Journal of the Wildland Research Institute

WILDER HORIZONS

In this issue

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Wilder Horizons

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Forward

Editorial

Articles

Guidelines for Contributing to Wilder Horizons

Wilder Horizons is the quarterly journal published by the Wildland Research Institute, University of Leeds. The journal invites contributions relevant to wildness and wildland in Britain and elsewhere, including issues about stewardship, education, research, policy, international perspectives, and inspirational articles.

Wilder Horizons solicits manuscripts not previously published and will review them before deciding on publication. It is the intention to develop a publishing policy that includes a mix of peer-reviewed research papers, feature articles, letters to the editor, announcements and book reviews. For any questions or submissions, please contact the Editor by email: editor@wilderhorizons.info

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Email: wildlandresearch@leeds.ac.uk
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In wildness is the preservation of the world

Henry Thoreau, 1817-1862

Welcome to the inaugural edition of ***Wilder Horizons***! This is a new journal aimed at creating a fresh and forward-looking publishing space for scientific articles as well as a forum for discussion and open debate. The journal accompanies the launch of the Wildland Research Institute based at University of Leeds and is intended to complement and build on existing journals such as *ECOS* and the *International Journal of Wilderness* as the principal place for academic writing on all issues relating specifically to wilderness and wildland across Britain and Europe.

The idea for both the institute and the journal have been a long time in gestation, but we believe the time is now right for this development, with interest in all things wild increasing among scientists, politicians and conservation professionals as well as the general public. Despite its age, the quote from Thoreau above serves to underline the significance of the wilderness theme and its relevance to the key questions of our time, including climate change, population growth, ecosystem services and environmental degradation. The topic is highly interdisciplinary, cutting as it does across the whole spectrum of academic fields from anthropology to zoology, as well as integrating both the arts and sciences with practical disciplines and popular culture. In many ways it is difficult to think of a field of academic endeavour that cannot claim some level of interest in our wilder places.

The editorial board welcomes all papers, whether reporting scientific research or debating current trends and opportunities within the field of wilderness and wildland. Opinion pieces are also sought. Papers covering the ecological, environmental, social and cultural implications of wildland and rewilding are particularly welcome.

These are exciting times for wildland research and many challenges and threats lie ahead. *Wilder Horizons* aims to help develop the scientific evidence base behind wilderness and wildland and inform and shape the ongoing debate. I hope you are able to join us in this journey and make this new journal a successful one.

Steve Carver, Director, Wildland Research Institute, 7th October 2009, on a plane somewhere over the Urals

Struggles for existence

Charles Darwin, 1809-1882

In this 200th year after the birth of Charles Darwin, we commemorate his book published 50 years later in which he unveiled the theory of natural selection. I believe the chapter before natural selection deserves some greater prominence since it takes us on a journey through the checks and relations between species that he called the 'struggles for existence', be it the limits or competition for food, the vagaries of reproduction, or falling prey to other species. This is the timescale of survival, a more immediate concern for wild nature than the much longer term of the evolutionary development of species.

Darwin was a constant and assiduous observer of the dynamism of wild nature, especially so when he stayed with his uncle, Josiah Wedgewood, on his estate in Staffordshire. There, in what has extraordinary contemporary resonance, he noted how the native species on 'a large and extremely barren heath' were markedly altered by the planting of Scots pines, resulting in what he approvingly observed as a greater range of plants, insects and birds:

"Here we see how potent has been the effect of the introduction of a single tree, nothing whatever else having been done, with the exception that the land had been enclosed, so that cattle could not enter"

Darwin made further observations on the extensive heaths near Farnham in Surrey where he saw the effects of cattle grazing in holding back the development of self-sown Scots Pine. By counting growth rings, Darwin found that some of the small trees were up to 26 years old, but had yet to grow above the heather that surrounded them. This early description of the phenomenon of infantilised trees was matched by his observation that they quickly grew away when the herbivore pressure was released as heathland was enclosed.

Darwin goes on to imagine in that chapter the challenge faced by a species being trans-located to new environments, and how its survival may be assisted by our intervention in giving it some advantage over the different set of competitors or enemies that it would face. He is however cautious about our abilities, and whether we should be so presumptuous:

"Probably in no single instance should we know what to do, so as to succeed. It will convince us of our ignorance on the mutual relations of all organic beings; a conviction as necessary, as it seems to be difficult to acquire. All that we can do, is to keep steadily in mind that each organic being is striving to increase at a geometrical ratio; that each at some period of its life, during some season of the year, during each generation or at intervals, has to struggle for life, and to suffer great destruction"

The species dependencies and the role of predation that Darwin explored in that chapter on the struggle for existence have many a contemporary context. Today, he would realise that the enclosure fencing would be the equivalent of re-introducing some uncertainty and fear in the landscape, perhaps with a top predator such as the wolf. He would also recognise that his reluctance to intervene in natural processes aligns him with enthusiasts for wildland, who have a greater faith in wild nature regulating more effectively its own ecological function.

This first issue of *Wilder Horizons* sets out to explore that greater faith, as it does the enthusiasm for wildland and the barriers to an increasing presence of it in Britain. Contributors were invited from amongst those who have something positive to say, who have a strong message and a measure of foresight. The journal issue thus sets out to place a marker for a more optimistic attitude

towards wildland in the face of what can sometimes seem a subjective antagonism towards it.

Part of the problem is the varying understanding of what wildland means, as is the case with the word natural. Ultimately though, the natural world does not operate by semantics, and it is the associations and processes, and the inspiration it provides, that better define wildland, and which are explored in these articles. There has been no collusion between the authors, and thus if it seems there are recurring themes, then these are the vital characteristics that attend and attest to wildness.

Philip Ashmole makes a distinction for us between conservation and ecological restoration, using the backdrop of the rewilding of a valley in the Borders through re-instating native woodland on a large scale. Michael Jeeves asks us to consider whether we are the greatest threat to wildland in that our system of nature conservation, and the antagonism of land owners and land managers, leaves little room for its presence. Neil Fitzmaurice has watched the wildness draining away as the conservation industry moved in on his local, publicly owned moor, untouched for 70 years except by the native red deer population. He makes a plea for unmanaged, wild places as a sanctuary for both the human spirit and for wild nature.

Mike Townsend sees that human progress has been bad news for biodiversity and the world's ecosystems. He dismisses that the threats facing a future wild nature can be resolved with technical fixes, or more of the same but on a larger scale. Mike believes that the remedy is nothing less than a paradigm shift in our attitude to nature and our relationship with it.

Wildness is not just about land when the largest, connected ecosystem on our planet is the oceans and seas. Mick Green challenges us about our exploitative use of the seas around our coasts, and argues for an approach to marine conservation that limits our activities, rather than the interventionist management approach of terrestrial conservation.

I asked Alan Watson Featherstone if he would write a view from the future of what he believes could be the result of a positive approach to wildland in Scotland. Using foresight is a way to overcome the caveats - and the cavilling - that often holds back constructive discussion. Alan's article brilliantly enters into that spirit, describing the wildland scene in Scotland in 2054, and looking back over the years at the changes and events that led to this better prospect for wildland.

I walk the wilderness of other continents, observing the self-willed nature of these landscapes, and see animals and plants that are no longer extant or are now scarce in the land of my birth. I note that it is the protected area systems of these other countries that enable them to retain these wilderness areas, and I contrast them with our system of nature conservation. There I run foul of the British opinion that says that these other countries have no lessons for our landscapes. I argue in my article that the new research coming out from these countries doesn't substantiate that opinion.

Rob Pheasant is an acoustician with a keen interest in landscape characteristics and their potential for tranquil space. The right audio-visual stimuli are key to restorative environments, and Rob's research that he briefly describes here is identifying the important component parts of these two modalities. Rob sees our reaction to these stimuli today very much in the same way that our hunter-gatherer ancestors reacted to the visual and auditory cues in the wilderness around them, and used in their various schema for survival.

The last two articles give us a perspective from outside our shores. Adrian Manning, now based in Australia, made proposals about the dynamics of ecological restoration of the Highlands in a recent journal article. Adrian has 'looked back' into Britain for his article here, laying out a clear understanding and agenda for rewilding, and supporting the need for the Wildland Research Institute in gathering the ecological evidence base that rewilding works.

There has been much activity on wildland policy in continental Europe this year, with the EU resolution on wilderness and the subsequent conference on wilderness and large natural habitat areas. Zoltán Kun was the co-ordinator for that conference, and he gives us an overview of the continental European scene. Zoltán is also Executive Director of the PAN Parks Foundation, and he describes how the PAN Parks system of protected areas combines wilderness protection with a tourism where people appreciate the pleasures offered by wilderness and treat it with the respect it deserves.

Future issues of the journal will retain an element of these articles that are a personal or organisational perspective. The Wildland Research Institute will be reporting on its own activities in the journal, and there will be space given over to other research reports as well as articles on proposals and polices for wildland.

Darwin, C. 1859. Chapter 3: Struggle for existence, On the origin of species, John Murray, London

Dr Mark Fisher, Editor, October 2009

Let the chips fall! But be aware of likely consequences

Philip Ashmole, Co-ordinator, Carrifran Wildwood project of Borders Forest Trust

The comments that follow are not a scientific analysis, but simply reflections on the decade that has passed since the start of our Wildwood project, for which we used the strapline 'Ecological restoration in the Southern Uplands of Scotland'.

My interpretation of the idiom "Let the chips fall where they may" is expressed neatly in one of the definitions that come up on the web. It is "not to worry about the effects of your actions". This seems to sum up a key feature of ecological restoration (rewilding) as opposed to conservation.

Conservation is essentially about management, acting to promote the welfare of one or more species or habitats that are deemed to be threatened.

Ecological restoration, in contrast, aims to re-establish an ecosystem, or at least a specific habitat, in approximately the form that it was in before massive human intervention, and then gradually to withdraw management and let natural processes determine the outcome.

In the latter case, one reasonable qualifier is that in an era of anthropogenic climate change it may in some cases be apparent that under current conditions (or those likely to develop in the near future) the ecosystem of the past will no longer flourish in exactly its pristine form. There may then be a case for some modification, such as addition of a few species suited to warmer conditions.

Rowan among the 450,000 trees established in Carrifran

In any case, it is important to be clear-sighted about the likely consequences of ecological restoration. Modern anthropogenic habitats often have low biodiversity, but the species present may be abundant and attractive. Restored habitats, though more nearly natural, may lack some of the species that we have come to expect and to appreciate.

At Carrifran Wildwood we are now ten years into a programme of ecological restoration that aims to re-create an ecosystem that underwent catastrophic modification by human agency many centuries ago (Ashmole & Ashmole 2009). Some six square kilometres of denuded sheepwalk will be gradually transformed into a diverse broadleaf forest. Open areas will persist, both on the most exposed summits (750-820m asl) and in some places where Scottish Natural Heritage did not allow us to plant trees (Carrifran is both an SSSI and SAC). Even in the latter places, however, the sward is becoming denser and changing in composition.

Modern anthropogenic habitats often have low biodiversity, but the species present may be abundant and attractive. Restored habitats, though more nearly natural, may lack some of the species that we have come to expect and to appreciate

One of our volunteers recently commented that the foodplant for orange tip butterflies was declining at Carrifran because of changes in the vegetation, and suggested that we should do some strimming to mimic a grazing regime. We probably won't go down the route of micromanagement for orange tips since we are committed to letting nature take over. However, the matter is complicated because we lack the full complement of originally native herbivores (as well as carnivores) and are anyhow intervening at present by culling roe deer to allow our half million rather even-aged and vulnerable saplings to get established.

By coincidence, another example of the complex effects of 'rewilding' has been in our minds recently. One afternoon in early September my wife and I spent a wonderful half hour watching otters mating in the large pond in our garden near Peebles (where we have built an artificial holt). But in the previous week we had seen an otter in the same pond make a hunting dash at the only moorhen that has been there this summer. The moorhen escaped that time, but no young were raised on the pond this year, probably because of the otters (which we have seen hunting moorhen chicks in the past). So getting the otters back in our catchment has a downside, although it is a step towards a more natural situation.

