# Nature

New South Wales

## Rewilding Special edition

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National Parks
Association of NSW

# Hi everyone and a warm welcome to this special rewilding edition of Nature NSW!

Rewilding has grabbed me for one key reason that I share with George Monbiot: it offers hope. Many readers will share my distress in seeing nature deleted by humans and will have experienced powerlessness in the face of relentless destruction. This is the Anthropocene, the epoch in which humans are the dominant force in nature - and where most don't seem to care.

Rewilding offers an alternative. The world was richly diverse before humans began to micro-manage nature. As Pope Frances said in his now-famous encyclical 'human intervention…is actually making our earth less rich and beautiful, ever more limited and grey'. So let's give nature a chance to reverse what Daniel Janzen calls 'the more insidious kinds of extinction, the extinction of ecological interactions'! For me, this is rewilding: allowing nature to re-establish interactions that in many cases we didn't know were lost - particularly via restoring predator populations. Is rewilding achievable globally? Well, as Michael Soulé said 'the greatest impediment to rewilding is an unwillingness to imagine it'.

Rewilding is a paradigm shift in ecological theory which has occurred rapidly. Because rewilding means different things in different places, we're going on a global tour. Rewilding Europe is working to recover predators and large herbivores. Even in little Ireland there is room for wilderness. But what happens when animals that used to perform important roles are extinct? One option is to use 'ecological surrogates' as in Mauritius and Pleistocene Park. We'll take a look at predators and their role in rewilding globally. We'll meet Rewilding Australia, learn about wilderness in NSW and a neat experiment to resolve debate over the ecological role of dingoes. We'll discuss impacts of dingoes on farmers and how we can reduce them, and examine what role Tasmanian Devils could play on the mainland. And our views on 'pest animals' will be challenged as we take a look at a wild Australia in the Anthropocene!

We are privileged to have articles from some of the world's best academics in this edition. All contributors have written for no financial reward. I would like to offer a huge thank you on behalf of the NPA for your efforts in protecting nature.

**Cover photo:**

Dingo *Canis dingo*

Creature Feature page 20

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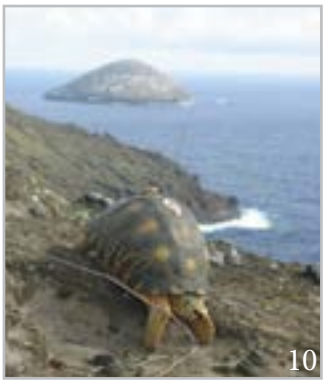



Rewilding Europe®

Making Europe a Wilder Place

**Mei A. Elderadži**
Communications Manager, Rewilding Europe

Rewilding Europe is an ambitious initiative, advocating the return of wilder nature and more abundant wildlife in one of the most crowded continents of the world. Dedicated to restoring natural function to ecosystems across the continent it is boldly moving towards its goal to rewild one million hectares of land by 2022 in 10 different areas across Europe.

A historic opportunity has unfolded in Europe. The urbanisation and the depopulation of rural areas has resulted in land abandonment of the countryside in many parts of Europe, in some regions at a large scale. Instead of being perceived as a problem, this could also be turned into an opportunity. Europe has witnessed the comeback of a number of iconic and key wildlife species over the last 40 years, providing possibilities for wildlife-based tourism for which demand is growing every year. There is also growing interest and support in European society, including at European Union policy level, for restoring ecosystems, returning wild nature and wildlife, and understanding the potential of rewilding.

At the same time Europe, diverse in landscapes, habitats, cultures and development, is still rapidly losing species and natural ecosystems through urbanisation, infrastructure development, and the industrialisation of agriculture, forestry and fishery. Much is being done to halt this, but Rewilding Europe aims for a new, additional approach to nature conservation in Europe, where the concept of wild nature and natural processes is accepted as one of the main conservation approaches.

## The beginning of a new movement

Rewilding Europe presented this new vision at its formal launch in 2010, and invited area nominations to become part of the initiative. A group of five areas was selected, out of more than 20 nominations that were received from across Europe, to create a first set of model areas for the new rewilding approach: the Danube Delta (Romania), the Eastern Carpathians (Poland - Slovakia), the Southern Carpathians (Romania), Velebit (Croatia) and Western Iberia (Portugal - Spain). In 2013 and 2014, two new areas were added to the portfolio: the Central Apennines (Italy) and

The demand for nature-based tourism has been growing steadily across Europe
Photo: Rewilding Europe

Old wooden building of the old Meteorological Station at Cuntu. Southern Carpathians, Romania.
Photo: Florian Möllers / Rewilding Europe

*"Conservation efforts should not only be about reducing threats to imperilled habitats and species, but should as much be about facilitating natural processes to flourish again in previously modified landscapes. Our hope is to have wild nature, wildlife and wilderness as a functional part of a modern, 21st-century Europe, benefiting both nature and people"*

**– Frans Schepers,**
Managing Director of Rewilding Europe

the Rhodope Mountains (Bulgaria), followed by the Oder Delta (Germany - Poland) and Lapland (Sweden) in 2015.

In all of these areas, efforts are focussed on showing practical, meaningful results in the return of wild nature and wildlife, creating a new pride in wild nature and developing nature-based economies based on this, and inspiring other initiatives across the continent to adopt this vision and approach. Rewilding Europe works bottom-up and provides support to local entities that have the leadership and ownership to work in these rewilding landscapes.

## Large animals are key to success

The return of a variety of wildlife species, in particular the larger mammals and birds - often keystone species in these ecosystems, provides an important foundation for successful 'rewilding' in the European continent. A resurgence in their populations is vital to creating a solid foundation for the successful 'rewilding' of many parts of Europe.

Large carnivore populations (Eurasian Wolf, Lynx and Brown Bear) in Europe are stable or generally growing in numbers and distribution thanks to legal protection and, in some cases, reintroductions. This provides both new challenges and opportunities for Europe. Scavenging species are generally not doing so well as levels of carrion are low in European landscapes. For this reason, up to now most vulture species can only survive by high levels of artificial feeding. Providing wild food (for instance via Vultures and other scavengers feeding on Wolf kills) is a long-term goal.

The absence or low densities of wild, large herbivores - like European Bison, bovines, horses and deer species - in some countries is a critical gap in the functioning of most European ecosystems. As a result natural grazing is missing as a key ecological process in many landscapes and the natural prey base for both carnivores and scavengers is limited in many areas.

As a starting point in bringing back lost wild herbivores, Rewilding Europe has worked so far on three

Wild Carpathian Wolf photographed in Bieszczady Mountains.
Photo: Grzegorz Leniewski / Wild Wonders

Release of European Bison in the Tarcu mountains nature reserve, Southern Carpathians, Romania.
Photo: Staffan Widstrand / Rewilding Europe

Griffon vultures feeding on carcass on mountain plateau. Abruzzo, Central Apennines, Italy
Photo: Bruno D'Amicis/Rewilding Europe

keystone species: the European Bison, Aurochs and European Wild Horse. A reintroduction of European Bison began in Romania in 2014, while Rewilding Europe, together with the Taurus Foundation, established four breeding sites of the 'Tauros', the closest possible stand-in (or 'ecological replacement') for the extinct Aurochs. Tauros breeding sites are located in Portugal, Spain, Croatia, Romania and The Netherlands and involve six different ancient breeds that form the basis for a back-breeding programme. Also, grazing pilots with different breeds of wild horses have begun in five different countries.

Population augmentations and the start of grazing pilots with wild-living bovines and horses have shown that these ecological replacements of the lost wild species function well in the presence of predators such as Wolves and Bears, that social herd structures quickly establish, and that a process of de-domestication begins very early.

In November 2014 Rewilding Europe published a Bison Rewilding Plan 2014-2024[1] demonstrating the planned contribution to the conservation of the European Bison, still listed as vulnerable on the IUCN Red List. Rewilding Europe and WWF-Romania have set up a Bison reintroduction project aiming to build a free-roaming population of over 300 animals in the Southern Carpathians by 2024. Through cooperation with 14 zoos in seven European countries, two translocations to Romania have already taken place and more than 30 Bison are now roaming the Romanian Tarcu Mountains. The European Commission has now also begun to support this initiative.

As well as for Bison, Rewilding Europe has prepared feasibility studies on reintroductions of four other species: Red Deer, Roe Deer, Beaver and Iberian Ibex. For the Wolf, which has the ability to re-colonise on its own, the focus is on promoting its natural comeback by preparing humans and removing the negative stigmas attached to the species, and to help reduce human wildlife conflicts.

## A continental network

Rewilding Europe sees itself as part of a broader European conservation movement in which many inspiring rewilding initiatives have been developed over the last few decades, and where many new ones are being started all over the continent. In 2013, in order to inspire others and to make a fair contribution to these efforts, Rewilding Europe started a new initiative within its wider programme: the European Rewilding Network

Tauros are being bred at five sites across Europe as ecological replacements for the extinct Aurochs
Photo: Staffan Widstrand / Rewilding Europe

One of the key to success for Rewilding Europe is economic gain from nature-based tourism such as hiking
Photo: Rewilding Europe

## A working definition for rewilding in a European context

Rewilding ensures natural processes and wild species play a much more prominent role in land and seascapes. This means that after initial support, nature is allowed to manage itself. Rewilding helps landscapes become wilder, whilst also providing opportunities for modern society to reconnect with such wilder places for the benefit of all life (Rewilding Europe, 2015).

For more information, please visit www.rewildingeurope.com and www.facebook.com/rewildingeurope

(ERN). The ERN aims to establish a living network of, ultimately, 100 rewilding initiatives across Europe. Although every initiative is unique and has its own opportunities linked directly to the specific area and people involved, the goal is to exchange knowledge and experiences - and to inspire each other. As of February, two years after its launch, ERN membership had more than doubled and now counts 43 members from 19 different countries, covering nearly 2.4 million hectares of land and water where rewilding is taking place in one form or another.

### Rewilding can benefit communities too

A key factor in success is whether local communities and stakeholders benefit from the rewilding approach. A second key component is therefore building nature-based economies through business work: supporting local rewilding enterprises and helping to develop new ones. A completely new tool was developed to support such businesses: Rewilding Europe Capital (REC). REC is Europe's first 'rewilding enterprise' funding facility and provides development loans and business support to new and existing businesses exploiting opportunities created by the emerging rewilding movement across Europe. REC seeks to provide technical, financial and promotional assistance to businesses that can make a meaningful difference to rewilding and those relying on natural landscapes. In less than two years REC has already supported 16 enterprises in four different countries (Portugal, Italy, Croatia and Romania) creating over 30 new jobs and enhancing the rewilding of 20,000ha of land. Scaling up is being planned.

