Qualitative Impact Assessment of Land Management Interventions on Ecosystem Services ("QEIA")

Report-3.7: Cultural Services

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Qualitative impact assessment of land management interventions on Ecosystem Services

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Birnie, J., Magowan, E., Law, R., Lucas, O.T., Hassin, A.E.J. (2023). *Qualitative impact assessment of land management interventions on Ecosystem Services ("QEIA").* Report-3 Theme-2: Greenhouse Gases (GHG) (Defra ECM_62324/UKCEH 08044)

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Williams, J.R., Newell Price, J.P., Williams, A.P., Bowes, M.J., Hutchins, M.G. & Qu, Y. et al. (2023). *Qualitative impact assessment of land management interventions on Ecosystem Services ("QEIA")*. Report-3, Theme-4: Water (Defra ECM_62324/UKCEH 08044)

Staley, J.T., Botham, M.S., Broughton, R.K., Carvell, C., Pywell, R.F., Wagner, M. & Woodcock, B.A. (2023). *Qualitative impact assessment of land management interventions on Ecosystem Services ("QEIA")*. Report-3 Theme-5A: Biodiversity - Cropland (Defra ECM_62324/UKCEH 08044)

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Maskell, L. & Norton, L. (2023). *Qualitative impact assessment of land management interventions on Ecosystem Services ("QEIA")*. Report-3 Theme-5C: Biodiversity - Semi-Natural Habitats (Defra ECM_62324/UKCEH 08044)

Siriwardena, G.M. (2023). *Qualitative impact assessment of land management interventions on Ecosystem Services ("QEIA")*. Report-3 Theme-5D: Biodiversity - Integrated System-Based Actions (Defra ECM_62324/UKCEH 08044)

Bentley, L., Feeney, C., Matthews, R., Evans, C.D., Garbutt, R.A., Thomson, A. & Emmett, B.A. (2023). *Qualitative impact assessment of land management interventions on Ecosystem Services ("QEIA")*. Report-3 Theme-6: Carbon Sequestration (Defra ECM_62324/UKCEH 08044)

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A list of all references used in the reports is also available as a separate database.

Foreword

The focus of this project was to provide a rapid qualitative assessment of land management interventions on Ecosystem Services (ES) proposed for inclusion in Environmental Land Management (ELM) schemes. This involved a review of the current evidence base by ten expert teams drawn from the independent research community in a consistent series of ten Evidence Reviews. These reviews were undertaken rapidly at Defra's request and together captured more than 2000 individual sources of evidence. These reviews were then used to inform an Integrated Assessment (IA) to provide a more accessible summary of these evidence reviews with a focus on capturing the actions with the greatest potential magnitude of change for the intended ES and their potential co-benefits and trade-offs across the Ecosystem Services and Ecosystem Services Indicators.

The final IA table captured scores for 741 actions across 8 Themes, 33 ES and 53 ES-indicators. This produced a total possible matrix of 39,273 scores. It should be noted that this piece of work is just one element of the wider underpinning work Defra has commissioned to support the development of the ELM schemes. The project was carried out in two phases with the environmental and provisioning services commissioned in Phase 1 and cultural and regulatory services in a follow-on Phase 2.

Due to the urgency of the need for these evidence reviews, there was insufficient time for systematic reviews and therefore the reviews relied on the knowledge of the team of the peer reviewed and grey literature with some rapid additional checking of recent reports and papers. This limitation of the review process was clearly explained and understood by Defra. The review presented here is one of the ten evidence reviews which informed the IA.

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1 INTRODUCTION

1.1 WHAT ARE CULTURAL ECOSYSTEM SERVICES (CES)?

As an approach, ecosystem services (ES) was mainstreamed with the publication of the Millennium Ecosystem Assessment (MA) (2005). The MA defines ES as 'the benefits people directly or indirectly obtain from the environment' (MA, 2005). Like Costanza et al (1997) the MA uses the term to include both 'goods' and 'services'. It classifies ES into 4 categories: provisioning, regulating supporting and cultural services. Cultural Ecosystem Services (CES) are defined as the **non-material benefits** obtained from ecosystems through spiritual enrichment, cognitive development, reflection, aesthetic experience and include things like social relations, aesthetic values and human wellbeing (Milcu et al 2013). According to De Groot, Ramakrishnan et al. (2005), CES comprise six main sub-sets:

1. Cultural identity – focusing on the cultural linkage between humans and their environment, and connected to knowledge systems and language;
2. Heritage values – also encompassing memories related to historically valuable land use practices;
3. Spiritual services – sacred, religious or other forms of spiritual inspiration derived from ecosystems;
4. Inspiration - which might be expressed through artefacts, arts or folklore;
5. Aesthetic appreciation of landscape; and
6. Recreation and tourism.

1.2 QUALITIES AND INDICATORS OF CES VALUE

Considerable focus has been placed upon identifying relevant indicators and measuring them in order to map and quantify ES at different spatial and temporal scales. This has presented some challenges particularly for cultural services, which are more difficult to quantify and measure than other ES (Fish et al 2016; Jones et al. 2021). Chan et al (2012) argue that the valuation of CES is complicated by their properties of intangibility and incommensurability. Plieninger et al (2013) nevertheless demonstrate that aesthetic values, social relations and educational values are related to individuals' wellbeing. They also show that such services are not scattered randomly across a landscape but rather follow specific patterns in terms of the intensity, richness and diversity of their provision. This bundled provision, they argue, can orientate management of CES towards multi-functionality, which is rarely achieved in land use science and policy.

A rather broader cultural approach is taken in the Demos 'Value Triangle', designed originally to conceptualise cultural values and raise their profile and legitimacy in public policy (Holden, 2006). It categorises the benefits for individuals and society arising through CES in three ways:

- Intrinsic value - based on subjective experience intellectually, emotionally and spiritually;
- Instrumental value – capturing the incidental or ancillary effects of culture or heritage, which is used to achieve a social or economic purpose; and
- Institutional value – recognising how organisations create value, based principally around their engagement with the public (e.g. how the work of the RSPB or National Trust raises societal appreciation of wildlife and special places).

Van Berkel and Verburg (2014) showed that there is societal demand for CES, focusing principally on landscape. Recognising that tourism services form an important aspect of amenities in agricultural landscapes, the authors assessed the value of landscape functions including aesthetic beauty, cultural heritage, spirituality and inspiration, by surveying tourists and visitors to sites. A useful review by Daniel et al (2012) concluded that spiritual and religious values can be instrumental in promoting biodiversity conservation, indicating that the relationship between agricultural management and CES has been underplayed, and that this relationship is very much two-way (Dwyer et al 2020).

The ES notion, and its meeting point with concepts of health and happiness, has been criticised for lacking recognition of how diversely and profoundly the material and non-material world can impact our health and happiness (Fish, 2011, Bryce et al., 2014). Yet framing the experiences of health and wellbeing we gain through interaction with environments in terms of cultural benefit can also help highlight how valuation of green and blue space is materially and culturally informed and specific (Hartig et al., 2014, Shanahan et al., 2015). However, not all health and wellbeing benefits are experienced through CES, and many other benefits come indirectly through provisioning (food and nutrition) and regulating (mediation of harmful events) services. Some of those impacts are assessed here where they directly influence people living in urban areas (Theme 11 on noise mitigation and Theme 12 on heat mitigation). Other health benefits which are more indirect, or which operate more at a landscape scale (e.g. benefits via climate mitigation) are detailed in Theme sections.

Conceptual approach to CES arising from environmental land management activities

For the purposes of this exercise, the team has conceptualised CES linked to payment for land management as arising in two main ways:

- one where social and cultural outcomes are derived **directly from engaging in land management activities** themselves, e.g. mental health, noise reduction and sense of place, and
- a second where socio-cultural beneficial outcomes are **derived indirectly from management that results in providing or improving land quality or accessibility**, e.g. for recreation, visual amenity and education.

As this report focuses on England, it is worth noting Defra's own consideration of cultural ecosystem services led to the identification of three overarching qualities: **Beauty, Engagement and Heritage**. Linking these to our earlier concepts we can see that each quality could be perceived or experienced either directly or indirectly, via funding which promotes land management activities. People who are themselves engaged in land management activities would experience beauty and benefit from direct contact/opportunity to investigate the historic environment; but other people who are provided with access or opportunity to enjoy land which is beautiful, has historic value or can be enjoyed for recreation or tourism, experience these services as an indirect result of the management which has enabled those opportunities.

Generally, when people seek to value CES it is common to assume a (Benthamist-derived) quantitative, summative perspective such that opportunities to enjoy CES are judged to be worth more than others when they reach the largest possible number of people (e.g. close to town and city, or attracting large visitor numbers). However, it is also important to note widely-accepted **qualitative** elements in CES provision, such that people are also recognised to value:

- management which offers a 'higher quality' experience than would have been the case without it (e.g. providing signage, opening up paths and rides, improving habitat quality so as to increase visual beauty or opportunities to see wildlife/beautiful views, or hear / smell / touch nature, carefully exposing archaeological remains and providing interpretation, restoring features which mark historic land use/cultural change, etc.)
- land or access to land which has a unique or rare experiential value – the sense of wilderness, which generally requires it to feel 'empty' of people and multiple signs of contemporary human activity. It is worth noting that Nature Scotland has a map that covers this concept in Scotland[1]. However, the ecology of English landscapes is intimately linked to human activity, as exemplified by Oliver Rackham's work on historical ecology (Rackham 1986).; or the ability to discover things which are not immediately obvious, by careful and patient attention (e.g. rare plants in small niches, historic symbols or artefacts hidden within the soil, nocturnal creatures, etc.).
- benefits offered particularly to groups who might otherwise not have such opportunities (socially-excluded groups including Black, Asian and minority ethnic **(**BAME), disadvantaged or differently-able, who could be targeted in various ways or where facilities are specifically designed to work well for them).

Our approach aims to acknowledge both quantitative and qualitative valuations of CES, whilst recognising that sometimes there can be tensions between the 'greatest enjoyment for the most people' approach and the quality of engagement for each person or target group. However, by seeking to provide a mix of socially-oriented CES where social engagement is to the fore, and individually-oriented CES where solitary or 'precious' experiences of beauty, heritage or engagement are possible, land management options should be able to cater for this wide range of CES values.

As with most types of ES, the **location, scale and temporal context of environmental land management actions will influence the CES value** that they offer. In addition, an important point to note with CES is that **the way in which activities are conducted can also make a big difference to their CES value** – particularly thinking about their direct value from engagement. For example, if natural flood management actions along a catchment are undertaken by professional contractors working for a landowner, this will have relatively limited direct CES value, whereas if the same actions are undertaken by a local community group, maybe also involving children from the village school and/or accompanied by educational and socio-cultural opportunities (a shared meal, songs and dances, a talk from a local historian, etc.), their direct CES value will be much greater (Short et al 2019). This brings some challenges into interpreting the significance of ELM activities since for many, the way in which those activities are organised is not otherwise specified. For that reason, scoring is accompanied where most relevant by a note on the potential influence of how activities take place.

2 OUTCOMES

In this section, we outline the structure of the report and clarify the changes made to the original indicators, as well as areas where further work is needed. We also identify key findings from the list of actions reviewed, including which actions showed the most potential for cultural services. We then highlight key, general issues arising from this review, which could hamper successful attempts to increase cultural services in England, including data gaps and the feasibility successful implementation. A further summary of key data gaps identified over the course of the report is provided in Section 5.

2.1 STRUCTURE OF THE REPORT

The team made a number of changes to the list of Cultural Services and Indicators that formed the basis of the Requirement 1 report. This includes the revisions in Cultural Services suggested by Heritage England in October 2022. It is this listing that forms the basis of this report, resulting in 13 themes to cover cultural services. The G indicators are also included and in some cases this is extended to include more relevant ones, as the table below shows.

Theme report	Indicator(s)
1. Recreation	G4: Engagement with the natural environment: G4a) Visits to the natural environment G4b) Visits to green and natural spaces. Public rights of way - number and condition and open-access areas G7: Health and wellbeing benefits G7 (interim): Percentage of adults in England reporting that time spent outdoors was good for their physical (and mental) health.
2. Mental health	G7: Health and wellbeing benefits G7 (interim): Percentage of adults in England reporting that time spent outdoors was good for their (physical and) mental health.
3. Educational	G6: Environmental attitudes and behaviours G6 (interim): Percentage of adults in England reporting that protecting the environment is important to them.
4. Volunteering	G5: People engaged in social action for the environment.
5. Tourism	G4: is not suitable for tourism. A different indicator needs to be found which separates out tourists from local users for recreation.
6. Cultural heritage	Number of designated heritage assets doesn't say anything about awareness. We suggest instead: Percentage of adults in England reporting that protecting cultural heritage is important to them.
7. Cultural heritage	G2b: Condition of Scheduled Monuments in England (based on entries with archaeological assessments). Expanded to cover the condition of all designated heritage assets.
8. Awareness of diversity - geodiversity	G2a: Condition of geological and geomorphological heritage features of Sites of Special Scientific Interest in England.
9. Awareness of diversity - wildlife	Currently 'naturalness of watercourses' but this is not about awareness. Therefore, we suggest instead 'Percentage of adults (and children) who perceive increased biodiversity in the environment.
10. Landscape character	G1: Changes in landscape and waterscape character. G3: Enhancement of green/blue infrastructure.
11. Noise mitigation	G7: Health and wellbeing benefits G7 (interim): Percentage of adults in England reporting that time spent outdoors was good for their physical and mental health.

12. Local temperature regulation	G7: Health and wellbeing benefits G7 (interim): Percentage of adults in England reporting that time spent outdoors was good for their physical and mental health.
13. Sense of place	Benefits to people of access to and engagement with high quality, accessible, suitably conserved heritage, as expressed through DCMS's 'willingness to pay' metric.

2.1.1 Theme 1: Enabling Recreation

Theme 1: Enabling Recreation is split into three indicators, all focusing on different aspects of enabling recreation. It makes sense to have one indicator focusing on physical activity and G4 can be used as this is in line with the 25 YEP target '*Making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing.* However, the inclusion of G5, with its focus on social action, did not make sense to the team. Instead, we propose adding an indicator to cover number and condition of Public Rights of Way (PROW) and open-access areas. The number of rights of way had been added under the service description of nature-based tourism following comments from Heritage England. We propose that bringing this indicator under the Enabling Recreation service provides a stronger rationale for the indicator.

The third indicator is G7, which we suggest is a better indicator than G5 as the indicator makes an explicit mention of physical activity whereas G5 did not. This amalgamation of indicators also merges the 'Enabling physical activity' theme as the team felt there was little or no difference between this and 'enabling recreation'.

2.1.2 Theme 2: Environmental settings for mental health

This is unchanged from the description proposed in Requirement 1 and retains the same 25 YEP target as Theme 1 and the same indicator, although the emphasis is on mental health rather than physical as this is the focus.

2.1.3 Theme 3: Enabling educational interactions

Theme 3 focuses on educational opportunities within the actions. The 25 YEP target description is *'Focusing on increasing action to improve the environment from all sectors of society'* and the indicator in G6: G6: Environmental attitudes and behaviours, namely the percentage of adults in England reporting that protecting the environment is important to them.

2.1.4 Theme 4: Volunteering opportunities

The last of the reports focusing on environmental engagement is around volunteering opportunities. In this case the 25 YEP indicator description is the same as Theme 3 on educational opportunities. However, the indicator is G5: People engaged in social action for the environment.

2.1.5 Theme 5: Tourism in environmental land

Theme 5 is an amalgamation of two former themes covering nature-based tourism and cultural heritage tourism. The new title is meant to focus on the land aspects of tourism by indicating that the tourism is taking place in land of environmental value. This also enables cultural heritage and nature-based tourism to be considered under the same theme and places the focus on the land rather than the activity, which is an economic one that might not be eligible for support through public funds. There is considerable evidence that enhancing the natural environment tends to attract more tourists and enhances the tourist experience. This is seen for woodland creation (Iversen *et al*. 2023; FitzGerald *et al*. 2021), orchard management (Cui *et al*. 2021), wetlands conservation and management (Boboc *et al*. 2016), calcareous grassland landscapes (Kostrakiewicz-Gieralt *et al*. 2020). The action of tourism itself will not enhance the cultural or other ecosystem services but it might facilitate investment that is able to enhance these areas of

land. The 25 YEP was the same for both previous themes and remains as '*Making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing*'.

The indicator remains as G4: Engagement with the natural environment G4a) Visits to the natural environment G4b) Visits to green and natural spaces. It is important to point out that this indicator is not able to distinguish between the *type* of visit to the natural environment and green space. Since this theme is about tourism it is important that the indicator is able to focus on tourism as opposed to recreation, which would also be included in G4. The second indicator, G6: percentage of adults reporting that protecting the environment is important to them, is appropriate indicator for this theme and it was deleted.

2.1.6 Theme 6: Awareness of Cultural Heritage

The original proposal was for a single report looking at both awareness and condition. We have split this into two themed sections. The first focuses on awareness of cultural heritage and as a result there is no clear 25YEP target as the current options only focus on condition. In terms of an indicators, we propose one that reflects the environment one with possible wording 'P*ercentage of adults in England reporting that protecting cultural heritage is important to them*'.

2.1.7 Theme 7: Condition of cultural heritage

The 25 YEP for this theme is '*Safeguarding and enhancing the beauty of our natural scenery and improving its environmental value while being sensitive to considerations of its heritage*'. The description has been revised to focus on condition in order to distinguish from Theme 6 which focuses on awareness. The indicator remains *G2b: condition of Schedule Ancient Monument* (SAM). However, it is important to stress that this indicator is very limited by focusing on SAMs compared to the population of heritage assets. As a result of we propose that a second indicator, *the condition of all designated heritage assets,* is added. However, even this indicator would be limited to designated sites (e.g. Scheduled Ancient Monuments), which is less than the total population of heritage assets.

2.1.8 Theme 8: Geodiversity

The chapter is one of two covering the awareness of enhancement of diversity and focuses on geodiversity in its own right. Geological and Geomorphological features (and therefore Geodiversity) are fundamentally components of 'Supporting' ecosystem services'. It is by means of that support that they can also contribute to Cultural services (for example, by contributing to landscape, waterscape and seascape character, natural beauty and a sense of place) but they also contribute in other ways to both Provisioning and Regulating services. The 25 YEP description is '*Safeguarding and enhancing the beauty of our natural scenery and improving its environmental value while being sensitive to considerations of its heritage'.* This generic statement leaves room for the issue of geodiversity to be covered. The indicators is G2a: *Condition of geological and geomorphological (heritage) features of Sites of Special Scientific Interest in England.*

2.1.9 Theme 9: Wildlife

The second in this set covers awareness of enhancement of diversity with a focus on wildlife. No25 YEP description was identified originally, and the team suggested the integration of two, namely *'Creating or restoring 500,000 hectares of wildlife-rich habitat outside the protected site network, focusing on priority habitats as part of a wider set of land management changes providing extensive benefits'* with *'safeguarding and enhancing the beauty of our natural scenery and improving its environmental value while being sensitive to considerations of its heritage'.* The original indicator was the 'visibility of wildlife' and the 'naturalness of watercourses' but neither cover awareness and as a result need replacing. We propose using '*percentage of adults who perceive increased biodiversity in the environment'*. We suggest only one indicator is needed for this theme.

2.1.10 Theme 10: Landscape character

Originally the suggested description covered Landscape, seascape and local environmental amenity, which has been merged into one theme covering landscape and seascape with two indicators. The 25 YEP target is '*safeguarding and enhancing the beauty of our natural scenery and improving its environmental value while being sensitive to considerations of its heritage*', which has been used for several other themes. However, the indicators have not been used before: G1: *change in landscape and seascape character* and G3: *enhancement of green/blue infrastructure*.

2.1.11 Theme 11: Regulating services: noise mitigation

This cross-cutting assessment of a regulating service (noise mitigation) is included here as the reference to the 25 YEP is '*Making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing*'. Here the reference to 'urban areas' is particularly important as noise mitigation is most likely to be relevant around areas of higher population. The indicator focuses on health and wellbeing, namely is G7: *Health and wellbeing benefits G7 (interim): Percentage of adults in England reporting that time spent outdoors was good for their physical and mental health*.

2.1.12 Theme 12: Regulating services: local temperature regulation

The second cross-cutting assessment of a regulating service is local temperature regulation and has the same 25 YEP description and indicators as Theme 11. The focus on urban areas is important within the indicator as is the focus on health and wellbeing.

2.1.13 Theme 13: Sense of place (as a use and non-use value)

Theme 13 assesses the issue of 'sense of place'. The stated link the 25 YEP are the clear link to 'beauty heritage and engagement', one of the six principles of the 25 YEP, and the material benefits that need to be picked up regarding its heritage and cultural services aspects. The 25 YEP target remains unchanged as a result. The indicator is a little more problematic as it is the '*benefits to people of access to and engagement with high quality, accessible, suitably-conserved heritage*' as there is a specific focus on the 'willingness to pay' metric as used by DCMS. However, this approach has many drawbacks as an approach (Bateman and Langford 1997; Hudson and Ritchie 2001 and Cookson 2003) especially when there are other quantitative surveys about sense of place which could be used instead (Tuan 1974; Relph 2008; Ryfield et al. 2019).

2.1.14 Additional points

As mentioned above in the Cultural Heritage Theme, it would seem relatively straight forward to expand the current indicator G2 (Condition of heritage features including designated geological sites and scheduled monument) to include a wider set of heritage assets, for example listed or registered traditional farm buildings. Some of the indicators need expanding so that they can assess awareness of cultural heritage assets as well as environmental ones, including both natural and cultural features and assets which don't benefit from specific national designations.

2.2 KEY FINDINGS

This report, and some themes in particular, focuses on exploring how awareness of the enhancement of biodiversity and geodiversity, may provide cultural ecosystems services. The ecosystems services (ES) framework outlines that the natural environment provides cultural ecosystems services through the intersection of material environment (woods, wetland, grassland moorland, coast, geodiversity and landscapes etc.) and the human activities or practices we undertake in these settings that bring us into relation with them (watching, listening, walking, playing, swimming, relaxing, exploring,meeting, gardening, fishing and other forms of harvesting and collection etc.) (Fish et al., 2016, O' Brien et al., 2017a). Place and practices together produce 'cultural ecosystem benefits', outcomes influencing our health and wellbeing (O'Brien et al., 2017a: 238).

Cultural ecosystem benefits have further been understood in terms of positive impacts to our: '*identities'* (through influencing our sense of our relationship with the environment, including our memories, sense of belonging, environmental attitudes, spiritual connections for example); *'experiences'* (via affective interactions with material environment, that may include feelings such as inspiration, expansiveness, appreciation, connectedness to nature and humanity); and *'capabilities'* (development of knowledge and abilities in relation to environmental interaction, including expertise and skills, and importantly physical health,) (Bryce et al., 2016: 260, O'Brien et al., 2017a). As Cultural benefits are effectively 'co-produced' through the interaction of people and nature (2017a: 237). These experiences of cultural value frequently overlap, interconnect and reinforce each other, so that despite our urge to categorise, it would be difficult to pin down where enjoyment of beauty becomes a spiritual experience for example or vice versa (Church et al., 2014:20).

Furthermore, many people will be unaware of the term 'cultural' itself but will be clearly aware of selected elements of cultural heritage (Rocchi *et al*. 2022). For example, historical buildings such as castles, manor houses or water mills will be well known to the public (Shuib & Hashim 2011). Specific landscape features (e.g. dry stone walls and traditional farm buildings (Courtney *et al*. 2007) will also be well known to the public to the extent that such landscapes can define a region (e.g. Yorkshire Dales). Defra et al. (2005) identified five main types of cultural heritage feature found on farmland: archaeological sites, traditional farm buildings, field patterns and field boundaries, ancient trees, and designed landscapes (Boatman et al. 2008). The natural, semi-natural and domesticated biological, geological environment and landscape character features are also an important component of rural cultural heritage. Current valued landscapes reflect the legacy of past practices (Lindholm & Ekblom 2019, Ferrara et al. 2022) and many areas of High Nature Value farming are sustained by traditional land management practices.

Actions that create, restore, manage or enhance habitats and natural geological features could positively enhance biodiversity and geodiversity awareness of the cultural benefits of both. These could include benefits for human 'capabilities' in terms of health and happiness for example. The evidence connecting biodiversity and human health and wellbeing is evolving. Whilst there is significant evidence connecting positive benefits of green environments for human happiness and wellbeing the influence of levels of biodiversity within that relationship and causality associated with degrees of species richness/abundance are being established (Fuller et a., 2007, Southon et al., 2018). A large part of this challenge is the diversity and consistency of study design in this area: methods and metrics employed and outcomes focused upon (Jorgensen & Gobster, 2010, Houlden et al., 2021, Hedin et al., 2022,).

Humans broadly appear to show a preference for more complex (diverse) natural settings (Kaplan & Kaplan, 1989). And as above, a number of studies demonstrate positive associations between biodiversity and self-reported assessments of health and wellbeing (Houlden et al., 2021, Hedin et al., 2021) However, many socio-cultural and individual variables can influence our environmental preferences and capacity to derive wellbeing benefits from biodiverse environments (Hedin et al., 2021). So, whilst a broad preference may exist, the relationships between positive wellbeing, mental health and biodiversity may be complicated and limited by such factors.

What is increasingly demonstrated through a sheer wealth of evidence is that exposure to and contact with nature (without specific consideration of its levels of biodiversity, geodiversity and landscape) can have important benefits for physiological, psychological and emotional health and wellbeing (Theme 2) and logically enrichment of biodiversity on any site could result in increased opportunities for such outcomes. In addition, meaningful, emotive 'experiences' with/in nature, including inspiration, appreciation, and a sense of empathetic relatedness could impact our sense of nature connectedness with benefits to our subjective sense of wellbeing and potential impacts on our motivation for undertaking pro-environmental behaviour (also in Theme 2) (Lumber et al., 2017, O'Brien et al., 2017a). The significant impacts of exposure to and contact with nature on human health and happiness are more and more recognised as 'natural health services. As such, supported access to them (commonly provided by third-sector organisations) is increasingly socially prescribed by health professionals (Cook et al., 2019).

Actions that may lead to increases in the biodiversity of environments could potentially also increase the likelihood of having a self-led learning experiences in that setting or that chances of others wanting to educate in relation to it (Theme 3), again positively impacting capabilities. Actions that potentially create, restore and enhance biodiversity through employing particular skills and practices in relation to environmental management could also increase capacity for such knowledge to be exchanged and preserved, impacting capabilities.

Actions increasing species abundance and diversity could also contribute to us being more likely to have significant experiences in the natural world that proves important in shaping and building our sense of our 'identity' as an individual in relation to the rest of the natural world. This 'environmental autobiography', potentially fuelled through meaningful memories and experiences of ourselves in relation to nature, may also inform our sense of caring and responsibility for the human and more than human world (Chalwa, 1995, Gaesser, 2013). Our involvement in pro-environmental activity such as volunteering in nature or individual action (e.g. wildlife-friendly gardening) may both drive and derive from, our sense of identity in relation to the natural world (Theme 4).

The EBHE element of ELMS offers a significant opportunity for many of the CES. For example, in the case of geodiversity the actions identified would be able to make good on the vision of the 2014 Geodiversity Charter for England by emphasising the role of geodiversity in place-making as a broader justification for introducing payments for geodiversity actions, as cultural services, which were costed in Webber et al. (2006).

Most of the actions would be implemented by farmers, land managers and landowners as well as nature-conservation trusts and local and national governmental organisations. There is an inherent difficulty because larger-scale schemes will be capital-intensive and may be difficult to integrate into working farms and other commercial land-based enterprises. A central uncertainty is what happens once the agreement has ended. Not surprisingly there is a reluctance among government agencies and NGOs to 'rent' the outcomes of any agreements, however payment rates for creation cannot be sustained beyond the initial agreement, which creates uncertainty for agreement holders (Marshall S et al 2020). Prosser et al. (2006) noted that grants and other public subsidy are key to many long-term management operations on geodiversity sites, which can result in the management of SSSIs being delegated to other organizations. A major barrier to uptake is that relatively few of the actions are likely to directly benefit other land-based operations, especially in farming, despite many being, effectively, commercially 'neutral'.

2.3 EVIDENCE GAPS

There are a number of amber scores relating to the landscape character benefits of some actions. While the public health (e.g. air quality) benefits of green infrastructure (GI) and blue infrastructure (BI) within cities are well known (Bowen and Lynch 2017; Coutts and Hahn 2015) the evidence base for improved health (e.g. reduction in respiratory diseases) outcomes remains to be adequately quantified. The other reason is that of context, many of the actions are large scale and will have complex interactions with other aspects of the natural and social environments and these need to be considered carefully. Coutts and Hahn (2015) focus on the list of benefits in order to highlight the breadth of research needed in order to understand the breadth of potential benefits that need to be considered in landscape conservation in order to fully understand the connections with health and well-being. There are relatively few studies on GI and BI outside of cities, for example Ruckelhoaus et al (2106) who focused on issues around coastal locations, noting the importance of location. There is little on this aspect from a seascapes perspective beyond coastal areas.

Tacit values, such as sense of place, can be difficult to define and measure (Anthony et al. 2009). Indeed, understanding the complex relationships that people form with places and environments is challenging, particularly as approaches to understanding values like a 'sense of place' draw upon a range of disciplines, such as environmental sociology, psychology, human geography, architecture and environmental humanities (Urquhart & Acott 2014).

Actions that link to community activities, such as ***EBHE-281****: Set up or engage with community tree planting projects* or ***EBHE-205****: creating wood pasture*, have evidence gaps as the evaluations into their cultural service impacts are not available as existing examples are place-specific and contextually dependent. There is no robust evaluation, that we were able to identify, into the impact of these type of actions on landscape character or sense of place. The Community Forest programme has in part been re-focused to bring the initative in line with the new focus on GI (Mell 2011) and increasing the quantity and quality of tree cover in and around cities is a major aspect of GI implementation. It is possible to extend evidence from other areas, for example, identity is particularly associated with agroforestry landscapes and this may help local community engagement (Elbakidze et al. 2021). Similarly, as far as we know, there is not specific evidence for the cultural benefits of ***EBHE-140****: creating a woodland creation plan*, although it seems logical that as an action it has the potential to result in protection and maintenance of existing cultural benefits. By helping to identify proximity and risk to existing cultural features and species rich/abundant habitats by any proposed woodland creation, it could help protect against the potential disbenefits posed by landscape change (shifts in landscape character, risks to heritage features, sense of place and access features such as rights of way) and harm to significant ecosystems (such as priority habitats and species).

A further example is presented by the restoration of semi-natural ancient woodland, which is likely to have significant impacts on the attractiveness of such places and likely increase their attractiveness to visitors. This is particularly the case with PAWS restoration due to the resulting large-scale landscape change. Broadleaved woodland creates a different perspective to plantation forestry with studies showing public preferences for mixed or broadleaf forests rather than conifers (Upton et al. 2012). Grose (2012) suggests that “if a local green is replaced by a non-local green, our sense of place is altered” (p. 159). Conifer forests are generally a darker green to broadleaved woodlands, and broadleaved woodlands have a seasonal dimension, with the colours changing throughout the year, and as a result less attractive to visitors. However, there is less evidence on the impact for visitors, and tourists in particular, compared to ‘sense of place’ or ‘landscape character’.

3 THEME 1: RECREATION

Recreation is varied and wide ranging in its scope covering different activities, different spaces by the general public who will undertake this with different intensity. Therefore this report has a wide brief covering the 'enabling of recreation. At its centre is the notion that engagement with nature, through recreation helps to maintain physical health and wellbeing. This was explored by Maller et al (2005) who conclude that 'public health strategies are yet to maximise the untapped resource nature provides, including the benefits of nature contact as an upstream health promotion intervention. Reviewing a range of evidence they conclude that nature, in a range of settings, plays a vital role in human health and well-being, by providing access to nature for individuals. A range of actions are required in order for this to happen but also there needs to be more evidence on the impacts and benefits. What is clear is that public access and therefore recreation is a public good but there are various barriers to this being exercised. It is noted by some NGOs (see Wildlife and Countryside Link 2021) that the condition and level of accessibility on the 120,000 miles of footpaths vary and prioritise the active and able. Only 7.2% of inland water resources have a right of access, which restricts where people can go. However, there is little evidence to indicate how the quality of access provision impacts recreation activity but work by Cortinovis et al (2018) in Italy and Ward Thompson and Aspinall (2011) suggested that changes to the design and look of green infrastructure can increase the amount of physical recreation. Work by the National Trust[1] has highlighted 295 deprived neighbourhoods where there is no accessible green space. The presence of accessible space in urban areas, especially trees, is according to a meta-analysis of sources by Wolf et al (2020) part of the 'Restoring Capacities', including attention restoration, mental health, stress reduction, and clinical outcomes through acts such as walking or running.

Recreation settings such as woodlands, moorland, coast, parks, playgrounds, trails and lakes provide a variety of economic, social, recreational and environmental benefits to communities (Brown et al 2016). Brown et al (2016) focus their study on woodlands in particular and found that much of the activity was focused on a network of accessibility paths and covered a wide range of activities, such as dog walking, mountain biking or walks to seek solitude and take in the Intricacy, intimacy and diversity of woodland features. When changes aimed at enhancing biodiversity were introduced some loss of wellbeing was experience, e.g. keeping dogs on leads or path diversions. Diock et al (2013) assessed the design and provision of access facilities as a barrier to woodland use. What they found was that among the forest estate in England preferences were made towards those considered in keeping with favouring rustic and naturalistic designs. The location of the recreation area is important, with local woodland providing different benefits to those further afield (Ward Thompson et al 2005). The key finding was that childhood experience of woodland impact adult's patterns of use as well as the proximity for regular use and being litter free. The research concluded that while the use of woodlands differs considerably, most people feel at peace in a woodland.

Beaches offer a particularly popular setting for recreation, especially on an island such as the UK offering a mix of land and water-based activities. As a result, the recreational needs are complex and diverse and Kim and Nicholls (2018) using data from Detroit suggest that taking a spatial and evidence-led approach can facilitate the formulation of more efficient and effective planning and policy approaches. These sites are often tourism centres, and there is a cross over between this Theme 1 and Theme 5 Tourism. Woodlands, especially in an area of high Tourism activity can be the basis for 'nature-based recreational tourism, as examined by Iversen et al (2023). The findings of the study based around a photo montage suggests there is support for more woodland cover in areas like the Lake District and would not affect return visits by tourists.

The role of recreation was particularly noted during the pandemic and some research has highlighted nature's contribution to both physical and mental wellbeing (Labib et al 2022). The work builds on what is

[1] www.nationaltrust.org.uk/features/new-research-shows-the-need-for-urban-green-space

known about natural environments improving human health and wellbeing using data collected during the first 2 years of the pandemic. Frequent visits to natural areas and even seeing green spaces helped recovery suggesting that nature-based infrastructure, interventions, designs, and governance can help in future health crises. New landscapes such as agro-forestry have also been considered (Elbakidze et al 2021) and recreation is one of the contributions that such landscapes can provide to society.