Local ornithologists have noted that black-headed gull colonies in wetlands and coot numbers on some lakes are also declining in the Scottish Borders, and otter predation is suspected as the cause. Since otters were probably top aquatic predators even in prehistoric times, their current density may well be approximately the natural one. Waterbirds may therefore have suffered much higher predation rates than we have come to expect. Presumably their populations survived because wetland habitats were far more extensive and complex than they are now. This reminds us of a planning regulation in force in some states in the USA, specifying that if a new pond is to be made, it must not be made in existing wetland, since it would then reduce the area of that valuable habitat. Now that beavers are back in Scotland we can hope that complex wetlands will be re-created, allowing coexistence of otters and waterbirds.

Restored populations of raptors in Scotland are probably having effects analogous to those caused by otters, and it is also becoming apparent that interactions among raptor

ISSN xxxx-xxxx

species – rarely seen while populations were grossly depressed – are a major feature of natural avian communities. Kestrels seem to have declined as buzzards have become abundant, and there have been observations of what seems to be murder of golden eagles by sea eagles.

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The lack of large predators in so many of our surviving ecosystems has rendered it difficult to gain understanding of the functioning of more natural ones. John Terborgh and his colleagues (2006), who studied newly created islands in a Venezuelan valley flooded by a new reservoir, gained evidence to support the suspicion – long held by some ecologists – that many terrestrial habitats have luxuriant plant cover only because herbivores are kept in check by predators. Aldo Leopold (1948) had reached this conclusion – though less rigorously – long ago when he wrote:

> *Since then I have lived to see state after state extirpate its wolves. I have watched the face of many a newly wolfless mountain, and seen the south-facing slopes wrinkle with a maze of new deer trails. I have seen every edible bush and seedling browsed, first to anaemic desuetude, and then to death. I have seen every edible tree defoliated to the height of a saddlehorn. Such a mountain looks as if someone had given God a new pruning shears, and forbidden Him all other exercise. In the end the starved bones of the hoped-for deer herd, dead of its own too-much, bleach with the bones of the dead sage, or molder under the high-lined junipers.*

Let us hope, therefore, that in the long run we may be able to restore at least some of our large terrestrial predators. When we do, we must not be surprised if some species suffer under their impact. In the meantime, if we are to see the rest of our restored ecosystems function in a nearly normal manner, we may need to use guns to mimic the actions of the missing carnivores,

Ashmole, M. J. & Ashmole, N. P. 2009. The Carrifran Wildwood Story: Ecological restoration from the grass roots. Borders Forest Trust, Jedburgh.

Leopold, A. 1948. A Sand County Almanac, and Sketches here and there. Oxford University Press.

Terborgh, J., Feeley, K. Silman, M., Nuñez, P., & Balukjian, B. 2006. Vegetation dynamics of predator-free land-bridge islands. Journal of Ecology 94, 253–263

Are human attitudes a threat to wildland?

Michael Jeeves, wildland enthusiast

The pasque-flower (*Pulsatilla vulgaris*) is one of the most beautiful and iconic of British wild flowers. Its purple blooms appear around Easter and adorn a few special places, but where it occurs the turf can be studded by large numbers of flowers. These are generally small and are on short stalks, competing with a multitude of other plants for space, water and nutrients, and all having to cope with grazing animals and human visitors too.

Pasque flower – photo David Castor

On my rockery, however, there is a large pasque-flower plant, also *Pulsatilla vulgaris*, I obtained from a garden centre about 25 years ago. I tend it carefully, preventing competition from other plants so that every year it delivers lots of large, magnificent flowers. It is much more impressive to look at than the wild pasque-flowers, but it is not *wild* and it is not in a *natural* place, depending on how those difficult words are defined. After all, humans are part of nature too, so our actions can be considered to be *natural.*

But what should be done if the population of a rare plant such as the pasque-flower falls into decline? Should it be left to compete with other plants and animals, unaided by humans, or should it be given a helping hand to ensure its future? And how much help is acceptable? Attitudes to these questions have, perhaps, hardened into more of an interventionist approach in recent years, fuelled by the growth of interest in nature conservation and the desire to succeed and obtain value for money. It is difficult to watch a species become extinct in a particular location, but losses in nature are inevitable. If we tend a wild plant so that it does not die, perhaps by putting cages around it to stop rabbits (*Oryctolagus cuniculus*) eating it, will it still be *wild* and is that the right action to take (Marren 2005)?

Similarly, if a grassland Site of Special Scientific Interest (SSSI) falls into decline, until many of its special plants have been lost, should we try to re-introduce them by, for example, spreading green hay? Will any plants that return by this method be wild or is this just another form of gardening? This procedure may not succeed anyway, but if it is not tried, many SSSIs will surely remain species-poor and perhaps be unworthy of their designation.

It is therefore unsurprising that people manipulate nature to achieve the results that they want to see, despite the fact that naturalness has hitherto been considered an important criterion in evaluating SSSIs, but where does this leave the 'hands-off' 'rewilding' approach? After all, SSSIs and other designated areas such as Special Areas of Conservation and Special Protection Areas are scattered throughout Britain and if human control is to be used to deliver pre-determined objectives, where will there be room for the wild? This apparent conflict has already raised concerns in the European Union and even outside of designated sites there are other obstacles to the wild, such as flood risk managers frowning upon trees in floodplains and hostility towards predators from many landowners.

SSSIs and other designated areas such as SACs and SPAs are scattered throughout Britain and if human control is to be used to deliver pre-determined objectives, where will there be room for the wild?

Landowners are not the only ones who have strong concerns about predators, however. Despite ecologists' claims that predators are an essential component of any ecosystem (e.g. Dennis 1995), even some conservationists and wildlife enthusiasts dislike them, controlling numbers on nature reserves so that they do not interfere with objectives to, for example, produce as many lapwing (*Vanellus vanellus*) young as possible. A proposed re-introduction of the white-tailed eagle (*Haliaeetus albicilla*) into England has run into trouble because of opposition from various quarters, prompting one author to suggest that there are two differing visions of the future of the countryside. One is a safe and conservative model, the other accepts a degree of danger and inconvenience (Mabey 2009).

Of course, as a nation of gardeners, in a densely populated land dominated by farming, it is not surprising that the British people like to be in control and think that nature can be improved upon. A few years ago, when the campaign to reduce the use of peat in gardening was getting underway, one unconvinced gardener was taken up to the Flow Country in Caithness, to see the vast, wild peatlands there, being threatened by peat digging. To the surprise of some, he proclaimed on looking over the peatlands that he liked his garden much more and that the peatlands failed to impress him.

At the root of some of these conflicts are differing interpretations of the words *wild* and *natural*, and therefore *wilderness* and *wildland* too

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ISSN xxxx-xxxx

wilderness and *wildland* too. Some people argue that humans are part of nature and therefore everything we do is natural, so the idea of wilderness or wildland has no value. But they are playing with words, because while humans are certainly part of nature, that word can also be used to mean 'other than human'. The idea of wilderness *does* have value (Keeling 2008).

The spiritual value of wildland has been beautifully described by Stegner (1969) and others, but its contribution to biodiversity conservation perhaps requires further investigation. Similarly, people's attitudes towards wildland and predators is also in need of more exploration and understanding if we are ever to have more than a handful of wildland projects in Britain, and all away from designated areas.

Dennis, R. 1995 Scotland's Native Forest – Return of the Wild. ECOS 16 (2): 17-21
Keeling, P. 2008. Does the Idea of Wilderness Need a Defence? Environmental Values 17: 505-519
Mabey, R. (2009) A Brush with Nature. BBC Wildlife. June 2009 p24
Marren, P. 2005. Comment – Caged Flowers. British Wildlife 17: 33-41
Stegner, W. (1969) Wilderness Letter *in* The Sound of Mountain Water Penguin Books

Michael Jeeves is Head of Conservation with the Leicestershire and Rutland Wildlife Trust and a wildland enthusiast. The views expressed here are his own.

Nothing Without Conservation?

Neil Fitzmaurice, Friends of Blacka Moor

We started the Friends of Blacka Moor group informally in 2005 after the Council decided to lease our favourite walking area to a wildlife trust. We were alarmed by plans to change the covenant on the land to allow for it to become managed as a nature reserve, with plans for the erection of barbed wire fencing, cattle grazing and a blitz on trees. Despite a lengthy consultation, protests and a petition, these plans have gone ahead largely unaltered

Now the local Parks and Countryside Department has been classifying and categorizing all its green spaces in preparation for the unveiling of a new Green Spaces Strategy intended to facilitate efficient delivery of new quality management standards. It's a fair bet that one category of green space I would like to see will not figure in this review.

We need places like this to help us to regain a little sanity. They would be natural refuges which are part of nobody's programme of management

I've had a vague pipedream on and off for many years which amounts to this: close to all major population centres should be large natural spaces where the land is hardly managed at all. The main criteria would be simply a sense of natural tranquillity as far as that can be managed in today's world, and the absence of any other agenda. Good access points should be the responsibility of the local authority as should an attractive green corridor approaching the site and perhaps one good PRoW or bridleway going through. Apart from that people can make their own footpaths. Obviously the law of the land would have to apply and open access would not imply a right to turn it into a motorized race track.

With the dominance of the nature conservation organizations and their 'scientific' designations it's hard for any other approach like this to get a look in. I would like to have access to countryside areas where managers take a back seat, where natural beauty and peaceful atmosphere is protected not just from development but also from exploitation for economic purposes and from special interest groups including conservation professionals. In fact the absence of bureaucratic involvement would be crucial although possibly hardest to achieve. We need places like this to help us to regain a little sanity. They would be natural refuges which are part of nobody's programme of management; we are comparable to the stressed out urban priests withdrawing temporarily to a spiritual retreat.

What kind of refuge?

My thought was always that certain places should simply exist in their own right, dancing to nobody's tune. These should be places that are wilder than other more managed green spaces. It really should not be that difficult. The problem is that the numerous candidates for such places have mostly been appropriated by more and more conservation designations administered bureaucratically and driven by increasingly professional and vocal pleaders for their sectional interests. The natural tranquillity lobby, if there ever got to be one, would hardly be noted for shouting loudest.

Yet for many years at Blacka Moor we had just such an oasis. There had been a previous history as a grouse moor and the joy here was that the woodland vegetation springing up was fighting back from the controlling forces that had held it down, like the cultural explosion that sometimes follows the fall of a dictatorship. Walking on a grouse moor can be one of the more dull and predictable outdoor experiences and if there is no rocky outcrop, water feature or distant view to give visual satisfaction you can find yourself counting the sheep droppings. But on Blacka the managers for many years were absent, sleeping or emasculated by lack of resources.

Blacka's delights could be put down to its wilder character. Intervention had been restricted to providing decent access. We have rowan and hawthorn flowering and fruiting in abundance with warblers and cuckoos singing while the neighbouring, sheep-grazed moor is dominated by managed heather. Here banks are covered with profusions of bilberry, crowberry and bracken where each year local people pull aside the bracken in July to reveal the harvest of fruit underneath. Sprouting up in the leggy heather is birch, pine, holly, oak and thorn with alders in the damp places along the streams. Badgers foxes and hares are the regular larger mammals and more lately increasing numbers of red deer feel at home in a place where economic activity had receded. The sightings of these have at times been spectacular as the trees give them a sense of security not felt on the bare moors.

Bilberry on Blacka Moor

How can we get more places like this?

Selected areas of moorland would be a good place to start especially where publicly owned. First requirements would be the removal of farm livestock and all management plans designed to artificially control habitats to attract certain species. From there would come a declaration that peace and tranquillity and natural forces are paramount. There's probably an optimum size for such a space and it helps if the nearby green areas are at least natural in feel.

The more managed and classified a place is the more it loses of this sense of a separate identity

Two acres in the middle of an industrial estate is unlikely to fit the bill. Having said that as a child my own small bedroom had a window from which I could see (and often hear) Europe's largest car factory. Despite this my early and middle childhood was spent exploring our favourite secret and natural places each with its own special atmosphere. Across a nearby field was a wood unmanaged in the recent past. Then there were the newt ponds and, best of all, the 'island' that stood proud in the middle of the field with sunken areas where dens could be made under the tall willow herb. The last of these did not survive long and was deeply mourned after one day the farmer arrived with a bulldozer. In my later childhood the others succumbed to the post-war council housing boom. But the memory lives on as having had access to places that still resonate in the imagination. So maybe smaller places can work, for children at least.