### Rewilding captures the imagination!

A strong communication effort, reaching out to many millions of Europeans, is the third key component of the initiative. Communication at all levels - from the local level to the wider European audience - is key to success. Rewilding has received a lot of attention, showing Europeans their natural heritage, the potential for a wilder continent and how both rural and urban citizens of Europe could benefit from this. Rewilding has become a new term in European conservation, and Rewilding Europe has been able to develop itself as the main architect and driver of this approach so far.

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# Wilderness

## in a modified European landscape

**Bill Murphy**
Freelance recreation consultant and wilderness advocate

The number of places in Europe where one can be away from the signs of human influence on the landscape is declining. The European Parliament called on member states to consider setting aside areas as wilderness in a landmark resolution in 2009[1]. In 2010, Coillte[2] and the National Parks and Wildlife Service (NPWS)[3] set up a working group[4] to assess the Nephin Beg Mountains in County Mayo as a potential wilderness area for Ireland. Following a major study the two land-owning partners set-aside over 11,000 ha (27,000 acres) of mountain, blanket bog, lake and plantation forest[5] as Ireland's first wilderness area in 2013.

How can you have wilderness in a small country like Ireland with its patchwork of farms, forests, bogs and mountains, dotted with homesteads, towns and cities and criss-crossed by roads and power lines, a landscape that has been managed and modified for millennia?

Anyone visiting Ireland is struck by the variety of landscapes that are crammed into a small island - human managed landscapes of tended farmlands, not to mention a growing urban landscape, particularly over the last 20 years, but also some of the best examples of wild boglands in Europe and upland landscapes with plant communities from across a broad range of climate zones[6].

Restoration is fraught with all sorts of scientific and practical issues. Primarily, what arbitrary point in time does one restore to? Climate change, invasive species, fragmented land use and other human impacts have changed what has gone before and we need a new approach to wilderness[7].

How do you assess an area as wilderness, particularly one that has been modified? The question - "is the area suitable for designation as a wilderness?" - begs the bigger question, "what defines wilderness?". The study team required a definition and tools that would deliver a robust assessment that could stand up to external scrutiny, but take into account our cultural understanding of landscapes and wilderness. Wilderness in Ireland therefore is essentially a free willed landscape, one where re-wilding means the removal of human management.

Accepting that landscapes while modified may not be natural but can be wild the team defined wilderness as:

- An extensive area of wild (or perceived wild) land
- An area with high biological values and

- A landscape that would offer visitors authentic primitive recreation experiences.

The definition reflects the different "values of wilderness" that the disciplines in the team wanted to incorporate in the vision of wilderness.

The team developed landscape assessment tools and used ecological designations and a modified Recreation Opportunity Spectrum[8] to develop a layered map of the landscape that ultimately allowed boundaries and different zones to be defined. A review of legislation[9] revealed a broadly similar approach to size. US legislation indicated a minimum size of 5,000 acres while Iceland required 2,500 ha. In Ireland a primitive and wild core area of 2,000 ha is required.

## Challenges

The Wild Nephin project is not restoration. We can however allow it to be wild, a free-willed landscape without human intervention. Over the next 15 years a transition plan will reverse some of the human interventions that have modified the landscape. Heavy thinning will move the forest[5] towards "old growth" conditions creating an open forest that will allow natural regeneration; dead and broken trees will enhance habitats. Strategic seed stands of native species will be created to act as a seed source for the thinned pine stands.

Removing roads and other human artifacts is easier but represents a huge step in land managers thinking. The real challenge in wilderness is managing humans and their urge to "improve" and "do things". Wilderness managers must resist the temptation to interfere. Our professional training hard wires us to manipulate habitats for land use objectives, our legislation (EU habitat directives for example), sometimes requires us to act to intervene to protect a habitat or species. "Wilderness management" is a contradiction in terms.

What will Wild Nephin be like in 50 years? It's hard to say, all we can do is step back and allow it to be free-willed and wild. The future for the wild is exciting.

The many lakes studded throughout the area add to the biolgical value
Photo: Bill Murphy

The forest enhances biodiversity and recreation opportunities
Photo: Bill Murphy


### About the author

Bill Murphy was the lead on the wilderness study team and the Chairman of the Wild Nephin Management board until June 2015.
A professional forester, Bill is now a freelance recreation consultant and wilderness advocate and is about to commence a postgraduate programme on the topic of wilderness with the Wildland Research Institute at the University of Leeds in the U.K.
Bill can be contacted at williammurphy123@gmail.com


### References


1. European Parliament resolution of 3rd February 2009 on Wilderness in Europe (2008/2210(INI))
2. Coillte is Ireland's state forest company and manages the nations forests for economic, social and ecological values; see www.coillte.ie . Approximately 4600ha of Coillte forest land form part of the Wild Nephin Wilderness.
3. The NPWS manages national parks and reserves, see www.npws.ie and Ballycroy National Park forms part of the wilderness area see www.ballycroynationalpark.ie .
4. The team was made up of different disciplines, landscape architects, ecologists, park mangers, recreation specialists, forest managers and environmental economists.
5. The forest consists primarily of lodgepole pine (*Pinus contorta*) although other species like Sitka spruce *(Picea sitchensis*) are present. The objective over the next 15 years will be to replace the spruce with mixed native broadleaved species and modify the pine stands with silvicultural thinning.
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# Rewilding

## oceanic islands with giant tortoises

**Dr Christine Griffiths**
Conservation Manager, Ebony Forest Ltd, Mauritius

On the small Indian Ocean island of Mauritius, species extinctions have left a legacy of dysfunctional ecosystems, poorly adapted to today's pressures of habitat destruction, invasive species and climate change. Most apparent is the loss of the island's two species of giant tortoises, keystone herbivores and frugivores (fruit-eaters) that once shaped the unique flora.

Today, less than two percent of the original native forest persists, 89% of endemic (not found anywhere else) flora is considered threatened, 61 species, including the infamous Dodo, are already extinct and Mauritius 'boasts' the third most endangered flora in the world. Radical rethinking to address Mauritius' dire habitat conservation was needed to establish long-term, large-scale sustainable impacts.

The Mauritian Wildlife Foundation's proposed solution to manage degraded habitats was to restore natural processes. This local non-governmental organisation started testing whether Aldabra Giant Tortoises *Aldabrachelys gigantea*, native to the Aldabra Atoll in the Seychelles, could be used as 'taxonomic replacements' to mimic the ecological functions of the extinct Mauritian Giant Tortoises, *Cylindraspis triserrata* and *C. inepta*. Aldabra tortoises, the last remaining giant tortoises of the eight species which once occurred in the Indian Ocean, were selected as suitable replacements because they are taxonomically related and believed to have similar ecological functions to the extinct species.

The first introduction of captive-bred Aldabra Giant Tortoises occurred in 2000 to the 26 ha offshore Mauritian islet of Ile aux Aigrettes (Griffiths *et al*. 2010). The effectiveness of the replacement tortoises was evaluated by their impact on the ecosystem, i.e. the effect of tortoises on the vegetation versus no tortoises. While much can be inferred about the interactions and impacts of the extinct species, comparing the replacement species' interactions with the extinct species is difficult due to the lack of detailed knowledge of their specific interactions. Since the introduction of tortoises to Ile aux Aigrettes, few ripe fruits remain under fruiting trees as the tortoises consume large quantities and disperse the seeds around the island.

*Astrochelys radiata* on Round Island.
Photo: Christine Griffiths

*Aldabrachelys gigantea* create 'grazing lawns'
Photo: Megan Whittaker

Endangered Ebony *Diospyros egrettarum* in tortoise poo
Photo: Christine Griffiths

*Aldabrachelys gigantea* on Ile aux Aigrettes
Photo: Megan Whittaker

The result has been to resurrect the dispersal and regeneration of native trees such as the Critically Endangered Ebony *Diospyros egrettarum* – familiar to many as one of the species favoured for carving in Africa. Like many other large-fruited species, ebony suffered in the absence of suitably large frugivores to consume and disperse its seeds. Aldabra Giant Tortoises have proved effective replacement species and rewilding Ile aux Aigrettes is aiding in the restoration and recovery of the native vegetation (Griffiths *et al*. 2011).

While the tortoises disperse native seeds, in general they avoid eating their slow-growing seedlings. An explanation as to why may be found in their heterophyllous leaf traits. Heterophylly, or having different shaped leaves on the same plant, is widespread among the Mascarene flora and is believed to be an adaptation to defend trees from browsing Mauritian tortoises, which once attained high densities. The Aldabran tortoise's behavior supports this hypothesis: they tend to avoid the low-growing "juvenile" leaves, often characterized by red coloration and different shape and size, in preference for the higher-growing mature leaves which are beyond tortoise browsing height (Eskildsen *et al*. 2004).

The tortoises preferential consumption of exotic vegetation on Ile aux Aigrettes was the catalyst for the introduction of tortoises to the larger Round Island, a 215 ha island north-east of Mauritius. Invasive grasses and herbaceous weeds were the greatest threat to the remnant flora of the island following the eradication of rabbits and goats in the 1980s. In 2007, twelve *Aldabrachelys gigantea* and twelve Madagascan *Astrochelys radiata* were introduced as part of a preliminary study to measure the impact of tortoises on the grassland vegetation. Today there are over 500 tortoises roaming freely on the island, restoring lost ecological interactions and facilitating the re-establishment of the hardwood forest by controlling the exotic vegetation, creating grazing lawns and dispersing native seeds (Griffiths *et al*. 2013). Despite Round Island's steep topography, large areas of bare rock which, in the sun, can reach temperatures in excess of 50°C, and lack of natural water, tortoise survival is high (Griffiths *et al*. 2012). Only one animal has died.

The introduction of giant tortoises, which were once present on most continents (except Antarctica and Australia) and on many isolated oceanic islands, as ecological replacements is increasingly being used as a restoration tool (Hansen *et al*. 2010). Restoration of ecological interactions and natural processes is imperative for long-term and large-scale habitat management, especially given the limitations of conservation funds.

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# Mammoth steppe
## and future climate

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During the late Pleistocene, the North Siberian and Alaskan plains accumulated massive strata of ice-rich loess sediments. The Siberian name for these sediments is yedoma, the soil of the vast Mammoth steppe ecosystem. Yedoma contains abundant plant remains (mostly grass and herb roots), living microbes and animal bones. Analyses of the concentration and distribution of animal bones in yedoma provides insight into the density of megafauna in this ecosystem.