3.1 Management Bundles

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:

The focus of Theme 1 is enabling recreation, with a focus on physical activity. The link to the 25 Year Environment Plan (YEP) is provided by the target:
Making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing
As a result, this report is focusing on three targets:

- G4 Engagement with the natural environment G4a) Visits to the natural environment G4b) Visits to green and natural spaces
- Public rights of way - number and condition and open-access areas
- G7: Health and wellbeing benefits G7 (interim): Percentage of adults in England reporting that time spent outdoors was good for their **physical** (and mental) health.

Therefore, the commentary around the different actions will focus on issues of engagement with the natural environment and the likelihood that members of the public will visit areas of the natural environment; the quantity and quality of the access infrastructure; and the benefits for physical wellbeing.

The focus is mainly on those management bundles that have high RAG scores and where the action is focused primarily around enhancing and encouraging recreation. What is clear from the evidence is that an enhanced and more accessible natural environment will be more attractive to society, therefore actions that create new areas, enhance ones not in an optimal state and maintain existing areas of high quality will benefit those who visit such areas. Where there is an opportunity for direct engagement with the actions through volunteering (Theme 4) or developing a sense of place (Theme 13) such as action **EBHE-281**, then the if done well the benefits can be longer lasting and encouraged increased physical activity.

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

3.2 Bundle: Habitat creation

3.2.1 Woodland

Actions to create or develop plans to create woodland and increased tree cover. See Theme 13 for a more detailed summary.

EBHE-104: Create a woodland creation plan
EBHE-140C: Create ghyll woodland
EBHE-209C: Create traditional orchards with local varieties of fruit tree
EBHE-281: Set up or engage with community tree planting projects

EBHE-104	Create a woodland creation plan	LT**	LT*	LT**
EBHE-140C	Create ghyll woodland	LT**	LT*	LT**
EBHE-209C	Create traditional orchards with local varieties of fruit tree	**	N	**
EBHE-281	Set up or engage with community tree planting projects	***	N	LTD***

3.2.1.1 Causality

Of note here is the community tree planting project, because this involves the community planting the trees, which is a physical activity, it increases a connection to the environment (Ward Thompson et al 2005) which means that those involved are more likely to return. The concern about the health and wellbeing benefits are linked to the lack of clarity around accessibility (Diock et al 2013) and the potential negative if the planting is not successful.

The amber rating for **EBHE-104** and 140C reflects that while they could be beneficial there is no mention of access being part of the creation plans. The same applies for EBHE205C wood pasture.

3.2.1.2 Co-benefits and Trade-offs

See Themes 9/10/13.

3.2.1.3 Magnitude

See Themes 9/10/13 and Wildlife and Countryside Link on the needs for access.

3.2.1.4 Timescale

Likely to be effective immediately.

3.2.1.5 Spatial Issues

N/A

3.2.1.6 Displacement

Depends on the habitat these actions are replacing.

3.2.1.7 Maintenance and Longevity

Not assessed

3.2.1.8 Climate Adaptation or Mitigation

See Theme 9 and 13.

3.2.1.9 Climate factors / Constraints

N/A

3.2.1.10 Benefits and Trade-offs to Farmer/Land manager

Access is available under current schemes but it not always an attractive action.

3.2.1.11 Uptake

See NE report from 2009 for clarify on access and the 2021 report by Wildlife and Countryside Link on the needs for access.

3.2.1.12 Other Notes

N/A

3.2.2 Woody features & scrub

EBHE-191: Plant and establish appropriate species of field boundary trees
EBHE-205C: Create wood pasture (e.g. through appropriate grazing)
EBHE-203C: Create targeted scrub

Amber LTD** or LT*

EBHE-191	Plant and establish appropriate species of field boundary trees	LTD**	LT*	LTD**
EBHE-205C	Create wood pasture (e.g. through appropriate grazing)	LTD**	LT*	LTD**
EBHE-203C	Create targeted scrub	LTD**	LT*	LTD**

See 3.2.1 (Woodland)

3.2.3 Ponds & wetlands

EBHE-169: Restore/ manage ghost ponds
EBHE-211: Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials

EBHE-169	Restore/ manage ghost ponds	**	N	*
EBHE-211	Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials	**	N	*

3.2.3.1 Causality
Both actions would improve the natural environment and features such as ponds are attractive forming part of the nature-based activities (Kim and Nicholls 2018 and Maller et al 2005).

3.2.3.2 Co-benefits and Trade-offs
Benefits for wildlife (theme 9) and sense of place (theme 13) with few trade offs.

3.2.3.3 Magnitude
See wildlife report.

3.2.3.4 Timescale
Effective within the year.

3.2.3.5 Spatial Issues
Small space required.

3.2.3.6 Displacement
N/A

3.2.3.7 Maintenance and Longevity
N/A

3.2.3.8 Climate Adaptation or Mitigation
Keeping ponds with water will be a challenge.

3.2.3.9 Climate factors / Constraints
N/A

3.2.3.10 Benefits and Trade-offs to Farmer/Land manager
See Wildlife report.

3.2.3.11 Uptake
N/A

3.2.3.12 Other Notes
N/A

3.2.4 Grassland

EBHE-214C: Create locally distinctive flower rich/hay meadows using traditional techniques

EBHE-214C	Create locally distinctive flower rich/hay meadows using traditional techniques	**	N	*

3.2.4.1 Causality
This action will produce areas that are attractive to those seeking places for recreation with a number of benefits (Labib et al 2022).

3.2.4.2 Co-benefits and Trade-offs
Benefits for wildlife (Theme 9), landscape character (Theme 10) and sense of place (Theme 13).

3.2.4.3 Magnitude
See Theme 9.

3.2.4.4 Timescale
Will take time to establish.

3.2.4.5 Spatial Issues
N/A

3.2.4.6 Displacement
N/A

3.2.4.7 Maintenance and Longevity
On-going management.

3.2.4.8 Climate Adaptation or Mitigation
N/A

3.2.4.9 Climate factors / Constraints
N/A

3.2.4.10 Benefits and Trade-offs to Farmer/Land manager
N/A

3.2.4.11 Uptake
N/A

3.2.4.12 Other Notes
N/A

3.3 BUNDLE: RESTORATION, MANAGEMENT AND ENHANCEMENT

3.3.1 Woodland

These actions are focused around the restoration of semi-natural ancient woodland. See descriptions in Themes 9 and 13.
EBHE-196: Planted Ancient Woodland (PAWS) restoration
EBHE-198: Restore/ manage ancient woodland with native broadleaf species

EBHE-196		Planted Ancient Woodland (PAWS) restoration	LT**	LT*	LT***
EBHE-198		Restore/ manage ancient woodland with native broadleaf species	LT***	LT*	LT***

3.3.1.1 Causality
The key aspects to consider here is that the higher quality the woodland the more benefits those using the space for recreation will receive (Brown et al 2016 and FitzGerald et al 2021). This is especially true of those areas where such areas are less numerous (Meakins 2011). However, as stated before there is no certainty that access will be present or increase from current levels. The benefits from this action are only realised if there is access included within the delivery of the action.

3.3.1.2 Co-benefits and Trade-offs
See Theme 9 and Theme 13.

3.3.1.3 Magnitude
See Theme 9 and Theme 13.

3.3.1.4 Timescale

Almost immediately.

3.3.1.5 Spatial Issues
N/A

3.3.1.6 Displacement
N/A

3.3.1.7 Maintenance and Longevity
All semi-ancient woodland is managed to some degree, any access related infrastructure will require maintenance and over time will need to be replaced.

3.3.1.8 Climate Adaptation or Mitigation
N/A

3.3.1.9 Climate factors / Constraints
N/A

3.3.1.10 Benefits and Trade-offs to Farmer/Land manager
It could link to existing recreational and tourist related enterprises, but increased access is also felt to bring increased challenges to framing enterprises (gates left open, straying from footpaths etc) and can impact on biodiversity.

3.3.1.11 Uptake
Farmers and land managers have in the past not been especially keen on access options under AES.

3.3.1.12 Other Notes
N/A

3.3.2 Boundary features

These actions are for traditional field boundaries and the removal of redundant fencing
EBHE-007: Create/ restore/ manage traditional field boundaries (e.g. dry stone walls, earth banks, stone faced earth banks, Cornish hedges)
EBHE-007D: see **EBHE-007**
EBHE-019: Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls
EBHE-019-D: see **EBHE-019**
EBHE-228: Remove redundant fencing (replace with invisible fences if desirable)
EBHE-229: Remove non-traditional, redundant structures

EBHE-007	Create/ restore/ manage traditional field boundaries (e.g. dry stone walls, earth banks, stone faced earth banks, Cornish hedges)	**	*	**
EBHE-019	Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls	***	**	***
EBHE-228	Remove redundant fencing (replace with invisible fences if desirable)	**	**	*
EBHE-229	Remove non-traditional, redundant structures	**	**	*

3.3.2.1 Causality
The benefits for access and recreation from the first two actions create an enhanced environment reflecting local landscape charater. Such field boundaries may form part of the access network of footpaths and other rights of way or be visible from them. Even at a distance this is a benefit.
The removal of redundant fencing and non-traditional structures would improve the visual look of the landscape and could improve access by making the countryside more 'open' and appealing for recreation. As noted by Diock et al (2013) barriers such as unnecessary or redundant structures are off-putting to those seeking recreation, especially in the locality. These actions are unlikely to increase the number of rights of way or areas of open access, however they will improve the condition in the longer

term with enhanced local features developed using traditional management. There might be some short-term disturbance while the work is being carried out.

3.3.2.2 Co-benefits and Trade-offs

The actions will provide co-benefits for tourism (Theme 5) landscape character (Theme 10) and sense of place (Theme 13).

3.3.2.3 Magnitude

Likely to be localised, but the loss of traditional boundaries see Theme 9.

3.3.2.4 Timescale

Immediate once redundant fencing and structures removed and once traditional boundary restored.

3.3.2.5 Spatial Issues

Not assessed.

3.3.2.6 Displacement

N/A

3.3.2.7 Maintenance and Longevity

Ongoing management on traditional boundary, none for removal of fencing or structures.

3.3.2.8 Climate Adaptation or Mitigation

N/A

3.3.2.9 Climate factors / Constraints

N/A

3.3.2.10 Benefits and Trade-offs to Farmer/Land manager

Traditional features in the landscape have been a positive feature of AES since they were introduced (NE 2009).

3.3.2.11 Uptake

Likely to be popular among farmers and land mangers based on previous experience (NE 2009).

3.3.2.12 Other Notes

N/A

3.4 BUNDLE: ACTIONS FOR HABITATS WITH SPECIFIC HYDROLOGICAL CHARACTERISTICS

3.4.1 Peatlands and wetlands

EBHE-164C: Create wetland habitats
EBHE-164EM: Enhance/ manage wetland habitats

EBHE-164C	Create wetland habitats	LTD**	LTD**	LTD**
EBHE-164EM	Enhance/ manage wetland habitats	LTD**	LTD**	LTD**

3.4.1.1 Causality

There is a lack of evidence as to how created water meadows and enhanced managed floodplain meadows will impact the level of engagement, condition of rights of way and level of activity. Improving the environment will be a positive. However, it is heavily context specific and there are some disbenefits as the increase in water will reduce the accessibility of the site as recreational needs are complex and diverse (Kim and Nicholls 2018).

3.4.1.2 Co-benefits and Trade-offs

The main benefits are for wildlife (Theme 9) and landscape character (Theme 10).

3.4.1.3 Magnitude

N/A

3.4.1.4 Timescale
Change can happen within the first year or two.

3.4.1.5 Spatial Issues
Can be large areas, context specific.

3.4.1.6 Displacement
Some displacement of other habitats.

3.4.1.7 Maintenance and Longevity
Long-term maintenance will be required.

3.4.1.8 Climate Adaptation or Mitigation
Keeping these sites wet will be a challenge.

3.4.1.9 Climate factors / Constraints
N/A

3.4.1.10 Benefits and Trade-offs to Farmer/Land manager
Creating new wetland habitats will mean possible productive land is lost, but it could reduce flooding on other parts of the holding.

3.4.1.11 Uptake
Will require a long-term funding programme.

3.4.1.12 Other Notes
Peatlands provide a key record of climate change through vegetational changes – some much longer than others, and hence safeguarding this record has a much broader societal importance

3.5 Bundle: Litter and Waste

3.5.1 Litter and Waste

EBHE-267: Store unused polythene away from public view
EBHE-274: Remove polythene covering the frames of a polytunnel for a minimum period of six months in any calendar year

EBHE-267	Store unused polythene away from public view	*	*	*
EBHE-274	Remove polythene covering the frames of a polytunnel for a minimum period of six months in any calendar year	*	*	*

3.5.1.1 Causality
Easy to approve these actions as they improve the visual nature of the landscape and therefore the engagement with the natural environment, this in turn will increase the likelihood of time spent outside. There will be no impact on the number and condition of rights of way.

3.5.1.2 Co-benefits and Trade-offs
See landscape character and sense of place reports.

3.5.1.3 Magnitude
Small or neglible

3.5.1.4 Timescale
N/A

3.5.1.5 Spatial Issues
N/A

3.5.1.6 Displacement
N/A

3.5.1.7 Maintenance and Longevity

N/A

3.5.1.8 Climate Adaptation or Mitigation

N/A

3.5.1.9 Climate factors / Constraints

N/A

3.5.1.10 Benefits and Trade-offs to Farmer/Land manager

3.5.1.11 Some crops, especially in more northern areas, will require year-round protection by polytunnels – and even in the south frosts can occur until the beginning of May and from early October - hence the 6 months is an arbitrary figure which is likely to be resisted by most growers. Hence, some local and/or crop-specific criteria might be more workable Uptake

N/A

3.5.1.12 Other Notes

N/A

3.6 BUNDLE: CREATE AND ENHANCE ACCESS AND PROW

3.6.1 Create access infrastructure and facilities

EBHE-005: Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW)
EBHE-255: Create/ maintain small scale access facilities supporting travel to site via road (e.g. Small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)

The actions **EBHE-005** and **EBHE-255** aim to create and maintain access facilities in rural areas. Specifically access by road for coaches, cars and bikes including hardstanding and bike shelters. Toilet facilities on-site and local affordable accommodation would also expand access.

EBHE-005	Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW)	***	*	***
EBHE-255	Create/ maintain small scale access facilities supporting travel to site via road (e.g. Small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)	***	*	***

3.6.1.1 Causality

Access to the natural and rural environment can be limited by site provision or route to the site (Burt *et al*. 2013). Older people, women and families with young children may be inhibited by lack of on-site facilities (e.g. toilets and level ground) (Stewart & Costley 2013). Lack of parking can be a serious issue as often seen in rural areas with key features during holiday periods (e.g. Snowdonia). To broaden areas that can be visited, more remote areas may benefit from the addition or promotion of cheap night accommodation nearby (Pina & Delfa 2005). Increasing facility provision and ease of access will increase visitors and potentially broaden visitor type which may affect the condition of the existing rights of way network unless the number of these is increased and the surface improved to take the additional footfall (Boardman 2022, Matlack 1993 and Duncan and Mummery 2005).

3.6.1.2 Co-benefits and Trade-offs

Co-benefits from this action could mean less congestion at beauty spots and less on-road parking (Butler 2020). However, sites with facilities may get overwhelmed with visitors if sites with facilities are few in the immediate area. Depending on location, more visits may be made by bike which would be beneficial for public health as well as minimising car journeys. Identifying sites for facilities improvement should be

carried out at the regional level taking care to space facilities improvement spatially and at appropriate locations.

3.6.1.3 Magnitude
Sites in the most popular areas can become easily overwhelmed by the number of visitors, in these areas substantial work may be needed to increase total number of safe parking areas. Care will need to be taken for the increase in facilities like car parking not to have a negative impact on the landscape. Where sites currently lack facilities the key will be to identify where best to invest from a regional perspective.

3.6.1.4 Timescale
Immediate after the work is carried out.

3.6.1.5 Spatial Issues
This depends on the scale of the lack of parking currently.

3.6.1.6 Displacement
The risk of developing fewer, larger facilities could increase road traffic unless there is a reasonable spread at the regional scale. This could also have implications where visitor number is greatly increased from current levels. The new facilities will change the land use and may replace important habitats, care will need to be taken to avoid this.

3.6.1.7 Maintenance and Longevity
On-going maintenance will be required, in line with public infrastructure elsewhere.

3.6.1.8 Climate Adaptation or Mitigation
Possible increase in visits by car to rural areas could have negative implication for climate change mitigation goals, but this is less of a concern over the longer-term assuming cars will be mostly electric with the electricity originating from renewable generation. A focus on public transport options would be a welcome alternative.

3.6.1.9 Climate factors / Constraints
Facilities should be built with the future climate change in mind.

3.6.1.10 Benefits and Trade-offs to Farmer/Land manager
Potentially more visitors which could impact areas near the facility with grater trampling and disturbance. The local economy could receive a cash boost from greater visitor numbers, especially if local tourist accommodation is expanded.

3.6.1.11 Uptake
Might be more interested if there is a link to existing recreation or tourism linked enterprises.

3.6.1.12 Other Notes
N/A

3.6.2 Rights of way and access

EBHE-006: Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety
EBHE-042: Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles

EBHE-006 aims to expand rights of way to facilitate the creation of circular routes taken in local points of interest. Where possible, this should also be done whilst facilitating access for mobility aids (**EBHE-042**). Creating a network of right of ways where the need to travel along roads is minimised will enhance access to the countryside in a safe way.

EBHE-006	Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community	***	D***	***

	circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety			
EBHE-042	Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles	***	D***	***

3.6.2.1 Causality

Current rights of way were not devised as a joined-up network and as such there can be a lot of gaps when attempting to avoid roads open to motorised traffic (Yamamoto *et al*. 2017). Access to the countryside and specifically off-road circuits may also be limited by mode of transport (car), as there is a lack of public transport allowing easy access to off-road rights of way (Wood *et al*. 2009). Many rights of way are currently not suitable to mobility aids due to elements aimed at stopping the movement of livestock (Ramblers 2023), or simply because the rights of way are overgrown. Enhancing the rights of way network will make visitors more aware of the different aesthetics values of the rural landscape (Shuib & Hashim 2011). The increased footfall may damage the existing and surrounding rights of way (Boardman 2022, Matlack 1993 and Duncan and Mummery 2005).

3.6.2.2 Co-benefits and Trade-offs

Co-benefits from this action would be opening out rural landmarks or point so interests that otherwise were not on a dedicated right of way. The main trade-offs would be linked to increased visitors to previously unvisited areas, with a potential for more disturbance to wildlife. The action should be taken with a view to link up key features in the landscape and where possible to facilitate also movement of fauna across the landscape. Involvement of local communities and stakeholders where new or improved rights of way are being identified (Defra 2022b) will be crucial to the success of the action.

3.6.2.3 Magnitude

To improve connectivity between rights of way will depend on locality and how close existing rights of way are to one another.

3.6.2.4 Timescale

Once the action is implemented, benefits to users should be immediate.

3.6.2.5 Spatial Issues

Locality specific.

3.6.2.6 Displacement

The main issue will be new visitors in previously unvisited areas as rights of way are opened; this could have some impact on wildlife (such as disturbance) and on livestock management (cattle movements) unless adequate preventative measures are taken (e.g. rules around dogs on lead).

3.6.2.7 Maintenance and Longevity

Likely to be similar to current rights of way.

3.6.2.8 Climate Adaptation or Mitigation

Care will need to be taken that new surfaces are resistant to extreme weather events, in high rain fall pathways can become channels for excess water and prone to erosion.

3.6.2.9 Climate factors / Constraints

N/A

3.6.2.10 Benefits and Trade-offs to Farmer/Land manager

Increased visitors and ramblers on farmland could cause disturbance and litter issues unless clear and better enforced rules are in place. An increase in the number of visitors, however, can increase the viability of any direct sale by farmers and other growers to such visitors.

3.6.2.11 Uptake

Landowners will need convincing that opening up new rights of way will not have detrimental impact on livestock or crops. Involvement of local communities and land managers will be crucial to the success of the action.

3.6.2.12 Other Notes

N/A

3.6.3 Mitigate access effects

EBHE-008: Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation
EBHE-015: Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)

EBHE-008 aims to mitigate the impact of visitors by creating and maintaining infrastructure to hide visitors from wildlife and keep visitors on designated paths. **EBHE-015** aims to create new permissive paths, which may need to include infrastructure to mitigate visitor impact.

EBHE-008	Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation	L**	***	L*
EBHE-015	Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)	***	N	**

3.6.3.1 Causality

Access to many rural areas can lead to adverse impacts on the environment (e.g. trampling, erosion), wildlife (e.g. disturbance) and farmland (e.g. damage to crops or stress to livestock) (Howley et al. 2010). Any new rights of way must take this access into account, and where necessary the landowner will need financial incentive to allow a permissive pathway on their land (CLA 2022). Creating and maintaining infrastructure to minimise disturbance of visitors to the countryside will minimise those concerns around potential negative impacts of on existing visitors but this risk remains and there is limited evidence for levels of engagement and amount of activity. However, action 008 will improve the condition of the rights of way so the condition of the rights of way network is improved. New rights of way, even if they are permissive, will offer new areas for recreation and will therefore increase engagement and activity.

3.6.3.2 Co-benefits and Trade-offs

Some structures to facilitate access to the countryside in a safe way may detract from the surroundings (e.g. boardwalks and viewing areas) if not done sensitively. They are also are costly and need maintaining. Similarly high hedges may minimise disturbance to wildlife but they may also affect the enjoyment of the visitor by blocking out much of the natural scenery and landscape, unless viewing 'portals' such as field entrances/ gates are maintained.. Co-benefits from hedge building, especially if they contain trees include habitat for smaller animals and insects along with the potential for carbon sequestration. Care should be taken when developing this infrastructure not to overly impact the characteristics of the landscape.

3.6.3.3 Magnitude

Mainly along already existing rights of way but also along any new permissive ways. In some instances, this will include the need to use land adjacent to the pathways, which may not always be possible.

3.6.3.4 Timescale

Once the action is implemented it may take a few years for living infrastructure to be optimal.

3.6.3.5 Spatial Issues

As above.

3.6.3.6 Displacement
The main impact is likely to be the need for land adjacent to pathways to be taken out of production (e.g. to allow hedge building).

3.6.3.7 Maintenance and Longevity
On-going maintenance is required, and for those non-living structures a need to replace every decade or two must be factored in. The permissive pathways may not all continue past the period of payment (3 years).

3.6.3.8 Climate Adaptation or Mitigation
Hedge planting may be beneficial from both a mitigation (carbon sequestration) and adaptation (minimising soil erosion, shade provision) perspective (Soil Association 2022). See relevant report.

3.6.3.9 Climate factors / Constraints
For hedge planting, care should be taken that the species chosen will adapt well to future climate change.

3.6.3.10 Benefits and Trade-offs to Farmer/Land manager
Hedge or banks may take land out of production but they would also in effect keep the visitors to the paths and in the case of hedges, should help keep dogs with their owners.

3.6.3.11 Uptake
Financial incentives could help with uptake where the landowner is expected to carry out the work (CLA 2023).

3.6.3.12 Other Notes
N/A

3.6.4 Expand and improve access

EBHE-020: Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)
EBHE-021: Create public access (on foot, on horse or on bike) to open access land and common land
EBHE-022: Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users
EBHE-023: Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users
EBHE-026: Dedicate land as access land

EBHE-020	Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)	***	N	LT*
EBHE-021	Create public access (on foot, on horse or on bike) to open access land and common land	***	N	LT*
EBHE-022	Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users	***	N	LT*
EBHE-023	Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users	***	N	LT*
EBHE-026	Dedicate land as access land	***	N	LT*

3.6.4.1 Causality

On occasions public access land has been lost due to development or other land use change; this should be minimised (**EBHE-20**). Improving and maintaining access infrastructure (**EBHE-021**; **EBHE-022**; **EBHE-023**) will clearly have a positive impact (Brown et al 2016) but the location of this access is important (Ward Thompson 2005) . Also making sure access suits all legal users will increase public use of the land (Peak District National Park). Opening up more land for easy public access will enhance public awareness of rural areas including both their natural and human heritage. The rating for proportion of those engaged is orange as it depends where this additional access is and there is limited evidence (L) and the action is context dependent (T).

3.6.4.2 Co-benefits and Trade-offs

The main trade-offs that need to be considered will be linked to increased visitor numbers, although if sufficient access points are created, then visitors should be less constrained in space and therefore impacts should be less concentrated. Involvement of local stakeholders and communities will be central to the success of the changes.

3.6.4.3 Magnitude

Significant size of the endeavour as it includes all open access and common land. Common land already makes up 38% of all open access land (Foundation for Common Land 2022) and individual commons commons receive high numbers of visitors already due to their distinct unenclosed nature.

3.6.4.4 Timescale

Once the action is implemented the impact should be immediate assuming visitors are made aware of the new opportunities.

3.6.4.5 Spatial Issues

Limited additional space is needed, the issue is more about managing access to current open access areas.

3.6.4.6 Displacement

These actions are likely to result in a more even distribution of visitors, thus limiting bottlenecks or concentration of visitors in relatively small areas.

3.6.4.7 Maintenance and Longevity

On-going maintenance is required for paths and access points.

3.6.4.8 Climate Adaptation or Mitigation

Location of pathways and substrate used need to be carefully chosen to not risk increasing erosion – this is especially so in the context of increased droughts and extreme precipitation events predicted with climate change.

3.6.4.9 Climate factors / Constraints

New footpaths need to be created so they are resilient to heavy loicalised rainfall.

3.6.4.10 Benefits and Trade-offs to Farmer/Land manager

The benefits to the farmer/land manager would be less concentrated visitor impact. The flip side to this is that areas previously receiving very few visitors will experience greater disturbance; dogs off leads being the greatest risk to livestock on open access land.

3.6.4.11 Uptake

Capital payments for any work carried by the landowner would be required.

3.6.4.12 Other Notes

N/A

3.6.5 Increasing access and use

EBHE-256: Create/ maintain small scale access facilities supporting travel to site via horse riding (e.g. hitching points and water for horses)

EBHE-265: Dedicate new Byways Open to all Traffic

EBHE-282: Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)
EBHE-284: Create launch points for recreational activities by such as paddle sports, fishing, wild swimming, for able-bodied and disabled users
EBHE-300: Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)

EBHE-256	Create/ maintain small scale access facilities supporting travel to site via horse riding (e.g. hitching points and water for horses)	***	*	**
EBHE-265	Dedicate new Byways Open to all Traffic	***	N	**
EBHE-282	Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)	***	N	LT*
EBHE-284	Create launch points for recreational activities by such as paddle sports, fishing, wild swimming, for able-bodied and disabled users	**	N	***
EBHE-300	Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)	L**	L*	L*

3.6.5.1 Causality

Open access land, as created under the CROW Act, has specific rights that restrict access to walking, unless the landowner specifically permits higher rights for horse-riding or cycling. PROW are covered by byway laws and come with a number of restrictions regarding either the type of transport allowed or what activity is allowed (e.g. prohibition of motorised vehicles or paddling on waterways). The benefit of these actions is that many of the restrictions will be removed and many more varied activities (Natural Resources Wales 2021) would be permissible on open access land, with the agreement of the landowner. This may have a knock-on impact on existing users (hence some amber and one red scores) but overall would attract a greater cross-section of the UK public to open access lands. Actions have been rated to reflect the limited evidence (L) and where the evidence is context dependent (T).

3.6.5.2 Co-benefits and Trade-offs

A key benefit from this action will be to attract a greater cross section of the UK public including those with disabilities or from differing cultural backgrounds and the siting of new access routes is key (Natural England 2017), and would thus help democratise access to the rural environment. Increasing and extending access opportunities will mean that people with a wider range of interests would be attracted to different aspects of the rural experience including cultural landscape, heritage, monuments, geology, geography (see Theme 6) as well as the natural environment and wildlife (see Theme 9). Trade-offs will need to be carefully considered as many activities (e.g. paddling) can have adverse impacts on habitats and wildlife, while increased visitors to open access areas can impact traditional management in those areas (e.g. worrying of livestock). Care would need to be taken to ensure that some areas remain free of activities that cause disturbance to wildlife. Excessive visitor number at particular sites would need to be managed to avoid damage to sensitive land surfaces. Better regulation of visitor behaviour may be required, especially with regards littering and dog nuisance.

3.6.5.3 Magnitude

All open access lands and public byways and rights of way would be considered in these actions, although it may be judicious top limit the actions in the first case to specially selected areas.

3.6.5.4 Timescale

Once the action is implemented, the change would be immediate assuming information has been transmitted to the public.

3.6.5.5 Spatial Issues

No additional open access per se would be required, but there be scope to expand certain open access areas.

3.6.5.6 Displacement

Removing restrictions in some areas but not others could have the undesired effect of shifting visitors to those areas with less restrictions.

3.6.5.7 Maintenance and Longevity

Careful monitoring of the impacts of removing restrictions on visitor behaviour and impacts would be required over the short to medium term.

3.6.5.8 Climate Adaptation or Mitigation

No direct implication for climate change actions, although impacts on natural vegetation and wildlife could be exacerbated by climate change.

3.6.5.9 Climate factors / Constraints

N/A

3.6.5.10 Benefits and Trade-offs to Farmer/Land manager

Benefits and trade-offs depend on how the public responds and whether lifting restrictions leads to an increase in visitor problem behaviour.

3.6.5.11 Uptake

Evidence form pilot studies would be needed to confirm that lifting restrictions did not lead to increase nuisance behaviour or other unintended consequences. .

3.6.5.12 Other Notes

N/A

3.7 BUNDLE: SIGNPOSTING, INFORMATION, FACILITIES AND EVENTS

3.7.1 Signposting and information – access focus

EBHE-004: Create/ maintain signage, way markers
EBHE-009: Create/ maintain improved public information signage (safety information, warnings biodiversity and environmental protection etc) above basic information / directions
EBHE-011: Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people
EBHE-012: Provide information on websites, apps and social media informing the public of access opportunities
EBHE-013: Distribute maps of access in and around the area including links to associated access ways
EBHE-257: Create/ maintain small scale facilities/street furniture on site (e.g. bins/recycling facilities, seats)

The aims of these actions are to increase information and facilities available for visitors so they can make the most out of their visit. **EBHE-004** aims to improve signage and way markers, which will assist visitors in finding their way around the pathways provided; this is followed up by the aim of **EBHE-013** which will provide maps of the area showing key points of access and key features. **EBHE-009** aims to provide additional information about elements found at the site and in the vicinity, this would include aspects of cultural and historical heritage. **EBHE-011** and **EBHE-012** aim to make better use of digital information sharing using websites, apps and social media to provide detailed information about public access opportunities and useful information concerning ease of access. EBHE0257 covers the maintenance or addition of small-scale furniture to provide seats and bins where appropriate.

EBHE-004	Create/ maintain signage, way markers	**	N	**
EBHE-009	Create/ maintain improved public information signage (safety information , warnings biodiversity and environmental protection etc) above basic information / directions	**	N	**
EBHE-011	Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people	**	N	**
EBHE-012	Provide information on websites, apps and social media informing the public of access opportunities	**	N	**
EBHE-013	Distribute maps of access in and around the area including links to associated access ways	**	N	**
EBHE-257	Create/ maintain small scale facilities/street furniture on site (e.g. bins/recycling facilities, seats)	TL*	TL*	TL*

3.7.1.1 Causality

Many visitors to the rural environment have limited information about the site or area before their visit (Cope *et al*. 2000), so the more information that can be provided either on site or beforehand via the internet would be valuable for their enjoyment. Visitors may not always come prepared with planned routes making clear signage, way markers, and the provision of maps very useful. The information provided on signage and maps should cater for a multitude of tastes (Pesonen 2012) and, in particular, should include information and location of points of particular interest. Maintenance of facilities is crucial and requires a management structure in place for many years. All actions are rated positively, with the exception of **EBHE-257**, which is scored amber because it is context specific and there is a lack of evidence but factors to consider are the potential visual detriment to recreation experience from adding 'furniture' such as bins and seats, in areas where they hadn't been previous.

3.7.1.2 Co-benefits and Trade-offs

A key co-benefit of this action is that visitors who may not have considered certain aspects of the rural environment (e.g. cultural heritage) may now do so, especially if they are provided with the sort of things to look out for along with explanations. This would be a clear opportunity to reach out to segments of the population who may not have previously had much exposure to cultural and historic aspects of the rural environment (Mischi 2009) and this would increase engagement with the natural environment. In this case there are no obvious trade-offs in providing additional information, apart from the visual impact of additional signage. As envisaged through the various actions, a multi-facetted approach to information sharing would work best and likely reach the maximum of people (Bünzli & Eppler 2018).

3.7.1.3 Magnitude

This is applicable across all areas where the public has access to the rural environment including open access areas and rights of way especially.

3.7.1.4 Timescale

Once the action is implemented the benefits to visitors would be immediate.

3.7.1.5 Spatial Issues

No additional space would be required for these actions.

3.7.1.6 Displacement

Unlikely that there would be a displacement of activity unless information is provided more for some areas and less for others.

3.7.1.7 Maintenance and Longevity

Maintenance for signage and way markers would be ongoing, as would information updates to websites and other means of communications.

3.7.1.8 Climate Adaptation or Mitigation

N/A

3.7.1.9 Climate factors / Constraints
N/A

3.7.1.10 Benefits and Trade-offs to Farmer/Land manager
The main benefits to farmers and land managers would be less people wandering away from paths or out of open access areas as they will be provided with the information necessary to avoid entering private land.

3.7.1.11 Uptake
Capital costs would need to be covered where this action occurs on private land.

3.7.1.12 Other Notes
N/A

3.7.2 Signposting and information – information and education

BHE-037: Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites
EBHE-039: Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour
EBHE-041: Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits

The aim of these three actions is to provide more in-depth information to visitors on all aspects of the site or area including ecological, geological, cultural and heritage. **EBHE-037** focusses on in-situ information backed up with digital information; **EBHE-039** focusses on digital opportunities to broaden the experience of the site visit with additional information; and **EBHE-040** focusses the primarily in-situ information at targeted audiences visiting for specific purposes.

EBHE-037	Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites	**	N	**
EBHE-039	Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour	**	N	**
EBHE-041	Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits	**	N	**

3.7.2.1 Causality
Information needed by visitors to better understand the natural and cultural environment are often lacking; providing background information and explanations to what they can observe in different areas is a useful way of engaging with the public about both the natural and cultural rural environment (Markiewicz-Patkowska *et al*. 2016). This action will increase the awareness of the public generally and enhance their recreation experience. Maintenance of facilities is crucial and requires a management structure in place for many years

3.7.2.2 Co-benefits and Trade-offs
A key co-benefit from this action would be for the public to have a greater awareness of the natural world, which will enhance their recreation experience. This is important in order to enhance the experience of urban citizens in particular (Brown et al 2016). It is thought there are few trade-offs from providing this information and a multi-facetted approach would be optimal to reach the widest range of the population.

3.7.2.3 Magnitude

This is applicable across all areas where the public has access to the rural environment including open access areas and rights of way especially.

