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*How can landscape professionals be involved in
rewilding schemes?*

A literature review and conceptual framework

A dissertation submitted in partial fulfilment of the requirements for
the degree of Master of Arts in Landscape Architecture

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Abstract:

In response to failing biodiversity and climate change, rewilding is gaining popularity as an alternative method of low-input nature conservation. This literature review examines rewilding theory and compares prominent case-studies, before exploring the ways in which landscape professionals have been involved in schemes, and perhaps should be in the future.

It is argued that landscape professionals should have a central role in rewilding projects, working as a facilitator and considering both ecological and sociological aspects whilst involving stakeholders throughout. Landscape professionals should be involved in rewilding from small-scale urban projects to large-scale planning and management. A conceptual framework is produced to act as a guide, primarily for developers of rewilding schemes, on how to utilise the landscape professional at each stage of a projects' development.

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1. Introduction:

Climate change is a major long-term challenge facing humanity and the planet – this is reflected by the 21st century shift of landscape professionals’ focus, with sustainability going from a minor consideration to becoming a central theme of design (Waterman, 2015).

It is widely acknowledged that we have entered a new geologic epoch – the Anthropocene (Subramanian, 2019), with humans now the dominant cause of environmental change on Earth (Lewis and Maslin, 2015). In addition to the geological impacts of human activity, there are severe biological impacts. Areas of wilderness, defined by the IUCN as ‘protected areas that are usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation’ (IUCN, 2020), have decreased by 10% globally in the last two decades (Watson *et al.*, 2016). In the UK, a history of land-use change has led to huge habitat loss (Ridding *et al.*, 2020). As a result, ‘true wilderness’ no longer exists in the UK, with some more remote areas of the Scottish Highlands considered the UK’s ‘wildest’ (Carver, Evans and Fritz, 2002).

Rewilding, which aims to regain a sense of wilderness to natural areas by restoring natural processes and reducing the impact of humans in a landscape, has gained major publicity and popularity in recent years as a nature-led, low-maintenance alternative to traditional conservation methods. As a relatively new method, the theory and evidence-base for its’ impacts are still building, resulting in scepticism from some members of the ecology discipline (Rubenstein and Rubenstein, 2016) and community stakeholders (NFU, 2019). However, partly due to the actions of individual visionaries in creating schemes, evidence is now mounting to suggest that rewilding can improve biodiversity, ecological reliance and provide ecosystem services (Pettorelli *et al.*, 2018).

There is scant literature on how landscape professionals could be involved in rewilding schemes, despite the understood importance of socio-ecological factors when implementing a conservation scheme (Corlett, 2016b), and despite rewilding organisations acknowledging that landscape professionals will have an important future role (Houlston and Sheppard, 2016).

Why Is the Landscape Professional Needed?

Landscape architecture is a wide-ranging discipline – encompassing ecological design, community-building, both urban and rural planning and landscape management. Landscape professionals are masters of ‘joined-up thinking’, creating holistic projects which combine natural and social elements, using public consultation as a major tool.

In the following chapters, the differing potential roles of the landscape professional within rewilding schemes will be explored: moving from small-scale urban design, to large-scale landscape planning.

If there is to be large-scale rewilding in the UK, it is vital that the population, both local and national, understand - and are in favour of – new schemes. Landscape professionals are in the unique position of understanding ecological processes and ecosystem services, being familiar with policy and having a

thorough understanding of how the landscape works. Above all, they are often advocates of positive social and environmental change, with the visual and verbal communication tools to engage with people from outside the profession.

This study will explore the ways in which landscape professionals could be involved in rewilding schemes at all scales. The following questions will be addressed:

- How does rewilding fit within current ecological theory, and what are the main conflicts with other overlapping disciplines? Does current national and international policy support rewilding projects?
- How could the landscape professional help improve public consultation and accessibility within rewilding schemes?
- How could the landscape professional create elements of rewilding at smaller scales, particularly in urban areas?
- What role could landscape planners/ managers have at larger scale projects?

The evidence provided will then be used to create a conceptual framework, which can be applied across all scales to define the role of the landscape professional in rewilding - providing guidance for project developers and policy-makers on how to utilise them.

2. Methods:

A systematic review of the literature was carried out. The book ‘Rewilding’, published in 2019 by Ecological Reviews and edited by Nathalie Pettorelli, provided an academic background to the subject and an introduction to the main themes, along with links to many other rewilding papers. The non-academic book ‘Wilding’ by Isabella Tree gave a useful account of on-the-ground issues involved in starting a scheme in the UK – prompting many online searches for literature related to the topics raised in the book, such as ‘dung beetle diversity Knepp’ and ‘Countryside Stewardship Scheme rewilding’. The academic search engines used were Google Scholar, Scopus and the University of Sheffield library search, StarPlus.

Other online search terms supplemented the literature gathered from the two books, using broad terms to research each section, such as ‘urban rewilding’ or ‘beaver reintroduction’. Wherever possible, academic papers published since 2010 were used, to ensure that the latest literature was referenced. All papers were downloaded and separated into folders according to their theme – for example, ‘Quantifying the multiple, environmental benefits of reintroducing the Eurasian Beaver’ by Brazier *et al.* (2016) was placed in the ‘river rewilding’ folder. All Papers and reports were documented using Mendeley.

To research case studies, a google search was used to locate the website of the respective project – which often provided links to management plans and scientific studies carried out on site. Landscape-specific case studies were found through the landezine website (www.landezine.com).

3. Rewilding - an Overview:

3.1. Defining Rewilding

A single definition for rewilding has not yet been agreed, with many variations in the peer-reviewed literature (Pettorelli *et al.*, 2018). For this study, a broad definition of rewilding from Navarro and Pereira (2017) will be used:

'the process of restoring the structural and functional complexity of degraded ecosystems while gradually reducing the human influence'

The broad definition of rewilding has led to categorisation of rewilding techniques into three distinct types (Sandom *et al.*, 2016):

- *Active Rewilding*: making interventions to allow natural processes to reoccur - this could be by removing physical barriers (such as a weir or drainage ditch) or by introducing/ removing certain species which fulfil specific ecological functions.
- *Passive Rewilding*: achieved by ceasing human management or use of an ecosystem and allowing ecological processes to take place. This is usually by land abandonment.
- *Trophic Rewilding*: achieved by top-down management leading to trophic cascades, usually through the introduction of large herbivorous animals (or megafauna).

3.2. Where does Rewilding fit within Ecological Theory?

Novel Ecosystems

Novel ecosystems are self-sufficient, stable communities of species which operate differently than their historical equivalents due to human activity, and cannot be returned to their historical state (Miller and Hobbs, 2019). The name is derived from their novel combinations of flora and fauna species – which could arise as a result of either an introduction of a 'trophic replacement' herbivore/non-native plant species, or a change in the abiotic conditions – such as the physical environment (Miller and Bestelmeyer, 2016). Novel ecosystems form where ecological restoration to a historical state is no longer possible, or incredibly difficult to achieve (Hobbs, Higgs and Hall, 2013). Some restoration ecologists argue that the definition for novel ecosystems is too broad and don't believe there is an irreversible threshold excluding the possibility of habitat restoration (Aronson *et al.*, 2014; Kattan, Aronson and Murcia, 2016).

Most rewilding schemes are considered novel ecosystems, particularly when a trophic replacement for an extinct species is utilised – such as at Knepp and the Oostvaardersplassen (see Section 3.4). At the Oostvaardersplassen the abiotic conditions are different from its historical state – as the reclaimed land was previously occupied by water.

Higgs (2016) makes the distinction between novel ecosystems (requiring no intensive or repeated management) and designed ecosystems (which exist primarily for human benefit). Figure 1, adapted from Higgs (2016) shows the trajectory of different typologies of self-assembled (not designed by humans) and

designed ecosystems. A hybrid ecosystem is one which has novel species but could still be restored to its historical state.

Figure 1 also shows which of these processes could be achieved through rewilding:

- Rewilding could cause a hybrid ecosystem to become either a novel or restored ecosystem - depending on which species were introduced, or naturally colonised the area.
- A historical ecosystem which becomes degraded could be restored using active rewilding methods (this would happen incidentally, not through the creation of goals)
- Rewilding usually leads to a designed ecosystem becoming a self-sustaining novel ecosystem. This could be due to:
 - * Reclaiming land either from water or from a change of land-use
 - * Green infrastructure becoming self-sustaining (or abandoned)
 - * A low-input agro-ecological scheme being self-sustaining
 - * Emerging ecological techniques (Higgs, 2016)

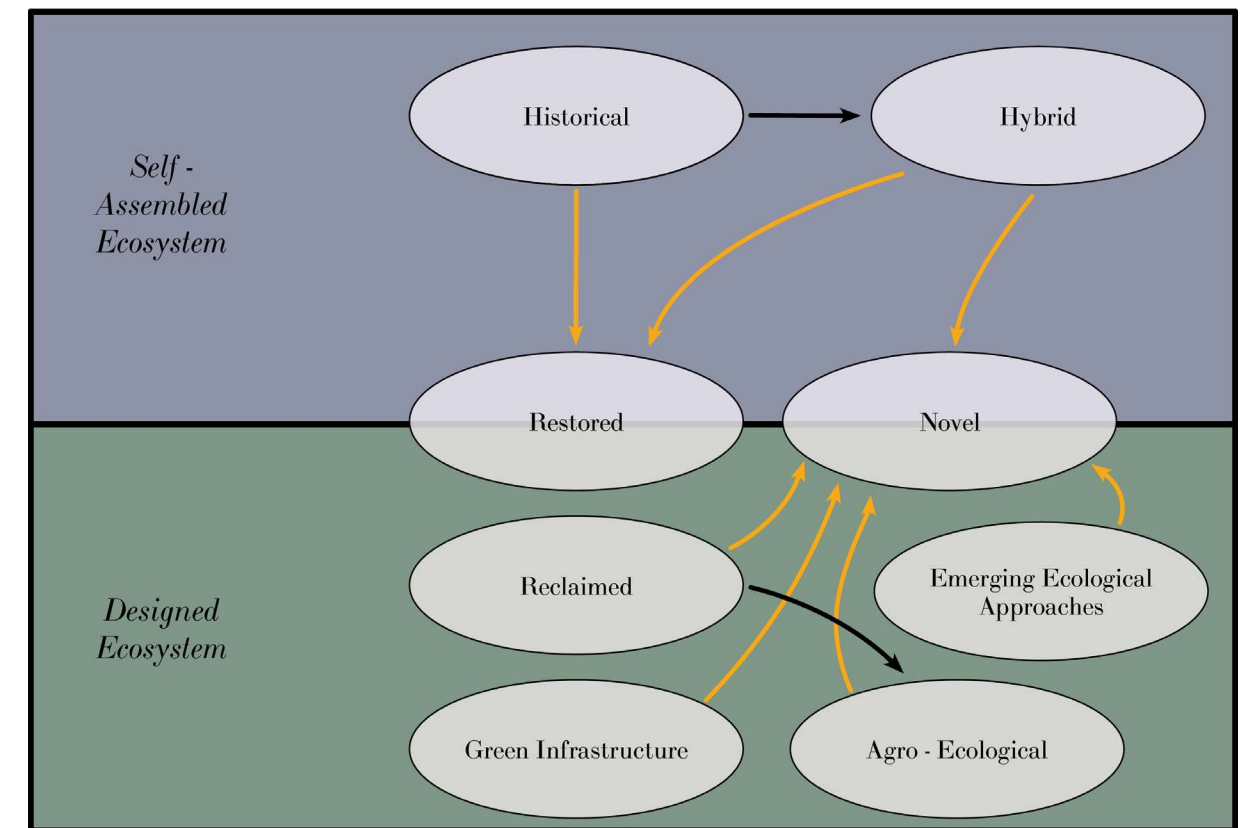


Figure 1: adapted from Higgs (2016). The yellow arrows represent processes which could be categorised as rewilding, with the black arrows representing non-rewilding processes. Both restored and novel ecosystems can be self-assembled from a degraded historical ecosystem, or designed by people for ecological integrity (Higgs 2016).