Red deer on Blacka Moor, October 2008

The childhood experience helps us identify what is important. The appeal lies partly in food for the imagination. It is best when you sense the place has a secret life of its own; for example, the hours of darkness dominate for much of the year and that is when much wildlife is most active. Even in summer daylight one part of Blacka becomes all but inaccessible when bracken and other rampant growth discourages visitors. A few mornings ago at 7am a series of fortissimo bellows came up from that part of the site (a reminder that the rutting season is here). I can remember often opening my childhood bedroom window at night and looking towards the shadow of the old oak climbing tree listening for a tawny owl. The more managed and classified a place is the more it loses of this sense of a separate identity.

Should any intervention be considered in these imaginary idyllic places?

Human action in just visiting makes changes to a place. On Blacka, during the years before the conservation industry moved in, informal paths were made and beautiful they could be, quite different underfoot from those used by farm animals. The tree roots across the paths, the steady pressure over time of feet on dead and dried bracken and the way that grass responds to boot traffic make a unique surface to walk on; each path has its own subtle character. The appeal of this can be lost in a day when a herd of conservation cattle marches through, obediently following the requirements of a management plan.

But what about views?

The succession to woodland can't be denied and don't people like 'openness'? I'm not averse to human impact here and those who wish to keep some open spaces among the trees to enhance the appeal, assuming there are no deer or other wildlife doing it for them should not be prevented from pulling up saplings. This could be the responsibility of volunteers from a local Friends Group. I am adamant that this must not be planned by a remote and deskbound bureaucracy after consulting with numerous other statutory offices, all peopled by those who never previously experienced, valued or even visited the site, and then inserted into the work programme of a management plan, following which funds have to be secured from another bureaucracy, to be implemented by contractors who have similarly never been there before with plant and machinery alien to the character of the place.

This is no travesty. Blacka is now managed by a wildlife trust with headquarters seven miles away. They are indisputably a bureaucracy as are the City Council who are trustees of the land and part fund the trust, and Natural England who tell them what to do, and there are supporting parts played by other agencies such as DEFRA, Rural Payments Agency, and HLF while The Charity Commission agonises about whether conservation can be compatible with the recreational elements in the charitable covenant on the land. How on earth did the place survive for 75 years without all this desk work?

The management begins

The local Natural England officer, walking over Blacka recently, told a friend that "Blacka is nothing without conservation". We experienced an alarming vision of 450 acres suddenly etherizing after a future government slashes spending on quangos. Perhaps she meant conservationists? Well, perhaps there is a role for such people whose very reason for existing is the control they exert over our landscapes? After all they are the ones who know just how far their tentacles have spread.

Living in the wild

Mike Townsend

In the Anthropocene

Maybe every generation feels it is living in momentous times. Frequently circumstances turn out to not have been as calamitous or exciting as was expected. Nonetheless there is plenty to suggest that this is an unusual period. In fact this has been described as an epoch making period (Lewis, 2009); a new era of Earth history like that when the dinosaurs disappeared, or during periods of great glaciations. Some have called it the 'Anthropocene' era – the era of humankind.

A feature of this new era, if that's what it proves to be, is that the forces of nature to be reckoned with have been summoned, at least in part, by events of our own making. All this is now becoming a familiar litany; climate change, species extinction, resources exploitation, and the rest, although with each new projection of change the picture painted seems more desperate.

These views are not unchallenged. Some believe anthropogenic climate change is less of a problem than is being portrayed or is taking a different path to that widely suggested (Taylor, 2009). Indeed the next couple of decades may cool as a result of natural underlying climate cycles (Pearce, 2009). Equally the path of population growth may confound predictions. However none of this detracts from the uncertainty these issues create, nor does it support a view that the way in which we have treated the Earth can reasonably be described as sustainable.

It is self-evidently true that we affect the world we live in, we shape elements of it for our purpose and we take from it for our needs. But it's not necessary that we determine every end or that it conforms to the bureaucratic metrics of rigid classification

In seeing ourselves as separate from nature, and more particularly in control, we have succumbed to a deceitful arrogance. Clinging to an unquestioning faith in progress and the discovery of natural laws to give us dominion, we have lately discovered the world is more complex. This may be the opportunity to grasp that realisation to construct a new understanding of our relationship with the world around us.

Beyond nature reserves

Human progress has been bad news for biodiversity and the world's ecosystems. Certainly some things have faired better than others, but despite the good intentions of nature conservation[+] our efforts can hardly be said to constitute unqualified success. Traditional nature conservation built on the establishment of representative nature reserves in which wildlife might be insulated from the outside world was probably never realistic. It was founded on the illusion of species and ecological communities in a static and unchanging world.

In recent years the concept of 'landscape scale' conservation has suggested a move beyond nature reserves and prescriptive outcomes for biodiversity. But there remains an enduring reluctance to embrace a fundamental shift. Conversations seem appended with the plea…'but not at the expense of designated areas, nature reserves and ground hard fought' - but also not as a way of clinging to or resuscitating the old paradigm.

Landscape scale conservation is not simply about big nature reserves. Biotic diversity requires that the processes that support evolution and adaptation be allowed as free a measure as possible (Mace et al., 1998). This is true everywhere; in places we might regard as truly wild, but also in the places where we live, in towns and cities, on farms and in production forests. Landscape scale conservation is about a different way of thinking, not a bigger scale of doing.

The policies, institutional arrangements and models developed for an era when climate change was not the dominant discourse, no longer match the actions now needed. And it is not whether or not one accepts the path of climate change as predicted, simply that the discourse has created an opportunity to recognise and communicate complexity and uncertainty. That recognition should foment a paradigm shift[++], not a segueing from small nature reserves to bigger, but a revolution in the way we think about the world in which we live.

It feels like we are on a cusp. We must stop thinking about nature conservation as one thing and everything else as something disconnected and different. We are not going to serve evolutionary adaptation and biodiversity by stubbornly retaining a focus on site centred technical solutions to problems that arise as a result of wider factors. We must fundamentally change the basis on which we formulate conservation action. In our age of enlightenment and reasoning, of scientific rationality and evidence based action, we have become mesmerised by the need to know everything before doing anything.

We must accept uncertainty and temper the notion that we can identify casual relationships and prescriptive interventions for deterministic ends. The idea of managing nature to provide services or meet specific (usually subjective) outcomes through tightly causal relationships betrays the lessons which should have been learnt.

Living in the wild

For me living in the wild is about everywhere. Richard Louv (2005) in his book, Last Child in the Woods, defines 'nature' as natural wildness: "biodiversity, abundance - related loose parts in a backyard or a rugged mountain

[+] Nature Conservation is taken to mean the protection, preservation, management, or restoration of wildlife and natural habitats

[++] Paradigm shift in this context refers to the seismic shift in perception and construction of understanding originally envisaged by Thomas Kuhn in *The Structure of Scientific Revolutions*, not the rather limp-wristed way in which it is frequently used

ridge. Most of all, nature is reflected in our capacity to wonder. Nasci. To be born". His definition rejects including everything as nature and natural, but also resists restricting it to virgin forest and wilderness.

It is self-evidently true that we affect the world we live in, we shape elements of it for our purpose and we take from it for our needs. But it's not necessary that we determine every end or that it conforms to the bureaucratic metrics of rigid classification. In the end, in any case, this is self deceit. Let us affect those things we can reasonably affect. Canute's folly should not be our own.

The United Nations Millennium Project describes 'environmental security' as …"the proactive minimization of anthropogenic threats to the functional integrity of the biosphere and thus to its interdependent human component (World Federation of UN Organisations); the self-evident truth that we need the Earth in good health. That can only be achieved by treading more lightly and allowing the processes which shape evolution and adaptation the space and freedom to operate. The space is both the wild lands of moor and mountain, but also the wild space within which we live; the freedom is the removal of the constraint of deterministic end points.

Nature is both a product of a conceptual understanding and physical reality; a mix of how we view our relationship with nature, how we value it and how we behave towards it. Let us have nature reserves and 'wilderness' areas where human influence is less than elsewhere, but not as a further unnecessary dialectic. If it is right in describing wilderness that nature should follow a more self-determined path then it is right elsewhere.

By displacing humankind from the dominant position in the ecosystem and accepting the limits of our knowledge and control we can begin to transform the character of obligations towards the natural world

By displacing humankind from the dominant position in the ecosystem and accepting the limits of our knowledge and control we can begin to transform the character of obligations towards the natural world (Smith, 1998). It is this which Aldo Leopold described when he called for a land ethic which would change the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it (Leopold, 1949).

It is both implausible and arrogant to believe we will destroy nature, but we are corrupting its course. Whilst science can help us in understanding the world around us it is insufficient; if human society is the cause of much of the loss of biodiversity and the rapidly changing climate, then understanding and transforming society must lie behind its resolution. Future nature is more than a technical prescription for the delivery of a prescribed action plan, and more than the satisfaction of consumer preferences; it will be shaped by our attitude to nature, our relationship with it, and an ethic which recognises the fulfilment of wider obligations.

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Mike Townsend is Senior Advisor – Conservation Team Leader for the Woodland Trust. The views expressed in this article are those of the author.

Wild Oceans – managing our own activities and not the sea

Mick Green, founder member of Friends of Cardigan Bay

The oceans are wild. Even my local bit of sea – Cardigan Bay, shallow and partially enclosed by land as it is – can be wild. There are many days when the bay is too wild to put to sea, when waves are actively eroding the cliffs and salt flies far inland.

We have damaged our oceans. We poisoned our oceans: tried to make its larger wildlife, such as whales, extinct; over-fished many species; made them more acid; and made massive changes to long lengths of shoreline, but they still feel wild. We haven't tamed them the way we have tamed much of our land. We haven't enclosed them, built in them to any large extent, and have only exploited certain aspects of them.

So with 40% of our wilder marine habitats designated under conservation regulations does that mean the wild life is safe? Unfortunately, not

They are though, under pressure – we are trying to exploit more and more aspects of them. From age old practices such as fishing, to hydrocarbon exploration and now newer forms of exploitation, such as renewable energy, we are looking more and more to our oceans as we over exploit our terrestrial resources.

Despite the fact that the increased pressures on our oceans have been recognised for some time, wildlife conservation in our oceans is behind terrestrial conservation. In the UK we have had a framework for protecting habitats and species since the 1949 National Parks and Access to the Countryside Act, which first brought in the concept that special areas should be protected. Whilst the Act stated that National Parks could be designated on land (and the definition included 'land that is covered by water'), and that it was our perceived wilder areas that were designed to be protected, nobody ever appears to have thought of designating marine parks. The 1981 Wildlife and the Countryside Act made the designation of Marine Nature Reserves possible. However, the Act was found to be so complex to implement that only two very small reserves – the sub sea parts of Skomer and Lundy Islands – were ever designated around Britain.

The coming of the European Birds Directive in 1979, and then the Habitats Directive in 1992, finally gave us the mechanism to designated protected areas at sea as 'Special Protection Areas' (SPA) or 'Special Areas of Conservation' (SAC). Designations though were slow coming. Few entirely marine SPA's were designated – in Welsh waters we only have Carmarthen Bay as a marine SPA, designated to protect wintering flocks of Common Scoter. We have fared better with SACs, with five designated around the Welsh waters – and when combined with the SPA, around 40% of Welsh territorial waters have been designated.

Offshore we have yet to designate any sites. Initially the Directives were not applied offshore (beyond the 12 miles of territorial waters). However, following a Court case brought by Greenpeace and the Whale and Dolphin Conservation Society, it was ruled that the Directive needs to be applied within all the waters of the UK's exclusive economic zone – up to 200 miles offshore. The government is currently consulting on offshore sites for SACs – once again the bird sites are yet to be looked at.

So with 40% of our wilder marine habitats designated under conservation regulations does that mean the wild life is safe? Unfortunately, not. This is due to a number of reasons.