3.7.2.4 Timescale
Once the action is implemented the benefits to visitors would be immediate.

3.7.2.5 Spatial Issues
No additional space is required for the action to be effective.

3.7.2.6 Displacement
Unlikely that there would be a displacement of activity unless information is provided more for some areas and less for others.

3.7.2.7 Maintenance and Longevity
Maintenance for signage and way markers would be ongoing, as would information updates to websites and other means of communications.

3.7.2.8 Climate Adaptation or Mitigation
N/A

3.7.2.9 Climate factors / Constraints
N/A

3.7.2.10 Benefits and Trade-offs to Farmer/Land manager
A greater awareness of the natural and local environment may lead to some visitors seeking out locally made products.

3.7.2.11 Uptake
N/A

3.7.2.12 Other Notes
N/A

3.7.3 Nature-based interventions

EBHE-040: Create/ maintain sites and small scale infrastructure suited to nature-based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture

This action aims to facilitate the delivery of nature-based interventions for people with special needs in a rural natural environment. Provision of small scale infrastructure would be required to encourage visits.

EBHE-040	Create/ maintain sites and small scale infrastructure suited to nature-based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture	**	N	*

3.7.3.1 Causality
Nature based interventions to help improve the lives of people with health, educational or social needs are receiving greater attention (Wilkie & Davinson 2021) and see Theme 4. However, the availability of sites where this is facilitated are few. By providing sites with small scale infrastructure suitable for facilitating nature-based intervention, this approach can be expanded. This action would increase engagement with the natural environment and lead to increased physical recreational activity.

3.7.3.2 Co-benefits and Trade-offs
Co-benefits from this action are that people with specific needs, who might not normally visit rural areas, will do so more. It is also likely to help with their health and wellbeing (Kelly *et al*. 2022). There is the opportunity to engage with these visitors about the wide range of interests seen in rural areas including around cultural heritage. No trade-offs are identified assuming this action is in addition to actions aimed at facilitating visits and improving the experience visitors generally.

3.7.3.3 Magnitude

This action would be targeted at a selection of sites based on their location near cities and or catering for a wide set of potential interests (e.g. wildlife, history, culture, foods).

3.7.3.4 Timescale
Once the action is implemented the benefits would be immediate.

3.7.3.5 Spatial Issues
A small amount of space is required for the action to be effective, primarily space for small scale infrastructure (toilet suitable for mobility aid users; multipurpose room or shelter of some kind).

3.7.3.6 Displacement
If carried out on a small scale at each selected site, there's unlikely to be much displacement.

3.7.3.7 Maintenance and Longevity
On-going maintenance is required to maintain facilities.

3.7.3.8 Climate Adaptation or Mitigation
The design and construction of the facilities should minimise climate change impacts and be adapted to future expected climate change.

3.7.3.9 Climate factors / Constraints
N/A

3.7.3.10 Benefits and Trade-offs to Farmer/Land manager
N/A

3.7.3.11 Uptake
N/A

3.7.3.12 Other Notes
N/A

3.7.4 Geological collection opportunities

EBHE-051: Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities
Action **EBHE-051** aims to provide collection opportunities for those interested in geology, to facilitate their enjoyment of their visit, but also to minimise unwanted disturbance that could be caused by searching for items in other areas.

EBHE-051	Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities	LT*	N	*

3.7.4.1 Causality
For people interested in geology and specifically rocks and fossils collecting, opportunities to pursue their interest is not always clear. By providing dedicated sites for geological collection opportunities (Clary 2020), visitors interested in this will have greater enjoyment of their visit and it could also attract interest from people who may not have considered geological aspects of the site. Information signs will be very important explaining why specimens can be collected from designated localities and not from others and include reference to the Geological Society's Code of Conduct. This may impact in a negative way on other users, e.g. horse riders if the surface is altered, but this will be context specific and there is limited evidence for this.

3.7.4.2 Co-benefits and Trade-offs
The co-benefits from this action is to broaden the public awareness of different facets of the rural environment, including for example past human activities related to mining for particular rocks or minerals. There is an opportunity here to link the activity to the natural environment of the area (Brown et al 2016). Adding information notice boards or interactive exhibits could further engage the public and need to

include reference to the Geological Society's Code of Conduct. Care would need to be taken that the areas provided for geological collection do not expand with visitor number and encroach on nearby areas preserved for alternative characteristics (e.g. habitats) and have a detrimental visual impact.

3.7.4.3 Magnitude
The issue is widespread with regard to current areas where there is public access in rural areas, very few have dedicated areas where rock and fossil collection is encouraged.

3.7.4.4 Timescale
Once the action is implemented the benefits would be immediate.

3.7.4.5 Spatial Issues
Small areas within larger areas of public access would be required to be transformed into opportunities for rock and fossil collection. Some excavation might be required to remove surface soil layers and expose rocks and deposits of interest. Areas would also need to be made safe (e.g. stabilise rock faces if present).

3.7.4.6 Displacement
By providing dedicated sites for rock and fossil collection, other areas should see less disturbance for this activity. A risk is the dedicated sites face expansion and movement of visitors to the periphery and out of the dedicated area in search of items to add to their collection. Measures should be taken to prevent this occurring.

3.7.4.7 Maintenance and Longevity
On-going maintenance is required to ensure the safety of the site and that surrounding areas are not being negatively impacted by activity spread.

3.7.4.8 Climate Adaptation or Mitigation
Care should be taken in locating the dedicated sites especially with regarding to erosion and (flash) flooding risk.

3.7.4.9 Climate factors / Constraints
N/A

3.7.4.10 Benefits and Trade-offs to Farmer/Land manager
N/A

3.7.4.11 Uptake
This would depend on the landowner and their areas of interest.

3.7.4.12 Other Notes
N/A

3.7.5 Geo-caching

EBHE-054: Create places for geo-caching
EBHE-057: Maintain places for geo-caching
Geo-caching is a relatively new activity where people, including young children, use GPS systems or a mobile phone to hide and find objects. The actions **EBHE-054** and **EBHE-057** aim to facilitate this activity by providing safe and defined areas in which to carry out this activity.

EBHE-054	Create places for geo-caching	*	N	*
EBHE-057	Maintain places for geo-caching	*		*

3.7.5.1 Causality
Geo-caching (Neustaedter *et al*. 2013) is unknown to many but would be an opportunity to engage with younger people and increase their interaction with the rural environment. Dedicating areas for geo-caching and advertising this would attract new visitors, including those with young children (Jones 2012). There

would be an opportunity to inform and engage with a new set of visitors with regards different aspects of the natural environment (see Theme 8). As a result, there would be a benefit in terms of engagement and the level of activity.

3.7.5.2 Co-benefits and Trade-offs

The main co-benefits from this action is the potential increase and broadening of type of people engaging with the rural environment. The main trade-off would relate to the size of the increase in visitor to particular sites and this would therefore need to be monitored. Linking in with online geocaching websites would be crucial to achieve maximum success.

3.7.5.3 Magnitude

This action is rather about an encouraging alternate activity in the rural environment, so would be implemented widely.

3.7.5.4 Timescale

Once the action is implemented the increase in geocaching activities in areas targeted is likely to be immediate.

3.7.5.5 Spatial Issues

Space required would depend on aims and target audience (e.g. children or young adults).

3.7.5.6 Displacement

Areas selected for geo-caching may see substantial increase in human disturbance impacting wildlife. Similarly geo-caching in close proximity to historical monuments may be best avoided.

3.7.5.7 Maintenance and Longevity

Limited maintenance is required, although this would depend on the vegetation and how clear this is required to be kept for geo-caching purposes.

3.7.5.8 Climate Adaptation or Mitigation

N/A

3.7.5.9 Climate factors / Constraints

N/A

3.7.5.10 Benefits and Trade-offs to Farmer/Land manager

Increased visitors could lead to opportunity in selling locally produced foods.

3.7.5.11 Uptake

Probably less suited to agricultural lands but other landowners or managers would likely see limited risks with this action.

3.7.5.12 Other Notes

N/A

3.7.6 Hosting visits and community activities

EBHE-060: Host school visits including forest schools and beach schools
EBHE-061: Host care farming visits
EBHE-062: Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities
EBHE-063: Host open days on farms, woodlands and country parks
EBHE-064: Host nature reserve visits
EBHE-074: Provide support (facilitators, supplies) for community food growing
EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value

The actions all aim to enhance public awareness and interest in the rural environment by hosting visits or open days in woodlands, on beaches, on farms, in country parks and at nature reserves. **EBHE-062**

specifically focusses on visitors with special needs. **EBHE-074** and **EBHE-266** have a particular focus on the local community.

EBHE-060	Host school visits including forest schools and beach schools	***	N	*
EBHE-061	Host care farming visits	***	N	*
EBHE-062	Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities	***	N	*
EBHE-063	Host open days on farms, woodlands and country parks	***	N	*
EBHE-064	Host nature reserve visits	***	N	*
EBHE-074	Provide support (facilitators, supplies) for community food growing	**		**
EBHE-266	Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value	**		**

3.7.6.1 Causality

People who don't normally visit rural areas or who wish to learn more about the rural environment have limited opportunities to do so (DGCMS 2021). Hosting visits to the rural environment would be an opportunity to engage with segments of the populations not always catered for. Hosting visits would engage the public on various aspects of the natural environment (Stolare *et al*. 2021). As a result all of these actions are rated highly for engagement and will also impact on the frequency of physical activity.

3.7.6.2 Co-benefits and Trade-offs

The key co-benefits from these actions would be to demonstrate the many facets of the rural environment and how they link together. For example, cultural heritage could be used as a thread to bind the various elements together (Hudecková & Sevcíková 2007). During visits, the public must be encouraged to ask questions and discuss answers for the full benefit to be realsied.

3.7.6.3 Magnitude

Public understanding of rural issues and the rural environment is often limited. Engaging with the public at sites across the country would be highly beneficial in increasing awareness of what rural areas have to offer.

3.7.6.4 Timescale

Once the action is implemented impact would be immediate.

3.7.6.5 Spatial Issues

No additional space would be required, but sites with some infrastructure present would be beneficial (toilets and shelter).

3.7.6.6 Displacement

N/A

3.7.6.7 Maintenance and Longevity

Depending on engagement form the public, these activities could be ongoing, but need not be overly frequent and would depend on host availability and resources.

3.7.6.8 Climate Adaptation or Mitigation

These actions would be an opportunity to include engagement around how climate change could impact the local landscape and rural environment.

3.7.6.9 Climate factors / Constraints

N/A

3.7.6.10 Benefits and Trade-offs to Farmer/Land manager

Opportunity for farmers to open their businesses to the public, especially those with specific needs (see Theme 4)

3.7.6.11 Uptake
Farmers and other hosts will need some financial assistance to facilitate the hosting and specific training.

3.7.6.12 Other Notes
N/A

3.7.7 Guided walks and engagement activities

EBHE-065: Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity
EBHE-066: Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity
EBHE-069: Provide guided geodiversity walks
EBHE-071: Provide fossil, mineral and rock hunting and collecting open events and days
EBHE-072: Provide nature survey opportunities, including open events and days
EBHE-271: Create/ enhance/ manage sites for wildlife watching

In addition to hosting visits (see 3.7.6), the actions **EBHE-065** and **ENHE-069** aim to provided guided walks and activities, action **EBHE-066** aims to provide interactive engagement activities on a wide range of topics and geological, and **EBHE-071** aims to stimulate interest in geology with open events.

EBHE-065	Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity	***	*	***
EBHE-066	Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity	**	N	*
EBHE-069	Provide guided geodiversity walks	**	N	*
EBHE-071	Provide fossil, mineral and rock hunting and collecting open events and days	**	N	T**
EBHE-072	Provide nature survey opportunities, including open events and days	*	TL*	*
EBHE-271	Create/ enhance/ manage sites for wildlife watching	**	N	**

3.7.7.1 Causality
To increase public engagement with the rural environment especially from those less likely to visit, activities that facilitate the participation in rural based activities are provided. These activities should broaden the population segments who visit rural areas. Many visitors to rural areas may do so for wildlife or landscape reasons (Visit Scotland 2016), by providing interactive engagement activities (**EBHE-066**) focussed on other aspects of the rural environment, a greater awareness of the natural environment can be installed (Malaescu 2022). In particular, elements linked to human activities (cultural heritage, land management) may often be overlooked by visitors interested in wildlife. Similarly, engagement around geology and geomorphology would increase awareness and possibly interest in this underlying aspect of landscapes. The actions are largely rated positive, and don't impact on the condition and number of rights of way. The only exception is **EBHE-065** where there might be an impact on existing users. There is also an amber rating for **EBHE-071** as care will need to taken not to over exploit such areas, especially if they are sensitive to such activity (See Theme 8). The amber rating for **EBHE_072** reflects concerns about the size of some open events and the impact on the condition of rights of way but this is context specific with limited evidence.

3.7.7.2 Co-benefits and Trade-offs
A key co-benefit from this action would be a greater awareness of the environment around them, including its roll in food production, if more people spend time walking or doing other activities in the countryside. A key trade-off that would need addressing is linked to collection of rocks or fossils – it is imperative that any risk of excessive collecting or damage whilst digging is minimised (Scottish Geodiversity Forum 2022) and the disturbance of wildlife. A key element to consider is the size of the group (Corrégé & Michinov 2021)

which undertakes a particular activity and to keep the group small enough to maintain good social interactions between group members.

3.7.7.3 Magnitude
See 3.7.6.3

3.7.7.4 Timescale
Once the action is implemented benefits would be immediate assuming successful advertising and good response from the public.

3.7.7.5 Spatial Issues
N/A

3.7.7.6 Displacement
No displacement risk for these activities was identified.

3.7.7.7 Maintenance and Longevity
Activities could be provided for as long as there is interest from the public.

3.7.7.8 Climate Adaptation or Mitigation
Ideas and concepts around climate change adaptation and mitigation could be introduced during the guided activities.

3.7.7.9 Climate factors / Constraints
N/A

3.7.7.10 Benefits and Trade-offs to Farmer/Land manager
N/A

3.7.7.11 Uptake
N/A

3.7.7.12 Other Notes
N/A

3.7.8 Installing and maintaining art features

EBHE-268: Install/ maintain visual and aural art features

This action looks to add and/or maintain artistic features in the landscape.

EBHE-268	Install/ maintain visual and aural art features	TL*	TL	TL*

3.7.8.1 Causality
The inclusion of art in the landscape can be positive as in the development of successful sculpture parks in the Forest of Dean and Yorkshire. However, the action is context specific and there is a lack of evidence regarding their impact on engagement, the condition of surrounding rights of way and levels of physical activity.

3.7.8.2 Co-benefits and Trade-offs
A key co-benefit from this action would be the increased engagement with the natural environment with people spend time walking or doing other activities in the countryside. A key trade-off that would need addressing is the increased footfall, something that needs to be carefully considered in sensitive habitats.

3.7.8.3 Magnitude
See 3.7.6

3.7.8.4 Timescale
Once the action is implemented benefits would be immediate assuming the art is well received

3.7.8.5 Spatial Issues

N/A

3.7.8.6 Displacement
Minor impact on surrounding environment

3.7.8.7 Maintenance and Longevity
Art installation require varying amounts of maintenance.

3.7.8.8 Climate Adaptation or Mitigation
N/A

3.7.8.9 Climate factors / Constraints
N/A

3.7.8.10 Benefits and Trade-offs to Farmer/Land manager
N/A

3.7.8.11 Uptake
N/A

3.7.8.12 Other Notes
N/A

3.8 Bundle: Maintenance, restoration of habitat features in Parks and Gardens

3.8.1 Maintenance, restoration of habitat features in Parks and Gardens

EBHE-090: Establish/ maintain a continuous grass sward in Registered Parks and Gardens
EBHE-231: Enhance/ manage landscape character in urban parks
EBHE-307: Retain mature and veteran standing trees in Registered Parks and Gardens
EBHE-308: Re-plant trees in Registered Parks and Gardens
EBHE-309: Maintain standing/fallen deadwood in Registered Parks and Gardens
EBHE-310: Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens
EBHE-311: Enhance/ maintain parkland features in Registered Parks and Gardens
EBHE-312: Maintain the current water regime in Registered Parks and Gardens
EBHE-313: Remove eyesores from Registered Parks and Gardens
EBHE-315: Enhance/ manage biodiversity in urban parks

All of these actions are seeking to maintain or restore features in Registered Parks and Gardens and other urban parks. The focus on the on the natural features, such as dead wood, veteran trees and removing eyesores. All of these are aimed at increasing the biodiversity in these spaces.

EBHE-090	Establish/ maintain a continuous grass sward in Registered Parks and Gardens	LT**	LT**	LT**
EBHE-231	Enhance/ manage landscape character in urban parks	L***	N	N
EBHE-307	Retain mature and veteran standing trees in Registered Parks and Gardens	LD***	N	N
EBHE-308	Re-plant trees in Registered Parks and Gardens	LD***	N	N
EBHE-309	Maintain standing/fallen deadwood in Registered Parks and Gardens	LDT***	N	N
EBHE-310	Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens	L***	N	N
EBHE-311	Enhance/ maintain parkland features in Registered Parks and Gardens	L***	N	LT*
EBHE-312	Maintain the current water regime in Registered Parks and Gardens	L***	N	N

EBHE-313	Remove eyesores from Registered Parks and Gardens	LT***	N	N
EBHE-315	Enhance/ manage biodiversity in urban parks	LDT***	N	N

3.8.1.1 Causality

All of these actions refer to the restoration and maintenance of urban parks and Registered Parks and Gardens. Therefore, these are well known and respected places and as a result there will be many views as to how these spaces should look and feel. Therefore, while the actions would improve the biodiversity of these spaces it is clear that changes to urban spaces need to be considered carefully (Cortinovis et al 2018 and Ward Thompson and Aspinall 2011). The benefit to mental health, stress reduction and attention restoration is known (Wolf et al 2020). In support of these actions, there is evidence that people favour the naturalistic and rustic appeal of such management (Diock et al 2013). The amber rating, largely due to a lack of evidence, is that these are well loved and respected features and therefore changes to the character and management of these spaces is likely to be closely watched (Natural England 2012 and OSS 2010). Even what constitutes an eyesore may be a subjective judgement

3.8.1.2 Co-benefits and Trade-offs

The main co-benefits are for wildlife and landscape character. There are few trade-offs, although if the changes are not felt to be in keeping by those living locally the sense of place will be impacted in a negative way. The reverse would be true if the actions were felt to be positive. .

3.8.1.3 Magnitude

There are 1,600 sites on the Register of Parks and Gardens which was established in 1983 and they are maintained by Historic England[2]

3.8.1.4 Timescale

Likely to be effective as soon as implemented

3.8.1.5 Spatial Issues

N/A

3.8.1.6 Displacement

Little if any displacement,

3.8.1.7 Maintenance and Longevity

Some maintenance required

3.8.1.8 Climate Adaptation or Mitigation

Most of the actions would not be impacted by climate change but the replanting of trees will require consideration regarding species selection.

3.8.1.9 Climate factors / Constraints

N/A

3.8.1.10 Benefits and Trade-offs to Farmer/Land manager

Managers of these areas will be aware of the needs and costs that these places require.

3.8.1.11 Uptake

N/A

3.8.1.12 Other Notes

N/A

3.9 BUNDLE: ACTIONS FOR GEODIVERSITY

[2] https://historicengland.org.uk/listing/what-is-designation/registered-parks-and-gardens/

3.9.1 Actions for geodiversity

EBHE-232: Maintain exposures of vertical or near-vertical faces
EBHE-234: Create/ maintain safety fencing for geodiversity features
EBHE-236: Stabilise cave entrances
EBHE-239: Remove fly tipped rubbish from geodiversity features
EBHE-244: Remove man-made barriers around active geodiversity features
EBHE-249: Create rock piles for sample collection
EBHE-250: Remove graffiti on geodiversity features
EBHE-251: Create/ enhance/ maintain access for caves or disused mines
EBHE-316: Control scrub or trees on top or in front of geodiversity features

These actions are all concerned with maintaining and enhancing areas for geodiversity, increasing the level of access, making these sites safe and stable, removing eye sores and man-made features that detract from these areas. Full consideration of the actions realting to geodiversity are made in the Theme 8 report on Geodiversity.

EBHE-232	Maintain exposures of vertical or near-vertical faces	T**	N	N
EBHE-234	Create/ maintain safety fencing for geodiversity features	TD*	N	*
EBHE-236	Stabilise cave entrances	T*	N	N
EBHE-239	Remove fly tipped rubbish from geodiversity features	***	N	***
EBHE-244	Remove man-made barriers around active geodiversity features	DT*	N	N
EBHE-249	Create rock piles for sample collection	T**	N	T*
EBHE-250	Remove graffiti on geodiversity features	***	N	***
EBHE-251	Create/ enhance/ maintain access for caves or disused mines	TD**	N	T*
EBHE-316	Control scrub or trees on top or in front of geodiversity features	TD*	N	N

3.9.1.1 Causality

The clear positive for these actions are for the removal of fly tip materials and graffiti. This will increase the engagement of those involved in recreation and is likely to increase the frequency the physical activity occurs. The other actions are all rated amber one or two * largely because the changes to the sites may benefit geodiversity but they might be other impacts in the look and character of these sites that needs to be considered carefully (Kim and Nicholls 2018).

3.9.1.2 Co-benefits and Trade-offs

The main benefit is for geodiversity and educational opportunities with few trade-offs, although removal of scrub and trees might harm biodiversity. Potential biodiversity impacts (e.g. on bats) by encouraging greater public access into caves. Public safety will need to be considered in relation to visits to caves, disused mines and quarries, and the removal of barriers around certain geodiversity features (e.g. dangerous cliff tops).

3.9.1.3 Magnitude

See Theme 8.

3.9.1.4 Timescale

As soon as implemented.

3.9.1.5 Spatial Issues

N/A

3.9.1.6 Displacement

N/A

3.9.1.7 Maintenance and Longevity

Stabilising cave entrances will need to be checked regularly as will all safety features.

3.9.1.8 Climate Adaptation or Mitigation

3.9.1.9 Climate-induced changes such as rates of coastal and fluvial erosion and deposition and the frequency of landslides, are likely to be reflected in physical changes to the landscape. Climate factors / Constraints

3.9.1.10 Climate-induced changes such as rates of coastal and fluvial erosion and deposition and the frequency of landslides, are likely to be reflected in physical changes to the landscape. Benefits and Trade-offs to Farmer/Land manager

See Theme 8.

3.9.1.11 Uptake

See Theme 8.

3.9.1.12 Other Notes

N/A

4 THEME 2. MENTAL HEALTH

There is increasing recognition of the importance of nature and place as a determinant of individuals' mental health and well-being (Bragg and Atkins, 2016). When discussing the mental health benefits that nature can provide, it is useful to make a distinction between targeted interventions for the vulnerable and public health initiatives for the general population. The literature highlights a range of mental wellbeing benefits for participants of targeted nature-based interventions (also called green care and eco-therapy), derived from the combination of three key attributes, namely the natural environment (biodiversity, geodiversity and landscapes), meaningful activities, and the social context (Bragg and Atkins, 2016).

Population-level studies have shown that people living in areas with higher levels of nature have improved mental, physical, and social health, are more likely to undertake physical activity and have a greater connection with nature (Cox et al., 2017). With a majority of people in UK living in cities and peri-urban areas, access to local parks and green spaces is particularly important. Natural environments are particularly rich in the characteristics necessary for restorative experiences (Kaplan, 1995) and access to nearby nature offers huge potential as an approach to illness prevention. Regularity of access is an important consideration; dose-response analysis shows that lower levels of depression are associated with minimum thresholds of weekly nature dose, for example (Cox et al., 2017).

4.1 MANAGEMENT BUNDLES

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:

- Habitat creation
  - Habitat creation/woodland (1action)
  - Habitat creation/horticulture (1 action)
- Signposting, information, facilities and events
  - Signposting, information, facilities and events/ (7 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

4.2 BUNDLE: HABITAT CREATION

4.2.1 Woodland

EBHE-281 Set up or engage with community tree planting projects

EBHE-281	Set up or engage with community tree planting projects	LT***

Community tree planning projects typically involve local people in designing their own projects, enabling them to connect with their environment, while fostering local ownership of trees' establishment and management. The evidence for the impact of community tree planting on mental health is limited but is consistent with the evidence logic chain and requires targeted engagement to be effective. As this action is highly likely to involve volunteers it is discussed under the theme 4 (volunteering opportunities) and is not discussed in detail here.

4.2.2 Horticulture

EBHE-262 Provide small scale infrastructure to support community horticulture (e.g. rabbit proof barriers, bee hives, water butts, small cropping areas, raised beds, small glasshouses, poly tunnels, piped water)

EBHE-262	Provide small scale infrastructure to support community horticulture (e.g. rabbit proof barriers, bee hives, water butts, small cropping areas, raised beds, small glasshouses, poly tunnels, piped water)	**

Community horticulture is closely related to social and therapeutic horticulture, which is the process of using plants and gardens to improve physical and mental health, as well as communication and thinking skills[3]. The provision of small scale infrastructure to support community horticulture is regarded as having a moderate benefit on mental health if done well. It is very similar to **EBHE-040**, and as such is discussed below (4.3.1).

4.3 BUNDLE: SIGNPOSTING, INFORMATION, FACILITIES AND EVENTS

4.3.1 Signposting, information, facilities and events

EBHE-040 Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture
EBHE-041 Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits
EBHE-061 Host care farming visits
EBHE-062 Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities
EBHE-074 Provide support (facilitators, supplies) for community food growing
EBHE-075 Provide support (facilitators, supplies) for therapeutic horticulture
EBHE-266 Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value

EBHE-061	Host care farming visits	***
EBHE-062	Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities	***
EBHE-075	Provide support (facilitators, supplies) for therapeutic horticulture	***
EBHE-040	Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture	**
EBHE-041	Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits	**
EBHE-074	Provide support (facilitators, supplies) for community food growing	**

4.3.1.1 Causality

EBHE-061, EBHE-062 & EBHE-075

Care farming is the therapeutic use of farming practices and is sometimes called social farming. It combines contact and connection with nature, social interaction and a broad range of farm-related activity. Care farming sits amongst other nature-based therapies that are collectively called green care or eco-therapy and is usually targeted at people with a defined physical or mental health challenge. Hosting visits for groups with special needs and providing support (facilitators, supplies) for therapeutic horticulture both fall under the broad remit of care-farming and as such are considered together here. These actions are judged to have major mental health benefits if done well.

EBHE-040, EBHE-041 & EBHE-074

[3] https://www.thrive.org.uk/how-we-help/what-we-do/social-therapeutic-horticulture

The above actions are regarded as holding the potential to have moderate mental health benefit if done well. They are not considered separately here because they are closely related to care farming and therapeutic horticulture but are regarded as having slightly less potential direct mental health benefit than the actual hosting of visits.

Exposure to the natural environment can have a positive psychological and emotional effect. Natural environments are particularly rich in the characteristics necessary for restorative experiences (Kaplan, 1995) and a meta-analysis of 31 recent studies shows that exposure to the natural environment can lead to stress reduction, and ultimately improve health (e.g. Yao et al., 2021).

Wide-ranging benefits to the psychological and social health of care farm participants are noted by Bragg et al., (2014); an increase in social inclusion, social and work skills, empowerment, social functioning, coping ability, social rehabilitation, cognitive functioning and wellbeing, self-esteem and mood, with a reduction in depression and anxiety related symptoms. These benefits derived from the combination of three key attributes: i) the natural environment; ii) meaningful activities; and iii) the social context (Bragg and Atkins, 2016).

4.3.1.2 Co-benefits and Trade-offs

Some groups who visit care farms, such as people suffering with dementia, often benefit from close supervision and support and as such group size is often relatively small. While there is a broad spectrum of supervisory needs, 1:1 carer to participant support is not uncommon.

Care farming can potentially provide clients with improvements to multiple health, social and educational outcomes at the same time (Bragg et al., 2014). Taking the value of care farm experiences for people with learning difficulties as an example, eco-therapy has proved to be a valuable route for people to be part of their community, take part in a meaningful activity that makes a difference, and to be more physically active (Bragg et al., 2013).

In terms of how care farming is conduced, Elings (2004) found five qualities that are important to make care farming visits a positive experience for adults with learning difficulties; the farmer as role model, meaningful work, small scale, social network, and clients addressed on the basis of possibilities.

4.3.1.3 Magnitude

Potential care farming visitors include people with a wide range of mental and physical health challenges who do not access nature based activities on a regular basis, although the proportion of the population who might benefit from care farm activities is unknown.

There are approximately 200 care farms in England and demand is rising, partly due to its clear therapeutic effectiveness (Keech et al., 2016).

4.3.1.4 Timescale

Although even brief contact with natural environments improves emotional well-being (McMahan and Estes, 2015), however there is little evidence that repeated and regular exposure can increase impact. For example, dose-response analysis showed that lower levels of depression were associated with minimum thresholds of weekly nature dose (Cox et al., 2015), while Berget et al., (2011) found a decline in anxiety from a 12-week farm animal assisted intervention.

4.3.1.5 Spatial Issues

Effective care farming visits can be hosted on relatively small farms where a range of activities can be offered.

4.3.1.6 Displacement

None.

4.3.1.7 Maintenance and Longevity

Many people who participate in care farming activities do so on an ongoing basis.

4.3.1.8 Climate Adaptation or Mitigation
None.

4.3.1.9 Climate factors / Constraints
None.

4.3.1.10 Benefits and Trade-offs to Farmer/Land manager
Increased social connection and a potentially diversified business are benefits to host farmers, while the time to develop skills and experience in hosting care farming visits is a potential trade-off.

4.3.1.11 Uptake
Not assessed.

4.3.1.12 Other Notes
N/A

4.3.2 EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value

EBHE-266	Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value	**

The International Organization for Standardization defines soundscape as an acoustic environment as perceived or experienced and/or understood by people, in context (Zhang et al., 2017). This action is considered to deliver moderate mental health benefits if done well, but as it is distinctive from care farming related actions is considered separately to care farming related actions. See Theme 11 (noice reduction).

4.3.2.1 Causality
According to the attention restoration theory, directed attention is a limited physiological resource and is susceptible to fatigue by overuse. Natural environments allow and promote the restoration of individuals within it from their state of directed attention fatigue; attending to softly fascinating stimuli such as walking in nature requires little effort and leaves mental space for reflection (Basu et al., 2019). Engaging the local community on how areas of tranquillity could be improved or new areas created could enhance a local population's opportunity to experience nature's restorative effect, obviously assuming regular access is granted by the landowner.
Zhang et al., (2017) found that different sounds, namely traffic, machine and natural sounds, in urban natural environments, have effects on the quality of environmental restoration. They suggest that soundscape planning and design can improve the sound quality in cities as well as the environmental restorative quality for urban residents.

4.3.2.2 Co-benefits and Trade-offs
Obviously heavy use of an area by the public may reduce the sense of tranquillity. Therefore there may be a trade-off between access and tranquillity.

4.3.2.3 Magnitude
Unknown

4.3.2.4 Timescale
Unknown

4.3.2.5 Spatial Issues
Unknown.

4.3.2.6 Displacement
Unknown.

4.3.2.7 Maintenance and Longevity

Unknown.

4.3.2.8 Climate Adaptation or Mitigation

Unknown.

4.3.2.9 Climate factors / Constraints

Unknown.

4.3.2.10 Benefits and Trade-offs to Farmer/Land manager

High levels of public access to an area may have detrimental impacts on other environmental objectives if habitats are disturbed on a regular basis.

4.3.2.11 Uptake

Not assessed.

4.3.2.12 Other Notes

N/A

5 THEME 3: EDUCATION

Children and young adults are spending less time outdoors than previous generations due to factors such as urbanisation, screen dependency, and the changing nature of childhood and parenting. This has created physical and emotional distancing from nature and time spent in natural environments (biodiversity, geodiversity and landscapes); major pathways shown to catalyse empathy and care for the environment have thus been neglected. There is evidence that time spent in nature leads to increased perceived value for connectedness to nature and, subsequently, greater pro-environmental attitudes and behaviours (Deville et al., 2021).

Barragan-Jason et al., (2023) conducted a systematic review of recent meta-analyses that investigate the impacts of psychological and/or physical connection with nature on human health and well-being and on attitudes and actions that promote nature conservation. In total 16 relevant meta-analyses covering 832 independent studies were identified, and consistent conclusions across geographically diverse experimental studies were found that physical connection with nature improves human cognition, social skills, physical and mental health, and psychological connection to nature. Experiments also showed that psychological connection with nature had significant positive impact on pro-environmental behaviours and values.

The wide range of benefits resulting from outdoor learning are also evidenced by Jucker and Von Au (2022) who found that outdoor learning enables learning in multiple dimensions, enhances social interaction, personal development and well-being, mental, physical and social health and creativity.

5.1 MANAGEMENT BUNDLES

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:

- Habitat creation
  - Habitat creation/horticulture (1 action)
- Systems action
  - Systems action/landscape actions (1 actions)
- Specific wildlife targeted actions
  - Specific wildlife targeted actions/ (3 actions)
- Restoration, management and enhancement
  - Restoration, management and enhancement/woodland (1 actions)
  - Restoration, management and enhancement/grassland (2 actions)
- Create and enhance access and PROW
  - Create and enhance access and PROW/ (1 actions)
- Signposting, information, facilities and events
  - Signposting, information, facilities and events/ (23 actions)
- Maintenance and restoration of cultural heritage sites
  - Maintenance and restoration of cultural heritage sites/ (23 actions)
- Maintenance, restoration of habitat features in Parks and Gardens
  - Maintenance, restoration of habitat features in Parks and Gardens/ (10 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

5.2 BUNDLE: HABITAT CREATION

5.2.1 Horticulture

EBHE-262: Provide small scale infrastructure to support community horticulture (e.g. rabbit proof barriers, bee hives, water butts, small cropping areas, raised beds, small glasshouses, poly tunnels, piped water)

EBHE-262	Provide small scale infrastructure to support community horticulture (e.g. rabbit proof barriers, bee hives, water butts, small cropping areas, raised beds, small glasshouses, poly tunnels, piped water	*

Community horticulture can deliver social benefits by bringing people together to share the benefits of gardening together[4]. It is discussed alongside care farming under the theme 2 (mental health). This action may or may not have a defined educational purpose, and as such it is regarded as having limited benefit on education if done well and is not discussed in detail here. It is worth noting, that the indicator is percentage of adults reporting that protecting the environment is important to them. Educating children is one way of reaching adults, as well as adult education, and community horticulture is one way of doing this.

5.3 BUNDLE: SYSTEMS ACTION

5.3.1 Landscapes Actions

EBHE-187: Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character.

EBHE-187	Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character	*

The creation of a landscape appraisal of a holding is judged to have limited impact on educational interactions even if it is done well, as such it is not considered in detail here.