Restoration versus Rewilding Ecology

There is an ongoing conflict between some restoration ecologists and rewilding ecologists. The Society for Ecological Restoration (SER) defines ecological restoration as:

'the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed'.

This has an emphasis on returning a degraded ecosystem to its historic trajectory (SER, 2020), which requires an in-depth understanding of historical ecology. This relationship between nature and people is examined through data gathering - using historic maps, species lists and pollen data (Egan, Howell and Kurt, 2001). Applied to *Figure 1* – restoration is constantly striving to achieve a restored ecosystem, from one which is at a hybrid (with ‘alien’ species) or degraded state.

However, our world has been impacted by humans to such an extent that it is important to accept that restoration to historical conditions may not be possible. The late-quaternary mass extinction of megafauna due to human activity (Bartlett *et al.*, 2016) has altered the landscape function of areas of woody vegetation (Bakker *et al.*, 2016). To restore the same ecological function, a proxy species would need to be introduced. Restored ecosystems are dependent on a thorough knowledge of the historical ecology of a site, which is difficult to establish and increases in difficulty as one reaches further back in history (Beller *et al.*, 2017). In addition to this, changing climatic conditions may make the restoration of historical states unachievable.

Rewilding is not goal-driven, striving for a historical state, but process-led, implementing minimum intervention and using historical ecology as an inspiration rather than a template (Corlett, 2016a). This could incidentally result in a restored ecosystem but is more likely to become one which is novel.

The theories of rewilding and restoration ecology have further diverged in recent years, with trophic rewilding having overtaken the previously favoured concept of Pleistocene rewilding – which uses the Pleistocene era as a historical benchmark for restoring ecological processes (Pettorelli *et al.*, 2018).

Critics of rewilding, and trophic rewilding in particular, state that there isn’t enough scientific backing to support large-scale animal reintroductions (despite generally having positive effects on ecosystem function when they have been implemented), meaning that the element of risk is too high (Rubenstein and Rubenstein, 2016). Whilst there is not much literature directly related to trophic rewilding, there have been extensive studies on trophic cascades (Rubenstein and Rubenstein, 2016) and rewilding advocates acknowledge the need for more empirical research on the effects of trophic rewilding (Svenning *et al.*, 2016).

Restoration v2.0

With wider acknowledgement that we are now entering the Anthropocene, restoration ecology is changing –historical reference points have less relevance in a world affected by climate change and dominated by humans (Harris *et al.*, 2006; Jackson and Hobbs, 2009)

Martin (2017) provided a more human-centred amended definition of ecological restoration, which considers ecosystem services:

‘Ecological restoration is the process of assisting the recovery of a degraded, damaged, or destroyed ecosystem to reflect values regarded as inherent in the ecosystem and to provide goods and services that people value’

The modernised version of restoration is sometimes referred to as Restoration v2.0. It is less goal driven - adopting pragmatic, socio-ecological goals using history as a guide rather than a template (like rewilding), and requires multiple trajectories to be identified rather than just one (Higgs *et al.*, 2014).

Restoration v2.0 has the potential to be compatible with rewilding. Whilst rewilding is usually not goal-driven but process-led, broad human-influenced goals rather than specific ecological goals may allow rewilding to come under the umbrella of habitat restoration (see *Figure 2*).

However, the history which trophic rewilding uses as a template is not always the same as that of restoration ecology. Trophic rewilding runs on the assumption proposed by Frans Vera (the visionary behind the Oostvaardersplassen), that the historical European ecosystems were mostly woodland pasture rather than the previously accepted theory of a closed-canopy (Vera, 2002). Vera suggests that forest systems are not constantly ‘closed’, but dynamic systems which alternate between states of park, scrub, grove and ‘break-up’ – which involves the tree canopy opening up due to the death of trees. This theory acknowledges the important role of large herbivores in forest systems to create a mosaic of habitats, boosting long-term conservation value (Rooney *et al.*, 2015; Schulze, Rosenthal and Peringer, 2018). Trophic rewilding aims to reintroduce previously existing ungulate species (or domestic proxy species) to provoke top-down trophic cascades (Svenning *et al.*, 2016) and create this mosaic of habitats.

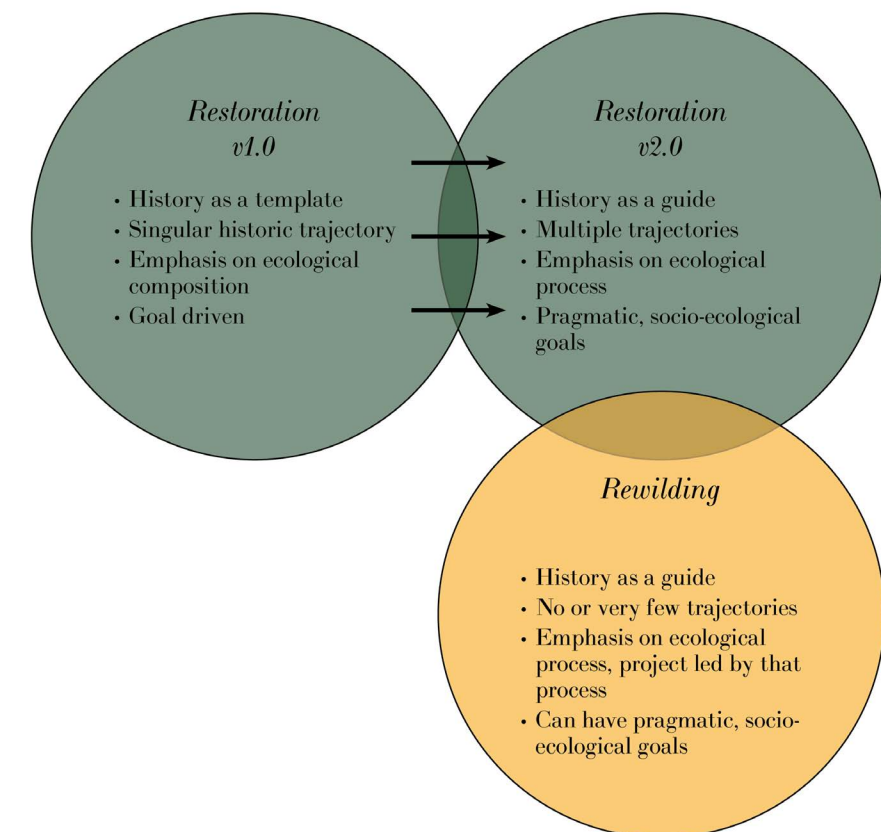


Figure 2: adapted from Higgs *et al.* (2014), this visual shows the overlap between the principles of Rewilding and Restoration v2.0, and the lack of overlap between Rewilding and traditional ecological restoration.

3.3. How Has Rewilding Been Incorporated into Policy?

With government's increasingly making commitments to reduce carbon emissions (UNFCCC, 2020) and improve their natural environments, there is a global opportunity for rewilding to find its way into national and international legislation.

The UK became the first country to declare a climate emergency, making a commitment to reduce carbon emissions to zero by 2050 (BBC, 2019). This has already started to have an impact, with the planned third runway at Heathrow Airport being ruled by the courts as not consistent with this declaration and the Paris Agreement (Carrington, 2020a).

The UK government are aware of rewilding's potential for the provision of ecosystem services (The Parliamentary Office of Science and Technology, 2016), but it has not yet been directly referred to in policy documents. However, the governments' new Agriculture Bill is seen as an opportunity to incorporate rewilding into law. With the UK leaving the EU, part of the new bill is to replace the EU's Common Agricultural Policy (CAP) for farming subsidies. The new Environmental Land Management Scheme aims to provide 'public funds for public services' through awarding land management contracts to landowners (Harvey, 2020). These contracts will aim to create enhanced landscapes, thriving wildlife and climate change mitigation and adaptation measures (Harvey, 2020). A report by Rewilding UK (2019) pledged support for the concept of 'public goods for public services' and suggested that carbon sequestration be included as a public good. They also calculated the value of potential carbon sequestration (per hectare) for a variety of different habitats, using a specified carbon price multiplied by the sequestration rate of that habitat. The response from Parliament suggested that carbon sequestration will have a role in land management contracts as part of the new Agriculture Bill but stopped short of committing to supporting rewilding as a carbon sequestration method (UK Government and Parliament, 2019).

In the EU, the legislation is goal-driven for the protection of specific species compositions and habitats, primarily through the Birds Directive and the Habitats Directive (Petturelli *et al.*, 2018; Root-Bernstein, Gooden and Boyes, 2018). The EU approach is subsequently in line with the methods of Restoration v1.0. In addition, the current agricultural subsidy system (the CAP), does not encourage farmers or land owners to create rewilding schemes, as it incentivises maintaining land as agricultural (Petturelli *et al.*, 2018). Fortunately, both within the UK and the EU, an increasing number of environmental NGOs are forming which champion rewilding (such as Rewilding UK) with the aim of influencing policy (Root-Bernstein, Gooden and Boyes, 2018).

The sites with protection under the EU Birds and Habitats Directives are designated as Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), creating a Europe-wide network called Natura 2000 (European Commission, 2008) (see *Figure 3*). Following lobbying from the NGO Wild Europe, with the support of 150 other organisations, the EU agreed to increase protection and funding for areas of wilderness (Root-Bernstein, Gooden and Boyes, 2018). Subsequently, the European Commission created guidelines for non-intervention management for 13% of the land in Natura 2000 sites which 'contain

wilderness qualities' (European Commission, 2013). This has 'opened the door' for rewilding to be supported by EU policy in these areas - though this has not yet happened, with policy-makers reluctant to support the reintroduction of large herbivores without more empirical evidence of their benefits (Root-Bernstein, Gooden and Boyes, 2018).



Figure 3: Natura 2000 sites, both terrestrial and aquatic. Image created using ArcGIS.

With connectivity a key issue in trophic rewilding, Natura 2000 sites could offer a starting point to create an interconnected network of natural areas between which animal species could migrate. However, Natura 2000 sites and Nationally Designated Protected Areas (NDPAs) don't necessarily indicate wilderness – particularly when compared to the European Wilderness Quality Index in *Figure 4* (Fisher *et al.*, 2010). Areas of wilderness are potentially more appropriate for trophic rewilding, due to a lower proximity to humans.

In the EU, abandonment of agricultural land in less productive areas creates an opportunity for new areas of wilderness to arise (Pereira and Navarro, 2015). A report for WWF Netherlands estimates that by 2030, agricultural land abandonment will amount to 168,000 km² (IEEP, 2010). For large-scale rewilding to be achievable in Europe, EU policy must encourage rewilding in areas other than just Natura 2000 sites - also on low-productivity agricultural land, NDPAs and areas already high on the Wilderness Quality Index.

