Maintaining regional Queensland’s natural capital and ecosystem services
- Proceedings of the Sustainable Queensland Forum

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Rural producers, natural resource managers and conservation managers face a constantly changing set of climatic and human influences. Traditional land production systems and environmental management are under pressure. New approaches to production and natural resource management are required in the face of government financial resource and capacity constraints, as well as the intensifying environmental challenges.

Expert advice and technical reports on climate-change adaptation have been provided to Government since the early 2000’s. However, with some exceptions, on-ground natural resource management has yet to reflect the new challenges. Further, some city-based community expectations of environmental management do not match the contemporary regional condition on farms or in conservation reserves.

Potential management and philosophical challenges for both the broader community and conservation managers arise from:

- the need for urban communities to fund the provision of ecosystem services by rural land managers;
- the use of stock grazing as a tool in managing the conservation estate;
- an increasing involvement of private-sector conservation management;
- the reality that maintaining environmental values alongside exotic and pest plant and animal species is complex and difficult to achieve; and
- accepting the inevitable loss or modification of some ecosystems.

This symposium sought to explore pathways to practical and effective natural resource and conservation management in regional Queensland. A key theme that arose from the proceedings was the need for a new societal accord:

- that recognises the universality of the global challenges, and is not focused on consumerism, domination and individualism (Ian Lowe, 1.0 *Towards a sustainable Queensland*);
- that includes institutional understanding of community values, whilst being sensitive to the evolution of community goas as they evolve (John Martin; 6.0 *Governance challenges and opportunities*);
- that incorporates local solutions that provide viable regional outcomes at variance with traditional governmental interests (Trevor Berrill 7.0 *The renewable energy revolution*, Adam Clarke 8.0 *Co-existence; a new regional partnership*).

Dr Alistair Melzer
Forum Convenor
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1. **Towards a sustainable Queensland**  
*Professor Ian Lowe – Griffith University*

There is a wide range of possible futures for the planet and human society. In 1970 a study was done that concluded that if the current growth trends continued, they would reach their limits by 2070 and the likely result would be economic and ecological collapse. This was not put as an inevitable outcome, but one that could be avoided if growth trends are slowed. The focus now should be on shaping a future that takes into account everything that we know and is sustainable for the foreseeable future.

The Council of Australian Governments (COAG) has adopted a strategy for sustainable development. This aims ‘to ensure sufficient resources are available for Australia’s population into the future and has committed to national water reforms, and improved energy efficiency of buildings and households’ (COAG website – COAG’s Reform Agenda). In theory this should mean that politicians from around Australia should be working towards this common goal, but in reality very few politicians implement policy to achieve this goal.

Conversely, if Australia was working towards being as **unsustainable** as possible, some ideal policies to put in place would be:

- stimulate rapid population growth by offering women financial incentives to have children and to increase immigration;
- increase consumption per person (e.g. encourage people to build larger houses and buy more things);
- base the economy on services and facilities that promote the overuse of natural and finite resources (e.g. base transportation networks on oil);
- demand resource growth;
- widen the inequality between the lower socio-economic and high flyers of society.

Now think about recent policies that have been implemented by politicians, and the facts that the population, and that consumption per person have both increased by 30%, and further, the income spectrum has widened to a factor of 150. Global trade agreements currently in place also limit the impact individuals can make by minimising their ecological footprints. For example, if all Australians were to become vegetarians, Australia would continue to produce beef for export. Short term gains currently outrank longer term gains. Much of Australia’s cropping land is being taken over by housing. This means that as Australia’s population grows, Australia will need to import more food, which in turn relies on the price of oil staying low.

Oil is a finite resource. The peak of the discovery of large oil sources has already passed and there are fewer and fewer new discoveries each year. Unfortunately the hype around peak oil being demonstrated by oil prices going up means that despite the fact that we are heading towards peak oil, there is little being done to offset it and then to move to more sustainable energy sources. As it stands, oil is at record low prices because of new technologies, such as the extraction of shale oil, bringing oil into the market which would otherwise have remained untapped.

The world is currently going through its sixth major extinction event. This is mainly because of habitat loss but in time this will be joined by climate change which will increase the net effect. The temperature now is nearly a degree warmer than average of the last 10,000 years and the change in landscape use is also impacting rainfall systems. For example, in 2015 the runoff into Perth’s water supply system was zero and now all Perth’s water is coming desalination plants. The earth is in crisis and cannot support anywhere near the current human population. Now is the time to make a decision.
When politicians are faced with a decision, there are three alternative responses:
1) hire a consultant to say there is no need for change;
2) avoid the problem by diverting people’s attention elsewhere;
3) take responsibility for the problem.
History has shown that those who take responsibility for a problem and develop a solution will survive and prosper. Those who don’t, will not.

To have sustainable communities, there must be equality in the importance of the environment, the community’s liveability and its economy. Currently the majority of decision makers place a much greater importance on the economy and only care about the environment if it impacts on this. Humanity tends to separate itself from natural systems, thinking that their survival is no longer dependant on these, but in reality they are just as dependant as trees and wildlife. If this can be recognised and acknowledged, an improved system showing the economy and society as part of the larger environment can be embraced and used by decision makers.

A lot of the damage to the environment is a result of our limited knowledge about complex natural systems; for example, increasing the yield of lands without thinking of the impacts on the salinity of the area. This lack of local knowledge also applies on a global scale, we need to think of how local effects impact on a global scale and also how global effects impact on a local scale. It is an important task of the future to promote social learning to understand natural systems.

If civilisation is to survive, we need a new suite of societal values which are not focussed around consumerism, domination and individualism. There is a need to recognise that we are all in this together and what was previously acceptable is no longer. The only durable change is behavioural change. If the community’s attitude can be changed, laws may not even be necessary. Human systems are non-linear so there is potential to have rapid and radical change.

This may be seen as impossible but all the significant changes in society were originally seen as utopian; for example, slavery and allowing women to vote. Hopefully people looking back on this century will wonder why we weren’t routinely thinking of our impact on the environment. It is our responsibility to future generations and other species to fix the problems we have caused now. As in the Native American saying, “We don’t inherit the land from our parents we borrow it from our children”.

In a world so full of differing opinions it’s easy to get confused and lose confidence in your own beliefs, but remember there is real science behind sustainability which isn’t given credence in popular opinion.
Pathway 1: Sustainable Communities

2. From red to green to black: A stewardship model for managing Queensland’s pastoral lands
Dr Geoff Edwards (Royal Society of Queensland)

Current land management practices in Queensland’s pastoral zone – its rangelands – are suboptimal. There are many issues: – biophysical, economic and governance issues. The biophysical ones include:
- sediment pollution: 500,000 tonnes of sediment from just one north Queensland catchment enters into the Reef lagoon per year;
- over-grazing with loss of groundcover and catchment quality;
- 200,000 hectares of vegetation cleared per year; and
- the ongoing spread of weeds.
Chronic over-grazing means that the recovery of the land is weaker after every drought. These issues have been well known by scientists and policy experts in government departments and CSIRO for three decades.

The economic issues include:
- free foreign investment policies allowing key components of the commodity supply chain (e.g. abattoirs) to be owned by competitor countries with little loyalty to domestic producers;
- World Trade Organisation disciplines requiring producers to accept international prices (so land managers are price-takers for their commodities); given costs have no such constraint, the profit margin is inadequate to allow them to regenerate their land capacity; and
- widespread low profitability – in 2007 anecdotally 85% of lands in mulga country were marginally profitable or unprofitable.

The governance issues include:
- funding for outreach and Landcare programs has been stop-start for two decades;
- State farm advisors were downsized in the 1990s–2000s; and
- funding for regional governance – notably regional planning and natural resource management bodies (NRM) – has been steadily decreasing for ten years.

Following deregulation of financial services in 1983, banks scrambled to gain market share. Easy money, especially since the 1988/89 boom, has seen rural debt climb to an all-time high, especially in comparison to the net value of farm production (see Figure 2.1). The rural debt problem currently does not have a policy solution.
Despite pleas in every report on Landcare funding that security of funding is essential to be able to plan into the future; these bodies continue to be funded on an insecure basis. Canberra’s contemporary enthusiasm for project-by-project funding and evaluation accentuates the lack of national political commitment.

In principle, graziers on freehold land have a civic and common law obligation to manage the land sustainably; and on leasehold lands they also have a statutory duty of care to do the same. However, the economic system does not enable this to occur. Markets are structured to work in favour of those already with market power and do not reliably supply funds for externalities (for example the environment) or public goods. They also do not necessarily reflect the cost of production wherever imports of cheaper goods from overseas or interstate farmlands with lower unit costs is permitted. Drought aid money is also being spent on ‘ad hoc’ programs which are not contributing towards fixing the land to make it more resilient to further periods of low rainfall.

A potential solution to these problems which has been trialled previously is the Delbessie Program*. This was announced in 2007 but by 2012 it was withdrawn following the change in government.

Given the inability of markets to recognise public goods, society needs to start paying landholders for producing ecosystem services (e.g. clean water) from their land in parallel with their commodity products.