5.4 BUNDLE: RESTORATION, MANAGEMENT AND ENHANCEMENT

5.4.1 Woodland

EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree

EBHE-209EM	Restore or manage traditional orchards with local varieties of fruit tree	T***

Traditional orchards are defined as sites where at least five fruit trees are present with no more than 20 metres between their crowns[5]. They can make a significant contribution to biodiversity, landscape character and local distinctiveness across the UK. Although this action could have major positive benefits in terms of enabling educational opportunities, evidence is currently limited, and the extent to which educational benefits are realised are likely to be contextually dependent. A more complete discussion of

[4] https://www.rhs.org.uk/get-involved/community-gardening/why

[5] https://www.data.gov.uk/dataset/1c8d4150-0126-4bf2-b697-a93a07007510/traditional-orchards-hap-provisional-england

community orchards is included in the theme 4 (volunteering opportunities) and therefore this action is not considered in detail here.

5.4.2 Grassland

EBHE-214EM: Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques
EBHE-214-X: Manage locally distinctive flower rich/hay meadows using traditional techniques

EBHE-214EM	Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques	**
EBHE-214-X	Manage locally distinctive flower rich/hay meadows using traditional techniques	**

Flower-rich hay meadows are now a rare and important habitat in the UK. They support a rich mixture of grasses and flowers with up to 45 species per square metre in the best meadows[6]. They can provide a good habitat for invertebrates which are an important food for birds, and if left uncut until July can provide an excellent habitat for ground nesting birds. The extent to which flower rich/hay meadows enable educational interactions will be dependent on access provision through guided visits and other facilitated events and is therefore considered alongside actions that fall under 'Signposting, information, facilities and events' (see section 5.6.1 below).

5.5 Bundle: Create and enhance access and PROW

5.5.1 Create and enhance access and PROW

EBHE-044: Create/ maintain safe access to beach schools sites

EBHE-044	Create/ maintain safe access to beach schools sites	L**

Beach schools have developed from, and follow the same ethos as, Forest Schools, using the coast as a platform to provide children with the opportunity to explore their natural surroundings in an organised setting. While there is limited evidence for the educational benefit provided through the creation and maintenance of safe access to beach school sites, it is consistent with evidence logic and is judged to have moderate positive benefit on enabling educational interactions if done well. This action is considered alongside action **EBHE-060**, 'Host school visits including forest schools and beach schools' under 5.6.1, below.

5.6 Bundle: Signposting, information, facilities and events

5.6.1 Signposting, information, facilities and events

EBHE-039: Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour
EBHE-040: Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture

[6] https://www.rspb.org.uk/our-work/conservation/conservation-and-sustainability/farming/advice/managing-habitats/hay-meadows/

EBHE-041: Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits
EBHE-043: Create/ maintain dedicated space for forest school opportunities
EBHE-050: Create/ maintain demonstration or outdoor classroom sites (e.g. for talks or lessons)
EBHE-052: Create/ maintain places for nature survey opportunities
EBHE-053: Provide/ maintain places for citizen science opportunities
EBHE-054: Create places for geo-caching
EBHE-055: Create/ maintain site based information promoting the use of the natural environment for physical activity, health and wellbeing
EBHE-056: Create/ maintain publicly accessible natural play spaces
EBHE-060: Host school visits including forest schools and beach schools
EBHE-062: Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities
EBHE-063: Host open days on farms, woodlands and country parks
EBHE-064: Host nature reserve visits
EBHE-065: Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity
EBHE-066: Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity
EBHE-069: Provide guided geodiversity walks
EBHE-071: Provide fossil, mineral and rock hunting and collecting open events and days
EBHE-072: Provide nature survey opportunities, including open events and days
EBHE-074: Provide support (faciltators, supplies) for community food growing
EBHE-075: Provide support (faciltators, supplies) for therapeutic horticulture
EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value

EBHE-053	Provide/ maintain places for citizen science opportunities	LT**
EBHE-071	Provide fossil, mineral and rock hunting and collecting open events and days	LTD**

Citizen science engages the public in a scientific project. Environment focused citizen science is an area of growing activity and there is an increasing knowledge base around its benefits to both science and participant learning. These two actions are regarded as implying an element of citizen science and to hold the potential to have a moderate benefit on education if done well; evidence is limited but is consistent with the evidence logic chain, although benefits are contextually dependent. For fossil, mineral and rock hunting and collecting there are potential disbenefits, depending on the sensitivity with which the action is carried out. Citizen science is considered in theme 4 (volunteering opportunities) so is not considered in detail here.

EBHE-043	Create/ maintain dedicated space for forest school opportunities	L***
EBHE-050	Create/ maintain demonstration or outdoor classroom sites (e.g. for talks or lessons)	LT***

The evidence for the benefit on educational engagement of actions to create and maintain dedicated space for forest school opportunities and outdoor classroom sites is limited but is consistent with the evidence logic chain. Forest schools and outdoor classrooms are considered in the discussion below.

EBHE-054	Create places for geo-caching	*

Geocaching is a type of global treasure hunt of people looking for caches, or hidden stashes of objects[7]. It is judged that this action has limited benefit on education even if done well, and so is not considered in detail here.

EBHE-039	Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour	**
EBHE-041	Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits	**
EBHE-052	Create/ maintain places for nature survey opportunities	**
EBHE-055	Create/ maintain site based information promoting the use of the natural environment for physical activity, health and wellbeing	**
EBHE-056	Create/ maintain publicly accessible natural play spaces	**
EBHE-065	Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity	**
EBHE-074	Provide support (facilitators, supplies) for community food growing	**
EBHE-075	Provide support (facilitators, supplies) for therapeutic horticulture	**
EBHE-266	Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value	**

The above actions help to enable access to outdoor learning opportunities, but as standalone actions are judged to have a moderate benefit on educational interactions. As such they do not have their own detailed analysis but relate heavily to the discussion for actions judged to have a major benefit on outdoor education, below. (**EBHE-065** involves the hosting of events but is judged to only have a moderate educational benefit as the stated focus is on social interaction and physical activity rather than education.)

EBHE-040	Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture	***
EBHE-060	Host school visits including forest schools and beach schools	***
EBHE-062	Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities	***
EBHE-063	Host open days on farms, woodlands and country parks	***
EBHE-064	Host nature reserve visits	***
EBHE-066	Provide interactive engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity	***
EBHE-069	Provide guided geodiversity walks	***
EBHE-072	Provide nature survey opportunities, including open events and days	***

[7] https://education.nationalgeographic.org/resource/geocaching

All of the above actions are judged to have a major benefit on enabling educational interactions, which in turn can have a positive impact on the percentage of adults in England reporting that protecting the environment is important to them. While actions involving visits, open days and guided walks to farms and nature reserves are discussed in the theme 2 (mental health) and theme 4 (volunteering), their impact on educational engagement is considered here under the broad description of outdoor education. Forest schools, beach schools and outdoor classrooms are given particular attention as they are not discussed elsewhere.

Forest schools is a growing movement offering children regular time in nature at a specific place i.e. both forest-based and place-based outdoor learning. Although school based, it is generally separate from the national curriculum. Children participate in regular visits to natural (ideally woodland) areas to engage in learning through play-based activities such as den building, fire lighting, campfire cooking, nature collecting, naming and identifying plants and animals, and nature art and craft. Children typically attend forest school on a weekly or biweekly basis which enables them to return to the site (Harris, 2021).

Beach schools have developed from Forest schools. They place an emphasis on outdoor learning and engaging children of all ages in a coastal environment to ignite the fun of outdoor exploration, discovery and learning[8].

Outdoor classrooms can help facilitate outdoor learning, which is an umbrella term for actively inclusive facilitated approaches that predominately use activities and experiences in the outdoors to aid learning, increase health and wellbeing, and build environmental awareness[9].

5.6.1.1 Causality

Until recently, claims that experiences with nature promoted learning were poorly evidenced (Kuo et al., 2022). However, hundreds of studies now provide compelling evidence that experiences of nature boosts academic learning, personal development, and environmental stewardship. In academic contexts, there is strong evidence that nature-based instruction can outperform traditional instruction. Nature may promote learning by improving learners' attention, levels of stress, self-discipline, interest and enjoyment in learning, and physical activity and fitness. Nature also appears to provide a calmer, quieter, safer context for learning; a warmer, more cooperative context, and enables autonomy that fosters developmentally beneficial forms of deep play. Nature can be particularly powerful for students not effectively reached by traditional instruction. The research on personal development and environmental stewardship is also compelling although not quantitative; multiple reports indicate shifts in perseverance, problem solving, critical thinking, leadership, teamwork, and resilience after time in nature. Similarly, over fifty studies point to nature playing a key role in the development of pro-environmental behaviour by helping to foster an emotional connection to nature.

Barragan-Jason et al., (2023) conducted a systematic review of recent meta-analyses that investigate the impacts of psychological and/or physical connection with nature on human health and well-being and on attitudes and actions that promote nature conservation. In total 16 relevant meta-analyses covering 832 independent studies were identified, and consistent conclusions were found that physical connection with nature improves human cognition, social skills, physical and mental health, and psychological connection to nature. Experiments also showed that psychological connection with nature had significant positive impact on pro-environmental behaviours and values. Although studies are biased toward adults rather than children the authors suggest that their review highlights a critical role for psychological and physical human-nature connections in developing a sustainable future.

[8] https://www.beachschoolsni.com/

[9] https://www.outdoor-learning.org/Good-Practice/Research-Resources/About-Outdoor-Learning

In her investigation into the role of forest schools in developing a relationship with nature and place, Harris (2021) explains that numerous studies show that time spent in nature when young can have lasting impact on children's attitudes to the natural environment through their lives. Formative experiences in nature enable the development of learning and interest in nature which then leads to a concern for the environment, and actions to conserve it. Through regular and repeated activities in a forest school, children become more relaxed, overcome fears, have fun, connect with nature as they come to know it better, and develop an affinity for the natural environment and a desire to protect it.

Turtle et al., (2015) supports this and highlights a statistically significant difference in environmental attitude between groups of children that had participated in a forest schools programme and those that had not participated, with children who have taken part in forest schools demonstrating a more pro-environmental attitude. The authors draw on the findings of an evaluation of a 14-week Forest School programme that showed that participants experienced increased self-esteem and self-confidence; improved social and physical motor skills; improved motivation and concentration; contributed to the development of language and social skills; and enhanced children's knowledge and understanding of the environment.

5.6.1.2 Co-benefits and Trade-offs

Outside learning outcomes include bringing back connections and meanings to place. Participation in localised outdoor experiences can promote a greater sense of belonging and connection to community and neighbourhood. Belonging and community connectedness can positively impact learning identities and, in turn, address aspects of cycles of disadvantage in marginalised communities (Cumming and Nash, 2015).

Weeland et al., (2019) draw on two meta-analyses on the effect of exposure to nature on self-regulation of schoolchildren that show small but significant positive overall associations of nature with self-regulation in both correlational and experimental studies. They conclude that nature may be a promising tool in stimulating children's self-regulation, and possibly preventing child psychopathology.

In terms of how action is undertaken, while the forest school movement offers children valuable outdoor experiences, it has at times become a "drag and drop" programme, which does not necessarily acknowledge local place, environment or culture. Place-based outdoor learning is a broader integrated approach that is interconnected with place, curriculum and learners (Lloyd et al., 2018).

5.6.1.3 Magnitude

There is growing evidence that children in the UK are suffering from a lack of engagement with nature and the outdoor environment (Soga and Gaston 2016). Equally knowledge about food and where it comes from is also lacking.

5.6.1.4 Timescale

The impact of outdoor learning activity on environmental behaviour over the long-term is yet to be fully assessed. However, empirical research cited by Harris (2021) found that practitioners were aware that some children returned to sites, sometimes bringing their friends or family, but were not certain how long this would last.

Deville et al., (2021) explain that more longitudinal studies that consider personal and social factors are needed to assess the duration and frequency of time spent in nature in childhood and its impact on pro-environmental attitudes and behaviours throughout the life course.

5.6.1.5 Spatial Issues

Research cited by Deville et al., (2021) indicates that overall time spent in nature, regardless of the quality of environmental conditions, leads to increased perceived values ascribed to nature, which is associated with pro-environmental attitudes and behaviours. Identifying contexts which cultivate this and reverse alienation from nature beginning in childhood may better sensitise adults to the urgency of environmental issues such as climate change, which adversely impact individual and environmental health.

5.6.1.6 Displacement

N/A

5.6.1.7 Maintenance and Longevity

The important role of teachers and other facilitators in sustaining impact is discussed by Prince (2017). Role modelling, mentoring and sustainable practice, by outdoor educators and using outdoor experiences, can contribute to pro-environmental action by offering a range of possibilities to engender pro-environmental behaviour. The place of role modelling through long-term mentoring in real, lived, outdoor environments that embrace pro-environmental behaviour is understood but further empirical research is required to substantiate the evidence base.

5.6.1.8 Climate Adaptation or Mitigation

Not assessed

5.6.1.9 Climate factors / Constraints

Not assessed

5.6.1.10 Benefits and Trade-offs to Farmer/Land manager

Not assessed

5.6.1.11 Uptake

Not assessed

5.6.1.12 Other Notes

N/A

5.7 Bundle: Maintenance, restoration of habitat features in Parks and Gardens

5.7.1 Maintenance, restoration of habitat features in Parks and Gardens

EBHE-090: Establish/ maintain a continuous grass sward in Registered Parks and Gardens
EBHE-231: Enhance/ manage landscape character in urban parks
EBHE-307: Retain mature and veteran standing trees in Registered Parks and Gardens
EBHE-308: Re-plant trees in Registered Parks and Gardens
EBHE-309: Maintain standing/fallen deadwood in Registered Parks and Gardens
EBHE-310: Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens
EBHE-311: Enhance/ maintain parkland features in Registered Parks and Gardens
EBHE-312: Maintain the current water regime in Registered Parks and Gardens
EBHE-313: Remove eyesores from Registered Parks and Gardens
EBHE-315: Enhance/ manage biodiversity in urban parks

See Theme 1 for assessment.

6 THEME 4: VOLUNTEERING

This report explores opportunities for, and cultural benefits associated with environmental volunteering, including those of an agricultural nature. It is important to note that much of the evidence specific to volunteering in and on behalf of environment takes a case study approach and employs varying metrics and approaches. However, these are complemented by some broader reviews and larger scale studies.

The cultural benefits of taking part in environmental volunteering can include impacts on our health and happiness. These may be realised through cultural benefits such as finding enjoyment, the social connection that takes place, opportunities for personal and collective achievement, being engaged in physical activity, developing knowledge and skills, being away from everyday stress and the benefits of spending time in restorative and relaxing natural spaces (see Theme 2 & 9) (Lovell et al., (2015). Research exploring environmental volunteering impacts over a 20-year period found it to be associated with better physical and mental health (Pillemer et al., 2010).

Taking part in environmental volunteering may also result in wider, knock on impacts to our pro-social and pro-environmental dispositions. Volunteers may grow in social confidence, feeling more positive about other people following their activity, broadening their social networks and reducing social isolation (Rogerson et al., 2017). Opportunities that enable volunteers to increase their connection to nature may also increase their pro-environmental behaviours and spend more time in green settings (see Theme 2 & 9) (ibid).

Environmental volunteering has been proposed as an important strategy for achieving mutual benefits for the health of people and environment (Williams et al., 2021, Patrick et al., 2022). However, it is important to note that factors like age, gender and income can influence who takes part in environmental volunteering (Pillemer et al., 2010, Winch et al., 2020). However, because of the cultural benefits that can potentially be accessed it is important that environmental volunteering opportunities are diversified and shaped towards inclusivity.

Novel forms of environmental volunteering have been established more recently through growing citizen science opportunities and its specific value as a pathway to increased health, happiness and pro-environmental attitudes and behaviours are starting to be more fully explored (Makuch & Aczel, 2020 Williams et al, 2021).

New collaborative networks and health interventions around environmental volunteering have emerged through the signposting of individuals towards environmental volunteering via social prescription from health professionals (see Theme 9 introduction). The growth of environmental volunteering on prescription acknowledges the broad range of cultural benefits and associated impacts on health and wellbeing that are potentially achieved through this activity (Garside et al., 2020, Leavell et al., 2019). HERE

6.1 MANAGEMENT BUNDLES

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:

- Habitat creation
  - Habitat creation/woodland (2 actions)
  - Habitat creation/grassland (1 action)
  - Habitat creation/horticulture (1 action)
- Restoration, management and enhancement
  - Restoration, management and enhancement/woodland (2 actions)
- Signposting, information, facilities and events
  - Signposting, information, facilities and events/ (14 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

6.1.1 Bundle: Habitat creation

6.1.2 Woodland

EBHE-209C: Create traditional orchards with local varieties of fruit tree
EBHE-281: Set up or engage with community tree planting projects

EBHE-281	Set up or engage with community tree planting projects	***
EBHE-209C	Create traditional orchards with local varieties of fruit tree	**

Set up or engage with community tree planting projects

Community tree planning projects typically involve local people in designing their own projects, enabling them to connect with their environment, while fostering local ownership of trees' establishment and management. Community tree planting is very likely to reply on volunteer engagement and as such this action is regarded as holding the potential to have a major benefit on volunteering if done well.

Create traditional orchards with local varieties of fruit tree
Traditional orchards are defined as sites where at least five fruit trees are present with no more than 20 metres between their crowns[10]. They make a significant contribution to biodiversity, landscape character and local distinctiveness across the UK. Trees are planted at low densities in permanent grassland, and managed in a low intensity way. There is much regional variation but tree species in traditional orchards include apple, pear, cherry, plum, damson and walnut. This action provides increased opportunity for engagement with nature and horticulture, which may lead to increased volunteer engagement, although the action could also be carried out without engaging volunteers. Therefore, it is judged to hold the potential for moderate benefits on volunteering if done well.

The above two actions are discussed together, below.

6.1.2.1 Causality

In their research into the motivations, barriers and benefits experienced through environmental volunteering in Britain, O'Brien et al., (2008) found that volunteers are not only motivated for environmental reasons but also by the personal benefits they gain from outdoor opportunities and the social nature of activities. Volunteers are often able to learn new skills and meet others while improving their health, well-being and quality of life. The authors suggest a continuum in motivation from altruistic aspects of volunteering through to volunteering that is focused on gaining new skills that will lead to future employment. Communities also often benefit from environmental volunteering with improved cohesion and access to green spaces.

Turning more specifically to literature that discusses the benefits of tree planting programmes, Moskell et al., (2011) explain that the opportunity to act upon personal values, to experience personal growth and development and to reduce or cope with negative feelings may all result from volunteering in urban tree planting programmes. Tree planting has been described as a symbolic ritual, ceremony or celebration (Moskell et al., (2011)) that can fulfil all of these functions.

[10] https://www.data.gov.uk/dataset/1c8d4150-0126-4bf2-b697-a93a07007510/traditional-orchards-hap-provisional-england

Following a literature review related to volunteering in urban forestry in the United States, Elton et al., (2022) found that urban forestry volunteers are often motivated by personal, social, and environmental considerations. The authors found that volunteers can encourage urban tree survival by advocating for, as well as performing, important maintenance-related duties including the administration of supplemental watering and pruning. Such activities will increase survival rates among newly planted trees, although evidence for such benefits is scarce.

6.1.2.2 Co-benefits and Trade-offs

Partick et al., (2022) found that environmental volunteering has the potential to address key determinants of health; social inclusion, employment and education. In a New South Wales study of peoples' motivations for, and co-benefits of, environmental volunteering, the authors describe multiple co-benefits of human-environmental interaction arising from environmental volunteering; mental, social, skill development, spiritual, physical, enhanced human-environmental interactions and direct benefits for the natural environment through habitat protection. The authors conclude that environmental volunteering is a planetary health strategy that could be incorporated into community-based health promotion.

Drawing on research into the links between changes to the natural environment (afforestation) and the changing lives of people who live, work and spend their leisure time in the National Forest area in the UK, Morris (2006) describes strong linkages between landscape change and a developing forest 'sociality', with forested places providing the setting for the reconfiguration of social networks and the emergence of new forms of 'connectedness'. The author argues that getting involved with forest-related activities, projects and initiatives can bring tangible social and economic, as well as environmental benefits.

In terms of the environmental co-benefits of tree planting, there are a very wide range of benefits, from carbon sequestration to improving air quality, increasing wildlife habitats and the creation of more liveable spaces for local communities.

6.1.2.3 Magnitude

Wildlife charity The People's Trust for Endangered Species has identified over 35,000 traditional orchards remaining in England, which suggests that 90% of traditional orchards have been lost since the 1950s[11].

The UK has one of the lowest tree covers in Europe (13%). Although the UK's woodland cover has more than doubled in the last 100 years, much of this is non-native trees, and existing native woodlands are generally isolated and in poor ecological condition.[12]

6.1.2.4 Timescale

The longer-term benefits of environmental volunteering were researched by Hine et al., (2008) who investigated the impact of environmental volunteering in Wales on behaviours and attitudes to the environment. The authors found that volunteering with The British Trust of Conservation Volunteers led to an increase in connectedness to nature, an increase in environmental awareness and responsibility and an increase in environmentally friendly practices. Volunteers with a high connectedness to nature score were likely to also have high environmental awareness and responsibility and were more likely to carry out environmentally friendly practices, from recycling to turning off the power to appliances at the plug. In terms of timescale, the adoption of environmentally friendly behaviour was shown to significantly increase with the length of time participants volunteered with BTCV; those who had been volunteering for over 6 months had slightly higher levels of environmentally friendly behaviour than those who had been volunteering for less than 6 months. A positive relationship was also found between the frequency of volunteering and environmentally friendly practice.

[11] https://www.theenglishgarden.co.uk/news-and-events/find-local-orchard-new-interactive-map/#:~:text=Wildlife%20charity%20the%20People%E2%80%99s%20Trust%20for%20Endangered%20Species,remaining%20in%20England%20and%20over%207%2C000%20in%20Wales

[12] https://www.woodlandtrust.org.uk/state-of-uk-woods-and-trees/

6.1.2.5 Spatial Issues
The minimum size of a traditional orchard is defined as five trees with crown edges less than 20m apart.[13]

6.1.2.6 Displacement
None identified.

6.1.2.7 Maintenance and Longevity
In their assessment of the health and wellbeing impacts of volunteering with The Wildlife Trusts, Barton et al., (2017) found that the mental wellbeing of volunteers improved significantly over a 12-week period, and that improvements were greatest for people who had not previously taken part in Wildlife Trust activities. Across the 12 weeks, the importance of 'conservation activities' and 'learning new skills' increased the most in attendees' rated importance, indicating that they could be key drivers of attendance. Learning new skills is one of the five ways to wellbeing[14].

6.1.2.8 Climate Adaptation or Mitigation
Planting trees can help sequester carbon and so mitigate climate change. It is estimated that apple tree orchards, for example, can absorb between 25 and 50 tonnes of carbon dioxide per hectare each year while simultaneously releasing 37 tonnes of oxygen into the atmosphere[15]

6.1.2.9 Climate factors / Constraints
Trees' ability to sequester carbon depends on the tree's maturity so there will obviously be a significant time lag between tree planting and the full sequestration benefit being realised. Furthermore, the role of even mature tree planting in addressing climate change should not be overestimated; it is estimated it would take 640 mature trees per person to account for all American emissions, for example.[16]

6.1.2.10 Benefits and Trade-offs to Farmer/Land manager
In their literature review "Encouraging woodland creation, regeneration and tree planting on agricultural land", Staddon et al., (2021) conclude that farmers must also be able to perceive local on-farm benefits, such as soil protection, livestock welfare, and enhanced biodiversity, and/or receive financial reward for the provision of ecosystem services from tree planting on their farm, rather than just the more indirect and long-term global benefits arising from climate change mitigation.

6.1.2.11 Uptake
The same authors found that younger farmers, or new entrants, and those with a relatively high level of education are more likely to plant trees, while older farmers who are looking to reduce production may see tree planting as a legacy for future generations, or as a pension. There is also some evidence that farmers with previous experience of woodland creation, environmental schemes or other forms of diversification are more likely to be considering further tree planting. Land tenure can influence willingness or opportunities to plant trees, with tenanted farms less likely to engage in woodland planting.

6.1.2.12 Other Notes
N/A

6.1.3 Grassland

EBHE-214C: Create locally distinctive flower rich/hay meadows using traditional techniques

[13] https://www.data.gov.uk/dataset/1c8d4150-0126-4bf2-b697-a93a07007510/traditional-orchards-hap-provisional-england
[14] https://www.nhs.uk/mental-health/self-help/guides-tools-and-activities/five-steps-to-mental-wellbeing/
[15] https://www.klriver.org/faq/how-much-carbon-dioxide-a-tree-absorb-best-solution..
[16] https://climate.mit.edu/ask-mit/how-many-new-trees-would-we-need-offset-our-carbon-emissions

EBHE-214C	Create locally distinctive flower rich/hay meadows using traditional techniques	**

Flower-rich hay meadows are now a rare and important habitat in the UK. During June and July, bright and varied colours in such meadows are very attractive and many people enjoy them. They support a rich mixture of grasses and flowers with up to 45 species per square metre in the best meadows[17]. They provide a good habitat for invertebrates which are an important food for birds, and if left uncut until July can provide an excellent habitat for ground nesting birds. Although grassland survey work may well engage volunteers, farmers will typically restore grasslands at field scale using modern machinery. As such this action is judged to have a moderate benefit on volunteering if done well. It provides increased opportunity for engagement with nature which may lead to increased volunteer engagement, but may be successfully carried out without volunteer engagement.

6.1.3.1 Causality

When considering sites for hay meadow creation, targeting is important as some sites are constrained by high fertility, but flower rich hay meadows can be restored from impoverished starting points where there is appropriate management. Site preparation is key, as is ensuring that the most appropriate species are introduced, and effective cutting and/or grazing management is also essential, particular during early stages[18]. Creating flower rich hay meadows could involve seed dispersing naturally from adjacent habitats, dispersal on domestic livestock and farm machinery, introduction via farmyard manure spread in winter or winter feeding of stock on hay imported from a species rich meadow.

6.1.3.2 Co-benefits and Trade-offs

See 6.1.3.1 above.

6.1.3.3 Magnitude

N/A

6.1.3.4 Timescale

It can take several years to achieve visible results.

6.1.3.5 Spatial Issues

Not specified.

6.1.3.6 Displacement

None identified.

6.1.3.7 Maintenance and Longevity

Ongoing maintenance includes avoiding cultivating or reseeding and not applying artificial fertiliser.

6.1.3.8 Climate Adaptation or Mitigation

None identified.

6.1.3.9 Climate factors / Constraints

Not assessed.

6.1.3.10 Benefits and Trade-offs to Farmer/Land manager

Reduced productivity (overall grass yield) and possibly reduced forage quality (due to delayed cutting / grazing) are trade-offs to be considered by land managers. Species diversity would add to the palatability of the forage.

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[17] https://www.rspb.org.uk/our-work/conservation/conservation-and-sustainability/farming/advice/managing-habitats/hay-meadows/

[18] https://naturalengland.blog.gov.uk/2017/08/15/how-to-create-a-wildflower-meadow/

6.1.3.11 Uptake
Not assessed.

6.1.3.12 Other Notes
N/A

6.1.4 Horticulture

EBHE-262: Provide small scale infrastructure to support community horticulture (e.g. rabbit proof barriers, bee hives, water butts, small cropping areas, raised beds, small glasshouses, poly tunnels, piped water)

EBHE-262	Provide small scale infrastructure to support community horticulture (e.g. rabbit proof barriers, bee hives, water butts, small cropping areas, raised beds, small glasshouses, poly tunnels, piped water)	**

This action can have a moderate benefit on volunteering if done well. It provides increased opportunity for engagement with nature which may lead to increased volunteer engagement.

6.2 Bundle: Restoration, management and enhancement

6.2.1 Woodland

EBHE-209: Create, restore or manage traditional orchards with local varieties of fruit tree
EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree

This action is regarded as holding the potential to have a major benefit on volunteering if done well, although evidence is currently limited.

EBHE-209	Create, restore or manage traditional orchards with local varieties of fruit tree	T***
EBHE-209EM	Restore or manage traditional orchards with local varieties of fruit tree	T***

See 6.1.2 for assessment

6.3 Bundle: Signposting, information, facilities and events

6.3.1 Signposting, information, facilities and events

EBHE-060: Host school visits including forest schools and beach schools
EBHE-061: Host care farming visits
EBHE-062: Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities
EBHE-063: Host open days on farms, woodlands and country parks
EBHE-064: Host nature reserve visits
EBHE-065: Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity
EBHE-066: Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity
EBHE-069: Provide guided geodiversity walks
EBHE-071: Provide fossil, mineral and rock hunting and collecting open events and days
EBHE-072: Provide nature survey opportunities, including open events and days

EBHE-074: Provide support (facilitators, supplies) for community food growing
EBHE-075: Provide support (facilitators, supplies) for therapeutic horticulture
EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value
EBHE-271: Create/ enhance/ manage sites for wildlife watching

EBHE-063	Host open days on farms, woodlands and country parks	***
EBHE-065	Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity	***
EBHE-066	Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity	***
EBHE-069	Provide guided geodiversity walks	***
EBHE-071	Provide fossil, mineral and rock hunting and collecting open events and days	***
EBHE-072	Provide nature survey opportunities, including open events and days	***

Citizen science engages the public in a scientific project. Environment focused citizen science is an area of growing activity and there is an increasing knowledge base around what works and it's benefits to both science and participant learning. These actions are regarded as implying an element of citizen science and as such to hold the potential to have a major benefit on volunteering if done well. They each imply volunteer engagement, either in the guided nature of activities (e.g. guided walks), involvement of surveys (e.g. nature surveys) or the length of activity (e.g. open day rather than visit).

EBHE-060	Host school visits including forest schools and beach schools	**
EBHE-061	Host care farming visits	**
EBHE-062	Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities	**
EBHE-064	Host nature reserve visits	**
EBHE-074	Provide support (facilitators, supplies) for community food growing	**
EBHE-075	Provide support (facilitators, supplies) for therapeutic horticulture	**
EBHE-266	Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value	**
EBHE-271	Create/ enhance/ manage sites for wildlife watching	**

These actions are likely to have moderate benefits on volunteering if done well. They provide increased opportunity for engagement with nature which may lead to increased volunteering, but they could be delivered in different ways, on a spectrum from commercially focussed delivered to heavy volunteer engagement. If volunteers are involved the benefits from volunteering are likely to be similar to the actions regarded as having major benefits on volunteering, above.

6.3.1.1 Causality

Citizen science engages the public in a scientific project. Volunteer involvement in science in the UK has typically focused on phenology, birds, and butterflies and has grown rapidly in recent years. For example, the British Trust for Ornithology's nationwide volunteer-based surveys cover a wide range of phenomena on the ecology of birds and are designed with a statistical rigor that is unusual for national biodiversity surveys (Kobori et al., 2016). See Theme 2.

6.3.1.2 Co-benefits and Trade-offs

Bonney et al., (2016) report limited but growing evidence that citizen science projects achieve participant gains in knowledge about scientific knowledge and process, increase public awareness of the diversity of scientific research, and provide deeper meaning to participants' hobbies.

6.3.1.3 Magnitude
Not assessed.

6.3.1.4 Timescale
Not assessed.

6.3.1.5 Spatial Issues
Not assessed.

6.3.1.6 Displacement
Not assessed.

6.3.1.7 Maintenance and Longevity
Not assessed.

6.3.1.8 Climate Adaptation or Mitigation
Not assessed.

6.3.1.9 Climate factors / Constraints
Not assessed.

6.3.1.10 Benefits and Trade-offs to Farmer/Land manager
Not assessed.

6.3.1.11 Uptake
Not assessed.

6.3.1.12 Other Notes
N/A

7 THEME 5: TOURISM

Rural tourism is gaining popularity worldwide. There are many facets to the drivers of tourism in the rural environment including the natural (geological and geomorphological) elements of the landscape, landscape character, wildlife, calmness, recreation activity, culture and heritage. Theme 5 addresses how various actions aimed at improving specific aspects of the rural environment such as habitat creation, restoration and management, landscape planning and related actions, improvement to access to the countryside, improved provision of information and engagement activities, maintenance and restoration of cultural heritage assets, maintenance and restoration of rural parks and gardens and facilitation of geodiversity interests can have beneficial impacts on tourism, both in term of tourist numbers but also in terms of tourists' interaction with the rural environment. This includes geo-tourism.

There is considerable evidence that enhancing the natural environment tends to attract more tourists and enhances the tourist experience. This is seen for woodland creation (Iversen et al. 2023; FitzGerald et al. 2021), orchard management (Cui et al. 2021), wetlands conservation and management (Boboc et al. 2016), calcareous grassland landscapes (Kostrakiewicz-Gieralt et al. 2020). This attraction of the natural environment and wildlife habitats is addressed in sections 7.2, 7.4, 7.5 and 7.6. Where wildlife is specifically being used to draw in tourist (Margaryan & Wall-Reinius 2017), there's a strong case for the conservation message to be made to raise awareness amongst tourist of the fragility of the natural world (Fernández-Llamazares et al. 2020; Hehir et al. 2022). Ecological restoration is likely to become a key element of landscape planning in the future (Stange et al. 2021).

It can be argued that there is an intricate relationship between landscape and tourism, with tourists drawn to particular regions for their landscape characteristics (Terkenli *et al*. 2021). The landscape contains both natural (or at least semi-natural) elements along with those clearly shaped by human activities including land use and buildings, often built with natural building stone and roofing stone from the locality (Gobster *et al*. 2007). As such when viewing a landscape, tourists or visitors are also viewing aspects of local culture, or in other words they are immersed in a cultural landscape (Penerliev 2017; Flint & Jennings 2021; Jepson & Sharpley 2014; Swanwick 2009). This may include aspects of how the land is farmed (Rust *et al*. 2021), both from a cropping but also livestock point of view (see 7.7 & 7.8). Landscape character, which is of course specific to each region or locality (see Fuschi & Evangelista 2017) is highlighted in section 7.3. How landscape character is maintained in the face of externalities is an interesting point; the case of invasive plants (section 7.3.2) is a priority conservation issue in many parts of the world (Lovelock *et al*. 2022).

A key aspect to enjoying the rural environment is access. Public rights of way (Yamamoto *et al*. 2017) and open access land rights (Jones & Yamaki 2015) are critical to the public visiting rural areas. This issue of access and how it can be improved upon (Morris *et al*. 2008) is discussed in section 7.10; section 8.5 in Theme 6 also addresses this issue of access. Different segments of the population visit the countryside for different reasons, and widening the range of activities that are encouraged would be beneficial in attracting more tourists. Some may visit for physical activities (Pandurangan *et al*. 2022), others may visit for cultural heritage aspects (Hodges 2009). The views of local stakeholders are crucial if tourists are to be welcomed (Peira *et al*. 2021). An integrated and planned approach to tourism in rural areas is important to make sure that tourism is kept within the carrying capacity of the local rural communities (Ilbery et al 2007; Cannas 2022). The importance of rural cultural events for tourism should also be considered (Thomas *et al*. 2020). Widening access may also include the provision of local accommodation fitting within the landscape character (Agapito *et al*. 2020), although it is possible that the accommodation would not be in keeping with the local landscape.