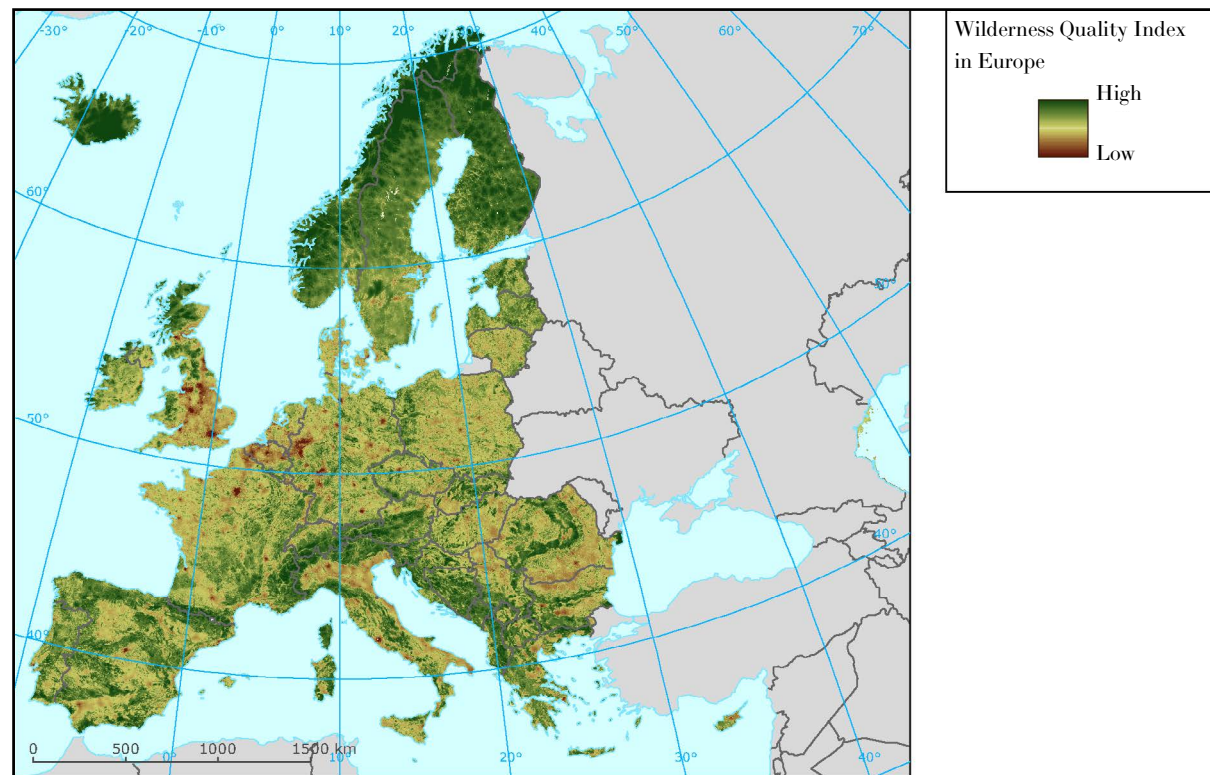


Figure 4: Wilderness Quality Index, showing areas with high wilderness quality in green (Map taken from European Environment Agency, 2011)

3.4. Case Studies

Oostvaardersplassen, Netherlands



Figure 5: Greylag Geese and Konik Ponies at the Oostvaardersplassen. Photo from: www.staatsbosbeheer.nl

The Oostvaardersplassen gradually developed into wetland after a proposed agricultural development fell through. The experiment, led by Frans Vera (dubbed the Father of rewilding) started after a large population of Greylag Goose, *Anser anser*, colonised the area and grazed the marsh plants – preventing the expected ‘closing’ of the marsh and preserving the areas’ character and biodiversity. In 1983, Vera and his team at the Staatsbosbeheer (State Forestry Service) decided to introduce large herbivorous species to maintain the adjacent grassland for the benefit of the geese, using domesticated breeds as trophic replacements of Aurochs (Heck Cattle) and Tarpan (Konik Ponies). In addition, Red Deer colonised the area. The herbivores prevented the development of closed-canopy forest, contradicting the dominant ecological theory of the time (Vera, 2000), as mentioned in Section 3.2.

Without natural predators, however, the herbivore populations needed to be self-regulatory. By 2010, the herbivores had apparently reached their carrying capacity, as numbers started declining (ICMO2, 2010). However, in 2018, after 3 successive mild winters, the populations had boomed (Barkham, 2018), with a harsh winter then causing mass starvation which led to over half of the grazers being culled or dying naturally. A public outcry, primarily from animal rights activists, subsequently led to a change of management, with the project no longer self-sustaining (Yin, 2019). It became apparent that the improvement in animal welfare (caused by allowing the animals to fully exhibit natural behaviours) was contradicted by starvation and lack of shelter from adverse environmental conditions. A new policy to keep grazer populations below carrying capacity and create new natural areas of shelter was devised by a group who assumed control of the project – with Frans Vera no longer involved (Staatsbosbeheer, 2020; Yin, 2019).

The Knepp Estate, Sussex



Figure 6: Old English Longhorn cattle surrounded by scrub at Knepp. Photo from www.knepp.co.uk

Inspired by Frans Vera's theories and the Oostvaardersplassen experiment, The Knepp Estate is composed of former agricultural land, rewilded when the existing dairy and arable farm owned by the estate was no longer profitable. The owners introduced a mix of Old English Longhorn cattle, Exmoor Ponies and Tamworth Pigs as proxies for their natural ancestors, along with Red Deer to join the existing Roe Deer (Tree, 2017). This was made possible due to funding from the Countryside Stewardship Scheme, enabling fencing to be erected around the 3 'blocks' of previously enclosed fields. The project also integrates a river restoration scheme, removing engineered elements of the river Adur which runs through the site.

The project has recorded many biodiversity successes – all of which were unplanned, due to the processes being nature-led rather than goal-driven. Dung beetle biodiversity has significantly increased (Brompton, 2018) – which is noteworthy, as they are biological indicators (Davis *et al.*, 2001). Knepp now has the largest breeding population in the UK of Purple Emperor Butterflies (*Apatura iris*), plus being a nationally important breeding site for the threatened species of Turtle Doves (*Streptopelia turtur*) and Nightingales (*Luscinia megarhynchos*) (Tree, 2017).

Herbivore populations are controlled and the meat from the cattle is sold to help cover the running costs of the project. Eco-tourism has been integrated, with the introduction of 'wildland safaris' and an on-site campsite. The owners state that it is considerably more economically sustainable than using the land for agriculture (Tree, 2018) – meaning that Knepp can be used as a blueprint for other agricultural land which is struggling financially.

Wild Ennerdale, Cumbria



Figure 7: Water being held on the floodplain. Photo from Wild Ennerdale

The Wild Ennerdale scheme is in the Ennerdale valley and around Ennerdale Water, which currently provides water to 60,000 homes. It was established by a partnership of the landowners in the valley: The National Trust, The Forestry Commission, and United Utilities (the water company who own the lake). Their vision is:

'to allow the evolution of Ennerdale as a wild valley for the benefit of people, relying more on natural processes to shape its landscape and ecology' (Wild Ennerdale, 2018)

The emphasis at Ennerdale is to create a balance between the requirements of nature and those of people – reducing the scale of human intervention by placing constraints on the way the landscape is used (Browning & Gorst, 2013). It uses the present as a starting point: acknowledging that the landscape has been shaped by, and must accommodate, human activity. With no specific ecological aims it can be categorised as rewilding rather than restoration.

Intensive sheep grazing was removed, replaced by free-roaming Galloway Cattle and a new fencing network to limit their movement. The removal of a bridge allowed the movement of gravel downstream – enabling the river to adopt a natural, dynamic course and encouraging natural processes to take place. This has increased the ability of the floodplain to reduce flooding downstream and improved the water quality, allowing for an increase in fish and freshwater mussel populations (Wild Ennerdale, 2018).

The land is not completely 'wild' – there is still an economic benefit through forestry and beef production, but it is natural farming system with an emphasis on biodiversity. It is hoped that the future Agriculture Bill will encourage more holistic farming schemes like Wild Ennerdale, particularly in designated areas such as The Lake District National Park, where biodiversity and nature are high on the agenda. However, upland shepherding is seen as a strong part of the cultural heritage of the area, so converting areas of intensive sheep grazing to areas of rewilding could be controversial (Mansfield, 2015).

| | <i>Oostaadersplassen</i> | <i>Knepp Estate</i> | <i>Wild Ennerdale</i> |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date established | Land reclaimed in 1968, grazers introduced in 1983 | 2003 | 2006 |
| Size | 5600 hectares | 1400 hectares | 5000 hectares |
| Owners / stakeholders | Publicly owned, managed by the State Forestry Service (Staatsbosbeheer) | Privately owned by the Burrell family, created with funding from UK and EU public bodies. | Land owners are The Forestry Commission, The National Trust and United Utilities. Natural England are involved as the site is an SSSI. |
| Type of rewilding | <ul style="list-style-type: none"> Active (originally combination of land draining and creation of site boundary, more recently creation of natural shelter areas) Trophic (introduction of grazers) | <ul style="list-style-type: none"> Active (erecting fence boundaries) Trophic (introduction of grazers) | <ul style="list-style-type: none"> Active (removal of sheep grazing, changing fence boundaries and removing a bridge) Trophic (introduction of cattle) |
| Type of ecosystem (applied to <i>Figure 1</i>) | Between reclaimed and novel | Between reclaimed and novel | Between reclaimed and novel |
| Nature Designations | Ramsar wetland | None | 40% of the site is an SSSI and SAC |
| Purpose | Experimental conservation | Conservation | Conservation & water quality |
| Challenges | <ul style="list-style-type: none"> Fluctuating herbivore populations, leading to overpopulation after a mild winter. Subsequent high mortality rate. | <ul style="list-style-type: none"> Difficulty in achieving funding for fencing which was key for the project. UK and EU laws have been a barrier, restricting natural processes (such as allowing carcasses to naturally decay). | <ul style="list-style-type: none"> Convincing all members of the partnership to 'challenge the norms' of land management - particularly within the Forestry Commission, who queried the loss of timber production (Natural England, 2008). Cattle presence by the lake water supply has led to United Utilities to raise concerns about water quality. |
| Criticisms | <ul style="list-style-type: none"> Primarily animal welfare complaints. Traditional ecologists criticism of Frans Vera's woodland pasture theory. | <ul style="list-style-type: none"> Traditional ecologists criticism of woodland pasture theory. Local farmers stating that the land should be used primarily for food production. Other rewilders stating that Knepp isn't 'true' rewilding due to the need for management by humans. | <ul style="list-style-type: none"> The ecological nature of the project prompted some stakeholder complaints that cultural and archaeological heritage was being sacrificed Some local farmers have negative attitudes towards the project - largely because rewilding is seen as a threat to the sheep farming industry. |

Table 1: comparing elements of the three case studies.