Firstly, limitations stem from the original transposition of the Habitats Directive into UK law. This was done by means of regulations and not primary legislation. For terrestrial sites there was already an existing method of legal site protection – the SSSI – and this was used as the main basis to protect terrestrial SACs. At sea, no such mechanism existed, and still does not. Instead, the regulations proposed that "any authority having functions relevant to marine conservation shall exercise those functions so as to secure compliance with the requirements of the Habitats Directive". Basically, it is business as usual, but authorities must 'take account' of the habitats directive when making decisions. This has led to clumsy committees of 'Relevant Authorities' running the show. Whilst the Regulations place no one Authority in charge, in practice there has been a 'lead Authority' nominated in servicing the groups of relevant Authorities. These have been the under resourced local authorities in the Welsh SACs.

Bottlenose dolphin in Cardigan Bay

Secondly, developments have continued within the SACs, with the authorities apparently not treating them much differently from the wider seas. For example, in Cardigan Bay SAC – designated primarily for its population of bottlenose dolphins - licences have been granted since designation to a shellfish processing factory to discharge quantities of shell waste directly into the SAC in Newquay. In addition, the sea fisheries committee have granted licences for scallop dredging across the site. Scallop dredging is known to be highly destructive, and basically ploughs through the whole of the sea bed. However, the sea fisheries committee claimed that there was no direct evidence that destroying the seabed would adversely affect the dolphins! Perhaps not, but common sense says that destroying part of the habitat on which the dolphin depends is surely going to have an affect and should not be allowed on a precautionary basis. This is now the

subject of a complaint to Europe as it is clearly in breach of the Directive.

The final proof that SAC designation confers no additional protection in the marine environment came in January 2006. The Department of Trade and Industry (now the Department of Energy and Climate Change) announced the 24th offshore oil and gas licensing round, which made the whole of the UK section of the Irish Sea, including all the SACs, available to oil companies to prospect for hydrocarbons. Correspondence with the DTI confirms that they do not consider SACs at all special or meriting any different approach to the rest of the Irish Sea. Worryingly, the Countryside Council for Wales and the other relevant authorities did not even try to ask for them to be excluded from the licensing round.

The third problem is the approach to conservation in both the Directive and the way the UK has transposed it into domestic regulations. It is essentially a reductionist approach, based on the perceived wisdom that has developed over 50 years of terrestrial conservation. Within the wild area that is the oceans around our coast, certain 'sites' were chosen for designation. On land, such 'sites' follow existing boundaries in most cases, as most of our countryside is already divided up and enclosed. There are no obvious boundaries at sea, so seemingly random borders were chosen and lines drawn on maps. At sea it is impossible to see these boundaries. Also, the sites are designated for species or habitats that are listed within the Directive. For marine habitats and species,these lists were very limited, reflecting our lack of knowledge of the state of our marine areas. The sites are then required to be 'managed' to protect these features.

The Welsh SACs were originally designated for a single or limited number of features. For example, Cardigan Bay SAC was designated for its population of bottlenose dolphins and Pen Lleyn a Sarnau SAC was designated for habitat features, and draft management plans were drawn up accordingly. Before these could be implemented, a review of the SACs concluded that further features should be added – more or less any species or habitat listed in the Directive that was to be found in the SAC was added to the designation. This meant the management plans had to be re-written to take account of these new features, and these have only recently been completed.

Developing marine conservation should be an ideal opportunity to take a different approach to conservation – one in which wild nature is allowed and encouraged and we don't set targets of man-made outcomes. If we try and control the marine ecosystems we will fail – our knowledge base is too low and the seas are just too wild to be managed

The very concept of 'management' is a very anthropocentric and is a terrestrial approach. On land the perceived wisdom has been to manage our nature reserves – a species or habitat is chosen as good and the site managed by often serious intervention to maintain the site in a state decided by man – often this means fighting against nature to preserve, for example, open areas against the natural process of woodland development. I would argue that this is inappropriate for many of our larger and wilder sites on land. At sea it is completely inappropriate.

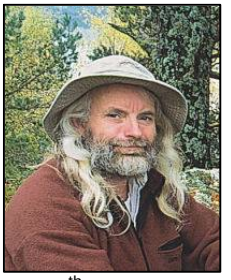
We cannot manage our marine environments – we can't send in the conservation corps to coppice the kelp beds! We cannot fence dolphins in to one area of sea. Recent research has shown that the 'resident' dolphins from Cardigan Bay range at least as far as the Anglesey coast of North Wales. We need a different approach to marine conservation. We need to manage our own activities – nature can manage itself.

The forthcoming marine bill presents a glimmer of hope – it proposes 'spatial planning' which may give us a better mechanism to plan our activities at sea. It also proposes an 'ecosystem based' approach which may be a way of taking into account all features of a marine ecosystem. However, it also gives us another layer of site designations and I fear this will be the main way the Act will be implemented.

Developing marine conservation should be an ideal opportunity to take a different approach to conservation – one in which wild nature is allowed and encouraged and we don't set targets of man-made outcomes. If we try and control the marine ecosystems we will fail – our knowledge base is too low and the seas are just too wild to be managed.

Mick Green is a Director of Ecology Matters

Scotland's forests – a possible view from 2054



Alan Watson Featherstone, Trees for Life

Looking back from the middle of the 21st century, it's hard to remember that at the turning of the new millennium, just over 50 years ago now, Scotland was still a mostly-deforested land, with few natural ecosystems that were self-sustaining and in good condition. At that time, sheep still outnumbered people (with over 6 million sheep and about 5 million people) and sitka spruce, a non-native conifer from the west coast of Canada, was the most numerous tree in the country, blanketing large swathes of the land in uniform plantations that greatly outnumbered the scattered remnants of the Caledonian Forest. Wildlife, especially in the form of large mammals, was noticeable mostly by its absence, although alien and weed species, ranging from grey squirrels to exotic rhododendrons and Japanese knotweed were abundant and spreading.

The awakening of environmental consciousness and concern about wildland (and the lack of it in Scotland) that had begun in the second half of the twentieth century was still relatively nascent then. Conservation groups, wilderness advocates and restoration practitioners were still a small minority of the population, and although they were beginning to be effective, the real results of their efforts, and the effects those would have on the country and culture as a whole, were not yet apparent.

The reintroduction of the European beaver in 2009 was undoubtedly a catalytic event that captured the imagination of many and represented a real breakthrough, as the first of the country's missing mammal species to be reinstated

This is not to diminish or disparage the work that had been done, because relatively small numbers of people had indeed achieved a lot, including the reintroduction of the sea eagle, and various projects to help restore some of the remnants of the Caledonian Forest. However, compared to the task that lay ahead, these promising results were small in scale, and, for the most part, quite localised.

It's important to remember too that conservationists then were working in a very different cultural context than we do today. At that time, the dominant world view and mind set of governments, companies, and indeed the general populace, was still very much fixated on the chimaera of unlimited economic growth, which was pursued unquestioningly by the vast majority of society, with little if any thought to the consequences for future generations, other species and natural ecosystems. It's hard for us now to understand how so many people, all over the world and in so many cultures, could have succumbed to the propaganda and brainwashing that was promulgated by governments, corporations, media and other institutions then, that enabled the impoverishment and depletion of the world's ecosystems and species to reach the extreme state that it did.

So how did we get from that sad and sorry position a mere 50 years or so ago, to where we are today? Looking back, it's hard (and perhaps slightly unfair) to pick out one or a few events, circumstances or people and organisations that contributed to what has become known as 'The Great Turning'. The roots of the change were in fact growing and gathering strength in many places, even in the late 20th century, but quietly and out of sight from the mainstream media and the mostly-negative world view that they reported on and helped to sustain.

The growing numbers of people visiting the Highlands in particular led to an increased awareness of the ecologically-depleted state of the landscape, and the plight of the Caledonian Forest and species such as the capercaillie and red squirrel. From the 1980s onwards a variety of mostly small scale forest restoration projects were initiated, by conservation groups, private landowners and government agencies. Special interest groups sprang up for all sorts of organisms, from moths and dragonflies to hedgehogs and badgers, and they began raising the profile of their chosen species and initiating projects to protect and restore their numbers.

This emergent environmental consciousness was paralleled by, and indeed contributed to, the reassertion of self-governance in Scotland, as symbolised by the establishment of the Scottish parliament in 1999. That in turn enabled crucial land reforms to take place, thereby beginning the reversal of the centuries-long process of disenfranchisement of the people from the land. As in other parts of the world where indigenous people had been forcibly removed from the land, the cultures (whether they be Aborigines in Australia, First Nations Peoples in Western Canada or crofters in the Highlands of Scotland) had gone into serious decline and suffered all the well-known problems of alcoholism, drug abuse, suicide and disease. Recognition that this had taken place in Scotland contributed to the movement to reclaim the land and return it to health and balance through the process of ecological restoration.

Caledonian pine forest

By the end of the first decade of this century, these initial steps were beginning to mesh together, creating a synergistic effect that would lead to a vast scaling up of the effort to return the land and species to health again.

The concern about global warming that preoccupied a lot of human concerns at the time also undoubtedly played a significant role in facilitating the change and making more resources available for forest restoration.

The reintroduction of the European beaver in 2009 was undoubtedly a catalytic event that captured the imagination of many and represented a real breakthrough, as the first of the country's missing mammal species to be reinstated. The success of that project clearly helped to pave the way for the reintroduction of the lynx in 2025, and indeed the reintroduction of the wolf in 2043, 300 years after the putative death of the last of the original wolf population, on the upper Findhorn River.

By the end of the second decade in this century, 30 years ago now, major changes in the Scottish landscape were becoming apparent. The native trees that had been planted from the 1980s onwards had reached the size where they were very visible, and indeed many of the schemes and projects had begun to connect up with each other by that time, so that in many areas the predominant experience when travelling through the country was that of there being large, interconnected tracts of natural forest again. This had been helped by the conversion in key of areas of former native woodland (the so-called PAWS areas) of many of the former commercial plantations of exotic conifers back to indigenous forest.

By about that time too, the process of forest restoration was becoming self-sustaining, in part due to the removal of sheep from many areas (due to the ending of the previous regime of perverse subsidies) and a targeted reduction of deer numbers, but also because the first generation of new native trees were entering their prime seed production years, resulting in many more naturally-occurring seedlings. Climate change also undoubtedly played a part, as the natural spread of forest at this time benefited from the longer summer growing seasons and milder winters. Another factor that is now also recognised as playing a key role was all the focused care and indeed love that was directed towards the land and its healing by restoration practitioners, hillwalkers and the general public. Just as gardeners with a 'green thumb' had long been known for their ability to facilitate more growth and better health in their plants and vegetables, so too did this begin to manifest on a larger level, as the cultural focus in Scotland swung away from economic growth and consumption towards the healing of the land and appreciation of all the life it sustains.

This is not to say that the last few decades have been without their challenges. Chief amongst those, from a forest point of view of course, has been the nadir, or low point, for ancient woodlands in Scotland that we are still in the midst of. Although we have more native woodland back in the country again than there has been for perhaps a thousand years, virtually all of that is less than 60 or 70 years old. The old trees and the 'granny pines' of the Caledonian Forest that inspired people in the late 20th century to initiate projects for the forest's restoration have now mostly died, and there are very few truly ancient trees remaining. This sad reality is of course unavoidable and a direct consequence of the virtually complete absence of any forest regeneration for a period of 200 years prior to the restoration initiatives of late 20th century. Even now, as we move ahead in the second half of the 21st century, it will still be another 100 years before we have a classic Caledonian Forest again, complete with a canopy of old trees. Until then, we will have to make do with the photographs and films of the last remnants that were taken before the old trees succumbed to the inevitable march of time.

Despite that lack of ancient forest, which of course is a global phenomenon now (and will take much longer to rectify for longer-lived trees species such as the redwoods), there is so much to celebrate and appreciate in Scotland today, compared to 50 years ago.

The expansion of native forests, and their reconnection into larger contiguous tracts, enabled the populations of many species to recover

Native woodland does now cover most of the land again, and the bryophyte-rich temperate rainforests of the west coast have recovered much of their former range and have been recognised for their international significance. The pinewoods of the Caledonian Forest are much expanded too, and most of the formerly isolated remnants have been reconnected with corridors of new woodland. Broadleaved woodland has expanded too in other parts of the country, and the newly-re-established forests of Orkney and Lewis have become justifiably famous as examples of restoration in difficult climatic and ecological circumstances: indeed they are helping to inform and inspire similar projects in areas as far afield as Tierra del Fuego, New Caledonia and Madagascar.

