

Under the FCA provisions of the *Land Act 1994* if part of a lease is identified as an FCA, only that part that lies outside the FCA may be renewed as a rural lease, the FCA itself reverting to the state upon renewal.

The Trust for Nature Queensland operates a rolling fund that is used to purchase properties, which are then placed under nature refuges and on-sold to recoup capital. The revolving fund approach could be used in conjunction with State and Australian Government funds to purchase properties to be subdivided, with the targeted portion entering the parks estate and the remainder on-sold with a nature refuge agreement if needed.

Nature refuge agreements themselves usually entail a subdivision-like approach that maps out a zoning scheme that allows restricted uses, including agriculture and livestock, in defined zones of a property.

Management budget review required

The estimates of additional management costs reported here only represent an extrapolation of current management spending patterns, and are subject to both over and under-estimation.

The costs of protected area management are driven, to a large extent, by visitation and also remoteness. Parks with high visitation are typically more expensive to manage, but also attract more tourism spending.

Many of the new parks in the comprehensive solution and virtually all the private nature refuges are unlikely ever to be as highly visited as parks near urban centres. Hence the \$109 million a year in added management costs estimated for the comprehensive solution (Table 1), based on current state-wide average per hectare investment (shown in Table 3), may represent an over-estimate.

An additional factor that may result in lower than expected costs is that expanding the estate may introduce economies of scale, especially with regard to existing regional administrative and management arrangements. Reducing boundary-to-area ratios and removing associated management problems that otherwise drive up per hectare costs are also possible as smaller, more fragmented parks are likely to be more costly to manage on a per hectare basis.

However, the level of management and financial investment required to effectively abate the threats to biodiversity within the parks estate will be certainly higher than current levels of investment and should be subjected to further assessment.

Recommendation 3:

The Queensland Government should identify levels of management funding needed to sufficiently and sustainably abate threats to protected areas on all State-protected areas and provide incentives for the management of protected areas on other tenures.

Reform nature refuges and extend options

Although nature refuges are a less costly way to meet targets than buying land for national parks, there are more risks and uncertainties associated with nature refuges in protecting biodiversity.²³

There has been no systematic auditing or studies to compare the effectiveness of nature refuges relative to parks in abating threats and conserving biodiversity. Unlike parks, no management plans are required for nature refuges, nor is there presently any strategic plan or provision for the systematic monitoring or auditing of their effectiveness, which represents a serious short-coming.

Nature refuges are not cost-free, as they demand some state commitment to their management. They also cost the conservation agency about \$25,000 per transaction to establish.

Nature refuges are promoted by different arms of the same agency, without strategic integration into state commitments to develop a CAR reserve system and the contribution they make to meeting these agreed goals needs to be assessed.

Unlike parks, nature refuges can be grazed by livestock, and are subject to logging, mineral and petroleum exploration and exploitation.

Nature refuges can apply to an entire working pastoral property. In such cases they may not legitimately meet the accepted International Union for Conservation of Nature (IUCN) guidelines that no more than 25% of multiple use category VI protected areas be given over to sustainable production purposes.²⁴

Unlike national parks, which have a base budget allocation for professional management, funding for nature refuge management is sporadic and provided only by government to a subset of landholders bidding for the limited funds of the NatureAssist program. Moreover, landholders in South-East Queensland are ineligible for this assistance and those in other coastal areas have lower priority than refuges in rural Queensland.²⁵

Unlike parks, nature refuges typically contribute little in terms of recreational opportunities and tourism industry revenues because they fall primarily on private land. However, this need not always be the case.

For fixed term rural leases, the amended *Land Act* provides an incentive in the form of a 20-year lease extension if the lease is in "good condition", has a conservation agreement and has an Indigenous use and

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access agreement. The conservation agreement need not be a nature refuge agreement and the Indigenous use and access agreement need not resolve or settle any pending Native Title claim.²⁶

A nature refuge agreement made over a lease without the involvement and approval of Native Title claimants is not binding on the lessee's title successors or other persons who have an interest in the land, including the Native Title claimants themselves.²⁷

Such nature refuges, therefore, do not meet the NRS inclusion criteria that the protected area be dedicated for at least 99 years.²⁸

These relative disadvantages of nature refuges could be overcome by the following key measures:

- ensuring that the expansion of nature refuges is strategically driven by agreed CAR commitments;
- developing and funding management plans, regular management effectiveness reporting and auditing arrangements for nature refuges;
- establishing the option for a strictly protected class of nature refuge equivalent to a national park to avoid mining exploration and development, or any other extractive uses. This would be particularly attractive for some private land-owners who have dedicated themselves to protecting their land and wish to see such efforts maintained;
- establishing systematic monitoring and controls over livestock or forestry production, if it is to be allowed in a nature refuge, to ensure no significant, measured impact on protected values;
- providing a significant increase in incentives and management support grants;
- supporting eco-tourism, where shown to be sustainable and appropriate; and
- settling Native Title claims over leasehold land targeted for nature refuges through consent determinations by the state to allow nature refuges to be dedicated in perpetuity under an appropriate Indigenous Land Use Agreement.

Recommendation 4:

The Queensland Government should create a new class of strictly protected nature refuges equivalent to a private national park that are closed to all extractive and other degrading land uses, with a budget to assist in the management of such refuges to at least national park standard.

Recommendation 5:

The Queensland Government should ensure that all new nature refuges strategically advance long-standing state commitments to develop a Comprehensive, Adequate and Representative (CAR) reserve system and that the effectiveness of all protected areas be monitored to meet environmental outcomes.

Legislated protection versus protected areas

It is pertinent in this debate to ask whether there is any real need to make such significant investments buying properties to become new national parks when there is separate legislated "protection" of ecosystems and native species. Does the creation of protected areas represent any significant additional benefit for biodiversity conservation?