Citizens elect governments and pay taxes to solve problems beyond the capacity of individuals in commercial markets. Land degradation and financial incapacity in the rangelands is a systemic problem that governments have not solved. A model for doing this will require new public funding. The model would empower a governance body to distribute funds to landholders based on a best practice manual. A regional NRM body as the regional coordinator would appoint an assessment team, including an independent contractor, to inspect each property and advise on an appropriate payment. A central pool of funds from consolidated revenue that was regularly audited would form the funding base. This funding could potentially come from delaying or minimising infrastructure programs such as the Brisbane Cross River Tunnel (worth $4.4 billion).
It is easy to demonstrate that budget allocations for environmental repair and capacity building will be economically beneficial for the Queensland economy. Infrastructure projects are promoted in terms of their Benefit Cost Ratio (BCR) for the monetary return to the community for every dollar spent. ‘Hard’ infrastructure projects, such as roads and ports that further entrench the consumption of fossil fuels, typically have a BCR of 1.2-1.4, far lower than typical ‘soft’ infrastructure projects such as scientific research and information systems, which are not portrayed in the press as being as beneficial to the economy as ‘hard’ infrastructure. Some published reports include estimates of BCR of 12 (research – Productivity Commission) to 140 (coordinated land resource mapping – Department of Lands). The discrepancy between the BCR of these two infrastructure types would indicate that ‘soft’ infrastructure should be funded generously, but budget allocations continue to be focussed towards ‘hard’ infrastructure projects. This needs to change.

Note - This talk was based on a discussion paper on paying landholders to produce ecosystem services as an alternative to producing commercial commodities. The discussion paper is currently in advanced draft form and should be published soon. It is a work in progress and this transcript does not necessarily reflect the policies of the Royal Society of Queensland.

* The Delbessie program was launched in 2007 and its purpose was to ensure the long-term environmental, social and economic sustainability of rural leasehold land. It offered incentives for entering into land management agreements at the time when leases over rural lands would be renewed, and identified lands that the government would acquire for conservation purposes (http://www.htw.com.au/Industry_Presentations/townsville%20-%20may%202008%20-mirranie%20barker%20presentation.pdf).

3. The Australian experience in using biodiversity tenders for conservation

Professor John Rolfe (Central Queensland University)

There is immense public value in protecting environmental assets. However, the key questions of how to do this and how many resources should be put towards this have not yet been answered.

There are four groups of key mechanisms to make this occur:

1) information, persuasion and extension - generating positive feedback loops in society;
2) regulation - may be required to ensure consistency and wide-spread adoption;
3) changes in property rights - can allow self-interest to enforce standards; and
4) incentives - can be positive or negative.

Choosing the best mechanism is not simple as there are many variations in their effectiveness, in any compliance effect and in the requirements for specialised knowledge. For example the failure of prohibition in America shows that regulation does not always provide the required outcome. Positive incentives in the form of payments for ecosystem services by agricultural landholders are used to effect in Europe. These can take the form of direct transfers related to production and conservation as well as program funds for specific conservation through annual payments or one-off payments.

Purchasing environmental actions from private landholders could be done through a tender process. The use of conservation tenders to allocate public funds would solve the problems of asymmetric information (both the landholders and environmental experts would add knowledge from their area of expertise) and complexity (by allowing the outcomes to be tailored to each property). The policy makers specify the biodiversity assets and management actions of interest and the landholders submit tenders reflecting their opportunity costs of supply plus a bid-shading profit premium.
Historically, conservation tenders have been run through a single round, sealed bid, discriminatory auction process with a reserve price, like the BushTender* process. Variants of these can involve multiple bidding rounds, combinatorial auctions and payment by outcomes. An example of payment by outcomes are auctions run to protect breeding birds; the landholder is paid on the number of breeding birds on their property. The tenders have then been assessed by their biodiversity benefits compared to their cost with the projects with the highest benefit cost ratios winning.

In the past 15 years, a number of trials of conservation tender processes have taken place. The first of these was the BushTender process run in Victoria in 2001. This was a single round, sealed bid, discriminatory auction to manage vegetation areas in two regions of Victoria. This introduced the use of market based instruments to conservation in Australia as well as the use of a biodiversity score to evaluate bids. Since then funding efficiency has been improved by ecologists working out enhanced mechanisms to score conservation values and economists calculating better cost analysis methods.

Studies have shown that tenders are more cost effective than grant schemes. Like grant schemes, tenders are equitable but the competitive nature of an auction improves the cost effectiveness of the money being spent by 2-3 times, equalling 2 - 3 times the environmental improvements. Despite this tender, processes in Australia are still receiving less than 1% of funding and the number of tenders being run has dropped significantly since 2012.

This may be because natural resource management agencies trend towards the use of grants as a more equitable and supportive system as grants have flat rates and low rejection numbers. There are also perceptions that landholders may not have the ability to construct bids, that the transaction and ongoing monitoring costs will be prohibitive, and concerns that agencies may lose control of the tender process through political influences. This is combined with a lack of skills within agencies to conduct tender processes and occasional lack of willingness to learn about the benefits of tender processes.

The number of people willing to participate in tenders is also low which impacts on the success of the auction. Reasons for this could include landholder attitudes and the nature of the relationships between landholders and the agencies running the auctions. Other issues with tender processes include concerns that moving towards market incentives will reduce landholders participation in voluntary conservation works, concerns that landholders will place strategic bids in order to be able to capture rents and that landholders with poor land management practices may be rewarded as they can make the largest improvements to their properties.

Conservation tenders have the potential to become the most effective way of getting conservation outcomes on privately owned lands but to be widely adopted across Australia, several challenges must be met. These challenges include:

- standardising the use of conservation tenders to limit transaction costs;
- demonstrating to agencies and policy makers the benefits of conservation tenders over grants;
- increasing the scale of tenders to get efficiency gains without increasing costs of metric design and transactions; and
- using repeated tenders without causing problems with landholders placing strategic bids.

4. Smart-Grazing  

*Dr Dave Swain (Central Queensland University)*

Research into the use of virtual fences as a way to manage grazing within landscapes is currently being undertaken. This management tool uses spatial data of the movement of animals across the landscape to gain a perspective on the drivers for these animals to use different areas.

A report by Hargraves and Smith (2004)* indicated that the world is currently going through its sixth wave of innovation. This wave is focussed on, amongst others, sustainability, renewable energy and whole system designs. There are now technologies that can create thinking systems which are able to measure and respond to events that are occurring in the environment and make adjustments accordingly.

Looking at the landscape as a whole of system and the use of current technologies and research embedded in real systems allows for local optimisation and enables producers to facilitate their own research. Current technologies are facilitating further awareness of biological processes. It is mandatory under legislation for livestock managers to use the National Livestock Identification System for the identification and traceability of cattle, sheep and goats. However, currently only 5% of managers are using this technology to its maximum capability. This technology can be used in combination with GPS tracking to understand individual animal’s behaviour – not only where they are going, but also what they are doing there. This provides an understanding of how these animals are preferentially using the landscape, and key areas can be investigated to discover the drivers behind these preferences. These drivers could include forage types, water availability and tree cover.

This information can be integrated into virtual fencing. The coordinates of areas that managers want cattle to avoid (for example a rainforest area that is preferentially used for shade) can be programmed into the animals’ collars and the animal will receive an electric shock or audio stimulation when it approaches those areas. This deterrent can also be programmed for a timeframe if necessary. Most cattle quickly learn to stay away from these areas without the need for a physical boundary that can prevent the egress of other species.

The use of virtual fencing in cattle management is still being investigated. Further research is being conducted to further optimise the system as well as taking in account animal welfare considerations and if the ability to control the animals is worth the benefit, especially economically.


5. Smart-Grazing; A koala study  

*Dr William Ellis (University of Queensland)*

Some ninety five percent of Queensland’s koala population probably occurs outside South East Queensland, but the majority of current research is undertaken on koalas that live within South East Queensland. This study focusses on koala management in rural and non-urban areas of Queensland.

Koalas live in many agricultural landscapes. A recent study of the use of the landscape by koalas in Ipswich has shown that koalas use these landscapes as a whole, not just the areas of expected habitat (vegetation patches). Landholders in these landscapes sometimes use the existence of koalas on their properties as justification that their land management techniques are environmentally friendly, however it is not known if koalas persist in these landscapes because of farm practices.
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(such as baiting for pest control, deliberate tree retention, weed management and watering activities) or despite the farming activities (including tree clearing).

The study is looking at ways to improve the quality of koala habitat by investigating the influences on breeding success, movement and koala persistence in these areas: what distances between trees are most advantageous and what attributes of agricultural landscapes are the most useful to koalas. Subtly changing the management of these areas could have positive impacts on koala populations and at the same time improve productivity and perhaps even profitability for farmers. For example, tree retention would not only provide koalas with extra foraging and shelter, but can also provide shade for stock and prevent erosion.

