Bio-cultural heritage and biodiversity: emerging paradigms in conservation and planning

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Bio-Cultural Heritage & Biodiversity - emerging paradigms in conservation and planning

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Abstract Long-term studies across Europe have clarified the eco-cultural nature of landscapes and their biodiversity, and the importance of bio-cultural heritage. This raises issues of the nature of '*Nature*' for example, and of how perceptions of '*natural*' landscapes may be misleading. Indeed, the lack of understanding of how ecological systems and their biodiversity relate to the cultural nature of landscapes is hugely problematic. Whilst wilder '*futurescapes*' offer many benefits, the underlying concepts frequently confuse abandonment of '*eco-cultural landscapes*' with '*re-wilding*'. The ending of traditional and customary uses and utilisation of landscapes mistakenly seen as re-naturing or re-wilding, and inherently a beneficial change, may threaten the conservation of important bio-cultural heritage. The reality of landscape heritage is that much biodiversity relates to long-term, predictable, sustainable, traditional uses. The ending of such traditions has now happened in many regions and taking place rapidly across much of Europe. Sudden, dramatic and often unexpected changes occur and massive declines of biodiversity result.

With environments transformed by human activity, the eco-cultural landscapes in traditional or customary management hold much of the most significant wildlife resources. The ending of traditional and customary management, termed '*cultural severance*' (Rotherham 2009), is probably the most serious threat for nature conservation in the twenty-first century, at least in the medium-term, the impacts exceeding those of climate change. The transformations now happening also have major implications for rural human communities and their economies.

Observational studies and cross-disciplinary research across Europe highlights the urgent need to recognise the eco-cultural nature of landscapes and to establish inventories and conservation programmes for important bio-cultural heritage. This paper results from long-term historical research, scientific analysis of case studies, and international researcher collaborations to present ideas and paradigms relating to emerging concepts and visions.

Key words bio-cultural heritage, biodiversity, eco-cultural landscapes, cultural severance, traditional and customary management

Introduction

A renewal of interest in new ways to address conservation problems through radical, novel approaches followed seminal texts by Adams (2003), Taylor (2005), and Vera (2000). '*Wilding*' and '*wilder*' landscapes, applied effectively and sensitively, offer huge, exciting benefits for biodiversity, bio-cultural heritage, and amenity. However, there are significant pitfalls if implementation lacks a broad, multi-disciplinary approach, with careful planning and design. The '*eco-cultural nature*' of landscape (Rotherham 2014a), resulting from long-term, intimate interactions between people and ecologies is important. Often the interplay of humanity with nature creates the construct of '*place*' and of local distinctiveness (e.g. Westland (ed.) 1997). Across Europe in particular, twenty-first century depopulation means rural landscapes *abandoned*' not '*wilded*', with ecology, communities and economies potentially devastated. Alongside urbanisation of rural landscapes, these socio-economic and demographic changes cause '*cultural severance*' (Rotherham 2008, 2013b), and this leads to long-term, often rapid, loss of biodiversity and landscape quality. Furthermore, from urban to remote, rural areas, attitudes to, and perceptions of, '*alien*' invasive species challenge to attempts to '*wild*' the landscape. Feral species, exotic plants and animals, and invasive natives forming recombinant biodiversity (Rotherham & Lambert 2001; Rotherham 2014a), but '*re-wilding*' discussions rarely mention feral and exotic. Current thinking may even place a positive spin on a future with invasive, alien species (e.g. Pearce 2015). Central to '*futurescapes*' and '*re-wilding*' are ideas and perceptions of '*wild*', '*wildness*', '*wilderness*', '*nature*', and '*natural*', and importantly there is an imperative need to both learn from bio-cultural heritage and to seek to conserve and safeguard what remains. The implications and scale of human impacts on nature were raised by authors such as Rachel Carson in *Silent Spring* (1962), with a legacy as discussed by Jameson (2012), and then more recently by, for example, McKibben (1990), in *The End of Nature*. Yet, despite these major contributions to debates on nature and humanity, the eco-cultural landscape and its bio-cultural heritage often remain overlooked or misunderstood. McKibben (1995) presented ideas and suggested solutions to remediate adverse human impacts, and it is perhaps from some of these and other similar writings, that the ideas of '*wild*' have emerged. Fundamental drivers within these eco-cultural landscapes have frequently been misunderstood (e.g. Hardin 1968; Ostrom 1990; Appell 1993).

Bio-cultural resources

Bio-cultural heritage, both tangible and intangible, is threatened with loss and decline on a scale that is unprecedented and it is widely recognised that traditional nature conservation is failing (Adams 2003; Rotherham 2014a). Within eco-cultural landscapes, the heritage associated with ancient woods, historic forests and long-lived trees provides a good example of the types if issues and problems (Muir 2005; Fowler 2002; Rackham 1976, 1980, 1986, 1996; Hayman 2003; Rotherham et al. 2012; Smout 2000). The remarkable resources of ancient trees, including open-grown veterans such as the Major Oak in Sherwood Forest (Nottinghamshire, England), the fuelwood pollards at Burnham Beeches (Buckinghamshire, England) or the old coppice limes of Whitwell Wood (Derbyshire, England), provide examples of irreplaceable bio-cultural heritage. In many cases, these trees and associated anthropogenic features in their landscapes are many centuries old; in some instances, such as the ancient lime coppices, they may be a thousand years or more.

[Figure 1]

An example of the type of threats and issue for such unique heritage was the loss of the Great Oak of Pontfadog, in Wrexham, North Wales, which blew down on 18th April 2013. The National Tree of Wales, estimated to be somewhere between 1,181 years and 1,628 years old, was a culturally modified veteran; a biological feature but altered by human usage over centuries. The tree could have survived for many more centuries with just a little help in terms of supporting wooden struts to help bear the load. Long-since isolated in its landscape as the forest in which it belonged had been cleared, the tree, though iconic, was allowed to collapse. Over northern parts of Britain, there are so-called 'orchards' of veteran pollard trees aged perhaps between 400 years and 600 years in age and managed historically to provide leaf fodder for domestic animals. Neglected for around 150 years since the practices largely died out, surviving re-grown pollards are top-heavy and vulnerable to catastrophic collapse and the same fate as the Pontfadog Oak. The first steps in rational, planned conservation, are to survey and audit the tree resources.

Writers in Cronon (ed) (1996) considered the interface between people and environment in relation to the human role in nature. As Cronon notes, 'Nature is not nearly as natural as it seems', and he examines the relationships in North America in Cronon (2003). Furthermore, authors such as Hoffman (2014) demonstrate the cultural influence in landscapes, in for example, Europe. The importance of the human-nature interaction in forming landscapes and even national identity was highlighted by, for example, Schwartz (2006) in the case of post-communist Latvia. Rackham (1996) and Grove, & Rackham (2003), considered the cultural importance of Mediterranean landscapes, and Smout (for example Smout 2000), describes the human influence in Scottish environments. However, as noted by Agnoletti et al. (2007), even though academic interest has grown in terms of identifying and valuing cultural landscapes and traditional management practices, there is only limited, integration of this in policy and landscape planning. Currently, few countries have effectively addressed the complex processes underlying landscape bio-cultural heritage and have established appropriate conservation methods and guidance. There are specific moves for example with forest management in France (Agnoletti et al. 2007), where forest landscapes and traditional forest techniques are considered '*heritage*' to be conserved. In Italy too, there has been significant progress by the Italian government and regional administrations such as in Tuscany, in the recognition and then conservation of unique cultural landscapes such as the chestnut groves (Agnoletti 2008, 2013). The bio-cultural resource of the landscapes, the ancient trees, and the associated infrastructure of human features such as drying barns and trackways, may then be managed as an integrated whole. Similarly, projects in both Austria (Johann 2013), and in Switzerland (Burgii & Stuber 2013), have raised awareness of the heritage and the issues, and some steps are being taken to achieve management which is more sustainable. However, major challenges still arise at national and European levels, and much planning and practical management neglects or event damages bio-cultural heritage (Rotherham 2014a). Integrating, preserving and enhancing social and cultural dimensions of sustainable landscape management remains problematic and austerity measures across the continent since 2008 have compounded the situation (Rotherham 2014a).

In order to change approaches to become more sustainable, it is important to raise awareness and to grow education and research in key fields relating to bio-cultural heritage and its conservation and that of intangible cultural heritage (i.e. oral traditions, traditional landscape-related knowledge). This was raised at workshops and conferences such as Forestry and Our Cultural Heritage (Sunne 2005), IUFRO All Division 9 Conference Sarajevo (2012), Linking Biological and Cultural Diversity in Europe, Florence (2014), Frontiers in Historical Ecology, Zurich (2011), and The End of Tradition?, Sheffield (2010). An aim has been to encourage appropriate approaches to be included in landscape management strategies. To this end, more countries should investigate the complex processes relating to bio-cultural heritage, conservation methods, and principles. Additionally, there is urgent need to collate inventories of landscape-related cultural sites and bio-cultural heritage resources in pragmatic and usable ways (such as GIS, GPS, LIDAR topography datasets, and databased information). These databases can then be used to assist and guide site managers to avoid or at least minimise adverse impacts of site works on bio-cultural assets. (Rotherham & Ardron developed a pioneering approached to this process in wooded landscapes for Ecclesall Woods in Sheffield, UK; see Rotherham 2007a, and Rotherham & Ardron 2006).

[Figure 2]

There is a need to recognise the issues for conservation of bio-cultural resources and then to apply the developed approaches more widely across the landscape. In some regions, such as the Alps for example, relevant policies are already in place. The declaration, *People and Culture*, as part of the *Alpine Convention* (2009) and its protocols, drew attention to people-centred, sustainable development policies focussing on the needs, desires, and views opinions of the communities in the region. Issues around the conservation and protection of both tangible and intangible cultural heritage, and the maintenance and development of physical and non-physical cultural heritage, including traditional knowledge, were considered in the convention. In particular, the document addressed traditional methods of landscape management, architectural, built and artistic heritage, traditional forestry, rural crafts, and related industrial activities. It is important that research be undertaken to highlight, for example, existing tangible and intangible cultural heritage of traditional knowledge. This is in order that practical conservation is better-informed, so bio-cultural heritage is more effectively safeguarded and maintained in the future.

However, it is necessary to recognise also, that perceptions and ideas relating to '*wild*' and to '*nature*' have changed and evolved over time (Oelschlaeger 1991; Giblett 1996). They also vary from place to place, and from region to region.