4. Public Consultation and Accessibility

Public engagement is important – as demonstrated by the controversy at Oostaadersplassen, which ultimately led to large changes to the project. One of the problems was lack of access to the site – people couldn't see the thriving bird life, all they saw were emaciated animals.

4.1. Public Access

Rewilding brings ecosystem services, such as carbon sequestration and biodiversity, but one of the main economic drivers for schemes is tourism (Tanasescu, 2017). Providing access for tourists should therefore be a priority for new rewilding schemes. However, human activity such as walking, mountain biking and off-road driving can have negative effects on wildlife (Marzano and Dandy, 2012) – particularly on the social structure and population performance of large ungulates (Manor and Saltz, 2003). It may be important to limit access to natural areas, although this could make public opposition more likely. It is therefore vital to create novel and exciting ways for people to explore rewilding sites whilst mitigating disturbance - particularly those with ungulates and ground-nesting birds.

Figure 8 explores examples of landscape architects being involved in increasing access to natural areas:

- Topia Landscape Architects created raised walkways providing routes through the forest in the Arninge-Ullna Riparian Forest Park conservation scheme in Stockholm. The forest floor is protected from tramping and visitors are restricted to footpaths
- To minimise wildlife disturbance at the Grand Voyeux Regional Nature Reserve, France, Terretaires Landscape Architects created viewing platforms, a raised walkway above the wetland and a tubular animal hide.
- Simply creating naturalistic paths can maintain a sense of wilderness and effectively guide people through a landscape. The use of natural materials at the waterfall of Skjervsfossen, Norway by Østengen & Bergo Landscape Architects, makes the site an exciting place to visit.
- Similarly, the MacKenzie Falls Gorge Trail in Australia, by The Hansen Partnership, created an attractive naturalistic path in a previously inaccessible area.



Figure 8: Clockwise from top left – walkway at Arninge-Ullna Riparian Forest Park, Stockholm (photo: Oscar Segerstrom); tunnel and viewing area at Grand Voyeux Regional Nature Reserve, France (photo: Nicolas Waltefaugle); walkway at MacKenzie Falls Gorge Trail, Australia (photo: Andrew Lloyd); steps to waterfall at Skjervsfossen, Norway (photo: Ostengen & Bergo AS)

4.2. Engagement

Another key factor in the perception of a project is effective communication. In private areas of land such as the Knepp estate, public opposition - while still important to consider – does not necessarily prevent the project from going ahead. The owners faced opposition from neighbouring farms but were in the rare position of having a huge area of land which they were willing to turn over to nature. Unlike most projects, they had full control of what happened to the land (within the confines of the law).

Rewilding in public areas, or land which is frequently visited and highly valued (such as National Parks), requires a larger amount of collaboration and consultation, as it is still a controversial subject with many stakeholders who live in these areas. As mentioned in relation to Wild Ennerdale, areas of countryside in the UK often have a strong cultural heritage which centres around agricultural practice – particularly upland shepherding in National Parks such as The Lake District, The Yorkshire Dales and The Peak District. The conflict between proponents of large-scale rewilding and those who want to protect these cultural landscapes requires careful consideration and mediation. Wild Ennerdale could act as a point of inspiration for similar sites – the project removed sheep grazing from a landscape which has a strong association with its' agro-pastoral use (the lake district was declared a UNESCO world heritage site for these reasons in 2017 (UNESCO, 2017)). It avoided direct conflict with farmers due to the land being owned by the members of the partnership.

Farmers are often a potential barrier to rewilding projects. With 72% of the UK's land agricultural

(DEFRA, 2019), farmers are often major stakeholders in potential sites so it is important to engage and encourage them. However, the National Farmers Union (NFU) currently reject the notion of large-scale rewilding in their plan for farming to achieve net zero carbon emissions by 2040 – dismissing it as 'not economically or socially viable' (NFU, 2019).

Indeed, an ambitious rewilding plan encompassing 10,000 hectares of Wales called 'Summit to Sea' was forced to scale-back following opposition from local farmers. Rebecca Wigley, the CEO of Rewilding Britain, blamed poor communication for their forced withdrawal from the project. She said:

“To succeed, it has to be community led and community supported as it finds ways to help both people and nature to thrive. While Summit to Sea held a series of face-to-face meetings and consultations locally, we should have communicated more widely that the project was to be community led and owned.” (Rewilding Britain, 2019)

This emphasises the importance of public consultation from the earliest stages of a project. Social-ecological frameworks are often used to analyse interactions between social and natural systems – usually to explore ecosystem services – but these can show a lack of understanding of human nature at the individual and collective level (Muhar *et al.*, 2018). Bauer, Wallner and Hunziker (2009) conducted a survey on rewilding attitudes in Switzerland, concluding that:

“when managing landscape change, all stakeholders are included in a participatory process and we advise a thorough assessment of the attitudes of the involved persons towards nature and rewilding at the start of such processes”

One of the main tenets of landscape the landscape profession is community engagement. Thompson, (2002) analysed literature and interviewed people in the landscape profession, finding three main value areas: community, ecology, and aesthetics (see Figure 9). Successful landscape projects combine these three values in a variety of ways, with different emphases depending on the nature of the project.

Rewilding projects must consider all three of these values when creating a scheme – with an emphasis on community and ecology.

Landscape professionals could engage a variety of stakeholders, such as government organisations, charities, NGOs and community groups to forge partnerships, while acting as mediators when conflicts arise. As competent verbal and visual communicators, they are arguably the most well-suited profession to bring the tenets of community, aesthetics and ecology (and their associated organisations) together and help implement a successful scheme. In the case of rewilding, community engagement could be used to educate and encourage farmers and other landowners to turn part of their land over to nature, in addition to identifying suitable areas and creating a collaborative scheme which would help foster a sense of community ownership and pride.

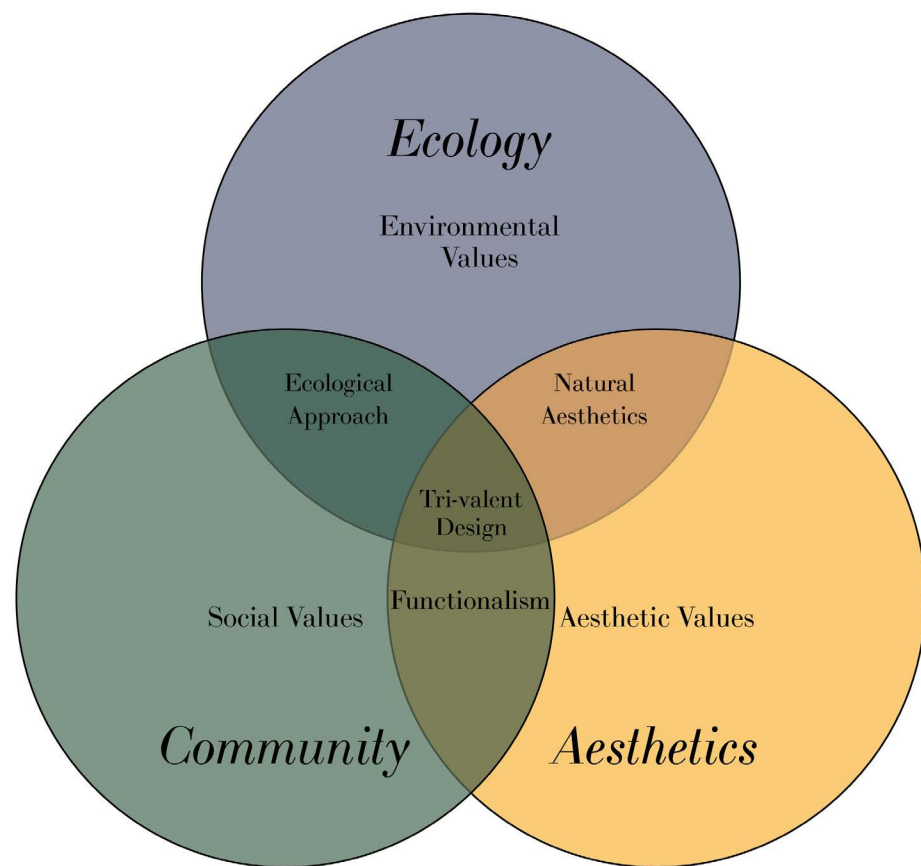


Figure 9: The three main value areas of landscape professionals, adopted from Thompson (2002).

4.3. Advocacy

Landscape professionals could also act as rewilding advocates – raising its profile through political and public engagement, while encouraging clients to consider incorporating elements of rewilding in schemes. Exposing people to the concepts of rewilding at any scale would increase public interest and enthusiasm, inevitably leading to more successful schemes. The landscape professionals’ ability to create visually-striking visuals is another way in which people in the profession can advocate for a scheme – conceptually visualising a space is an effective method for gaining public support and increasing a projects’ profile.

Landscape professionals engage with the political realm through an understanding of planning and environmental policy and campaigning for changes to these where they see necessary. The policy team at the Landscape Institute (the professional body for landscape architects in the UK) are very active in this regard – upon the formation of the new government in 2019, they produced a document named ‘12 Asks of the New Government’ (The Landscape Institute, 2019) – which included investing in green infrastructure and cutting net emissions. They also frequently issue responses to policy changes and environmental issues after consulting their members. Some within the landscape profession have shown an interest in being involved in rewilding (Houlston and Shepherd, 2016) - perhaps there is an opportunity for the Landscape Institute to put pressure on local, national and international (as mentioned in Section 3.3.) governments to provide legislation or funding for new schemes.

5. Rewilding at Smaller Scales

Currently, much of the rewilding literature focusses on large-scale rural land – particularly in regard to trophic rewilding which relies on free-roaming herbivores over large areas. However, using the Navarro & Pereira definition of rewilding, the principles of rewilding could be applied to smaller-scale urban projects. With ‘true’ rewilding (no human intervention) not yet achieved on the case studies listed in Chapter 3, rewilding can be interpreted ‘on a spectrum’ (see Figure 10), from a high amount of human intervention to none at all. This chapter will explore how the current interest in rewilding presents an opportunity for the concept to be explored in urban areas – dividing these opportunities’ typologies and providing them with definitions.