### A highly productive ecosystem was transformed

Siberian plains once supported one Mammoth, five Bison, eight Horses, fifteen Reindeer, plus more rare Muskoxen, Wooly Rhinoceros, Cervus, Saiga, Snow Sheep, Moose, Cave Lions, Wolves and Wolverines per square kilometer[1]. The mammoth steppe was a highly productive ecosystem. Over winter, animals ate plants that grew during the summer and herbivores quickly recycled nutrients. Biocycling was many times faster than today. Trampling was so intense that only quickly growing grasses and herbs could resist it. Numerous animals maintained these pastures, and therefore this ecosystem was largely independent of climate[1]. It occupied territory from modern Spain to Canada and from Arctic islands to China.

Holocene climate warming must have increased the productivity of northern pastures. However climate warming also allowed humans to penetrate the north. Human hunting of naive animals meant animal density quickly dropped, which caused a substantial drop in biocycling. Grass litter started to form on the soil surface and productivity and transpiration dropped.

Animals in the Pleistocene Park have turned swampy tundra into highly productive pasture
Photo: Sergey A. Zimov

Soils became moist and, in time, less productive plants displaced highly productive grasses and herbs and a great ecosystem vanished. Pastures changed into tundra and northern taiga[1]. Only the most remote and inaccessible territories maintained herbivore populations into historical times.

### But we can restore productivity

But if mammoth steppe once existed in a wide range of climatic conditions, then similarly productive pasture ecosystems can be created. All that is needed is to reintroduce locally extinct megafauna species and protect them from poaching. This process has already started. In medieval times the north of Siberia was colonized by Yakuts. Their horses adapted to the severe northern climate, and some are now wild and live independently of humans. Similarly, reindeer herders vanished from the Taimyr Peninsula, and those territories are now occupied by a million wild Reindeer. Muskox and Bison were reintroduced to northern Siberia and a successful reintroduction of Bison to Alaska also occurred.

This sparse population of herbivores has little influence on vegetation and soils. But as their numbers grow their influence will rise. Biocycling will increase and productivity of grasses and herbs will rise. Density of herbivores will become sufficient to maintain Siberian Tigers, which control not only herbivore populations, but also those of Wolves. And this productivity increase is real: according to scientists, Wrangel Island in the mid-20th century could only support 350 Reindeer. But by the end of the century their number grew to 8,000 (plus 1,000 Muskox)[1].

There is another way to revive the pasture ecosystems: collect those animals from the mammoth steppe which did not go extinct and, using fences, maintain a high density (10 tons biomass per square kilometer), to influence vegetation cover and soils, i.e. create a small but fully

On these slopes yedoma is melting at up to 20 cm per day. Grasses help prevent this erosion
Photo: Sergey A. Zimov

functioning pasture ecosystem. After that, shift fences to expand this ecosystem to new territories[2].

This is "Pleistocene Park" in the Kolyma river lowlands, 150km south of the Arctic coast. Subject to this Pleistocene density of animals, vegetation underwent a dramatic change. All tall shrubs were broken, moss was trampled, grasses and herbs dominate everywhere and there is no litter on the surface. Soils became dryer and grass roots now penetrate the entire depth of the active layer seeking water and nutrients. Animals that had not met for millennia are remembering how to co-exist.

## A global warming feedback loop

Global warming is most active in the Arctic and permafrost degradation has already started. Half of the volume of yedoma is ice. When this melts, water escapes and the ground surface collapses. So if yedoma is 40m thick then thawing will cause the soil surface to fall by 20m. This, accompanied with active erosion and mud flows, destroys the land surface and forms badlands.

Yedoma plains can be viewed as a giant glacier, protected from the hot summer sun only by a meter-thick layer of modern soil. Warming will thaw ice-poor permafrost slowly, and ice-rich will thaw within several decades. Yedoma is one of the biggest carbon reservoirs in the world containing 400-500 billion tons of carbon, or three times that of all tropical forests. And yedoma carbon is not humus but mostly fresh organic remains. As it melts, microbes awaken and start consuming what they didn't finish in the Pleistocene. In aerobic conditions this produces $CO_2$ and, in anaerobic, methane[3,4].

Greenhouse gas flux in the atmosphere will amplify global warming which in turn will amplify emission of greenhouse gases from permafrost. There is only one way to slow down permafrost degradation by climate. Permafrost temperature is dependent on the thickness of snow cover. Air temperature can drop to -50ºC, while soil covered with a thick layer of snow may be only -10ºC. In northern Siberia snow causes permafrost to be 5-7ºC warmer than average annual air temperature. In the Arctic, herbivores have to excavate snow several times a winter to find food. This decreases snow thickness by 2-3 times and increases heat conductivity. Therefore, on Pleistocene Park pastures, temperature of permafrost is 4ºC lower than on similar grasslands with no animals.

Forest and shrublands are dark in both summer and winter and actively absorb heat and warm the atmosphere. Pastures are light in the summer and in autumn and in winter and spring they are white. Psychrophilic (extreme cold loving organisms) mammoth steppe thus regulated its favorable cold climate itself.

## Can rewilding slow global warming?

Let's imagine a productive pasture ecosystem with an optimum density of herbivores maintained by predators. Every year thousands of calves and foals are born. For them to survive they must find new pastures. There is little forage for herbivores in the taiga and tundra. But if permafrost begins to melt, the surface will start collapsing, existing vegetation will slide into gullies and the super-fertile soils of the mammoth steppe will be exposed. These soils will be covered within a year with densely growing grasses, which will anchor soil and prevent further erosion. Higher transpiration will reduce water and thus mudflows. These grasses will attract herbivores, which will eat the grass and trample the snow. The following winter soils will freeze deeper and permafrost temperature will drop.

In Paris, leaders agreed to reduce the emission of greenhouse gases in the next decades, by tens of billions of tons. That is a complicated and expensive task. North Siberian plains contain hundreds of billions of tons of carbon in the permafrost, which is starting to find its way back to the atmosphere. To slow down or stop this process all that is needed is to bring back animals that lived there, help them adapt, and protect them. The rest they will do themselves.

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# Who's afraid of the big bad wolf?

## The influence of predators and their role in rewilding

**Dr Oisín Sweeney**
Science Officer, NPA NSW

### Fear drives a fascination

Predators hold a special place in our minds and cultures. They appear in fairy-tales, films (one series, about an alien super-predator, was called simply 'predator') and ancient cave paintings as far apart as France and Australia. This fascination with predators probably stems from the fact that for most of our evolutionary history we were considered tasty morsels – and still are in some places around the world. Although most of us now go about our daily lives free of the fear of being eaten, our ancestors simply couldn't afford to ignore predators. It may have been a fatal error. So humans were once one of the many species subject to predation, and the same influences predators have over prey today may once have been exerted on our ancestors.

### Apex predators

Ignoring humans now, the term 'apex predator' refers to an animal that is top of the food chain. Lions, tigers, wolves and sharks spring to mind immediately. But of course, it's not entirely that simple! For example, Foxes (*Vulpes vulpes*) are the apex predator in areas of Europe, such as Ireland and Britain, where wolves are absent. But foxes would be considered 'mesopredators' (predators subject to influence by larger apex predators) in mainland European countries where wolves roam free. But when we consider predators in the context of rewilding, it is usually larger predators that are the focus of attention. And that's because they have some unexpected and profound impacts upon their environments; impacts that justify the use of the term 'keystone species' in recognition of the fact that their influence goes beyond that of other species that share their environment.

Red fox *Vulpes vulpes hunting mice in the grassland*

### Trophic cascades

One of the defining impacts of apex predators is their ability to trigger 'trophic cascades'. This is a sort of ecological chain reaction where plants that aren't directly consumed by carnivores are nonetheless influenced by their actions. The reintroduction of wolves to Yellowstone National Park has become the quintessential example of this: bringing wolves back didn't just result in fewer Elk (*Cervus elaphus*) via predation, but it also changed Elk behaviour via the creation of a 'landscape of fear'. This terrifying-sounding concept means that, as Elk became attuned to the presence of wolves, they spent less time in places where predation risk was greater. The result? A recovery of Aspen (*Populus tremuloides*) vegetation on river banks. An example I learned about in university, before rewilding had become a well-known field, is that of Sea Otters (*Enhydra lutris*) in

Alaska reducing sea urchin numbers which in turn increased kelp cover by reducing urchin grazing. There are other amazing examples too: on the African savanna Leopards (*Panthera pardus*) and Wild Dogs (*Lycaon pictus*) control how thorny the tree communities are. How? By influencing the behaviour of Impala (*Aepyceros melampus*): in places where predation risk is low and Impala linger, thorny Acacia are more abundant as thorns are a defence against browsing by Impala. Where predation risk is higher, browsing is reduced and less thorny Acacia species are dominant. In Australia, the cover of native grasses is influenced by Dingoes (*Canis dingo*): where Dingoes are absent, macropods (kangaroos and wallabies) are more abundant and native grass cover declines.

In fact, the diversity of ecological patterns and processes that are influenced by predators is mind boggling. Examples include carbon storage, carbon flux and wildfire patterns by mediating grazing and influencing vegetation biomass, and parasite transfer between Baboons (*Papio anubis*) and humans due to increasing Baboon populations in the absence of predators. It is a sobering thought to consider that, although these trophic interactions may develop over evolutionary timescales, they can be dismantled very quickly by fishing, hunting and persecution by humans. This is why one team of academics considers the declines and range contraction of apex predators as 'humankind's most pervasive influence on nature' .

## Australia: a big continent with few big predators

Has it ever struck you that for such a huge place there aren't many big carnivores in Australia? Well, it hasn't always been like that. Australia has lost all of its megafaunal predators except the Saltwater Crocodile (*Crocodylus porosus*) including, since European colonisation, the Thylacine (*Thylacinus cynocephalus*). It now has one of the most depauperate large predator assemblages on earth. The most widespread remaining predator, the dingo (*Canis dingo*), is a naturalised species thought to have been brought to Australia approximately 3,000 years ago from Asia (see 'Creature Feature' in this edition). The other extant (reasonably) large-bodied native predator is the Tasmanian Devil (*Sarcophilus harrisii*), which also scavenges extensively. Devils were once widespread on the Australian mainland but are now confined to Tasmania. The cause of the extinction on the mainland is uncertain, but climate change and/or the introduction of the Dingo are likely drivers.

Saltwater Crocodile *Crocodylus porosus*, Australia's last native megafaunal predator

## A hard sell? Predators in a human-dominated world

So it's clear that large predators perform roles in ecosystems that simply can't be replicated by human management. Of course we still try, and Australia is a good example here: instead of experimenting with approaches to apply research suggesting that dingoes could perform a role in protecting native mammals from introduced foxes and cats (see other articles in this edition) we are currently wedded to a human-centric approach of baiting and shooting. On a global scale, it would be horrific if we lost our apex predators—imagine how much blander would be a world without lions, tigers, sharks or killer whales. Herein lies the potential of rewilding: by valuing the influence of such animals in terms of their ecological functions we can begin to put in place measures to protect people and communities who may suffer occasional losses from predators; because we know that it's money well spent.

