Rewilding: the Realisation and Reality of a New Challenge for Nature in the Twenty-first Century

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INTRODUCTION

The domestication of Earth

Much of this book has considered the history of our changing perceptions of nature. In this final chapter we would like to focus on rewilding: a bold new approach that offers the potential to dramatically change our relationship with nature in the twenty-first century. The ideas for the chapter crystallised during a hike in Cox Scrub Conservation Park, an arid native scrub reserve located on the Fleurieu Peninsula, south of Adelaide in Australia. At only 5.44 km², the reserve is, by Australian standards, a 'postage stamp'. It is also quite difficult to observe wildlife in the reserve; only a lone ring-tailed possum sitting atop a tree in the scorching heat provided some indication of life. The surrounding landscape has become largely pastoral, with orchards and wineries now encroaching along the border of the reserve, and filling in former sheep pastures. Wildness has been drawn largely out of the reserve by progressive dewilding; global landscapes, it would seem, are becoming increasingly homogenised.

The coastline between Adelaide and Melbourne must have looked very different back in the early ninteenth century when the English natural historian John Gould was surveying and collecting specimens on the peninsula (see Fig 29.1). Whilst one can imagine the difficulties Gould faced exploring this wild, beautiful but hostile environment, it would be wrong to assume that this landscape was without human influence, though it is likely that the landscape management of Aboriginal communities, who had shaped the landscape for more than 45,000 years, was largely lost on Gould and other early explorers of the Australian continent. Fire management of the vegetation by Aboriginal people was common practice since their ancestors arrived in Australia, with many places managed like an 'estate' (following the Aboriginal concept of Country), creating an open woodland landscape (Gammage 2011) with various cultural and ecological practices. The Aboriginals brought about significant ecological changes to Australia, long before the first European explorers set foot on Australian shores (Flannery 1994), not least in terms of hunting megafauna, such as the hippopotamus-sized Diprotodon, to extinction.

In many respects nature is experienced within specific spatial and temporal contexts, a snapshot of 'wildness' in time and space. The recording of landscape, either in written or visual forms, can only ever offer an incomplete or 'salami-sliced' *memento mori* of how the landscape once looked, a phenomenon also referred to as *shifting baseline syndrome* (Papworth *et al.* 2009). Ecological changes to a (sense of) place can occur rapidly during an individual's lifetime, and



29.1. The Thylacine (*Thylacinus cynocephalus*), presumed extinct in 1982, can be regarded as an icon of 'dewilding'.

can include the local extinction of species (for example the expansion of oil palm in Borneo at the expense of tropical forest (see Lindsay *et al.* 2012)).

Notwithstanding the sublime immensity of its remote 'wild' places, Australia has a long history of landscape domestication and modification,¹ and while this represents only a fraction of the human footprint, the Australian experience is in many ways symptomatic of the so-called Anthropocene Age we are entering; the *domestication* of Earth caused by and producing human alienation from nature (Wuerthner *et al.* 2014). Humanity is now utilising global natural resources at an unprecedented scale and rate. As Krausmann *et al.* (2013) indicate, HANPP (Human Appropriation of Net Primary Production – essentially global vegetation use) has risen from 13% in 1910 to 25% in 2005. The principal drivers behind this increase include advances in technology and transportation, an increasingly interconnected (and market orientated) global economy and a rapidly expanding human population, with an estimated 9 billion people by 2050. Even the most remote places on our planet are no longer immune from human actions. The *dewilding* of the planet is in full swing, and there is increasing evidence that we are entering the sixth great extinction event (Kolbert 2014).

Amongst the many dystopian projections for the future of humankind, there is still perhaps sufficient time to pull back from the brink and develop *ecologically sustainable* societies, living responsibly *with* the natural world (Lavigne 2006). One small step in this direction is provided

¹ Principally through the introduction of exotic invasive species, European agricultural techniques, opencast mining and the continued urbanisation of the coastal zones.

by an increasing awareness of the value of natural heritage, and a corresponding interest in the concept of rewilding.

The Rewilding Movement

Since the early 1980s there has been increasing recognition that the protectionist approach to conservation – where an area is declared off limits and 'protected' – is not effective in safeguarding biodiversity and above all the ecological and evolutionary processes and functions necessary to maintain – or better, enhance – the natural world (Frankel and Soulé 1981). A more holistic approach was needed to replace the old reductionist approach of the biological sciences, rooted in a seventeenth-century view of nature. The term rewilding, seen by some as a counter movement against the humanisation of nature, was first coined by Dave Foreman (Foote 1990). Rewilding as a novel, bold conservation approach has slowly gained mainstream acceptance, though it is practised differently by a number of schools of ecological thought, each with its own theoretical and scientific background. Three approaches can be characterised.

'Carnivore' top-down rewilding

The concept of top-down rewilding has been developed by group of strongly affiliated conservation biologists in the United States, including Dave Foreman, Michael Soulé, John Terborgh and Reed Noss (see, for example, Soulé and Noss 1998; Soulé and Terborgh 1999). They provided the original rewilding definition, namely:

Rewilding is large-scale conservation committed at restoring and protecting natural processes and states in core wilderness areas, providing effective connectivity between such areas, and protecting or reintroducing apex predators and other keystone species.

The movement is strongly rooted in the science of conservation biology and influenced by the deep ecology philosophy and land ethics of Aldo Leopold (Meine 2013) and Arne Naess (Naess 1989) (see Sessions 1995; Devall and Sessions 2007; Drengson and Devall 2008). In North America the movement is advocated most strongly through the Wildlands Network, Center for Biodiversity, The Rewilding Institute and the Defenders of Wildlife. Soulé and Noss (1998) recognise three independent features that characterise contemporary rewilding: Large, strictly protected **core** reserves (the wild); landscape **connectivity**; and keystone species, which are usually **carnivores**. In shorthand, these are the three Cs: Cores, Corridors, and Carnivores. The realisation of a 3C ecological network of wild lands across the 'the spine of the continent' is their primary goal (Hannibal 2012).