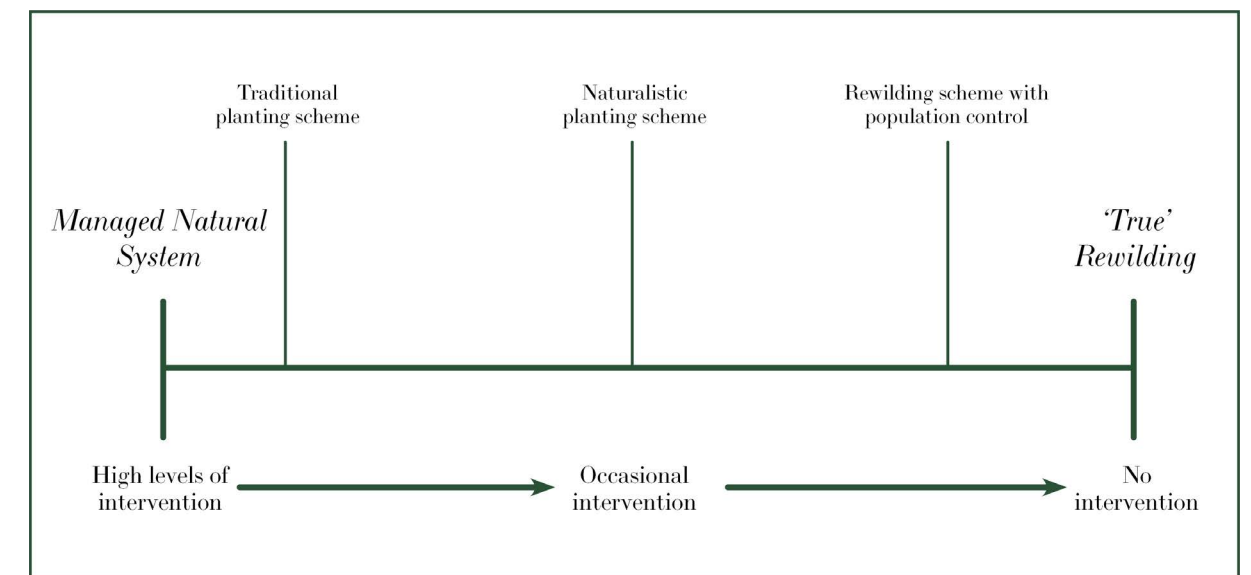


Figure 10: rewilding on a spectrum, showing different levels of intervention. The figure shows three examples of natural systems: traditional planting schemes require consistent weeding, pruning and replacement of plants; naturalistic planting schemes require occasional weeding and ‘cutting back’; and trophic rewilding schemes (without a predator) require population control to prevent over grazing and/or starvation.

5.1. Designed Planting

Landscape professionals are at the forefront of planting design, with recent trends favouring the creation of an ecological system which emulates semi-natural plant communities, reducing the need for ongoing maintenance (Hitchmough, 2004). This technique is not incompatible with active rewilding- allowing the composition of the plant community to naturally evolve as the plants compete. A paper from Alizadeh and Hitchmough (2019) proposed that a greater understanding of the ecological character of individual species, or autecology, is required for fewer failures in designed planting. Nonetheless, even successful naturalistic planting plans require weeding, particularly in their early years before plants have fully established (Koningen, 2004). With ecological succession ‘frozen’ there is also a need to have ongoing weeding to remove any colonising later-successional plants (Dunnett, 2004).

In landscapes which have been degraded or altered by human influence (such as in urban areas), the soil microbial community may not be appropriate to support a semi-natural plant community. Arbuscular mycorrhizal fungi (AMF) form a symbiosis with the roots of a plant, with 80-90% of plants having

species-specific associated AMF (Wang and Qiu, 2006). A study by Koziol and Bever (2017) inoculated some plots with AMF from a North-American prairie habitat before introducing a prairie seed-mix – they found that the inoculation drove plant community composition, leading to the dominance of desirable plant species. This technique could reduce management pressures in naturalistic planting design. One could inoculate a plot with the AMF mix specific to a desired plant community, then simply add the correlating seed-mix.

Through a greater understanding of the autecology of plants and the composition of AMF for specific desired habitats, there can be a greater amount of control in the composition of designed plant communities whilst reducing the need for maintenance. There is further research needed for designed planting to be considered rewilding, so an aspirational definition of urban rewilding can be provided:

“rewilding for planting design is a form of active rewilding which creates the conditions for a sustainable plant community to form, which requires no - or very little - ongoing management”

5.2. Urban River Rewilding

‘River rewilding’ is applicable in both urban and rural areas – the whole river catchment affects its condition and flow. This section will examine how river rewilding could be achieved at the urban scale while *Section 6.3* will concentrate on the large-scale.

Most European cities have at least one river passing through them (EEA, 2016), with many rivers central to a cities’ culture and prosperity. However, most cities have a damaged relationship to their river – the industrial era led to the ‘hardening’ of edges, preventing rivers from taking their natural course. The pollution of rivers from industrial waste and sewage in the 19th and 20th centuries, and more recently from farming (Plimmer, 2019) and water companies (Monbiot, 2020), has caused huge ecological damage. A government report found that in 2016, only 14% of rivers in the UK had a good ecological condition (Environment Agency, 2018). Pollution of rivers has also led to the end of our traditional interactions with them - such as swimming, fishing, and boating (EEA, 2016).

Although urban rivers tend to be degraded landscapes, local councils do acknowledge that they are important parts of ‘green networks’. A paper from Ersoy, Jorgensen and Warren (2019) examined the green and ecological networks in the city of Sheffield, UK. They found that Sheffield City Council’s Core Strategy stresses the importance of green corridors, of which the cities multiple rivers, streams and valleys are a key component (see *Figure 10*).

In this case, the positive attitude from Sheffield City Council on improving urban river corridor biodiversity provides a good opportunity for these areas to be rewilded. The close proximity to the Peak District also provides the option of linking urban or peri-urban river corridors to rural areas of wildlife designation.

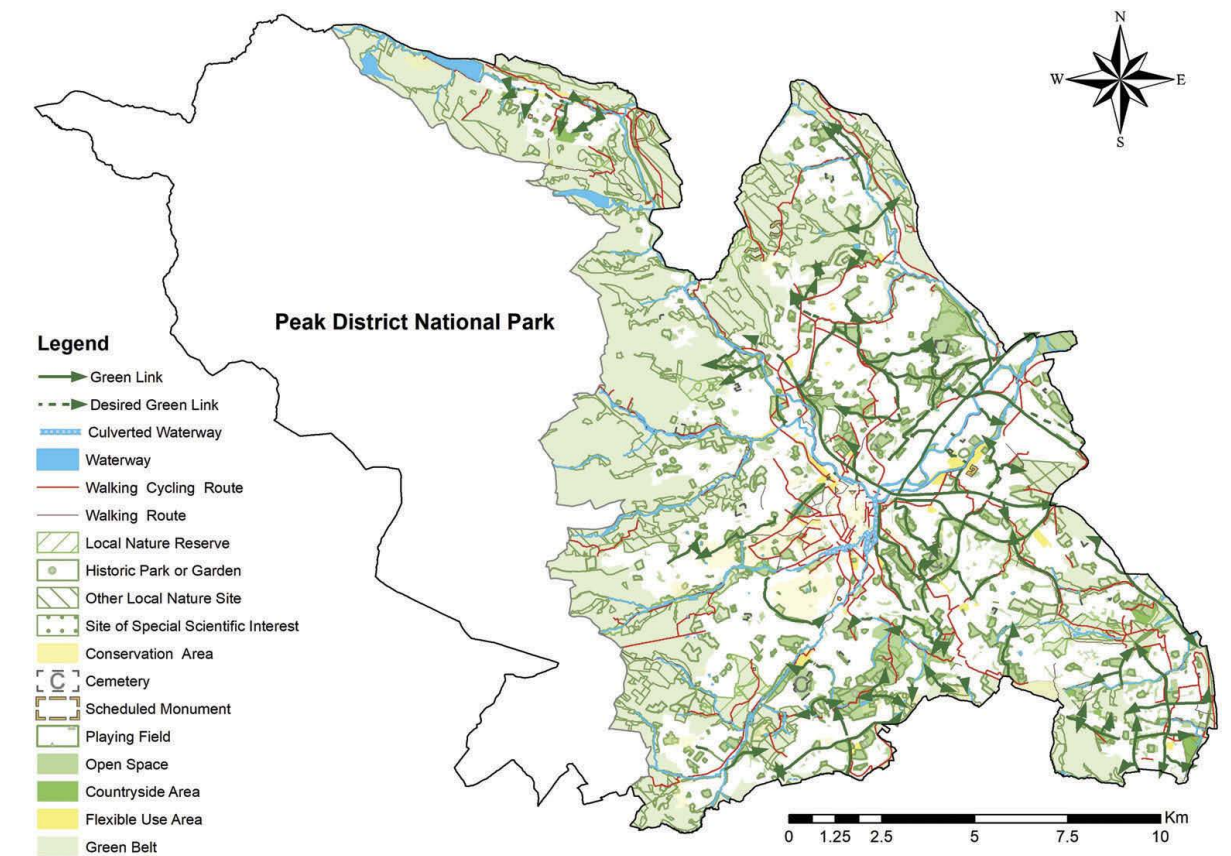


Figure 11: Green ecological networks in Sheffield, taken from Ersoy *et al.* (2019) but originally produced by Sheffield City Council Parks & Countryside. The network comprises of 12711ha, although this includes desired links, which are shown here in green arrows.

The ‘Room for the River’ project in The Netherlands is a wide-reaching response to the high flood risk in the country and makes interventions at 34 locations. H+N+S Landscape Architects helped create a ‘river bypass’ on the Waal river at Nijmegen, with a new channel absorbing high waters, resulting in the creation of an island which houses a nature park and beach (see *Figure 12*). The landscape architects’ ability to think holistically and combine the benefits of nature, innovation and recreation were important for the success of the project.

Other landscape professionals could take influence from the Room for the River project – incorporating elements of rewilding in future flood alleviation schemes. The landscape profession can also have a central role by making other urban river rewilding interventions, such as deculverting rivers and softening edges.

Urban river rewilding can be defined as:

“restoring natural processes to rivers by removing the human influence - this could be through the removal of artificial banks and allowing the river to regain a dynamic course, deculverting, and creating urban green networks with rivers providing important routes”

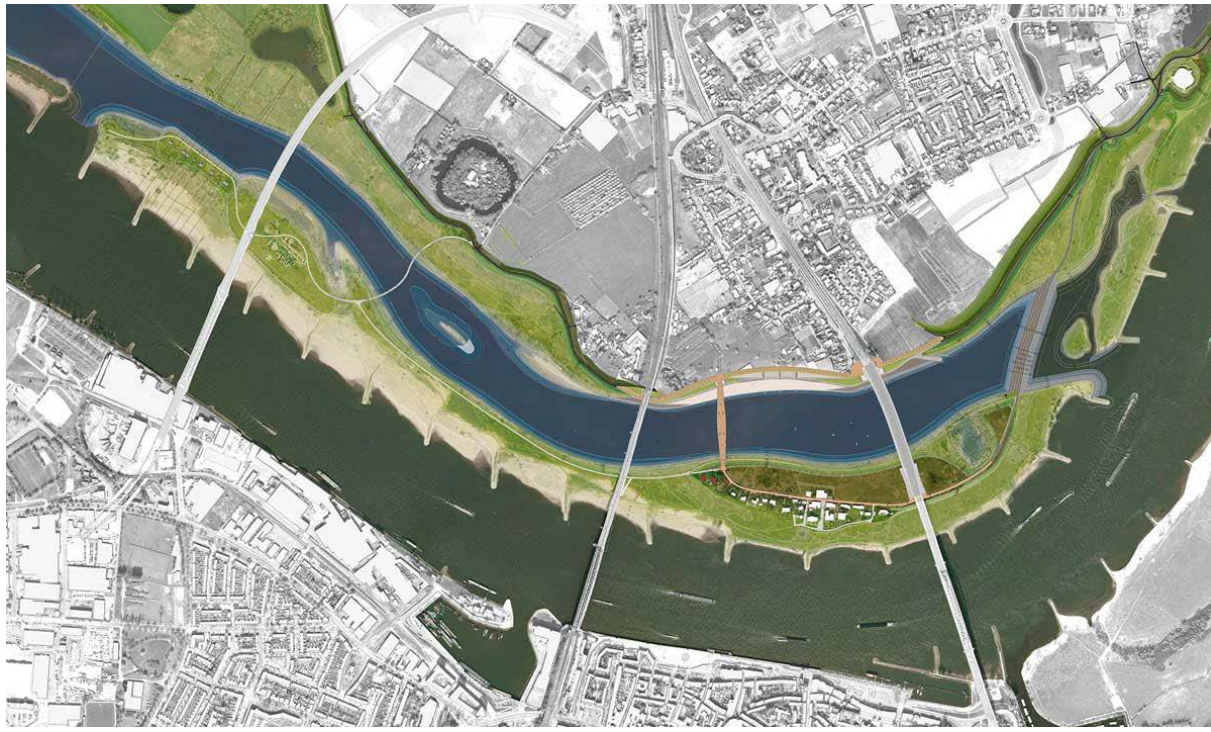


Figure 12: the Waal River bypass at Nijmegen, Netherlands. Created as part of 'The Room for the River' project, by H+N+S landscape architects. Image from H+N+S.