### Note from author

We had two of Australia's most high profile predator ecologists lined up to write about the influence of predators but they withdrew at short notice. However, because predators are so important in the concept of rewilding, the issue would have been weakened without reference to them. I have therefore done my best to summarise research demonstrating the influence of predators, and to demonstrate why predators are key to healthy ecosystems.

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Eastern quoll © marc faucher

# Rewilding
## can it save Australia's landscapes?

**Rob Brewster**
Rewilding Australia

Rewilding Australia is both an organisation and a philosophy. Both share a vision of moving conservation beyond the preservation of our degraded existing landscapes, towards their restoration.

This vision is more than just a romantic notion of what we've lost. It's driven by science.

Our ecologists have become very adept at monitoring species declines, but we're risk averse about reintroducing lost wildlife, particularly carnivores, which are keystone species that provide ecosystems with top down regulation.

### So what's the problem?

Ecosystems are inherently complex. We've amplified these complexities by introducing species such as foxes and cats. For over a century we've been at war with these interlopers. Baiting and shooting campaigns typify our standard tactical response. And, if you throw enough time and money at it, often these programs work. But as soon as the money dries up, the pests come back.

A letter penned by a farmer in 1921 provides insight into the trophic cascade of unintended consequences that can occur when our carnivores are removed. Whilst baits of this era targeted dingoes, they also killed quolls and goannas. The loss of dingoes allowed kangaroo numbers to skyrocket, reducing groundcover that small mammals required for refuge. The collateral damage; poisoned animal carcasses rotting in landscape, increased blow-fly numbers and the incidence of fly-strike on the sheep that farmers were trying to protect from dingoes, leading to significant stock losses. With no dingoes or quolls, rabbits plagued, facilitating the rapid spread of foxes across the continent.

### Eastern Quolls

Until the 1900s Eastern Quolls were found in the hundreds of thousands across south eastern Australia. Reports from the early years of settlement lamented that rabbits introduced for hunting were routinely dispatched by quolls. For many years establishing a rabbit population in Australia was unachievable. And then the quolls disappeared. Disease, indiscriminate poisoning and cats played a role. Foxes probably sealed their fate. Foxes are the one variable that Tasmania didn't have – and Eastern Quolls have managed to hang on down there.

### Tasmania

For decades, scientists have viewed our island State of Tasmania as an ark – containing species lost from the mainland. Then in 1996 a Tasmanian Devil turned up with a grotesque facial tumour. Within 20 years the transmittable cancer would spread across Tasmania, reducing numbers by 80%.

In December 2015 the Eastern Quoll was listed as endangered by the Federal Government. Their listing was made on scientific advice that indicated a population decline of much as 50% in response to a run of unseasonable weather that reduced their breeding success. When this weather anomaly abated, the quoll numbers didn't recover as anticipated. Why? With the decline of devils, cats became more active during the evenings; suppressing their recovery. The ark may have sprung a leak.

So how do we get better at restoring our ecosystems? How can we wean ourselves off a tactical response and move towards a strategic landscape management approach?

### Back to the Eastern Quoll

Feral-free islands and predator exclusion zones will be vital for the ongoing protection of founder populations of Eastern Quolls. However, these come with their own set of challenges. Inbreeding depression and predator naivety is always a danger. Reintroducing Eastern Quolls into landscapes where feral predators have been suppressed will inform scientists of predation thresholds and the habitat complexity Eastern Quolls require, whilst providing the space for populations to expand. And perhaps the Tasmanian Devil's expertise in regulating ecosystems in Tasmania could be applied to mainland ecosystems? Devils evolved on the mainland, were an integral part of mainland ecosystems for millennia and have only been gone for an evolutionary blink of the eye. Devils might just be part of the solution to getting Eastern Quolls back into the wider landscape.

Returning these species to our ecosystems may be part of the solution to helping our wildlife breathe a little easier. We can't see predator reintroductions as a single species issue – it's their relationships within ecosystems that will be important. And as Tasmania has been the savior for many of the mammals the mainland has lost, perhaps it's time to return that favour.

# Future Wilderness Protection in NSW

Deua Valley one of the best wilderness areas in NSW is still unprotected - Photo: H. Gold

**Keith Muir**
Director, Colong Foundation for Wilderness

In 2014, NSW national parks received over 39 million visits and as park visitation grows, visitor pressures increase. Fortunately, due to the efforts of many conservationists, attempts to wind back nature-focused park management have almost always failed. The horse riding in wilderness trial, for example, is failing to demonstrate any genuine demand for this proposed activity. The political consensus that once a wilderness is protected, it should stay that way, has not disappeared in NSW - not yet anyway.

Our NSW wilderness estate helps manage a broad range of low-impact, nature-based recreation opportunities that permit all those millions of visitors to enjoy our unique and wonderfully pristine national parks. As conservationists, we just need to talk up the fact that our well-loved parks are developed enough. These large intact landscapes provide the best chance for species and ecosystems to persist in the face of rapid climate change (Mackey and Rogers, 2015).

Following the establishment of the Wilderness Act in 1987, protection began slowly with the Greiner and Fahey governments declaring 650,000 hectares of wilderness between 1991 and 1995. Since March 2011, there have been seven additions to existing wilderness areas, totalling 14,661 hectares, including expansion of the Nattai Wilderness by 11,400 hectares.

The NSW wilderness estate stands at 2,103,379 hectares, the majority being created under Bob Carr and Bob Debus. Thirty years ago, the Wilderness Working Group reported that 4.4 per cent of NSW remained in a wilderness condition, although western NSW was not considered. On these calculations, 40 per cent of the wilderness in the eastern third of the state remains unprotected.

## Is there still wilderness left to preserve in NSW?

Declaration of the iconic central Deua Valley, Coolangubra and Tantawangalo in the South East Forests, and Tabletop and the Main Range in Kosciuszko National Park should be the priority areas for wilderness reservation. Some of these areas will need restoration, but this is not impossible or inappropriate.

The Murruin wilderness in the Blue Mountains, and the southern end of the Metropolitan Special Area should be investigated as potential wilderness areas. The coastal wilderness areas of the Moors in Myall Lakes National Park, and the Sandon and Wooli catchments in Yuraygir National Park also merit expedited assessment.

Further north are the undeclared Carrai, Mann River, Timbarra, Binghi and Cataract wilderness areas, and on the western slopes in the Brigalow, the Pilliga and Bebo wilderness areas are outstanding candidates.

Many existing wilderness areas are incomplete, such as the Macleay Gorges, and require either voluntary acquisition or resolution of forestry and mineral resource issues to fully protect NPWS identified wilderness. To this end, the Dunphy Wilderness Fund should be re-established as a statutory fund as specified by the Wilderness Act, to voluntarily acquire about 200,000 hectares of private wilderness, and far more if Outback NSW wilderness is considered. The private enclaves of wilderness within national parks should be a key priority. The acquisition of these areas can greatly enhance the ecological integrity of core reserve areas. An allocation of $20 million over five years, in addition to the current acquisition budget would permit acquisition of up to 75,000 hectares of wilderness.

## Western Division Areas

Assessment of the dozen potential Outback wilderness areas should use revised Wilderness Guidelines appropriate for arid landscapes. Landholder consultation should include discussion of opportunities for voluntary land acquisition and conservation agreement options.

## Research

The Wilderness Act places an obligation on the National Parks and Wildlife Service Director to provide for scientific research and education with regard to wilderness. Instead of pursuing the perverse horse riding in wilderness trial, this duty should seek to promote positive perceptions of wilderness in the community.

Our threatened wilderness areas need to be protected and better managed for nature and future generations.

Helen Gee, a founding member of the Tasmanian Wilderness Society, observed, "We need to understand wilderness. Wilderness has so much to teach us".

### About the author

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Mutawintji is the only protected wilderness in outback NSW
Photo H. Gold

# Reintroducing the Dingo

## A large-scale experiment to test whether reintroducing the Dingo can help save native species


**Dr Thomas Newsome**
Deakin University/Oregon State University/University of Sydney

There is global interest in restoring apex predators that have long suffered from persecution by humans. This interest is partly driven by the ecosystem services apex predators can provide, especially via 'trophic cascades' in which they exert strong control over ecosystem functions by propagating impacts downward through the food web.

In Australia, for example, there is interest among scientists and conservationists in restoring populations of Dingoes. Dingoes are absent, or found in very low numbers, across much of central and western New South Wales, as well as parts of South Australia. Broad scale control programs, in combination with the erection of the 5,500 km Dingo fence have driven this trend.

Calls for restoring Dingo populations are based around the argument that Dingoes can keep in check smaller predators such as invasive Red Foxes and feral Cats, in turn benefiting native species by reducing overall predation pressure upon them. Dingoes may also control feral Goats, as well as native herbivores such as Kangaroos and Emus, that together contribute to overgrazing when present in large numbers.

These are critical interactions to consider: Australia has the highest extinction rate for mammals over the last 200 years, with the loss of 29 endemic species. Predation by Red Foxes and feral Cats are a common factor in many of these extinctions, and a current threat to many other threatened species.

### So what is preventing us from bringing back dingoes?

One issue is that the nature and strength of Dingo-induced trophic cascades has become one of the most debated topics among scientists, to the extent that Dingo-induced trophic cascades have been both vigorously asserted and denied respectively.

Earlier last year, however, a simple but ambitious solution was proposed to resolve this debate.

It involves moving the Dingo fence around Sturt National Park in western New South Wales, on the border with Queensland and South Australia. The park is currently inside (south of) the Dingo fence, where Dingoes are uncommon. This proposal would put it on the outside, where Dingoes are more common.

By allowing Dingoes to naturally recolonise Sturt National Park, it would form the basis of a reintroduction experiment. By looking at the impacts of Dingoes on a range of species and processes, the experiment would test whether the Dingo can restore ecosystem functions.

To undertake the study 275 km of new Dingo-proof fencing would be required. Monitoring costs would be in the order of A$1 million per year, which is about 10% of what is spent maintaining the Dingo fence each year. Money well spent to answer such an important question.

The major prerequisite for the experiment to proceed would be convincing local communities to support the effort. If forthcoming, that support would likely help to sway government policy, and garnering this support would require effective community engagement and extension.

Is Australia bold enough to do the right science to help resolve Australia's mammal extinction crisis?

Only time will tell.

### About the author

Thomas Newsome is a Fulbright Postdoctoral Scholar. He holds an Alfred Deakin Postdoctoral Research Fellowship and a courtesy faculty position at Oregon State University. He collaborates with the Desert Ecology Research Group at The University of Sydney, where he completed his PhD on the ecology of the Dingo.