Large carnivores such as the bear, wolf and puma are regarded as 'ecologically interactive' species and, together with their prey species, constitute an evolutionised integral relationship vital to the maintenance and restoration of functional food chains in large-scale natural ecosystems. Human co-existence with these species is seen as essential for rewilding (Eisenberg 2014). Large carnivores as apex predators disproportionally (in terms of biomass or abundance) exert top-down regulatory cascades (Terborgh and Estes 2010). The importance of top-down regulation or trophic cascades through the action of keystone or umbrella species² has been convincingly demonstrated through several case studies. For example, a classic study concerns the role that sea otters play in sustaining

² For a treatment on 'keystone', 'flagship', 'umbrella' species and other proxies, refer to, for example, Frankel and Soulé (1981); Mills *et al.* (1993); Fleishman *et al.* (2000); and Caro (2010).

the vitality and integrity of marine kelp forest ecosystems along the western US seaboard through the depredation of kelp-eating sea urchins (Estes *et al.* 2004). Similarly, the return of the wolf to Yellowstone National Park in 1995 has led to profound changes in the Yellowstone ecosystem. A key factor has been the return of the landscape of fear (Berger 2008; Laundré *et al.* 2010), reducing oversized Wapiti or 'Elk' herds that were excessively browsing and grazing the park's riparian areas. The return of the wolf controlled herbivore populations, which in turn enabled vegetation (e.g.,cottonwood, aspen, etc.) to recover. The wolves also controlled coyote numbers, which were predating pronghorn fawns and down-regulating smaller meso-carnivores.

Wolf-driven top-down regulation, through the dispersal and killing of their prey and immediate competitors, benefitted several plant and animal species. Indeed, biodiversity as a whole began to recover to its former state and functionality (see, for example, Ripple and Beschta 2003; 2005; and 2011). Bison, brown bear, beaver, raven, song birds, and even fish populations are benefitting from the return of the wolf. The landscape also regained some of its former hydrology with, for example, the recovery of wetlands and streams diverted by the engineering work of beavers. Nature thus became re-equipped to exert its full myriad of selective and balancing forces and flows necessary to maintain healthy ecosystems.³

The 3C approach to rewilding is also gaining ground outside the US, including in Europe (e.g., in Germany, the UK and Spain), South Africa and Australia. In Europe, rewilding is perhaps mostly effectively mainstreamed in Germany, where the government has a stated aim to set aside at least 2% of land area to restore 'wilderness', and create natural areas with as little human intervention as possible. To some extent this process has its roots in the unification of East and West Germany, when the abandoned 'Iron Curtain' and its associated ribbon of no man's land, provided the opportunity to safeguard an ecological corridor along the former divide of capitalist West and communist East; from the Baltics to the Balkans. The NGO Deutsche BUND (Friends of the Earth) has been instrumental in developing this protected green ribbon and other ecological networks. This connectivity is important and elsewhere in Europe trans-boundary, limited-intervention management is now driving rewilding in places like the Šumava National Park in the Czech Republic, which is connected to the Bavarian Forest National Park (Meyer et al. 2009; Křenová and Kiener 2012). In Germany, rewilding has also occurred opportunistically in relation to areas of agricultural abandonment and redundant military ranges. Key to this process is the strong (and growing) involvement of 'land care communities', based on traditional approaches to landscape stewardship.

'Herbivore' bottom-up rewilding

Bottom-up rewilding is based on the rewilding of former agricultural or reclaimed land with the introduction of wild/semi-wild ungulates, such as fallow and red deer, horses (mainly the Polish Konik) and (retro)breeds of cattle (e.g.,Scottish Highland and Heck cattle). The highly inbred European bison is one of the flagship species of this movement, which has a strong foundation in the Netherlands and is largely based on work by Frans Vera (1997), who argues that large mamma-lian herbivores, through their grazing and browsing activities, were key in maintaining mosaic landscapes of patchy grassland and forest (wood pastures) in temperate lowland Europe during the

³ A note of caution, however: while the ecological role of the wolf is fairly clear in 'relatively natural' ecosystems like Yellowstone, this role may be less pronounced in more human-modified and ecologically impoverished landscapes (Vucetich *et al.* 2005; Mech 2012; Kuijper *et al.* 2013).

Holocene. According to Vera, these landscapes were in a constant flux with recurring succession from grassland to thorny shrub and deciduous woodland. In Vera's model this is predominantly driven by herbivory. The impact with other reset dynamics, for example wildfire, windfall, flooding, humans (including fire management) and the influence of climate change, is somewhat neglected in Vera's approach, but is viewed by others as playing a combined role (see, for example, Innes and Blackford 2003; Clear 2013). Under Vera's model, extensive closed-canopy or climax forest coverage cannot develop – an approach critiqued by a number of commentators (Svenning 2002; Rackham 2003; Whitehouse and Smith 2004; Hodder *et al.* 2009). Crucially, Vera's model also excludes the ecology of fear and corresponding top-down ecosystem regulation.

Nevertheless, the restoration or development of natural areas using solely grazing management with wild/semi-wild herbivores has found pragmatic, cost-effective applications in European nature management. In the Netherlands, where large carnivores have not yet returned, it is applied in many small and often isolated nature reserves, including river floodplains reclaimed for nature and in wetlands like the well-known Oostvaarderplassen site. These areas were set aside to compensate for the extensive loss of natural cultural landscapes and the last remnants of secondary wilderness (e.g.,heathland, peatland and wetland) after World War II.