Dilemmas & contentions

A major issue with respect to Europe's traditional cultural landscapes is their dependence on varying degrees of human impact, in many cases, traditional or customary rural practices. Many of these landscapes include richly diverse areas of significant local and regional distinctiveness, and with associated high levels of biodiversity. These landscapes have evolved slowly over time. They reflect and often depend on the imprint of human utilisation in traditional or customary ways. When existing land uses are extensified or abandoned, traditional cultural landscapes may be displaced by spontaneous ecological successions with resulting vegetation and landscape change. However, this severance of human customary utilisation is often greeted as a positive phenomenon, and as re-wilding (Rotherham 2014b). Yet mostly, this is not '*wilding*' but abandonment and dereliction (Rotherham 2009, 2014b). Interestingly, these changes are happening at a time when the provision of benefits, so-called '*ecosystem services*' by nature to humanity, are finally being recognised and valued (e.g. Juniper 2013, 2015; Maier 2012).

However, in terms of landscape management and bio-cultural resources, conservation is on the horns of a dilemma. Whilst abandonment is bad, the converse is also true in that intensified human utilisation especially with macro-mechanisation and industrial agriculture or forestry, displaces traditional landscapes and imposes simplified ones of limited ecological diversity. At local, regional and national scales, human cultural values and attachments, bio-cultural resources and assets, and associated biodiversity are progressively degraded. Such change can also affect future rural economic function, through for example, reduced tourism and leisure value. As traditional rural economies decline, and governments or planners seek to replace or at least supplement agriculture and forestry with tourism income, the value of the leisurely landscape is expected to grow. In this context, the particular character of the local or regional cultural landscape requires investigation in terms of economic development through tourism expansion. This in turn might help engender the conditions necessary to promote valorisation and conservation of bio-cultural. History, tradition, tangible and intangible heritage, and local cultural knowledge combine as regional identity factors and potentially a distinctive tourist product. However, the major challenge is to convert economic and social benefits, for tourism businesses, into support for local communities to maintain locally traditional land uses. The risk is that tourism develops as a parasitic business opportunity and fails to support and enhance local traditional values (Rotherham 2008).

Bio-cultural heritage and assets exist within the '*cultural landscape*' of the physical and natural environment interacting with and modified by human activities. The term the '*eco-cultural landscape*' (Rotherham 2008, 2013b, 2013d, 2014a), refers to the intimate relationships between people and nature which form '*landscapes*' over long periods. The cultural landscape has a duality of meaning in relation to lands, which themselves have been altered by human activity, and to interactions between people seeking to subsist within a physical setting in which they live and work. Over time, such human activities shape the landscape and modify its form to become a significant factor in regional or local character, and to provide communities with their own identity. Such shared identities generate feelings of unity between, for example, localities at human, economic, spatial, and cultural levels. The images generated may result in the external projection and presentation of a shared. Today, this may attract investment and promote both external and internal networks of co-operation and coordination; important factors in tourism development (Capriello & Rotherham 2008). To better promote and exploit these benefits requires recognition, enhanced understanding, and above all, effective conservation of the underpinning bio-cultural heritage. Corporate awareness of these cultural and environmental phenomena is necessary in order to exemplify and diffuse local and regional identities expressed through shared cultural and historic roots. These are imprinted into landscapes as patterns of land-use and spatial occupation. Since the 1980s, such regional adaptations have been recognised increasingly in terms of significance for indigenous knowledge, sustainable development, and hence for nature conservation and agriculture. In this respect, there have been programmes, projects, policies, and strategies to grow synergies of traditional insight and modern scientific knowledge to explore solutions for shared problems. Despite this, as observed by Agnoletti et al. (2007), development based on sound scientific and historic understanding of cultural landscapes is still lacking across most of Europe.

Methodologies

This paper draws on the findings of long-term observational studies of key habitats and their wildlife; long-term observational studies of rural economies and tourism; analysis of long-term trends of political, social, economic and ecological influences in the landscape. Essentially, the paper is a review of much current thinking on issues of '*futurescapes*', on bio-cultural heritage, on eco-cultural landscapes, and on matters of cultural severance and re-wilding.

The work addresses relationships between traditional and customary management of natural resources and combines with the findings of long-term observational studies to highlight the connection between management and ecology (e.g. Rotherham 2007a, 2008, 2013b, 2014a). In terms of environmental context, an historic time-line has been generated to support the concept that many key wildlife habitats and their ecologies have descended from analogues in the primeval European environment (Vera 2000, 2005, 2009; Rotherham 2014a). Importantly, when considering nature conservation, biodiversity, bio-cultural heritage and sustainability, these unique communities, which have been maintained in traditional landscapes. This is the essence of the eco-cultural nature of the landscape as the space occupied by bio-cultural heritage.

The methodological approach involves the creation of the conceptual timeline from analysis and primary observation, and populate of the resulting tapestry of landscape mosaics by case studies at local and regional levels. Ecological and social changes at spatial levels then reflect the drivers of environmental, economic, and political factors. The timeline approach provides a framework to enhance understanding and to facilitate future actions.

Results & Discussion

Recent studies (Rotherham et al. 2012; Rotherham 2012, 2013a & b, 2014a) have sought to place the ideas and concepts of Frans Vera (Vera 2000, 2005, 2007, 2009), into an ecological and historical timeline. The basic ideas of the timeline were presented in Rotherham (2014a), and it is suggested that the biodiversity and ecological characteristics of the open and fluid landscape suggested by Vera for primeval Europe, are present in the modified land use patterns of the medieval period. In England, the act of Commons in 1235 is suggested as a watershed moment in the '*fixing*' of rural patterns and their habitats (Rotherham 2012). Plant and animal communities present in the mosaic landscape suggested for the Vera model are in part taken into medieval land use patterns and both maintained or modified by traditional and customary usage. The major losses of diversity of ecosystems and of associated species then follow much later with the processes of enclosure and improvement, of urbanisation, and industrialisation, both urban and rural. A major trigger for the decline of traditional landscapes and ecologies is the advent of large-scale energy subsidies from fossil fuels, firstly mineral coal and then oil. For the first time in history, human communities were de-coupled from their local environmental resources, with catastrophic implications for bio-cultural heritage.

Misunderstood cultures & overlooked impacts

The occurrence and especially the extent of traditional, customary, '*cultural*' use of natural resources and the consequent impacts on landscape and ecology of often overlooked (Agnoletti 2006, 2007; Rotherham 2008, 2014a). Indeed, the interpretation of the naturalness of landscapes and ecologies has frequently been misjudged and sometimes on a colossal scale. For example, major landscape-scale effects, such as the role of medieval peat cutting to supply Norwich and other areas with fuel, in the formation of England's Norfolk Broads, was overlooked until the 1950s (Lambert et al. 1961). Ecosystems and landscapes are considered '*free-willed*', natural and wild even when they are deeply eco-cultural and features are often considered to be '*natural*' (Rotherham 2014b).

[Figure 3]

An example of such misunderstanding is in the British uplands where mountain and moorland are deemed wild and natural landscapes, whereas in reality they have been affected by grazing and other farming activities, often by industry, and especially by fuel utilisation such as peat turbary (Ardron 1999; Rotherham 1999a, 2005). Rotherham et al. (1997, 2004) described how medieval and later peat cutting transformed many British upland landscapes. Similarly, ancient woodlands are rated as some of Britain's most valued conservation sites (Rackham 1986, 1989, 2006; Peterken 1981), and yet their histories and eco-cultural natures are widely misunderstood. Management as coppice for fuelwood, charcoal, whitecoal, and pit-props, is often forgotten and the transformed soils and vegetation are considered to be natural phenomena (Rotherham 2007b; Perlin 1989). Key drivers of change leading to contemporary ecologies are unseen. Furthermore, the implications for important bio-cultural heritage following cultural severance of wooded landscapes and their modern emergence as '*leisurely landscapes*' are ignored. Much contemporary site management is based on limited understanding of history and heritage and a misplaced view of ecology; and this applies across a wide range of vegetation and habitat types.

Medieval woods, heaths, commons, and bogs across western and Mediterranean Europe supplied most people with fuel, building materials and food over many centuries (Rackham, 1980, 1986, 1990, 2003; Warde 2005). Additionally, along with providing energy for domestic use, medieval coppice woods and peatland turbaries, also fuelled early industry.

These sometimes-intensive uses had major impacts on soils and vegetation and often transformed landscapes, and different fuels (mineral coal, wood, charcoal, and peat or turf), varied in their effects. Although some of these changes were major determinants in the landscape, their impacts are rarely considered (Rotherham et al. 2004; Rotherham 2005).

The multiplicity of landscape uses over history made many of these areas contested spaces with different, rival stakeholders and actors vying for resource rights. In England there are descriptions of conflicts over resource use, with for example, medieval iron masters accused of destroying woods and affected both local, common usage and the Crown's need for shipbuilding timber (Rotherham & Egan 2005). Indeed, to the untutored eye a wood managed as *'sustainable*' coppice appears devastated, whereas re-grown high forest seems pristine and almost primeval, '*ancient*' woodland or old growth forest; both misunderstanding of the landscapes, their ecologies, and their histories. Today, such woodlands are believed to be either modern plantations or even remnants of primeval '*wildwood*'; both equally misconceived ideas. Medieval and later parklands, often descended from ancient wood pasture, were often contested spaces (Harding, & Rose 1986; Liddiard 2003), and even recently, were considered of limited conservation significance.

Landscape utilisation

Subsistence use and later industrial exploitation of landscape resources over centuries generates character-defining change and this varies at local and regional levels. Particular environmental conditions and resources, and the drivers of economic, political and social forces, together with interaction and competition, are vital determinants in land-use and landscape. Eco-cultural landscapes show continuums often punctuated by crises for community and environment (Rotherham 2005). Interactions between community, resource utilisation, and environment drove the development of the landscapes we inherit today but the fundamental relationship, its sophistication and totality, is rarely appreciated. Subsistence communities with traditional and customary uses interacted intimately with the environment; medieval landscapes being like the traditional family pig, with everything used except the squeak. Almost all landscapes were modified, some were transformed, and others, especially during social, economic, or environmental crises, were devastated, but the intimacy and the totality of past utilisation are things, which now elude us. Like strangers in a foreign land (Lowenthal 1985), as visitors in our leisurely landscapes, we gaze into the past unfettered by knowledge or insight.