Until recently, there has been some resistance from landholders to koala studies in rural landscapes. This is partly because of landholder perceptions that the presence of koalas on their properties could “lock up” country and prevent further development and farming diversity, but also may be due to a lack of trust between landowners and researchers – especially environmental researchers. However, the encroachment of coal seam gas and a range of exploration and mining activity across the Queensland Agricultural landscape has opened the eyes of many farmers to the possible threats to their family enterprises: mining leases have in some cases erased generations of effective custodianship of the natural resources of areas in a short space of time. As a result, landholders are concerned that their ability to farm the land may be compromised, but they recognise that, unlike mines, the presence of koalas will not necessarily impact their property rights or the lands productivity. Those farmers adjacent to or even surrounding the thousands of abandoned mines across Queensland can weigh up whether removing the natural habitat of endangered species is truly in the best interests of their generational legacy.

Of all the activities governments and researchers can undertake to protect koalas in Queensland, those that protect and enhance koala habitat will be the most effective in the long run. Beyond the urban south east corner of Queensland lives large and vaguely connected koala populations, which show little impact of disease and are free from the impacts of urban roads. Unlike their urban counterparts, the conservation of these koala populations is not complex and does not involve costly intensive intervention; these populations utilise the rural landscape and with some careful management of simple threats (such as feral dogs) and the retention of current habitat they should survive for generations to come. Actions including incentive based approaches such as nature refuges, direct payment/recognition approaches and/or purchase of properties with koala habitat to be gazetted as protected area – but retaining the freedom for farmers to work the land productively, represent the clearest path for a sustainable agricultural landscape for the future. There is a clear imperative for the government to incentivise the revegetation and rehabilitation of areas that are strategically important for koalas across the state, as many of these areas are in private hands. Koala use of revegetated areas is well documented, and although it takes several years for trees to be large enough to be used, most farmers work with a view well over the political horizon.

The results to date from actions in Queensland are positive. For example, near Maryborough the koala recolonization project is proving to be a success: koalas that were rehabilitated have established a breeding population in an area where koalas were removed through hunting many years ago. Careful management of koala reintroductions to vacant landscapes may succeed, and work is underway to identify what koalas and habitats are best suited to such programs. In the south east of Queensland there is strong support within local councils to incentivise habitat retention in areas such as the “koala precinct” in the Brisbane Valley. In central Queensland, communities of conservation-minded farmers are opening their farms to our research and engaging in the conversation that informs researchers about the history of koalas on their land while also informs
the farmers about what they can do better for koala conservation. There is more than a groundswell of support for these activities and while the farmers are understandably cautious in their dealings with us, lest their capacity to earn a living is diminished as a result of harbouring an icon such as the koala, they also recognise that this furry little Australian may be the only thing that stands between their continued family enterprise and a massive hole in the ground. The recent abandonment by the minerals sector of any serious environmental responsibility in some of these local areas, combined with its attachment to fly in – fly out workforces, leaves local farmers with little option but to remain committed to their land to provide opportunities for future generations of farmers. In doing so, and with the help of governments, they may also secure the future of the koala in Queensland.

6. Governance challenges and opportunities

Professor Emeritus John Martin (La Trobe University)

‘Institutions are the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights).’ (D. C. North (1991) The Journal of Economic Perspectives, 5(1), pp. 97-112).

Institutions matter but so do individuals. Working around the constraints of institutions to implement projects on a community level and finding a balance between government and community input is difficult. The key to making such a partnership work is for institutions to gain an understanding of the community’s values, to work with individual local champions who can represent the community, and to balance the outcomes of their findings with the economic and regulatory restraints.

An example of when an institution has worked well with a community to form a positive outcome is the Noosa Biosphere Reserve. The council worked to gain an understanding of the community’s values and how the biosphere could enhance these. They then educated people, including local school children, about the positive aspects of living in the biosphere reserve. This led to the community feeling a sense of ownership of the biosphere and therefore an interest in protecting it to protect their local way of life.

Institutions need to understand the belief structure of those they want to influence. For example, what sustainability means in one place may have no relevance in another. Institutions must have a clear understanding of what is meant by individual communities before starting a project. This understanding must also be continually revised as communities achieve goals and evolve. If this can be achieved, institutions and communities can work together to produce positive and lasting results.

7. The renewable energy revolution

Trevor Berrill (TREVolution)

There is currently a renewable energy revolution occurring worldwide. As the world moves towards higher renewable energy targets, there is potential for rural communities and landholders to adopt the production of renewable energy as a secondary income.

Worldwide in 2015, greater than 19% of the total energy produced was from renewable sources and over 8.1 million jobs were directly and indirectly related to this. Germany is leading the industrial world by producing 30% of its total electricity needs from renewable sources and creating a huge
export industry from renewable energy products. Its goal is 80 percent by 2050, together with a halving of total energy use. One hundred and seventy three countries have now committed to strong renewable energy targets.

Globally, the drivers towards renewable energy are the escalating costs of fossil fuels, rapidly falling costs for renewable energy and the fact that the public are trending towards the use of solar power and home owned power stations. In Australia, community support for renewable energy is approximately 89%, fuelled by electricity prices almost doubling in the last 6 years. On average, renewable energy currently counts for about 14% of all electricity generated, with many cities shifting towards 100% targets.

Queensland is currently falling behind most other states by only producing 9.5% renewable energy. The four largest renewable energy contributors are photovoltaic (PV) systems (38%), biomass (30%), hydro (20%) and solar hot water (11%). The current ALP government had a target of 50% renewable energy by 2030 and it was trending towards reaching this target under the former Bligh Labor government. Renewable energy targets will not be reached unless commitments are made to strong and lasting policy initiatives.

![RE Capacity (MW) & Generation (GWh) 2014](image)

**Figure 7.1: A graphical representation of the requirements for 50% renewable energy by 2030 (graphs courtesy of Trevor Berrill)**

There are many economic, environmental and social reasons to support renewable energy. The economic reasons include the creation of jobs, the provision of long term price certainty for electricity prices and the provision of opportunities for communities to innovate and diversify away from standard income sources. Environmental reasons include the reduction of Queenslanders’ high environmental footprint and the protection of farmland for food production. Lastly the social reasons include the creation of longer term jobs, increased safety to communities and workers and the potential for solar and wind farming to be combined with food production. The last point is an important one for rural communities. For example landholders can make $10,000 per year for one wind turbine on their property. This alternative income could mean that landholders do not need to rely on government hand-outs for an income during extreme events such as droughts.

Two examples of food production areas that were threatened by coal mining, and are choosing to produce renewable energy instead, are Felton Valley (south west of Toowoomba in south eastern
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Queensland) and the New Hope Acland Mine area (north west of Oakey in south eastern Queensland). Both areas requested a sustainable energy plan as an alternative land use model and regional development scenario to combine food production with energy production.

The plan for the Acland mine area involved an analysis of what type of sustainable energy the area could deliver, the creation of a map showing areas for potential solar PV farms (avoiding areas of strategic cropping land, remnant vegetation and flood plains) and a quantification of the employment opportunities that solar PV farming could create. The results showed that the area could produce up to 400MW of power (enough to power 70,000 homes) at the same time as producing enough food energy to feed 70,000 people, the combined solar and food farming would produce over 180 full time jobs indefinitely, farmers could earn over $1100 per year per hectare by leasing their land for solar and the income from the sale of electricity would be up to $170 million per year. If this plan is implemented in full, the environmental values include savings in pollution of 234 mega tonnes of carbon dioxide and water savings of 8.9 gigalitres per year.

Felton Valley is the first community in Australia to stop a coal mine being built in their area. The community requested a sustainable energy plan to investigate the use of solar and wind to produce energy in combination with food production instead of building a mine. The results of the investigation showed that solar and wind power from the area could produce energy for approx. 160,000 homes in south-east Queensland and unprocessed food energy for approx. 160,000 people. The area is now renowned as a food production area and runs an annual food festival which brings approximately 10,000 people into the area, boosting the tourism economy also. Solar farms are now being planned near Millmerran and Oaky.

In summary, there is strong community support to move away from fossil fuels. However, this transition is being held up in Australia due to the strong influence of the fossil fuel industry on government decisions. Transitioning to renewable energy is both technically and economically achievable and would provide an excellent supplementary income for farming communities being impacted by outside forces.

8. Co-existence; a new regional partnership

Mr Adam Clarke (Wildlife Preservation Society of Queensland)

The present co-existence between the Upper Dawson branch of the Wildlife Preservation Society of Queensland (W.P.S.Q.) and the coal seam gas industry (CSG) is an example of how two parties, with different priorities and backgrounds, are learning to work together towards the common goal of protecting our natural environment while accommodating massive development. NOT EASY!! Prior to CSG encroaching on these lands, landholders coexisted with government departments that had some control over the agricultural industry and the landholders believed that they had control and rights to develop their land with minimum interference from outside interests.

Far-sighted land managers had already looked towards improving their long term productivity, which embracing the Landcare movement. They were totally unprepared for the impact of massive CSG. It appears that local government and the State politicians were also similarly unprepared. Initially, landholders and the community at large were not given support or any plans of how to deal with this life changing development.

There was a ‘wild west gold rush’ feel to the whole enterprise that engulfed our communities. The disruption to the landholders was overwhelming and caused terrific ill will and outright hostility. The industry of the State government (of both persuasions) did not either realise the chaos they were
creating or as some people have suggested, they did not care! To us in the development area, we appeared to be the enemy and had to be fought regardless of the cost, rather than be accepted as part of a partnership.