# The Dingo
# Creature Feature

**Spencer Pignotti**
Intern, National Parks Association of NSW

The Australian Dingo *Canis dingo* is the largest terrestrial predator left in Australian ecosystems. The first archaeological evidence of Dingoes on the Australian mainland is dated back at least 4,000 years. Once Dingoes arrived on the continent from Asia they quickly colonised suitable ecosystems due to their interactions with the indigenous Australian people. Dingoes soon occupied most of the Australian continent by following or accompanying Aboriginal people as they moved from place to place. When Europeans arrived they assumed incorrectly that the Dingo was domesticated. Dingoes were never intentionally domesticated by indigenous Australians, as they made no attempt to selectively breed dingoes. However, Dingoes were deeply ingrained in Aboriginal life and culture.

## How Dingoes differ from Dogs

One of the controversies surrounding Dingoes is how they differ from domestic Dogs. Prior to the arrival of Europeans, Dingoes had been isolated from other canids like Wolves or Dogs for 3,000 years (Oskarsson *et al*, 2011). As a result, Dingoes were exposed to genetic drift and natural selection that led to them becoming a unique canid. The official taxonomic status of Dingoes is hard to define due to hybridisation with Dogs and scientific description of Dingoes. In addition, there is no surviving original specimen to compare modern Dingoes to. The only reference of original Dingoes before widespread European colonisation is a simple sketch and brief description by Sydney's first governor Arthur Phillip in 1789.

What makes Dingoes distinctly different from domestic Dogs is their broad head, tapered snout, erect ears, and bushy tail. It is a common misconception that pure Dingoes only have a yellow coat, as but their fur varies in colour depending on their particular habitat. Coat colours can range from ginger red to a golden yellow and even black or white. They are the largest land carnivore in Australia with a body mass of around 12-24 kg and a body length of 0.8 to 1.2 m. Dingoes breed anywhere from March to June and only have one litter per year. A Dingo pup is fully grown at seven months and they can live up to 10 years in the wild or 15 in captivity. Dingoes can be found almost any ecosystem, but their range is restricted by access to a viable water source.

As a result, Dingoes can be found in deserts, grassland, and even urban environments.

Although they look like Dogs, Dingoes cannot bark. Instead they howl, scent rub, or urinate on objects to communicate. Dingoes have distinct territories that they defend from other Dingoes, but territory can be shared when packs are formed to hunt large game. Dingoes have a mixed diet but tend to eat mammals such as Rabbits, Wallabies, and even Kangaroos. The Dingo can function as an 'apex predator' but in times of low food availability they can eat small reptiles, insects, or even scavenge for food. Unfortunately, they occasionally target livestock and farm animals which leads to human conflict.

## Threats to Dingoes

Dingoes are under constant pressure from humans due to hunting, baiting, habitat degradation, and interbreeding with domestic Dogs. The active hunting of Dingoes first started when European colonists arrived and Dingoes began preying on livestock. Soon the colonists began to hunt Dingoes to prevent them from attacking their farm animals. At one point the Crown fined colonists who did not hunt Dingoes off their land. This tradition of enthusiastically hunting Dingoes continued into the 21st century and created a negative stigma surrounding Dingoes. Furthermore, there were bounties placed on Dingo pelts as an incentive for hunters to increase hunting Dingoes. Baiting is another strategy used to kill Dingo populations, however this can be ineffective and can kill other non-target animals if not carried out correctly. Multiple studies have shown it does not affect Dingo diet or population distribution; sometimes it has even lead to its population increasing (e.g. Allen and Leung 2014).

The most serious threat to Dingo populations is interbreeding with domestic Dogs. When wild Dingoes breed with domestic Dogs it dilutes their gene pool. As a result, with less true wild Dingoes the population is vulnerable to disease and even extinction. Dingoes need large areas of continuous habitat to hunt, breed, and establish territories. Habitat loss, degradation, and fragmentation is not only decreasing the amount of habitat for Dingoes but also shrinking the buffer zone between habitat and human occupied zones. With less wild habitat to occupy, dingoes are forced into more and more urbanised areas. This downward spiral can be resolved with proper land management and informing the public of the importance of Dingoes to natural ecosystems.

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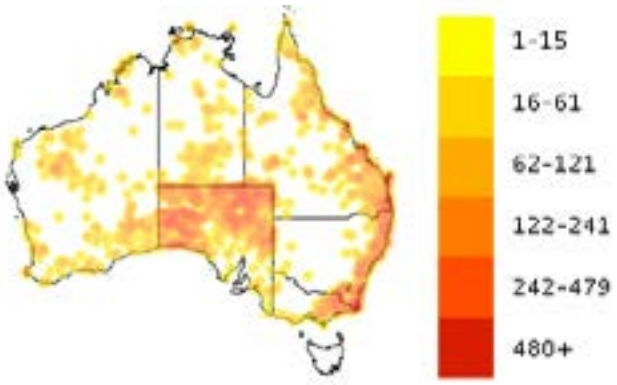


Dingo occurrence records map
Source: Atlas of Living Australia

Dingo *Canis dingo,* Frazer Island, Queensland.
Wildlife authorities recognise that Fraser Island dingoes may become the purest strain of dingo on the eastern Australian seaboard and perhaps Australia-wide (Woodall et al 1996) as they have not crossbred with domestic or feral dogs to the same extent as most mainland populations. Therefore, their conservation is of national significance

# Threats & opportunities

## Managing wild dogs within livestock production ecosystems

**Dr Lee Allen**
Senior Zoologist, Queensland Biosecurity, Department of Agriculture & Fisheries, Toowoomba

Wild Dogs, including Australia's native 'wolf' – the Dingo – are said to be incompatible with Sheep. Sheep innately react to the presence of a Dog by scattering erratically, a behaviour that incites Dogs to chase and attack. Sheep are easily outpaced and mutilation or death commonly occurs as a result. The attitude of Sheep producers towards wild Dogs is understandably hostile due to distress over the animal welfare issues and substantial economic losses wild Dogs inflict on their livestock. They are also frustrated with the limited and highly regulated control tools available and their inability to prevent continuing attacks. In contrast, producers of beef cattle are often ambivalent towards wild Dogs. Although they experience bitten or predated Calves occasionally wild Dogs do not appear to cause losses at most locations in most years (L. R. Allen 2014). When exposed to harassment from wild Dogs, beef cattle develop nasty dispositions towards Dogs. Typically, adult cattle try to gore or crush a menacing Dog and Cows cooperatively protect vulnerable Calves by grouping them together in a crèche watchfully minded by attending adults.

In recent years, independent, large-scale studies across northern and central Australia have indicated that wild Dog predation is not a common cause of calf mortality and annual or semi-annual poison baiting programs are not associated with greater calf branding rates (B. L. Allen 2015a). When available, wild Dogs prefer to prey upon small to medium-sized animals like Rodents, Rabbits and Possums switching to larger species like Wallabies and Kangaroos as preferred prey become scarce. Wild Dogs will attack Calves at times but if more preferred species of prey are readily available the incidents of Calf attacks are minimal. Dry years are often associated with increased attacks on Calves. Although the causes of Calf loss in these years are unclear; poor nutrition, weak cows and Calves and less prey are likely factors that cause wild Dogs to switch to attacking Calves. Lethal control under these circumstances does not necessarily reduce Calf losses (L. R. Allen 2015b).

Large predators are thought to play an important role in maintaining biodiversity and healthy ecosystem function by keeping smaller predators at low density and reducing the abundance of large herbivores. Wild Dogs are believed to perform this role in Australian ecosystems by keeping Foxes and Cats at low enough densities to allow threatened marsupial prey to persist (Johnson *et al*. 2007) and by regulating Kangaroo populations (Pople *et al*. 2000). However, most agricultural regions have undergone significant fragmentation and modification as a consequence of human development. Former positive keystone roles may no longer exist in contemporary landscapes so that in some circumstances, wild Dogs may actually be adding to the pressures on threatened species and biodiversity rather than providing a net benefit. Differentiating between those enterprises, landscapes and ecosystems where wild Dogs have net-negative impacts from enterprises, landscapes and ecosystems where their impact is benign or net positive requires careful evaluation.

Biodiversity in Australia's agricultural rangelands has struggled under the impacts of over-grazing, recurring drought and ubiquitous introduced

pests. The habit of wild Dogs to prey heavily on livestock competitors and contributors to total grazing pressure (species like Kangaroos, Wallabies, Rabbits, feral Goats and Pigs) has prompted ecologists and economists to evaluate the relative worth of the 'environmental services' provided by wild Dogs. Modelling suggests there are few scenarios where culling wild Dogs in beef production areas is cost effective because wild Dogs reduce Kangaroo numbers thereby increasing pasture biomass (Prowse *et al*. 2015). There are large tracts of state forest, conservation areas, mining leases, reserves and non-livestock uses of rangelands where culling wild Dogs is unlikely to financially benefit anyone.

Extreme vulnerability of Sheep to wild Dog attacks presents a serious management dilemma when Sheep production is intermixed with land uses where wild Dogs have neutral or positive benefit. Landscape-scale lethal control of wild Dogs is promoted as the best-practice solution to wild Dog 'problems' (McKenzie *et al*. 2014). Excluding wild Dogs (i.e. fencing), preventing interactions between Sheep and wild Dogs (i.e. guardian animals) and lethal control at those times and locations where negative impacts are predicted likely could be a better, more targeted strategy.

Currently, hundreds of kilometres of exclusion fencing are being erected around clusters of grazing properties in western Queensland whose owners are committed to removing wild Dogs and reducing pests. Many cooperatives have formal agreements in body-corporate type financial structures to guarantee maintenance of the fences in perpetuity. Some producers are fencing just their own property. There are risks to biodiversity with this approach if critically important wildlife dispersal corridors are obstructed. Then again, a more targeted strategy of managing wild Dogs just in those areas where negative impacts occur rather than at a landscape scale is conceivable. Fencing, guardian animals and future control technologies may facilitate some level of wild Dog 'services' to coexist with livestock production with wild Dogs limiting or regulating pest populations. Managing total grazing pressure is a critical step to improving land condition, drought resilience and livestock profitability in Australia's semi-arid rangelands. Correctly managed, wild Dogs in the landscape can be a win-win situation for livestock production and the environment.

## About the author

Dr Allen has been employed in pest animal management with the Queensland Government for 34 years, principally on wild dogs. Now at the end of his research career, Dr Allen advocates a more circumspect approach to how wild dogs are managed, particularly in the rangelands where beef cattle production is the dominant livestock enterprise.

Cameron Corner is the point where Queensland, South Australia, and New South Wales meet. The Dingo Fence passes through Cameron Corner along the New South Wales border.