5.3. Urban Trophic Rewilding

Trophic rewilding in urban areas (including urban river corridors) would allow free-roaming grazers to migrate between areas, but could be problematic with built infrastructure such as roads and train tracks providing a barrier to movement. Grazing management is used in some isolated urban areas as an alternative to 'cutting management', primarily for ecological reasons (Harvey, 2002). For example, Sutton Park National Nature Reserve in Birmingham (see Figure 12), owned and managed by Birmingham City Council, has an area of lowland heath which is maintained by cattle and Exmoor ponies (Sutton Park, 2014). Whilst the park utilises natural processes, it cannot be classed as rewilding, as it is still heavily managed in other ways and is not aiming to reduce human input. Neither are the grazers truly wild – the ponies are constrained to a small area of heath which covers only 32 hectares, and the cattle, while free to roam, are owned by local farmers who remove them during the winter months (Harvey, 2002).

For urban grazing systems to be considered a form of rewilding, they need to be nature-led. Urban nature reserves such as Sutton Park would need to increase the number of grazers, house them in the park all-year-round and remove the restrictions of movement caused by internal fencing. Due to land-use pressures, urban conservation sites tend to be smaller and more fragmented than their rural counterparts. With a smaller site (<1000ha) the benefits of rewilding are limited, due to a higher edge-to-area ratio making autonomy more difficult (Corlett, 2016a) – habitat edges can cause changes in ecological conditions which can lead to a less stable ecosystem. Smaller habitats fragments also have reduced species richness (Collinge, 1996).

Sutton Park uses grazing animals to keep the habitat in a form of stasis as lowland heath – a rewilding scheme would instead aim for a dynamic mosaic of habitats, perhaps including lowland heath, but

acknowledging that the location and size of the heath may shift over time.



Figure 13: Fence to restrain the movement of the Exmoor Ponies at Sutton Park National Nature Reserve. The effect of grazing on the vegetation can be seen - the heath has sustained on the grazed area on the right. Photo from www.sp.scnhs.org.uk/conservation.html.

In urban areas, accessibility is especially important, so people can enjoy and explore local greenspace. If there are semi-wild herbivores which have a high visibility within the landscape, maintaining a high standard of welfare may be important. At the Oostvaardersplassen, ill and emaciated animals caused huge public opposition to the project, despite the site having low accessibility. Learning from this, potential sites should ensure that there is a prerequisite of appropriate natural shelter areas. Other animal welfare interventions could be due to the herds' health being monitored, perhaps utilising the help of local volunteers. These interventions could include:

- Providing veterinary care where appropriate
- Culling of dying animals
- Supplementary feeding of thin animals – as seen at Knepp (The Livestock Partnership, 2016)

Species and breed selection in urban sites could also be important. For example, highland cattle are popular due to their novel appearance, while cattle with horns can be perceived as dangerous (Harvey, 2002). Perhaps greater exposure to different breeds and non-dangerous species would reduce this anxiety over time. Some species reintroductions, however, wouldn't be appropriate for urban areas - the recently reintroduced European Bison (*Bison bonasus*) is potentially dangerous when in close proximity to humans (Carrington, 2020b).

Deer species are large herbivores which are already present in urban areas but differ from cattle, pigs and ponies, as they are truly wild. Much of the literature around deer populations focuses on the negative effects they have on forest regeneration when they reach a certain population density (Gill and Morgan,

2010), but this is often from the perspective of forest regeneration being the ultimate successional objective. Deer have possibly gained a bad reputation from grazing saplings which have been planted by humans, resulting in a stereotype that they are a barrier to ecological restoration. Deer have actually played an important part in rewilding projects at the Oostvaardersplassen and Knepp – where thorny scrub establishes first to protect saplings from grazers (Tree, 2018). Increasing opportunities for deer to migrate between urban areas of nature may aid urban rewilding efforts; nonetheless, densities may need to be controlled and areas which aren't part of a rewilding programme may need to be protected from intensive grazing.

Landscape professionals could provide connectivity routes between fragmented urban and peri-urban greenspaces, devising innovative solutions to the problems that could arise from free-roaming animals. The appropriateness of the location of urban rewilding schemes will need strong consideration and consultation with the public and stakeholders – landscape professionals are the best equipped to do this (as mentioned in *Section 4.2*) – with key considerations such as 'will the animals be safe?' and 'how will the local population respond to the scheme?'

Urban trophic rewilding can be defined as:

“introducing, or encouraging, large herbivores to naturally maintain urban green spaces while keeping human maintenance to a minimum. The emphasis is on managing the animals rather than the plants, to achieve broad biodiversity aims”

6. Landscape Planning and Management

This chapter will focus on the larger scale - with an emphasis on rural areas. The landscape professionals' role could be from the genesis of a project - by helping to form partnerships between interested parties - continuing through to implementation and management. How both disciplines of landscape planning and landscape management can help shape rewilding schemes will be examined.

6.1. Site Selection and Connectivity

Connectivity between natural areas is a key aim in rewilding schemes (Johns, 2019), to create a larger, less fragmented ecosystem and increase species dispersal. This should be achieved with a multiscale approach, from maintaining hedgerows for birds and insects, to creating wide corridors allowing the migration of large mammals (Perino *et al.*, 2019). Some strategic-scale restoration schemes aim to connect natural areas, such as 'Cairngorms Connect' in Scotland and 'The Great Fen' in the east of England – both are highly managed with specific goals, so aren't considered rewilding. However, they could form part of a rewilding network if the organisers were to allow free-roaming herbivores to move through their site. This would require restoration schemes to follow the guidelines for 'Restoration v2.0' and be more flexible in their goals.

Rewilding Britain have set out aims to 'upscale' rewilding nationally - transforming 120,000 hectares by 2022 (Rewilding Britain, 2020). This is an ambitious target in a short space of time – and as Rewilding Britain state, will be impossible to achieve without the input of landscape professionals (Houlston and Shepherd, 2016).

To help select rewilding sites, landscape professionals could carry out Landscape Character Assessments (LCAs). They can be used to analyse peoples' perceptions of a landscape, subsequently informing decision-making. However, LCAs alone do not provide a comprehensive guide for selecting sites with complex issues such as rewilding.

Multi Criteria Evaluations (MCE) (also known as a Multi Criteria Analysis or a Multi Criteria Decision Analysis) are a technique which predominantly use GIS software to combine biological, geographical, and social data (Malczewski, 2006), which landscape planners can use to decide the nature and location of a project. Integrating stakeholder preferences is important for choosing ecological sites (Uribe *et al.*, 2014). Martínez-Sastre *et al.* (2017) used this technique to combine social and ecosystem-services data to create 4 different scenarios for land management in the Sierra Morena mountain range in Spain (see *Figure 14*). The process was participatory, ensuring that all relevant local stakeholders were involved from the start. It aimed to minimise conflicts between these stakeholders while maximising the benefits of ecosystem services; before further consultation led to the selection of the favoured scenario.

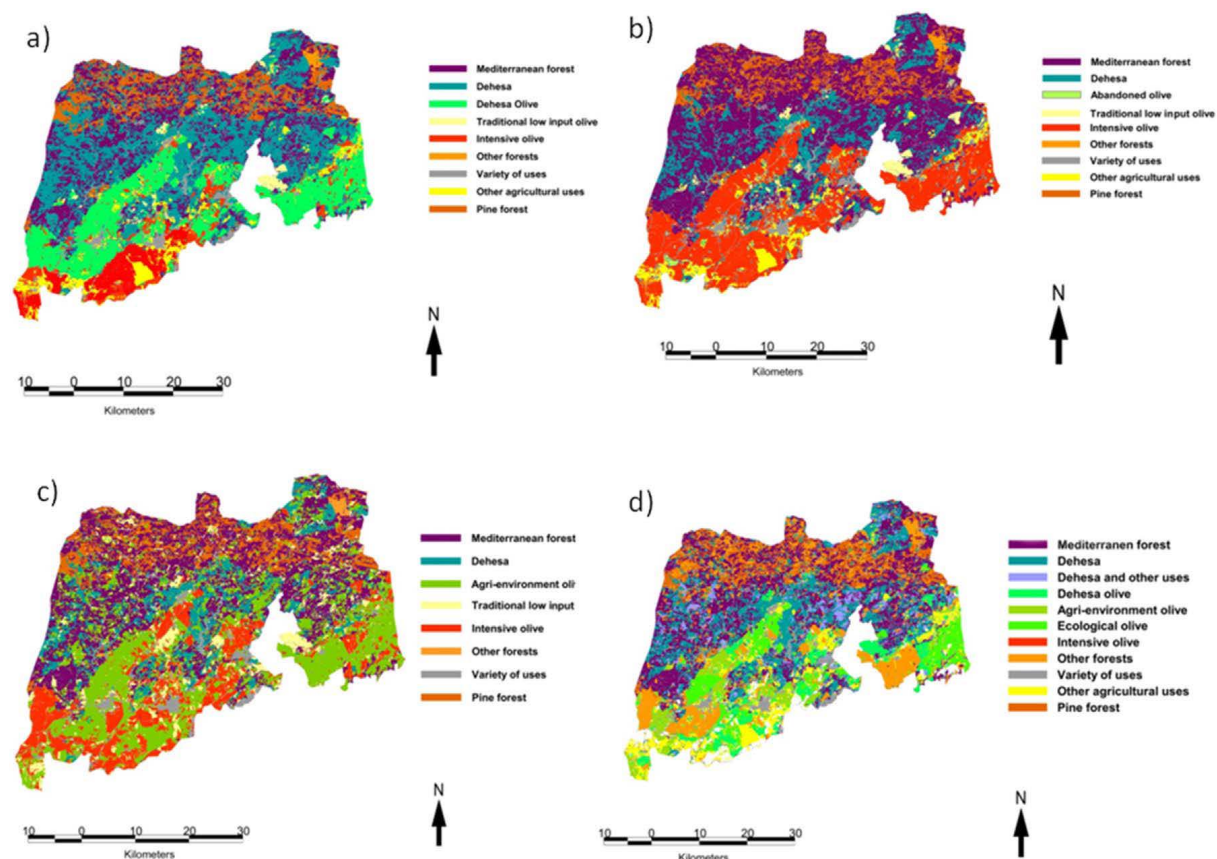


Figure 14: The four scenarios proposed as a result of MCE mapping by Martínez-Sastre *et al.* (2017). The scenarios are a) Scenario 1 "Intensified and green olive production" b) Scenario 2 "Business as usual" c) Scenario 3 "Back to livestock" d) Scenario 4 "Mosaic landscape". The stakeholders all agreed that Scenario 4 would be the most appropriate.