After much investigation into where the State government and extractive industries were taking us, whether we liked it or not, our branch of the W.P.S.Q. decided to focus on the local impacts of CSG and leave the larger arguments to the better resourced head office. We consequently, after much soul searching and debate, adopted our ‘local coexistence policy’. This involved joining every consultative committee in the area, as well as putting in submissions for all the Environmental Impact Statements etc.

This soon led to the CSG companies realising that practical protests by our environmental group could hold up their operations and it would be better if we got together to sort out the issues. Through this engagement, our branch of the W.P.S.Q. made contact with the government officials and industry members. By visiting mine sites and gas fields etc., we were able to get a better understanding of the impacts to our environments.

The price of coal then fell dramatically making the proposed coal mines unviable for the Upper Dawson. This gave us time to concentrate of the CSG industry. This resultant drop in ‘planned’ royalties prompted the State government to endeavour to short cut environmental objections. To this end, both levels of government have made moves towards changing the Environment Protection and Biodiversity Conservation Act 1999 (EPBC) to remove people’s rights to object to development proposals. This must be strongly opposed. We see this EPBC Act as a vehicle that allows groups, such as ours, an opportunity to raise our objections and have them considered by the authorities or ultimately by the courts.

The extractive industries are not going to stop. Food and fibre must be produced for the world’s population and we also have to realise that we have only one environment to leave in good shape for future generations. Therefore, it is imperative that **LONG TERM COEXISTENCE BETWEEN AGRICULTURE, EXTRACTIVE INDUSTRIES AND THE ENVIRONMENT** be demanded by government.

**WE ARE NOT BLINDLY AGAINST DEVELOPMENT BUT WE ARE AGAINST BLIND DEVELOPMENT!**
WORKSHOP SESSION 1

Economic incentives for key environmental values

‘It’s hard to be green when you are in the red’ – Adam Clarke

This statement sums up landholders attitude towards best practice environmental management of their lands. The urban community must be educated to understand that for rural landholders to be capable of managing their lands sustainably, the prices of the food produced must reflect the increased cost of production. Currently, most farmers are forced to drive their country too hard as the marginal prices they receive for their produce do not allow them to undertake sustainable land management practices. Farmers do not want help, they just want a fair go and to be paid for what they produce (not just for the food product but also for ecosystem services such as producing clean water or healthy ecosystems). A constant flow of payments for these ongoing ecosystem services would also ensure the longevity of these activities, especially in times of hardship (such as drought).

The government is currently trying to improve natural resources with only minimal amounts of money. The environmental situation could be improved by making the ‘middle men’ with market control pay more to landholders who manage their lands sustainably. Some milk cooperatives and sugar mills pay more for produce by landholders who meet certain environmental management standards. In New Zealand, the government has specified standards which dairy farmers must meet in order to prevent or minimise the flow of nitrates into the water systems. Government officials visit farms with members of the dairy cooperative to check if the landholders are following the standards; if they are not, the cooperative will not buy the milk from that farm until the standards are met.

Social change is about changing community values. History has shown that this is possible (for example women being given voting rights) and it is now time to use the current change in attitudes to the environment through education about climate change, and the subsequent increase in uptake of clean energy, to also focus on valuing the land. The ‘Lock the Gate’ movement brought people together from both rural and urban communities in a collective campaign against long-standing economic models allowing large companies to put huge investments into areas without any accountability for the social disruption or environmental damage this causes.

Social change starts at a community level and needs government support to go further. For an accord between the country and the government to occur, people need to become more realistic in their expectations of what can be provided on both sides. Urban societies do not currently have any understanding of the rural economy or how putting a value on ecosystem services could improve the overall environment. There needs to be an education process for large communities, especially in urban areas, so people can begin to revaluate their own belief systems of what they should expect from their food and how they want the land it is grown on to be managed. Rural and urban communities need to take a collective custodianship view of the land to breach the current divide and start to influence political decisions.

These changes will hit the concept of modern economics and there will need to be a re-education of people throughout the whole system. The pinch points will need to be identified and controlled as large companies such as Coles and Woolworths may choose to source products from overseas if the price for products increases too much. This education system needs to become smarter and apply contemporary and emerging communication methods. The recent outcry against low milk prices in large supermarkets was driven primarily by social media and has led to an approximately 30% decrease in the sales of non-branded milk.
Balancing regulation vs incentives

Voluntary uptake of sustainable and best practice management techniques will always be limited. The introduction of regulations is one way of ensuring the majority of landholders will manage their land in accordance with mandatory standards. For example, new legislation regarding land clearing by rural landholders that was brought into effect in 2006, drastically reduced the number of hectares being cleared. However, the increasing moves to regulate environmental management away from the rural sector are reinforcing the cultural divide between urban and rural communities. In these cases, both a stick and a carrot are necessary to get the right environmental, and social, outcomes.

Delbessie* was an example of a great mix of both regulations and incentives for better land management practices. However, Delbessie’s removal and the introduction of rolling term leases when the Newman government came into power meant that the negotiation capacity for the government to work towards more environmentally sustainable land management techniques was lost and the regulations are now about compliance only. Adequately resourced and continuous tools are necessary for any system to be successful.

Before systems can be created and implemented, the desired outcomes and ways of measuring performance need to be defined. Adequate resources and time must be allocated to allow for consistency of measurements across systems; currently there is a lot of information from a range of different systems but as it is incompatible with other systems, it is unable to be used in a meaningful way. The desired outcomes must also be defined to prevent information being gathered without having an on-ground impact. This has previously occurred with the Healthy Waterways Program** which measures the health of river systems in Queensland but has not led to on-ground improvements in river health.

A South East Queensland regional planning exercise run by the State government in 2001, planned to use a mix of both regulations and incentives to improve environmental values across the landscape, but this was never put into effect due to the lack of political will. Various local governments, such as Brisbane City Council charge environmental levies to place demands on neighbours to provide good environmental values, such as clean water, to properties downstream but this does not extend beyond local government boundaries.

The use of incentives is a long term path that will always need to be supplemented by the power of regulations. There must also be a wide range of incentives as individual landholders will be interested in different incentives.

* The Delbessie program was launched in 2007 and its purpose was to ensure the long-term environmental, social and economic sustainability of rural leasehold land. It clarified when leases over rural lands would be renewed and for how long, and when the government will acquire lands for conservation purposes (http://www.htw.com.au/Industry_Presentations/townsville%20-%20may%202008%20-mirranie%20barker%20presentation.pdf).
** Healthy Waterways Program - http://healthywaterways.org/

Social change and private/community agreements for environmental outcomes

The long term goal of incentives for ecosystem services is to change community attitudes so incentives are no longer necessary. Any payment system for ecosystem services should be designed to foster community acceptance and value of these services so they become main stream. The positive effects of improved environmental stewardship of the land need to be publicised so people can understand their value. Part of the change in community values will include an economics
revolution in how the community views the economy in relation to the environment. The current economic system encompasses the environment in a venn diagram, but in reality the reverse is true and the economy should lie within the circle of the environment.

Figure WS1.1 Venn diagrams showing the current and potential future way of placing the economy in relation to the environment (diagrams courtesy of Ian Lowe)

The production of foodstuffs needs to be linked to the consumer. Community interest and their concern for the welfare of the areas where their food is coming from can be utilised by linking individual products to the individual farms or areas where they are produced. This could then be used to demonstrate how these areas and their unique values could be protected and their sustainability ensured by paying a little extra for the product.

Rural communities must communicate both individually and on a community level. Positive incentives from landholders who have previously volunteered to undertake sustainable land management techniques should be used to inform neighbouring landholders of the potential for them to receive rewards for also undertaking sustainable practices. A community can use learnings such as these to work towards change and collective actions. Rural communities are currently under stress from the impacts of natural forces, aging populations, poor employment opportunities, badly designed regulations and/or pressure from outside groups. Ways to invest in sustainable ecosystems must be tailored to meet the stressors in individual communities. Collective actions, such as community and landholder agreements for environmental outcomes, can lead to change in community culture and its long term sustainability.

Governments can assist communities to become sustainable through education; focussing on what is meant by sustainability and how this can be achieved. Governments can control ‘hard’ institutions to support this such as services and resources but the ‘soft’ institutions which come from the communities themselves are the most important. These can include new ideas and new people. Sustainable communities are ones that are continually changing and can renew in response to stress.

Summary of recommendations and proposals

1) Education of the community about the value of ecosystem services to start a change in social values. This could be done through social media.
2) A system involving both regulations and incentives for responsible environmental stewardship of rural lands and a payment system for ecosystem services need to be
designed, adequately resourced and receive long term commitments from both political parties.

3) Further investigate the issue of making rural communities more sustainable and peruse government investment in this. As part of this, investigate what can be done in communities that are no longer viable through an inability to learn and change.
Pathway 2: Protected Area Policy

9. A strategy for expanding and managing Queensland’s protected area estate

Sarah Young (Department of Environment and Heritage Protection)

Protected areas listed under the Nature Conservation Act 1992 (NCA) are the cornerstone of nature conservation in Queensland. Currently, 7.92% of Queensland is listed as protected area. This includes national parks, conservation parks and nature refuges. The current government has committed to expanding the protected area estate to 17%, the same target as set by the Convention on Biological Diversity. This estate is aiming to conserve a representative sample of the State’s unique biodiversity and natural features. The government has also committed to ensuring that national parks are managed in accordance with their cardinal principle under the NCA – ‘to provide, to the greatest possible extent, for the permanent preservation of the area’s natural condition and the protection of the area’s cultural resources and values’.