Local, utilitarian subsistence

European traditional agrarian, early industrial or subsistence communities depended on the local environment for most of their immediate resource needs. Indeed, until relatively recently only the affluent in more sophisticated economies had access to imported or luxury goods. Local communities and their individuals or households, for essential arable, pasture, fuel and building materials, relied on the limited resources of land, which they owned, or for which rights were held in common. Traditional and customary utilisation developed over centuries, which by medieval times, had a sophisticated web of cultural customs, legal rights and restrictions controlling them. The local and regional systems of usage adapted tom particular conditions and generally provided the effects of changing populations, vagaries of weather, and for the impacts of other catastrophes such as disease. Customary rights developed in order to protect shared resource rights within communities whose stakeholders were not equals. Furthermore, in the pre-industrial and pre-urban society, if these controls failed, and the system was unreliable and unsustainable, the community was at risk; people were deeply immersed in their local environment (Rotherham 2013b).

The long-term impacts of such uses on environments and ecology are etched indelibly into pre-industrial landscapes and today have major implications for future management. Indeed, understanding the implications of land-use and long-term human influences (both drastic and subtle), on soils, water, and vegetation are essential if a futurescape vision is to be rooted in reality. Yet as noted earlier, much contemporary site management for nature conservation is not informed by any in-depth knowledge of past uses. Furthermore, the implications of cultural severance and the problems for bio-cultural heritage with intensified or abandoned systems in unappreciated. Abandoned pastoral landscapes for example, with rapidly declining biodiversity, deterioration in aesthetic qualities, and loss of indigenous local communities, are greeted as the expansion of '*forest landscapes*' and an inherently '*good*' thing (Rotherham 2014b). Much of this management (or lack of management), does not pass any test of sustainability for environmental, economic or social values, and yet this is overlooked or ignored. However, with the interrogation of ecological systems at landscape level with understanding of cultural severance implications challenges current conservation management.

Examples of British landscape impacts in uplands & lowlands

The effects of customary landscape utilisation can be assessed for particular resources, products or materials, like fuel, or foodstuffs. For example, many British upland landscapes evolved over centuries through influences of environmental factors and human exploitation for fuel and grazing. By the 1800s, management for game, particularly red grouse and deer, affected many areas. Subsistence utilisation was ended, in England by Parliamentary enclosures, and in the Highlands of Scotland, by the *'Clearances*', both through the eighteenth and nineteenth centuries, and both leading to cultural severance. These became strongly contested spaces with hotly disputed resources.

The processes of exploitation and utilisation transformed vegetation and soil, changing landscape colour and texture large areas of the British uplands. Wetland drainage combined with removal of deep layers of thick peat or shallower organic turf, reduced water-holding capacity and changed water behaviour in vast areas of landscapes in catchments below the upland zones.

[Figure 4]

Lowland areas of England, like the Humberhead Levels, the Cambridgeshire Fens, the Norfolk Broads, and the Somerset Levels, were progressively changed throughout the medieval period (Rotherham 2013c). There was exploitation and drainage of marginal peatlands and conversion to agriculture. In the Norfolk Broads, peat removal to fuel commoners and ecclesiastical centres created vast, open turbaries, but by the late medieval these were being inundated by floodwaters and industrial exploitation was abandoned. However, the dramatic changes came from the 1600s onwards across the other regions with huge drainage and land improvement schemes, displacement of local common rights and of commoners, and the removal of almost all the peat resources. By the late nineteenth and into the twentieth century, the drivers in these lands were industrial, modern farming and industrial harvesting of the remaining deep peats. In many areas, removal of peatlands was so complete that even their memory was quickly lost. Landscapes, ecologies and communities were transformed beyond recognition (Rotherham 2013c).

Lowland and upland fringe sites were exploited and progressively destroyed during the sixteenth, seventeenth, and eighteenth centuries; much of this removal associated with Parliamentary and private '*enclosures*' of heath, moor, common, bog and '*waste*' (Gimingham 1972; Webb 1998, 1986; Rotherham 2011a). Whilst agrarian and then early industrial communities often maintained vital environmental resources through complex social, economic, and legal mechanisms, capital-based exploitation was often more destructive (Rotherham, 2013b). Therefore, although the productive landscapes created, in the medieval period reflected social need, with mechanisms for conservation providing continuity over long periods, increasing technological industrialisation, urbanisation, and rural de-population transformed or exhausted the resources. The essentially conservative cultural landscapes were abandoned, transformed, and swept away on a tide of '*improvement*' (Rotherham 2014a). With industrial and urban areas increasingly techno-centric, agriculture became industrial, fuelled by coal and then oil. With social and technological innovation during the 1700s and 1800s, landscapes were freed of dependence on local sustainability and the needs of local subsistence. By the late twentieth century, across much of Britain, the cultural landscape was a largely forgotten, archaic relict of a lost existence.

[Figure 5]

Heath, common, fen, & bog

Peatland landscapes and their vegetation make a good example of the processes of traditional utilisation and subsequent cultural severance and either improvement or abandonment. Formerly widespread and abundant across much of Western Europe these habitats are now drastically reduced (Rotherham 2011b). Exploitation of these resources transformed both landscapes and sometimes the economy too (see De Vries 1974; De Zeeuw 1978). Those areas that remain are often in poor condition, and such landscapes have been transformed by agricultural intensification and land '*improvement*'. Britain holds a globally significant resources of these sites, and the scale of destruction, abandonment, and resulting fragmentation of lowland heaths has long been recognised (e.g. Gimingham 1972; Webb 1986). However, even these authors substantially under-estimated the wider extent and the scale of loss. Indeed, this destruction or abandonment so completely decimated the resource, that even expert researchers missed much of it (Rotherham 1995, 1996, 2009). This has erased landscape, ecology, and community from the countryside, with resulting reduced biodiversity and lost bio-cultural heritage.

The bulk of the people were cottagers, labourers, farm servants, and squatters, and the heath or common was a resource at the centre of their lives and existence. Cottagers either owned or occupied cottages, to which ancient custom attached rights of commonage on the '*wastes*'. Such rights were of various kinds including the pasturing of animals on the common, cutting of turf and extraction of fuel, or of building stone. Widespread conversion of heath, moor, waste, fen, bog, and marsh, to arable and to enclosed pasture, abruptly ended such utilisation by the rural population especially the rural poor and the poorer commoners.

[Figure 6]

The nature and scale of induced landscape changes are basic to understanding their present-day condition and character, much the result of long-term use for subsistence farming. The scale of such impacts has been significantly under-appreciated. Separation of these landscapes into lowlands (enclosed and improved) and uplands (unenclosed and unimproved) often masks the human element which is often less evident in peripheral zones. Where it has been environmentally possible and economically feasible, enclosure, liming, cutting, and drainage, followed by agricultural intensification or creeping urbanisation, changed most lowland areas almost beyond recognition. In the twenty-first century, the loss of cultural, subsistence impacts has big implications for nature conservation management. With their plagio-climax communities, abandoned heaths, commons, grasslands, and other habitats progress speedily through successional changes to tall herb, scrub, and woodland. Ecologies change and many conservation priority species decline.

Even with recognition of the need for effective conservation, this is frequently without an appreciation of the scale of the impacts of cultural severance and the loss or change in biodiversity. Very often, conservation is primarily protection with relatively small areas of targeted, generally grant-aided management. Conservation managers have a range of tools to achieve their aims, and these include varying mixes of grazing by domestic stock and regimes of cutting or harvesting tall vegetation in order to halt or deflect ecological successions. Whilst these bring some benefits to biodiversity conservation, they often omit important aspects of the traditional processes that they attempt to mimic. An important part of the bio-cultural heritage that is lost with cultural severance is the intangible heritage of local knowledge of process and product. Furthermore, not driven by economic utilisation, conservation is vulnerable to short-term grant availability and problems of spatial, temporal, and cultural continuity. The results for ecology may also be disastrous (Denton 2013, 2014).

Local subsistence to feed people & livestock

Pre-industrial European subsistence landscapes had, of necessity, direct importance and relevance to local people. Landscapes generate distinctive local and regional products and the distinctive capabilities and character of the land led to particular land use patterns and resulting ecologies (Rotherham (ed.) 2013). Coastal wetlands for example, were valued for dairy products like cheese, and for high quality beef, and other meats such as mutton. Such otherwise marginal lands might be maintained when less valued areas were lost to '*improvement*' (Rippon 2000). Salt marshes dotted with salterns produced salt to flavour and preserve food, and again were highly valued. For landscapes unaffected by modern technologies, interactions between production of food and drink were especially intimate. As recently as the late 1800s and early 1900s, countries like Britain were characterised by distinctive zones of productive farming landscapes, with characteristic local and regional foods, drinks, cultures, traditions, and biodiversity. The bio-cultural heritage generated by the distinctive regions was often related to such utilisations, and the cultural heritage derived from seasonal celebrations in regional farming or land use calendar.

In Britain, there were broad zones with lowland arable farming, coastal grazing marsh, western beef, dairy, and upland sheep and beef cattle. Each zone reflected particular environmental constraints, but in a pre-petrochemical era with dependence on animal power, all areas produced mixed crops including oats, hay and grass. With their wet conditions, upland zones favoured oats over other grain, but also maintained hay meadows and pastures to feed livestock and draught animals. The utilisation of long periods generated distinctive ecologies, landscapes and land use patterns, and associated cultural traditions and behaviours. Together these have become a complex of tangible and intangible bio-cultural heritage and biodiversity. Typical birds in the British uplands for example, included twite and corncrake, both associated with traditionally managed landscapes. The two species became very rare and in many regions extinct, following cultural severance and the ending of traditional management. Similarly, with the ending of traditional uses, rural depopulation meant the communities of these landscapes dissipated, the patterns of meadows and pastures were lost, and associated ecologies declined. These patterns of use plus the plants and animals, the built structures and human communities, amount to the bio-cultural heritage characteristic of each region.

Food production and harvesting, together with hunting for sport and for food, have influenced rural landscapes across Europe over thousands of years. Hunting has been hugely significant in many European landscapes and affected species and cultural heritage both directly (through exploitation) and indirectly (through landscape management). Alongside the tangible heritage, hunting activities have extensive intangible heritage too. Land maintained and administered for hunting greatly influenced landscape development at both and regional levels. England for example, had extensive royal forests, private parks and chases established from late Saxon times with elements of some persisting into the modern countryside (Rotherham, 2007b; Liddiard 2003, Liddiard (ed.) 2007; Tubbs 1986). Many hunting parks led directly or indirectly to grand ornamental parks of the 1700s and 1800s, which in turn became defining features in many British landscapes (e.g. Harding, & Wall (eds) 2000).