An MCE approach might be the most suitable for selecting rewilding areas - perhaps using Natura 2000 sites, areas high on the Wilderness Quality Index (mentioned in Section 3.4.) and LCAs as variables. Once the most suitable sites have been selected, further study and consultation could be utilised to identify the most appropriate routes and interventions for linking the sites, to achieve the connectivity required for successful large-scale rewilding. Connectivity interventions could include new areas of fencing and widening hedgerows.

Landscape professionals have a holistic understanding of social and ecological issues, so are well-suited for both conducting MCE's with special and social data, and identifying potential linkages between them.

6.2. Large-scale Active Rewilding

Human activity has caused rural areas to significantly change in character from their state of wilderness – particularly in the UK. Subsequently, passive and trophic rewilding processes won't always lead to a fully self-functioning ecosystem - interventions to reverse the anthropological effects on a landscape may be necessary.

Tree planting is required in some rewilding schemes. This could be due to high grazing pressure preventing sapling development – which led to a lack of tree and shrub cover (and subsequent lack of shelter for the grazers) at the Oostvaardersplassen (Theunissen, 2019). Some natural areas might be so isolated from seed sources due to habitat fragmentation, that it prevents natural tree colonisation. Indeed, the 'Trees for

Life' project in Scotland used active rewilding methods by planting native trees to restore Caledonian Forest habitat (Trees for Life, 2020b).

Landscape professionals could have a role in selecting areas for tree planting – such as the new animal shelter areas at the Oostvaardersplassen by Feddes/Olthof Landscape Architects, pictured in Figure 15 (Staatsbosbeheer, 2020). Tree selection may also be important: native trees which were historically present may no longer be appropriate. This could be in anticipation of, or in reaction to, the effects of climate change: such as warmer, dryer climatic conditions or a higher frequency of winter flooding. Diseases affecting native tree populations may also lead to the need for a wider planting palette.



Figure 15: the new areas of shelter planting at the Oostvaardersplassen. Map from www.staatsbosbeheer.nl

The removal of human-built infrastructure is another form of active rewilding. This could involve managed realignment of flood defences: which breaches coastal defence barriers to restore natural areas of tidal floodplain (French, 2006). For example, the 'Trees for Life' project reinstated bog woodland by blocking drainage ditches and restoring hydrological conditions, allowing vegetation to re-establish (Trees for Life, 2020b).

Active rewilding at a strategic scale could involve removing anthropological barriers which restrict the movement of animal species. These could be species introduced as part of a trophic rewilding scheme, or those already present, such as badger or deer. Interventions could include removing fences (like at Wild Ennerdale), or providing 'wildlife bridges' over roads or train tracks (Natural England, 2015).

Landscape professionals could be involved through analysing the landscape at the strategic scale – determining where interventions would be most appropriate.

6.3. River Catchment Rewilding

Extreme flooding events cause huge damage to both agricultural land and urban areas – the frequency of these floods are increasing due to climate change (Environment Agency, 2018) and increased urbanisation (Miller *et al.*, 2014). The traditional response to flooding is an engineered one: draining farmland in rural areas leads to more runoff to rivers, which in turn increases the need for built flood defences in urban areas. While engineered responses often deal with the effects of flooding, natural flood management (NFM) responses aim to deal with the cause. NFM slows the flow of water through a landscape, either by utilising or mimicking natural environmental conditions (Wingfield *et al.*, 2019). The Parliamentary Office of Science and Technology (2011) gives the following mechanisms which these natural processes aim to achieve:

- Water storage – using reservoirs, channels or ponds
- Increased soil infiltration – reducing water runoff from the surface
- Slowed water – by increasing flow resistance
- Reduced water flow connectivity – interrupting flow, perhaps through the presence of plants

NFM has been introduced at several UK sites, but has not been widely adopted as a flood management technique. The interventions at current NFM sites, such as Holnicote in Somerset (National Trust, 2015) and Pickering in Yorkshire (Nisbet, Thomas and Roe, 2015) have been man-made – introducing artificial dams, flood storage areas, seeding and planting. The success of these trials, along with others, prompted the Environment Agency to produce a series of papers in favour of the concept (Environment Agency, 2017) – with the government subsequently allocating £15 million for new NFM projects. This figure is dwarfed by the £1.3 billion average yearly cost of property flooding (DEFRA, 2012) and the £867 million yearly investment in flood defences planned for between 2021 and 2027 (Helm, 2020) – the proportion of this to be spent on NFM is not yet clear.

For rewilding to be compatible with NFM schemes, there needs to be a move away from projects with solely man-made interventions. This has started to happen through the reintroduction of the Eurasian Beaver (*Castor fiber*) as ecosystem engineers: they build dams to create pools in which they can protect themselves from predators whilst increasing the area of woodland riparian zones (Rosell *et al.*, 2005). This restores ecosystem processes, increases aquatic biodiversity (Law, Mclean and Willby, 2016) and most significantly, mitigates downstream flooding (Nyssen, Pontzele and Billi, 2011). Beavers can help to achieve the desired effects of NFM listed above – by storing and slowing water through their creation of pools and leaky dams, and by increasing soil infiltration (Westbrook, Cooper and Baker, 2006).

Following successful trials in Scotland and Devon, England, more beaver reintroductions are being called-for (Weston, 2020). However, some stakeholders have reservations – people who are involved in agriculture and fishing are likely to be opposed (Auster, Puttock and Brazier, 2020). Beaver dams can cause unpredictable flooding on agricultural land (Auster, 2018); while there are misconceptions that beavers eat fish and dam-making negatively affects fish stocks - when they actually have a net positive effect (Kemp *et al.*, 2012). Indeed, people who are more informed about beaver ecology tend to have a positive response to reintroductions, suggesting that greater education is needed (Auster, Puttock and Brazier, 2020).



Figure 16: Beavers at the River Otter in Devon. Photo by Mike Symes.

At Wild Ennerdale, the River Liza is no longer restricted by built interventions, allowing the whole of the wide valley floor to be utilised and a dynamic fluvial system to be re-established. This is a form of active rewilding – removing grazing and barriers to allow natural processes (both ecological and hydrological) to return has had a positive effect on flood mitigation and water quality. During the 2009 and 2015 floods in West Cumbria, the river broke its banks and filled the floodplain by moving between newly formed channels when one had become blocked by debris from the surrounding forest; where the water from other lakes became turgid and undrinkable, natural filtering caused Ennerdale's water to remain clear, with the river still fordable (Browning, 2014). By rewilding the valley, the flood peak was attenuated, and the sediment loads were decreased (Carver, 2016).

Landscape professionals could use a socio-ecological MCE to influence the nature of species reintroductions. Reintroductions can be controversial, and any conflicts with other stakeholders must be managed. A Beaver reintroduction scheme in Italy used a SWOT analysis and MCE to determine the most appropriate location in the area (Treves *et al.*, 2020). The landscape professional could also use mapping to create buffers around rivers and chart the current and potential floodplains to reduce damage to agricultural/developed land and mitigate flooding.

6.4. Landscape Management

Landscape architects and planners tend to focus on designing and implementing a scheme, but for an ongoing rewilding project, there needs to be a system in place for post-implementation management. For this study, it is assumed that the post-implementation will be carried out by a 'Landscape Manager', although this could in fact be the same practitioner (or practice) as the 'Landscape Architect'.

The relationships between the managers of a rewilding project and its' stakeholders are ongoing – with a nature-led system liable to result in unexpected outcomes which may have a knock-on-effect to

stakeholders.

For example, if the area is designated a Site of Special Scientific Interest (SSSI) – any proposed changes to the site which might have negative environmental repercussions would need to gain permission from Natural England before going ahead. This would give third-party groups who use the land (such as farmers) less flexibility in how they choose to manage it. The landscape manager would need to communicate this possibility to farmers from the start of a project and provide reassurance or other options.

It would be the landscape managers responsibility to foresee conflicts between stakeholders and act as a mediator to alleviate problems. They would ideally take a ‘landscape ecology’ approach – which focuses on strong communication between scientists, policy makers and landscape managers (Freeman and Ray, 2001).

The landscape manager would have an up-to-date knowledge of local and national policy – keeping abreast of any policy changes which might affect the project; a close relationship to the local government would be beneficial. Ongoing relationships with NGO’s (such as Rewilding Britain), charities (such as the RSPB) and Public Bodies (such as Natural England) could help to secure ongoing funding to sustain a project and provide improvements.

For a trophic rewilding project, to draw up an effective management plan, the landscape manager would need an understanding of the autecology of the animals which are being managed. Species selection depends on the ecological functions which are being aimed for and would ideally use a decision framework to help determine the most appropriate animal (Svenning *et al.*, 2016).



Figure 17: Eurasian Lynx (*Lynx lynx*) are one of the species suggested for predator reintroductions in the UK. Photo by Tom Bech.

The subject of predator reintroduction is hugely divisive (Bauer and von Atzigen, 2019). If predators were to be introduced to a scheme, perhaps a few years in, when herbivore populations become high (and perhaps when the public are more open to the prospect of wild carnivores), it would inevitably create controversy and division. The landscape manager will have a role in creating clear and open communication to placate the fears of stakeholders and convince them of the benefits.

The landscape manager would also aid the creation of eco-tourism opportunities, such as the nature safaris and camping at Knepp - these would potentially be put in place in the years following the genesis of a scheme, after the ecological conditions have improved.

7. Creating a Framework

The previous chapters have made the argument for the inclusion of a landscape professional across different stages of rewilding projects at varying scales, with them playing a pivotal role in potential future schemes. Conceptual frameworks can be used to analyse relationships between inter-connected systems. This chapter will introduce a newly developed conceptual framework, which brings together the research outlined in this study to demonstrate how the landscape professional could influence the creation and maintenance of a rewilding scheme.

7.1 Stakeholder Interactions

Before introducing the framework, the interaction of stakeholders at varying scales of rewilding schemes will be looked at.

Figure 18 explores which stakeholders could be involved at the site, landscape and regional scales, and how they might interact - and is applicable during all stages of a project:

- *Site* – a small-scale rewilding project, as discussed in *Chapter 5*. Architects and engineers may be involved if it is within the built environment, with the potential of private companies being affected. The landscape manager has been identified as a separate role, interacting with the landscape architect.
- *Landscape* – most likely a trophic/active rewilding scheme in the rural environment. Due to the inclusion of semi-wild animals, veterinarians may be involved, and hydrologists may be required if there will be elements of river rewilding. The scheme at Knepp is at the landscape scale.
- *Regional* – a series of potentially connected rewilding schemes at the strategic planning scale. There is more of an emphasis on the interaction between governmental and organisational groups and local farmers and residents. ‘Wild East’, which aims for landowners to rewild portions of their land to create a rewilding network in East Anglia, is a good example of a regional-scale project.