In order to work towards reaching this target, the government has directed that the departments of Environment and Heritage Protection (EHP) and National Parks, Sport and Racing (NPSR), investigate innovative ways in which to increase protected area. As the land managers of protected areas owned by the state, NPSR has been tasked with exploring options for ensuring that current and future national parks have adequate funding for the cardinal principle to be achieved.

As nature refuges (held by private landholders) are under the portfolio of EHP, EHP has been tasked with exploring and developing solutions to protect privately managed lands with exemplary conservation values from incompatible land uses and ways in which to provide incentives to landholders to place protected area covenants over their land.

Initial consultation with targeted stakeholders focussed on potential improvements to the nature refuge framework to deliver improved conservation outcomes and exploring alternative income streams and management of protected areas through cooperation with third parties, the possible expansion of fees for the use of national parks and the introduction of ‘levels of service’ to distribute funds to parks within the state. This consultation indicated that there is broad support for managing and resourcing parks according to their values and visitation (levels of service), national parks remaining the core of the protected area estate, protecting private protected areas with outstanding conservation values from incompatible land use, recognising conservation as a legitimate land use within the leasehold lands administration framework and investigating alternative funding sources for protected areas.

One idea being explored by EHP is a new class of private protected area under the NCA to protect privately managed lands with outstanding conservation values from incompatible uses such as mining and forestry. This tenure would apply to both privately owned and leasehold lands with similar conservation values to national parks and would provide the same level of protection and management as well. The process to gazette these areas would be undertaken on a case-by-case basis considering the significance of the resource interests and the landholder’s management capacity. As with nature refuges, the agreements would be voluntary and perpetual and existing nature refuges could be eligible if they meet the criteria. Further work needs to be done to develop assessment criteria to determine the areas’ natural values and landholders’ management capabilities and what management principles and arrangements should be put in place.
A protected area strategy is currently being developed by EHP and NPSR that will further investigate the ideas from the initial consultation and possible legislative and policy changes to ensure the government can deliver on its commitments.

### 10. Protected area policy – challenges and consequences

*Peter Ogilvie (Wildlife Preservation Society of Queensland)*

‘A policy is a deliberate system of principles to guide decisions and achieve outcomes. A policy is a statement of intent and is implemented by a procedure or protocol.’
- *Peter Ogilvie*

The International Union for Conservation of Nature (IUCN) has a range of protected area categories to classify protected areas according to their management objectives. These are regarded as the global standard for defining protected areas but have not been well integrated into the range of protected area tenures under the *Nature Conservation Act 1992* (NCA), especially under the previous Liberal National Party (LNP) government who removed many of the tenure categories. The LNP government also changed the cardinal principle of national parks and introduced special management areas within national parks which allowed a range of activities within national parks which could, potentially, impact on the protection of the parks natural and cultural values.

The Convention on Biological Diversity* in 2010 decided to set a target of at least 17% of terrestrial and inland waters and 10% of coastal and marine areas to be protected by 2020. This target was to ‘Enhance the coverage and quality, representativeness and, if appropriate, connectivity of protected areas as a contribution to the development of representative systems of protected areas and coherent ecological networks that include all relevant biomes, ecoregions, or ecosystems’ (COP 10 Decision X/31). The Queensland government has committed to working towards this but decision makers need to be careful to ensure that the percentage does not become the only goal and that the representativeness and connectivity of these areas are also given priority.

Over the last 50 years there has been a steep increase in the number of hectares of land under national park tenure (from 338,850 hectares in 1958 to 7,576,342 hectares in 2008). In central Queensland, this has caused concern that national parks are areas where introduced species breed and the grazing that could assist with managing some of these species is excluded. This led to the previous government changing the legislation to further neutralise the legal protection provided by the cardinal principle for national park management under the NCA and sanction the dangerous policy of permitting grazing in national parks.

Dangerous and narrow-minded policies relating to the management of the environment are continually being created. An example of this is the climate change policy which emphasises that the selection of new protected areas be based solely on their climate resilience instead of also including the area’s representativeness. Other examples include threatened species policies. Currently, each state complete their own assessment of a species to determine their status. As many species occur throughout Australia, a memorandum of understanding between all the states should be created which utilises the IUCN’s threatened species criteria assessment to assess and assign a status to each species in Australia as a whole. There is also the problem of emerging policies such as allowing private companies to manage national parks. Issues surrounding this need to be addressed before inadequately researched policies are introduced.
Before policies are created, the overall goals of the policies should be defined. The Queensland government needs to define these before further policies relating to protected area are established. The Wildlife Preservation Society of Queensland policy goals for protected areas include –

- (a) to expand the Queensland Conservation Reserve System and enhance its management in order to arrest the rapid decline in biodiversity, conserving representative and resilient samples of remaining regional ecosystems;
- (b) to demonstrate a measurable decline in biodiversity loss by 2030;
- (c) to have 80% of regional ecosystems represented adequately in the Qld Conservation System by 2027;
- (d) to establish an additional category of nature refuge which excludes mining on private land of very high conservation value;
- (e) to encourage the government of the day to develop a plan by the second half of 2017 designed to achieve the above, and to establish a Protected Area Advisory Group to advise and report on progress.

Reaching the targets for marine protected areas may be even more challenging as, in general, public attitudes towards marine environments are not as empathetic as towards terrestrial environments. The challenges lie in supporting scientific research to justify protective measures, explaining the results of this research to the public and educating them about the importance of marine conservation and the necessity for a compliance regime, countering uninformed community attitudes and anticipating the potential effects of climate change.

* [https://www.cbd.int/sp/](https://www.cbd.int/sp/)

** The Queensland Conservation Reserve System includes the following: (a) all protected areas established under the Nature Conservation Act, (b) some State forest land, (c) some private conservation reserves, (d) some Indigenous protected areas, and (e) some local government reserves, based on appropriate audits to confirm conservation value.

(Peter Ogilvie)
Pathway 3: Smart Management

11. Climate change projection for Queensland

Associate Professor Jozef Syktus (Global Change Institute, University of Queensland)

The Intergovernmental Panel on Climate Change* has set a globally agreed goal to limit global warming to below 2 °C above pre-industrial levels. Small island states, vulnerable countries and less developed countries have also asked for the warming to be limited to below 1.5°C by 2100. However, the current climate change policies are expected to result in an increase of about 3.6°C. If the unconditional pledges of governments are included, this increase is only reduced to 2.7°C. If this goal is to be met, emissions of greenhouse gases must be reduced rapidly and brought to zero shortly after the mid-century. The longer it is before real reductions are made, the larger these reductions will need to be.

For Australia, one of the biggest impacts of climate change will reduce rainfall. The diagram below (Figure 11.1) shows areas of significant reduction in rainfall in red and historical trends are showing many rain bearing systems are no longer hitting the continent.

Figure 11.1 Multi-model projections of drought using Standardized Precipitation Index (SPI-12 months) for a time when global warming will reach 4°C (diagram courtesy of Jozef Syktus). Changes are shown for SPI < -2 (one in 20 years drought) and show changes in frequency of drought compared to the historical (pre-industrial 1861-1890) period. Red to orange show increased frequency under global warming compared to historical.

How much the temperature rises will affect how the rainfall patterns change***. Extremes (drought to floods) will become more frequent in the mid latitudes and the weather in general will become
more unstable. There will also be a significant shift in distribution for minimum and maximum temperatures (Figure 11.2).

Figure 11.2 Predicted shifts in the distribution of temperature maxima and minima. (graphs courtesy of Jozef Syktus)

A potential method to mitigate against these changes on a regional level in Australia is to increase the cover of native woody vegetation. Woody vegetation is known to transpire more than cropping areas, moderating the temperature along with enhancing cloud formation. This increase in precipitation provides additional moisture to soil and trees, thus reinforcing the positive feedback loop. The increased evapotranspiration results from the capacity deep-rooted woody vegetation to access soil moisture.

To test this hypothesis, the impact of restoring economically marginal cropping lands to woody vegetation and maintaining crops and pastures on areas of high productivity was modelled. Under the Representative Concentration Pathway 8.5** (which predicts a temperature anomaly of 4.9°C) the changes for the 2056 – 2075 period relative to the 1986 – 2005 period show that at a continental scale, average summer warming for all land areas was reduced by 0.18°C from 4.1°C for the period 2056 – 2075 compared to 1986 – 2005. For the restored regions (representing 20% of Australia), the averaged surface temperature increase was 3.2°C which is 0.82°C cooler compared to agricultural landscapes. Further, there was reduction of 12% in the summer drying of the near-surface soil for the restored regions****.