Guardian Dog watching over Sheep. *See pg 24 for more about guardian Dogs*

Photo: Linda Van Bommel

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# livestock guardian dogs

## Keeping livestock safe from predation

**Dr Linda van Bommel**
Postdoctoral researcher, ANU College of Medicine, Biology and Environment

Livestock Guardian Dogs (LGDs) are amongst the oldest and most numerous of the working dogs in the world. They have been used for centuries to protect domestic animals from predators and thieves in Europe and Asia, and their popularity in other parts of the world is increasing. LGDs should not be confused with Herding Dogs, although both work with livestock. Herding Dogs, such as Kelpies, herd livestock on command, but cannot be left with stock unsupervised. LGDs will not herd livestock on command, but live with them full-time, and protect them from threats. In order for LGD pups to become good LGDs, they are raised with livestock from an early age so they develop a strong bond with the stock. As a result, adult LGDs view livestock as their social companions, and are therefore very protective of them.

LGDs can protect a range of livestock species from several types of predators, such as Wolves, Bears, Coyotes and even Cheetah and Leopard. They work in many different situations, and can be equally effective on small properties as on extensive livestock operations. In Australia, LGDs successfully protect livestock from Dingoes, feral or domestic dogs and Red Foxes, but also from several other predator species, such as Tasmanian Devils and Wedge-tailed Eagles. They are used to protect sheep, goats, poultry and cattle, but they can work with any type of livestock, including Rabbits,

Guardian animals can be used to protect a wide range of livestock, including chickens
Photo: Linda Van Bommel

Emus and domestic deer. The breed most commonly used in Australia is the Maremma Sheepdog (Maremma).

LGDs in Australia appear very effective. In a survey of 150 producers using LGDs in Australia, 96% of respondents reported that predation either ceased or decreased after obtaining LGDs (van Bommel & Johnson 2012). The results from this survey also indicate that the cost-effectiveness of LGDs is high. The cost of purchasing and maintaining a LGD is usually fully offset by the value of the stock saved within 1-3 years, after which the dog represents a profit for the farmer (van Bommel & Johnson 2012). LGDs can make the difference between running a viable or unviable livestock operation (van Bommel 2010). For example, the property 'Riversdale' is situated in north-eastern Victoria, close to the border with NSW. Riversdale measures 1,215 ha, and runs 2,000 Merinos and 600 cattle. Wild dogs regularly cause sheep losses in the area. Before the use of Maremmas, shooting was the main form of predator control on Riversdale, and substantial effort was spent trying to locate trespassing wild dogs. However, sheep farming on Riversdale became unviable when, for three years in a row, only 1% of lambs survived to adulthood each year and, in the same period, a total of 300 adult sheep were lost. Maremmas were then obtained as an alternative form of predator control, after which predation went down drastically. Currently four Maremmas are guarding all the sheep on the property. No adult sheep are lost to predation and the lambing percentage has increased to 70%.

The constant presence of LGDs is an effective deterrent for all predators, which keeps livestock safe from predation. Many property owners report that the knowledge that their LGDs are on the job 24-7 gives them peace of mind, and greatly reduces their own stress levels. In addition, the livestock seem to be calmer when they are guarded by LGDs, perhaps because they know the dogs will protect them. The use of LGDs in Australia is increasing as more property owners realise their potential as a predator control method. For more information on LGDs, please see the 'Best Practice Manual for the use of Livestock Guardian Dogs' (http://www.invasiveanimals.com/wp-content/uploads/2010/09/Guardian-Dogs-web.pdf).

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# Return of the DEVIL?

**Prof Chris Johnson and Assoc. Prof Menna Jones**
School of Biological Sciences, University of Tasmania

Until just a few thousand years ago, Tasmanian Devils lived throughout most of mainland Australia.

## Should we bring them back? Before deciding this, we would need to answer a few questions.

**First, could Devils survive on mainland Australia?** This is easy: almost certainly they could, although they might never become as widespread as in the past. There are large areas of the southeastern mainland with climate and vegetation similar to where Devils thrive in Tasmania, and with many of the same prey species[1]. We can't be sure what made Devils go extinct on the mainland, but it is likely to have been a synergy between extreme climate events and predation and competition by the Dingo and Aboriginal people[2, 3]. Especially in areas without Dingoes, there should be nothing to prevent Devils re-establishing on the mainland.

The more important question is: **why would we want them on the mainland?** The Devil is the largest surviving marsupial carnivore, and would be the largest mammalian predator in mainland habitats without Dingoes. It could therefore step into an important role as a top predator, regulating some prey populations and suppressing two invasive predators, the Red Fox and feral cat. If devils did help control foxes and cats, they might provide indirect benefits to prey species threatened by those predators. But this is a big ask - **can they do it?**

The answer to that question, for the moment, is we're not sure. The Devil has recently declined catastrophically in Tasmania under extreme mortality from Devil Facial Tumour Disease. This is tragic, but provides an opportunity to examine the effect of changed Devil abundance on feral cats, which are common in Tasmania. Analysis of survey data suggests that decline of Devils from high to low abundance was followed by increases in feral cats[4]. However, those studies could not measure abundance of cats directly or study their behaviour in detail, so it is difficult to interpret the magnitude of the effect of Devils on cats. It is even harder to pin down the mechanism. For example, **do Devils hunt down and kill cats?**

Probably not, or very rarely, but there are other ways in which Devils could be bad for cats. First, being formidable scavengers, Devils are very good at removing carrion. Cats do not

Devils scavenge extensively and groups of devils can devour a carcass very quickly
Photo: Menna Jones

usually eat carrion, but will resort to scavenging to get through lean times such as drought. In the presence of Devils, cat populations might decline under those conditions. Second, Devils might disrupt reproduction in cats, by disturbing dens or killing kittens. Third, aggression from Devils could mean that cats avoid them, and therefore make less use of habitats where Devils are most active and where there is most food for predators. The size difference between Devils and cats indicates that Devils would dominate in one-on-one encounters. In combination, these influences could mean that cats are more likely to decline, or less likely to recover from low numbers, when Devils are around.

In other words, the interaction of Devils and cats is probably subtle and complex. We are learning more about it in two projects, the first studying the consequences of decline of Devils across Tasmania and the second investigating changes in the ecology of feral cats on Maria Island, where a population of Devils was recently established and is growing to high abundance. There are some interesting signs – for example, that cats have moved away from areas frequented by Devils and are producing fewer kittens – but definite conclusions will be a few years away.

We know less about the interaction of foxes and Devils, because the Red Fox has never succeeded in establishing a population in Tasmania, despite several introductions in the past. This raises an intriguing possibility: **maybe Devils explain the failure of foxes to establish down here[5]?** If Devils have prevented the smaller foxes from taking off in Tasmania, it is likely they did so through similarly complex and subtle processes as just described for cats.

The nature of the interaction means that the effects of Devils on foxes and cats would be strongest when Devils are abundant and the other predators are rare. The main impact of Devils could be to slow or prevent growth of fox or cat populations from low to high abundance. They might not always succeed in this, but the presence of Devils could mean that foxes and cats have lower impact overall, and could also make conventional management of them more effective.

The final question is: **how should we go about reintroducing Devils to the mainland?** We argue that this should be done in several stages, the first of which would be a limited trial. That trial should be designed as an experiment to learn more about the ecological effects of Devils in mainland environments, detect unwanted impacts, and study interactions—especially between Devils and foxes—that cannot be observed in Tasmania.

Because the effects of Devils on foxes and cats are likely to be strongest when Devils are abundant and the other predators rare, the ideal design for this trial would be to first reduce abundance of foxes and cats, then introduce a large group of Devils and test their effect on recovery of foxes and cats.

Depending on results of the first stage, we could think about reintroductions over larger areas, and eventually free release into open landscapes. If we ever reach that point, we will have accomplished something of lasting value: an increase in the diversity of native species and ecological interactions in the ecosystems of mainland Australia.

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# Bettongs and Bantengs
# Welcome to Australia's Wild Anthropocene!

**Dr Arian Wallach,**
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Humans have fundamentally transformed the planet to such an extent that many agree that we have entered a new geological epoch – the 'Anthropocene'. Much about how we think about this period is dominated by the stark recognition that this epoch is identifiable as a sixth mass extinction.

Australia is home to the world's only wild Dromedary Camel population

One distinguishing feature of this period is the vast movement of species across the globe. This 'biotic globalisation' is considered a major threat, and much effort is directed towards saving biodiversity by controlling non-native species. However, emerging evidence urges caution, and highlights a fundamentally different approach. Embracing our modern ecologies can significantly promote biodiversity, locally and globally.

## Killing is not a silver bullet

In Australia, 30 mammal species have been lost in the past 200 years, the worst mammalian extinction wave in modern times. Some introduced species have been implicated in this decline, particularly Foxes and Cats, and so Australian conservation focuses on controlling and eradicating non-native species. But ecosystems are incredibly complex, and trying to mend nature by killing wildlife can cause further harm.

Rarely do control operations meet their conservation targets, and they often backfire. Mallefowl nesting success actually declines where Foxes are poison-baited[1]; Woylie populations have crashed because intensive Fox control caused higher Cat predation[2]; and native vegetation was damaged by Rabbits following an island eradication of Cats[3]. Even if control efforts achieve certain aims, there are significant other reasons to hold back.

Many 'invasive' species are endangered[4]. Australia has provided safe haven for many refugees: Rabbits are simultaneously 'declared pest animals' across Australia, and Vulnerable to extinction in their native Iberian Peninsula; Carp are so successful in the Murray-Darling there are plans to infect them with herpes, even while they are listed as Vulnerable in their native range. Banteng are Endangered in Southeast Asia but are thriving in the Northern Territory, and of six introduced Deer species, three are threatened with extinction.

The word 'native' has a long and convoluted history[5], and for some there is no defined place to call home. Driven to extinction in the wild 2,000 years ago, Dromedary Camels long persisted only in domestication, until a few pioneers went 'feral' across Australia's deserts. Today, Australia is home to the world's only wild Dromedary population. As author Ken Thompson asks in his book by this name, 'Where Do Camels Belong?'[6]. Their nearest relative, the Bactrian Camel of Mongolia, is Critically Endangered. The true ancestral roots of all Camels is not in the Middle East but in North America where they evolved for tens of millions of years, but went extinct about 8,000 years ago. Many species must move to

survive, and thankfully camels persisted long enough to make their escape into South America, Asia and North Africa, and more recently - Australia.

## Introduced species are rewilding the world

Humanity started driving extinctions long before white men sailed boats across the seas. One of the great tragedies of our past has been the extinction of many of the Earth's megafauna (>100kg) by the end of the Pleistocene, 10-50 thousand years ago, probably by human hunters. Australia lost its entire megafauna assemblage thousands of years before Captain Cook landed on these shores. These declines continue today with around 60% of surviving megafauna threatened in their native ranges[7].