A number of legislative provisions for biodiversity conservation are already present in Queensland. The major acts being:

- the recently amended *Land Act 1994*, which now lists "conserve biodiversity" as a duty of care of all leaseholders on state land. However, there is no clear mechanism or program for determining whether lessees are complying with duty-of-care requirements, other than by assessments of "land condition", which only applies to fixed-term rural leases and has limited scope for assessing biodiversity values.²⁹
- the *Nature Conservation Act 1994*, which lays out the management categories for parks and nature refuges. This act generally prohibits the taking of native wildlife without a permit, but has few effective provisions for protecting habitats, other than through the creation of protected areas.
- the *Wild Rivers Act 2006*, which allows for the delineation of "high preservation areas" (HPAs) along designated rivers. Although dam-building is prohibited, minor harmful actions may still be permitted

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in HPAs, including ongoing livestock production and extractive activities, new sewage treatment works and new borrow pits less than 100 sq m.³⁰

- the *Vegetation Management Act 2003* (VMA), which regulates the clearing of remnant vegetation as well as some regrowth on leasehold land through permits subject to codes. This act does not absolutely prohibit clearing of any ecosystem and restricted levels of clearing may continue without a permit under a number of exemptions and codes. Mining, in particular, is not bound by the act. In addition, permits for clearing of intact vegetation may go forward if “offset” by protecting non-remnant vegetation of exactly the same type to the point that it matures into remnant vegetation, theoretically replacing what was lost. This act also does not regulate the non-clearing related impacts of livestock production, which is the most pervasive land use and the most common threat to native species.³¹ In contrast, national parks prohibit the clearing of any vegetation other than exotic pest species.

Although these laws restrict activities known to harm wildlife and biodiversity, they do not amount to a dedication of specific areas to the primary purpose of conservation and recovery of biodiversity. The IUCN definition of a protected area requires such a specific dedication, so that all other uses and purposes are secondary.

Moreover, research demonstrates that protected areas are essential for the protection (significantly correlated with stable or recovering trends of populations) of threatened species in Australia compared to other land uses.³²

Return on Investment

Protected areas produce many benefits, some of which are quantifiable in dollar terms³³. They include:

- tourism jobs and revenue;
- Indigenous development;
- reducing the threat of native species extinction;
- reducing erosion, soil loss and water pollution;
- storing carbon; and
- conserving genetic resources.

Tourism revenue

Fully attributable annual parks tourism spending under the comprehensive solution was forecast to increase by about 50%, with the final parks system generating on average \$1.2 billion, and up to \$1.83 billion a year in tourism spending in 2008 dollars (Table 2). As discussed below, the proportion of tourist spending fully attributable to parks may be underestimated.

This level of spending would return to Treasury about 10%, or at least \$120 million a year, in GST (Tables 1 and 2). This amount is much greater than the projected \$12 million annual investment needed to meet the government's 2020 commitment or even the estimated \$52 million annual capital budget needed to achieve a comprehensive solution (Table 1).

Recent surveys by Ballantyne et al estimated that visitors to national parks in Queensland spent \$4.43 billion in 2006-7, which represented 28% of the state's total annual tourism expenditure.

Table 2: Tourism spending attributed to national parks, and estimates of spending increases under the comprehensive solution (in 2008 dollars).

Bioregion aggregates	National parks-generated spending (\$m) ¹		2008 parks area (1000 ha)	Parks-generated spending per hectare (\$m)		Parks added (1000 ha)	Parks-generated spending added (\$m)	
	Average	High est.		Average	High est.		Average	High est.
Central Qld Coast ²	\$88	\$155	146	\$600	\$1,061	90	\$54	\$96
South-East Qld ³	\$341	\$493	843	\$404	\$585	359	\$145	\$210
Tropical north ⁴	\$334	\$530	2,504	\$133	\$212	944	\$126	\$200
Brigalow Belt and Darling Downs ⁵	\$27	\$33	945	\$28	\$35	2,466	\$70	\$86
Outback ⁶	\$12	\$15	3,944	\$3	\$4	3,522	\$10	\$13
Queensland	\$801	\$1,226	8,382			7,382	\$406	\$606

1. Corrected from 2006 to 2008 dollars from Ballantyne et al (Table 13) using Reserve Bank currency devaluation rates.³⁵
2. The Central Queensland Coast bioregion matched to Mackay Whitsundays and Capricorn tourism regions in above cited study 1.
3. The South-East Queensland bioregion matched to Gold and Sunshine coasts, Wide Bay, Great Sandy and Brisbane tourism regions in 1.
4. Comprising the Wet Tropics and Cape York bioregions matched to TNQ and Townsville tourism regions in 1.
5. Comprising the Brigalow Belt and New England Tablelands bioregions matched to Carnarvon and Toowoomba tourism regions respectively in 1.
6. All other bioregions matched to Outback tourism region in 1.

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However, only 17% of this spend – between \$750 and \$1,148 million – was considered to be entirely attributable to the existence of national parks visited (Table 2).³⁴

This “attribution factor”, to identify the portion of all tourist spending that is entirely attributable to parks, was strikingly lower than the 88-92% found in studies for two regions of Western Australia³⁵ and thus may be underestimated for Queensland.

To estimate the potential contribution to tourism revenues from the comprehensive solution, we matched bioregional park areas added to the tourism regions used by Ballantyne et al 2009. Spending per hectare estimators for each tourism region were then used to forecast the spending increase from areas of parks added in the comprehensive solution (Table 2).

Since most simulated parks additions were in lower yield inland bioregions, and purchases were excluded by design from higher yield coastal regions, the forecast tourism revenue increase is not in the same proportion as the simulated increase in area.

This could change, depending on how the government and industry invest in marketing and destination development in Outback Queensland.