[Figure 7]

Alongside obvious modern landscape drivers of agriculture and forestry, there have been numerous intimate and subtle interactions between communities and the countryside for sustenance, subsistence, for hunting and sport. The traditional and customary uses have created rich bio-cultural resources but in many parts of Europe, these have ended over the last two centuries, but the decline has accelerated through the late twentieth century. Whilst rural bio-cultural heritage and diversity is a living dynamic, and so changes and evolves over time, sudden and rapid industrialisation or abandonment of traditional uses threats both biological and cultural aspects. As uses end, even their memory, and the intangible, cultural heritage is lost too. For nature conservation, the problem seems to be that understanding of what generated and maintained the biodiversity that we want to safeguard or enhance, an intangible heritage, has been lost. This situation then presents serious problems for planners and managers when restoration projects, for example, fail.

Local and regional exploitation of landscapes and their resources varies with environmental, socio-political, and economic pressures. During climatic deterioration, for example, upland zones may be abandoned and low-lying peatlands may be vulnerable to catastrophic flooding. Political and economic pressures may tip the balance of spatial disputes and resource competition, or may push communities back to subsistence use of environmental resources as more sophisticated assets become scarce or unaffordable. Over-use and exhaustion of a particular resource, or access to it restricted for social or political reasons, may mean alternatives, including less suitable materials, have to be found. Competition or restriction on use might be through the influence of different or alternative requirements like oak timber for the late medieval navy affected by wood harvested for charcoal-fuelled iron smelting. Both these competed with wood use for fuel by both rich and poor; but poorer commoners and peasants were the worst affected. Competition between commoner, peasant, and major landowners, and between industrial exploitation and domestic use has affected many landscapes and importantly, their bio-cultural heritage today. In some cases, later industrial uses have removed entire palimpsests of eco-cultural landscapes and their associated heritage resources, both tangible and intangible.

Cultural severance & bio-cultural heritage

Human resource use in the natural landscape is a fundamental driver (Rotherham, 1999; De Moor et al. 2002; Agnoletti et al. (eds.) 2005). It interacts with the ecology and other environmental factors through complex social, legal, economic, and political mechanisms, facilitating and constraining usage (e.g. Tubbs 1986). Almost all the landscapes observed across Europe and many other parts of the world are eco-cultural, often managed in traditional ways for centuries. In this context, observations the impacts of people over time have been described for 1) wooded and forested landscapes, 2) marsh, meadow and fen, 3) heath, bog and common, and for 4) cultivated landscapes such as field systems (Rotherham 2014a).

Traditional and customary '*cultural*' utilisation, whilst not always sustainable, generated and drove many landscapes we now value so highly (e.g. Rotherham 2007b, 2013b). The reasons and mechanisms were discussed earlier, ranging from direct environmental impacts (like lowering nutrient levels and creating micro-disturbance), to indirect effects through social and economic impacts (allowing people the means to remain on the land or in a region). With the agricultural and industrial revolutions, the long process of severance in European landscapes began in earnest with people and supplies of food, fuel, building materials or other resources increasingly separated. Timing and impacts vary but the trends are the same across most European countries, though lagging in some eastern and Mediterranean regions.

As industry and agriculture move more towards technological processes, resources and solutions, nature and local landscapes are less important. Concomitant with severance is the massive shift from rural to urban populations, a phenomenon that continues to accelerate in the twenty-first century. For many regions, rural working communities in subsistence landscapes were displaced to become urban poor. The traditional rural environment becomes a disputed space and local people squeezed out; the landscape abandoned to become a backdrop to tourism, and the affluent seeker of rural recreation (Rotherham, 2014a).

[Figure 8]

However, there is a problem and it is one of the most serious threats, perhaps to environmental sustainability, and certainly to nature conservation. With the abandonment of traditional uses and practices, many sites have been lost or fragmented. Those that remain now have little or no management, and more-or-less quickly pass through successional change. Not 'natural' but 'cultural' landscapes, these have ecologies evolved over centuries of locally distinct and generally predictable exploitation driven by economic need. Attempts to now conserve and manage the remaining fragments are often far too little and far too late. Importantly too, they generally omit key parts of the traditional process, and have no long-term economic viability, or at least not one connected to land management processes.

Economy and landscape are separated at the level of cultural tradition and subsistence, to be replaced by a 'sticking plaster' approach through targeted grant aid. This is often laudable and in the short-term may be essential if sites, species and even some traditions are not to be totally lost. However, it is not a long-term solution, and it may be dangerous indeed to believe that it is. There is a widespread myth that release from farming in many areas will lead to '*re-wilding*' or '*re-naturing*' of landscapes, and so will be inherently good for wildlife (Monbiot 2013a, 2013b; Fisher 2006, 2013; Carver 2014). Some of the critical issues were discussed by Dudley (2011) and by Elliot (1997) in considering both the issues of so-called '*faking nature*', and the often-unquestioned '*ethics*' of restoration projects. Despite concerns, it is clear that restoration, however defined, offers many opportunities for improvement (e.g. Egan et al. (eds) 2011; Hall (ed.) 2009). In the case of re-wilding or re-naturing, it is true that some species will benefit, although these will ebb and flow as successional changes move on. However, the abandonment of a cultural or working landscape will in many cases simply amount to dereliction. This is seen increasingly across the Mediterranean, as rural areas are de-populated and both social and environmental problems result (e.g. Grove, & Rackham 2003). Favourably located landscapes may acquire a veneer of tourism affluence or commuter-belt sophistication, but most areas go into steep decline. With a derelict landscape and no working rural population, a degraded ecology and an abandoned cultural heritage, most regions will hold little appeal for the tourism or the leisure visitor (Rotherham 2013a, 2013b).

Progress in modern economies usually means socio-economic development, rural depopulation, and urban growth. It involves technological provision of needs, and separation of people from nature. The process forms part of human cultural evolution, but with serious environmental consequences. With severance of people and landscape, there is rapid de-coupling of communities from local environmental resources and ending of traditional land uses. For individual sites, the ecological consequences can be especially problematic:

1. Eutrophication due to non-removal of biomass (for fuel, animal bedding, fodder)
2. Lack of micro-disturbance from grazing or other working animals, and from subsistence activities (including transhumance use *etc*)
3. Lack of propagule dispersal, particularly seeds through grazing stock moving from site to site
4. Successional change due to abandonment (the rate varying with the landscape and its location, so upland zones in the UK for example are more resilient than lowland one)
5. Decreased value for local communities and abandonment or replacement by other uses (building development *etc*)
6. Fragmentation and isolation

At regional levels, there is serious risk of losing unique cultural heritage. Furthermore, this not only drove the ecology of former landscapes, but also may be a vital link to heritage tourism economies in the future. That gross changes are driven by economic ‘*progress*’ but responses are generally not, remains a huge challenge since most conservation initiatives are cosmetic rather than economic. Many successful conservation and environmental projects across Britain and throughout Europe are to be celebrated and encouraged, but their scale is insufficient to redress the balance of on-going losses. Additionally, most conservation projects merely address their ecological or ‘biodiversity’ components not the wider, more fundamental, bio-cultural heritage.

There are examples of good practice such as the work of bodies such as England’s National Trust in Cumbria. Here the operations are closing the gap between nature conservation and the local economy. However, this limited success is against a backdrop of cultural landscape abandonment probably unprecedented in human history, and it does not necessarily address core issues of bio-cultural heritage.

As local cultural knowledge is lost or not recognised, we no longer know how landscapes were managed even fifty or so years ago. This process of severance is happening rapidly across Europe, especially around the Mediterranean, and in former Eastern Bloc countries. It has occurred in Britain too (e.g. Rotherham 2007a), and recent ethnological research with older farmers in the Peak National Park showed how rapid abandonment of family farms is leading to loss of the intangible heritage of local knowledge about countryside. Those wishing to conserve such lands and their unique wildlife heritage frequently have little understanding of how the ecology evolved through the eco-cultural nature of the landscape (Rotherham 2014b).

Sherwood Forest in Nottinghamshire as an example of process & problem for bio-cultural heritage

The example of wooded or forested landscapes and their trees was given earlier as an example for which there are rich and diverse resources of biodiversity inter-twined with bio-cultural heritage (Rackham 1986; Peterken 1996). Sherwood Forest displays the characteristics of the consequences of cultural severance. The highest level of bio-cultural heritage of the area is in the great and ancient trees of global iconic status. Furthermore, the trees hold uniquely rich biodiversity from rare fungi to threatened saproxylic invertebrates (see for example, Rotherham 2007b). Additionally, some of the individual trees have famous stories and cultural heritage attached to them, and all the big trees tell a story of the remarkable landscape history of the Forest. There is much more to add, but this sufficiently illustrates the point.

The Forest mixed historic uses as grazing and commonland for peasants and as a royal hunting preserve. The great trees were standing in an expansive landscape of grazed wood pasture with heath, bog, grassland and scrub, which most of all was open. The world-famous Major Oak is one of the largest of its type in the world, and tells of growing as an open-grown tree in a grazed landscape. Some of the trees may be '*shreds*' and others may be '*pollards*'.

Probably around 100 to 150 years ago, the grazing management reduced considerably, and the royal forest had long-since been abandoned. From the 1920s onwards, and accelerating during the 1950s and 1960s, much of the area was afforested with exotic conifers, and other areas were military training grounds. With stock grazing now ended, the ecology began progressive successional change to scrub and then young birch woodland. Severance occurred with removal of traditional management but also with the loss of the local commoners and others with a stake in the grazed landscape. Areas were either abandoned to succession or planted with conifers, both resulting in the '*shrouding*' of the bio-cultural heritage resource of veteran trees, and the associated biodiversity. Some of the great trees survived though with diminished vigour, but many slipped silently and unnoticed into death. By the 1980s, it was realised that this nationally and in parts, globally, significant landscape and its ecology was in serious decline. Therefore, steps have been taken to reverse successional change and to remove conifer plantations. The work has achieved some success, though many ancient trees have been lost. Ironically, grant-funded projects to remove conifers from around veteran oaks (haloing) succeeded in actually killing many because the work was undertaken too quickly and the sudden change in microclimate was too much of a shock.