Twinflower (Linnaea borealis)

One of the major differences of course, and one which would most surprise someone from 20th century Scotland who travelled forward in time to the present day, is the abundance of wildlife and formerly rare species now. The expansion of native forests, and their reconnection into larger contiguous tracts, enabled the populations of many species to recover. Pine martens, red squirrel and capercaillie are a few of the better known ones, but the natural spread of species such as twinflower, various types of tooth fungi, wood ants and the Scottish crossbill to their present level of abundance and health was unplanned, unexpected and surprisingly rapid. What would previous generations make too of the still-unexplained appearance in our woods today of the calypso orchid and various forest-dependent lichen species known previously from Scandinavia but not Scotland? Arguments still rage about whether those species previously occurred here,

and were lost during the deforestation era only to recolonise naturally when there was enough habitat for them, or whether they were the result of clandestine reintroductions.

It's a similar situation to that with the wild boar, which are familiar residents of our forests today. By the time an 'official' reintroduction took place in 2016 it is believed there were already wild populations existing from both escaped farm animals and deliberately but secretively released ones. The truth about the situation will probably now never be known, but what's important is the wild boar has become successfully re-established as part of our native fauna, along with the European beaver, lynx and, most recently, the wolf.

In another 50 years time, people then will hopefully be able to write about the successful return of bears, but for time being that remains, like the return of true ancient forests with old trees in Scotland, another dream to look forward to.

Ecological incompleteness and our missing top predators: learning the lessons from abroad

Mark Fisher, Self-willed land

"In the absence of mega-herbivores, migratory ungulates, and top predators, ecology will by default become the science of human artefacts"
Terborgh (2005)

John Terborgh sets us a considerable obstacle if we are to appreciate what a truly wild world would be. He has, however, made a significant contribution to our understanding when his comparative studies in Venezuela on the influence of predators on landscape vegetation lent considerable support to the top-down control of the Green World Hypothesis – that predators limit the influence of herbivores, allowing vegetation to flourish (Hairston et al., 1960). It was the fortunate set of circumstances, the inundation of a section of the Caroní valley for a hydro-electric scheme that brought forth a group of predator free islands, and which provided the experimental model that gave evidence of a trophic cascade. The subsequent paper in *Science* boldly declared an "ecological meltdown" resulting from the unregulated activity of herbivores (Terborgh et al., 2001).

The *dramatis personae* of Terborgh's research are exotic by the standards of our temperate and generally depauperate landscapes. His research talks of howler monkeys, iguanas and leaf-cutter ants as the primary herbivores; and with armadillos, harpy eagle, jaguar, puma and ocelot as the predators missing from the small islands. The meltdown so brutally described was the demise of the semi-deciduous, dry tropical forest into a barren ground of leafless trees, red earth brought up by the excavations of the ants, and all smothered by a defensive thorny scrub that is choked by lianas (Terborgh et al., 2006)

In Britain, that meltdown could seem to some to be the default state, living as we do within the confines of the poor hand we have dealt ourselves over the millennia, and which offers little of the ecological richness that Terborgh enjoyed in his control areas in the Bolivar State, of a more complete and natural landscape. This massive "shifting baseline syndrome" (Pauley, 1995) that we have perpetrated on ourselves is exemplified throughout our cultural history and in our conservation philosophy.

Thus Alex Watt (1947) in his influential studies of the last century on natural and cyclical disturbances implicated in gap and patch dynamics, located his early research on the rabbit infested, sandy heathland landscape of Lakenheath Warren in the Brecklands. In reality, Watt was observing the vegetational processes that were happening within a matrix of artificially created disturbance. The natural effects of wind and drought were overlaid on this, but the ecology that he studied was that which happens between and around our interventions. What would have been the control site to this?

In addition, contemporary British nature conservation majors on grazing as a cheap management tool (Natural England, 2005), but sells it on the attraction of rare livestock breeds, sometimes even inferring their presence somehow lends an atmosphere of wildness. Should Natural England emblazon its reports and publications with pictures of cows and sheep? What's wrong with a genuine wild animal like a native deer? Don't we also know of that remote tourist destination that attracts the brochure phrase of "the last wilderness left in Britain"?

It's a common refrain that N. America has no lessons for the ecology of Britain. Even tentative explorations of wildness and wildland potential can be countered as being in thrall to "North American models and examples" and that "wildness is entirely subjective"

That there is an extant wildness in Britain is recognised only by its scarceness, or by its nuisance factor (deer, foxes). Two woodland geophytes of my interest, May Lily and Whorled Solomon's Seal, are better represented in the forests of N. America and continental Europe than the one or two sites where they cling on in Britain. I have seen the elusive pine marten, and the twinflower, in the Never Summer Wilderness of Colorado, but never here. I recognised the dwarf birch in the montane riparian corridors and willow flats up and down the Rocky Mountains, but will probably never find its cousin in its last upland redoubt in England. I stumbled over a bobcat near the Californian coast, but see only feral cats in the English uplands, the Eurasian lynx long gone and the wildcat confined now to the Highlands. And yet all of these should be my heritage, as should the wolves of Yellowstone National Park that brought me to my knees last year by the overwhelming emotional effect that they had on me.

It's a common refrain that N. America has no lessons for the ecology of Britain. Even tentative explorations of wildness and wildland potential can be countered as being in thrall to "North American models and examples" and that "wildness is entirely subjective" (Jarman, 2009). The dead hand at work here denies the biophysical and ecological reality of wildness as espoused by Terborgh, and fatally restricts us to an inherited incompleteness that reduces our horizons, doomed as we appear to be in accepting the consequences of that shifting baseline syndrome.

There are however robust parallels to be drawn from contemporary research in N. America and elsewhere. Over the last few years, Joel Berger's group working near the Teton Mountains in Wyoming established an effect on herbivore populations that had come about from indirect effects mediated by changes in meso-carnivore abundance and behaviour, rather than direct predation by a top carnivore (Berger et al., 2008).

Coyotes are held in poor regard in N. America, and this is amply matched in Britain by our vilification and persecution of the fox for its reputation of mischief and thievery

Berger had studied the survival rate of pronghorn antelope fawns in wolf-free and wolf-abundant sites in the Greater Yellowstone Ecosystem, and found a four-fold higher survival in areas used by wolves. It was already known that coyotes accounted for 97% of predation-related mortality of pronghorn fawns in the study areas, and thus the difference had to be due to the effects that wolves had on the coyote population. Sure enough, a negative correlation was found between coyote and wolf densities, the transient population of coyotes being much higher in the absence of wolves, with a least half of the mortality of the transient coyotes caused by wolves. Thus predation of coyotes, and instilling fear in them so that they relocate out of wolf territories, was evidence of both a density mediated and a behaviourally mediated trophic cascade. Berger noted that the high rates of coyote predation on pronghorn fawns in the absence of wolves, also supported the hypothesis of meso-predator release in the absence of a top predator (Crooks & Soulé, 1999).

Coyotes are held in poor regard in N. America, and this is amply matched in Britain by our vilification and persecution of the fox for its reputation of mischief and thievery. The estimate of 80,000 foxes shot and 30,000 snared each year (Baker & Harris, 1997), mostly in the interests of protecting ground nesting birds, shows the extent to which game keeping, and latterly nature conservation managers claim a right to control “accepted” predators. That the fox is considered the top predator in the UK is however evidence of the absence now of a natural predator, indicating that the foxes’ impact shares with the coyote the phenomenon of meso-predator release.

In continental Europe, lynx prey on red fox (Helldin et al., 2006, Jobin et al., 2000, Odden et al., 2006) and may also redistribute fox in the same way that wolves move on coyote. A study in boreal Sweden suggests that the lack of lynx over most of their former ranges may have resulted in a misbalance in the number of red foxes in many areas (Helldin et al., 2006). Allowing large carnivores such as the lynx to re-establish could thus be an effective natural way of limiting fox populations and their influence.

The potential of reintroducing lynx to British landscapes was given a legislative imperative under the European Union’s Habitats and Species Directive 92/43 when the surprisingly younger age of lynx bones from a cave near Inchnadamph in Sutherland (Kitchener & Bonsall, 1997) was confirmed by the dating of bones found in Moughton Fell Fissure Cave near Settle showing the lynx lived there in Roman times, between AD80 and AD320, and bones from Kinsey Cave near Giggleswick showed an animal that probably lived between AD425 and AD600 (Hetherington et al., 2006).

The younger dating of lynx bones indicated that its extinction was more likely to be from a human cause than what had been considered a climatic one arising from a catastrophic re-emergence of tundra and the retreat of woodland during the onset of a late colder period running from 11,000 to 10,000 years ago. The lynx as an ambush hunter, relies on the complexity of terrain afforded by woodland in the predation of roe deer, their main prey. Thus what does the much later survival of lynx than was previously thought, say for the landscape cover in the Craven Limestone Complex in Yorkshire where the bones were found, an area known to have been farmed extensively since at least 4000 years ago?

Scrubby limestone pavement, July 2007

Given that woodland clearance increasingly became the norm in Britain, it must be the case that lynx hung on after the Romans by a combination of the rocky topography of the Limestone Dales, and by creating their own localised scrubby woodland cover by instilling fear and thus moving on the herbivores that held woodland regeneration back (Fisher, 2009). The systematised monastic sheep grazing after the Norman Conquest considerably multiplied the herbivore pressure and undoubtedly bracketed the end of lynx in this limestone landscape.

That top predators have a profound influence on woodland regeneration has been shown by the studies of Oregon-based researchers Robert Beschta and William Ripple (2009), many of which are founded on observations in the Greater Yellowstone Ecosystem after wolves were reintroduced there in 1995. Willow species and aspen showed significant regeneration in riparian corridors along with the returning wolf population, the studies describing a spatially patchy recovery of woody browse species released from the herbivorous actions of elk. The patchy nature of recovery was due to elk avoiding places or browsing less where there was a higher risk of wolf predation, such as along river banks.

Like the elk in Yellowstone, the ecological over-abundance of deer populations in the Scottish Highlands are blamed for significant ecological impact, especially in holding back woodland regeneration, leading to interest in the reintroduction of wolves to control deer and reverse the ecological degeneration (BBC News, 2002). Recently, a joint Norwegian/British group used the population simulations of a predator-prey model to test the dynamics of wolf reintroduction on the densities of Highland red deer (Nilsen et al., 2007). Their modelling of one expanding wolf population closely followed the observed patterns in the northern range in Yellowstone National Park, and their simulations suggested that the deer density in some areas would be reduced by more than 50% following a wolf reintroduction.

Their conclusion was that fewer wolves may be needed than indicated by the predator–prey modelling of the Norwegian/British group, to have significant positive impacts on ecosystems in the Scottish Highlands

A density mediated trophic cascade would be one factor following reintroduction of wolves, but it was not long before Adrian Manning and Iain Gordon, associates in Australia that were both familiar with the Highland scene, joined with William Ripple in pointing out that the non-lethal behaviourally-mediated effects of wolves would also have a profound effect on deer behaviour in Scotland, and consequently on the ecosystems in which they lived (Manning et al., 2009). Their message was that it was important to learn the lessons from analogous ecosystems where the creature is extant, or where it has been successfully reintroduced, noting the new research emerging from wolf reintroduction projects in N. America. Their conclusion was that fewer wolves may be needed than indicated by the predator–prey modelling of the Norwegian/British group, to have significant positive impacts on ecosystems in the Scottish Highlands.

In making the case here for a broader view of the functional ecology of Britain, overcoming the culturally-induced inertia and drawing on evidence where it may be found, I leave aside the politics and practicalities of reintroductions. I would however argue that these broader discussions are essential to provide the scientific evidence on which to inform the decision making process. I should also point out that in my wake will come those who see somewhere like the Weald as a perfect place to let elephants roam wild in a bid to bring back an analogue of a lost mega-herbivore, the wooly mammoth. It will be an interesting discussion.