Indigenous development

Indigenous Protected Areas (IPAs) represent a success story, accounting for one-third by area of the growth in the NRS over the period 1997-2007,³⁶ primarily in other states.

IPAs have attracted increased Australian Government support through Working on Country programs and have had many well documented social and economic benefits for Indigenous communities.³⁷

In Queensland there is one Indigenous-owned nature refuge – Jamba Dhandan Duringala, near Bollon – and two IPAs under the Australian Government program in Queensland thus far – the Kaanju Homelands IPA on Cape York, and Guanaba, in South-East Queensland.

Seven more IPAs are under development.³⁸ On Cape York Peninsula, an increasing number of national parks have been transferred to Indigenous ownership and joint management as a result of the *Cape York Heritage Act 2007*.

National parks and nature refuges in Queensland have generated relatively few benefits for Indigenous development to date, with progress largely confined to Cape York. Broadly, Native Title claims remain largely unresolved and Indigenous land ownership remains low outside of Cape York.

Indigenous involvement in protected area management either as parks service employees or as rangers on Indigenous-owned and run protected areas (IPAs) remains low. Outside of Cape York, there has been relatively little movement towards answering the position of Native Title and Traditional Owner bodies articulated at a summit in 1999, which, among other things, requested that:

- the state transfer ownership of parks back to legitimate Traditional Owners; and
- parks be co-managed with the objective of eventual sole management by the Traditional Owners.³⁹

Native Title interests should not represent a significant impediment to the expansion of the protected area estate. Indeed, the removal of competing title or other interests over state lands (principally on leasehold lands), represents a significant step forward for Traditional Owners seeking the full exercise of their long-sought Native Title rights. In some cases, the movement of state lands into the parks estate could entail recovery of full ownership of country with joint or co-management.

Acquiring land for the conservation estate, particularly freehold land on which Native Title was presumed by the court system to have been extinguished, could also provide an opportunity for Traditional Owners to realise their aspirations for “looking after country”, depending on the willingness of government to assist.

Recommendation 6:

The Queensland Government should settle pending Native Title claims concurrent with the creation of all new protected areas, where applicable, and support Traditional Owners in their aspirations to look after their country within new protected areas.

Reducing extinction risk for native plants and animals

Targets for the sampling of threatened species ranges were not used in this analysis, due to the large numbers of species involved and the uncertain, variable and incomplete nature of distribution and habitat data.

Recent research shows significant gaps in the inclusion of threatened species habitats in Queensland's protected areas. Forty-four percent of 390 species listed under the Federal *Environmental Protection and Biodiversity Conservation Act* predominantly occurring in Queensland have less than 10% of their "known or likely to occur" distributions protected, while 74.4% had less than 50% of their distributions inside protected areas as defined in the 2006 CAPAD. Sixty-five species had no protected habitat at all.⁴⁰

These conclusions corroborate an earlier analysis based on the limited data contained in recovery plans for threatened fauna, which identified 26 species occurring in Queensland for which data in recovery plans was sufficient to classify the proportion of occupied habitat inside protected areas. Eleven species (42%) had less than 10% of their habitat protected, while 73% had less than 50% protected.⁴¹

The contribution of future protected areas to protecting threatened species habitats was coarsely quantified in this study, with significant limitations.⁴²

The areas identified as priorities for inclusion in 80% or more of simulations, if protected, would improve the habitat protection category for 24% of species, relative to the existing system, indicating a significant improvement in habitat protected in the simulated solutions. There was no significant difference between plants and animals.

However, this analysis is a weak indicator of the reserve system's performance for capturing threatened species habitats because it relies on an incomplete set of point records, and distributions are not modelled or inferred, which presents its own difficulties. Species survey effort and resulting records are also incomplete and biased to existing protected areas and more populated, coastal areas or those close to roads. The analysis also overestimates the actual overlap of protected areas with species ranges, since records of species occurrence are biased towards protected areas.

Reducing erosion, soil loss and water pollution

To quantify the contribution of protected areas to soil conservation, hill-slope erosion ratio (present to pre-European) spatial estimates⁴³ were compared between existing protected areas and those within 5 kilometres of existing protected areas.⁴⁴

The average erosion ratio in areas within 5 km of Queensland protected areas was more than double, at 4.41 the average ratio inside protected areas of 1.81.

Hence we could expect a halving of soil erosion and loss rates, on average, across the 20 million ha proposed for addition in the comprehensive solution.

Storing carbon

Protected areas, particularly those converted from state forests or grazing land, have significant potential to draw down atmospheric carbon dioxide and reduce greenhouse gas emissions. These carbon savings could be used to attract extra revenue to assist in parks expansion, depending on policy settings arising from the national Carbon Pollution Reduction Scheme (CPRS).

Woody regrowth areas in Queensland absorb from 1–26 tonnes of carbon per hectare annually, depending on productivity.⁴⁵ It has been determined in southern Australia that mature *Eucalyptus regnans* forests even if subject to infrequent stand-replacing fires hold three times the carbon of a forest logged on an 80-year cycle.⁴⁶

This suggests that even remnant vegetation in areas such as state forests formerly subject to degradation from grazing, thinning or logging has the capacity to absorb significant additional amounts of carbon dioxide. If brought into protected areas, this vegetation could also qualify for carbon credits, depending on national policy.

Under the proposed CPRS, the Australian Government has ruled out coverage of deforestation, which includes regrowth absorption of carbon as a net offset, and has indicated that incentive schemes could be developed as complementary measures to combat deforestation. The states and territories are therefore free

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to develop their own schemes to regulate or encourage deforestation emissions reductions to complement the national scheme. Reforestation projects on land that was non-forest as of 31 December 1989 are accounted for separately to deforestation and may already be accredited as carbon sink offsets for the voluntary market.⁴⁸

Converting agricultural properties into protected areas also helps reduce greenhouse gas emissions by ceasing methane emissions from livestock and nitrous oxide emissions from fertilizers. Methane emissions from livestock are the largest single source of agricultural emissions.⁴⁷

Conserving genetic resources

Queensland enacted the *Biodiscovery Act 2004* to regulate access to and benefits from sharing the State's genetic resources.