* Intergovernmental Panel on Climate Change - http://www.ipcc.ch/
12. Using climate change science to guide expansion of Queensland’s protected area estate

Brad Ellis (Department of Environment and Heritage Protection)

The Department of Environment and Heritage Protection, along with James Cook University are creating maps showing the climate resilience of areas in Queensland (Figure 12.1). This was started by the previous government to find ways to maximise biodiversity conservation by choosing future protected areas that will be the most resilient to climate change. The first map combined baseline data of suitable habitat from 1990 with predicted suitable climate for 2085 under the Representative Concentration Pathway 8.5* for 1320 vertebrate species. This produced the map below:

Figure 12.1 Landscape scale mapping of property resilience to climate change impacts. (map courtesy of Brad Ellis)

Some outlying areas such as the Carnarvons which provide a micro-climate within the larger landscape did not appear on the map due to the scale, but were added to the list of climate resilient...
areas. From this research, funding was provided to buy climate resilient properties for future protection, resulting in the purchase of 10 to 12 properties.

After the success of the first map, it was decided to extend what information was included in the map. One important aspect of protected area additions that was included was the CAR (Comprehensive, Adequate and Representative) system** which aims to have adequate representation of all Queensland biodiversity under protected area. This addition meant that not only climate resilient properties were targeted but also ones that rated highly in the CAR system.

As part of this addition, a clustering analysis to sum up the comprehensiveness and representativeness of the bioregions was run with the available data. This resulted in a map of different climate diversity groups (Figure 12.2) which is much different to the usual bioregional mapping.

![Map of state-wide climate diversity groups](image)

**Figure 12.2: Map of state-wide climate diversity groups. (map courtesy of Brad Ellis)**

The ability for highly rated properties to be protected will always be limited by the willingness of the landholders to sell or sign voluntary conservation agreements for their properties. The use of these maps can only show government staff where to start making enquiries; it cannot guarantee the protection of the properties.
A third map is currently being worked on which will include regional ecosystems, plant data from the herbarium, further and updated species distribution models and potential threats outside climate change (for example invasive species and fire). The targets for biodiversity and regional ecosystems are also being continually refined so this data will be updated on an ongoing basis.


** The CAR strategy describes three principles for choosing protected areas, as follows:

- Comprehensiveness: Inclusion of the full range of ecosystems recognised at an appropriate scale within and across each bioregion.
- Adequacy: The protected area estate will have the required level of reservation to ensure the ecological viability and integrity of populations, species and communities.
- Representativeness: Those areas that are selected for inclusion in the protected area estate should reasonably reflect the biotic diversity of the ecosystems from which they derive.

13. Managing protected areas under climate change
Sherri Tanner-McAllister

There are many management strategies and approaches available to assess and deal with the impacts of climate change. However, there is no approach to adapting on-site management of parks to deal with climate change in situ as the available tools are impractical for on-ground management through lack of data or being too specialised.

Protected area management has traditionally been based on past conservation values and conditions, and managed to maintain those values in the present. This approach focusses on building resilience of our natural resources by managing current threats. As climate change impacts increase, this approach is unlikely to provide adequate protection for these areas as it will introduce new threats, and exacerbate existing ones. Natural resource managers will need to manage for change with strategies based on diversity and flexibility to deal with the expected and unexpected impacts on social as well as ecological values.

Protected areas are vulnerable to climate change as they cannot move through the landscape to more suitable climates. This means that strategies such as corridors and stepping stones, will not be of assistance and ecosystems within parks that are going to transform. A process designed for park managers needs to be developed. To do this the context of the individual park must first be understood – it’s values, threats, socio-ecological structure, regional situation, landscape context, size and boundary ratio, species meta-populations, as well as governance and the current management systems.

Park managers can either allow for change or try to prevent it. Allowing for change can be done one of three ways: (1) doing nothing; (2) building resistance; or (3) modifying the existing system. Firstly, managers may decide to do nothing due to a lack of resources, the impacts being out of the manager’s control, species being capable of surviving in a range of climates, or the threat being so severe that any management techniques will not change the outcome. Secondly, building resilience can be undertaken in instances where the threat is so severe that a change will occur, but a choice is made to minimise the rate of change. This can be done by removing and/or managing the threats and stressors in a system. Thirdly, trying to prevent change involves modifying the existing system and may be used to conserve a key value. This can be through hard, soft and/or indirect adaptation strategies. Hard adaptation strategies are usually in the form of engineering solutions, for example building levees to prevent inundation from rising sea levels or installing irrigation sprayers and artificial shelters to aid frogs. Soft adaptation strategies involve establishing or reinvigorating natural
Maintaining regional Queensland’s natural capital and ecosystem services

infrastructure and/or low impact technology. This may be through assisted colonisation or translocation of species to assist dispersal where natural migration is restricted or genetic conservation through captive breeding programs or seed and tissue preservation. Indirect adaptation can be achieved through a change in management, for example manipulating fire regimes.

A decision-making workshop was undertaken with Queensland Parks and Wildlife Service, to test the capability of these strategies as a way of assisting with the management of parks, was conducted for Queensland’s Gondwana Rainforests of Australia World Heritage parks. The participants assessed three values against each of the six strategies outlined above for each park. Examples of actions for each strategy were proposed and the probability of success of the strategy meeting the objective and the cost of implementing the strategies was rated. The aim was to determine strategies with a high likelihood of success but with low costs. However, once these have been selected, the social, ecological, economic, cultural and political implications must also be taken into consideration. For example, building resilience into the walking track system at Lamington National Park by closing some difficult to maintain tracks and using the available resources to maintain the rest of the tracks is feasible but could have high political and economic implications to the tourism industry.

A combination of strategies will provide the most benefit to protected areas. This diverse approach lowers the risk of negative changes as only one strategy may fail to meet the management objectives. Different strategies will also be needed for individual parks to manage the various impacts. Despite this, parks should also be managed within a regional context, taking into account the needs of species in surrounding areas. For example, a particular species may be entirely dependent on a particular park and so expensive strategies may be necessary for the species’ survival. Despite all that, there will always be matters, such as loss of cloud cover and social restrictions, which are beyond the control of managers. To counteract this, the decision making process must be incorporated into an adaptive management framework*.


14. Threats posed by the spread of invasive grasses

John Clarkson (Queensland Parks and Wildlife Service)

From 1988 to 2005, there has been an 82% increase in the number of introduced grasses in the Cape York Peninsula (Figure 14.1). The ones of most concern are Guinea grass, para grass, molasses grass, buffel grass, grader grass, Indian couch, annual mission grass, thatch grass, Gamba grass, olive hymenachne and Aleman grass. These are mainly pasture grasses that were deliberately introduced, but some such as grader grass have been introduced accidently. Sixty one percent of these grasses have now naturalised.
Figure 14.1 Timeline of introduction of exotic grasses to Queensland. (Gramshaw & Walker (1988)* – courtesy of John Clarkson)

The threat of further introductions is continual along with the potential for the current range of some grasses to spread. An example of this is buffel grass which is currently geographically limited by its inability to tolerate cold climates. Work is currently been undertaken in the United States of America to increase the cold tolerance of buffel grass. It is presently legal to import this grass into Australia, potentially spreading the problem to the southern states.

Grasses are a problem because they are difficult to identify and distinguish from native species, they are often well established before they are recognised and the infestation is too large to control, there are few selective herbicides and little chance of biological control. Grasses are also invasive; they can be planted in a paddock, but that will not prevent them from spreading outside this area. Grasses can impact on fire behaviour (an increased fuel load can lead to tree deaths), the nitrogen cycle, sward structure, species richness and abundance (by forming monocultures) and they can hybridise with native species. Tall grasses can also impact on road safety by restricting visibility, and the tourism industry by spoiling views and the economy by adding to the cost of road slashing and primary production through the increased cost of managing the fire risk. Grasses also change the physical structure of the ground layer. For example, unlike most natives, grader grass does not form clumps and instead spreads uniformly across the landscape, minimising the amount of available space. This has led to a significant difference in reptile abundance between sites with and without grader grass, for example robust skinks are known to avoid areas with grader grass.

Control options include: (1) prevention; (2) eradication; (3) containment; (4) reduction of impacts; and (5) doing nothing.

(1) Prevention is the least expensive option but requires a comprehensive understanding of where the target species currently occurs, what its dispersal mechanisms are and training for staff to be capable of identifying new outbreaks. The actions of others can compromise any prevention activities.

(2) Eradication of grass species is extremely difficult. Managers must have a comprehensive knowledge of where the species currently occurs, its biology and the longevity of its seeds. There must also be a commitment to its long-term control.
Maintaining regional Queensland’s natural capital and ecosystem services

(3) Containment of a pest species is often seen as the easiest option. However it still requires an understanding of the dispersal mechanisms and must be continued forever.

(4) Reduction of impacts is the protection of important assets in the landscape that are, or could be, impacted by weeds. These assets could include production assets such as crop yields, biological assets such as vegetation structure and cultural assets (both indigenous and non-indigenous).

(5) Doing nothing must be a conscious decision based on knowing that the impacts do not warrant action, other priorities or that there is no effective treatment. Managers must be ready to respond appropriately there appears to be any negative changes.