A further element that needs considering is how the availability of information can influence visits to the rural environment. This may be linked to on-site information, online information, hosted visited, guided walks and other facilitated activities (see section 7.11; section 8.6 in Theme 6 also touches upon these points). Guided walks are an excellent opportunity in engaging with the public and raising awareness about the rural environment and thus enhancing the tourist or visitor experience (Husar *et al*. 2020; Lopes *et al*. 2019). Facilitating activities such as geocaching can also attract tourists who may not normally visit the rural environment on a regular basis (Skinner *et al*. 2018).

Many tourists visiting rural areas may do so for cultural reasons, as highlighted above. Cultural built heritage assets such as historic buildings and archaeological sites draw a substantial number of tourists to rural areas. Section 7.11 investigates how the maintenance and restoration of cultural heritage assets improves the tourist experience. A key issue is improving the access to historic buildings (Walter 2022). Historical buildings can be reused, if restoration is carried sensitively, for tourist accommodation or other uses linked to tourism activities (Ariffin *et al*. 2020; Arfa *et al*. 2022). For tourists to be attracted to a particular region many elements need to be in place including accommodation, eateries (Slocum & Curtis 2016), and attractions (such as historic buildings) (Ziernicka-Wojtaszek & Malec 2022). Not only buildings of historical noteworthiness, but traditional rural buildings characteristic of a particular region through the building material used and can be promoted as heritage attractions (Parlato et al. 2022); however, the importance of stakeholder involvement is crucial in deciding on approaches to be taken (Sardaro et al. 2021).

Rural gardens and parks including those in small towns and villages are often valued by tourists, who may be from a different demographic than tourists attracted to more natural or wild aspects of the countryside. Other Sections addresses actions that could further improve the attractiveness of these rural heritage assets. Conserving and restoring gardens and parks will preserve these cultural assets for future generation, assuming key principles are followed (Jacques 2017). Climate change is however a parameter that must be considered when restoring historic parks and gardens (Dix 2019). Water features and their maintenance

can greatly enhance the character of a garden or park and, are appreciated by visitors (Al-Suwaid *et al*. 2022).

Finally, section 7.12 highlights that geodiversity tourism can be enhanced by improving access to and information availability for geological and geomorphological features such as disused quarries, natural rock exposures (including on coastlines), geomorphological features such as tors, limestone pavements and natural river systems as well as for caves and disused mining areas. Implicit in this is the maintenance of such features including vegetation clearance and any permitted areas for specimen collecting. These topics are addressed in detail in Theme 6 (8.8) and Theme 8.

The indicator for this theme is derived from the pledged in the 25YEP that '*there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing'*. The indicator selected is G4: Engagement with the natural environment G4a) Visits to the natural environment G4b) Visits to green and natural spaces. However, this is not appropriate for tourism and has already been used in conjunction with the Enabling Recreation (Theme 1). A different indicator is required that separates out tourists from local recreational users. Something linked to the Day Visits survey run by VisitBritain[19] might be more meaningful.

7.1 Management Bundles

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:

- Habitat creation
  - Habitat creation/woodland (3 actions)
  - Habitat creation/woody features (2 actions)
  - Habitat creation/ponds and wetlands (2 actions)
  - Habitat creation/grassland (1 action)
- Systems action
  - Systems action/landscape actions (4 actions)
  - Systems action/invasive management (1 actions)
- Specific wildlife targeted actions
  - Specific wildlife targeted actions/ (2 actions)
- Restoration, management and enhancement
  - Restoration, management and enhancement/woodland (4 actions)
  - Restoration, management and enhancement/woody features (3 actions)
  - Restoration, management and enhancement/scrub (1 actions)
  - Restoration, management and enhancement/grassland (2 actions)
  - Restoration, management and enhancement/boundary features (6 actions)
- Actions for habitats with specific hydrological characteristics
  - Actions for habitats with specific hydrological characteristics/peatlands and wetlands (4 actions)
- Livestock management
  - Livestock management/selection and diversification (2 actions)
- Litter and waste
  - Litter and waste/ (3 actions)
- Create and enhance access and PROW
  - Create and enhance access and PROW/ (20 actions)
- Signposting, information, facilities and events

[19] www.visitbritain.org

  - Signposting, information, facilities and events/ (34 actions)
- Maintenance and restoration of cultural heritage sites
  - Maintenance and restoration of cultural heritage sites/ (21 actions)
- Actions for geodiversity
  - Actions for geodiversity/ (15 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

7.2 BUNDLE: HABITAT CREATION

7.2.1 Woodland

EBHE-140: Create a woodland creation plan - woodland creation plans are required in order to receive governmental grants for woodland creation. The plan must include identification of landscape and visual sensitivities relevant to woodland creation, as well as identification of proximity to priority habitats or species, national or international designations, heritage assets etc. All new woodland must be UKFS (UK Forestry Standard) compliant.

EBHE-140C: Create ghyll woodland - ghyll woodlands are native woodland found on steep-sided valleys, predominantly in uplands area in western Britain (Flora local 2005).
EBHE-209C: Create traditional orchards with local varieties of fruit tree - traditional orchards are structurally and ecologically similar to wood-pasture and parkland, having widely spaced fruit trees within wider grassland, that is either grazed or cut (JNCC 2008). They are important biodiversity hotspots and include UK BAP priority habitats and species. A feature of traditional orchards is the variety of the fruit cultivars they contain and the low intensity management regimes applied (in contrast to more intensively managed orchards) (JNCC 2008).

The main benefits from the above four actions are described in Theme 9. Below we set out specific impacts of the actions on tourism.

EBHE-140	Create a woodland creation plan	LT**
EBHE-140C	Create ghyll woodland	LT**
EBHE-209C	Create traditional orchards with local varieties of fruit tree	**

7.2.1.1 Causality

There is no direct evidence relating to the impact of woodland creation plans on tourism, the assumption is made that through the development of a plan consideration is given to a number of factors that might impact the attractiveness of the area and thus its appeal to visitors, but these would be highly context dependent. The premise of undertaking a woodland creation plan is that new planting will be undertaken following best practice, thus positively impacting sense of place. Orchards are characteristic of settled landscapes and would therefore enhance local character which is more likely to be positive for tourism. In some locations, where communities are strongly attached to existing (less wooded) landscapes, woodland creation might have a negative impact on sense of place, although this should be accounted for and mitigated against in the woodland creation plan.

Ghyll woodlands have significant wildlife value and are important in a landscape and historical context (Flora locale 2005). Given their importance for native wildlife and their landscape importance, the creation of new ghyll woodlands is likely to provide benefits to visitors to these places.

Extending or restoring traditional woodlands make an important contribution to landscape character and local distinctiveness, creating a mosaic of habitats in the landscape (JNCC 2008). This makes areas more attractive and is likely to appeal visitors to these areas.

7.2.1.2 Co-benefits and Trade-offs

The other co-benefits, including improved biodiversity through new or enhanced habitat provision (see Theme 9); carbon sequestration, air and water pollution control, flooding alleviation, as well as health and wellbeing benefits (see Theme 2) including recreation (see Theme 1) and sense of place (see Theme 13), where the woodland is linked to access. Potential trade-offs are generally limited, but could be significant in some areas where landscape character is strongly connected to a non-woodland landscape.

7.2.1.3 Magnitude

N/A

7.2.1.4 Timescale

Some benefits are likely to be realised as soon as the action is undertaken. However, given the time it takes for woodlands and orchards to reach maturity, the full benefits are unlikely to be felt until 20+ years after establishment.

7.2.1.5 Spatial Issues

Large-scale woodland creation is likely to have more of a landscape impact than more localised ghyll woodland creation, or small-scale traditional orchard creation. However both might be of equal significance.

7.2.1.6 Displacement

The main impact is in terms of the habitat type that new woodland or orchard creation displaces. If these existing habitats are important contributors to sense of place (e.g. upland grassland), new woodland could have a negative (at least initially) impact on sense of place due to presence of tree shelters. However, where woodland replaces more intensive land uses, sense of place improvements could be significant (Short et al 2022).

7.2.1.7 Maintenance and Longevity

All woodland and orchard creation will need long-term maintenance. Trees need watering and weeding, and protection from browsers, in their early years to allow them to establish. Orchard settings will need further ongoing pruning, harvesting and grassland cutting/grazing, in order to maintain the habitat and its sense of place. All of these activities have an economic cost. Woodlands are likely to require thinning and management for many decades.

7.2.1.8 Climate Adaptation or Mitigation

Climate change is likely to impact the type of tree species that will thrive, leading to some natural or assisted migration of tree species. Changes in familiar tree species in the landscapes and woodland settings has the potential to impact sense of place. However, the impact is likely to be small given that such changes occur over long timescales.

7.2.1.9 Climate factors / Constraints

N/A

7.2.1.10 Benefits and Trade-offs to Farmer/Land manager

See Theme 9.

7.2.1.11 Uptake

See Theme 9.

7.2.1.12 Other Notes

N/A

7.2.2 Woody features & scrub

EBHE-191: Plant and establish appropriate species of field boundary trees - trees in hedgerows are important components that give a landscape character, creating a sense of place.

EBHE-205C: Create wood pasture (eg through appropriate grazing) - wood pasture is land that is managed through grazing, with trees in these settings often pollarded. Many of the UK's ancient trees are in wood pasture or parkland settings, although wood pasture is currently quite a rare habitat.

EBHE-191	Plant and establish appropriate species of field boundary trees	LT**
EBHE-205	Create wood pasture (eg through appropriate grazing)	LTD**

7.2.2.1 Causality

Field boundary trees – limited evidence to specifically support this action, but increasing field boundary trees will have an impact on landscape character, which in turn can influence attractiveness to visitors (Natural England 2014). See Theme 10 for further details.

Wood pasture - some evidence (from European studies) to suggest that wood pasture (and wider agroforestry) landscapes are important for quality of life, with *identity* particularly associated with agroforestry landscapes (Elbakidze et al. 2021). Such areas are likely to be attractive to visitors.

7.2.2.2 Co-benefits and Trade-offs

Both actions are likely to have benefits (mostly) to the attractiveness of places and this will increase tourism potential, but there are likely to be other co-benefits, including, in particular, improved biodiversity through new or enhanced habitat provision (see Theme 9). Further benefits may also include health and wellbeing benefits if access is included (see Theme 2).

Potential trade-offs are generally limited, but could be significant in some areas where an open and expansive landscape preferred.

7.2.2.3 Magnitude

N/A

7.2.2.4 Timescale

Benefits of introducing wood pasture are likely to be realised within a year or two of implementation. However, it may take 10+ years for the benefits of field boundary trees to be realised.

7.2.2.5 Spatial Issues

Field boundary trees would not require additional space but can be included as part of ongoing existing hedgerow management. Larger areas of wood pasture is likely to have more of an impact than small wood pastures, although even small areas of wood pasture could be impactful in the right setting.

7.2.2.6 Displacement

Field boundary trees should not displace other major habitat types, however wood pasture is likely to. If the existing habitats is an important contributor to the distinctiveness of the area (e.g. upland grassland), conversion to wood pasture could have a negative (at least initially) attractiveness to visitors. However, where wood pasture replaces more intensive land uses, sense of place improvements could be significant.

7.2.2.7 Maintenance and Longevity

Newly planted field boundary trees will need watering and protection from browsers in their early years to allow them to establish. Trees in wood pasture will also need watering and protection from browsers, and may need management such as pollarding as their size increases.

7.2.2.8 Climate Adaptation or Mitigation

Climate change is likely to impact the type of tree species that will thrive, leading to some natural or assisted migration of tree species. Changes in familiar tree species in the landscapes in terms of hedgerow trees or trees in wood pasture has the potential to impact the 'look' of a place. However, the impact is likely to be small given that such changes occur over long timescales.

7.2.2.9 Climate factors / Constraints
N/A

7.2.2.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 9.

7.2.2.11 Uptake
See Theme 9.

7.2.2.12 Other Notes
N/A

7.2.3 Ponds & wetlands

EBHE-169: Restore/ manage ghost ponds

EBHE-211: Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials
See Themes 8 and 9.

EBHE-169	Restore/ manage ghost ponds	*
EBHE-211	Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials	**

7.2.3.1 Causality
As a component in the landscape, ponds have some impact on its attractiveness, but it is likely to be limited. The more emphasis on traditional features the greater the benefit for visitors. Many ponds will be small and may not be visible from roads or footpaths, but there impact on wider habitats will extend further than the immediate area around the pond.

7.2.3.2 Co-benefits and Trade-offs
See Themes 8 and 9.

7.2.3.3 Magnitude
See Themes 8 and 9.

7.2.3.4 Timescale
See Themes 8 and 9.

7.2.3.5 Spatial Issues
See Themes 8 and 9.

7.2.3.6 Displacement
See Themes 8 and 9.

7.2.3.7 Maintenance and Longevity
See Themes 8 and 9.

7.2.3.8 Climate Adaptation or Mitigation
See Themes 8 and 9.

7.2.3.9 Climate factors / Constraints
See Themes 8 and 9.

7.2.3.10 Benefits and Trade-offs to Farmer/Land manager
See Themes 8 and 9.

7.2.3.11 Uptake
See Themes 8 and 9.

7.2.3.12 Other Notes
N/A

7.2.4 Grassland

EBHE-214C: Create locally distinctive flower rich/hay meadows using traditional techniques

EBHE-214C	Create locally distinctive flower rich/hay meadows using traditional techniques	**

See Theme 9.

7.2.4.1 Causality
See theme 9: creation of locally distinctive flower rich/hay meadows using traditional techniques could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness. Where this occurs it is likely to increase the value of the area for visitors.

7.2.4.2 Co-benefits and Trade-offs
Mainly biodiversity benefits with some carbon sequestration in the meadow remains in grassland for over 20 years.

7.2.4.3 Magnitude
Loss of traditional hay meadows has been dramatic over the past 50 years.

7.2.4.4 Timescale
Enjoyment of these places might be quicker than ecological recovery.

7.2.4.5 Spatial Issues
N/A

7.2.4.6 Displacement
N/A

7.2.4.7 Maintenance and Longevity
N/A

7.2.4.8 Climate Adaptation or Mitigation
N/A

7.2.4.9 Climate factors / Constraints
N/A

7.2.4.10 Benefits and Trade-offs to Farmer/Land manager
N/A

7.2.4.11 Uptake
N/A

7.2.4.12 Other Notes
N/A

7.3 BUNDLE: SYSTEMS ACTION

7.3.1 Landscapes Actions

EBHE-233: Control scrub or trees to maintain views - – this action is specific to locations where there are highly valued viewpoints. Maintenance of views helps to preserve the sense of place.

EBHE-269: Install/ maintain water features to facilitate positive soundscape and mask unwanted sound – used around sensitive sites that are prone to noise pollution, such as from motorways or other industrial activity – see Theme 11.
EBHE-273: Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound - see **EBHE-269** – tree, shrubs and vegetation provide a sound buffer – see Theme 11.
EBHE-303: Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings – polytunnels can impact on the attractiveness pf an area at the landscape scale and planting trees will reduce this impact.

EBHE-233	Control scrub or trees to maintain views	**
EBHE-269	Install/ maintain water features to facilitate positive soundscape and mask unwanted sound	T**
EBHE-273	Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound	LT**
EBHE-303	Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings	L**

7.3.1.1 Causality

These landscapes actions are likely to have major or moderate positive benefits on visitors and tourists, when done well, although for most actions there is limited evidence.
EBHE-233: has been coded as having a moderate impact on sense of place given that it will be contextually dependent to those locations with highly valued viewpoints. In these instances, this action will contribute to maintenance of spaces attractive to visitors, who are likely to value views highly.
EBHE-269, as with **EBHE-233**, this action will have a moderate impact, providing positive benefits in areas where there is unwanted sound. However, it will be important to consider the nature of the water features, particularly in terms of their 'naturalness'.
EBHE-273 and 303: trees, shrubs and vegetation provide a sound buffer which can reduce noise by five to ten decibels for every 30m width of woodland (FR, undated) and can help hide unsightly structures like polytunnels. However, it is dependent on species choice and planting design as to whether this action would have a positive impact on tourism.

7.3.1.2 Co-benefits and Trade-offs

See Theme 13

7.3.1.3 Magnitude

While many of these actions are carried out at a fairly small scale, the impact could be realised at the landscape scale (e.g. **EBHE-233**, **EBHE-303**). The impacts would also be dependent on the location – for instance, tree planting to mitigate the visual impact of polytunnels or to buffer noise that is located in a valley below urban/residential areas/recreation hotspots is likely to have a greater landscape impact than similar actions carried out further up hillsides.

7.3.1.4 Timescale

Most actions will be realised shortly after implementation, although actions involving tree planting will take some years to be fully realised.

7.3.1.5 Spatial Issues

N/A

7.3.1.6 Displacement

N/A

7.3.1.7 Maintenance and Longevity

See theme 13

7.3.1.8 Climate Adaptation or Mitigation

N/A

7.3.1.9 Climate factors / Constraints

N/A

7.3.1.10 Benefits and Trade-offs to Farmer/Land manager

Mostly of little benefit to farmer and land manager/owner.

7.3.1.11 Uptake

N/A

7.3.1.12 Other Notes

N/A

7.3.2 Invasive management

EBHE-301: Control invasive plant species by chemical means to help manage archaeological sites
Aims to control invasive plant species and thus help prevent vegetation encroachment at archaeological sites, which affects both long term preservation of the site as well as visitor enjoyment.

EBHE-301	Control invasive plant species by chemical means to help manage archaeological sites	*

See theme 7 for assessment.

7.4 BUNDLE: SPECIFIC WILDLIFE TARGETED ACTIONS

7.4.1 Specific wildlife targeted actions

EBHE-182: Create and use a wildlife management plan
EBHE-224: Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally
See Theme 9, both actions aimed at increasing visible biodiversity. Rated low for the plan as it is only a plan and the fallow plots might be less attractive visually for some of the year.

EBHE-182	Create and use a wildlife management plan	T*
EBHE-224	Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally	T*

See theme 9 for assessment.

7.5 BUNDLE: RESTORATION, MANAGEMENT AND ENHANCEMENT

7.5.1 Woodland

EBHE-140EM: Enhance/ manage ghyll woodland – see 7.1.1 (**EBHE-104C**)

EBHE-196: Planted Ancient Woodland (PAWS) restoration - PAWS are ancient woodland sites where semi-natural woodland has been replaced with a plantation. Most PAWS sites are either currently being restored or are likely to be restored to semi-natural woodland over the next few decades. The transition from plantation to semi-natural woodland is likely to have an impact on sense of place.
EBHE-198: Restore/ manage ancient woodland with native broadleaf species - see **EBHE-196**

EBHE-209: Create, restore or manage traditional orchards with local varieties of fruit tree – Creating, restoring or managing traditional orchards can add to a sense of place through the production of local varieties of fruit which are place-specific.
EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree – see **EBHE-209**
EBHE-314: Create a woodland management plan – See 7.1.1 (**EBHE-140**)

EBHE-140EM	Enhance/ manage ghyll woodland	LT**
EBHE-196	Planted Ancient Woodland (PAWS) restoration	LT**
EBHE-198	Restore/ manage ancient woodland with native broadleaf species	LT**
EBHE-209	Restore/ manage ancient woodland with native broadleaf species	T***
EBHE-209EM	Restore or manage traditional orchards with local varieties of fruit tree	T***
EBHE-314	Create a woodland management plan	LT**

7.5.1.1 Causality

The restoration of semi-natural ancient woodland is likely to have significant impacts on the attractiveness of these places and largely increase their attractiveness to visitors. This is particularly the case with PAWS restoration due to the resulting large-scale landscape change. Broadleaved woodland creates a different perspective to plantation forestry with studies showing public preferences for mixed or broadleaf forests rather than conifers (Upton et al. 2012). Grose (2012) suggests that "if a local green is replaced by a non-local green, our sense of place is altered" (p. 159). Conifer forests are generally a darker green to broadleaved woodlands, and broadleaved woodlands have a seasonal dimension, with the colours changing throughout the year, and as a result less attractive to visitors. However, there is less evidence on the impact for visitors, compared to sense of place or landscape character in places such actions will be context specific and less good in the short-term if clear-felling is involved.

7.5.1.2 Co-benefits and Trade-offs

Restoring semi-natural ancient woodland will provide biodiversity benefits, recreational and wellbeing benefits, as well as long term carbon sequestration benefits. Trade-offs are a reduction in productive forestry, with an impact on the availability of timber and other wood products.

7.5.1.3 Magnitude

Only a small extent of ancient woodland remains in the UK, just 2.5% of the UK's land area (Reid et al. 2021). The restoration of PAWS action seeks to restore all PAWS to semi-natural woodland over the next 20-30 years.

7.5.1.4 Timescale

This depends on whether PAWS restoration is realised through clear-felling and replanting/natural regeneration, or through gradual thinning with native trees allowed to establish under the plantation canopy. However, it will take several years for restored semi-natural woodlands to establish new habitats and ecosystems.

7.5.1.5 Spatial Issues

Potential to provide important connectivity between habitats if located near to other semi-natural woodland sites.

7.5.1.6 Displacement

The loss of plantation forestry through PAWS restoration could displace commercial forestry to other locations, with resulting positive or negative impacts depending the site location/context. For instance, if new commercial plantations are created on other landscape types with a highly valued sense of place this may have a negative impact.

7.5.1.7 Maintenance and Longevity

Once established, semi-natural woodland is permanent.

7.5.1.8 Climate Adaptation or Mitigation

Climate change is likely to impact the viability of native tree species to thrive. This may result in the natural range of some climate sensitive species moving further north and a shift in the suitability of tree species across different regions of the UK. South, central and eastern England are likely to have drier and warmers summers and will, therefore, require drought tolerant species.

7.5.1.9 Climate factors / Constraints

Need to consider alternative native and near-native species, as suggested in 15.5.1.8.

7.5.1.10 Benefits and Trade-offs to Farmer/Land manager

See Theme 6.

7.5.1.11 Uptake

See Theme 6.

7.5.1.12 Other Notes

N/A

7.5.2 Woody features

EBHE-192: Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction – action will protect in-field trees – ensuring their maintenance over the long-term can contribute to protection of landscape character, although the direct impact of the action on sense of place is likely to be limited.
EBHE-205: Create, Enhance/ manage wood pasture (eg through appropriate grazing) - see 7.2.2 (**EBHE-205C**)
EBHE-205EM: Enhance/ manage wood pasture (eg through appropriate grazing) - see 7.2.2 (**EBHE-205C**)

EBHE-192	Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction	*
EBHE-205	Create, Enhance/ manage wood pasture (eg through appropriate grazing)	LTD**
EBHE-205EM	Enhance/ manage wood pasture (eg through appropriate grazing)	LTD**

7.5.2.1 Causality

EBHE-192 will have limited benefits for visitors, although will help to ensure longevity of in-field trees which are an integral part of the landscape is some areas. However, the creation, enhancement and management of wood pasture has the potential to develop distinctive landscapes, depending on the land use that it is replacing – see 7.2.2 (**EBHE-205C**).

7.5.2.2 Co-benefits and Trade-offs

N/A

7.5.2.3 Magnitude

N/A

7.5.2.4 Timescale

N/A

7.5.2.5 Spatial Issues

N/A

7.5.2.6 Displacement

N/A

7.5.2.7 Maintenance and Longevity

N/A

7.5.2.8 Climate Adaptation or Mitigation
N/A

7.5.2.9 Climate factors / Constraints
N/A

7.5.2.10 Benefits and Trade-offs to Farmer/Land manager
N/A

7.5.2.11 Uptake
N/A

7.5.2.12 Other Notes
N/A

7.5.3 Scrub

EBHE-203EM: **Enhance / manage targeted scrub –** scrub is considered a 'successional' habitat as it is, naturally, a temporary habitat between more open habitat areas (e.g. grassland, heathland) and woodland. Therefore, the main purpose for scrub management is to maintain it as scrub, providing a habitat for those species which depend on it, and to also present scrub from invading other valuable habitats, such as grassland and heathland.

EBHE-203EM	Enhance / manage targeted scrub	*

7.5.3.1 Causality
Maintaining scrub will have a minor impact on the attractiveness of places to visitors, this can be negative in the short term but will maintain existing landscape character and habitats. Well managed scrub is positive for the environment and the more abundant wildlife may be attractive to visitors.

7.5.3.2 Co-benefits and Trade-offs
In additional to visitor benefits, scrub management will also provide enhanced landscape, recreational and biodiversity benefits. There will be a trade off in habitat provision between scrub and other habitat types.

7.5.3.3 Magnitude
Loss of scrub habitat, and adjoining grassland/heathland habitats.

7.5.3.4 Timescale
Mostly immediate.

7.5.3.5 Spatial Issues
N/A

7.5.3.6 Displacement
Scrub management will impact on adjoining grassland/heathland habitats through preventing scrub incursion on these other open habitat areas.

7.5.3.7 Maintenance and Longevity
On-going maintenance is require to maintain scrub as it is a successional habitat. If left unmanaged, it will transition to woodland, and encroach on adjoining open habitats.

7.5.3.8 Climate Adaptation or Mitigation
Not assessed.

7.5.3.9 Climate factors / Constraints
N/A

7.5.3.10 Benefits and Trade-offs to Farmer/Land manager

N/A

7.5.3.11 Uptake
See theme 6.

7.5.3.12 Other Notes
N/A

7.5.4 Grassland

EBHE-214EM: enhance and manage locally distinctive flower rich/hay meadows using traditional techniques - wildflower meadows declined during the twentieth century due to changes in agricultural practices, such as increased field drainage, herbicide use and urban encroachment. Restoration of wildflower habitats occurs through, for example, agri-environment schemes and set-aside programmes.

EBHE-214-X: Manage locally distinctive flower rich/hay meadows using traditional techniques – see above.

EBHE-214EM	Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques	*
EBHE-214X	Manage locally distinctive flower rich/hay meadows using traditional techniques	*

7.5.4.1 Causality
There are limited benefits to tourism for these actions, only in that flower-rich areas will be more attractive to visitors, should they be accessible.

7.5.4.2 Co-benefits and Trade-offs
Additional benefits from this action include improved biodiversity and landscape benefits. However, in some locations wildflower measures may conflict with local community preferences, particularly due to their untidy nature in the autumn and the height of vegetation may impede human access (FR, undated).

7.5.4.3 Magnitude
The action is trying to prevent the loss of this habitat.

7.5.4.4 Timescale
Impacts are realised in the first year and will grow over time where done well and successful.

7.5.4.5 Spatial Issues
N/A

7.5.4.6 Displacement
N/A

7.5.4.7 Maintenance and Longevity
Ongoing management required.

7.5.4.8 Climate Adaptation or Mitigation
Potential impacts on the habitat, in particular for drought-sensitive species.

7.5.4.9 Climate factors / Constraints
N/A

7.5.4.10 Benefits and Trade-offs to Farmer/Land manager
See theme 6.

7.5.4.11 Uptake
Not assessed.

7.5.4.12 Other Notes
N/A

7.5.5 Boundary features

EBHE-007: Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges) – traditional field boundaries form an integral part in rural landscapes. Alongside their practical purpose (stock proofing, shelter for livestock), they are also important habitats for wildlife.
EBHE-019: Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls – as above but focus on those bunraries alongside rights of way.
EBHE-228: Remove redundant fencing (replace with invisible fences if desirable) - removal of fencing where is serves no purpose, or replace with invisible fencing
EBHE-229: Remove non-traditional, redundant structures – for safety or visual impact reasons.

EBHE-007	Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges)	**
EBHE-019	Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls	***
EBHE-228	Remove redundant fencing (replace with invisible fences if desirable)	**
EBHE-229	Remove non-traditional, redundant structures	**

7.5.5.1 Causality
Actions that involve the improvement or maintenance of traditional field boundaries are likely to have a major benefit for visitors, especially alongside existing rights of way, as they enhance landscape character and represent the cultural heritage and distinctiveness of the area. In many areas this is an attraction to visitors, hence to awarding of two and three stars.

7.5.5.2 Co-benefits and Trade-offs
Maintenance of traditional field boundaries with also have benefits for recreation (see Theme 1), cultural heritage (see Themes 6 and 7), biodiversity (see Theme 9) and sense of place (Theme 13).

7.5.5.3 Magnitude
Maintenance of traditional field boundaries at a landscape scale.

7.5.5.4 Timescale
Action is effective as soon as it is implemented.

7.5.5.5 Spatial Issues
N/A

7.5.5.6 Displacement
N/A

7.5.5.7 Maintenance and Longevity
On-going maintenance of traditional field boundaries is required, although would be required fairly infrequently.

7.5.5.8 Climate Adaptation or Mitigation
N/A

7.5.5.9 Climate factors / Constraints
N/A

7.5.5.10 Benefits and Trade-offs to Farmer/Land manager

Traditional field boundaries (such as dry stone walls, hedges and earth banks) can provide shelter for livestock (against wind, rain and sun), and are a low-maintenance form of stock proofing.

7.5.5.11 Uptake

These have been popular options in previous AES programmes (NE2009)

7.5.5.12 Other Notes

N/A

7.6 Bundle: Actions for habitats with specific hydrological characteristics

7.6.1 Peatlands and wetlands

EBHE-164C: Create wetland habitats – wetlands are important for biodiversity, including endangered species and migratory birds. However, they are endangered habitats, disappearing three times as fast as forests (WWT 2022).
EBHE-164EM: enhance/ manage wetland habitats – see above.
EBHE-212: Create/ maintain raised water level areas by appropriate installation and operation of water level controls – actions to keep higher water levels that would be the case through gravity.
EBHE-216: Rewet moorland (including common land), eg through appropriate traditional grazing techniques – rewetting moorland typically occurs through physically blocking man-made drains and gulleys caused by erosion.

EBHE-164C	Create wetland habitats	**
EBHE-164EM	enhance/ manage wetland habitats	**
EBHE-212	Create/ maintain raised water level areas by appropriate installation and operation of water level controls	*
EBHE-216	Rewet moorland (including common land), eg through appropriate traditional grazing techniques	*

7.6.1.1 Causality

Living near to or visiting wetlands and experiencing its environment and wildlife is good for human wellbeing and creates an attractive place to visit (WWT 2022). Sense of place through wetland creation or management will deliver the greatest benefits in places where people currently have no or very limited access to green or blue spaces (WWT 2022).

7.6.1.2 Co-benefits and Trade-offs

Other benefits from wetland creation include the provision of freshwater and water quality improvement, pollutant removal, carbon sequestration, provide nursery sites for many commercial fish species, protection from flooding, support livelihoods, improve biodiversity (they are the most biodiverse habitat on earth), prevent coastal erosion and provide sites for recreation and tourism (WWT 2022; Pedersen et al. 2019). They can be located in both urban and rural areas, but wetlands near to residential areas are likely to have highapproval values contributing to quality of life and wellbeing (Pedersen et al. 2019). Peatlands are also a geodiversity issue as they record recent vegetational and hence climate change]

7.6.1.3 Magnitude

Restoration of habitat and climate adaptation.

7.6.1.4 Timescale

Benefits will accrue over of a short time scale.

7.6.1.5 Spatial Issues

Wetlands range from small located sites (such as ponds or bogs in urban settings) to largescale wetland sites.

7.6.1.6 Displacement

Wetland creation alters land for the foreseeable future, so it cannot be used for other purposes (e.g. agriculture, development).

7.6.1.7 Maintenance and Longevity

Some ongoing maintenance required.

7.6.1.8 Climate Adaptation or Mitigation

Wetland creation will have important climate adaptation and mitigation benefits. It will enable protection against flooding and improve climate regulation in urban settings (Pedersen et al. 2019) – see also Theme 12.

7.6.1.9 Climate factors / Constraints

Various factors need to be considered, such as wetland restoration may become impossible, in some cases, because of climate change impacts on the water environment, including hydrological and hydrogeological processes. In other cases, the restoration ambitions will often need to be modified, to reflect those impacts

7.6.1.10 Benefits and Trade-offs to Farmer/Land manager

Little benefits for farmer or land manager unless it provides a buffer to protect other land areas, or there are other economic benefits from wetland creation (e.g. recreational/tourism opportunities) or benefits through carbon markets.

7.6.1.11 Uptake

Farm businesses are more likely to undertake wetland creation on land that is unproductive than where it offers wider economic benefits.

7.6.1.12 Other Notes

N/A

7.7 BUNDLE: LIVESTOCK MANAGEMENT

7.7.1 Selection and diversification

EBHE-226: Use rare breeds for conservation grazing
EBHE-227: Maintain genetic diversity by rearing rare breed livestock
See Theme 9 and 10.

EBHE-226	Use rare breeds for conservation grazing	*
EBHE-227	Maintain genetic diversity by rearing rare breed livestock	*

7.7.1.1 Causality

The use of rare breeds for conservation grazing is likely to have minimal impacts on tourism, however traditional livestock in the countryside are broadly welcomed by visitors. Rare and traditional breeds are often ideally adapted to managing valued habitats, such as 'Ruby Reds' on Rhos/ Culm pasture and Exmoor ponies on scrub. This is illustrated by the Rare Breeds Survival Trust (RBST).

7.7.1.2 Co-benefits and Trade-offs

See Theme 9 and Theme 6.

7.7.1.3 Magnitude

N/A

7.7.1.4 Timescale

N/A

7.7.1.5 Spatial Issues

N/A

7.7.1.6 Displacement
N/A

7.7.1.7 Maintenance and Longevity
N/A

7.7.1.8 Climate Adaptation or Mitigation
N/A

7.7.1.9 Climate factors / Constraints
N/A

7.7.1.10 Benefits and Trade-offs to Farmer/Land manager
N/A

7.7.1.11 Uptake
N/A

7.7.1.12 Other Notes
N/A

7.8 Bundle: Litter and Waste

7.8.1 Litter and Waste

EBHE-267: Store unused polythene away from public view
EBHE-274: Remove polythene covering the frames of a polytunnel for a minimum period of six months in any calendar year
EBHE-278: Remove waste plastics in an approved manner, wash, and segregate and store correctly and recycling. NB recycling scheme available locally required for compliance.

These actions cover the removal of plastic waste so that it is not have a negative visual impact.

EBHE-267	Store unused polythene away from public view	**
EBHE-274	Remove polythene covering the frames of a polytunnel for a minimum period of six months in any calendar year	**
EBHE-278	Remove waste plastics in an approved manner, wash, and segregate and store correctly and recycling. NB recycling scheme available locally required for compliance.	**

7.8.1.1 Causality
While extensive areas of polytunnels can have a significant impact on landscape character, particularly when they are highly visible, the specific actions relating to removal, storage and disposal of polythene are likely to have a limited impact on tourist activity. What is more important to consider is the location and prominence of large areas of polytunnels, particular in sensitive landscapes or where they impact on long distance views.

7.8.1.2 Co-benefits and Trade-offs
Polythene removal, storage and disposal will have benefits for recreation (Theme 1), biodiversity (Theme 9) and landscape (Theme 10). Erection of large scale polytunnels, while contributing to improved food production, has potential impacts on local tourism and leisure industries.