The restoration work is dependent on grant aid but this is justified because of the huge significance of the area for its heritage, its ecology, but also the economic significance of its tourism. There are even ideas of reintroducing large grazing herbivores to areas of the forest and the heath, though this has to be aid for whereas historically it was an economic driver. Growing populations of both red deer and fallow deer are already spreading across the area having escaped from nearby aristocratic parks. Overall, the future looks reasonably positive for the Forest, though government support and funding are always in doubt. However, over the last century or more, a huge and irreplaceable bio-cultural heritage has been lost. Some of the tangible heritage survives bit most of the intangible, cultural knowledge has ben lost.

Futurescapes & re-wilding

Approaches to conservation or landscape management, that suggest either or both '*abandonment*' or '*re-wilding*', can in fact present significant problems. Firstly, with declining biodiversity over the last fifty years or more, abandonment may be the final straw for many species. In terms of bio-cultural heritage, abandonment is undoubtedly disastrous. Furthermore, from an historic perspective, abandonment-style '*re-wilding*' is itself a misnomer since it implies a reversion to a former '*natural*' state (Monbiot 2013a, 2013b; Fisher 2006, 2013; Carver 2014). In reality, this is a myth and the example of regenerating the Great Forest of Caledon exemplifies this. It is a great idea, which gains a strong emotional response. If the Great Forest had existed, then the idea would be even better. The reality is that most landscapes lacking trees in northern Scotland have done so for thousands of years. The history is that these were not '*wild*', '*natural*' areas but settled populated landscapes (Rotherham 2014b).

Taking people out of the landscape and separating people from nature is wrong on many social, ethical, economic and political levels; and damaging to ecology, biodiversity, and bio-cultural heritage. It is not inherently wrong to create patches of Caledonian Pine Forest habitats now and in the future, if that is what we want for nature conservation. However, to claim this is somehow re-creating past landscapes is misleading and misinformed. The other aspect of the wilding debate is the idea of '*feral*', '*free*', '*self-willed*' nature unfettered by human constraints (Monbiot 2013a, 2013b; Fisher 2006, 2013; Carver 2014; Taylor 2005). However, is it a problem if abandonment to feral nature leads to colonisation by invasive Sitka spruce, Japanese knotweed, bracken, Himalayan balsam, or rhododendron? We decide, and the result is eco-cultural not natural. Feral future nature might be significantly populated by competitive, exotic, globalising species, something which the advocates of '*re-wilding*' rarely discuss, but according to Pearce (2015) for example, might be inevitable. However, large herbivore projects such as at Knepp in southern England (Taylor 2006) or Wild Ennerdale in northwest England (Browning & Gorst 2013; Taylor 2010), offer alternative visons of a wilder futurescape that resonates with many historic landscapes. Coastal zones also offer major opportunities for designed wilder environments (e.g. May et al. 2006). Unfortunately, the ideas and opportunities of wilder landscapes are frequently misunderstood (e.g. Vidal 2006), with suggestions of unsuitable and unsustainable herbivores for example, '*wilded*' into inappropriate environments. Furthermore, this is often in landscapes perceived as devoid of people.

Nature with & without people

To remove people from the natural world is not natural since we are a part of nature. For many reasons, in the twenty-first century it may be beneficial to have wilder landscapes than we have had in the recent past. However, these are designed scenarios led and determined by humanity. The skill in nature conservation and a challenge for the future may be to embed humanity in the natural world but in ways less damaging and more positive than throughout the twentieth century. There is a toolkit of options and techniques that can be applied as various types of land management and deliberate conservation interventions. Approaches may involve grazing by wild, feral, or domesticated stock of various types applied in different densities and seasons (e.g. Rotherham 2013a). These interventions influence the ecological outcomes, and sometimes the favoured approach may be non-intervention. Each intervention or non-intervention leads to ecological successional changes and, based on knowledge of site environmental conditions these are predictable (Rotherham 2014b).

This is not new since people have intervened in nature for many diverse reasons over many centuries. In times past, such as with the great English landscape designers of the 1700s and the wild gardeners of the 1800s, people have created '*wilderness*'. This was often through removal of people, application of grazing regimes, and 'wild' exotic species; manufactured, romantic wilderness but not natural. These wild landscapes were to be viewed from the outside rather than lived in. In designing futurescapes, wilder landscapes have much to offer, alongside other traditional and indeed, radical conservation approaches (Rotherham 2014a, 2014b).

In a rapidly changing world, approaches to landscape conservation need planning and design. They must apply science and the insights of history. Failure to do this effectively risks continuing downwards spiral of environmental quality and declining species diversity, alongside rural depopulation and deteriorating rural economies, both farming and tourism. Because of massive human impacts on the environment over countless centuries, whether we like it or not, we are custodians of the countryside. The responsibility for future landscapes is ours. The decisions we make and how those decisions are reached may be debated, but simply abandoning landscapes, (and even de-populating them), are not viable options. However, '*wilder by design*' and large-scale, imaginative, wilding projects in appropriate locations, offer great possibilities, but these are not wilderness but wilder eco-cultural landscapes (Rotherham 2014b).

Futurescapes visions & free nature

Where does bio-cultural heritage sit within a vision of free, self-willed nature? How should conservation bodies respond to remnant biodiversity and priority species lost when a site is '*freed*'? Even if we accept that, '*the loss of a few species is a price worth paying for a wilder nature*' (Carver 2014), who decides? If we intervene, then who does it, why do they do it, what do they do, where do they do it, and when do they do it, and who decides and pays? (Rotherham 2014b) Over centuries, people have shifted environmental baselines so significantly that whether we choose to intervene or not, the outcomes are culturally determined within eco-cultural landscapes. Even the decision not to intervene is a positive intervention; people and nature trapped within our humanity, as a part of nature. Therefore, the critical paradigms are concerned with 1) the type of human interventions in nature and the responses that follow the changed parameters; and 2) how might these be managed and manipulated to free nature for a wilder landscape; and 3) how does bio-cultural heritage fit within these conceptual frameworks. History and science inform likely trajectories for future, wilder nature, but it may be a rocky road ahead.

Conclusions

Bio-cultural heritage needs to be placed firmly at the forefront of conservation, as a link between people, history and biodiversity. In Europe most coppice woods and associated ground flora, birds like nightingales, and woodland butterflies have gone. With ancient wood pastures abandoned, we lose 1,000-year-old oaks, unique saproxylic invertebrates, lichens, and fungi. Heathlands and grasslands like meadows and pastures, are essentially eco-cultural; severed from human tradition, they become rank, eutrophic communities of little ecological interest aside from catholic, competitive, opportunists. All this is widely known, and predicted in the plant strategy work of Grime et al. 2007) and Hodgson (1986), and by specialists like Webb (1986, 1990, 1998) and Chadwick (1982), considering European heathlands. With areas abandoned, landscapes become contested spaces; local, traditional peoples squeezed out by capital-intensive land-uses, absentee landowners, and leisure or recreation (Rotherham 2014a). Whilst traditional management transformed ecologies, local economic dependence fosters sustainable uses unless other factors tip the balance. Incomers may bring fresh ideas and fresh funds for environmental management and innovation, but across Europe, traditional landscapes morph into either abandonment or into leisurely landscapes detached from most ecosystem functions. With a few exceptions such as the work of the National Trust in Britain, little of the leisure and tourism economic activity feeds back into land management or conservation.

Following abandonment, biomass increase, eutrophication, and intensive recreational use or urbanisation, many areas become vulnerable to rampant wildfires. From California, to Australia, from Greece, Spain, and Italy to France, and from Dorset heaths to Peak District moors, such fires are predictable results of cultural severance and abandonment. Traditional peoples often used regular fires to manage their landscapes, re-cycling and releasing precious nutrients, and providing essential grazing at the right time of year. When European imperialists populated the planet, they generally viewed native, indigenes as ignorant and primitive, and suppressed local fire management of landscapes. Today's catastrophic wildfires are direct consequences and descendants of past cultural severance (Rotherham 2008, 2013b, 2014b; Pyne 2001).

A major challenge now is to record local cultural knowledge and insight, to re-build and celebrate local connectivity with nature, to value local traditions and uses, and to apply the knowledge in a meaningful way. Bio-cultural heritage is at the core of such ideas. It is neither possible nor desirable (socially and economically) to stop the clock, but we need to find long-term economically sustainable solutions to these problems. The approaches must be more ambitious and more radical than anything that we have achieved so far. Webb (1986, 1998) considered the issues and conservation management options for the European heathland component of this discussion, and his prognosis was less than positive.

With dynamic landscapes and fluid ecologies (Rotherham 2014a) replaced by fixed locations, habitat fragmentation, isolation, and soils and water altered by eutrophication, environmental conditions today are not '*natural*'. Regular micro-disturbance, vital for many species, is replaced by unpredictable macro-disturbances. Domestic grazing herbivores or wild / wilded stock may be either beneficial or calamitous for conservation target species, depending on what, how, and when (Rotherham & Lambert 2011; Rotherham 2014b). Introducing large herbivores into small, isolated sites does not produce ecological benefits since they lack the dynamics of larger-scale ecosystems. Animal behaviour is not '*natural*' without large carnivores influencing and directing herbivore feeding patterns and movement. Abandoned to '*re-wilding*' without either or both large herbivores or carnivores is not '*natural*' but attenuated ecology lacking keystone fauna or traditional management (Rotherham 2013a). Ecological successions are then predictable but no more '*natural*' than other options, and to intervene or not, a management decision for already highly modified landscapes. Informed by history, ecological visions must look forwards to new futurescapes to conserve and enhance not only biodiversity, but also bio-cultural heritage. The realities of such visions are beginning to be addressed by environmental writers such as Marris (2011), but there is a genuine risk that bio-cultural heritage may simply be overlooked and lost.