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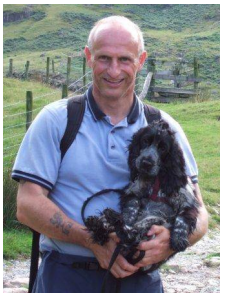
The role of audio-visual interaction in landscape characterization



Robert Pheasant, Greg Watts and Kirill Horoshenkov
School of Engineering, Design and Technology, University of Bradford, West Yorkshire, United Kingdom, BD7 1DP, email: R.J.Pheasant2@Bradford.ac.uk

This paper provides an insight into the role of audio-visual interaction in the perceptual process of landscape characterization. It does this by giving an overview of a number of studies carried out by the authors into the role of sensory interaction within the tranquillity construct, and concludes with the assessment that modern day humans are as well equipped to survive in a wilderness environment, as were our savannah dwelling ancestors.

1. BACKGROUND

During the prolonged hunter-gather stages of human evolution, frequent moves through what we now refer to as 'wilderness landscapes' were necessary for our ancient ancestors to secure the resources critical to their survival. In order to succeed and safely negotiate these hostile environments they would have utilized a combination of visual and auditory information to guide and protect them. Three-dimensional visual stimuli comprised of the spatial form, arrangement and animation of landscape features would have very quickly provided them, as it does us today, with configurational coherence. This is supported by studies carried out by Oliva & Torralba (2006), which have shown that scene information can be captured in a single glance and that the 'gist' of a scene can be determined in less than 100ms. However, this is 50 – 60ms slower than the cognitive reaction time to auditory stimuli (Jaoekowski et al., 1990) which for our ancestors would have contained essential information on both animate and inanimate hazards. This complex mix of sensory inputs will have determined the way in which environments were perceived and would have quickly become incorporated into a broad range of schemata. These organised, clustered and abstract bodies of information were used, not only to interpret situations occurring but also to predict them, and were the perceptual templates on which habitat selection was made. Consequently the basis for survival, which in its simplest form meant avoiding predation, was the ability to draw upon and interpret an array of sensory information that once combined, formed the simple cues compatible with a model for success.

Within their Attention Restoration theory (ART), Kaplan and Kaplan (1989) identified that exposure to natural 'restorative environments' aids recovery from the type of sensory overload that characterizes modern living. The theory works on the principle that the amount of reflection possible within a restorative (tranquil) environment, depends upon the type of fascination that the environment holds. 'Soft fascination' is deemed to occur when there is enough interest in the surroundings to hold attention, but not so much that it compromises the ability to reflect. Such spaces need to be away from daily distractions and have an extent that provides mystery and allows the imagination to wander, thereby enabling individuals to engage effortlessly with their setting. In contrast 'directed attention' requires a significant amount of cognitive effort, and it is known that prolonged periods of sustained mental activity can lead to directed attention fatigue and significantly impair performance (Hartig et al., 1997).

For our ancient ancestors, impaired performance brought about by mental fatigue, would have had potentially fatal consequences. Therefore it seems entirely plausible that they developed mechanisms that allowed either individual members of the group, or the group as a whole, to take periods of cognitive respite. During this time they would have been able to distance themselves from the stress of constantly living with the fear of predation, whilst at the same time engaging with the 'soft fascination' afforded by their chosen location. Such 'tranquil' environments may well have comprised wide open views with lush vegetation, where 'soft fascination' was provided by grazing herbivores that acted as bio-indicators of impending danger, and glassy water surface textures, which when broken increased arousal. During this 'down time' additional survival information would have been provided by the auditory and visual modalities, which supply instantaneous pre-cognitive data to the amygdala, the area of the brain responsible for the instinctive fight and flight response, and also by social co-operation of the group.

Consequently the basis for survival, which in its simplest form meant avoiding predation, was the ability to draw upon and interpret an array of sensory information that once combined, formed the simple cues compatible with a model for success

Given the obvious importance of sensory interaction within the context of landscape characterization it is surprising that the relationship between the auditory and visual modalities is not more widely reported. This shortfall has been addressed in part by resent research carried out by the University of Bradford into the extent that audio-visual interaction influences how tranquil a range of contrasting environments are perceived to be. Due to space constrains it is only possible within this article to give an overview of this work, which was funded by EPSRC Grant N^{o} GR/P/02738/01, and enhanced by contributions from Sheffield University's Clinical Academic Psychiatry Department (SCANLab). A more in depth analysis of the methodology and results can be found in the journal articles and conference papers cited.

2. LATEST RESEARCH

The tranquillity construct was used within this research as it provided a mechanism by which both subjective responses and objective measurements, of uni and bi-modal audio-visual data could be recorded, whilst at the same time enabling a 'Tranquillity Rating Prediction Tool' to be developed (Pheasant et al., 2008, Watts et al. , 2009a). To achieve this, a three stage experimental strategy was adopted that incorporated: a photographic ranking exercise, a subjective assessment of audio-visual stimuli in a psychoacoustic suite and an fMRI neuro-imaging pilot study (Watts et al., 2009b).

2.1 Photographic Ranking Exercise

During the photographic ranking exercise one hundred subjects were asked to assess how tranquil they perceived one hundred 15 x 10cm images of English rural and urban environments to be. The percentage of natural and manmade features present in each photograph was then measured and compared against the ranked position using regression analysis. These results are shown in Table 1, where it can be seen from the strength of the coefficients, the significance values (*p-values*) and the confidence intervals, that the presence of water, geological features and flora within a scene all significantly influenced its ranked position. Interestingly the percentage of space occupied by people with in a scene, rather than the number of people present, had a negative effect. These results provided a good indication of the key factors that influence the perception of tranquillity when responding to a visual only stimulus.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.792
R Square	0.628
Adjusted R Square	0.612
Standard Error	12.313
Observations	100.000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4.000	24267.477	6066.869	40.019	0.000
Residual	95.000	14401.918	151.599		
Total	99.00	38669.394			

	Coefficients	*Standard Error*	*T Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	19.566	3.392	5.68	9.96476E-08	12.832	26.300
% Water	0.702	0.099	7.077	2.50470E-10	0.505	0.900
% Geological features	0.562	0.087	6.023	3.22266E-08	0.353	0.700
% Flora	0.489	0.050	9.853	3.41120E-16	0.390	0.588
% Space occupied by people	-1.590	0.482	-3.297	1.37356E-03	-2.548	-0.633

Table 1: Results of the Regression Analysis

2.2 Subjective Assessments

Prior to commencing the photographic ranking exercise a decision was taken to revisit the locations ranked at 10 percentile intervals, i.e. positions 1, 10, 20, 30…100 and collect video data for use in the subjective experiments conducted in the psychoacoustic suite. The methodology and results of these experiments are in Pheasant et al. (2008) and Watts et al. (2009a), but in brief involved 44 subjects assessing how tranquil they found a range of contrasting environments to be when presented with uni and bi-modal audio-visual data. In addition they were also asked to gauge how loud they found the following five generic soundscape components: mechanical noise, sounds made by humans, biological sounds, the weather and sounds made by water. These measures along with values calculated for commonly used noise indices such as LAeq and LAmax, plus the percentage of natural features contained within a scene, were statistically tested against the dependent variable 'mean tranquillity rating' and an expression for the tranquillity rating prediction tool derived.

A number of important findings in relation to audio-visual interaction emerged from these experiments. The first was that when the percentage of natural features within a scene and the A-weighted decibel level recorded at each location were tested statistically, they were both shown to contribute to the perception of tranquillity in equal measure, i.e. no one modality dominated. The second was that of the five soundscape components, only the natural elements, i.e. biological sounds, the weather and the sound of water, significantly influenced the perception of tranquillity in the combined audio-visual experimental condition ($R^2 = 0.98$, $p<0.01$).

2.3 fMRI Pilot Study

During analysis of the audio-visual data presented to subjects in the subjective experiments described above, it became apparent that some manmade sounds are similar to natural sounds yet perceived completely differently because of the associated visual scene. This reinforced the notion that multi-sensory processes were at work in the perceptual processes and that scene coherence is dependent on both auditory and visual information. In order to understand more fully this interaction and to gain insights on how restorative environments might be constructed the use of fMRI techniques were explored.

The paradigm adopted for the brain scans involved exposing 12 subjects to both tranquil and non-tranquil scenes, but using the same audio input, so that the effects of the visual modulation on perception of tranquillity could be isolated. The breakthrough in designing the study came with the recognition that the sounds produced by waves breaking on a shallow sandy beach (surfing beach) are perceived to be similar to those at motorway sites. Both are characterised by a constant roar. In the former case the breaking of numerous individual waves at various distances from the shore, create a near constant sound level and the same can be said for the rolling noise created by heavy traffic on a motorway. When typical spectra from these two sources are compared, it can be seen that they are very similar, especially at mid frequencies, as shown in Fig. 1.

Prior to commencing the experiment the pre-recorded audio data for each of the scenes shown in Figure 2, was removed and replaced with shaped broadband noise set at 65dB for each environment and modelled to fit the averaged spectrum shown in Figure 1.

The significance of these findings to the wilderness debate is that provided such environments are wholly 'natural' and not polluted by mechanical noise, we are as physically well equipped now as we were hundreds of thousands of years ago to survive in them

Once inside the scanner, the subjects were exposed to short duration (3.5 sec) video clips of the beach and motorway scenes and the expectation was that these would be experienced as tranquil and non-tranquil environments. Each scene was presented in both the combined audio-visual and visual only experimental

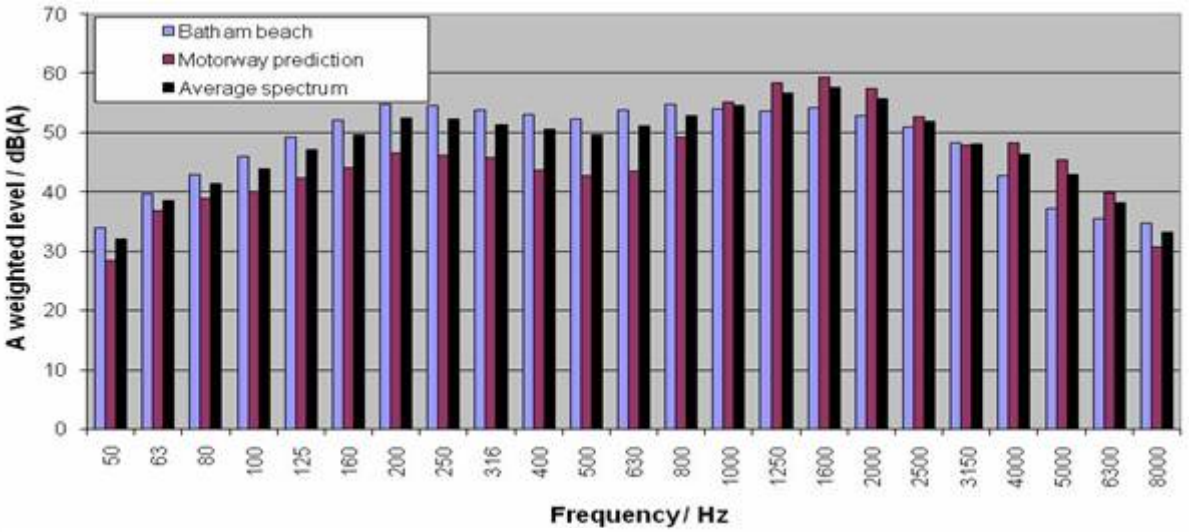


Figure 1: Spectra of sounds at a surfing beach and a motorway site (M62)

conditions. This allowed, under conditions of identical auditory input, examination of visually induced changes in the auditory cortex's connections with other brain regions.

Of particular interest were the supposed connections between the auditory cortex and medial prefrontal cortex, which has been implicated in a number of functions that relate to the experience of mental states including self-reflection (Johnson et al., 2006) and empathy for others (Farrow et al., 2001).

The preliminary results of this pilot study, which amounted to a probe of effective connectivity, identified areas of the brain that receive significantly enhanced contributions from the auditory cortex under the tranquil visual only condition compared to the none-tranquil visual only condition. This difference may be interpreted as greater engagement with tranquil environments and in contrast an apparent rejection of non-tranquil places. Such results are a first step in developing the fMRI technique for use in the design and improvement of tranquil spaces for amenity areas and in the development of appropriate restorative environments to aid recovery from illness and the improvement of wellbeing.