Three groups of stakeholders have been identified:

- *Professionals* – who are employed by organisers of a project
- *Institutions* – who may provide planning permission or funding
- *Other stakeholders* – who will be affected by, or take an interest in the project

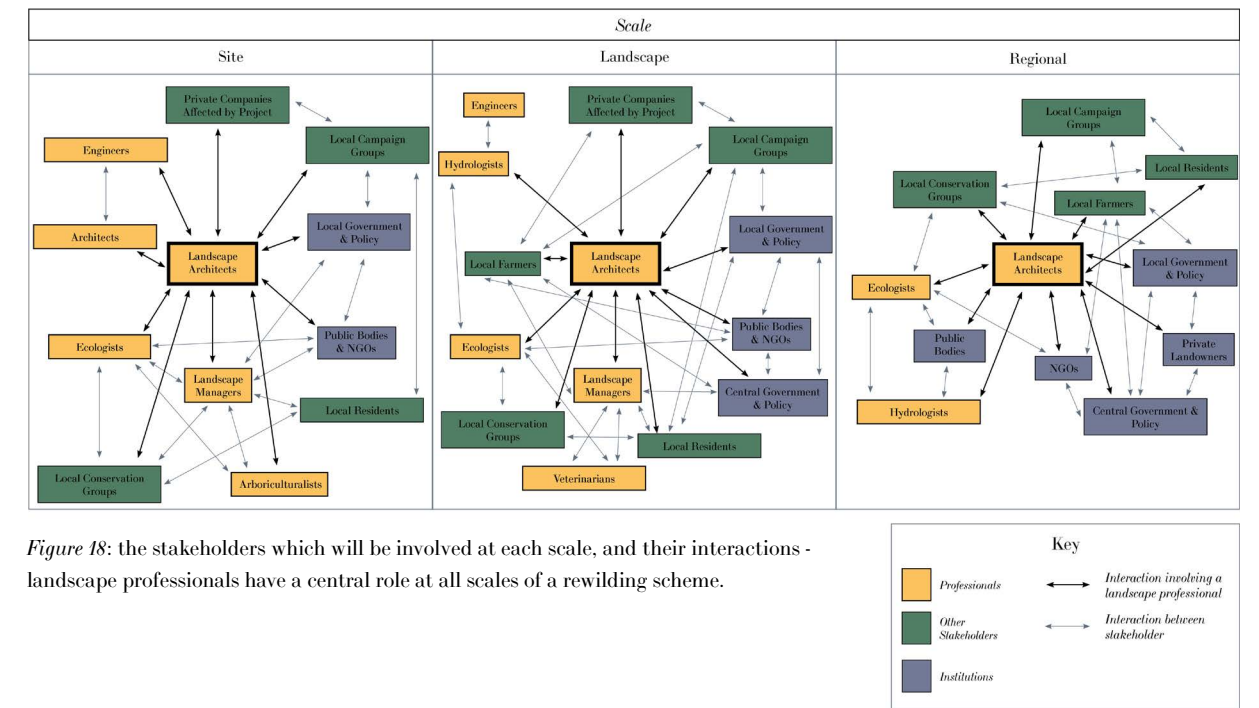


Figure 18: the stakeholders which will be involved at each scale, and their interactions - landscape professionals have a central role at all scales of a rewilding scheme.

7.2 Conceptual Framework

The framework is shown in *Figure 19*, has a temporal axis to guide the reader through the various stages of a project. Each stage is explained below.

Initial Idea

Perhaps through advice, demand or investment from stakeholders, the formation of a partnership (such as Wild Ennerdale), or a landowner initiative (such as Knepp), the idea of creating a rewilding project is formed. The stakeholder influence could come from the consultation stage of a proposed project which may not have originally incorporated rewilding.

Rewilding Proposal

The developer - who could be a variety of different groups, including a local council, landowner, property developer or partnership - commits to creating a proposal. They employ a landscape professional - some practices or individuals may specialise in rewilding at the planning scale, some may specialise in urban rewilding.

Consultation Stage

The landscape professional engages with stakeholders and professionals – perhaps using *Figure 17* as a template for who to engage at which scale. Concerns and demands of these stakeholders are considered, policy is examined and professionals (such as ecologists) may be employed to undertake surveys.

Site Analysis

The landscape professional carries out site visits, studies or creates an LCA (if necessary) and collects spatial data (such as historical maps, agricultural grade etc). This information is combined with the stakeholder information, possibly using a socio-ecological MCE for site selection, to create the proposal(s).

Proposal

The proposal(s) are presented to the stakeholders, professionals and the developer/client. If there are several proposals, a consensus on the preferred option would be agreed, with the landscape professional getting feedback from the different groups. The landscape professionals' visual communication skills will be especially useful at this stage – to promote the project and increase stakeholder enthusiasm. Feedback from developers or stakeholders may result in the landscape professional being required to return to the analysis stage to alter or redesign the proposal(s).

Implementation

With the relevant permissions and funding, a project can get underway. This stage could include a wide range of interventions discussed in previous chapters, such as erecting fencing, introducing animals, constructing an urban rewilding site, or planting trees.

Post-Implementation

The landscape professional – most likely a landscape manager - would continue to consult the stakeholders and the developer/client, while the project develops and changes over the years.

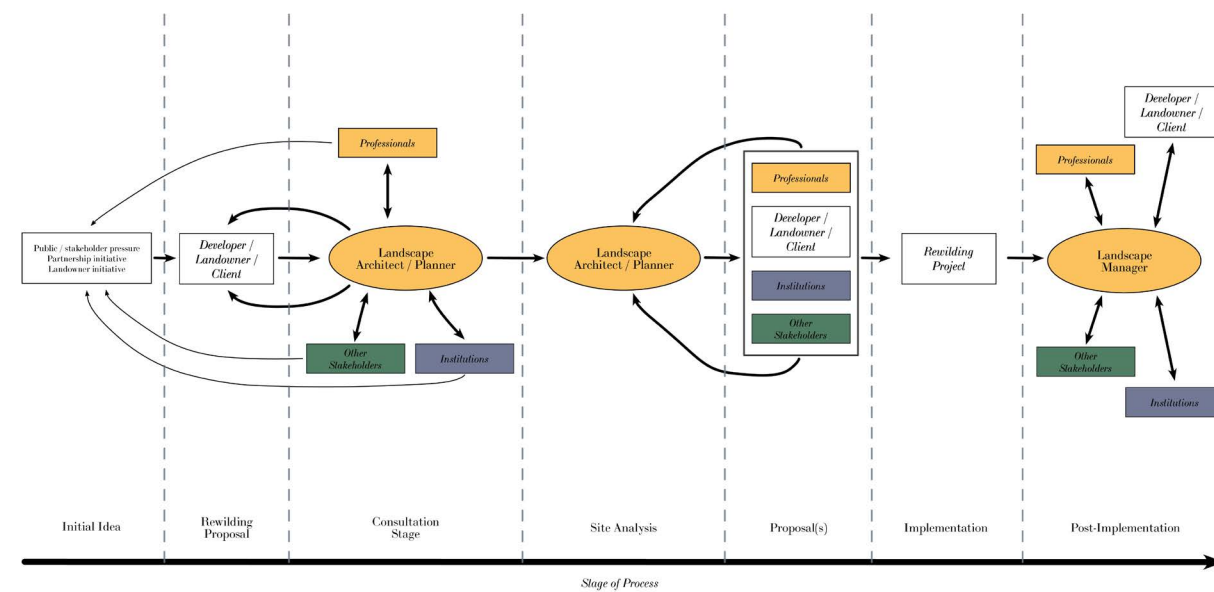


Figure 19: the conceptual framework demonstrating how the landscape professional could be involved throughout a rewilding scheme.

7.3. Applying the Framework

Here the framework will be tested: first using the Oostvaardersplassen (OVP) as an example of a project which would have benefitted from the inclusion of a landscape professional from its start. Whilst still a ground-breaking experiment, many consider the experiment a failure due to the public outrage and subsequent management change; it progressed from its' initial idea through to it being proposed, implemented and managed without proper public consultation. If Frans Vera and his team at the Staatsbosbeheer had utilised the expertise of a landscape professional to keep a clear and open dialogue with stakeholders, particularly during the post-implementation stage, the public opposition could have been managed, mitigating the resulting damaged reputation and validity of rewilding projects as a whole.

Similarly, the 'Summit to Sea' project suffered a setback due to a lack of public consultation and understanding (Rewilding Britain, 2019), leading to the projects' aims shifting from a rewilding scheme to become a conservation and habitat restoration scheme (Summit to Sea, 2020). The project is still at the consultation stage – perhaps if the organisers had employed a landscape professional to carry out large-scale landscape analysis and stakeholder consultation, resulting in socio-ecological proposals, there would not have been a backlash against the rewilding elements of the project.

Currently in the consultation phase, the 'Wild East' project is trying to reach out to landowners at all scales. As the developers and visionaries are farmers from the area, they are well-suited to be actively involved at all stages of development. In this case, the landscape professional would be important in forming a large-scale site region analysis, perhaps working closely with the Wild East team to set the conditions of the MCE, and drawing up professional site-proposals.

At the urban scale, the landscape professionals' role as a rewilding advocate could be important. The consultation stage could be an opportunity to gain support for rewilding elements to be integrated into a scheme, before suggesting this to the client or developer. Alternatively, the championing of rewilding by the landscape profession could result in public pressure from stakeholders for more urban development to integrate rewilding elements.

8. Discussion

The urgency for climate change mitigation is growing, and although policy-makers are moving slowly, the fact that governments have committed to international (such as The Paris Agreement) and national targets (climate emergency in the UK) means that policy does theoretically support more sustainable uses of the landscape. The nature of rewilding schemes – aiming to work towards an ecosystem with little or no human input, should represent the most sustainable use of a landscape, resulting in rewilding being a key tool in reaching climate change targets and creating ecosystem services. This study examined the various ways in which the landscape profession can and should be involved in future rewilding schemes – particularly due to the socio-ecological nature of our anthropological landscapes, and the fact that landscape professionals possess relevant and appropriate tools. The resulting conceptual framework, outlined in *Section 7.2*, demonstrates how landscape professionals should play a central role in the creation of rewilding schemes at all scales.

8.1. Recommendations for Use

The framework promotes the inclusion of the landscape professional as an integral part of a rewilding scheme. It is designed primarily for use by developers, individuals and partnerships who are either interested in creating a scheme, or incorporating elements of rewilding into a potential project.

Landscape professionals could also make use of the framework – following the temporal stages through a project – although they are likely to be already familiar with this type of process.

8.2. Limitations of the Framework

The success of the framework is dependent on the developer understanding the value of utilising a landscape professional. More landscape professionals must get acquainted with the principles of rewilding, and the profession should put itself forward as the most appropriate to run rewilding schemes.

Some developers may not want to outsource the planning and management of a scheme to a third-party. In this case, perhaps a collaborative process would be more appropriate, with the landscape professional working through the stages of a project with the developer.

For projects to be viable, particularly at the large-scale, rewilding needs to be incorporated into policy. Without governments making rewilding a financially viable option for landowners, the framework would not be widely applicable at the landscape and regional scale.

8.3. Further Study

This study has given some evidence that rewilding has benefits for biodiversity. With the global failure to meet any biodiversity targets from the Kyoto Protocol (Greenfield, 2020), the urgency and importance to find novel ways of increasing biodiversity has never been higher. More investment is needed to create experimental rewilding schemes, which can provide further evidence for the benefits which they can bring.

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