The Oostvaarderplassen (54 km²) are located in the reclaimed Flevopolder, bordering on the new city of Almere, and have become a model for what the Dutch have actively promoted as their 'New Wilderness' or the 'Dutch Serengeti'. However, this endeavour has been criticised in some quarters, ostensibly because the wetland is situated in an isolating matrix of highly cultivated landscapes and is overstocked with herbivores, including deer, cattle and horses. These large animals can only move within the perimeter of the fencing around them, allowing only the exchange of animals like roe deer and smaller ground mammals. With a limited land area, low connectivity and an absence of predators, the only means of regulating herbivore numbers is by allowing die-off (density dependent regulation), either through starvation in cold winters (which is strongly objected to by animal rights organisations) or by culling. Overgrazing and excessive trampling is in many respects problematic, leading for instance to the disappearance of certain plant and bird species. A recent study has shown the necessity of grazing refuges in the reserve to allow trees to rejuvenate (Smit et al. 2015); hence more intervention is required in the absence of natural predators. Despite such problems, the Dutch Forestry Service claims that the Oostvaarderplassen have provided a number of positive ecological effects (Vera 2008). Frans Vera argues that large carnivores could be part of the Oostvaarderplassen project in the future. With a calculation based on herbivore biomass, he claims that the site could support around a hundred wolves. This is questionable, however, given that an average wolf pack in temperate Europe occupies 300 km² of strictly bounded territory (though as defensive wolf pack interactions also determine the number of packs in an area, perhaps a single wolf pack can be sustained in Oostvaarderplassen). The carrying capacity for viable large carnivore populations is thus another important consideration for rewilding. Clearly, the rewilding situation in the Oostvaarderplassen - with a 'fabricated' food chain in the absence of apex predators - is very different from the large-scale ecology of Yellowstone National Park.

Pleistocene rewilding

In a now famous 2005 paper in Nature, Josh Donlan and colleagues presented a plan to restore animals that disappeared 13,000 years ago from Pleistocene North America (Donlan 2005; 2007). Donlan argues that abandoned cattle lands could be restocked with apex predators such as lion

and cheetah, large herbivores such as elephant, Bactrian camel and Przewalski horse, and scavenger species such as the spotted hyena and Californian condor. These animals would function as 'proxies' for long-extinct ancestors that once roamed the prairies of North America (Flannery 2001; Martin 2005; Levy 2011). George Monbiot, in his rewilding manifesto *Feral* (2013), reflects on an echo of the past with the overly defensive mechanisms of certain plant species (like the big thorns of Blackthorn), once used against the 'environmental engineering' of species like the straight-tusked elephant (Palaeoloxodon antiquus).⁴ This elephant lived amongst a rich community of herbivores and carnivores in Europe (Sandoma et al. 2014), thriving during interglacials of the Pleistocene. It is hard, however, not to liken the idea of Pleistocene rewilding to Jurassic Park or Noah's Ark. There are obvious scientific constraints, if not ethical objections.

Instead of Pleistocene rewilding, a more nuanced and arguably more realistic approach is the restoration of large mammal communities with extant species (Maehr *et al.* 2001). This could be aimed at providing recuperative refuges for species with a high extinction risk. For example, there is an opportunity to create 'safe havens' for the Siberian or Amur tiger, which has recently been shown to be genetically identical as a subspecies to the 'extinct' Caspian tiger (Dybas 2010). This subspecies once ranged in temperate lowland regions of the Caucasus, through Central Asia into the Russian Far East, the latter being its current last stronghold (Jungius *et al.* 2009). The tiger could be reintroduced to parts of its former range in protected areas of Central Asia. The obvious constraints to this approach would be the common 'dewilding' pressures of continued habitat destruction, human encroachment and poaching. In addition, the former lowland habitat of the tiger, once consisting of extensive Tugai riparian forest, is nowadays highly patchy and degraded. Nevertheless, establishing habitat for viable Siberian tiger populations at the required scale, interconnection and protection in suitable areas of its former range would be a tremendous rewilding achievement. It could follow the successful 'blueprint' of restoring the Przewalski horse to the steppes of Khustain Nuruu National Park in Mongolia (Wit and Bouman 2006).

What Should a Rewilded Landscape Look Like?

The growing rewilding discussion, with different settings, ambitions and approaches, raises the question of what counts for wilderness/wild nature in the twenty-first century, particularly with respect to setting objectives or (societal) allowances or achievable limits for rewilding. This is a surprisingly difficult question to answer. Wilderness is a highly contested term⁵ (Cronon 1996; Nelson and Callicott 2008), with much debate centred on the notion of wilderness as a construct; wilderness areas are 'produced wilderness' in that their creation has often involved the forcible expulsion of indigenous peoples (Ginn and Demeritt 2009), or the recreational use of wilderness as a ritual for reproducing the American frontier experience (Williams 2000; see also

⁴ This elephant is closely related to the extant Asian elephant.

⁵ Jørgensen (in press, 2) highlights the importance of the 1964 US *Wilderness Act*, which has profoundly influenced wilderness thinking. Wilderness under the Act is defined as 'an area where the earth and its community of life are untrammeled by man', yet wilderness is also a 'resource' for human use, and as such is a highly contested term. See, for example, Nash (1982); Oelschlaeger (1991); Gomez-Pompa and Kaus (1992); Soulé and Lease (1995); Schama (1995); Cronon (1996); Diamond (1997); Christian (1998); Crist (2004); Nelson and Callicott (2008); Vining and Price (2008); Ginn and Demeritt (2009); and Clingerman *et al.* (2014) for different thoughts on nature, wilderness and the human place in nature throughout history.

Crist 2004 for a forceful critique of the social constructionist argument). As Williams (2000) notes, the point is not to deny the existence of a 'wild reality' but to recognise that the meaning of that reality is continuously created and recreated through social interactions and practices. Defining a state of, or a goal for, restoring wilderness or wildness also depends on the disciplinary framework within which it is assessed, with, for example, different perspectives emerging from ecology, environmental and cultural philosophy, and geography.

Thus the state of contemporary wilderness is difficult to discuss, as it depends on the definition and properties of wildness used (Oelschlaeger 1991). Regardless of definitions, the ongoing HANPP discussed earlier has led to an increasingly mechanised and technologically dependant agro-ecology, causing dewilding on an unprecedented scale in large parts of the world, including parts of Europe. According to a GIS assessment by Mark Fisher from the Wildlands Research Institute, wild land in Europe now remains only as vestiges in the remotest of places (Fisher *et al.* 2010).

It could be argued that wilderness started to disappear during the Neolithic era, once Homo sapiens began cultivating the earth and living in settlements and communities, creating the division between human culture and nature. From then on the division increased with everexpanding cultivation, both intensively and extensively. Lowland natural landscapes were among the first to be cultivated by people, with many other species dissipated or purposefully exterminated, particularly those that strongly conflicted with human interests, like the large mammalian carnivores (as discussed earlier in relation to Australia). Some species retreated to remoter areas like mountain ranges, deep forests or wetlands, and over time many areas that were too difficult or unprofitable to exploit, or too impenetrable to inhabit, were protected as reserves or national parks. Though the value of these 'protectionist conservation islands' has been questioned, they do at least hold potential source populations for rewilding projects.