With a vision to bring back a Pleistocene-like wilderness, there has been a growing call to 'rewild' the world with large animals. Because many species are gone forever, the case has been made to introduce similar species to replace missing functions. Scientists have called for the rewilding of North America with African Cheetahs and Asian Elephants, and one project has introduced Cattle and Horses into a Dutch nature reserve to recreate the great game herds of the past. But much of this has already been spontaneously accomplished.

In an upcoming study[8] we show that in every major region of the world there are currently more megafauna genera, compared to the end of the Pleistocene, thanks to introduced and 'feral' species. After thousands of years with no megafauna, Anthropocene Australia includes nine species of which seven are threatened or extinct in their native ranges. Some species have escaped domestication, and in their wild form they are bringing back ancestral traits. This is one of the greatest rewilding success stories in the world, but it is not celebrated as such.

Introduced animals, particularly those with domestic ancestry, do not usually receive conservation attention, and it has become customary to view their ecological roles as harmful by default. But aside from clear cases of extinctions, the term 'harm' is usually vague, and may be better replaced with 'change'. Australia's Anthropocene megafauna are, of course, changing their new habitats, possibly by bringing back lost Pleistocene functionality, and none have caused extinctions. In fact, very few introduced species have.

Konik horse, stallions fighting during breeding season. Oostvaardersplassen, Netherlands.
Mission: Oostervaardersplassen, Netherlands, June 2009
Photo: Mark Hamblin/Wild Wonders of Europe

Overall, introduced species provide undervalued, understudied but probably important and beneficial ecological functions. In Australia, introduced Bantengs have formed symbiotic feeding-cleaning relationships with native Torresian Crows[9]; introduced Rabbits are filling important niches as ecological engineers and as prey[10]; and islands with Foxes and Cats have more native mammals because they help suppress Rats[11].

## Valuing all wildlife

Killing wildlife in the name of conservation is also ethically and socially problematic, because the harm we cause to individuals is certain and severe, whereas the hoped-for benefits to populations and ecosystems may never materialise[12]. Last year, animal rights advocates, including international public figures Morrissey and Brigitte Bardot, sent letters of condemnation to the Australian government for its plan to kill 20 million wild Cats by 2020. Similarly, a Brumby cull in the Northern Territory in the 1980s resulted in the symbolic trial and conviction of members of the Australian government by the International Court of Justice for Animal Rights. Many Australian Aboriginal people have embraced introduced species and do not want them culled, even incorporating them into their Dreaming[13].

Does valuing the lives and ecological functions of introduced species mean that we are giving up on Australia's rich endemic fauna and flora? Do we have to choose between the conservation of the endangered introduced Banteng and the endangered native Bettong? Not necessarily.

When introduced species drive the decline of natives, it is often assumed that the absence of ancient co-evolution disadvantages the natives who have not had enough time to develop effective mechanisms to fight back. However, species may be more adaptable than previously believed. The introduction of Cane Toads to Australia has triggered behavioural and morphological adaptations to the Toad's toxin, enabling the recovery of native predator populations from initial declines[14].

Mobs of emus have long been a common sight in inland Australia. They now share country with introduced animals like camels and horses.

## Large predators can help species coexist

The ecological effects of species do not exist in a vacuum, but rather are highly context specific. One powerful driver of relationships between native and introduced species is the presence of large predators[4]. Apex predators shape ecosystems by suppressing populations of their herbivore prey and smaller mesopredators, enabling more species to coexist than otherwise would. Where apex predators are removed grazing pressure can become too high for some plant species to tolerate, and higher predation by mesopredators can all but eliminate some prey species. This pattern holds true regardless of whether ecosystems contain mostly natives or a mix of native and introduced species.

Apex carnivores are some of the most persecuted and endangered group of species on the planet, and so many ecosystems lack their ecological roles. In the absence of apex predators, population irruptions of prey and mesopredators occur both in and out of their native ranges, and native and introduced species can irrupt together. Foxes, wild Boar and Deer can reach high densities both in their native and introduced ranges where apex predators are removed. Similarly, both introduced Rabbits and native Bilbies can reach high densities and suppress other species when their predators are excluded[4].

Australia's apex predator, the Dingo, benefits ecosystems by limiting populations of introduced animals such as Foxes, Cats, wild Goats and Rabbits, and native species such as Kangaroos and Emus. They are also formidable hunters of introduced wild Boar, wild Donkeys and Brumbies. Dingoes consistently outperform our most intensive of pest control operations[15] even though we probably kill many more animals, because they do more than just kill, they also communicate. Prey know that Dingoes are a threat and will stay away from areas they frequent, and will stay hidden during the times of day they are most active. This produces areas and times where small native animals are safer[16].

## Fostering a wild Anthropocene

Dingoes, however, have no safe place in Australia. There are two main reasons for this: they are killed on pastoral lands by farmers trying to protect their livestock; and they are also killed on national parks as part of conservation predator control programs. Here lies the quandary – but also a solution.

Continuing to battle introduced species in the hope of recreating more historic ecosystems will harm globally endangered species and risk causing further losses of native species that depend on Dingoes. But if we are willing to re-imagine a new Australia – a wild cosmopolitan ecology in which both Bettongs and Bantengs belong – we can start supporting those ecological mechanisms that promote coexistence. National Parks are the most obvious places to start.

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# Rewilding the Ocean

**John Turnbull**
President, National Parks Association of NSW

Rewilding is relevant to our oceans as well as out terrestrial ecosystems. Humans have fished our oceans for centuries, often focusing on high trophic-level or apex predators. Today, scientists estimate that global fish biomass has declined by two-thirds from historical baselines, with shark biomass down by a massive 93%[1].

## What effect does this have on our oceans?

Unsurprisingly, it's not dissimilar to the story on land. Removal of apex or high-level species removes predatory pressure on their prey. Depending on the complex web of interactions between species, this can lead to a boom in one species at the expense of others.

One of the best-documented examples of this is the interaction between Sea Otters, Urchins and Kelp in the north Pacific. Sea Otters are a voracious predator of Sea Urchins, which they collect from the sea floor and consume at their leisure as they float about on the sea surface. During the 18th and 19th centuries, Sea Otters were hunted almost to extinction, leading to a boom in Urchin numbers and dramatic decline in the Urchin's food – Kelp. In recent years, thanks to protection of Sea Otters, the Kelp has returned, providing much-needed primary production, habitat for important fish species and carbon storage.

In NSW, we have our own urchin story, but in our case the predators of urchins are lobsters and large fish. The removal of predators can lead to growth in urchin barrens and a decline in our own kelp forests. Furthermore, warming oceans and strengthening currents have carried black urchins across to Tasmania, where they are wreaking havoc on kelp forests.

So what is the solution? We could try re-introducing predator species, but in a vast ocean without fences this cannot be managed as it can on land. Recent studies have shown that marine reserves, by allowing the return of large fishes and lobsters, are an effective way of reinstating trophic dynamics and increasing resilience of kelp beds[2]. Rewilding can happen in the ocean if we provide adequate protection and just let nature do her thing.

Black urchins are "ecosystem engineers" - when they arrive in an area they can have such an effect that they re-engineer the landscape to create urchin barrens. They scrape the rock like no other, leaving bare patches. This boulder would have once been smoothly rounded and covered in algae. Note that they can't make it to the top of the boulder; too much surge; so kelp survives there.
Photo: John Turnbull

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Sydney Offshore Reefs

# Featured Dive

Category: Boat dives
Depth: Deep rating, 25+ m
Rating: Moderate to advanced

Access: Boat only, typically from Sydney Harbour boat-ramps
Special equipment: SMB, Nitrox preferable

**John Turnbull**
President, National Parks Association of NSW

As a terrestrial species, we tend to think of the ocean from the perspective of the shore. But the ocean is vast and varied, with spectacular features such as canyons, seamounts and reefs. Many parts of NSW, including Sydney, have offshore reefs of stunning diversity and natural beauty. In this article I will focus on two of my local favourites, The Colours and Dee Why Wide.

The Colours reef is about half a kilometre offshore, just off The Gap. The boat anchors in about 20 m of water, so you need at least advanced, and preferably deep rating for this dive. You can swim around on top of the reef in 22 m or so, but the real fun comes when you descend over the wall, to the east, and explore the cracks and crevices down to 30 m. Here you will find soft corals, sea stars, basket stars, ascidians and other invertebrates. Fish life is limited, but you will find various colourful deeper water species including Banded Sea Perch and beardies, and for some reason Comb Wrasse seem to really like The Colours.

Dee Why Wide is about 1 kilometre offshore from Dee Why Lagoon. It has a similar depth profile to The Colours, and some similarities in marine life. Dee Why Wide has some interesting marine artefacts, including a couple of huge old anchors, and several caves and swim-throughs.

But the real attractions for me are the sponge gardens. With the aid of a video light, I am amazed by the stunning array of shapes, textures and colours on this reef. Sponges are of course animals, and so I find myself marvelling at the beauty and diversity of nature, equivalent to the most colourful coral reef or bed of wildflowers.

These dives are definitely worth a trip if you're in Sydney. If you haven't dived them before, make sure you buddy up with someone who knows the site. They are both much better on nitrox, as your bottom time will be limited on air and you'll have to come up with more gas than reserve. Risks are of course the exposure of diving offshore and the depth, so make sure you carry a surface marker buoy, watch your non-deco time closely and ascend at the correct (slow) rate. It's easy to get lost on these sites, as the terrain is rough and varied, so a line back to the anchor is advisable.

If you have an underwater camera, don't leave it behind! One strobe, or preferably two, is essential in my view in order to bring out the colours on both sites. A wide lens completes the picture, and you'll be taking home shots that others will find hard to believe. These sites prove to me that you don't have to settle for second best in nature if you live in a big city.

Diver near The Colours Reef, Sydney
Photo: John Turnbull

Long finned Pike *Dinolestes lewini*
Photo: John Turnbull

Velvet Sea Star *Petricia vernicina*
Photo: John Turnbull

Matt's
# Walk of the Month

The Walk of the Month is a joint initiative with Wildwalks.com aimed at introducing folk to the joys of bushwalking. Open to everyone - members and non-members alike - each month we choose a walk that can be considered both iconic and introductory. Guided by one of NPA's volunteer leaders, these walks enable participants to 'try bushwalking' or simply revisit an old favourite. We have only listed one walk per month due to spatial restrictions but the full Walk of the Month program can be found at www.npansw.org.au. Go to the website for more information and to register for any of these walks. You can also consult the website or printed activities program for details of the 1,000 plus guided walks offered each year to members.