Figure 2: Typical scenes used in the fMRI study

3. CONCLUSIONS

The overview of the three studies presented here has not only shown natural components of the visual and acoustic environment as being fundamental to the tranquillity construct, it has also shown how the two modalities work in support of each other. Perhaps when we imagine our ancient ancestors taking a period of cognitive respite, we should not be surprised that the visual modality has the ability to 'connect' the auditory-cortex to higher cognitive centres of the brain, as 'sensory certainty' would have played a fundamental role in keeping them alive. It is also not surprising that the loudness of mechanical noise, i.e. noise from machinery, played no role in the perception of tranquillity, as in evolutionary terms it has only been around for an exceptionally short amount of time. The significance of these findings to the wilderness debate is that provided such environments are wholly 'natural' and not polluted by mechanical noise, we are as physically well equipped now as we were hundreds of thousands of years ago to survive in them.

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Re-wilding the conservation agenda in the UK

Adrian Manning, Fenner School of Environment and Society, Australian National University

The creation of wildland, through the process of re-wilding, has great potential to address (at least) two key challenges for conservation in the UK: (1) ongoing biodiversity loss; (2) facilitating climate change adaptation. Consequently, there is a strong argument for re-wilding and wildland to become mainstream in conservation research, policy and action in the UK. In this perspective piece, I will argue that there is a need for a re-think of our conservation approaches, and will discuss in particular the ecological arguments for re-wilding, and the key factors that are needed for it to become a major complementary component of conservation strategies.

Why do we need to rethink our approaches to conservation in the UK?

I see five key issues:

(1) ***Shifting baselines syndrome***. The environment experienced by people when they are young provides the baseline for their expectations regarding quality and ecological functions of natural areas (Miller 2005). In a continually degrading environment, there is a ''ratcheting down'' of the expectations of each generation as the baseline is lowered (Miller 2005). For example, today many children are only familiar with the introduced grey squirrel in their local woodlands. Yet their parents might remember red squirrels and so forth. Looking further back, some species we now associate only with the Scottish Highlands were once ubiquitous in the landscapes of the UK. For example, the pine marten (until at least 1800) and wildcats (before 1800) (Yalden 1999). Even Capercaillie lived in County Durham in the 11th Century (Rackham 1979). We must be very wary of framing our conservation goals based on current or recent environmental baselines as they are a result of the very degrading processes that caused the loss of biodiversity (see below).

(2) ***Current approaches are not working***. Despite many local successes, on the broad scale many native species continue to decline, and their habitats continue to be degraded or lost. Also, we now are at a very low environmental baseline after millennia of ecosystem modification and loss. In Australia this is often euphemistically termed "over-clearing", but applies equally to the UK. For example, the grubbing out of ancient woodlands and hedgerows or the draining of wetlands. We have gone too far for much of our native biodiversity.

The UK has developed many valuable cultural landscapes which have distinct suites of native species. However, agricultural intensification and changing economics have had a profound effect on these areas. To maintain the range of habitats and species we have left, often requires intensive, costly micro-management. It is not clear that applying current conservation approaches more resolutely will arrest the general trend of species and habitat loss and modification, or facilitate climate change adaptation.

(3) ***Changing concepts of landscapes and conservation.*** Traditionally, conservation has been pursued through spatially static, reserves embedded in landscapes generally used for commodity production (e.g. agriculture and forestry). However, most land is off-reserve and all species cannot be conserved in reserves. At the same time, landscapes have often been conceptualised from a human perspective as either habitat or non-habitat, with connectivity being provided by corridors. However, more recently it has been recognised that different organisms perceive and respond to the same landscape differently (Manning et al. 2004). The implication of this is that there are as many landscapes as there are organisms to perceive them – this is a challenge for land managers; especially because of climate change.

(4) ***Climate change***. In response to climate change, ecological communities are expected to disassemble, and organisms will respond individualistically with differing rates of movement (Peters 1990; Erasmus et al. 2002; Thuiller 2004). In addition, ecological processes and interactions between species and with the environment will change (Breshears et al. 2005). The implication of this is that landscapes and ecosystems in the UK will be in 'disequilibrium' as organisms try to respond to climate change. Effectively, the traditional concept of 'the balance of nature' in the British countryside is no longer tenable. Modern landscapes are much more fragmented than those in which many species evolved. The combination of climate change and the reduction in natural connectivity are a major barrier to adaptation by many species. Conservation-through-reserves alone is not enough to arrest or reverse species loss or adapt to climate change. There is some doubt that all organisms will use corridors for movement (Donald and Evans 2007). This, and the recognition of the importance of different species' perceptions and responses to the same landscape, requires a shift in emphasis from corridors towards 'whole landscape' connectivity; irrespective of land use or ownership (Manning et al. 2009a).

To maintain the range of habitats and species we have left, often requires intensive, costly micro-management.

Climate change will also result in the emergence of 'novel ecosystems' that contain combinations of species that have not previously been observed, including exotic species (Hobbs et al. 2006). For conservation, this raises the challenge of whether to try and resist these changes, often at high expense, or let an ecosystem evolve in a new direction.

(5) ***Resources for conservation are limited***. The magnitude of the challenges facing UK conservation means that funds are unlikely ever to be sufficient to support current approaches to the extent needed. Conservation needs to be effective over a larger area without a significant increase in resources.

The combination of these issues requires reflection on the effectiveness of our current approaches to conservation. What is working? What isn't? What is sustainable? What isn't? Are there additional approaches that could be adopted? Wildland and re-wilding have the potential to complement current approaches and help overcome these issues.

What are wildland and re-wilding?

Wildland is a description of an area containing an essentially 'natural' ecosystem. Some general properties of natural ecosystems are:

- self-organisation (i.e. things live, grow and move where and when they want);
- self-renewal;
- that natural processes, disturbances and interactions predominate;
- they generally cover large areas (i.e. landscapes);
- they are often structurally and compositionally heterogenous at a range of scales with gradual boundaries transitions;
- a high degree of connectivity for many organisms and processes;
- they generally have fully functioning food webs including key trophic levels;
- they have 'adaptive capacity';
- they tend towards 'resilience'

Re-wilding is the process of returning some or all of these properties to an area. In some ways, re-wilding is a better term than 'ecological restoration', because it circumvents unproductive arguments about "restore what?" (which are sometimes used to stall moves to try alternative landscape management approaches). In reality it is not possible to restore a facsimile of any point in the past. It is however possible to restore the *properties* of 'wild' ecosystems.

How could re-wilding help overcome these five conservation issues?

The adaptive and self-organising properties of wildland means that they should be able to respond more easily to drivers of change. The whole-of-landscape approach, including high connectivity, better reflects the needs of individual species. Wildland and re-wilding focuses on the harnessing of natural ecological processes over large areas – such ecosystems should require much less resources to manage them over time. The wilder properties of re-wilded landscapes, including the reintroduction of lost species will help raise the low baseline of expectation that we currently have. The process of re-wilding also provides a unique opportunity to research the process of ecosystem recovery.

Re-wilding in practice

While re-wilding has great potential for addressing the biodiversity crisis in the UK, it requires some changes in how we think about conservation and our goals. Ceding human control means allowing an ecosystem to head off in directions that may not currently be considered desirable. For example, allowing wildfires to burn, allowing scrub to grow in open habitats, allow animal populations to boom and bust. Wild ecosystems are often considered 'messy' – which in ecological terms is 'heterogeneity' – a key ecosystem property (see below). Managers would no longer aim for a particular habitat type or numbers of a particular species, but rather the target would be the overall vision or goal. For example, a goal might be to guide an ecosystem towards self-organisation and self-perpetuation, so that minimal inputs are needed.

In the initial stages, re-wilding may be resource intensive during the period when the key ingredients of an ecosystem are established (e.g. reintroduction of keystone species, addition of deadwood, remediation of threatening or degrading processes), but in the long-term it should be possible to withdraw active management. Re-wilding will undoubtedly need more land than is currently allocated to conservation because it is by definition more extensive in order to allow natural processes to operate and organisms to respond adaptively.

Wildland and re-wilding focuses on the harnessing of natural ecological processes over large areas – such ecosystems should require much less resources to manage them over time

Does re-wilding mean the end of current approaches?

Re-wilding should be seen as complementary to current approaches, however, I think the centre of gravity needs to shift in the direction of wildness for the reasons outlined above. There will always be a need for species- or habitat-specific actions, but if re-wilding works, as I think it could, the need for the former would reduce if the latter was successful.

Is re-wilding a threat to traditional landscapes?

UK landscapes have always changed, even though that change may have been slow (though not always). From a biodiversity perspective, a large degree of damage was done between 1940 and 1985 through agricultural intensification in the drive for food production (Marren 2002). Rapid climate change promises to become another major driver of landscape change. Change is inevitable, but we do have choices about how we adapt to that change. Re-wilding is a way to allow natural adaptation and restore some of the wildness that has been lost from landscapes over the millennia. Re-wilding and traditional landscapes are not mutually exclusive and could co-exist as part of an integrated approach to adaptation of human and ecological communities. In 500 years time, re-wilded landscapes would also be considered traditional.

Wilderness, wilderness everywhere?

There is a common misconception about re-wilding; that it means all options, no matter how wild, could happen anywhere. This is not the case. Re-wilding should be seen as a continuum of options appropriate to the location (though the most ambitious end of this continuum should be wild). At one end of the continuum, re-wilding would mean the return of what we might term, 'wilderness' to some landscapes, however in others, re-wilding would return 'wildness' i.e. some of the properties of wild ecosystems. For example, when pine martens and

wildcats were still widespread, the landscapes they occupied were not wilderness, but they did possess a wildness that has since been lost.

So, in many UK landscapes, I see that re-wilding would return wildness as distinct from wilderness. This would result in integrated landscapes that have the properties of the wild ecosystems within which organisms evolved, without needing to be facsimiles, and that integrate conservation and production. For example, colleagues and I recently argued that scattered trees could be used in production landscapes to complement ecological networks and reserves and to facilitate climate change adaptations (Manning et al. 2009b). This would create gradual boundary transitions, allow the co-existence of woodland and open country organisms on the same land and permit multi-directional movements in response to climate change.

There are many myths about, and barriers to, the wider adoption of re-wilding. Building the evidence on the ecological benefits of re-wilding in the UK context will go long way to address this

Similarly, the UK may want to explore the possibilities for creating 'hybrid' ecosystems that fulfil the needs (habitat and connectivity) for organisms currently supported by separate 'habitats'. This will require increasing the scale of management to the landscape, and developing production systems that also integrate the properties of more natural systems. For example, in Australia it has been shown that rotational grazing can benefit biodiversity and allow scattered native trees to regenerate naturally in fields without affecting production output (Fischer et al. 2009). Could similar integrated systems be developed extensively in the UK (e.g. new wood-pasture)?

How can re-wilding become mainstream?

The following are some ideas about some key factors that I think are required for wildland and re-wilding to become a mainstream part of conservation research, policy and action in the UK.

Re-wilding must become evidence-based. If re-wilding is to be adopted by policymakers and land managers, it is essential that it can prove that it is more effective than current approaches, and can address the five key issues outlined above. Consequently, I believe that it is imperative that it become evidence-based. Critical to building an evidence-based approach is the ability to show the relationship between cause (re-wilding actions) and effect (ecological outcomes). This requires not only monitoring of ecosystems changes, but designed, long-term 'natural' experiments. This will require the integration of re-wilding projects with research programmes – and the associated increase in the number of researchers in re-wilding at UK universities and research agencies. In particular, I think it is particularly important in these early years that pioneering re-wilding projects are able to provide evidence to encourage further support within the community, government and non-government sector.

Understanding the myths about, and barriers to, re-wilding. There are many myths about, and barriers to, the wider adoption of re-wilding. Building the evidence on the ecological benefits of re-wilding in the UK context will go a long way to address this. However, there are also cultural barriers, both within society and the conservation sector, to a transition towards re-wilding approaches. For example, natural systems may be considered 'messy' by some (see above), regenerating scrub may be seen as a threat to a particular habitat type and withdrawal of intervention may be seen as 'poor' land management. It is important that re-wilding research also helps understand the reasons for these perceptions and ways to overcome them.