29.2. Eagle owls (Bubo Bubo), which were regarded as a wilderness species, are now able to expand in cultivated landscapes, for instance using sand quarries in the west of Germany as breeding sites.

A key question is: is it still realistic to restore degrees of wilderness around our habitations in highly cultivated landscapes? We would argue that wildness, as an aspect of wilderness, can (and does) exist even within highly modified cultural landscapes (see Fig 29.2). This brings us to our first main point: there is always the potential for rewilding.

The Wilderness Continuum conceptual model, as developed by Lesslie and Taylor (1985) and adapted by Carver (2014), provides a useful template to place rewilding ambitions into perspective. The model (Fig 29.3) presents a gradient for the degree of naturalness versus that of anthropogenic modification of landscapes: from pristine (least touched) wilderness and 'wild' human transformed wildland estates to semi-natural areas (e.g., productive forests); and to highly urbanised, technogeneously modified and agriculturally intensified environments where biodiversity is reduced to a minimum or to the most adaptable of species.



Spontaneous rewilding/natural succession (*natura naturans*)

29.3. Wilderness continuum model with rewilding ambitions.

The drive to advance cultivation of lands and to further domesticate nature is typified in parts of Western Europe. The Netherlands, for example, contains some of the most man-modified landscapes (such as the Flevopolder) anywhere on earth. Practically every square centimetre of this country has been transformed; a continuous process of reclaiming, cultivating, intensively farming and urbanising. Although it may appear that wilderness has completely disappeared, aspects of wildness can re-emerge even in urbanised and agriculturalised areas, sustained and revived through small-scale ecological restoration projects. Where human activity is reduced or where land is purposefully set aside for ecological development, nature (i.e.,natura naturans)⁶ recovers to reach a certain successional state.

Many human cultures, past and present, have also co-existed with nature, in some cases even enriching it. And nature is always in a state of flux, constantly changing and sometimes completely reset, for example in relation to violent events such as earthquakes and volcanic activity. We can also be inspired by 'traditionally conserved' rural places, where certain ecological and cultural balances are still maintained. While strong ecologically interactive species (Soulé *et al.* 2003) like bear, moose, bison and beaver became extirpated during the cultivation of many landscapes of Europe, age-old traditional land-use and human agricultural stewardship allowed other, more adaptable species and diverse ecological communities to flourish or persist. Good examples of 'old cultural landscapes' with a degree of wildness include the Dutch wet pastoral meadows on former lowland mires and the Spanish Dehesa (agro-sylvo-pastoral systems, known as Montado in Portugal). Nowadays, these increasingly abandoned systems provide a range of challenges in terms of preserving both cultural and natural heritage, yet the safeguarding of such traditional land-use is increasingly recognised as important for biodiversity. For example, conservation of the cinereous vulture depends not only on the protection of breeding areas, but also on the maintenance of well-conserved dehesas close to the colonies (Carrete and Donázar 2005).

Another (though different) example of diverse wildness in a traditionally managed landscape is found in the Romanian Carpathians. Here relatively dense populations of bear, wolf, lynx, wild cat, wild boar and red deer and other rich biodiversity were fostered or 'subsidised' with a combined system of low intensive harvest forestry, active hunting management and the age-old practice of sheep herding between mountains and plains (In Europe this tradition is called transhumance). Until fairly recently the landscape was a mosaic landscape of old-growth forests, florally rich mountain meadows and lush stream valleys (Quammen 2003; Mertens and Huband 2004), providing a common reference for wildness and rewilding in Europe.

During a rewilding project in 2003–2006 (van Maanen *et al.* 2006), conservation biologist Michael Soulé proclaimed the Romanian Carpathians to be Europe's Yellowstone, as one of the continent's more pristine cultural 'wilderness' areas, with great potential for ecotourism and cultural tourism. Although bound within a totalitarian political system and living in economic poverty, rural Romanians were attuned to their landscape. The Romanian rural folk seem to have maintained a 'truce' with large carnivores, combining acceptance with hunting management (van Maanen *et al.* 2006). Though this situation is now changing rapidly,⁷ there is still a parallel to be drawn with other 'wildland estates', for example as managed by the Australian Aboriginals or native tribes in the Amazon.

In such areas, humans can be considered as 'stewards' of nature. Within this frame wilderness can be defined as the level to which we have taken care to preserve its extent, integrity, connectedness and the ecological and cultural diversity within. However, this is stewardship not in the sense of replicating capitalist, value-based and technology driven development – as seemingly advocated by some neo-environmentalists (Wuerthner et al. 2014) – but rather stewardship inspired and persuaded by deep ecological motivations. As humans existing within nature we

⁶ Nature doing what nature does, according to Baruch Spinoza's Ethics.

⁷ Since the fall of Ceausescu and accession to the European Union (EU), Romania is fast 'reforming'. In this process pastoral abandonment, land privatisation, forestry intensification, industrial scale mining, housing and infrastructure development are now causing a great deal of dewilding.

can work with it by fostering wildness, instead of against it or breaking it down (as we refer to with the term dewilding). In realising human inclusive rewilding by ecological enrichment of cultivated areas, we can learn a great deal from traditional cultures and former land management practices, past and present.

RETURN OF THE WILD THINGS

Nature around the globe is largely waning, but in some parts of the Western world it is also waxing. A clear demonstration of the dynamic, restorative effect of nature – spontaneous rewilding – is provided by one of the most urbanised, developed places on Earth: Western mainland Europe. Within the European Union, changes in rural land-use are driven by complex interactive globalised economic and demographical developments. Such changes are particularly evident in the larger, more remote mountainous countries of central, eastern and southern Europe. Rural depopulation through ageing and migration of younger people to urban centres is causing large areas of land to fall fallow; here nature can rewild. The Institute for European Environmental Policy estimates that 3–4% of the EU will be abandoned by 2030, with 126,000–168,000 km² potentially available for nature development (Keenleyside and Tucker 2010).