One biodiscovery company, alone, has invested \$100 million in a Queensland collaboration to build natural product discovery capacity, indicating the potentially enormous economic value of protected genetic resources.⁴⁸

However, no systematic assessment has yet been published of the economic value of the genetic resources in Queensland's existing or future protected areas. Clearly it must be greater than \$100 million.

Key issues and opportunities to expand the protected area system

Stock route reserves

The stock route network in Queensland averages 300 metres wide – much more than that needed for roadways and utilities – and primarily consists of overlapping road reserves and reserves for camping and water.

On term grazing leases, stock routes may extend beyond road reserves to overlap leased state land. That part of the stock route network completely overlapping road reserves is referred to here as “stock route reserve”.

About two million ha of stock routes in Queensland are no longer used for the droving of stock and are classified as “inactive”. Local governments are responsible for stock route management but do not have revenue to meet costs, since fees and levels of usage in many areas are low.

Stock route reserves often retain the only remnant vegetation in largely cleared areas and comprise a ready-made corridor for wildlife and plants that are altering their ranges in response to climate change. The stock route reserve also provides a framework around which landscape recovery could be focused. It is proposed that inactive stock routes of high biodiversity value be afforded additional protection, coupled with funding for their conservation management. Such arrangements need not alienate stock routes from occasional stock movements under specific conditions, should future needs apply.

Recommendation 7:

The Queensland Government should add conservation protection to high conservation value inactive stock route reserves and bring them into the protected area network while still allowing for the controlled movement of stock under special circumstances.

Unallocated state land transfers

Queensland still has approximately 1.2 m ha of unallocated state land (USL). The *Land Act 1994* as amended only requires the Chief Executive to “take account” of planning strategies and policies and the explicit object of the act to protect “environmentally and culturally valuable and sensitive areas and features.”⁴⁹

However, conversion of USL to commercial use still appears to be the priority, with conservation uses secondary.⁵⁰

The fate of USL is decided without public notice, consultation or adherence to publicly consulted strategies or principles that include biodiversity conservation.

Recommendation 8:

The Queensland Government should stop the disposal of unallocated state land (USL) with high biodiversity values and start a systematic process, with public input, for transferring all suitable USL to national parks at the same time as Native Title claims are resolved.

Transfer of state forests

About 406,000 ha of state forest and timber protected areas in South-East Queensland and 480,000 ha in the Wet Tropics have been closed to logging and are in the process of being converted to national parks. About 80% of the Wet Tropics forest transfer area and 58% of South-East Queensland’s forest protected areas were gazetted as protected areas as of late 2007.⁵¹

Other state forests that potentially could make significant contributions to the protected area estate are those in the Brigalow Belt ("Western Hardwoods") and Central Queensland Coast bioregions.

In 2006, the government announced a buy-back of 30% of the timber allocation in the Western Hardwoods transfer area⁵² and, in 2008, spending of \$44.6 million over seven years to add 8,200 ha to the plantation resource base for the timber industry. It is not clear, however, if this fully resolves the timber industry claims over this area.⁵³ No further details have emerged on the resolution of grazing, mining and bee-keeping permits and leases over the Western Hardwoods forests.

It is important that those priority state forest areas required to develop a CAR reserve system be advanced as part of securing the current government commitments to expand the national park estate.

Recommendation 9:

The Queensland Government should transfer areas of state forest into national parks, as required, to build the CAR reserve system and halt any further approvals or renewals of mining exploration permits and grazing permits or leases in these areas.

Leasehold land purchases or FCAs

Three principle modes exist for bringing leasehold land into the protected area system:

- through acquisition: leases can be acquired like any property by purchase at market value from a willing seller;
- Future Conservation Areas (FCAs) over term leases; and
- nature refuge agreements.

State rural leasehold land covers about 63% of Queensland, mostly in the north and west. Some 50% is under fixed term leases and the remainder is under perpetual or freehold leases.

Between 2007 and 2012, 65% of rural term leases will become eligible for renewal, with actual renewals commencing in 2012. This provides a major opportunity for the government to convert high-value leases into national parks either by purchase or eventual transfer into the parks estate as FCAs, or through a nature refuge agreement binding on successive title holders.⁵⁴ As discussed above, perpetual nature refuge agreements require settlement of Native Title claims.

Under the FCA provisions of the *Land Act 1994* all or part of a lease can be identified as an FCA by the conservation planning agency. In such cases, lessees will be notified that upon lease renewal they will have a final 30-year lease placed over that portion of the lease area identified as an FCA, a lease which will not be renewed at expiration of the lease period, allowing the FCA to transfer to the parks estate. Upon expiration, the state will still be liable to pay the landholder the value of any improvements on the lease. The FCA would be placed under special management restrictions for the duration of the final term lease. Lessees may opt to sell the lease back to the state at market value rather than renew the lease with these new conditions. Thus a substantial portion of identified FCAs will require purchase at market value to be brought into the parks estate, requiring government funding for this purpose.

Many examples exist in Queensland of valuable acquisitions being lost when landholders finally decide to sell but the government has no funding available.

The other dominant mode is likely to be nature refuge agreements for lessees not wishing to sell. In this study we assumed, conservatively, that 75% of leases targeted for protection would be placed under voluntary nature refuge agreements.

Overlapping mining and petroleum tenures

The ubiquity of mining and petroleum tenements, particularly exploration permits, presents a significant obstacle to the advancement of the state's protected area commitments.