7.8.1.3 Magnitude
N/A

7.8.1.4 Timescale
N/A

7.8.1.5 Spatial Issues
N/A

7.8.1.6 Displacement
N/A

7.8.1.7 Maintenance and Longevity
N/A

7.8.1.8 Climate Adaptation or Mitigation
Removal of polythene is likely to be increasingly required in order to avoid damage during storms. Removal of polythene during the wetter months of the year can also help with flooding alleviation.

7.8.1.9 Climate factors / Constraints
N/A

7.8.1.10 Benefits and Trade-offs to Farmer/Land manager
There will be a labour input for the removal, storage and disposal of polythene. Removal of polythene for a minimum of 6 months per year is unlikely to align with many horticultural crop cycles so consideration needs to be given to the economic costs and benefits. Moreover, this may well not be appropriate to the local growing season or crop and hence might not be acceptable to many growers.

7.8.1.11 Uptake
Farm businesses are more likely to undertake these actions when they align to crop cycle needs.

7.8.1.12 Other Notes
N/A

7.9 BUNDLE: CREATE AND ENHANCE ACCESS AND PROW

7.9.1 Create access infrastructure and facilities

EBHE-005: Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW)
EBHE-255: Create/ maintain small scale access facilities supporting travel to site via road (e.g. Small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)

The action **EBHE-005** and **EBHE-255** aim to create and maintain access facilities in rural areas. Specifically access by road for coaches, cars and bikes including hardstanding and bike shelters. Toilet facilities on-site and local affordable accommodation would also expand access.

EBHE-005	Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW)	***
EBHE-255	Create/ maintain small scale access facilities supporting travel to site via road (e.g. Small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)	***

7.9.1.1 Causality
Access to the natural and rural environment can be limited by site provision or route to the site (Burt *et al*. 2013). Older people, women and families with young children may be inhibited by lack of on-site facilities

(toilets) (Stewart & Costley 2013). Lack of parking can be a serious issue as often seen in rural areas with key features during holiday periods (e.g. Snowdonia). To broaden areas that can be visited, more remote areas may benefit from the addition of cheap night accommodation nearby (Pina & Delfa 2005). Increasing facility provision and ease of access will increase visitors and potentially broaden visitor type to include those drawn by the cultural values of the rural environment (Dümcke & Gnedovsky 2013).

7.9.1.2 Co-benefits and Trade-offs

Co-benefits from this action could mean less congestion at beauty spots and less on-road parking (Butler 2020). However, sites with facilities may get overwhelmed with visitors if sites with facilities are few in the immediate area. Depending on location, more visits may be made by bike which would be beneficial for public health as well as minimising car journeys. Identifying sites for facilities improvement should be carried out at the regional level taking care to space facilities improvement spatially.

7.9.1.3 Magnitude

Many sites in the most popular areas become easily overwhelmed by the number of visitors, so in these areas substantial work may be needed to increase total number of safe parking areas. Priority should be given to sites currently lacking facilities and the key will be to identify where best to invest from a regional perspective.

7.9.1.4 Timescale

Immediate after the work is carried out.

7.9.1.5 Spatial Issues

This depends on the scale of the lack of parking currently.

7.9.1.6 Displacement

The risk of developing fewer, larger facilities could increase road traffic unless there is a reasonable spread at the regional scale. This could also have implications where visitor number is greatly increased from current levels.

7.9.1.7 Maintenance and Longevity

On-going maintenance will be required, in line with public infrastructure elsewhere.

7.9.1.8 Climate Adaptation or Mitigation

Possible increase in visits by car to rural areas could have negative implication for climate change mitigation goals, but this is less of a concern over the longer-term assuming cars will be mostly electric with the electricity originating from renewable generation.

7.9.1.9 Climate factors / Constraints

Facilites should be built with the future climate change in mind.

7.9.1.10 Benefits and Trade-offs to Farmer/Land manager

Potentially more visitors which could impact areas near the facility with grater trampling and disturbance. The local economy could receive a cash boost from greater visitor numbers, especially if local tourist accommodation is expanded.

7.9.1.11 Uptake

Might be more interested if there is a link to existing recreation or tourism linked enterprises.

7.9.1.12 Other Notes

N/A

7.9.2 Rights of way and access

EBHE-006: Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety

EBHE-042: Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles

EBHE-006 aims to expand rights of way to facilitate the creation of circular routes taken in local points of interest. Where possible, this should also be done whilst facilitating access for mobility aids (**EBHE-042**). Creating a network of right of ways where the need to travel along roads is minimised will enhance access to the countryside in a safe way.

EBHE-006	Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety	***
EBHE-042	Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles	***

7.9.2.1 Causality

Current rights of way were not devised as a joined-up network and as such there can be a lot of gaps when attempting to avoid roads open to motorised traffic (Yamamoto *et al*. 2017). Access to the countryside and specifically off-road circuits may also be limited by mode of transport (car), as there is a lack of public transport allowing easy access to off-road rights of way (Wood *et al*. 2009). Many rights of way are currently not suitable to mobility aids due to elements aimed at stopping the movement of livestock (Ramblers 2023), or simply because the rights of way are overgrown. Enhancing the rights of way network whilst taking in places of cultural interest will make visitors more aware of the cultural aesthetics of the rural landscape (Shuib & Hashim 2011) and this will be appealing to tourism more widely.

7.9.2.2 Co-benefits and Trade-offs

Co-benefits from this action would be opening out rural landmarks or point so interests that otherwise were not on a dedicated right of way. The main trade-offs would be linked to increased visitors to previously unvisited areas, with a potential for more disturbance to wildlife. The action should be taken with a view to link up key features in the landscape and where possible to facilitate also movement of fauna across the landscape. Involvement of local communities and stakeholders where new or improved rights of way are being identified (Defra 2022b) will be crucial to the success of the action.

7.9.2.3 Magnitude

To improve connectivity between rights of way will depend on locality and how close existing rights of way are to one another.

7.9.2.4 Timescale

Once the action is implemented, benefits to users should be immediate.

7.9.2.5 Spatial Issues

Depends on locality.

7.9.2.6 Displacement

The main issue will be new visitors in previously unvisited areas as rights of way are opened; this could have some impact on wildlife and on livestock unless adequate preventative measures are taken (e.g. rules around dogs on lead).

7.9.2.7 Maintenance and Longevity

Similar to current rights of way.

7.9.2.8 Climate Adaptation or Mitigation

N/A

7.9.2.9 Climate factors / Constraints

N/A

7.9.2.10 Benefits and Trade-offs to Farmer/Land manager

Increased visitors and ramblers on farmland could cause disturbance and litter issues unless clear and better enforced rules are in place.

7.9.2.11 Uptake

Landowners will need convincing that opening up new rights of way will not have detrimental impact on livestock or crops. Involvement of local communities and land managers will be crucial to the success of the action.

7.9.2.12 Other Notes

N/A

7.9.3 Mitigate access effects

EBHE-008: Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation
EBHE-015: Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)

EBHE-008 aims to mitigate the impact of visitors by creating and maintaining infrastructure to hide visitors from wildlife and keep visitors on designated paths. **EBHE-015** aims to create new permissive paths, which may need to include infrastructure to mitigate visitor impact.

EBHE-008	Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation	L***
EBHE-015	Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)	**

7.9.3.1 Causality

Access to many rural areas can lead to adverse impacts on the environment (e.g. trampling), wildlife (e.g. disturbance) and farmland (e.g. damage to crops or stress to livestock) (Howley *et al*. 2010). Any new rights of way must take this access into account, and where necessary the landowner will need financial incentive to allow a permissive pathway on their land (CLA 2022). Creating and maintaining infrastructure to minimise disturbance of visitors to the countryside will minimise those concerns around potential negative impacts of visitors. Such features would be attractive to tourists but might have a visual impact and there is limited evidence covering these features in the landscape. New permissive access can be useful in creating circular routes and such well signposted routes are popular with visitors.

7.9.3.2 Co-benefits and Trade-offs

Some structures to facilitate access to the countryside in a safe way may detract from the surroundings (e.g. boardwalks) if not done sensitively. Similarly high hedges may minimise disturbance to wildlife but they may also affect the enjoyment of the visitor by blocking out much of the natural scenery and landscape. Co-benefits from hedge building, especially if they contain trees include habitat for smaller animals and insects along with the potential for carbon sequestration. Care should be taken when developing this infrastructure not to overly impact key the characteristics of the landscape.

7.9.3.3 Magnitude

Mainly along already existing rights of way but also along any new permissive ways. In some instances, this will include the need to use land adjacent to the pathways, which may not always be possible.

7.9.3.4 Timescale

Once the action is implemented it may take a few years for living infrastructure to be optimal.

7.9.3.5 Spatial Issues
See Magnitude above (7.9.3.3)

7.9.3.6 Displacement
The main impact is likely to be the need for land adjacent to pathways to be taken out of production (e.g. to allow hedge building).

7.9.3.7 Maintenance and Longevity
On-going maintenance is required, and for those non-living structures a need to replace every decade or two must be factored in. The permissive pathways may not all continue past the period of payment (3 years).

7.9.3.8 Climate Adaptation or Mitigation
Hedge planting may be beneficial from both a mitigation (carbon sequestration) and adaptation (minimising soil erosion, shade provision) perspective (Soil Association 2022).

7.9.3.9 Climate factors / Constraints
For hedge planting, care should be taken that the species chosen will adapt well to future climate change.

7.9.3.10 Benefits and Trade-offs to Farmer/Land manager
Hedge or banks may take land out of production but they would also in effect keep the visitors to the paths and in the case of hedges, should help keep dogs with their owners.

7.9.3.11 Uptake
Financial incentives could help with uptake where the landowner is expected to carry out the work.

7.9.3.12 Other Notes
N/A

7.9.4 Expand and improve access

EBHE-020: Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)
EBHE-021: Create public access (on foot, on horse or on bike) to open access land and common land
EBHE-022: Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users.
EBHE-023: Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users.
EBHE-026: Dedicate land as access land

Actions **EBHE-020** and **EBHE-026** aim to increase the area of land that the public can access. Actions **EBHE-021**, **EBHE-022** and **EBHE-023** aim to facilitate access by providing more access or entry points and by providing better path surfaces and pathway widths.

EBHE-020	Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)	L*
EBHE-021	Create public access (on foot, on horse or on bike) to open access land and common land	L*
EBHE-022	Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users.	L*

EBHE-023	Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users.	L*
EBHE-026	Dedicate land as access land	**

7.9.4.1 Causality

On occasions public access land has been lost due to development or other land use change; this should be minimised (**EBHE-20**). Although land may be open access, use of the land is often limited by non-existent or poor access infrastructure (Ramblers 2023). Improving and maintaining access infrastructure (**EBHE-021**; **EBHE-022**; **EBHE-023**) will increase public use of the land, both locally and for visitors. Also making sure access suits all legal users will increase public use of the land (Peak District National Park). Opening up more land for easy public access will enhance public awareness of rural areas including both their natural and human heritage. All the actions discussed in this section have a RAG rating of orange TL*, where L denotes limited evidence, and T that the rating is context dependent. Dedicating additional open access land would be popular with visitors, provided they are aware that is has been dedicated and is open access.

7.9.4.2 Co-benefits and Trade-offs

The main trade-offs that need to be considered will be linked to increased visitor numbers, although is sufficient access points are created, then visitors should be less constrained in space and therefore impacts should be less concentrated. Involvement of local stakeholders and communities will be central to the success of the changes.

7.9.4.3 Magnitude

Significant size of the endeavour as it includes all open access and common land.

7.9.4.4 Timescale

Once the action is implemented the impact should be immediate assuming visitors are made aware of the new opportunities.

7.9.4.5 Spatial Issues

Limited additional space is needed, the issue is more about managing access to current open access areas.

7.9.4.6 Displacement

These actions are likely to result in a more even distribution of visitors, thus limiting bottlenecks or concentration of visitors in relatively small areas.

7.9.4.7 Maintenance and Longevity

On-going maintenance is required for paths and access points.

7.9.4.8 Climate Adaptation or Mitigation

Location of pathways and substrate used need to be carefully chosen to not risk increasing erosion – this is especially so in the context of increased droughts and extreme precipitation events predicted with climate change.

7.9.4.9 Climate factors / Constraints

N/A

7.9.4.10 Benefits and Trade-offs to Farmer/Land manager

The benefits to the farmer/land manager would be less concentrated visitor impact. The flip side to this is that areas previously receiving very visitors will experience greater disturbance; dogs off leads being the greatest risk to livestock on open access land.

7.9.4.11 Uptake

Capital payments for any work carried by the landowner would be required.

7.9.4.12 Other Notes

N/A

7.9.5 Create access infrastructure and facilities

EBHE-256: Create/ maintain small scale access facilities supporting travel to site via horse riding (e.g. hitching points and water for horses)
EBHE-265: Dedicate new Byways Open to all Traffic
EBHE-282: Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)
EBHE-284: Create launch points for recreational activities by such as paddle sports, fishing, wild swimming, for able-bodied and disabled users
EBHE-300: Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)

EBHE-256	Create/ maintain small scale access facilities supporting travel to site via horse riding (e.g. hitching points and water for horses)	T**
EBHE-265	Dedicate new Byways Open to all Traffic	**
EBHE-282	Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)	L*
EBHE-284	Create launch points for recreational activities by such as paddle sports, fishing, wild swimming, for able-bodied and disabled users	***
EBHE-300	Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)	TL***

7.9.5.1 Causality

Open access land and byways often come with a number of restrictions regarding either the type of transport allowed or what activity is allowed (e.g. prohibition of paddling). The benefit of these actions is that many of the restrictions will be removed and many more varied activities (Natural Resources Wales 2021) would be welcome on open access land and by those using them. This would likely attract a greater cross-section of the UK public (Ramblers 2023) to open access areas. Actions have the following RAG ratings: **EBHE-256** orange T** and BHE-282 orange L* (as the benefits are likely to be context specific and need to be introduced in collaboration with existing activities); **EBHE-265** green ** as clearer regulation on Byways will be easier to understand. **EBHE-284** green *** as these are popular activities with a limited number of launch points, and **EBHE-300** orange TL***, as coordinating the activities will offer more circular and coordinated activities. L denotes limited evidence and T denotes the evidence is context dependent.

7.9.5.2 Co-benefits and Trade-offs

A key benefit from this action will be to attract a greater cross section of the UK public including those with disabilities or from differing cultural backgrounds (Natural England 2017), and would thus help democratise access to the rural environment. People with a wider range of interests would be attracted to different aspects of the rural experience including cultural landscape, heritage, monuments, geology, geography (Jeroscenkova *et al*. 2016) as well as the natural environment and wildlife. Trade-offs will need to be carefully considered as many activities (e.g. paddling) can have nefarious impacts on habitats and wildlife. Care would need to be taken to ensure that some areas remain free of activities that cause disturbance to wildlife. Excessive visitor number at particular sites (e.g. historical monument) would need to be managed to avoid damage. Better education of visitors, and possibly regulation of visitor behaviour, may be required, especially with regards littering and dog nuisance.

7.9.5.3 Magnitude

All open access lands and public byways and rights of way would be considered in these actions, although it may be judicious top limit the actions in the first case to specially selected areas.

7.9.5.4 Timescale

Once the action is implemented, the change would be immediate assuming information has been transmitted to the public.

7.9.5.5 Spatial Issues
No additional open access per se would be required, but there be scope to expand certain open access areas.

7.9.5.6 Displacement
Removing restrictions in some areas but not others could have the undesired effect of shifting visitors to those areas with less restrictions.

7.9.5.7 Maintenance and Longevity
Careful monitoring of the impacts of removing restrictions on visitor behaviour and impacts would be required over the short to medium term.

7.9.5.8 Climate Adaptation or Mitigation
No direct implication for climate change actions, although impacts on natural vegetation and wildlife could be exacerbated by climate change.

7.9.5.9 Climate factors / Constraints
N/A

7.9.5.10 Benefits and Trade-offs to Farmer/Land manager
Benefits and trade-offs depend on how the public responds and whether lifting restrictions leads to an increase in visitor problem behaviour.

7.9.5.11 Uptake
Evidence form pilot studies would be needed to confirm that lifting restrictions did not lead to increase nuisance behaviour or other unintended consequences.

7.9.5.12 Other Notes
N/A

7.10 Bundle: Signposting, information, facilities and events

7.10.1 Signposting and information – access focus

EBHE-004: Create/ maintain signage, way markers
EBHE-009: Create/ maintain improved public information signage (safety information, warnings biodiversity and environmental protection etc) above basic information / directions
EBHE-011: Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people
EBHE-012: Provide information on websites, apps and social media informing the public of access opportunities
EBHE-013: Distribute maps of access in and around the area including links to associated access ways

The aims of these actions are to increase information available for visitors so they can make the most out of their visit. **EBHE-004** aims to improve signage and way markers, which will assist visitors in finding their way around the pathways provided; this is followed up by the aim of **EBHE-013** which will provide maps of the area showing key points of access and key features. **EBHE-009** aims to provide additional information about elements found at the site and in the vicinity, this would include aspects of cultural and historical heritage. **EBHE-011** and **EBHE-012** aim to make better use of digital information sharing using websites, apps and social media to provide detailed information about public access opportunities and useful information concerning ease of access.

EBHE-004	Create/ maintain signage, way markers	**

EBHE-009	Create/ maintain improved public information signage (safety information, warnings biodiversity and environmental protection etc) above basic information / directions	**
EBHE-011	Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people	**
EBHE-012	Provide information on websites, apps and social media informing the public of access opportunities	**
EBHE-013	Distribute maps of access in and around the area including links to associated access ways	**

7.10.1.1 Causality

Many visitors to the rural environment have limited information about the site or area before their visit (Cope *et al*. 2000), so the more information that can be provided either on site or beforehand via the internet would be valuable for their enjoyment. Visitors may not always come prepared with planned routes making clear signage, way markers, and the provision of maps very useful. The information provided on signage and maps should cater for a multitude of tastes (Pesonen 2012) and, in particular, could include information and location of points of cultural or historical interest as well as habitats and flora and fauna of interest.

7.10.1.2 Co-benefits and Trade-offs

A key co-benefit of this action is that visitors who may not have considered certain aspects of the rural environment (e.g. cultural heritage, specific habitats) may now do so, especially if they are provided with the sort of things to look out for along with explanations. This would be a clear opportunity to reach out to segments of the population who may not have previously had much exposure to cultural and historic aspects of the rural environment (Mischi 2009). In this case there are no obvious trade-offs in providing additional information. As envisaged through the various actions, a multi-facetted approach to information sharing would work best and likely reach the maximum of people (Bünzli & Eppler 2018).

7.10.1.3 Magnitude

This is applicable across all areas where the public has access to the rural environment including open access areas and rights of way especially.

7.10.1.4 Timescale

Once the action is implemented the benefits to visitors would be immediate.

7.10.1.5 Spatial Issues

No additional space would be required for these actions.

7.10.1.6 Displacement

Unlikely that there would be a displacement of activity unless information is provided more for some areas and less for others.

7.10.1.7 Maintenance and Longevity

Maintenance for signage and way markers would be ongoing, as would information updates to websites and other means of communications.

7.10.1.8 Climate Adaptation or Mitigation

N/A

7.10.1.9 Climate factors / Constraints

N/A

7.10.1.10 Benefits and Trade-offs to Farmer/Land manager

The main benefits to farmers and land managers would be less people wandering away from paths or out of open access areas as they will be provided with the information necessary to avoid entering private land.

7.10.1.11 Uptake
N/A

7.10.1.12 Other Notes
N/A

7.10.2 Signposting and information – information and education

EBHE-037: Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites
EBHE-039: Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour
EBHE-041: Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits

The aim of these three actions is to provide more in-depth information to visitors on all aspects of the site or area including ecological, geological, cultural and heritage. **EBHE-037** focusses on in-situ information backed up with digital information; **EBHE-039** focusses on digital opportunities to broaden the experience of the site visit with additional information; and **EBHE-040** focusses the primarily in-situ information at targeted audiences visiting for specific purposes.

EBHE-037	Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites	**
EBHE-039	Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour	**
EBHE-041	Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits	**

7.10.2.1 Causality
Information needed by visitors to better understand the natural and cultural environment are often lacking; providing background information and explanations to what they can observe in different areas is a useful way of engaging with the public about both the natural and cultural rural environment (Markiewicz-Patkowska *et al*. 2016). This action will increase the awareness of the public, including tourists, and enhance their recreation experience.

7.10.2.2 Co-benefits and Trade-offs
A key co-benefit from this action would be for the public to have a greater awareness of the natural world, which will enhance their recreation experience. This is important in order to enhance the experience of urban citizens in particular (Brown et al 2016). It is thought there are few trade-offs from providing this information and a multi-facetted approach would be optimal.

7.10.2.3 Magnitude
This is applicable across all areas where the public has access to the rural environment including open access areas and rights of way especially.

7.10.2.4 Timescale
Once the action is implemented the benefits to visitors would be immediate.

7.10.2.5 Spatial Issues
No additional space is required for the action to be effective.

7.10.2.6 Displacement
Unlikely that there would be a displacement of activity unless information is provided more for some areas and less for others.

7.10.2.7 Maintenance and Longevity
Maintenance for signage and way markers would be ongoing, as would information updates to websites and other means of communications.

7.10.2.8 Climate Adaptation or Mitigation
N/A

7.10.2.9 Climate factors / Constraints
N/A

7.10.2.10 Benefits and Trade-offs to Farmer/Land manager
A greater awareness of the natural and local environment may lead to some visitors seeking out locally made products.

7.10.2.11 Uptake
N/A

7.10.2.12 Other Notes
N/A

7.10.3 Nature-based interventions

EBHE-040: Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture

This action **EBHE-040** aims to facilitate the delivery of nature-based interventions for people with special needs in a rural natural environment. Provision of small scale infrastructure would be required to encourage visits.

EBHE-040	Create/ maintain sites and small-scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture	*

7.10.3.1 Causality
Nature based interventions to help improve the lives of people with health, educational or social needs are receiving greater attention (Wilkie & Davinson 2021) and see Theme 4. However, the availability of sites where this is facilitated are few. By providing sites with small scale infrastructure suitable for facilitating nature-based intervention, this approach can be expanded. This action would increase engagement with the natural environment and lead to increased physical recreational activity.

7.10.3.2 Co-benefits and Trade-offs
Co-benefits from this action are that people with specific needs, who might not normally visit rural areas, will do so more. It is also likely to help with their health and wellbeing (Kelly *et al*. 2022). There is the opportunity to engage with these visitors about the wide range of interests seen in rural areas including around cultural heritage. No trade-offs are identified assuming this action is in addition to actions aimed at facilitating visits and improving the experience visitors generally.

7.10.3.3 Magnitude

This action would be targeted at a selection of sites based on their location near cities and or catering for a wide set of potential interests (e.g. wildlife, history, culture, foods).

7.10.3.4 Timescale
Immediate.

7.10.3.5 Spatial Issues
A small amount of space is required for the action to be effective, primarily space for small scale infrastructure (toilet suitable for mobility aid users; multipurpose room or shelter of some kind).

7.10.3.6 Displacement
If carried out on a small scale at each selected site, there's unlikely to be much displacement.

7.10.3.7 Maintenance and Longevity
On-going maintenance is required to maintain facilities.

7.10.3.8 Climate Adaptation or Mitigation
The design and construction of the facilities should minimise climate change impacts and be adapted to future expected climate change.

7.10.3.9 Climate factors / Constraints
N/A

7.10.3.10 Benefits and Trade-offs to Farmer/Land manager
N/A

7.10.3.11 Uptake
N/A

7.10.3.12 Other Notes
N/A

7.10.4 Signposting, information, facilities and events

EBHE-051: **Create/ maintain places for fossil, mineral and rock hunting and collecting opportuniti**es

Action **EBHE-051** aims to provide collection opportunities for those interested in geology, to facilitate their enjoyment of their visit, but also to minimise unwanted disturbance that could be caused by searching for items in other areas.

EBHE-051	Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities	*

7.10.4.1 Causality
For people interested in geology and specifically rocks and fossils collecting, opportunities to pursue their interest is not always clear. By providing dedicated sites for geological collection opportunities (Clary 2020), visitors interested in this will have greater enjoyment of their visit and it could also attract interest from people who may not have considered geological aspects of the site. This may impact in a negative way on other users but this will be context specific and there is limited evidence for this. See Themes 1 and 8.

7.10.4.2 Co-benefits and Trade-offs
The co-benefits from this action is to broaden the public awareness of different facets of the rural environment, including for example past human activities related to mining for particular rocks or minerals. There is an opportunity here to link the activity to the natural environment of the area (Brown et al 2016). Adding information notice boards or interactive exhibits could further engage the public. Care would need to be taken that the areas provided for geological collection do not expand with visitor number and encroach on nearby areas preserved for alternative characteristics (e.g. habitats) and have a detrimental visual impact.

7.10.4.3 Magnitude
N/A

7.10.4.4 Timescale
N/A

7.10.4.5 Spatial Issues
N/A

7.10.4.6 Displacement
N/A

7.10.4.7 Maintenance and Longevity
N/A

7.10.4.8 Climate Adaptation or Mitigation
N/A

7.10.4.9 Climate factors / Constraints
N/A

7.10.4.10 Benefits and Trade-offs to Farmer/Land manager
N/A

7.10.4.11 Uptake
N/A

7.10.4.12 Other Notes
N/A

7.10.5 Geo-caching

EBHE-054: Create places for geo-caching
EBHE-057: Maintain places for geo-caching

Geo-caching is a relatively new activity where people, including young children, use GPS systems or a mobile phone to hide and find objects. The actions **EBHE-054** and **EBHE-057** aim to facilitate this activity by providing safe and defined areas in which to carry out this activity.

EBHE-054	Create places for geo-caching	**
EBHE-057	Maintain places for geo-caching	**

7.10.5.1 Causality
Geo-caching (Neustaedter *et al*. 2013) is unknown to many, but has a world-wide following, but would be an opportunity to engage with younger people and increase their interaction with the rural environment. Dedicating areas for geo-caching and advertising this would attract new visitors, including those with young children (Jones 2012). There would be an opportunity to inform and engage with a new set of visitors with regards different aspects of the natural environment (see Theme 8). As a result there would be a benefit in terms of engagement and the level of activity. See Theme 6 & 8.

7.10.5.2 Co-benefits and Trade-offs
The main co-benefits from this action is the potential increase and broadening of type of people engaging with the rural environment. The main trade-off would relate to the size of the increase in visitor to particular sites and this would therefore need to be monitored. Linking in with online geocaching websites would be crucial to achieve maximum success.

7.10.5.3 Magnitude

This action is rather about an encouraging alternate activity in the rural environment, so would be implemented widely.

7.10.5.4 Timescale
Once the action is implemented the increase in geocaching activities in areas targeted is likely to be immediate.

7.10.5.5 Spatial Issues
Space required would depend on aims and target audience (e.g. children or young adults).

7.10.5.6 Displacement
Areas selected for geo-caching may see substantial increase in human disturbance impacting wildlife. Similarly geo-caching in close proximity to historical monuments may be best avoided.

7.10.5.7 Maintenance and Longevity
Limited maintenance is required, although this would depend on the vegetation and how clear this is required to be kept for geo-caching purposes.

7.10.5.8 Climate Adaptation or Mitigation
N/A

7.10.5.9 Climate factors / Constraints
N/A

7.10.5.10 Benefits and Trade-offs to Farmer/Land manager
Increased visitors could lead to opportunity in selling locally produced foods.

7.10.5.11 Uptake
Probably less suited to agricultural lands but other land owners or managers would likely see limited risks with this action.

7.10.5.12 Other Notes
N/A

7.10.6 Hosting visits and community activities

EBHE-060: Host school visits including forest schools and beach schools
EBHE-061: Host care farming visits
EBHE-062: Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities
EBHE-063: Host open days on farms, woodlands and country parks
EBHE-064: Host nature reserve visits
EBHE-074: Provide support (facilitators, supplies) for community food growing
EBHE-075: Provide support (facilitators, supplies) for therapeutic horticulture
EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value

The actions all aim to enhance public awareness and interest in the rural environment by hosting visits or open days in woodlands, on beaches, on farms, in country parks and at nature reserves. **EBHE-062** specifically focusses on visitors with special needs. **EBHE-074** and **EBHE-266** have a particular focus on the local community.

EBHE-060	Host school visits including forest schools and beach schools	*
EBHE-061	Host care farming visits	*
EBHE-062	Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities	*

EBHE-063	Host open days on farms, woodlands and country parks	*
EBHE-064	Host nature reserve visits	*
EBHE-074	Provide support (facilitators, supplies) for community food growing	*
EBHE-075	Provide support (facilitators, supplies) for therapeutic horticulture	*
EBHE--266	Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value	**

7.10.6.1 Causality

People who don't normally visit rural areas or who wish to learn more about the rural environment have limited opportunities to do so (DGCMS 2021). Hosting visits to the rural environment would be an opportunity to engage with segments of the populations not always catered for. Hosting visits would engage the public, including those from outside the area, on various aspects of the natural environment (Stolare *et al*. 2021). As a result, all of these actions are rated to increase engagement with the natural environment, which is attractive to some visitors looking for nature-based tourism.

7.10.6.2 Co-benefits and Trade-offs

The key co-benefits from these actions would be to demonstrate the many facets of the rural environment and how they link together. Cultural heritage could be used as a thread to bind the various elements together (Hudecková & Sevcíková 2007).

7.10.6.3 Magnitude

Public understanding of rural issues and the rural environment is often limited. Engaging with the public at sites across the country would be highly beneficial in increasing awareness of what rural areas have to offer.

7.10.6.4 Timescale

Once the action is implemented impact would be immediate.

7.10.6.5 Spatial Issues

No additional space would be required, but sites with some infrastructure present would be beneficial (toilets and shelter).

7.10.6.6 Displacement

N/A

7.10.6.7 Maintenance and Longevity

Depending on engagement form the public, these activities could be ongoing, but need not be overly frequent and would depend on host availability and resources.

7.10.6.8 Climate Adaptation or Mitigation

These actions would be an opportunity to include engagement around how climate change could impact the local landscape and rural environment.

7.10.6.9 Climate factors / Constraints

N/A

7.10.6.10 Benefits and Trade-offs to Farmer/Land manager

Opportunity for farmers to open their businesses to the public, especially those with specific needs (see Theme 4).

7.10.6.11 Uptake

Farmers and other hosts will need some financial assistance to facilitate the hosting and specific training.

7.10.6.12 Other Notes

N/A

7.10.7 Signposting, information, facilities and events

EBHE-065: Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity
EBHE-066: Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity
EBHE-069: Provide guided geodiversity walks
EBHE-071: Provide fossil, mineral and rock hunting and collecting open events and days
EBHE-072: Provide nature survey opportunities, including open events and days
EBHE-271: Create/ enhance/ manage sites for wildlife watching

In addition to hosting visits (see 3.1.6), the actions **EBHE-065** and **ENHE-069** aim to provided guided walks and activities, action **EBHE-066** aims to provide interactive engagement activities on a wide range of topics

EBHE-065	Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity	***
EBHE-066	Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity	**
EBHE-069	Provide guided geodiversity walks	***
EBHE-071	Provide fossil, mineral and rock hunting and collecting open events and days	*
EBHE-072	Provide nature survey opportunities, including open events and days	*
EBHE--271	Create/ enhance/ manage sites for wildlife watching	**

and geological, and **EBHE-071** aims to stimulate interest in geology with open events.

7.10.7.1 Causality

These activities are likely to be attractive to those seeking nature-based tourism. Many visitors to rural areas may do so for wildlife or landscape reasons (Visit Scotland 2016), by providing interactive engagement activities (**EBHE-066**) focussed on other aspects of the rural environment, a greater awareness of the natural environment can be installed (Malaescu 2022). In particular, elements linked to human activities (cultural heritage, land management) may often be overlooked by visitors interested in wildlife. Similarly, engagement around geology would increase awareness and possibly interest in this underlying aspect of landscapes. The actions are rated positive as a result, with examples of guided walks proving popular in many national parks.

7.10.7.2 Co-benefits and Trade-offs

A key co-benefit from this action would be a greater awareness of the environment around them if more people spend time walking or doing other activities in the countryside. A key trade-off that would need addressing is linked to collection of rocks or fossils – it is imperative that any risk of excessive collecting or damage whilst digging is minimised (Scottish Geodiversity Forum 2022) and the disturbance of wildlife. A key element to consider is the size of the group (Corrégé & Michinov 2021) which undertakes a particular activity and to keep the group small enough to maintain good social interactions between group members.

7.10.7.3 Magnitude

See themes 6 and 8.

7.10.7.4 Timescale

See themes 6 and 8.

7.10.7.5 Spatial Issues

See themes 6 and 8.

7.10.7.6 Displacement

See themes 6 and 8.

7.10.7.7 Maintenance and Longevity
See themes 6 and 8.

7.10.7.8 Climate Adaptation or Mitigation
See themes 6 and 8.

7.10.7.9 Climate factors / Constraints
See themes 6 and 8.

7.10.7.10 Benefits and Trade-offs to Farmer/Land manager
See themes 6 and 8.

7.10.7.11 Uptake
See themes 6 and 8.

7.10.7.12 Other Notes
N/A

7.10.8 Signposting, information, facilities and events

EBHE-268: Install/ maintain visual and aural art features

EBHE--268	Install/ maintain visual and aural art features	**

7.10.8.1 Causality
The inclusion of art in the landscape can be positive as in the development of successful sculpture parks in the Forest of Dean and Yorkshire. However, the action is context specific and there is a lack of evidence regarding their impact on engagement, the condition of surrounding rights of way and levels of physical activity. It isd assumed that these features will be visible and accessible in order to receive funding.

7.10.8.2 Co-benefits and Trade-offs
A key co-benefit from this action would be the increased engagement with the natural environment with people spend time walking or doing other activities in the countryside. A key trade-off that would need addressing is the increased footfall, something that needs to be carefully considered in sensitive habitats.

7.10.8.3 Magnitude
Public understanding of rural issues and the rural environment is often limited. Engaging with the public at sites across the country would be highly beneficial in increasing awareness of what rural areas have to offer as well as how sensitive they are.

7.10.8.4 Timescale
Once the action is implemented benefits would be immediate assuming the art is well received.

7.10.8.5 Spatial Issues
N/A

7.10.8.6 Displacement
Minor impact on surrounding environment.

7.10.8.7 Maintenance and Longevity
Art installations require varying amounts of maintenance.

7.10.8.8 Climate Adaptation or Mitigation
N/A

7.10.8.9 Climate factors / Constraints
N/A

7.10.8.10 Benefits and Trade-offs to Farmer/Land manager
N/A

7.10.8.11 Uptake
N/A

7.10.8.12 Other Notes
N/A

7.11 BUNDLE: MAINTENANCE AND RESTORATION OF CULTURAL HERITAGE SITES

7.11.1 Maintenance and restoration

EBHE-077: Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)
EBHE-298: Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-299: Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-305: Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)

Action **EBHE-077** aims to maintain a weatherproof condition on historical listed assets; **EBHE-298** aims to carry out conservation or consolidation on historical assets on the SHINE database; **EBHE-299** aims to carry out drainage works on historical assets on the SHINE database; **EBHE-305** aims to carry out restoration work on selected listed buildings.