This should of course be seen as part of a longer-term trend; the waxing and waning of landuse followed by spontaneous rewilding has occurred regularly since people began working the land. In Middle-Age Europe it was periodically driven by wars, famine and disease. In Europe, demographic transition halted this process, largely due to the industrial revolution and advances in agriculture and medicine. But now changing economic conditions are driving renewed land abandonment in Europe.

A consequence of land abandonment, in combination with wildlife protection, is the return of wildlife previously extirpated (in Europe such species include red deer, moose, brown bear, lynx, wild cat, wolf, otter, pine marten, beaver, raven, eagle owl, peregrine falcon and the white-tailed sea-eagle). Not all are returning fully of their own accord; some are or need to be reintroduced and in many cases active management is required to strengthen their populations. For example the lynx was reintroduced to the central German Harz Mountains in 2000. A population is now well established and functioning as a source population, for instance for the new German lynx project in the Palatinate Forest, and presents an inspiring reference for the reintroduction of the lynx in the United Kingdom. Elsewhere, like in the Netherlands, beaver and otter reintroductions have been reasonably successful. Many species are also returning of their own accord, of which the wolf – due to its high dispersive ability, adaptedness and fecundity – is currently the flag-bearer for spontaneous rewilding in North-western Europe.

The return of the wolf started with the first pair of breeding wolves in 2000 in the German region of Lausitz, where the 'last wolf' (the 'Tiger of Sabrodt') was shot in 1904 (Stoepel 2004). Lausitz consists of wide 'moonscapes' of abandoned brown coal mines, former military practice sites, heathland, stream valleys with broad-leaved forest, arable lands and large tracts of Scots pine forest. Wild boar, red deer, roe deer and introduced mouflon and fallow deer commonly roam the area, providing a dependable and easy food base for wolves. This is, however, not a wilderness; it is a highly human-modified landscape. The area is currently experiencing population loss, as young people move elsewhere for employment and the old generation passes away. Wolves have taken advantage of this situation; in 2014, a total of sixteen wolf packs, located in an area of 3500 km², were recorded and there may well be more packs as yet unnoticed. The wolf

pack cluster in Lausitz represents the main source population for wolves spreading further into Germany in a predominantly north-westerly direction. Young dispersive wolves appear to move along river courses and forested hill ranges, to settle in other relatively quiet rural areas. Several military practice sites in northern Germany now also hold wolf populations, with an estimated twenty-five wolf packs currently in Germany (Wolfsregion Lausitz 2014).

Wolf recovery in Western Europe is in many respects a rewilding success story - in this case occurring without reintroduction, but a comeback promoted through land-use changes and with human consent. This development may meet with active management as wolf numbers increase and human interests are unacceptably affected – perhaps a new chapter in the uneasy historical relationship between wolves and humans (see, for example, Moriceau 2013). The stage is set for further large carnivore rewilding with ongoing land abandonment in central and southern Europe. The growing abundance of ungulates as the food base for large carnivores appears to be driven by a combination of factors and changes, including afforestation, reduced hunting management and increased ecological productivity. The 'problem' of increasing ungulate abundance with respect to forestry interests in such places is also providing an incentive to reintroduce larger carnivores that are less badly reputed and dispersive than the wolf. Encouragingly, foresters - as key stakeholders - initiated the reintroduction of lynx in the German Hartz Mountains. The return of the wolf to Europe, with its mythic and historical reputation, is stirring the minds of many people. For some it symbolises the hopeful return of wildness and nature; for others it represents the return of a 'blood thirsty monster' that will kill livestock, pets and possibly harm humans. The wolf certainly gives us reason to ponder the state of nature in the highly cultivated (technogeneous) landscapes of Europe. This provides both a challenge and an opportunity: first, to rethink the semi-natural areas so close to human settlements; second, to break down the 'civilised' barriers and divisions that exist between human culture and nature. Our second main point therefore is that alongside good conservation policy and practice, a 'rewilding of the mind' is also required; as humans we need to rethink our relationship with the natural world.

Some Concluding Thoughts

Rewilding as an emergent paradigm presents a 'beacon of light' for conservation, inspiring a progressive, but as yet fragmented, conservation movement. There are clear links to the past, for example the writings of Thoreau, Leopold and Lovelock articulate many of the core principles of rewilding, but the contemporary appeal of this movement is to transcend way beyond the traditional protection of mostly isolated nature reserves, now increasingly under pressure from external and internal human influences. Instead we should focus on the development of wild-land networks that provide sufficient room for ecological dynamics and the maintenance of vital ecological services. Restoring former trophic relationships is key to this process, including the reintroduction of large carnivores as keystone species. Human communities should not necessarily be excluded from rewilding areas (and we have earlier identified examples of cultural land-scapes and adaptive 'wild' species). There are economic opportunities that come with rewilding, if attuned with nature. However, interactions between people, their economic interests and wild species and habitats need to be carefully monitored and managed to avoid conflict or over-exploitation. It is also important to note that rewilding is context-dependent and not absolute. There are degrees of rewilding, often depending on the natural heritage in place and common

societal perceptions on nature, and the shared need to conserve it. This is an important consideration for any rewilding project.

On the evidence of recent media coverage in the UK, particularly concerning the proposed lynx reintroduction, rewilding is gaining public support in Europe (see also Bauer *et al.* 2009). There is also increasing recognition that we depend on healthy ecosystems or the biosphere for our well-being. In the Western World, 'being in nature' has become popularised through increasingly mainstreamed nature-based lifestyle choices.⁸ With growing ecological awareness comes a certain rewilding of minds.

But is rewilding being effectively achieved on the ground? Yes, little by little. Dedicated individuals (including citizen scientists), communities and organisations are progressively taking action to restore and foster their local environment with elements of wildness. This is a start. Achieving connectivity is the next step, and this will require much greater social, political and economic will if it is to succeed. Linked to this, as we have argued throughout this chapter, is the reintroduction of ecologically interactive (and usually carnivore) species in suitable natural areas, harmonised with existing human interests and safety.