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Figure 2. The Wood-Wain by Birkett Foster 'The Wood-Wain' showing a managed English wood in the early nineteenth century as eco-cultural countryside

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Figure 4. Peat bog as a cultural landscape - peat cutting on Brown Willy, Bodmin Moor, Cornwall

Figure 5. The cultural landscape of the peat fen, with gathering and loading peats from the drying grounds

Figure 6. Burnham Beeches near London shown in the 1920s with veteran beech trees pollarded as the city's fuel allotment

Figure 7. In Sherwood Forest, from a Victorian print showing a commoner with his sheep as an eco-cultural landscape

Figure 8. Abandoned from cultural utilisation, Sherwood Forest as a birchwood and heath in the 1940s

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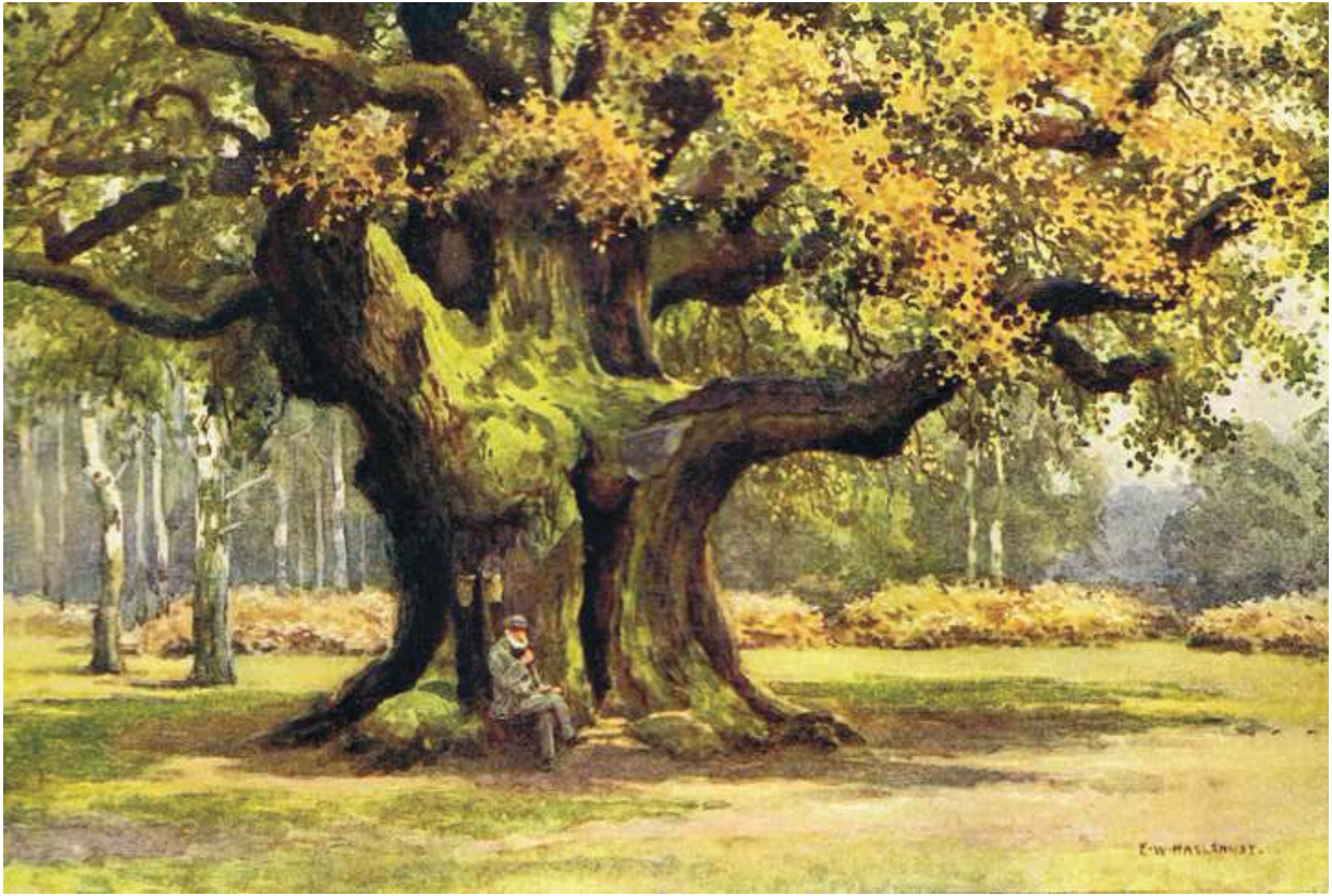
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Figure 2

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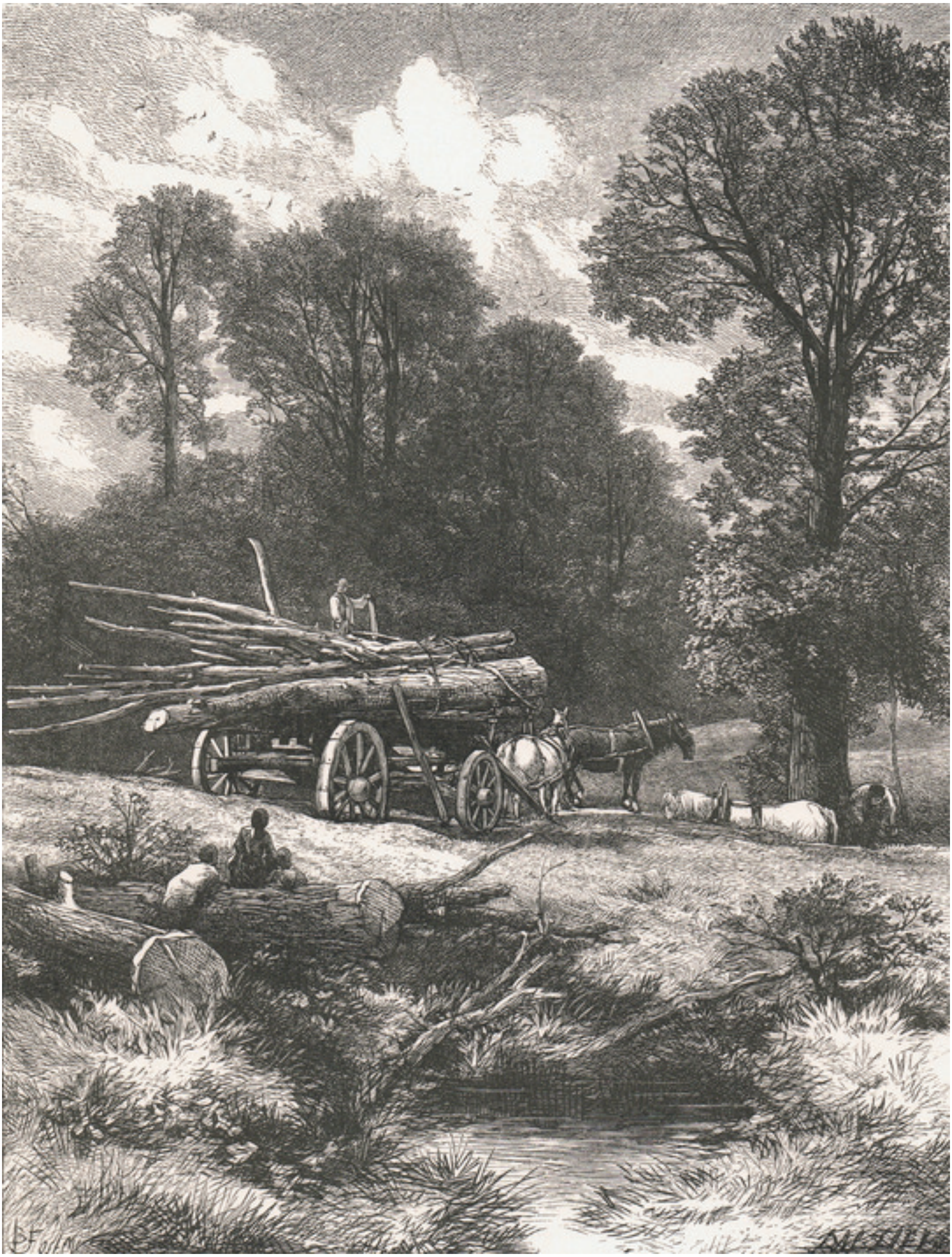

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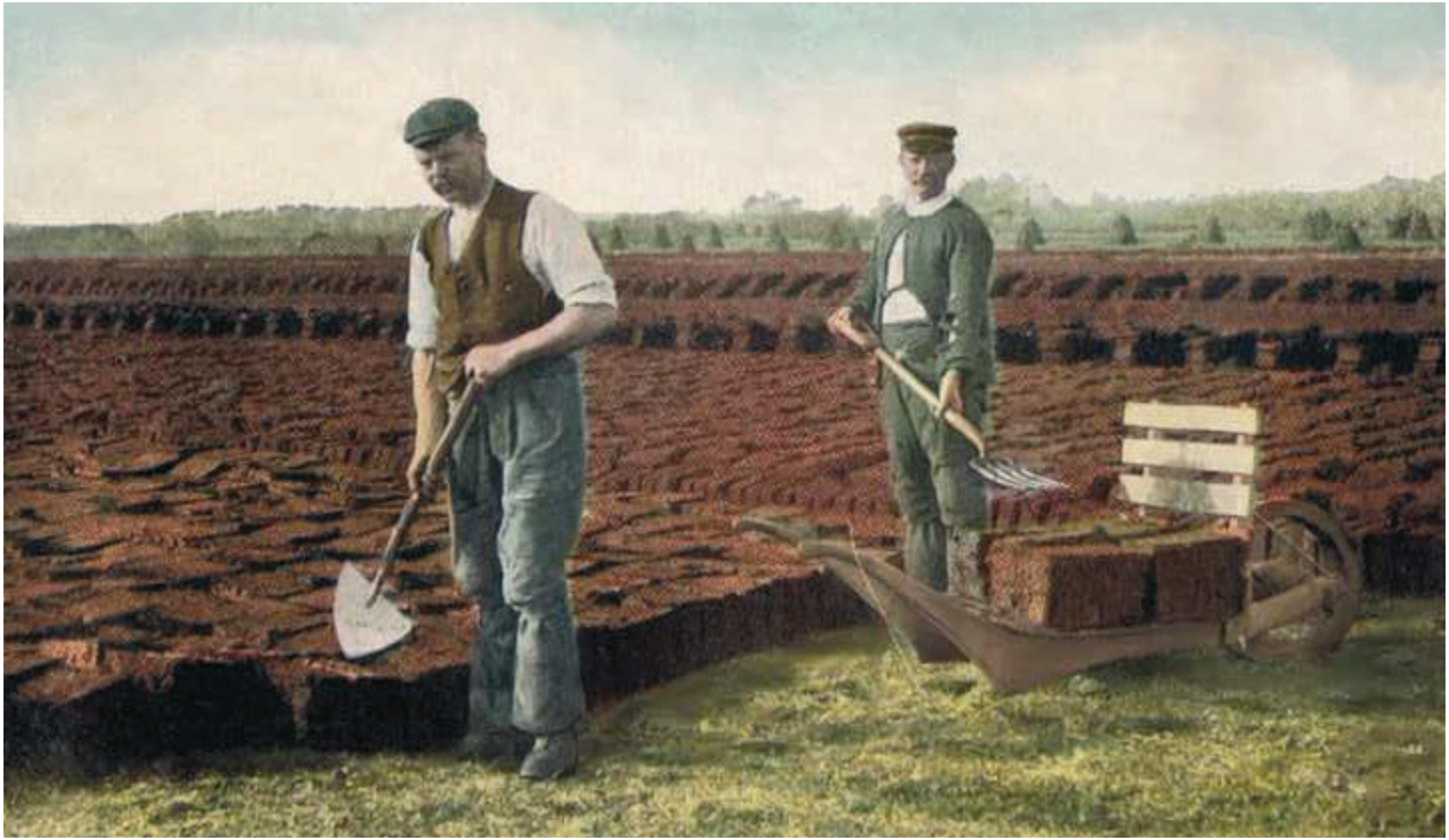