EBHE-077	Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	T***
EBHE-298	Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	T***
EBHE-299	Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	T***
EBHE-305	Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	T***

7.11.1.1 Causality
Many listed buildings and buildings on the SHINE database (Powell *et al*. 2020) are not in good condition and require attention if they are to be preserved for future enjoyment. These four actions are aimed at maintaining, improving or restoring the condition of building of historical or cultural interest. Enhancing the condition and appearance of these buildings will add value to the cultural heritage of the landscape (Powell *et al*. 2019b). However, it is context specific as tom whether these actions would be accessible to visitors or if the presence of visitors would impact on the restoration of the sites themselves.

7.11.1.2 Co-benefits and Trade-offs
Co-benefits from these actions could result in a proportion of the buildings being able to attract visitor fees, or some buildings being sensitively converted into other uses (e.g. for tourists) (Rossitti *et al.* 2021). Careful consideration should be made with wildlife needs in the vicinity of historic or cultural buildings (e.g.

drainage). Any change of use or upgrade to allow use for alternate purposes would need to be done in a way not to detract from the historic or cultural value of the building.

7.11.1.3 Magnitude
Historic buildings across the country are often in poor condition or need constant maintenance, resulting in the task at hand being financially significant.

7.11.1.4 Timescale
Once the action is implemented the benefits should be immediate in terms of stopping further degradation of buildings and also attracting more visitors, where appropriate.

7.11.1.5 Spatial Issues
No additional space would be required.

7.11.1.6 Displacement
Limited risk of displacement issues.

7.11.1.7 Maintenance and Longevity
On-going maintenance is required as for any building if the aim is to stop any degradation in the appearance of the buildings.

7.11.1.8 Climate Adaptation or Mitigation
Future climate impacts may need to be considered for some buildings especially those in flood prone areas.

7.11.1.9 Climate factors / Constraints
As above.

7.11.1.10 Benefits and Trade-offs to Farmer/Land manager
The owner may be able to re-purpose the building for alternative use including income generation, if done sensitively.

7.11.1.11 Uptake
Owners of buildings which require rectification works to be carried are likely to require financial assistance.

7.11.1.12 Other Notes
N/A

7.11.2 Protection from cultivation impacts

EBHE-287: Do not harrow or roll Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-288: Do not plough, sub-soil cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-287	Do not harrow or roll Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	TL*
EBHE-288	Do not plough, sub-soil cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	TL*

7.11.2.1 Causality
Agriculture and especially soil disturbance has had a negative impact on scheduled monuments and heritage assets over the years. Cultivation and linked activities disturb the soil and can directly damage the asset of interest (Trow 2010). The actions **EBHE-287** and **EBHE-288** prohibit or minimise certain agricultural activities thus removing or minimising the risk of damage to the assets being protected. Both are rated as

amber as there is not link between the action and increased access and understanding amongst visitors, as a result it is context specific with limited evidence.

7.11.2.2 Co-benefits and Trade-offs

One co-benefit from this action is with regard to the soil itself, which is likely to benefit in terms of biological diversity and soil health (Staddon *et al*. 2022) as soil disturbance is minimised. This has potential but small benefits for increased soil C sequestration (Kämpf *et al*. 2016). Careful consideration will need to be made to help the farmer adjust to the new requirements and financial assistance may be required (e.g. for change of equipment to direct drill).

7.11.2.3 Magnitude

Any site with a scheduled monument or heritage asset could be affected by these actions, making these actions relatively widespread if confined in area.

7.11.2.4 Timescale

Once the action is implemented, damage caused by the targeted agricultural activities should cease promptly.

7.11.2.5 Spatial Issues

The space required would roughly match the footprint of sites covering scheduled monuments or heritage assets.

7.11.2.6 Displacement

No negative impacts anticipated and there could be some positive impacts with regard to less erosion and thus less sediment entering freshwater courses.

7.11.2.7 Maintenance and Longevity

This change in how the land is managed would be long-term.

7.11.2.8 Climate Adaptation or Mitigation

Potential mitigation benefits if the land managed with minimal disturbance can sequester additional carbon. Also, from an adaptation point of view, less susceptibility of the sites to water erosion would be a benefit.

7.11.2.9 Climate factors / Constraints

N/A

7.11.2.10 Benefits and Trade-offs to Farmer/Land manager

Farmer would likely need assistance to transition to the new rules on the management of land under these actions, otherwise there is likely to loss of income in the short term.

7.11.2.11 Uptake

Financial assistance to farmers would likely be required (Marshall et al 2020).

7.11.2.12 Other Notes

N/A

7.11.3 Clearing and visibility

EBHE-083: Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments
EBHE-088: Maintain the visibility of upstanding Scheduled Monuments/heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments

The aim of actions **EBHE-083** and **EBHE-088** is to keep vegetation trimmed and maintain visibility of scheduled monuments and heritage assets.

EBHE-083	Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	T***
EBHE-088	Maintain the visibility of upstanding Scheduled Monuments/heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments	T***

7.11.3.1 Causality

Many scheduled buildings and heritage assets that are not listed buildings or scheduled monuments can suffer from vegetation encroachment which has both the capacity to degrade the asset and, also impact the visibility of the asset (Forest Research 2023). These actions aim to rectify this by keeping the vegetation under control. Assuming that there is access and that this is not detrimental to the heritage assets, visitors will thus enjoy the assets of historical or cultural interest better as their views will not be obstructed. As a result, the scores are positive but context specific.

7.11.3.2 Co-benefits and Trade-offs

With buildings and heritage assets becoming more visible, the public will be more aware of their presence and importance. This will increase the awareness of cultural heritage as people take walks in rural environment or visit specific sites of cultural value. How the action is undertaken will be crucial for the buy-in of the public and it is recommended that natural or mechanical solutions are employed wherever possible negating the need to use herbicides (Papafotiou *et al*. 2010). There are three possible approaches that would seem appropriate depending on the task required: regular mechanical removal (by machine or manually), grazing with selected livestock (e.g. sheep or goats), or replanting with lower growing vegetation (e.g. grass or short shrubs).

7.11.3.3 Magnitude

Many heritage assets suffer from encroachment by vegetation, so it is a relatively widespread issue.

7.11.3.4 Timescale

Once the action is implemented it will be effective immediately.

7.11.3.5 Spatial Issues

The immediate vicinity of scheduled monuments and heritage assets would be the focus of these actions.

7.11.3.6 Displacement

There may be some impacts on wildlife, and this will need to be minimised.

7.11.3.7 Maintenance and Longevity

On-going maintenance is required, most likely at yearly intervals.

7.11.3.8 Climate Adaptation or Mitigation

Any impact on local hydrology would need to be assessed – for example would the change in vegetation result in excessive drying of the soil (especially with predicted climate change adaptation) potentially impacting the stability of the assets being protected.

7.11.3.9 Climate factors / Constraints

See Climate Adaption or Mitigation above (7.11.3.8)

7.11.3.10 Benefits and Trade-offs to Farmer/Land manager

None were identified.

7.11.3.11 Uptake

Payment for any work that landowners are required to do would be necessary.

7.11.3.12 Other Notes

N/A

7.11.4 Restoring/maintaining high water level

EBHE-084: Restore/ maintain high water levels to protect heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments
EBHE-084-XXX: Restore/ maintain high water levels to protect scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments

Action **EBHE-084** and **EBHE-084-XXX** aim to restore water levels and thus sub-surface water conditions favourable to long term preservation of ancient sites, including scheduled monuments and other heritage assets.

EBHE-084	Restore/ maintain high water levels to protect heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	T***
EBHE-084-XXX	Restore/ maintain high water levels to protect scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	T***

7.11.4.1 Causality

Drainage and other impacts to hydrology has resulted in some scheduled monuments or heritage assets being exposed to less favourable conditions for preservations (López-Bultó & Morera 2022). **EBHE-084** aims to rectify this by restoring and maintaining high water levels across affected sites. In addition, assets which would have been intimately linked with and dependent upon higher water levels (e.g. moats) are mostly dry. **EBHE-084** would seek to restore such assets to how they would have been when in use. Having the intended water level at historical assets such as moats, will greatly increase public awareness of how those cultural assets would have looked in the past. In terms of the benefits for tourism the rating is amber as access might not be appropriate or beneficial.

7.11.4.2 Co-benefits and Trade-offs

Co-benefits from this action would primarily lie in recreating environmental conditions before widespread drainage took place and thus provide an opportunity for increasing habitats dependent on high water levels. Note that many such habitats have been lost.

7.11.4.3 Magnitude

The issue is widespread as many areas have been drained or have suffered altered hydrology as lands have been ‘improved’ for agriculture.

7.11.4.4 Timescale

Once the action is implemented there will be a period of several years before the full benefits become evident.

7.11.4.5 Spatial Issues

In many cases restoring hydrology for particular sites may require much wider modifications and as such will require the involvement of relevant landowners across the landscape. This may result in the action not being workable for some sites.

7.11.4.6 Displacement

Restoring high water level in one area will clearly impact neighbouring areas and will need to be decided and actioned at sub-catchment level. Increasing water level near productive farmland may not be acceptable.

7.11.4.7 Maintenance and Longevity

On-going maintenance would be required to keep the water level at the optimal level, and this would likely need ongoing activities (unless full natural hydrology can be restored in the selected area).

7.11.4.8 Climate Adaptation or Mitigation

Climate change complicates matters as hydrology will be altered by changes in precipitation, longer periods of drought and changes to vegetation as a result of this. In some cases, trying to restore water levels to what in were in the past will simply be a lost cause. Careful analysis and detailed studies will be needed to determine whether actions taken will result in success despite climate change pressures.

7.11.4.9 Climate factors / Constraints

See Climate Adaption or Mitigation above (7.11.4.8)

7.11.4.10 Benefits and Trade-offs to Farmer/Land manager

There are potential negative impacts to agriculture if local hydrology results in wetter fields, but how the farmer responds to this will determine the outcome; e.g. change of land use, crop or of land management may overcome increased water level. Potentially some loss of land for food production.

7.11.4.11 Uptake

If change in hydrology impacts farm businesses, they will likely require financial incentives and/or compensation to allow re-wetting of their land.

7.11.4.12 Other Notes

N/A

7.11.5 Removing eyesores

EBHE-089: Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-296: Remove eyesores from Registered Battlefields
EBHE-306: Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)

EBHE-089	Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	T***
EBHE-296	Remove eyesores from Registered Battlefields	T***
EBHE-306	Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	T***

7.11.5.1 Causality

Eyesores are maybe present on or near sites containing assets of cultural or historical value (see Theme 6) such as scheduled monuments, heritage assets and battlefields. Eyesores detract from the beauty, atmosphere and ambience of the sites. Remove eyesores will heighten visitors' enjoyment of the cultural or historical asset even when viewed from a distance and reinforce the importance of the asset. Improving the presentation of cultural or historical assets will also increase public awareness of cultural heritage. All three actions have a RAG rating of amber T*** as the action is context specific in terms of the tourism benefit as access may not be appropriate or beneficial.

7.11.5.2 Co-benefits and Trade-offs

Removing eyesores will have wider benefits than just at the target site as they will no longer be visible from a landscape perspective too. Whilst removing the eyesores there is an opportunity to explain the action to the public and increase awareness of cultural heritage and how it can be enhanced.

7.11.5.3 Magnitude

Eyesores are widespread and some may be costly to remove. Prioritising types of eyesores or targeting specific cultural asset types will likely be required.

7.11.5.4 Timescale

Once the action is implemented it will be effective immediately

7.11.5.5 Spatial Issues
Very little, nothing additional.

7.11.5.6 Displacement
None

7.11.5.7 Maintenance and Longevity
If regulation is in place to prevent future eyesores, the main action would be to monitor for any changes.

7.11.5.8 Climate Adaptation or Mitigation
N/A

7.11.5.9 Climate factors / Constraints
N/A

7.11.5.10 Benefits and Trade-offs to Farmer/Land manager
It depends if the eyesore was in use or not by the farmers/landowner.

7.11.5.11 Uptake
Landowners may need financial assistance to remove eyesores.

7.11.5.12 Other Notes
N/A

7.11.6 Grass cover maintenance

EBHE-289: Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands under grass cover within woodlands
EBHE-290: Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion with no ground disturbance, bare patches or erosion.
EBHE-292: Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-293: Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-294: Enhance the management and presentation of Registered Battlefields

EBHE-289	Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands under grass cover within woodlands	TL*
EBHE-290	Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion with no ground disturbance, bare patches or erosion.	TL*
EBHE-292	Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	TL*
EBHE-293	Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	TL*
EBHE-294	Enhance the management and presentation of Registered Battlefields	T***

7.11.6.1 Causality

Many scheduled monuments and heritage assets can appear unkempt with either excess vegetation or poorly maintained grass cover showing bare patches and erosion as a result of excessive trampling. Within woodlands, there is the problem of tree and shrub encroachment (Forest Research 2023). Action **EBHE-289** seeks to maintain grass cover at sites of interests within woodland, which will enhance the awareness to asset being present. Establishing and maintaining grass cover will enhance visibility of the asset and raise awareness of the cultural heritage being protected. Better management of battlefield sites to keep vegetation under control and the site with a tidy appearance will also enhance the awareness of cultural heritage at the site (Historic England 2023). Rabbits, and to a lesser extent moles, foxes and badgers, by their burrowing activity can both damage the asset being protected as well as given the site an unkempt appearance. Preventing the presence of burrowing animals would therefore be beneficial to improving site presentation. **EBHE-294** is rated highly as there is a suggestion that access is present and appropriate, but this remains context specific. The other actions are less important from a tourism perspective but could be beneficial in the right context, although there is a lack of evidence to support this. For example, the sites may appear manicured and actually become of less interest to many visitors who might also be visiting for a connection with nature (Visit Scotland 2016). Care should be taken that the actions don't result in overly sanitised versions of how the sites looked previously.

7.11.6.2 Co-benefits and Trade-offs

The key co-benefits from these actions will be raise the apparent prestige of the sites and thus raise awareness of cultural heritage. Vegetation and some encroachment can add character to the sites and even highlight the age of the sites. In addition, the removal of animals from sites would appear to go against the trend for increasing wildlife and encouraging nature.

7.11.6.3 Magnitude

Many sites are not as well maintained as they could so there is substantial scope for improvement.

7.11.6.4 Timescale

Once the action is implemented the benefits, especially in terms of site presentation, will be immediate.

7.11.6.5 Spatial Issues

No additional space required.

7.11.6.6 Displacement

The local impact on wildlife could have some impact in neighbouring areas.

7.11.6.7 Maintenance and Longevity

On-going maintenance would be required on a regular basis (e.g. mowing or grazing).

7.11.6.8 Climate Adaptation or Mitigation

Care will need to be taken to ensure that the species making up the grass cover will cope with predicted future climate change. Grass cover should ideally a broad range of grasses, legumes and forbs.

7.11.6.9 Climate factors / Constraints

Not assessed

7.11.6.10 Benefits and Trade-offs to Farmer/Land manager

This would depend on individual viewpoints as to whether more or less managed sites are appealing.

7.11.6.11 Uptake

Financial incentives may be required especially if there would be a land use change (e.g. from cultivation).

7.11.6.12 Other Notes

N/A

7.11.7 Preventing damage by vehicles and livestock

EBHE-295: Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-297: Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-295 aims to prevent use of vehicles around scheduled monuments and heritage assets. **EBHE-297** aims to minimise vehicle and livestock impacts where scheduled monuments and heritage assets are located on farmland.

EBHE-295	Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	TL*
EBHE-297	Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	TL*

7.11.7.1 .Causality

Vehicles and livestock can negatively impact the condition of belowground scheduled monuments or heritage assets (Historic England 2004). The actions **EBHE-295** and **EBHE-297** aim to remove risks from vehicles and minimise risks form livestock by preventing use of vehicles close to sites being protected and ensure that heavy livestock traffic does not occur in the immediate vicinity of site of heritage value. Less physical disturbance will thus occur. From a tourism perspective both actions might have some benefits, but they are context specific and will not in themselves improve the experience of visitors unless they are specific made aware of the assets and the management.

7.11.7.2 Co-benefits and Trade-offs

Co-benefits from these actions are that landowners will be more aware of the cultural heritage and the need to minimise the disturbance of these assets if they are to remain for future generations. For farmers a potentially negative aspect is that they are less free to choose where to place livestock feeders and water troughs, which are rarely placed randomly (Coimbra *et al*. 2012). In the case these items need to be moved away from say a shaded area, help may be required to assist the farmer in provided shade shelter for livestock. Close coordination with stakeholders will clearly be required, especially for any prescribed changes to how a farmer has organised fields for livestock.

7.11.7.3 Magnitude

Once the action is implemented, results should be seen promptly.

7.11.7.4 Timescale

Once the action is implemented the benefits, especially in terms of site presentation, will be immediate.

7.11.7.5 Spatial Issues

No additional space is required, the actions focus on the areas immediately above and around scheduled monuments or heritage assets.

7.11.7.6 Displacement

None identified.

7.11.7.7 Maintenance and Longevity

The changes will be ongoing, i.e. no reversion to previous practice.

7.11.7.8 Climate Adaptation or Mitigation

N/A

7.11.7.9 Climate factors / Constraints

N/A

7.11.7.10 Benefits and Trade-offs to Farmer/Land manager

For farmers a potentially negative aspect is that they are less free to choose where to place livestock feeders and water troughs, which are rarely placed randomly (Coimbra *et al*. 2012). In the case these items

need to be moved away from say a shaded area, help may be required to assist the farmer in provided shade shelter for livestock.

7.11.7.11 Uptake

At the minimum , close contact with stakeholders will be required and, in some cases, financial assistance may be needed (e.g. moving a field entrance; building a shelter).

7.11.7.12 Other Notes

N/A

7.12 Bundle: Actions for geodiversity

7.12.1 Caves and mines

EBHE-236: Stabilise cave entrances
EBHE-251: Create/ enhance/ maintain access for caves or disused mines

Caves and disused mines are often closed to the public. **EBHE-236** seeks to make cave entrance safe by stabilising them, and **EBHE-251** aims to provide safe access to caves or disused mines.
See further explanation in earlier actions.

EBHE-236	Stabilise cave entrances	**
EBHE-251	Create/ enhance/ maintain access for caves or disused mines	***

7.12.1.1 Causality

Mining is often a forgotten rural activity (Wheeler 2014) but many regions have a long tradition of mining in rural areas going back to the Bronze age (e.g. tin mining in Cornwall, copper mining in Wales, coal mining in Yorkshire and County Durham). Improving access and safety to mines and caves will heighten public awareness of past mining activities, a key aspect of cultural heritage (Tost *et al*. 2021). All actions are rated positively with those most positive being due to the emphasis on access for visitors. There is a potentially a boost in tourism, Cheddar caves and Dan yr Ogof caves for example attract large numbers of visitors).

7.12.1.2 Co-benefits and Trade-offs

7.12.1.3 This action, facilitating access to caves and disused mines, would require a safety first approach, which may limit the number of sites that could benefit from this action. As a result, safety could have represented a major obstacle in terms of both costs and liabilities, especially with regard to mines and caves. Magnitude

Caves and disused mines across Britain could benefit from this action, but this is likely to be very few.

7.12.1.4 Timescale

Once the action is implemented and awareness raised with the public the benefits should be relatively quick.

7.12.1.5 Spatial Issues

No additional space would be required, although to be a viable tourist attraction, there would be a need for car parks and buildings.

7.12.1.6 Displacement

Unlikely that any displacement would occur.

7.12.1.7 Maintenance and Longevity

Maintenance of cave and mine entrances would be required as long as these remain open to the public. Cave Conservation Plans will help establish thresholds

7.12.1.8 Climate Adaptation or Mitigation

7.12.1.9 Caves are very delicate systems and are affected by climate change, e.g. temperature, rainfall, species considerations,Climate factors / Constraints

Climate change impacts on rock/sediment stability and any change to risk of flash flooding would be the critical issues to consider.

7.12.1.10 Benefits and Trade-offs to Farmer/Land manager

Potential increase in tourist numbers would likely be the key effect. However, landowners are not going to permit increased access unless their liability is addressed and hence only managed access by insured groups and individuals is likely to be acceptable.

7.12.1.11 Uptake

N/A

7.12.1.12 Other Notes

N/A

7.12.2 Tidying geodiversity features

EBHE-234: Create/ maintain safety fencing for geodiversity features
EBHE-239: Remove fly tipped rubbish from geodiversity features
EBHE-244: Remove man-made barriers around active geodiversity features
EBHE-250: Remove graffiti on geodiversity features
EBHE-316: Control scrub or trees on top or in front of geodiversity features

These actions aim to create safe and attractive spaces around geodiversity spaces so the features can be appreciated. All five actions together would significantly clean up and enhance the presentation of geodiversity features.

EBHE-234	Create/ maintain safety fencing for geodiversity features	*
EBHE-239	Remove fly tipped rubbish from geodiversity features	***
EBHE-244	Remove man-made barriers around active geodiversity features	*
EBHE-250	Remove graffiti on geodiversity features	***
EBHE-316	Control scrub or trees on top or in front of geodiversity features	***

7.12.2.1 Causality

Geodiversity sites can be marred by the presence of rubbish (Purdy *et al*. 2022) and/or graffiti given the features a less than pleasing feel. Tidying up the geodiversity feature will raise the esteem with which visitors view it and thus also raise awareness of the cultural value of the site as it being looked after. Man-made barriers detract from the feature and their removal would similarly enhance the perceived value of the geodiversity feature.

7.12.2.2 Co-benefits and Trade-offs

Tidying up geodiversity features and removing rubbish could have the positive effect of further flying tipping being less likely to occur. A disbenefit of removing man-made barriers is that the site may become less safe especially for children, so clear signage would need to present.

7.12.2.3 Magnitude

Many sites suffer from fly tipping but unclear how widespread the issue is with regards to sites with notable geodiversity features compared to other sites. Fly tipping is a country-wide issue that gets worse as the economy falters.

7.12.2.4 Timescale

Once the action is implemented the action should be immediate.

7.12.2.5 Spatial Issues

No additional space would be required.

7.12.2.6 Displacement
Unlikely that these actions would lead to any displacement.

7.12.2.7 Maintenance and Longevity
On-going tidying will be needed as fly-tipping, throwing away rubbish and other anti-social vandalism will not cease (unless the site can be protected by CCTV).

7.12.2.8 Climate Adaptation or Mitigation
N/A

7.12.2.9 Climate factors / Constraints
N/A

7.12.2.10 Benefits and Trade-offs to Farmer/Land manager
The landowner will benefit from removal of rubbish from their land.

7.12.2.11 Uptake
Assuming the cost is borne elsewhere, there's unlikely to be any objection form the landowner.

7.12.2.12 Other Notes
N/A

7.12.3 Facilitating collection

EBHE-232: Maintain exposures of vertical or near-vertical faces
EBHE-238: Scrape rock faces
EBHE-240: Re-excavate sections of geodiversity features
EBHE-242: Create/ maintain trenches
EBHE-243: Create casts or moulds of finite geodiversity features
EBHE-246: Protect geodiversity features by protective cover
EBHE-247: Remove scree or spoil
EBHE-249: Create rock piles for sample collection

All of these actions aim to facilitate the collection and appreciation of geodiversity features. For detailed examination of these actions and their examination see Theme 8.

EBHE-232	Maintain exposures of vertical or near-vertical faces	***
EBHE-238	Scrape rock faces	LTD*
EBHE-240	Re-excavate sections of geodiversity features	*
EBHE-242	Create/ maintain trenches	*
EBHE-243	Create casts or moulds of finite geodiversity features	*
EBHE-246	Protect geodiversity features by protective cover	T***
EBHE-247	Remove scree or spoil	*
EBHE-249	Create rock piles for sample collection	*

7.12.3.1 Causality
From a tourism perspective there issome evidence that well-managed geodiversity sites associated with fossil / specimen collection can definitely attract visitors. A good example is the Writhlington geological SSSI in Somerset - a former coal mining spoil tip which is periodically turned over to expose fresh material for

collectors[20]. Maintaining vertical exposures provides the best visual and image of geodiversity features, where appropriate. Vertical exposures are ideal, but not always feasible, especially in 'soft' or easily eroded sediments. Actively scraping rock faces does cause damage and can look intrusive, there is little evidence this is beneficial and will be context specific. There might be disbenefits for biodiversity, but likely to be localised and not significant. Other actions will improve the visitors' experience. At the coast, the best way of maintaining vertical exposures is to resist proposals for sea defences, where this is feasible. Protecting geodiversity with a protective cover may be visually inappropriate and will need to be considered carefully.

7.12.3.2 Co-benefits and Trade-offs

See theme 8, possible trade-offs with biodiversity from actions to expose geodiversity features.

7.12.3.3 Magnitude

See theme 8

7.12.3.4 Timescale

Once the action is implemented should be effective immediately

7.12.3.5 Spatial Issues

N/A

7.12.3.6 Displacement

N/A

7.12.3.7 Maintenance and Longevity

See theme 8

7.12.3.8 Climate Adaptation or Mitigation

N/A

7.12.3.9 Climate factors / Constraints

See theme 8

7.12.3.10 Benefits and Trade-offs to Farmer/Land manager

N/A

7.12.3.11 Uptake

N/A

7.12.3.12 Other Notes

N/A

[20] see https://ukfossils.co.uk/2007/05/31/writhlington/

8 THEME 6: AWARENESS OF CULTURAL HERITAGE

Cultural heritage is defined as those elements, both tangible and intangible (Swensen et al. 2013; de Madariaga 2021), that reflect the culture of a society. Rural cultural heritage (Jeroscenkova *et al*. 2016) reflect heritage tied to the rural environment and countryside, including both the anthropogenic and natural elements (Scazzosi 2018). In particular, rural cultural heritage is associated with buildings, monuments (including archaeological sites), landscapes, and biological manifestations of culture along with intimately linked intangible culture such as traditions and knowledge (Dümcke & Gnedovsky 2013, Eriksson 2018). The interwoven aspect of rural culture heritage with the natural or semi-natural environment (including wildlife, habitats and geology) is key in understanding rural cultural heritage (Aalders & Stanik 2019; Prus *et al*. 2020; Zhang *et al*. 2017). For example, many geodiversity sites have their place in the history of the science, including associations with famous geological pioneers]

Many people will be unaware of the term 'cultural' itself but will be clearly aware of selected elements of cultural heritage (Rocchi *et al*. 2022). For example, historical buildings such as castles, manor houses or water mills will be well known to the public (Shuib & Hashim 2011). Specific landscape features (e.g. dry stone walls and traditional farm buildings (Courtney *et al*. 2007) will also be well known to the public to the extent that such landscapes can define a region (e.g. Yorkshire Dales). Defra et al. (2005) identified five main types of heritage feature found on farmland: archaeological sites, traditional farm buildings, field patterns and field boundaries, ancient trees, and designed landscapes (Boatman et al. 2008). The natural, semi-natural and domesticated biological environment is also an important component of rural cultural heritage. Current landscapes reflect the legacy of past practices (Lindholm & Ekblom 2019, Ferrara et al. 2022) and many areas of High Nature Value farming are sustained by traditional land management practices.

The UK has geographical areas where the cultural heritage of the landscape is protected to a greater extent than outside those areas: World Heritage sites, the National Parks and Areas of Outstanding Natural Beauty (AONB). Within any region, however, local landmarks are often loved by the local community and when in danger from land use change or development can elicit strong feelings, often linked to feelings of belonging or identity (Elbakidze *et al*. 2021; Sardoro *et al*. 2021). The feeling of identity (Mischi 2009) is possibly stronger in rural communities than cities as traditions and ways of life can to some extent be traced back centuries. Research with farmers (Daugstad *et al*. 2006), arguably the glue that binds rural communities together in most rural areas, highlights how strong the feeling of identity can be with regards to the landscape and farming practices and traditions (Ghirardello *et al*. 2022).

A rural landscape reflects past actions of local people and is maintained by current actions. There has been much change to the rural landscape over the past century as populations have grown and migrated to the cities, and agricultural has shifted from local production and consumption to industrial level production and export countrywide and further afield. The post-war transformation of agriculture has resulted in both the intensification and extensification of production in different locations. The processes of intensification are often characterised by active change; that is the deliberate removal of features to increase efficiency and output, while extensification can be characterised by passive change, such as the neglect and abandonment of features resulting in dereliction (Gaskell and Owen 2005). In some areas, particularly the lowlands, a shift from extensive low input agriculture to intensive high input agriculture has transformed the landscape (Holmes *et al*. 2022) with the loss of many traditional features as well as damage to the environment, including both natural and anthropogenic assets such as traditional farm buildings and structures. In the uplands, a mixed pattern of extensification and intensification has taken place, often within the same holding, where some areas area are 'ranched' leading to the functional redundancy and neglect of parts of the farm infrastructure, such as tractional field boundaries, buildings and routeways.

Public awareness of cultural heritage (Malaescu 2022) is increasing as evidence by the wish of many to preserve or conserve natural environments and their wildlife and, also ancient and traditional buildings and features. There are several aspects to achieving these wishes including managing, enhancing, restoring and

creating natural environments or habitats that have been lost or damaged as well as protecting traditional features of the landscape (Spulerová *et al*. 2015) such as farm structures. Theme 6 has three short sections highlighting how public awareness of cultural heritage can be raised by habit creation such as woodlands (specifically traditional orchards, 8.2.1) and by restoration, enhancement and management of woodland (8.4.1), grassland (8.4.2) and boundary features (8.4.3). There are also landscape level actions (Hudecková & Sevcíková 2007) that can be taken that would also increase public awareness of cultural heritage including landscape wide decisions (8.3.1) and, more practically, improved management of invasive plant species (8.3.2) that can, if left untreated, significantly alter an affected site and landscape.

A key issue affecting public awareness of rural cultural heritage is access to the rural environment, or lack thereof. It is very clear that the majority of people in the UK who actively engage with, and spend time in the rural environment are from the more affluent sections of the population and, also do not represent the ethnic diversity of the UK wide population (Burt *et al*. 2013). There are clearly barriers to full participation, which may be linked to access opportunities, rules or regulations, and lack of information or knowledge. Wider participation by the general public with a focus on underrepresented groups is a key government aim.

Section 8.5 focusses on ways creating and enhancing access (Howley *et al*. 2010) and expanding Public Right of Ways (PROW) (Yamamoto *et al*. 2017) and highlights how this will increase public awareness by encouraging visits by segments of the population who may not normally visit rural areas (Personen 2012). One issue observed is that site facilities may be lacking in key areas, this is especially so for visitors with young children (Stewart & Costley 2013) and those who use mobility aids; this is addressed in section 8.5.1. Directly linked to this issue of access for all, including those with mobility aids, is the use and access of PROWs (8.5.2). As more people access the countryside, there will be need to mitigate any negative impacts of access (8.5.3), but if managed right this can also include raising awareness of cultural heritage the need to treat assets with care. Increasing access will also be facilitated by improving path and access infrastructure (8.5.4). Finally, a key aspect of widening access and drawing in more visitors is to widen what activities are permitted and facilitate a much wider range of activities than are currently encouraged (8.5.5). Ultimately, by broadening and increasing the number of visitors to the rural environment, a greater proportion of the public will become aware of what the rural environment has to offer including the cultural heritage of the places they visit.

Section 8.6 focusses on how public awareness of cultural heritage (Markiewicz-Patkowska *et al*. 2016) can be raised by better provision of information and directly interacting with the public during hosted visits and activities. Many people may be reticent to visit the rural environment through lack of familiarity and information on the countryside. Providing better signage and easily accessible information, both on site and on the internet, will greatly help potential visitors overcome any reticence (8.6.1 and 8.6.2). There is also the possibility to facilitate nature-based health and wellbeing interventions in the rural environment (8.6.3). Arranging hosted visits to rural environment, especially at dedicated public access sites would offer the opportunity to directly engage with the public on all aspects of cultural heritage (8.6.6). This engagement could be further enhanced by provided guided walks and led engagement activities (8.6.7). In addition, the facilitation of specific targeted activities suitable for the rural environment, for example geological collecting or geo-caching game, would also be a way of further engaging with potentially hard to reach segments of the population (8.6.4 and 8.6.5).

Possibly the most direct way of increasing public awareness of cultural heritage is to better maintain or restore cultural heritage sites including buildings and archaeological sites (8.7). By enhancing the appearance and visibility of assets of cultural heritage value, the public may both notice the assets more and value them more, assuming they are visible. Many cultural heritage sites (Powell *et al*. 2020) are not maintained as well as they could be, and many historical buildings are in need of restoration (8.7.1). Sites of cultural heritage value are often located on farmland and agricultural activities may damage those assets over time; alternative land management is required to minimise any negative impact from agriculture (8.7.2). Clearing vegetation form cultural heritage sites and thus increasing visibility of the sites will enhance awareness of the value of the site to visitors (8.7.3). In some cases, there is a need to manage the

water level to preserve the site or restore a site to how it would have looked (e.g. moat) which will awareness with the public regarding the importance and past environment of the site (8.7.4). Improving the presentation of sites by removing eyesores and maintaining a well-kept grass cover will enhance the perceived value of the site by visitors (8.7.5 and 8.7.6). Finally, limiting the use of vehicles and livestock above buried sites will highlight the value of the unseen asset, in the sense that it deserves protection (8.7.7).

Finally, there is a short section on specifics geodiversity aspects of cultural heritage including caves, quarries and mines (8.8). Many rural areas have a rich mining and quarrying tradition (Tost *et al*. 2021) going back in some cases millennia. Improving the presentation and safety of mines and caves (8.8.1 and 8.8.2), and facilitating public engagement by provision of collection opportunities (8.8.3) will raise public awareness of the heritage value of these sites.

8.1 Management Bundles

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:

- Habitat creation
  - Habitat creation/woodland (2 actions)
- Systems action
  - Systems action/landscape actions (1 action)
  - Systems action/invasive management (1 action)
- Restoration, management and enhancement
  - Restoration, management and enhancement/woodland (1 action)
  - Restoration, management and enhancement/grassland (3 actions)
  - Restoration, management and enhancement/boundary features (2 actions)
- Create and enhance access and PROW
  - Create and enhance access and PROW/ (16 actions)
- Signposting, information, facilities and events
  - Signposting, information, facilities and events/ (21 actions)
- Maintenance and restoration of cultural heritage sites
  - Maintenance and restoration of cultural heritage sites/ (21 actions)
- Actions for geodiversity
  - Actions for geodiversity/ (6 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

8.2 Bundle: Habitat creation

8.2.1 Woodland

EBHE-209: Create traditional orchards with local varieties of fruit tree; and EBHE-281: Set up or engage with community tree planting projects

Creating traditional orchards with local varieties of fruit trees (**EBHE-209**) taps into local knowledge and culture with the intention to revive past agricultural landscapes. Involving local communities and stakeholders with the tree planting and engaging with community tree planting projects (**EBHE-281**) will facilitate the creation and ongoing stewardship of traditional orchards.