There are also important 'size' issues to consider. Areas in Western Europe where sustainable populations of lynx and wolf can re-establish are currently limited. Source populations are small, disparate and restricted to remote areas, especially for the lynx. Rewilding requires larger natural spaces that are more connected (see also Ceausu et al. 2015), moving away from the old approach of conserving natural areas or reserves in a relatively small-scale, fragmented and thus vulnerable configuration towards a network of larger natural core areas with high interconnectivity. Size matters; areas should be large enough to enable ecologically effective populations of large carnivores and herbivores to interact as predators and prey (thus creating an ecology of fear).

The likelihood of large carnivore species – particularly wolves and bears – settling into the human dominated landscape matrix raises concerns of habituation, with the potential for conflict requiring human intervention. This would be contradictory to rewilding. Hence we would also argue that ecologically interactive species like the wolf should provide us with the motivation to establish new innovative standards for nature conservation, reversing natural habitat loss on adequately large ecological scales. Furthermore, the restoration of sizeable natural cores and connections (depending on target species) is beneficial to more autonomous ecological dynamics, as well as important ecosystem services (for instance buffering mechanisms against climate change).

The current proposal by the Lynx UK Trust to reintroduce the Eurasian lynx to cultural wildland areas in the UK represents an interesting case study for rewilding with carnivores. It is aimed, first of all, at restoring trophic balance to areas where excessive deer numbers and intensive browsing are preventing forest rejuvenation, to the frustration of foresters and ecologists alike. A foreseen positive side effect is that the return of the lynx will also increase the wilderness

⁸ Much has been written about the benefits of nature for human health and well-being (see, for example, Julie Taylor's chapter, this volume). People are increasingly seeking to experience wild places or wildness (rewilding the mind), often as a means to find escape from a busy, stressful and estranging urban lifestyle; for instance seeking education, health or spiritual enrichment or existential balm. This 'nature-based mindfulness' can take a number of forms, including bushcraft and survival skills, wildlife watching, animal tracking, wild food foraging and simply hiking or gardening.

appeal of these areas by enhancing (eco)tourism, as lynx reintroduction projects in mainland Europe have demonstrated. This also provides an economic incentive for rewilding. The initiative builds on a process of constructive public and stakeholder consultation and proceeds according to a sound scientific and interdisciplinary approach, closely involving a network of experts. There are similar project proposals emerging globally, for example the Wildlands Network in the US, and dingo rehabilitation to counter the invasive fox problem and native species loss in Australia (Letnic et al. 2012).

From a Western European perspective, where land-use and demographics are different from the USA, living with carnivores presents a new relationship and many challenges. Securing a critical mass of public support, political commitment (with the problem of short-term governance) and the land rights to effectuate rewilding is, of course, the difficult part. Rewilding requires an interdisciplinary and broad-based scientific, societal and long-term political commitment if it is to be ecologically and institutionally effective. As rewilding initiatives develop in different ecological, socio-economic and spatial contexts, there is a clear need for harmonising objectives, approaches and support mechanisms. We believe that a long-term holistic approach, coupled with sound scientific evidence and, crucially, wide-spread community support is vital for success.

This leads us to perhaps the most important question: to what extent are societies willing and able to rewild and what are the ecological and socio-economic conditions required for ecologically meaningful and sustainable rewilding? We have argued that rewilding in some form or another can happen pretty much anywhere. A crucial precondition for rewilding is to break down the 'civilised' barriers, divisions and control mechanisms that exist between human culture and nature. For this 'rewilding of the mind' or 'rewilding land ethic' (after Leopold 1949) to take hold, a paradigm shift in our thinking is required, from anthropocentric to ecocentric; moving us away from economic exploitation towards more sustainable living (Schumacher 1977). Perhaps the most important precondition for rewilding involves winning over hearts and minds, through education, public mainstreaming, community involvement and long-term policy. As Aldo Leopold (1949) remarked: 'The only reality is an intelligent respect for, and adjustment to, the inherent tendencies of land to produce life'.

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BIBLIOGRAPHY AND REFERENCES

Bauer, N, Wallner, A, and Hunziker, M, 2009 The change of European landscapes: Human-nature relationships, public attitudes towards rewilding, and the implications for landscape management in Switzerland, *Journal of Environmental Management* 90, 2910–20

Berger, J, 2008 The Better to Eat You With, University of Chicago Press, Chicago

Caro, T, 2010 Conservation by Proxy: Indicator, Umbrella, Keystone, Flagship and Other Surrogate Species, Island Press, Washington DC

Carrete, M, and Donázar, J A, 2005 Application of central-place foraging theory shows the importance of Mediterranean dehesas for the conservation of the Cinereous Vulture, Aegypius monachus, *Biological Conservation* 126, 582–90

Carver, S, 2014 The Wilderness Continuum and its Implications for Wilderness Protection, paper presented at the European Wilderness Society *Europe's Wilderness Days* conference, Mittersill, Austria, 1-4 October

Ceausu, S, Hofmann, M, Navarro, L M, Carver, S, Verburg, P H, and Pereira, H M, 2015 Mapping opportunities and challenges for rewilding in Europe, *Conservation Biology* 29, 1017–27

Christian, P A, 1998 An International Wilderness Management Scale: a Common Language for a Common Heritage, *USDA Forest Service Proceedings*, RMRS-P-4

Clear, J L, 2013 Holocene fire and vegetation dynamics in the northern European forests, unpublished Doctoral Thesis, University of Liverpool, Liverpool

Clingerman, F, Treanor, B, Drenthen, M, and Utsler, D (eds), 2014 *Interpreting Nature: The Emerging Field of Environmental Hermeneutics*, Fordham University Press, New York

Crist, E, 2004 Against the Social Construction of Nature and Wilderness, Environmental Ethics 26 (1), 5-24

Cronon, W (ed.), 1996, Uncommon Ground: Rethinking the Human Place in Nature, W W Norton & Company, New York

Devall, B, and Sessions, G, 2007 Deep Ecology: Living as if Nature Mattered, Gibbs Smith, Salt Lake City, UT

Diamond, J, 1997 Guns, Germs, and Steel: The Fates of Human Societies, W W Norton & Company, New York