Developing new measures of success. Re-wilding does not have the same measures of success as conventional approaches have i.e. number of species, area of habitat etc. This is because natural ecosystems and the populations of species that form them, fluctuate and change naturally. New measures of success need to be developed that can be used to demonstrate the value of the approach, and ensure that it is working effectively.

Support for re-wilding. To make the transition into the mainstream, re-wilding needs support in the form of resources, directed through policy, research funding, and grants and incentives. Underpinned by emerging evidence, policies need to be developed that reconcile both species/habitat/site-based approaches and ecosystem/landscape/re-wilding approaches.

Rebuilding the baselines. Ambitious demonstration projects are essential to (1) understand the ecology of re-wilding in the UK context (2) show what is possible within the UK; (3) raise the baseline of conservation expectations. Some excellent examples already exist. I believe that there is a need for a step-change in Government incentives and encouragement for this type of project.

Some might ask the question: won't wild places somewhere else do for our benchmarks? Wild places and re-wilding projects overseas provide very important inspiration and examples of what could be possible. However, they often don't seem to translate into the action required to establish similar projects in the UK. Ultimately, I think this is because it is always possible to say "but things are different over there". A good example is beaver reintroduction. Beaver populations have been recovered or reintroduced to most European countries over the last century (Halley and Rosell 2002). However, despite these conservation benchmarks it took until 2009 for a reintroduction to happen in Scotland – after what many would consider has been a needlessly drawn-out process. Interestingly, inspired by the Scottish project, England has now conducted a feasibility study into beaver reintroduction – illustrating the power of UK benchmarks to influence conservation thinking.

I believe that we need at least one place in the UK that is re-wilded and includes all the key species and ecological processes that would have been present had humans not removed or modified them. This should include large predators. We need to start seeing these key species for the processes that they bring back, and the positive effects they have on ecosystems, not as an ends in themselves. This could occur under controlled conditions (as we have proposed recently; Manning et al. 2009c). This would not only serve to raise the shifting baseline to the highest level possible (by which all other projects could position themselves). It would also provide a unique research opportunity to learn from a large-scale ecosystem recovery and inform any future decision on a wider reintroductions. At the same time, there should also

be a range of demonstration re-wilding projects in every region or county – leading ultimately to re-wilding as part of every landscape in the UK.

Stretch-goals and back-casting

To achieve ambitious re-wilding goals that are far beyond what is currently thought possible, stretch goals can be very useful. Stretch goals are highly ambitious goals that are identified to inspire creativity and innovation to achieve things that currently seem impossible (Manning et al. 2006). Once an ambitious stretch goal has been decided, it is then possible to use backcasting to work out the milestones needed to achieve the goal. This approach overcomes problems of setting goals based on low baselines and on past trends.

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Managing the transition

Species/habitat and site-based approaches have developed for good reasons. These approaches will always be important, but I think there is a need for a shift in the centre of gravity towards re-wilding and wildland. In a country that has a tradition of intensively managed landscapes, this alternative challenges the norm. This means a move from specific habitats that may support specific species, towards heterogenous landscapes that support a species somewhere at any given point in time. Such a transition will need to be managed carefully over the long-term and would be contingent on evidence indicating improved biodiversity conservation and adaptation outcomes resulting from re-wilding.

Conclusion

Re-wilding, and the creation of wildland, should not be seen as a rival to current approaches, but rather as complementary, in achieving the ultimate goal – adaptive landscapes in which biodiversity thrives. Re-wilding principles are already being applied in many places with success. However, I believe this must happen much more. It is imperative that ecological evidence is gathered to prove that re-wilding works, and that we understand how to make the transition from where we are now. The new Wildland Research Institute at Leeds University is a highly significant development in this process, and promises to provide vital research leadership in this critically important emerging field of conservation. In the future, I believe that all landscapes should contain some wildland as part of a nationwide strategy which supports adaptive human and ecological communities. The new Wildland Research Institute has a major role to play in helping make this a reality.

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This perspective article draws on the work of Dr Manning. References have been minimised due to lack of space, but for more information and reprints of relevant papers please contact Dr Manning at adrian.manning@anu.edu.au.

Protecting Europe's wilderness

Zoltán Kun, Executive Director of the PAN Parks Foundation

Wilderness protection is gaining more and more attention in Europe despite the continents' history of strong human impact on nature and the fact that active management techniques are deeply-etched in conservationists' mind. In October 2008 a broad coalition of NGOs, for-profit companies and private individuals submitted the 'Resolution on Wilderness' to the European Commission. These over 100 entities called for the improved protection of Europe's wilderness heritage. A milestone in European wilderness protection was the adoption of a special report on wilderness by the European Parliament.

The word 'wilderness' means the 'virgin' areas, a natural environment that has not been significantly modified by human activity. These areas are core areas for nature. Wilderness areas are places where nature processes and wildlife thrives. These areas are large areas of land or sea, which - together with its native plant and animal communities and the ecosystems of which they are a part - is in a natural state, and where major human interference needs to be avoided.

However wilderness has a double perception. On one hand it is viewed as a place to fear and avoid, where monsters and unknown dangers exist. On the other hand it seems as a place to enjoy and contemplate, as a place which gives us a temporary asylum from the stress of the urban-industrial civilization.

For a long time, the word 'wilderness' has been used as a synonym for dangerous or unpleasant locations that humans have either tried to avoid or 'civilize'. However, today the use of the word is changing. European citizens are more and more interested in 'undisturbed' nature. They are willing to travel large distances to see such areas in Africa or the Americas. However, we must increase their awareness that wilderness exists also in Europe, where species are found in their natural habitats and where we can try and understand what European nature was like before any human impact.

Europe is without a doubt the continent where nature has been most affected by human influence. Indeed the continent's rich biodiversity found in some parts of the old continent are very interconnected with, and dependent upon human management. The European landscape has been modified by thousands of years of human activity and it is part of our cultural, social and economic heritage.

There is nowadays a serious debate on the advantages and disadvantages of our Wilderness cult; some say, for instance, that it gives us permission to evade responsibility for the places where we actually live. Due to the close relationship between nature and human development in Europe, it is sometimes forgotten that there remain – even if only in small fragments covering no more than about 1% of our territory – small, yet important areas of what can be called 'virgin', 'natural', 'wild' or 'wilderness' areas.

Wilderness and wild areas are important because of their indirect and direct economic, health, social, research and cultural values. They have high intrinsic value, are essential laboratories for research into biodiversity and natural processes and provide gene banks for the future. They can also contribute to mitigation and adaptation to climate change, and provide a wide range of ecosystem services. At a human level they provide huge scope for spiritual inspiration and physical recreation and renewal.

These natural, undisturbed areas are also the last places on our continent where the natural process of evolution continues. These areas are also reference laboratories for us to observe the effect of phenomena such as climate change, which then allows us to use the information gained in developing appropriate strategies for adaptation. We know a lot about natural processes – but it is still just a small fragment. Wilderness areas are clearly the best sources of knowledge about them.

There are also many ethical reasons to keep wilderness abundant in Europe. We have a moral obligation to ensure that future generations can enjoy and benefit from Europe's truly wild areas

There are also many ethical reasons to keep wilderness abundant in Europe. We have a moral obligation to ensure that future generations can enjoy and benefit from Europe's truly wild areas. We, as a generally well developed society also push others – on other continents – not to destroy their wilderness and nature for the sake of short term profit generation. There is no way to maintain our credibility with regard to the message we give to others if we cannot protect the remaining wilderness of our land.

Fortunately there are many European people and institutions aware of this and who actively contribute to improved wilderness protection and awareness-raising in Europe. There are several developments proving an increasing interest in and support of European wilderness. The 'Resolution on Wilderness' submitted to the European Commission by a broad coalition of NGOs, for-profit companies and private individuals led to various specific actions such as:

- The European Parliament adopted a special report on wilderness on February 5 2009, which called the European Commission and the Member States to take concrete actions. The report was adopted with a vast majority proving an overall European support.
- The European Commission ordered a study on Undisturbed Forest Management earlier in 2009
- The European Commission supported the 1st European conference on 'Wilderness and Large Natural Habitat Areas' in Prague on May 27-28 2009.

The Conference hosted by the Czech EU Presidency brought together some 250 participants from some 40 countries, including officials of government ministries, nature agencies, conservation NGOs, academics and interested parties from landholders, agriculture, forestry, business and other sectors. The objectives of the conference were to (i) raise the profile of wilderness and wild areas in Europe; (ii) recommend an agenda for

protection and restoration of such areas, and; (iii) build a partnership between sectors based on consensus for implementing this strategy.

The conference concluded a Message, which forms the 'Agenda for Wilderness' in Europe. There are substantial opportunities for supporting the protection and restoration of such areas – including identification and valuation of their multiple non-extractive benefits, which in addition to their contribution to biodiversity and landscape conservation can be utilised for local communities, landholders and society in general.

Although wild areas are an important part of the strategy for halting biodiversity loss and promoting natural ecosystem processes and functions, many of them are still not adequately protected. Future policy on biodiversity will be directed increasingly towards the protection of the resilience, integrity and vitality of natural ecosystems. In the context of such an approach, based on the protection and development of natural/green infrastructure in a multifunctional landscape, wilderness areas have a unique and highly valuable contribution to make.

There is a very strict threshold for the wilderness area. There must be at least 10,000 ha of the territory still in natural state, which excludes extractive human uses

There is an innovative initiative for increasing the effectiveness of wilderness protection in Europe.

PAN Parks Foundation (PPF) manages a network of protected areas that are still the remaining most undisturbed lands in Europe. PAN Parks is working to create a world where the great wilderness areas of Europe are protected and enjoyed as sanctuaries of nature: where the natural systems of animals and plants are safe to thrive; where people appreciate the pleasures offered by wilderness with the respect it deserves; and where our knowledge and understanding is enhanced for the benefit of nature and humanity alike.

There are already ten PAN Parks throughout Europe stretching from the Artic Circle to the Mediterranean. PAN Parks Foundation applies tourism as a tool in order to create new supporters for conservation. There is a very strict threshold for the wilderness area. There must be at least 10,000 ha of the territory still in natural state, which excludes extractive human uses.

Improved wilderness conservation is the most significant achievement of the PAN Parks concept realised by creating a small but vital network of wilderness protected areas. There are altogether more than 200,000 ha of certified wilderness in these cooperating protected areas. Here is a list of certified PAN Parks and the size of their wilderness zone:

- Archipelago National Park (Finland) – 10,600 ha
- Borjomi-Kharagauli National Park (Georgia) - 50,325 ha (non EU)
- Fulufjället National Park (Sweden) - 22,140 ha
- Oulanka National Park (Finland) - 12,924 ha
- Central Balkan National Park (Bulgaria) – 21,019 ha
- Majella National Park (Italy)- 25,500 ha
- Paanajärvi National Park (Russia) – 30,000 ha (non EU)
- Peneda-Geres National Park (Portugal) - 5,000 ha
- Retezat National Park (Romania) - 14,215 ha
- Rila National Park (Bulgaria) - 16.350 ha
- Total verified wilderness: 208,073 ha (of which 127,748 ha are in EU Member States)

The PAN Parks approach creates unique opportunity also to at least partially solve the problem of a growing number of abandoned areas throughout Europe through rewilding, restoration projects.

The PAN Parks network develops sustainable tourism as an important part of the use of wilderness in Europe. Sustainable tourism encourages ordinary people to discover the hidden values of the nature without causing damage to it. Sustainable tourism strengthens the acceptance of the conservation policy, as the citizens understand the need for protection through their personal experience.

We hope that PAN Parks can serve as an example and will thus encourage countries and organisations throughout Europe to improve protection of wilderness. Biodiversity continues to decline rapidly in Europe, though a few species and ecosystems are recovering. Although European states have achieved substantial progress in the conservation of biodiversity, and are committed to halt the loss of biodiversity by 2010, we believe that the increasing size of wilderness and wild lands will also further support halting biodiversity loss Europe.