Nearly 80% of properties recently acquired by Queensland for conversion to national park have exploration permits pending or granted over them, subject to restrictions.⁵⁵ Nearly one-third of nature refuges and nearly 60% of state forests have exploration permits.

Permits are relatively evenly distributed among coal, mineral and petroleum, and a large proportion were already granted as of data currency in 2007.

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Fifty-one percent of all lots selected for inclusion in the protected area system in 90-100% of protected area simulations (p 23) were overlapped by exploration permits, 31.2% of which were already granted as of July 2007. In comparison, only a small fraction of the area of existing or prospective protected areas was covered by mineral development or mining and petroleum leases.

An urgent review is needed of potential barriers and delays to the gazettal of protected areas posed by mining tenements and particularly the very extensive petroleum and gas Authorities to Prospect.

Fortunately, the actual footprint of mining leases represents a small, almost negligible fraction of the area required for protection. Actual petroleum and gas extraction installations have an even smaller final footprint and should present even less of an impediment than mining to the gazettal of parks.

At times in the past, the expansion of Queensland's national park system has advanced on an orderly basis with professional assessment of likely mineral value and careful consideration of conservation options. All this suggests that it should be possible to enable the expansion of the national park system to proceed without unnecessary delay or significant impediment to mineral and petroleum exploration.

Recommendation 10:

The Queensland Government should review policy settings for mining and petroleum exploration arrangements to enable its commitments to protected area expansion to proceed unimpeded.

Simulation of a comprehensive, least-cost protected area solution for Queensland

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We used MARXAN software⁵⁶ to simulate the most cost-efficient designs for inclusion of actual properties in protected areas (“solutions”) that meet the conservation targets and constraints described below.

We used a zero boundary length modifier (BLM), placing no additional value on a more compact or connected solution, which would be certain to result in greater cost.

We generated 1,000 simulated solutions using Marxan and singled out the least-cost solution for reporting in Table 1 and Figure 1.

However, there are many alternate planning units that can be added to a protected area system that make the same progress toward targets, and so there are many different equivalent solutions instead of one “ideal solution”. Any single solution, although least-cost, may also prove unfeasible in practice due, for example, to a lack of landholder interest in selling or placing a nature refuge over a property.

Planning region, planning units

The planning region comprised the approximate 166 million ha of Queensland that is mapped for regional ecosystems.⁵⁷ In the southern Gulf region, no protected area solution could be resolved due to the lack of finalized regional ecosystem maps.

Of this area, approximately 8.7 million ha is currently under Parks and Wildlife Service administered national parks or conservation parks, forest or resources reserves or under nature refuges outside of parks service administration.⁵⁸

These areas were treated as a starting point for inclusion in any simulated protected area design. The purchase of additional lands in the South-East Queensland, Central Queensland Coast and Wet Tropics bioregions was excluded in this analysis owing to the very high cost of land and the existing high level of representation.

In order to accurately estimate costs and the extent of land needed to meet targets, we used actual lots-on-plan (“properties”) as defined by the State Digital Cadastral Database (DCDB)⁵⁹ as the planning units to be moved as a whole in and out of protected area solutions during simulations. Actual properties are the scale at which property transactions occur, whether as property agreements, leases or purchases. Systematic conservation studies rarely use properties as planning units.

For each property, we used tenure classifications in the DCDB and a recently released layer of inferred market values of land based on actual property sales records to estimate costs for simulated purchases of lots.⁶⁰

At each simulation step, randomly chosen lots were directed into the evolving system design along seven alternate pathways with different types of costs attached, depending on existing tenure and the most likely options for inclusion (Table 3).

We corrected the variable dates of land valuation and sales data to 2008 dollars using published annual interest rates from the Reserve Bank of Australia.⁶¹ Fixed transaction costs were estimated, based on advice from a land valuation expert.

Park establishment costs were not included in the analysis. These costs are difficult to characterize systematically and depend crucially on the levels of visitor use and the remoteness of the parks.

Table 3: Protected area addition pathways and characteristic costs applicable.

Pathway into protected area system	Cost of acquiring	Transaction cost	Annual management costs	Constraints
Freehold (FH) voluntary purchase for new park	Market value	\$15,000 per sale for coastal properties, \$10,000 elsewhere ¹	\$8.12 per ha ²	20% of FH lots, no purchases in SEQ, CQC, WET ⁶
Leasehold (LH) voluntary purchase for new park	Market value	\$15,000 per sale for coastal properties, \$10,000 elsewhere	As above	20% of LH lots
LH Future Conservation Areas (FCA) transfer to parks system	Value of improvements ³	None	As above	5% of LH lots
State land or state forests transfer to parks system	None ⁴	None	As above	None
FH converted to nature refuge	None	None	\$3.82 per ha ⁵	80% of FH lots
LH converted to nature refuge	None	None	As above	75% of LH lots

1. Values based on advice from a valuer in round figures, only applicable to land purchases and not including internal departmental costs.
2. A single rate of management cost per hectare estimated crudely by total expenditure on parks management in 2006-7 divided by the area of the estate in 2006.⁶²
3. Estimated by the difference between market value and unimproved value to be paid by the state upon lease termination according to *Land Act 1994* as amended.
4. Only cost is to agency for transfer of property into the protected estate. Assumed to be covered by baseline agency budgets. However, the state may also need to "buy out" or phase out logging and grazing interests over priority state forests by funding alternate resource bases, such as plantations.
5. In 2007, the government announced \$10 million had been committed over four years to the NatureAssist grants program for nature refuges, an average of \$2.5 million a year. This divided by the 652 kha area of the nature refuge estate mid-2008 produced a crude average of \$3.82/ha (www.epa.qld.gov.au).
6. South-East Queensland, Central Queensland Coast and Wet Tropics bioregions.