Donlan, J, 2005 Re-wilding North America, Nature 436, 913-14

----- 2007 Restoring America's Big, Wild Animals, Scientific American, June, 70-7

Drengson, A, and Devall, B, 2008 The Ecology of Wisdom: Writings by Arne Naess, Counterpoint, Berkeley, CA

Dybas, C L, 2010 The One and Future Tiger, BioScience 60 (11), 872-7

Eisenberg, C, 2014 The Carnivore Way: Coexisting with and Conserving North America's Predators, Island Press, Washington DC

Estes, J A, Danner, E M, Doak, D F, Konar, B, Springer, A M, Steinberg, P D, Tinker, M T, and Williams, T M, 2004 Complex Trophic Interactions in Kelp Forest Ecosystems, *Bulletin of Marine Science* 74 (3), 621–38

Flannery, T, 1994 The Future Eaters, New Holland Publishers, Sydney

—— 2001 The Eternal Frontier: An Ecological History of North America and its Peoples, Text Publishing, Melbourne

Fleishman, E D, Murphy, D, and Brussard, P F, 2000 A new method for selection of umbrella species for conservation planning, *Ecological Applications* 10, 569–79

Fisher, M, Carver, S, Kun, Z, McMorran, R, Arrel, K, and Mitchell, G, 2010 Review of status and conservation of wild land in Europe, Final Report CR/2009/31, University of Leeds, Leeds

Foote, J, 1990 Trying to Take Back the Planet, Newsweek, 5 February, 24-5

Frankel, O H, and Soulé, M E, 1981 *Conservation and Evolution*, Cambridge University Press, Cambridge Gammage, B, 2011 *The Biggest Estate on Earth: How Aboriginals Made Australia*, Allen & Unwin, Sydney

Ginn, F, and Demeritt, D, 2009 Nature, in *Key Concepts in Geography* (eds N Clifford, S Holloway, S Rice, and G Valentine), Sage, London, 300–11

Gomez-Pompa, A, and Kaus, A, 1992 Taming the Wilderness Myth, Bioscience 42 (4), 271-9

Hannibal, M E, 2012 The Spine of the Continent: The race to save America's last, best Wilderness, Lyons Press, Guilford, CT

Hodder, K H, Buckland, P C, Kirby, K J, and Bullock, J M, 2009 Can the pre-Neolithic provide suitable models for re-wilding the landscape in Britain?, *British Wildlife*, June, 4–15

Innes, J B, and Blackford, J J, 2003 The Ecology of Late Mesolithic Woodland Disturbances: Model Testing with Fungal Spore Assemblage Data, *Journal of Archaeological Science* 30, 185–94

Jørgensen, D, (in press) Rethinking rewilding, Geoforum, doi://10.1016/j.geoforum.2014.11.016

Jungius, H, Chikin, Y, Tsaruk, O, and Pereladova, O, 2009 Pre-Feasibility Study on the Possible Restoration of the Caspian Tiger in the Amu Darya Delta, WWF Russia

Keenleyside, C, and Tucker, G, 2010 Farmland Abandonment in the EU: an Assessment of Trends and Prospects, Institute for European Environmental Policy, London

Kolbert, E, 2014 The Sixth Extinction: An Unnatural History, Henry Holt and Company, New York

Krausmann, F, Erb, K H, Gingrich, S, Haberl, H, Bondeau, A, Gaube, V, Lauk, C, Plutzar, C, and Searchinger, T D, 2013 Global human appropriation of net primary production doubled in the 20th century, *Proceedings of the National Academy of Sciences of the United States of America* 110 (25), 10324–9

Křenová, Z, and Kiener, H, 2012 Europe's Wild Heart – Still Beating? *European Journal of Environmental Sciences* 2 (2), 115–24

Kuijper, D P J, de Kleine, C, Churski, M, van Hooft, P, Bubnicki, J, and Jędrzejewska, B, 2013 Landscape of fear in Europe: wolves affect spatial patterns of ungulate browsing in Białowieża Primeval Forest, Poland, *Ecography* 36 (12), 1263–75

Laundré, J W, Hernández, L, and Ripple, W J, 2010 The Landscape of Fear: Ecological Implications of Being Afraid, *The Open Ecology Journal* 3, 1–7

Lavigne, D M (ed.), 2006 Gaining Ground: In Pursuit of Ecological Sustainability, *International Fund for Animal Welfare*, Guelph, Canada and University of Limerick, Ireland

Leopold, A, 1949 A Sand County Almanac, Oxford University Press, New York

Lesslie, R G and Taylor, S G, 1985 The wilderness continuum concept and its implications for Australian wilderness preservation policy, *Biological Conservation* 32 (4), 309–33

Letnic, M, Ritchie, E G, and Dickman, C R, 2012 Top predators as biodiversity regulators: the dingo *Canis lupus* dingo as a case study, *Biological Reviews* 87, 390–413

Levy, S, 2011 Once and Future Giants: What Ice Age Extinctions Tell us About the Fate of Earth's Largest Animals, Oxford University Press, Oxford

Lindsay, E, Convery, I, Ramsey, R, and Simmons, E, 2012 Rainforests, Place and Palm Oil in Sabah, Borneo, in *Making Sense of Place* (eds I Convery, G Corsane, and P Davis), The Boydell Press, Woodbridge

Maehr, D S, Noss, R F, and Larkin, J L (eds), 2001 Large Mammal Restoration: Ecological and Sociological Challenges in the 21st Century, Island Press, Washington DC

Martin, P S, 2005 *Twilight Of The Mammoths: Ice Age Extinctions and the Rewilding of America*, University of California Press, Berkeley, CA

Mech, L D, 2012 Is science in danger of sanctifying the wolf? Biological Conservation 150, 143-9

Meine, C (ed.), 2013 Aldo Leopold: A Sand County Almanac & Other Writings on Conservation and Ecology, The Library of America, New York Mertens, A, and Huband, S, 2004 Romanian transhumance: the past the present and future scenarios, in *Transhumance and Biodiversity in European Mountains*, Report of the EU-FP5 project TRANSHUMOUNT (EVK2-CT-2002-80017) (eds Bunce, R G H, Pérez-Soba, M, Jongman, R H G, Gómez Sal, A, Herzog, F and Austad, I), IALE publication series nr 1, 321