If the decision to manage a species is made, there are several ways in which to do this. Fire can be a great way to control grass at a landscape level. It can also reduce the biomass before secondary treatments such as herbicides are applied and can reduce populations. However, before using fire, managers must have an understanding of how the grass species and the vegetation community responses to fire, as fire can assist with the spread of some grasses and can lead to tree death in fire sensitive vegetation types. Grazing can also be a useful option, especially in areas of fire sensitive communities or a long history of grazing. The intended conservation outcome, and not any other factor, must drive the timing and duration of the grazing. There has been little progress made towards biocontrol for grass species’ as it has previously been deemed unsuitable due to the taxonomic relatedness to native grasses and the lack of sufficiently host-specific agents. However, recent research into some grass species has shown very little genetic variation within pest species in Australia due to their introduction from only one cultivar. There is potential to exploit this weakness and research is currently been undertaken to look for biocontrol agents for the weedy sporobolus group, serrated tussock and Chilean needle grass.

Introduced grasses will never be eradicated so steps need to be taken to deal with the ongoing threat and impacts. Staff must be trained in weed identification and their impacts to create further awareness and ability to deal with outbreaks effectively. Further research is also needed to gain a better understanding of the biology of grasses, the role of fire and grazing in their control and create improved herbicides. These steps, combined with the adoption of the Northern Australian Pasture Plant Evaluation Committee* Code of Practice to subject all proposed releases of new pasture plants to a weed risk-assessment protocol and improvements to quarantine procedures at the point of entry should give Australia the best chance of fighting this threat.

* Pastures Australia (PA) was formed in 2006 to better co-ordinate investment and activities in pasture plant improvement. PA is an unincorporated joint venture between five research organisations being Meat and Livestock Australia, Australian Wool Innovation, Dairy Australia, Grains Research and Development Corporation and Rural Industries Research and Development Corporation. The main charter of PA was to be an industry-wide venture to ensure efficient investment in pastures research and development.

15. Conservation Outcomes: grazing, a conservation tool in fire sensitive ecosystems impacted by buffel grass

Dr Rhonda Melzer (Queensland Parks and Wildlife Service)

(This presentation draws heavily on Melzer R.I. (2015) When is stock grazing an appropriate ‘tool’ for reducing Cenchrus ciliaris (buffel grass) on conservation reserves? Proc. Royal Society of Qld 120: 53-68.)

The inclusion of grazing as part of an integrated control program for buffel grass (Cenchrus ciliaris) should be considered where the conservation outcomes far outweigh any negative impacts. This is most likely to be the case when buffel is widespread and abundant within a fire-sensitive ecosystem.

Buffel grass has long been recognised as a serious threat to the environment through direct impacts (such as outcompeting native species) and indirect impacts (such as altered fire regimes). The most impacted species tend to be the specialists rather than the generalists, such as those that rely on specific food sources that decline with buffel grass invasion or need relatively long fire-free intervals or fire sensitive habitat features such as fallen logs.

Three ecological communities in Queensland that are listed as endangered under the Commonwealth EPBC Act are threatened by buffel grass: briga1ow (Acacia harpophylla – whether dominant or subdominant); semi-evergreen vine thickets in the Brigalow Belt; and bluegrass (Dichanthium spp.) grasslands of the Brigalow Belt. Other significant fire-sensitive Acacia dominated communities are also threatened by buffel grass including gidgee (A. cambagei) and blackwood (A. argyrodendron). Two examples of the impact of buffel on such ecosystems are given below.

Mazeppa National Park was gazetted to conserve a remnant of endangered regional ecosystem 11.4.6 –gidgee woodland on Cainozoic clay plains. Buffel grass has gradually encroached on the park, fuelling fires that have further promoted the spread of the grass. Over a quarter of the park has been substantially transformed by buffel-fuelled fires, despite attempts to prevent fire entering the park by conducting regular planned burns in the road reserve and maintaining boundary fire control lines.

Nairana National Park was gazetted to preserve remnant blackwood communities (including the endangered regional ecosystem 11.4.5 - blackwood woodland on Cainozoic clay plains). Part of the Park was initially gazetted as National Park (Recovery) to allow grazing to continue as a way of protecting these fire sensitive ecosystems. Grazing was however, excluded and severe wildfire subsequently devastated some areas of blackwood. Buffel covers large areas in the park and surrounding properties so the use of herbicide alone to control it and reduce the fire risk would be impossible.

The negative impacts of stock grazing on ecosystems are well known. Australian ecosystems evolved in the absence of grazing by hoofed animals and thus it is usually inappropriate to use stock grazing as a tool for weed management on conservation reserves. However, in fire-sensitive communities such as those in the national parks mentioned above, there are no effective options for minimising the impacts of buffel grass apart from grazing. The negative impacts of grazing are far outweighed by those of buffel-fuelled fires which can result in irreversibly transformed ecosystems.

In situations where grazing is being considered as a ‘tool’ to manage high biomass grasses such as buffel grass, it must be to achieve an outcome that cannot be achieved by any other means, and the benefits must outweigh the negative impacts.

A decision tree (Figure 15.1) has been developed to help land managers determine when stock grazing may be an appropriate management tool for reducing the impacts of buffel grass on natural values on conservation estate.
Grazing is currently being used as a tool to achieve conservation outcomes on four reserves managed by the Queensland Parks and Wildlife Service. Two of these are provided as examples below.

Albinia Conservation Park (CP) was once a brigalow/bonewood (Macropterus leichhardtii) scrub but was cleared and sown to pasture grasses in the 1980s. Buffel grass dominates the landscape. Grazing is used to reduce the fuel load prior to each wildfire season. Stock are removed over the wet/growing season. Over the 10 years since the project commenced, the height and canopy cover of the brigalow has increased substantially and it is hoped that by 2025, the canopy cover will be sufficient to suppress the grass growth such that the ecosystem is naturally fire resistant. Bluegrass
grasslands occur around the perimeter of the CP. These include highly palatable native grasses that have persisted very well under the grazing regime.

Taunton National Park (Scientific) is home to the endangered bridled nail-tailed wallaby (BNTW) (*Onychogalea fraenata*). Unfortunately, buffel grass is impacting the brigalow ecosystems it relies on and reducing the abundance of the native herbaceous species which are its preferred fodder. Ongoing heavy grazing is being undertaken in parts of the Park to promote woody thickening of the brigalow, create gaps for BNTW fodder species, keep the buffel grass short (to provide a relatively nutritious food for the wallaby in lieu of adequate native fodder) and reduce fire risk. The long term strategy is to ‘rundown’ the buffel grass by continuing to graze when it is storing reserves at the end of the growing season. Preliminary results of herbicide trials suggest that an allelopathic effect of buffel may impede the recovery of ground stratum diversity, but this impact should lessen with ‘rundown’.

Conservation reserves are not isolated from external influences and some have also been modified by previous in situ land uses including clearing, introduction of pasture grasses and commercial grazing practices. It will sometimes be necessary to use ‘novel’ approaches, such as stock grazing, to ensure the protection or recovery of natural values. Stock grazing must however, only be considered for use on a conservation reserve when there is no other effective means to minimise the impacts of buffel grass on natural values; and the conservation outcomes achieved by stock grazing far outweigh any negative impacts. The grazing must be undertaken as part of an integrated control strategy with explicit outcomes and performance measures that can be evaluated over time.

16. The role of citizen science in sustainable tourism

*Justin Foster (Earthwatch)*

The Earthwatch Institute* aims to ‘connect people with nature through science’ through its Citizen Science Program**. This global, not-for-profit organisation has been partnering with government, business, trusts and foundations in Australia for over 25 years and is one of the world’s largest private funders of independent scientific field research and conservation. The Citizen Science Program partners participants with scientists to answer real-world questions, increasing scientific capacity and inspiring people to instigate change. The use of participants provides opportunities to conduct work in a wide range of areas over long periods of time.

Participants can be members of the public, employees from private companies who are being funded by their workplace to participate in environmental research or students or teachers, participating in one of Earthwatch’s educational programs. Participants can choose from a variety of projects across the world ranging from 1 – 15 days in the field. All projects are led by a scientist (principal investigator) and are a great example of sustainable tourism.

Examples of projects in Queensland include; *Wildlife of Australia’s Rainforest* a projects which focuses on research of the effects of climate change on species distributions and abundance in the wet tropics. The project involves participants undertaking fauna surveys and the data collected will continue to be used to help shape the scientific response to climate change. *Snorkelling Australia’s Underwater Meadows*, which studies the effects of coastal development and increased freight traffic on marine ecosystems in Moreton Bay. Participants in the project collect ecological data on the sediment loads and seagrass and marine animal populations. The information collected formed part of a report on the health of Moreton Bay which will be used for community education and petitioning politicians to protect this ecosystem. *Recovery of the Great Barrier Reef* is studying the impacts of natural disasters and Black Band Disease*** on the health of the Great Barrier Reef. The
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project involves participants tagging and photographing diseased areas in an underwater survey area and conducting experiments in aquariums. This data will lead to better management and conservation strategies for coral in the Great Barrier Reef.