Targets

The only features sampled in protected area simulations were mapped regional ecosystems at the 1:50,000 scale.⁶³ Regional ecosystems in Queensland are classified by bioregion, land zone and vegetation community.

Regional ecosystems are considered a robust basis for designing reserve systems. Species level targets are less reliable because data on habitat needs is generally incomplete and sometimes biased to areas more intensively surveyed for particular species.⁶⁴

The objective was a comprehensive protected area solution, at least-cost for acquisition, such that all mapped regional ecosystems were included:

- to at least 8% by area of the pre-clearing extent of each mapped regional ecosystem;
- if this was less than 800 ha, 800 ha minimum; and
- if the pre-clearing extent was less than 800 ha, 100% of remnant extent.

Mixture of pathways

Simulations followed simple rules in Table 3 for deciding which pathways to apply to a randomly chosen property.

Any given freehold property targeted for inclusion as a protected area had an 80% chance of being put under a nature refuge, otherwise it was purchased at market value.

Any given leasehold property targeted for inclusion as a protected area had a 75% chance of being put under a nature refuge, 20% chance of being purchased at market value, and a 5% chance of being acquired through non-renewal (see p 21).

Subdivision and/or disposal of surplus property

To reduce costs, it is essential to subdivide some properties to dispose of or avoid purchasing surplus areas of low-priority ecosystems and non-remnant vegetation. However, there are limitations to subdivision as an efficiency measure.

Regional ecosystems take quite irregular shapes that cannot practicably be excised from a lot other than by subdivision of a regularly shaped block containing the targeted ecosystem. Moreover, regional ecosystems are not precisely mapped. Rather, tracts of remnant vegetation are mapped with each tract consisting of mixtures of regional ecosystems. The exact subdivision needed to most efficiently excise ecosystems excess to requirements could not be simulated without detailed property level analysis and was therefore beyond the scope of this study.

In addition, which ecosystems are targeted for subdivision within a given simulation will change from simulation to simulation, according to what has already been acquired elsewhere in the random order of inclusion of properties.

Hence we decided to calculate a surplus property factor to be applied to all areas and costs for properties making up the comprehensive solution (Table 1).

In total, the set of entire properties flagged as FPAs in the comprehensive solution had a total area of 30.4 million ha. Of this, 7 million ha was non-remnant vegetation. A further 3.26 million ha was not-of-concern regional ecosystems in excess of 30% of their pre-clearing extent already in protected areas.

Assuming this surplus could be disposed of or excluded prior to purchase, transfer or a nature refuge declaration, this left 20.14 million ha retained as protected areas in the final analysis. The full area and cost breakdown of the resulting least-cost comprehensive solution is shown in Table 1.

Solution efficiency

The comprehensive solution developed here efficiently represents all of Queensland's ecosystem diversity in the minimum area at least-cost by way of:

- 52% of all 1,312 mapped regional ecosystems in Queensland represented in protected areas to 30% or more of pre-clearing extent despite the total area flagged for protection in the least-cost simulation representing only 17% of the state's land area (29.4 million ha);
- 20% represented at 15% to <30% by area;
- 11% represented at 10% to <15% by area; and
- only 17% of mapped regional ecosystems represented at <10% of area. Nonetheless, 62 of these had endangered biodiversity status.

The bioregions with the largest additions in the comprehensive solution correlated well with those identified as high priority for the NRS, with the Brigalow Belt (north and south) showing the largest growth of any bioregion in the simulated least-cost comprehensive solution (Figure 1).⁶⁵

Notes and references

¹ Transcript Speech Friday 28 March 2008: Anna Bligh, Premier Of Queensland Re: Witches Falls' 100th Birthday; National Park Area Increase Commitment, Queensland Government Dept of Premier and Cabinet Extract:

"We in Cabinet earlier this week resolved to increase our national park estate by 50 per cent by 2020. As I'm sure many of you know, the Goss Government many years ago committed to reaching a target of five per cent of Queensland's land mass as national park. We are within a whisker of reaching that five per cent target. Today we commit ourselves to a 7.5 per cent target by 2020 which gives us twelve years to increase by a further 50 per cent. You can see from these graphs – and some of you can come and have a look later – while we 100 years ago declared our first park we have some pretty slow progress for a number of years and then we've really seen a lot of activity in the last 20 to 30 years; and I think that it is important that we do take it to the next step. In addition we won't just be looking at expanding our national park estate, there are of course other forms of conservation tenure, and what we want to do at the same time as growing our national park estate is to grow the total area under conservation tenure from its current 8.3 million hectares to 20 million hectares by the same time - 2020. What this means is that by 2020 our national park estate will amount to 12 million hectares, 12 million hectares of national park here in Queensland. Just to put it in perspective that is two Tasmania's worth of national park or the size of the country of North Korea. The amount of land that we will have under conservation tenure here in Queensland under the new target will equal 20 million hectares, 20 million hectares of conservation tenure by 2020. That is the size of Scotland and England combined. So it is a very significant target and it's quite a stretch for us but we're committed to stretching ourselves to having the same sort of commitment as the forebears have when they made this our first national park. Of course acquiring national park, protecting it, looking after it - costs money. So what will we do to fund this new commitment? We anticipate that this commitment will require at least \$120 million over the next twelve years. How are we going to fund that? Today I'm pleased to announce the establishment of a new environmental initiative here in Queensland. We will be establishing a new fund called 'Eco Fund Queensland'. What this new fund will do is bring together across all of the areas of Government all funds that are going in from either government, developers, the private sector and individuals into either green offsets that are required under legislation for developments that have an environmental impact, or carbon offset funds that are going into carbon offsets that are offsetting emissions"

² Sattler PS, Taylor MFJ, 2008. *Building Nature's Safety Net 2008. Progress on the Directions for the National Reserve System*. WWF-Australia Report, WWF-Australia, Sydney.