Meyer, T, Kiener, H, and Krenova, Z, 2009 The Wild Heart of Europe, *International Journal of Wilderness* 15 (3), 33–40

Mills, L S, Soulé, M E and Doak, D F, 1993 The keystone-species concept in ecology and conservation, *BioScience* 43 (4), 219–24

Monbiot, G, 2013 Feral: Searching for Enchantment on the Frontiers of Rewilding, Allen Lane, London

Moriceau, J-M, 2013 Sur les pas du loup: Tour de France historique et culturel du loup du Moyen Âge à nos jours, Montbel, Paris

Naess, A, 1989 Ecology, Community and Lifestyle, Cambridge University Press, Cambridge

Nash, R, 1982 Wilderness and the American Mind, Yale University Press, New Haven, CT

Nelson, M P, and Callicott, J B, 2008 The Wilderness Debate Rages On: Continuing the Great New Wilderness Debate, University of Georgia Press, Athens, GA

Oelschlaeger, M, 1991 The Idea of Wilderness, Yale University Press, London

Papworth, S K, Rist, J, Coad, L and Milner-Gulland, E J, 2009 Evidence for shifting baseline syndrome in conservation, *Conservation Letters* 2, 93–100

Quammen, D, 2003 Monster of God: The Man-eating Predator in the Jungles of History and the Mind, W W Norton & Company, New York

Rackham, O, 2003 Ancient Woodland: Its History, Vegetation and Use in England, Castlepoint Press, Dalbeattie

Ripple, W and Beschta, R L, 2003 Wolf reintroduction, predation risk, and cottonwood recovery in Yellowstone National Park, *Forest Ecology and Management* 184, 299–313

------ 2005 Linking Wolves and Plants: Aldo Leopold on Trophic Cascades, BioScience 55 (7), 613-21

------- 2011 Trophic cascades in Yellowstone: The first 15 years after wolf reintroduction, *Biological Conservation* 145 (1), 205–13

Sandoma, C J, Ejrnæs, R, Hansen, M D D, and Svenninga, J-C, 2014 High herbivore density associated with vegetation diversity in interglacial ecosystems, *Proceedings of the National Academy of Sciences* 111 (11), 4162–7

Schama, S, 1995 Landscape and Memory, Harper Collins, London

Schumacher, E F, 1977 A Guide for the Perplexed, Vintage Books, London

Sessions, G, 1995 Deep Ecology for the 21st Century: Readings on the Philosophy and Practice of the New Environmentalism, Shambhala, London

Smit, C, Ruifrok, J L, van Klink, R, and Olff, H, 2015 Rewilding with large herbivores: The importance of grazing refuges for sapling establishment and wood-pasture formation, *Biological Conservation* 182, 134–42

Soulé, M, and Lease, G (eds), 1995 Reinventing Nature? Responses to Postmodern Deconstruction, Island Press, Washington DC

Soulé, M, and Noss, R, 1998 Rewilding and Biodiversity: Complementary Goals for Continental Conservation, *Wild Earth* 8 (3), 19–28

Soulé, M, and Terborgh, J (eds), 1999 Continental Conservation: Scientific Foundations of Regional Reserve Networks, Island Press, Washington DC

Soulé, M E, Estes, J A, Berger, J, and Martinez Del Rio, C, 2003 Ecological Effectiveness: Conservation Goals for Interactive Species, *Conservation Biology* 17 (5), 1238–50

Stoepel, B, 2004 Expeditionen ins Tierreich: Wolfe in Deutschland, Hoffmann & Campe Verlag, Berlin

Svenning, J-C, 2002 A review of natural vegetation openness in north-western Europe, *Biological Conservation* 104, 133–48

Terborgh, J, and Estes, J E (eds), 2010 Trophic Cascades: Predators, Prey, and the Changing Dynamics of Nature, Island Press, Washington DC

van Maanen, E, Predoiu, G, Klaver, R, Soulé, M, Popa, M, Ionescu, O, Jurj, R, Negus, S, Ionescu, G, and Altenburg, W, 2006 *Safeguarding the Romanian Carpathian Ecological Network: a vision for large carnivores and biodiversity in Eastern Europe*, A & W ecological consultants, Veenwouden, The Netherlands, and ICAS Wildlife Unit, Brasov, Romania

Vera, F W M, 1997 *Metaphors for the Wilderness: Oak, Hazel, Cattle and Horse*, Ministry of Agriculture, Nature Management and Fisheries, The Hague

------- 2008 Voorbij de horizon van het vertrouwde (Beyond the familiar horizon), Staatsbosbeheer (Dutch Forestry Service), Driebergen

Vining, J, and Price, E A, 2008 The Distinction between Humans and Nature: Human Perceptions of Connectedness to Nature and Elements of the Natural and Unnatural, *Human Ecology Review* 15 (1), 1–11

Vucetich, J A, Smith, D W, and Stalker, D R, 2005 Influence of harvest, climate and wolf predation on Yellowstone elk, 1961/2004, *Oikos* 111, 259–70

Whitehouse, NJ and DN Smith, 2004, 'Islands' in Holocene forests: Implications for Forest Openness, Landscape Clearance and 'Culture-Steppe' Species, *Environmental Archaeology* 9, 203–212

Williams, D R, 2000 Personal and social meanings of wilderness: Constructing and contesting places in a global village, in *Personal, societal, and ecological values of wilderness: Sixth World Wilderness Congress proceedings on research, management, and allocation, Vol II* (eds A E Watson and G Applet), US Forest Service, Rocky Mountain Research Station, Ogden UT, 77–82

Wit, P, and Bouman, I, 2006 *The tale of the Przewalski's horse: coming home to Mongolia*, KNNV Publishers, Utrecht

Wolfsregion Lausitz, 2014 Homepage, available from: http://www.wolfsregion-lausitz.de/ [8 September 2015]

Wuerthner, G, Crist, E, and Butler, T (eds), 2014 Keeping the Wild: Against the Domestication of Earth, Island Press, Washington DC