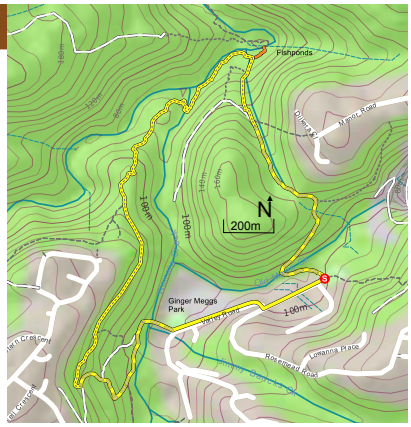
## Blue Gum Walk (Joe's Mountain Circuit) – Saturday 26th March

Length: 4.2km Duration: 2hrs

This is an enjoyable circuit walk that allows you to explore this rare pocket of Sydney Blue Gum forest. You will follow a signposted track across a few creeks and alongside Waitara Creek, with a few cascades. There are many small sandstone caves and a great diversity in plant life along the way. Sit quietly on the bank of Waitara Creek and you may see a water dragon, or get going early and listen for the Lyrebirds.

Where to meet: At the end of Rosemead Rd, Hornsby near Lockinvar Place. Please meet at 10am.
If you catch the train you can walk about 1km along the Great North Walk, down the steep hill, to the start of this walk.

Getting Back to the start of the walk: This is a circuit walk and will finish back where we start.





## Jibbon Head (Royal National Park) – Saturday 30th April

Length: 6.8 km Duration: 2hrs 30min

On this loop walk you will enjoy some grand ocean views, a few secluded beaches, rock shelves and some Aboriginal engravings. The walk starts in the community of Bundeena and follows the roads to Jibbon Beach then along the track to Jibbon Head and Shelley beach, then a long stretch of sandy management trail through the heath.

Where to meet: Bundeena Ferry Wharf at the intersection of Loftus and Brighton Streets in Bundeena. Please meet at 10am (either drive or catch the ferry from Cronulla departing at about 9:30)

Getting Back to the start of the walk: This is a circuit walk, so we will finish back at the ferry wharf by about 1pm.

Facilities: There are Public Toilets near the start and end of this walk.

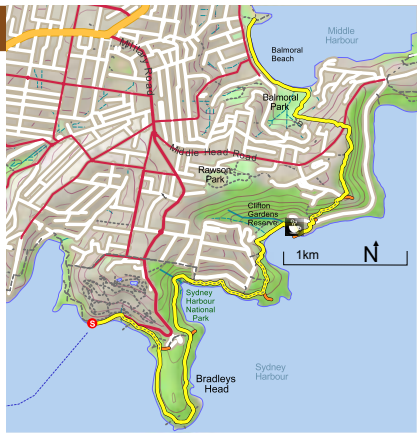
## Taronga Zoo to Balmoral Beach – Saturday 28th May

Length: 6.8 km Duration: 4hrs

This walk explores a great section of Sydney Harbour. The walk starts at the Taronga Zoo ferry wharf with views of the Opera House and the Sydney Harbour Bridge. The spectacular views continue as you explore bushland and the bays along the way. The walk also explores a historic section of the harbour, including the fortifications at Bradleys Head and Chowder Bay.

Where to meet: We will meet outside the ferry wharf at the lower end of Taronga Zoo, at the end of Athol Wharf Rd. Please meet at 10am.

Getting Back to the start of the walk: After the walk you can catch a bus home, but if you want to get back to the start it is about 45 min walk via the streets.




**Bookings for all WOMs are essential.** book online: www.wildwalks.com/wom

# A wilder future for our forests

**If you have enjoyed this edition of Nature NSW you may want to help us in our campaign to create a wilder future for our public native forests.**

As you may know, the end of the Regional Forest Agreements (RFAs) is fast approaching. Commonwealth Government policy is to simply extend the RFAs – without so much as a review as to their effectiveness.

**NSW does not have to support this policy!**

This would be tragic for our forests and the wildlife they support. But there is a better way! We want to create a new future for our forests and reverse the population declines we are seeing in forest species such as Greater Gliders and Koalas.

By restoring our forests, allowing them to grow older and wilder and using them for low-impact activities we will help to make sure that we enhance connectivity and provide key habitat features such as tree hollows.

I am compiling a vital report to convince the NSW government that logging is bad for nature, bad for the climate and bad for the economy.

**Please support our campaign and help us create a new future for our forests!**

**www.logging.sucks/donate.html**



**Dr Oisín Sweeney**
Science Officer,
National Parks Association of NSW

# Letter to the editor

## Comment on: On Park & Off Park Conservation by Paul Adam (Nature NSW Summer 2015)

**Dr John Benson**
Ecologist and long term National Parks Association member

While Paul Adam (Nature NSW Summer 2015) correctly states that many ecosystems and species are not adequately sampled in the current NSW protected area system, his statement: "The existing protected area network in New South Wales was created from Crown Land" requires comment.

Over the last three decades, more than $300 million has been spent on acquiring private land (freehold, eastern NSW leasehold lands and Western Lands Leasehold lands) for the NSW public reserve system. Therefore, the NSW public reserve system is not solely derived from un-alienated Crown Land. Acquisition funding sources have included annual NPWS funding, NSW Coastal Lands Protection Scheme funds, the NSW Environmental Trust and the Commonwealth National Reserve System. Additionally, there have been grants during the Regional Forest Agreements and one off grants for special acquisitions.

I estimate that the proportion of the reserve system derived from acquired lands including Western Leasehold is in the order of 15% but stand to be corrected. These acquired lands have, in the main, targeted the sampling of poorly represented landscapes, ecosystems, plant communities or species, although there has also been considerable boundary rationalisation to improve the management of existing reserves. The rationale of developing a comprehensive, adequate and representative reserve system (CAR) is enshrined in the 2009 NPWS Reserve Establishment Plan, which is based on a NSW gap analysis and applies the principles of decades of CAR research, much of it originating in NSW. Additionally, the detailed plant community classification and risk/protected area assessment database project (described in pages 66-27 NPA Journal Vol 51 No. 3 2007) published by the Royal Botanic Gardens and covering 80% of NSW west of the Great Dividing Range, contains data on 600 plant communities including calculations or estimates of areas in private and public protected areas. This database, therefore, provides a tool for refining future land acquisition in those inland NSW landscapes. If only that project was completed across all of NSW!

The NPWS personnel who have built the NSW reserve system over the last four decades deserve public gratitude. They cannot easily publish their work, yet history may judge their achievements as more critical to nature conservation than academic outputs.

Concerning off-park conservation mechanisms, Paul Adam is correct to state that off-reserve caveats are important in sampling ecological communities in landscapes difficult to sample in public reserves. However, he fails to mention the NSW Land Conservation Trust created in 2001 has entered into hundreds of agreements with a revolving fund. There are several hundred voluntary Conservation Agreements under the National Parks and Wildlife Act, numerous vegetation management agreements were entered into under the NSW Native Conservation Vegetation Act 1998 and its replacement the Native Vegetation Act 2003, and it has always been possible to protect aspects of land through a caveat under Section 88E of the Conveyancing Act.

A matter for concern is that the proposed NSW Biodiversity Act may fail, in comparison with the current Native Vegetation Act, to protect vegetation remnants in agricultural zone that are most in need of remnant protection and ecological restoration. Firstly, the mapping of native vegetation in these areas to determine if a development approval process should proceed, is likely to leave out small remnants and patches of isolated trees, so there will be less opportunity to control losses or arrange for offsets. Secondly, the Act may rely more than at present on a purely voluntary approach through the NSW Nature Conservation Trust. This is less likely to attract off-reserve protection in higher nutrient landscapes subject to cropping or other intensive uses, compared to rougher terrain which is usually better represented in protected areas.


# NPA News

## NPA STATE COUNCIL PREPARATIONS

Far South Coast Branch members are gearing up to host the NPA State Council meeting in early March.

The Council meeting will be a fantastic opportunity for locals to share information and network on important conservation issues with NPA representatives from around the state.

### The current draft program is

**Friday** - Drinks and Nibblies/Meet and Greet | **Saturday** - Council meeting | **Saturday night** - Movie on the establishment of National Parks in the South East -the work of branch member Dave Gallan | **Sunday** - Bush walk in nearby Bournda National Park

Picture: FSC Branch members take in the rugged coastline along the Kangarutha Track, Bournda National Park during our recent January walk (17th Jan 2016). Photo: Doug Reckord

## Vale Dane Wimbush

Sadly we heard that Dane Wimbush passed away on 24th November 2015. Dane was a committed conservationist who devoted much time and energy into the long term campaign to protect our natural heritage. He brought to that work a fine analytical mind and wealth of scientific knowledge.

As a man of science, he helped us to understand better our precious alpine areas. His work is influential and substantial and will continue to inspire others.

Dane was a lovely man and a great contributor and will be sorely missed by Robyn, his family and his friends throughout the world. Read more about Dane here http://wild.tl/ane

## Vale Neville Schrader OAM

NPA was saddened to learn of the passing of Neville Schrader AO on Sunday 24 January. Neville was the driving force behind the establishment of the Lachlan Valley branch of the NPA and a key contributor to nature conservation in western NSW. Through his persistence and dedication, Neville was instrumental in the establishment of Goobang National Park, a jewel in the crown of western NSW parks.

Neville, as editor and major contributor, was also responsible for the creation and publication of "Flora and Fauna of the Parkes Shire", a book regularly turned to for information on our local environment. As an avid and exceptional amateur ornithologist Neville's knowledge of avian fauna was unsurpassed.

Neville was awarded the Order of Australia Medal in 2003 for service to conservation and the environment, particularly as a field naturalist and ornithologist. Neville will be greatly missed by his wife Shaydeen and family as well as all of us in the environmental community.

## Next NPA/WEA Course: Australian Wilderness Photography – how it influenced a nation

**SATURDAY 19 MARCH, 2016**

**10am-12 pm | Cost $35**

Peter Dombrovskis mesmerising photo of the Franklin River in Tasmania captured a nation's imagination. Why did this image have such a profound impact on Australian politics in the 1980s? Learn about past and contemporary Australian wilderness photographers – such as John Watt Beattie, Olegas Truchanas, Henry Gold, Ian Brown, Nick Moir, Richard Green and Rob Blakers. Discover how their photography shaped and influenced attitudes to the environment.

**Tutor:** Janine Kitson. Bookings essential.

**Contact WEA, SYDNEY: Ph:** (02) 9264 2781

**E:** info@weasydney.nsw.edu.au | www.weasydney.com.au




**Premier screening on Saturday 5th of March**
at the Picture Show Man cinema, Merimbula

See the trailer: **bit.ly/understorey**