³ Transcript as cited above.

⁴ NRMMC (Natural Resource Management Ministerial Council) 2004. *Directions for the National Reserve System – A Partnership Approach*. Department of the Environment and Heritage, Australian Government, Canberra.

⁵ Table 1 in Sattler & Taylor 2008 cited above.

⁶ Howard BMF, Young MD, 1995. Selecting and costing representative expansion of the NWS protected area network. Unpublished paper for the CSIRO, Division of Wildlife and Ecology Resource Futures Program.

⁷ <http://www.daff.gov.au/rfa/about/reserve-criteria>

⁸ The IUCN 2003 Durban Action Plan recommended establishing protected areas for 20 to 30% of the world's oceans by 2012.

⁹ NRMMC 2004 cited above.

¹⁰ \$186 million represents 3.9% of total tourism spending, after back-correcting to 2006 dollars (Ballantyne R, Brown R, Pegg S, Scott S, 2009. *Valuing tourism spend arising from visitation to Queensland national parks*. CRC Sustainable Tourism technical report. Tourism represented 119,000 jobs in 2006-7 (Thiep Van Ho et al. 2008, *Tourism Satellite Accounts 2006–07: Queensland*, Sustainable Tourism Cooperative Research Centre Technical Report). Assuming jobs can be pro-rated in the same way as tourism spending, 3.9% of all spending represents approximately 4,640 jobs.

¹¹ HORSCEA 1993. *Biodiversity: The Role of Protected Areas*. Report on the House of Representatives Standing Committee on Environment, Recreation and the Arts, Australian Government Publishing Service, Canberra.

¹² <http://www.greeninfrastructure.eu/>

¹³ Queensland ALP tourism policy: "Provide an additional \$36 million over three years for new regionally focused tourism marketing and product development campaigns" http://www.qld.alp.org.au/_dbase_upl/TOURISMPOLICY.pdf

¹⁴ <http://www.budget.qld.gov.au/budget-papers/2008-09/bp3-2-2008-09.pdf>

¹⁵ <http://www.budget.qld.gov.au/>

¹⁶ See note 11 above. 28% of all tourism spending is by visitors to national parks and if pro-rated to the total 119,000 jobs in tourism this represents 33,320 jobs. GBR figures from <http://www.petergarrett.com.au/383.aspx>

¹⁷ <http://www.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=47037> and http://www.dip.qld.gov.au/resources/map/Traveston_Dam_map_proposed.pdf

- ¹⁸ http://www.aph.gov.au/SENATE/COMMITTEE/rrat_ctte/completed_inquiries/2004-07/traveston_dam/report/c06.htm
- ¹⁹ Carbon offsets require replanting (or perhaps regrowth) of vegetation on formerly cleared land. Replanting of simulated natural vegetation may be consistent with the Kyoto protocol definition of “reforestation” but these are relatively expensive. It is unclear if natural regrowth would qualify as an eligible offset under the National Carbon Pollution Reduction Scheme, and only after 2013 when forestry and agriculture is included in the scheme. If the Eco Fund is only going to recognise offsets consistent with the national scheme, contributions from this offset will be delayed and uncertain in scope. Environmental offsets will be constrained in most cases to securing regrowth of equivalent vegetation to the point where the lost vegetation is replaced. A net loss of mature, remnant ecosystems could be allowed under these types of offsets. Moreover, existing policy is to avoid and minimize impacts of developments before offsets are considered. It is doubtful if many development projects would end up being required to produce suitable offsets to protect a large enough spectrum of Queensland’s biodiversity.
- ²⁰ Advice from the Environmental Defender’s Office, March 2009.
- ²¹ <http://www.treasury.qld.gov.au/office/knowledge/docs/mid-year-review/mid-year-review-2008-09.pdf>
- ²² Auspoll 2009. Attitudes towards Land Clearing and Environmental Issues in Queensland. Unpublished research report prepared for WWF-Australia February 2009.
- ²³ http://www.epa.qld.gov.au/nature_conservation/nature_refuges/the_nature_refuges_program/
- ²⁴ http://www.unep-wcmc.org/protected_areas/categories/australia.pdf
- ²⁵ http://www.epa.qld.gov.au/nature_conservation/nature_refuges/natureassist/
- ²⁶ Department of Natural Resources and Water, 2007 Delbessie Agreement (State Rural Leasehold Land Strategy) December 2007. pp3-4. http://www.nrw.qld.gov.au/land/state/rural_leasehold/strategy.html Lease terms meeting these conditions could go from 30 to 50 years. The *Cape York Heritage Act* allows for longer extensions to 75 years.
- ²⁷ http://www.epa.qld.gov.au/nature_conservation/nature_refuges/the_nature_refuges_program/
- ²⁸ NRMCC 2004 cited above
- ²⁹ http://www.nrw.qld.gov.au/land/state/rural_leasehold/land_cond_assessments.html
- ³⁰ http://www.nrw.qld.gov.au/wildrivers/pdf/wild_rivers_code_2007.pdf
- ³¹ Sattler P, Creighton C. 2002. *Australian Terrestrial Biodiversity Assessment*. Australian Government, National Land and Water Resources Audit, Canberra.
- ³² Fig 5 in Sattler & Taylor 2008 cited above.
- ³³ Mulongoy KJ, Gidda SB, 2008. *The Value of Nature: Ecological, Economic, Cultural and Social Benefits of Protected Areas*. Secretariat of the Convention on Biological Diversity, Montreal, 30 pages.
- ³⁴ Ballantyne R, Brown R, Pegg S, Scott S, 2009. *Valuing tourism spend arising from visitation to Queensland national parks*. CRC Sustainable Tourism technical report.
- ³⁵ Carlsen J. 2004. *Assessment of the economic value of recreation and tourism in Western Australia’s national parks, marine parks and forests*. CRC sustainable tourism technical report.
- ³⁶ Sattler & Taylor cited above, p 52.
- ³⁷ Altman JC, Buchanan JG, Larsen L, 2007. *The environmental significance of the Indigenous estate: Natural resource management as economic development in remote Australia*, Centre for Aboriginal Economic Policy Research Discussion Paper 287/2007, Australian National University.
- Gilligan B. 2006. *Indigenous Protected Areas Programme Evaluation. Report prepared for the Australian Department of Environment and Heritage*, Australian Government, Canberra.
- ³⁸ <http://www.environment.gov.au/indigenous/ipa/map.html>
- ³⁹ <http://www.faira.org.au/lrq/archives/199910/stories/exercise-your-story.html>
- ⁴⁰ Evans et al in prep.
- ⁴¹ Data from Taylor M, Booth C, 2008. *Protected area gaps for threatened Australian animals identified from recovery plans*, WWF-Australia, Sydney.
- ⁴² 36,344 location records for terrestrial species listed under the state Nature Conservation Act or under the *Environmental Protection and Biodiversity Conservation Act* (C’w’th) were obtained from the Environmental Protection Agency’s Wildnet database. An additional 30,469 records were withheld by the EPA and not available for this analysis, including large numbers of bird records. Records were scored as to whether or not they fell in the existing parks estate, or in the areas selected for inclusion in 80% or more of simulations. Unconfirmed records were weighted at 1/5th of the confirmed records. Wildnet provides a comparatively crude model of species distributions compared with modelled habitat maps. Proportions of records falling within the parks estate was found to generally overestimate the proportion of a species range actually protected as estimated from a separate analysis (Evans et al in prep). Among the 197 species for which a comparison could be made, 36.4% of species were classified into a higher category of habitat protected by the Wildnet analysis than by the analysis of Evans et al. Only 9.7% were classified into a lower category.
- ⁴³ CSIRO 2001. *Prediction of sheet and rill erosion over the Australian continent, incorporating monthly soil loss distribution*, Technical Report 13/01, CSIRO Land and Water, Canberra, Australia. <http://www.clw.csiro.au/publications/technical2001/tr13-01.pdf>