Figure 4

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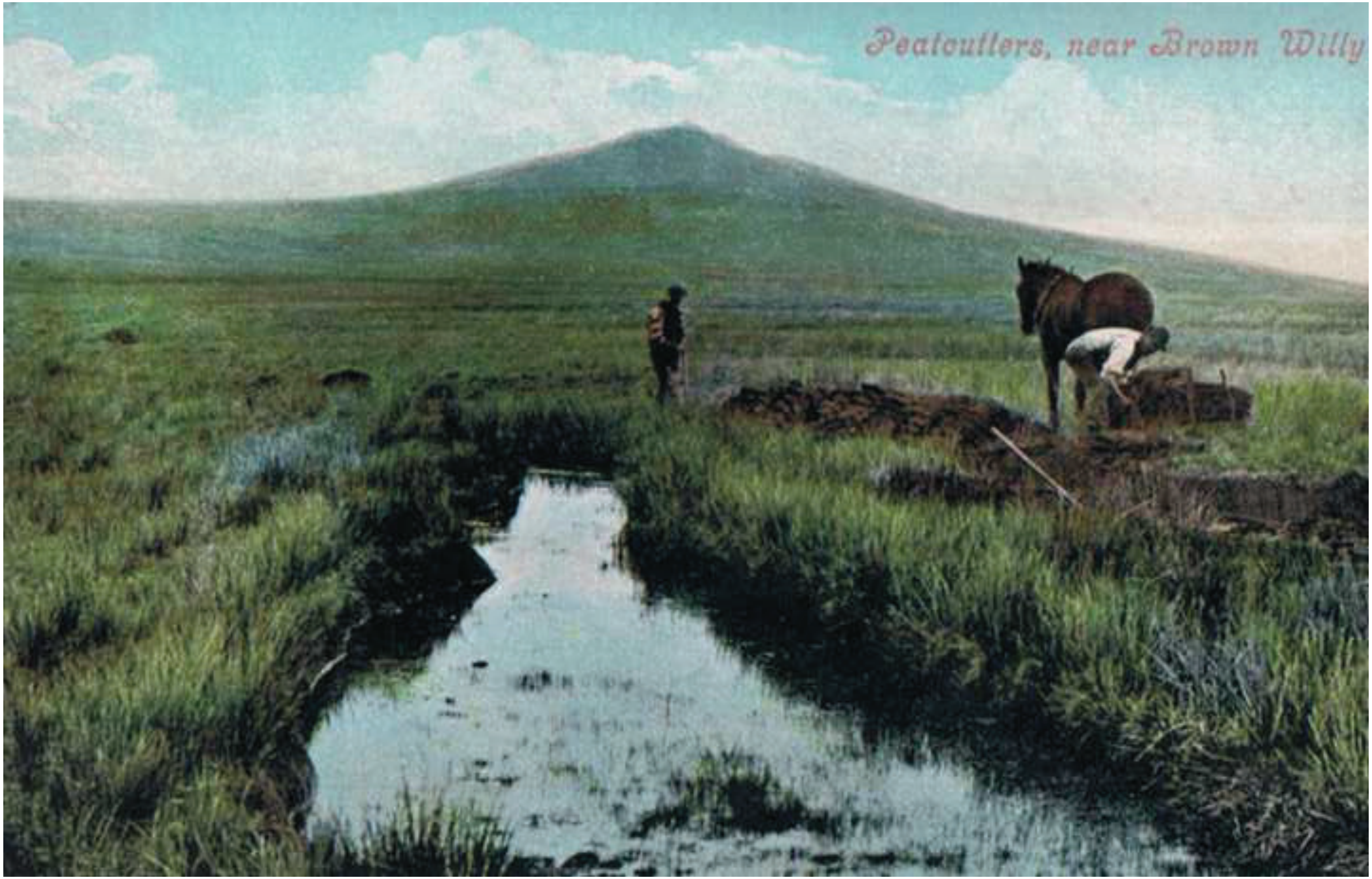
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Figure 5

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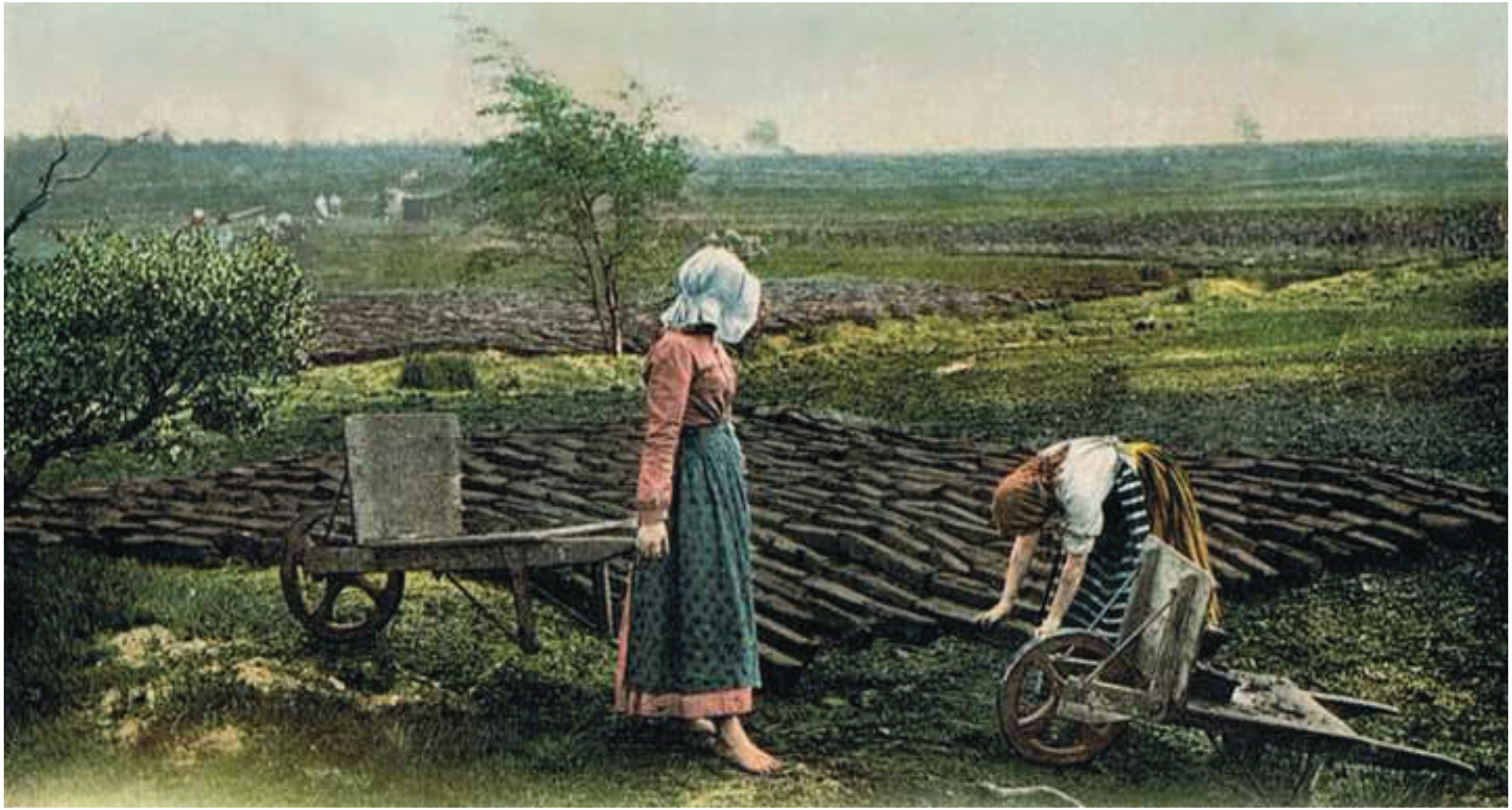