Projects such as these have also had some significant scientific findings. One example of these is the discovery that nearly 30% of turtle deaths are linked to turtles mistaking plastic litter for jellyfish, double what was previously thought. This discovery will be used to inform decision makers about the use of plastic products and litter programs. Another is the discovery that corals that host bacteria resulting from human activities are more vulnerable to stress than those without them. This is an important finding that will inform decision making surrounding the impacts of climate change and the protection of ecosystems close to human activities.

Ecotourism activities such as these not only provide scientific data but also positive interactions for people with the environment and a greater public awareness and appreciation of the importance of the environment to everyday life.


** Citizen Science Program - [http://au.earthwatch.org/scientific-research/our-approach-to-research-citizen-science](http://au.earthwatch.org/scientific-research/our-approach-to-research-citizen-science)

*** Black Band Disease – Black Band Disease is a bacterial disease comprising of multiple species of bacteria. These bacteria form a black band which migrates across healthy coral communities, eating through the tissue to expose the coral skeleton. The disease has been found in the Great Barrier Reef since 1993 but only as sporadic occurrences or in low prevalence. In 2006, the first large outbreaks have occurred and scientists are concerned that the predicted warmer ocean temperatures caused by climate change will lead to longer outbreaks and faster tissue loss.

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17. Developing a new vision – managing conservation areas in Queensland’s changing landscapes

*Dr Alistair Melzer (Central Queensland University)*

The world is changing. Changes are currently occurring to the weather, fire regimes and species distributions and these will only intensify with climate change. These changes are challenging traditional park management and the values that these areas are managed for. There needs to be a broadly based review of the management systems currently in place so alterations can be made to accommodate for future change.

The Queensland Parks and Wildlife Service (within the Department of National Parks, Sport and Racing) and the Queensland Department of Environment and Heritage Protection are currently working to adapt management techniques to cope with the upcoming change. However, they are constrained by decreasing budgets, staff reductions, ongoing restructures, constantly changing legislation and the upcoming retirement of 40% of the workforce over the next 5 years. These problems lead to a loss of corporate knowledge, the separation of key functional areas across different departments and the derailment of long term projects. With the government working towards increasing the protected area estate, there has been, and will continue to be, an increase in the estate, but as yet, sufficient resources to manage these extra areas has not been provided. The ongoing requirement for budget efficiency dividends (the reduction of budgets in anticipation of efficiencies being found) will continue to constrain the capacity for public servants to meet current challenges and plan for the future.

The *Nature Conservation Act 1992* was developed 24 years ago and although it is being constantly revised, it now needs an overall review. This review should include looking at the feasibility and appropriateness of the object and cardinal principal of national parks. The cardinal principle of national parks is the permanent conservation of their natural values. This implies that nature can be
protected and permanently preserved whereas natural areas and processes are dynamic and will continue to change. The flexibility of the management principles for nature refuges and conservation parks are better suited to dealing with upcoming challenges and changes.

In order to change the management principles of national parks, community perceptions of what national parks are need to become more realistic as these perceptions can influence decision makers. The most difficult part of this is that the community must first be prepared to accept that there is a need for change. The fundamental understanding of what national parks look like must change to include the permanent presence of pest species such as pigs, cats and weeds. This does not imply that these species will no longer be managed, but that they will be managed at a level appropriate to each national park. The key values of each park will also continue to be managed, but with the presence of pest species.

These upcoming challenges require a whole-of-government response that recognises the dominance of climate change impacts on protected areas in the change spectrum. Responses need to be long term and allow for the continued preservation of areas to allow biological changes to occur. New key values and management targets need to be included in the acquisitions policy for new national parks and appropriate resources allocated to this. Field staff should be trained to understand ecological processes and climate change and should recognise and accept the associated environmental challenges. Staff should still be encouraged to have a custodial attitude towards their land as this is critical to identifying any early warning signs of impacts and determining the appropriate management. The use of new technologies such as drones should also be included as potential management strategies. The management of protected areas must be undertaken on a landscape level and integrated with the management of surrounding areas. Meeting the challenge of pest management in particular will never be achieved without broad community support and government commitment.

**WORKSHOP SESSION 2**

**Towards a new paradigm in conservation estate management**

Most scientific data and discoveries are ignored, or denied, for a prolonged period of time before being accepted. In order for this to occur, a logical set of evidence needs to be compiled. The on-ground managers of protected areas are realising that a different management approach is necessary; but a body of evidence on how best to do this has not yet been developed. This could start as a background paper on how best to manage protected areas in the future that incorporates the information and lines of evidence presented at this forum.

The next ‘State of the Parks’* process will be undertaken in 2018 and will be a review of ‘iconic’ parks and a selection of some others. This process assesses the condition, trend and outputs of individual parks. Current national parks should be investigated to see if (1) their management is achieving stated goals, and (2) the likelihood of achieving their goals, especially in the context of the upcoming impacts of climate change. The previous government was in the process of reviewing all national parks but in the context of potentially de-gazetting some to lower types of protected area.

A review of the *Nature Conservation Act 1992* is needed, along with an appraisal of the tenure of protected areas. This review should not be undertaken by the government, but by a group of scientists with the ability to capture the depth of knowledge that has been encapsulated in this forum. The review should address significant threatening processes and climate change as well as
examining the drivers for change in terms of the future of conservation in Queensland and should not involve the consolidation and weakening of options and strategies like the recent review of a range of biodiversity and conservation legislation in New South Wales.

* State of the Parks – This is an evaluation of the effectiveness of park management activities in improving condition of national parks. It looks at the outcomes of management programs and the extent to which park management objectives are being met as well as identifying emerging issues and current challenges. This process is undertaken by park management agencies across Australia.

Public vs private management of conservation estate (fences)

There is a large spectrum of options for management of protected areas by private companies. Options include companies becoming the trustees of parks and/or taking full responsibility for the park’s management. The issue of who will pay for this management, and/or what parts, is also in question along with who will take responsibility for the administrative side of managing a park.

There already is capacity for the involvement of private companies in protected area management across the landscape and within individual areas. Previous landholders can be invited to manage newly acquired areas and become part of the solution. Cross tenure relationships have been formed in the past in reaction to wildlife corridor plans (for example) and can assist with the overall management of areas of different tenure. This ‘nil tenure’ approach assists with meeting the broader ecological goals and objectives of protected areas as managing a species across the landscape can lead to improved ecological outcomes since animals and plants do not respect fences. Through this, communities and individuals can have input to protected area management and therefore get a sense of ‘ownership’ and connection with that area.

If land management of protected areas is privatised to any extent, there must be integration and coordination with current land managers and land management practices. This includes ongoing communication with Queensland Parks and Wildlife staff. If private conservation management groups are permitted to manage protected areas, there is the risk of rangers perceiving this as an insult on their land management skills. Rangers are extremely valuable land managers who can have a long history and knowledge of particular areas. Any private management agreements must respect and value this knowledge and ensure it is used accordingly.

Is State policy and regulation up to the task ahead?

A whole of government coordinating forum is necessary to bring State government policies and regulations to a point where they are capable of dealing with the task ahead and reaching sustainability goals. This may not necessarily involve the development of new policy and regulations, but simply implementing current ones that are not being used. The government needs to be willing to use these tools for their intended purpose, otherwise the task will be much more difficult. The government also needs to investigate whether the implementation of some policies is being impeded by others that countermand what they aim to do. For example, the State is effectively giving up its interest in conservation on leasehold lands by making it easier for landholders of leasehold lands to apply to have their lands converted to freeholdings.

One issue that must be resolved before real improvements to biodiversity and ecosystem health can be made is the issue of the natural resource interests (for example mining exploration permits) that currently lie over the majority of Queensland. Decision makers must also define what the goal is that is to be achieved by the regulation. A review is required to map existing regulation and policy issues and their effectiveness in light of the upcoming problems. This review could investigate different
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options for a range of different goals. This could include a review of the current range of protected area tenures, their suitability to deal with the upcoming threats and impacts of climate change and the tenures of the current estate and provide a policy framework for the future of conservation tenures in Queensland. This will have a significant impact on the expectations of what protected areas can provide, how they are managed and needs to be presented to both major political parties before the next election. The first step towards this is to revert to the protected area categories that were in place prior to the Newman government (which has now been done) and then investigate new categories designed to cope with the new challenges.

Now is the time to prepare these documents as the current opposition is already seeking advice from key conservation stakeholders about future policy platforms. Having these documents already prepared will allow them to be ready for when a political opportunity arises.

Summary of recommendations and proposals

1) Circulate proposals of what needs to be done and identify key tasks.
2) Identify small working groups to pursue a limited number of key tasks. This must not be rushed but be a considered process.
3) Write a background paper based on information provided at this forum. This should be done by a 3 – 4 person team.
4) The Royal Society of Queensland will write to the Minister of Science and Innovation suggesting the creation of a multi-disciplinary panel comprising of people outside the political environment and individual government departments to provide advice to the Minister on scientific issues that may have fragmented information.
5) Identify the drivers for change in the future of conservation in Queensland.
6) Review the tenure of current protected areas and write a policy statement addressing the range of tenures necessary to satisfy conservation needs now and in the future.
7) Write a paper about where Queensland currently sits in relation to conservation on protected areas and private lands. This paper would include detail about what is needed in terms of management on public and private lands and investigate possible changes to management and new ways of approaching stewardship incentives.