- ⁴⁴ Australian Government Collaborative Australian Protected Areas Database, 2006 release (spatial data).
- ⁴⁵ Fensham RJ, Guymer GP 2009. Carbon accumulation through ecosystem recovery, *Environ. Sci. Policy* in press.
- ⁴⁶ Dean C, Roxburgh S, Mackey B 2003. Growth modeling of *Eucalyptus regnans* for carbon accounting at the landscape scale, Chapter 3 in Amaro A, Reed D, Soares P (eds) *Modelling forest systems*, CAB international.
- ⁴⁷ <http://www.climatechange.gov.au/whitepaper/index.html>
- ⁴⁸ http://www.ias.unu.edu/resource_centre/Queensland%20Biodiscovery%20Collaboration_The%20Griffith%20University%20AstraZeneca%20Partnership%20for%20Natural%20Product%20Discovery.pdf
- ⁴⁹ Land Act s16 “Deciding appropriate tenure (1) Before land is allocated under this Act, the chief executive must evaluate the land to assess the most appropriate tenure and use for the land. (2) The evaluation must take account of State, regional and local planning strategies and policies and the object of this Act.”
- ⁵⁰ Minister for Natural Resources and Water and Minister Assisting the Premier in North Queensland, The Honourable Craig Wallace 2008 “Bligh government begins statewide hunt for new housing, commercial and industrial land”, Queensland Government Media Release, 24 July 2008.
<http://www.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=59378>
- ⁵¹ http://www.epa.qld.gov.au/parks_and_forests/managing_parks_and_forests/forest_transfer_processes_in_queensland/south_east_queensland_forests_agreement_seqfa/protected_area_gazettals_update/
- ⁵² <http://statements.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=45702>
- ⁵³ <http://statements.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=60317>
- ⁵⁴ Delbessie Agreement cited above.
- ⁵⁵ Results of a GIS analysis of mining coal and petroleum permits and leases spatial data downloaded from the Mines department website in July 2007, and overlapped with the 2008 EPA estate and nature refuge spatial data layers.
- ⁵⁶ Ball IR, Possingham HP, 2000. *MARXAN (V1.8.2): Marine Reserve Design Using Spatially Explicit Annealing, a Manual*.
Possingham HP, Ball IR, Andelman S, 2000. Mathematical methods for identifying representative reserve networks. In: Ferson S, Burgman M (eds) *Quantitative methods for conservation biology*, Springer-Verlag, New York, pp 291-305. downloadable from <http://www.uq.edu.au/marxan/index.html?page=77066&p=1.1.6>
- ⁵⁷ Queensland Herbarium 2008 *Regional Ecosystems of Queensland 2005 v6* (spatial data).
- ⁵⁸ Queensland Environmental Protection Agency 2008 *Estate and Nature Refuges* (spatial data obtained under license).
- ⁵⁹ Department of Natural Resources and Water 2008 *Digital Cadastral Database for Queensland* (spatial data obtained under license).
- ⁶⁰ Department of Natural Resources and Water 2008 *Property Sales Data Version 01/02/2008* (spatial data obtained under license).
- ⁶¹ <http://www.rba.gov.au/>
- ⁶² Table 7 in Sattler & Taylor 2008 cited above
- ⁶³ EPA 2008 cited above.
- ⁶⁴ Possingham et al. 2002. Limits to the use of threatened species lists, *Trends in Ecology and Evolution* 17, 503-507. https://transfer.natureserve.org/download/longterm/ERWG/Background_papers/PossinghaetalTREE2002.pdf
- ⁶⁵ Sattler & Taylor 2008 cited above.