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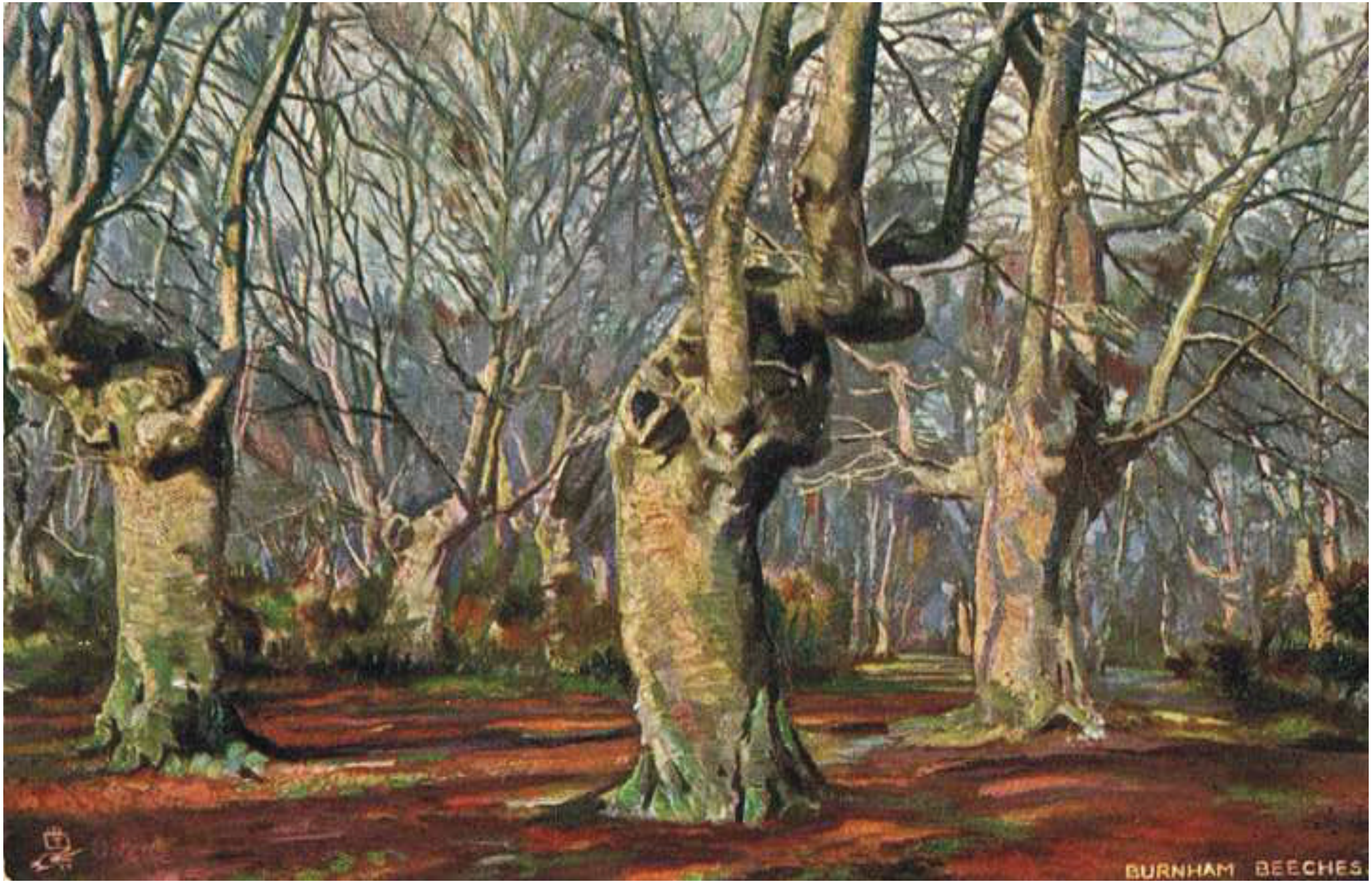
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Figure 7

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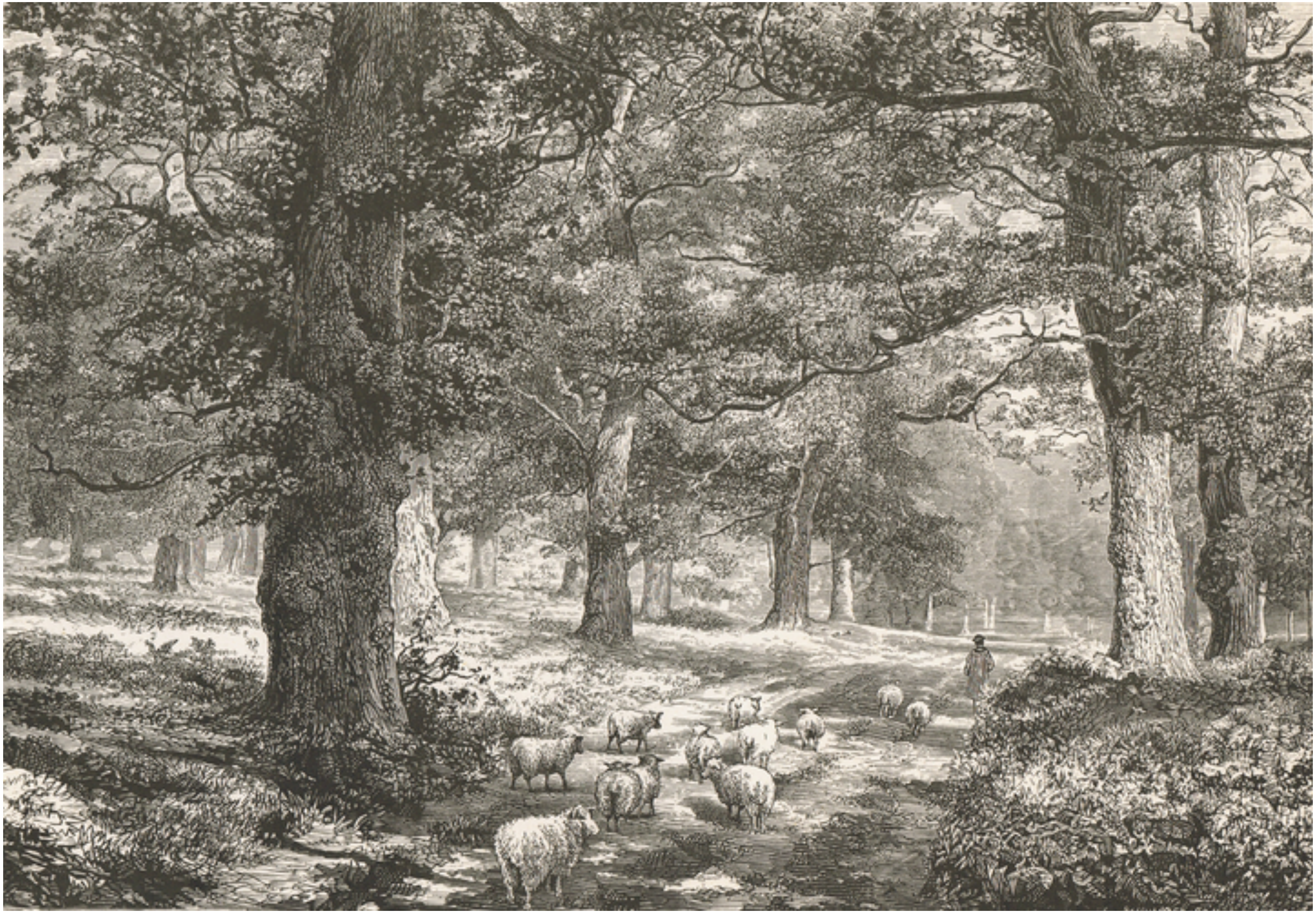

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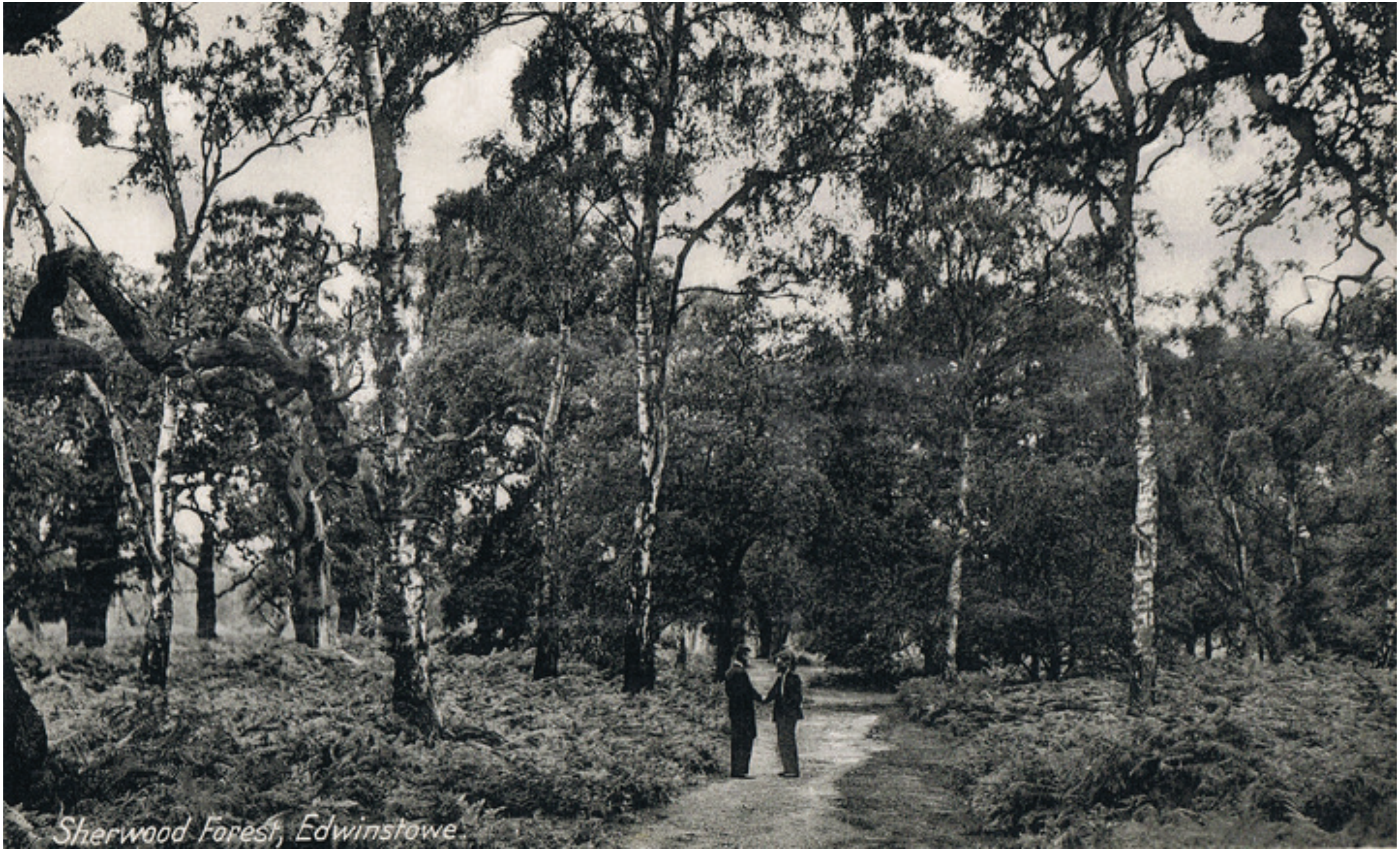
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