EBHE-209	Create traditional orchards with local varieties of fruit tree	**
EBHE-281	Set up or engage with community tree planting projects	*

8.2.1.1 Causality

Traditional orchards have been lost in great numbers over the past half century (National Trust 2022) with the land being repurposed for more intensive orchards with trees from a limited number of varieties (as found in supermarkets), for other agricultural uses (e.g. cereal production) or lost to urbanisation and development; this has greatly changed the character of the landscape in many areas. The actions to create traditional orchards (**EBHE-209**) facilitated by engagement with local communities (EBHE 281) aims to buck this trend. Traditional orchards play a central role in local cultural landscape and heritage (Spulerová *et al*. 2015). RAG rating for **EBHE-209** is green** and similarly for **EBHE-281** is green*.

8.2.1.2 Co-benefits and Trade-offs

There are the other co-benefits from creating traditional orchards: production of local specialities food and drink, increased biodiversity through open woodland type habitats, possibility of increased carbon storage in orchard soil systems, opportunity to expand silvo-pastural agriculture (e.g. sheep or cattle grazing within the orchards). The action should preferably be undertaken in areas with a history of orchards and with the involvement of local communities and stakeholders. Involvement of local communities to create a sense of co-ownership of the newly created traditional orchards would facilitate success over the long term.

8.2.1.3 Magnitude

It is estimated that 80 to 90 % of traditional orchards have been lost in England and Wales since 1900 with an area of around 80000 hectares lost (National Trust 2022). There is therefore significant scope to re-create traditional orchards where they were locally prevalent.

8.2.1.4 Timescale

From planting, traditional orchards would take 20 to 30 years to mature depending on age of trees used at inception. However, benefits would be seen earlier than that and within a few years for wildlife (e.g. insects) for example.

8.2.1.5 Spatial Issues

The size of a traditional orchard varies but should contain at least 5 trees with their crowns less than 20 m apart (Natural England 2021). Ideally, a larger number of trees of trees would be included in each parcel, but total area can be quite constrained (e.g. less than a hectare).

8.2.1.6 Displacement

No negative impact on neighbouring areas would be envisaged unless the tree planting is close to protected sites.

8.2.1.7 Maintenance and Longevity

On-going maintenance of traditional orchards is required and would involve tree care as well as maintenance of the area between trees either as pasture or alternative use. Longevity would be in the decades assuming the orchard is well cared for and trees are replaced when they become less productive. Enjoyment by the local community would be ongoing.

8.2.1.8 Climate Adaptation or Mitigation

Depending on site, it is likely that there would be a net benefit in terms of net carbon sequestration especially if permanent grass cover is maintained between the trees. From an adaptation point, great care should be taken is selecting tree species or varieties and it might be required that trees are sourced from further south than the planting locality. There is a danger that simply planting varieties that were locally adapted will result in loss of trees as they will not be adapted to the future climate change conditions (increased summer heat and drought especially).

8.2.1.9 Climate factors / Constraints

See Climate Adaption or Mitigation above (8.2.1.8).

8.2.1.10 Benefits and Trade-offs to Farmer/Land manager

The main benefits to the farmer/land manager would be around diversifying income including the selling of the fruits or nuts.

8.2.1.11 Uptake

Farm businesses and communities are more likely to consider orchard planting if financial help is available for the initial costs. This is especially important as there will be delay of several years before income can be generated from the orchard (Barden & Neilsen 2003). For those land managers unfamiliar with orchards and tree care, advice would also be beneficial.

8.2.1.12 Other Notes

N/A

8.3 BUNDLE: SYSTEMS ACTION

8.3.1 Landscape Actions

EBHE-187: Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character

Action **EBHE-187** aims to create a landscape appraisal of the holding to determine how it integrates into the wider landscape. Key characteristics can then be identified that either enhance or detract from the wider landscape; these can then be prioritised for further action when considered at the landscape level. This is important as landscapes are often a mosaic of different land uses and an aim would be to restore some this variability whilst also facilitating interconnections (Aalders & Stanik 2019).

EBHE-187	Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character	*

8.3.1.1 Causality

Traditionally many conservation or preservation efforts of for example cultural heritage were done at site level (Historic England 2022), whereas now there is acknowledgement that the role of landscape as a whole is arguably more important if the aim is to preserve local or regional differences often exhibited through the landscape. **EBHE-187** aims to facilitate this shift to landscape level preservation and conservation by identifying how individual elements fit into the landscape. This will lead to a more joined up way of protecting cultural heritage across the landscape (Ghirardello *et al*. 2022). Action **EBHE-187** has a RAG rating orange L*, where L denoted limited evidence available.

8.3.1.2 Co-benefits and Trade-offs

By taken a landscape wide perspective, not only can the interlinkages between cultural heritage be enhanced but also the interconnection with other aspects of the rural environment including nature and wildlife, farming and rural businesses (Holmes *et al*. 2022). In effect an integrated view emerges where numerous stakeholders can share in the outcome. No specific trade-offs were identified. Community and stakeholder involvement will be central to the quality of the output.

8.3.1.3 Magnitude

This action will be required across all landscapes nationally.

8.3.1.4 Timescale

The action itself should be viewed as starting point for making decisions on practical courses of action to preserve landscape characteristics. As such the end results would not be seen in the short-term.

8.3.1.5 Spatial Issues

N/A - as this is more an information gathering exercise.

8.3.1.6 Displacement

BY undertaking this action in a particular location what impact is there on other areas? These are likely to
N/A

8.3.1.7 Maintenance and Longevity
Regular assessments may be required to monitor whether intentions are being met.

8.3.1.8 Climate Adaptation or Mitigation
Both mitigation opportunities and adaptation needs should be considered when assessing the place of a holding within the landscape.

8.3.1.9 Climate factors / Constraints
N/A

8.3.1.10 Benefits and Trade-offs to Farmer/Land manager
Understanding how their land fits into the wider landscape could be of interest to many.

8.3.1.11 Uptake
There should be no major obstacle in the uptake of this action by most landowners.

8.3.1.12 Other Notes
N/A

8.3.2 Invasive management

EBHE-301: Control invasive plant species by chemical means to help manage archaeological sites

EBHE-301 aims to control invasive plant species and thus help prevent vegetation encroachment at archaeological sites, which affects both long term preservation of the site as well as visitor enjoyment.

EBHE-301	Control invasive plant species by chemical means to help manage archaeological sites	**

8.3.2.1 Causality
Many areas of the UK are impacted by invasive non-native plant species such as Rhododendron (*Rhododendron ponticum)*, Himalayan balsam (*Impatiens glandulifera*) and giant hogweed (*Heracleum mantegazzianum*) (Defra 2022a) and archaeological sites are not immune. Sites can become completely overgrown by these highly competitive species making any observable remains (e.g. earthen banks) invisible (see also 8.7.3 and 8.7.6). This impacts the enjoyment of the public (Sardaro *et al*. 2021) and would decrease awareness of the value of historic or cultural asset in the eyes of visitors. Controlling invasive plants by chemical means is a tested method to overcome the problem (Defra 2022a) but isn't without down sides (i.e. herbicide use). The action has a RAG rating of green**.

8.3.2.2 Co-benefits and Trade-offs
An obvious co-benefit is that invasive species will be removed from areas where this action is carried out and this will have benefits for native wildlife. On the downside of the use of chemicals may not be acceptable to some of the public (Mwebaze *et al*. 2018) when alternatives are available even if more costly. Restoration of native vegetation of a type preferred for the preservation of sites (e.g. grass/forb cover 8.7.6) will need to be carried out subsequent to removal of invasives. Careful consideration will need to be taken as to whether chemical application is the most appropriate solution, the choice of chemical will need careful consideration, unintended impacts on wildlife will need to be mitigated, vegetation restoration will need to be undertaken.

8.3.2.3 Magnitude
Only a proportion of sites will be affected by the issue of invasive plant species.

8.3.2.4 Timescale
Ongoing action may be required over several years before invasive plant species are eradicated from a site.

8.3.2.5 Spatial Issues
The affected site itself along with neighbouring areas. If adjacent areas are not also treated, then the invasive plants will very swiftly return.

8.3.2.6 Displacement
The action will require adjacent areas to also be treated (see Spatial Issues above (8.3.2.5)).

8.3.2.7 Maintenance and Longevity
Ongoing treatment will be required until there is no more evidence of problem species at the site, this will need to be monitored over the medium term to verify that invasives haven't re-appeared.

8.3.2.8 Climate Adaptation or Mitigation
After removal of unwanted vegetation, the soil should not be left bare for long and new vegetation should be established as soon as possible taking into account future climate conditions (e.g. warmer and drier).

8.3.2.9 Climate factors / Constraints
See Climate Adaption or Mitigation above (8.3.2.8).

8.3.2.10 Benefits and Trade-offs to Farmer/Land manager
Removing unwanted invasive plants from their land and from neighbouring land will be of benefit to farmers and landowners.

8.3.2.11 Uptake
Landowners may need financial assistance to carry out the required work.

8.3.2.12 Other Notes
N/A

8.4 Bundle: Restoration, Management and Enhancement

8.4.1 Woodland

EBHE-209: Create traditional orchards with local varieties of fruit tree
Please see section 8.2.1 on woodland habitat creation which covers action **EBHE-209**.

EBHE-209	Create traditional orchards with local varieties of fruit tree	**

8.4.2 Grassland

EBHE-214: Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques; ECAR-035: Reduce stocking density or remove livestock grazing where likely impacts on sensitive habitats and species (aquatic and terrestrial); ETPW-156: Replace grazing of sheep with cattle grazing, particularly on limestone habitats
Action **EBHE-214** aims to recreate the common past landscape feature of hay meadows, which include high biodiversity and floristic content. Hay meadows are steeped in tradition and are the quintessential picture of traditional farming practice in much of the UK. Actions **ECAR-035** and **ETPW-156** are two specific actions which would facilitate **EBHE-214**: reduce or remove grazing pressure or replace sheep with cattle grazing.

Theme 9 (Enhance wildlife) deals with grazing management actions **ECAR-035** and **ETPW-156** in detail. This section will focus on the more general implications of action **EBHE-214** (which encompasses grazing as a traditional technique) for cultural awareness.

EBHE-214	Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques	*
ECAR-035	Reduce stocking density or remove livestock grazing where likely impacts on sensitive habitats and species (aquatic and terrestrial)	*
ETPW-156	Replace grazing of sheep with cattle grazing, particularly on limestone habitats	*

8.4.2.1 Causality

Many hay traditional species rich meadows and grasslands have been lost with the remainder being classified as high conservation priority (Boob *et al*. 2019). Theme 9 discusses the biodiversity aspect in detail, here a landscape viewpoint is taken. Nostalgia for past rural life may not be as big in the UK as for other countries, such as France or Italy, where the link to the countryside remains strong even for a high proportion of city inhabitants (Lombardini 2019). Nonetheless, the awareness by the public of how the countryside has changed is leading to the revival of rural traditions (Holmes *et al*. 2022). Facilitating the revival of traditional grassland and meadow practices (**EBHE-214**) will restore some of the diversity of the traditional landscape and revive traditional management approaches. In turn this will raise the public's awareness of cultural heritage in rural traditions of working and connections to the land (Rocchi *et al*. 2022). The actions have a RAG rating of green*.

8.4.2.2 Co-benefits and Trade-offs

This action will have both strong benefits for biodiversity and revival of rural traditions. In addition, there could be benefits with regard carbon sequestration depending on grassland type (Dai *et al*. 2015). Removing some of the monotony linked to intensive agriculture and reintroducing varied species rich grassland grazed by local varieties of sheep or cattle could also lead to boosts in tourists looking for that 'picture postcard' image of rural Britain (Visit England 2022). There may be some limited trade-offs in terms of farm income, but this is likely to be both short-lived (as a higher price can be obtained for less intensively produced meat) and off-set by payments linked to environment stewardship. Local community and stakeholder involvement is paramount in the success of take up of alternative farming approaches (Piñeiro *et al*. 2020).

8.4.2.3 Magnitude

This is a countrywide issue, but certain areas may be more open to take up, such as those areas which have maintained a tradition of small holdings rather than larger scale farm holdings.

8.4.2.4 Timescale

Recreating traditional floristically diverse grassland takes time and it would take several years before the full restoration is achieved. Benefits will however be seen much quicker with increased diversity of insects for example.

8.4.2.5 Spatial Issues

This action can be done at the field scale, but ideally some awareness of landscape wide integration should be included (see 8.3.1).

8.4.2.6 Displacement

No significant negative displacement is anticipated for this action.

8.4.2.7 Maintenance and Longevity

This action would require ongoing commitment of using traditional methods of grassland management.

8.4.2.8 Climate Adaptation or Mitigation

Establishing diverse permanent grassland could aid in carbon sequestration although the extent of this is grassland type dependent. Diverse grasslands have been shown to be more resilient to external perturbations such as drought and as such species rich grassland will better adapt to climate change than species poor grasslands (Craine *et al*. 2013).

8.4.2.9 Climate factors / Constraints

It is likely that climate change will mean species assemblages will shift with some species disappearing and other species appearing in a particular region (IPCC 2022). It is therefore imperative that the species mix aspired to in diverse grasslands is flexible and not prescriptive. Species that will cope as the climate changes and that will be adapted to the new conditions will be required. In many areas recreating the mix of species common in for example the 1930s or 1950s will simply not be possible.

8.4.2.10 Benefits and Trade-offs to Farmer/Land manager

Some farmers and landowners will derive personal pleasure form a more diverse grassland teeming with wildlife (Staddon *et al*. 2021). Others may view the potential decrease in livestock production as a negative. Increased production of more specialist local food could be a benefit as could the potential for increased tourism opportunities and diversifying of the farm business.

8.4.2.11 Uptake

Financial and technical assistance may be required to maximise uptake.

8.4.2.12 Other Notes

N/A

8.4.3 Boundary features

EBHE-007: Create, restore or manage traditional field boundaries (e.g. dry stone walls, earth banks, stone faced earth banks, Cornish hedges); EBHE-019: Create or maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls

EBHE-007	Create, restore or manage traditional field boundaries (e.g. dry stone walls, earth banks, stone faced earth banks, Cornish hedges)	**
EBHE-019	Create or maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls	**

8.4.3.1 Causality

The rural landscape was until relatively recently marked by boundary features often specific to particular regions thus making the region a particle landscape is found in easily identifiable (e.g. Cotswold stone dry walls). Many boundary features have been lost including those marking field boundaries which gave the landscape more structure (Courtney *et al*. 2007). Much of the public is aware of cultural heritage of such boundaries and will associate particular regions with different types of boundaries (e.g. dry stone walls in the Yorkshire Dales, Cornish hedges in Cornwall) (Powell *et al*. 2018; Jiménez de Madariaga 2021). The loss of boundary markers has significantly affected the character of many landscapes and a restoration of appropriate boundaries is the aim of actions **EBHE-007** and **EBHE-019**. Investing in field and path boundary restoration will raise public awareness of their cultural role in the landscape. Both actions have a RAG rating of green**.

8.4.3.2 Co-benefits and Trade-offs

For some features, especially the living ones (e.g. hedges) a key co-benefit will for wildlife and increase in valuable habitat and food source. The reinstatement of field boundaries where they have been removed will potentially lead to a shift to less intensive agricultural practices or shift to alternative livestock grazing approaches (Daugstad *et al*. 2006). The actions should be undertaken to align with traditions of a particular region and be integrated at the landscape level (see 8.3.1).

8.4.3.3 Magnitude

This is a widespread issue with traditional boundaries being lost throughout Britain.

8.4.3.4 Timescale

The action will take time to achieve, both in terms of labour but also in terms in terms of establishment and maturation for living boundaries.

8.4.3.5 Spatial Issues

Where the current boundary is a fence, electric or otherwise, space will be required to create a more traditional boundary (i.e. wall or hedge). Hedges or earth banks for example may be a metre thick or so.

8.4.3.6 Displacement

No displacement issue identified.

8.4.3.7 Maintenance and Longevity

On-going maintenance will be required but this will vary between features.

8.4.3.8 Climate Adaptation or Mitigation

Hedges can have benefits in terms of carbon sequestration (Biffi *et al*. 2022). All boundary features could have beneficial effects in terms of minimising erosion risk, this is especially so in view of future climate change.

8.4.3.9 Climate factors / Constraints

None *per se*.

8.4.3.10 Benefits and Trade-offs to Farmer/Land manager

The main potential benefits of reinstating traditional boundaries would be erosion mitigation and shelter for livestock (wind break).

8.4.3.11 Uptake

Landowners will likely require financial assistance for the work to be carried out.

8.4.3.12 Other Notes

N/A

8.5 BUNDLE: CREATE AND ENHANCE ACCESS AND PROW

8.5.1 Create access infrastructure and facilities

EBHE-005: Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW); and EBHE-255: Create/ maintain small scale access facilities supporting travel to site via road (e.g. small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)

The action **EBHE-005** and **EBHE-255** aim to create and maintain access facilities in rural areas. Specifically access by road for coaches, cars and bikes including hardstanding and bike shelters. Toilet facilities on-site and local affordable accommodation would also expand access.

EBHE-005	Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW)	***
EBHE-255	Create/ maintain small scale access facilities supporting travel to site via road (e.g. small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)	***

8.5.1.1 Causality

Access to the natural and rural environment can be limited by site provision or route to the site (Burt *et al*. 2013). Older people, women and families with young children may be inhibited by lack of on-site facilities (toilets) (Stewart & Costley 2013). Lack of parking can be a serious issue as often seen in rural areas with key features during holiday periods (e.g. Snowdonia). To broaden areas that can be visited, more remote areas may benefit from the addition of cheap night accommodation nearby (Pina & Delfa 2005). Increasing facility provision and ease of access will increase visitors and potentially broaden visitor type to include those drawn by the cultural values of the rural environment (Dümcke & Gnedovsky 2013). RAG rating is green*** for these actions.

8.5.1.2 Co-benefits and Trade-offs

Co-benefits from this action could mean less congestion at beauty spots and less on-road parking (Butler 2020). However, sites with facilities may get overwhelmed with visitors if sites with facilities are few in the immediate area. Depending on location, more visits may be made by bike which would be beneficial for public health as well as minimising car journeys. Identifying sites for facilities improvement should be carried out at the regional level taking care to space facilities improvement spatially.

8.5.1.3 Magnitude
Many sites in the most popular areas become easily overwhelmed by the number of visitors, so in these areas substantial work may be needed to increase total number of safe parking areas. Many sites currently lack facilities and the key will be to identify where best to invest from a regional perspective.

8.5.1.4 Timescale
Immediate after the work is carried out.

8.5.1.5 Spatial Issues
This depends on the scale of the lack of parking currently.

8.5.1.6 Displacement
The risk of developing fewer, larger facilities could increase road traffic unless there is a reasonable spread at the regional scale. This could also have implications where visitor number is greatly increased from current levels.

8.5.1.7 Maintenance and Longevity
On-going maintenance will be required, in line with public infrastructure elsewhere.

8.5.1.8 Climate Adaptation or Mitigation
Possible increase in visits by car to rural areas could have negative implication for climate change mitigation goals, but this is less of a concern over the longer-term assuming cars will be mostly electric with the electricity originating from renewable generation.

8.5.1.9 Climate factors / Constraints
Facilites should be built with the future climate change in mind.

8.5.1.10 Benefits and Trade-offs to Farmer/Land manager
Potentially more visitors which could impact areas near the facility with grater trampling and disturbance. The local economy could receive a cash boost from greater visitor numbers, especially if local tourist accommodation is expanded.

8.5.1.11 Uptake
Might be more interested if there is a link to existing recreation or tourism linked enterprises.

8.5.1.12 Other Notes
N/A

8.5.2 Rights of way and access

EBHE-006: Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off-road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off-road network or improve public safety
EBHE-042: Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles

EBHE-006 aims to expand rights of way to facilitate the creation of circular routes taken in local points of interest. Where possible, this should also be done whilst facilitating access for mobility aids (**EBHE-042**). Creating a network of right of ways where the need to travel along roads is minimised will enhance access to the countryside in a safe way.

EBHE-006	Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety	**
EBHE-042	Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles	**

8.5.2.1 Causality

Current rights of way were not devised as a joined-up network and as such there can be a lot of gaps when attempting to avoid roads open to motorised traffic (Yamamoto *et al*. 2017). Access to the countryside and specifically off-road circuits may also be limited by mode of transport (car), as there is a lack of public transport allowing easy access to off-road rights of way (Wood *et al*. 2009). Many rights of way are currently not suitable to mobility aids due to elements aimed at stopping the movement of livestock (Ramblers 2023), or simply because the rights of way are overgrown. Enhancing the rights of way network whilst taking in places of cultural interest will make visitors more aware of the cultural aesthetics of the rural landscape (Shuib & Hashim 2011). RAG rating is green**.

8.5.2.2 Co-benefits and Trade-offs

Co-benefits from this action would be opening out rural landmarks or point so interests that otherwise were not on a dedicated right of way. The main trade-offs would be linked to increased visitors to previously unvisited areas, with a potential for more disturbance to wildlife. The action should be taken with a view to link up key features in the landscape and where possible to facilitate also movement of fauna across the landscape. Involvement of local communities and stakeholders where new or improved rights of way are being identified (Defra 2022b) will be crucial to the success of the action.

8.5.2.3 Magnitude

To improve connectivity between rights of way will depend on locality and how close existing rights of way are to one another.

8.5.2.4 Timescale

Once the action is implemented, benefits to users should be immediate.

8.5.2.5 Spatial Issues

Depends on locality.

8.5.2.6 Displacement

The main issue will be new visitors in previously unvisited areas as rights of way are opened; this could have some impact on wildlife and on livestock unless adequate preventative measures are taken (e.g. rules around dogs on lead).

8.5.2.7 Maintenance and Longevity

Similar to current rights of way.

8.5.2.8 Climate Adaptation or Mitigation

N/A

8.5.2.9 Climate factors / Constraints

N/A

8.5.2.10 Benefits and Trade-offs to Farmer/Land manager

Increased visitors and ramblers on farmland could cause disturbance and litter issues unless clear and better enforced rules are in place.

8.5.2.11 Uptake

Landowners will need convincing that opening up new rights of way will not have detrimental impact on livestock or crops. Involvement of local communities and land managers will be crucial to the success of the action.

8.5.2.12 Other Notes

N/A

8.5.3 Mitigate access effects

EBHE-008: Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation

EBHE-015: Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years).

EBHE-008 aims to mitigate the impact of visitors by creating and maintaining infrastructure to hide visitors from wildlife and keep visitors on designated paths. **EBHE-015** aims to create new permissive paths, which may need to include infrastructure to mitigate visitor impact.

EBHE-008	Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation	*
EBHE-015	Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)	*

8.5.3.1 Causality

Access to many rural areas can lead to adverse impacts on the environment (e.g. trampling), wildlife (e.g. disturbance) and farmland (e.g. damage to crops or stress to livestock) (Howley *et al*. 2010). Any new rights of way must take this access into account, and where necessary the landowner will need financial incentive to allow a permissive pathway on their land (CLA 2022). Creating and maintaining infrastructure to minimise disturbance of visitors to the countryside will minimise those concerns around potential negative impacts of visitors. Both actions have a RAG orange L* rating, where L denotes the limited evidence available.

8.5.3.2 Co-benefits and Trade-offs

Some structures to facilitate access to the countryside in a safe way may detract from the surroundings (e.g. boardwalks) if not done sensitively. Similarly high hedges may minimise disturbance to wildlife but they may also affect the enjoyment of the visitor by blocking out much of the natural scenery and landscape. Co-benefits from hedge building, especially if they contain trees include habitat for smaller animals and insects along with the potential for carbon sequestration. Care should be taken when developing this infrastructure not to overly impacts the characteristics of the landscape.

8.5.3.3 Magnitude

Mainly along already existing rights of way but also along any new permissive ways. In some instances, this will include the need to use land adjacent to the pathways, which may not always be possible.

8.5.3.4 Timescale

Once the action is implemented it may take a few years for living infrastructure to be optimal.

8.5.3.5 Spatial Issues

See Magnitude above (8.5.3.3)

8.5.3.6 Displacement

The main impact is likely to be the need for land adjacent to pathways to be taken out of production (e.g. to allow hedge building).

8.5.3.7 Maintenance and Longevity

On-going maintenance is required, and for those non-living structures a need to replace every decade or two must be factored in. The permissive pathways may not all continue past the period of payment (3 years).

8.5.3.8 Climate Adaptation or Mitigation

Hedge planting may be beneficial from both a mitigation (carbon sequestration) and adaptation (minimising soil erosion, shade provision) perspective (Soil Association 2022).

8.5.3.9 Climate factors / Constraints

For hedge planting, care should be taken that the species chosen will adapt well to future climate change.

8.5.3.10 Benefits and Trade-offs to Farmer/Land manager

Hedge or banks may take land out of production but they would also in effect keep the visitors to the paths and in the case of hedges, should help keep dogs with their owners.

8.5.3.11 Uptake

Financial incentives could help with uptake where the landowner is expected to carry out the work.

8.5.3.12 Other Notes

N/A

8.5.4 Expand and improve access

EBHE-020: Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)
EBHE-021: Create public access (on foot, on horse or on bike) to open access land and common land;
EBHE-022: Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users
EBHE-023: Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users
EBHE-026: Dedicate land as access land.

Actions **EBHE-020** and **EBHE-026** aim to increase the area of land that the public can access. Actions **EBHE-021**, **EBHE-022** and **EBHE-023** aim to facilitate access by providing more access or entry points and by providing better path surfaces and pathway widths.

EBHE-020	Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)	**
EBHE-021	Create public access (on foot, on horse or on bike) to open access land and common land	**
EBHE-022	Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users	**
EBHE-023	Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users	**
EBHE-026	Dedicate land as access land	**

8.5.4.1 Causality

On occasions public access land has been lost due to development or other land use change; this should be minimised (**EBHE-20**). Although land may be open access, use of the land is often limited by non-existent or poor access infrastructure. Improving and maintaining access infrastructure (**EBHE-021**; **EBHE-022**; **EBHE-023**) will increase public use of the land. Also making sure access suits all legal users will increase public use of the land (Peak District National Park). Opening up more land for easy public access will enhance public awareness of rural areas including both their natural and human heritage. All the actions discussed in this section have a RAG rating of orange TL**, where L denotes limited evidence, and T that the rating is context dependent.

8.5.4.2 Co-benefits and Trade-offs

The main trade-offs that need to be considered will be linked to increased visitor numbers, although is sufficient access points are created, then visitors should be less constrained in space and therefore impacts

should be less concentrated. Involvement of local stakeholders and communities will be central to the success of the changes.

8.5.4.3 Magnitude
Significant size of the endeavour as it includes all open access and common land.

8.5.4.4 Timescale
Once the action is implemented the impact should be immediate assuming visitors are made aware of the new opportunities.

8.5.4.5 Spatial Issues
Limited additional space is needed, the issue is more about managing access to current open access areas.

8.5.4.6 Displacement
These actions are likely to result in a more even distribution of visitors, thus limiting bottlenecks or concentration of visitors in relatively small areas.

8.5.4.7 Maintenance and Longevity
On-going maintenance is required for paths and access points.

8.5.4.8 Climate Adaptation or Mitigation
Location of pathways and substrate used need to be carefully chosen to not risk increasing erosion – this is especially so in the context of increased droughts and extreme precipitation events predicted with climate change.

8.5.4.9 Climate factors / Constraints
See Climate Adaption or Mitigation above (8.5.4.8).

8.5.4.10 Benefits and Trade-offs to Farmer/Land manager
The benefits to the farmer/land manager would be less concentrated visitor impact. The flip side to this is that areas previously receiving very visitors will experience greater disturbance; dogs off leads being the greatest risk to livestock on open access land.

8.5.4.11 Uptake
Capital payments for any work carried by the landowner would be required.

8.5.4.12 Other Notes
N/A

8.5.5 Increasing access and use

EBHE-256: Create/ maintain small scale access facilities supporting travel to site via horse riding (e.g. hitching points and water for horses)
EBHE-265: Dedicate new Byways Open to all Traffic
EBHE-282: Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)
EBHE-284: Create launch points for recreational activities by such as paddle sports, fishing, wild swimming, for able-bodied and disabled users
EBHE-300: Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)

These wider actions aim to increase access to the rural environment and public use of open access land. **EBHE-256** and **EBHE-265** aim to facilitate access to open access land by different means of transport. **EBHE-282** and **EBHE-284** aim to broaden the scope and activities carried out on open access land including on freshwater. **EBHE-300** aims to open up new land for public use.

EBHE-256	Create/ maintain small scale access facilities supporting travel to site via horse riding (e.g. hitching points and water for horses)	*

EBHE-265	Dedicate new Byways Open to all Traffic	*
EBHE-282	Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)	**
EBHE-284	Create launch points for recreational activities by such as paddle sports, fishing, wild swimming, for able-bodied and disabled users	**
EBHE-300	Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)	*

8.5.5.1 Causality

Open access land and byways often come with a number of restrictions regarding either the type of transport allowed or what activity is allowed (e.g. prohibition of paddling). The benefit of these actions is that many of the restrictions will be removed and many more varied activities (Natural Resources Wales 2021) would be welcome on open access land. This would likely attract a greater cross-section of the UK public (ref) to open access lands. Actions have the following RAG ratings: **EBHE-256** orange T*, **EBHE-265** orange L*, **EBHE-282** orange **, **EBHE-284** orange TL**, and **EBHE-300** orange TL*, where L denotes limited evidence and T denotes the evidence is context dependent.

8.5.5.2 Co-benefits and Trade-offs

A key benefit from this action will be to attract a greater cross section of the UK public including those with disabilities or from differing cultural backgrounds (Natural England 2017), and would thus help democratise access to the rural environment. People with a wider range of interests would be attracted to different aspects of the rural experience including cultural landscape, heritage, monuments, geology, geography (Jeroscenkova *et al*. 2016) as well as the natural environment and wildlife. Trade-offs will need to be carefully considered as many activities (e.g. paddling) can have nefarious impacts on habitats and wildlife. Care would need to be taken to ensure that some areas remain free of activities that cause disturbance to wildlife. Excessive visitor number at particular sites (e.g. historical monument) would need to be managed to avoid damage. Better regulation of visitor behaviour may be required, especially with regards littering and dog nuisance.

8.5.5.3 Magnitude

All open access lands and public byways and rights of way would be considered in these actions, although it may be judicious top limit the actions in the first case to specially selected areas.

8.5.5.4 Timescale

Once the action is implemented, the change would be immediate assuming information has been transmitted to the public.

8.5.5.5 Spatial Issues

No additional open access per se would be required, but there be scope to expand certain open access areas.

8.5.5.6 Displacement

Removing restrictions in some areas but not others could have the undesired effect of shifting visitors to those areas with less restrictions.

8.5.5.7 Maintenance and Longevity

Careful monitoring of the impacts of removing restrictions on visitor behaviour and impacts would be required over the short to medium term.

8.5.5.8 Climate Adaptation or Mitigation

No direct implication for climate change actions, although impacts on natural vegetation and wildlife could be exacerbated by climate change.

8.5.5.9 Climate factors / Constraints

N/A

8.5.5.10 Benefits and Trade-offs to Farmer/Land manager

Benefits and trade-offs depend on how the public responds and whether lifting restrictions leads to an increase in visitor problem behaviour.

8.5.5.11 Uptake

Evidence form pilot studies would be needed to confirm that lifting restrictions did not lead to increase nuisance behaviour or other unintended consequences.

8.5.5.12 Other Notes

N/A

8.6 BUNDLE: SIGNPOSTING, INFORMATION, FACILITIES AND EVENTS

8.6.1 Signposting and information – access focus

EBHE-004: Create/ maintain signage, way markers
EBHE-009: Create/ maintain improved public information signage (safety information , warnings biodiversity and environmental protection etc) above basic information / directions
EBHE-011: Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people
EBHE-012: Provide information on websites, apps and social media informing the public of access opportunities
EHBE-013: Distribute maps of access in and around the area including links to associated access ways

The aims of these actions are to increase information available for visitors so they can make the most out of their visit. **EBHE-004** aims to improve signage and way markers, which will assist visitors in finding their way around the pathways provided; this is followed up by the aim of **EBHE-013** which will provide maps of the area showing key points of access and key features. **EBHE-009** aims to provide additional information about elements found at the site and in the vicinity, this would include aspects of cultural and historical heritage. **EBHE-011** and **EBHE-012** aim to make better use of digital information sharing using websites, apps and social media to provide detailed information about public access opportunities and useful information concerning ease of access.

EBHE-004	Create/ maintain signage, way markers	*
EBHE-009	Create/ maintain improved public information signage (safety information, warnings biodiversity and environmental protection etc) above basic information / directions	**
EBHE-011	Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people with mobility aids	*
EBHE-012	Provide information on websites, apps and social media informing the public of access opportunities	*
EBHE-013	Distribute maps of access in and around the area including links to associated access ways	*

8.6.1.1 Causality

Many visitors to the rural environment have limited information about the site or area before their visit (Cope *et al*. 2000), so the more information that can be provided either on site or beforehand via the internet would be valuable for their enjoyment. Visitors may not always come prepared with planned routes making clear signage, way markers, and the provision of maps very useful. The information provided on signage and maps should cater for a multitude of tastes (Pesonen 2012) and, in particular, should

include information and location of points of cultural or historical interest. Action **EBHE-009** has a RAG rating of green**, all other actions have a RAG rating of green*.

8.6.1.2 Co-benefits and Trade-offs

A key co-benefit of this action is that visitors who may not have considered certain aspects of the rural environment (e.g. cultural heritage) may now do so, especially if they are provided with the sort of things to look out for along with explanations. This would be a clear opportunity to reach out to segments of the population who may not have previously had much exposure to cultural and historic aspects of the rural environment (Mischi 2009). In this case there are no obvious trade-offs in providing additional information. As envisaged through the various actions, a multi-facetted approach to information sharing would work best and likely reach the maximum of people (Bünzli & Eppler 2018).

8.6.1.3 Magnitude

This is applicable across all areas where the public has access to the rural environment including open access areas and rights of way especially.

8.6.1.4 Timescale

Once the action is implemented the benefits to visitors would be immediate.

8.6.1.5 Spatial Issues

No additional space would be required for these actions.

8.6.1.6 Displacement

Unlikely that there would be a displacement of activity unless information is provided more for some areas and less for others.

8.6.1.7 Maintenance and Longevity

Maintenance for signage and way markers would be ongoing, as would information updates to websites and other means of communications.

8.6.1.8 Climate Adaptation or Mitigation

N/A

8.6.1.9 Climate factors / Constraints

N/A

8.6.1.10 Benefits and Trade-offs to Farmer/Land manager

The main benefits to farmers and land managers would be less people wandering away from paths or out of open access areas as they will be provided with the information necessary to avoid entering private land.

8.6.1.11 Uptake

N/A

8.6.1.12 Other Notes

N/A

8.6.2 Signposting and information – information and education

EBHE-037: Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites
EBHE-039: Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour
EBHE-041: Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits

The aim of these three actions is to provide more in-depth information to visitors on all aspects of the site or area including ecological, geological, cultural and heritage. **EBHE-037** focusses on in-situ information backed up with digital information; **EBHE-039** focusses on digital opportunities to broaden the experience of the site visit with additional information; and **EBHE-040** focusses the primarily in-situ information at targeted audiences visiting for specific purposes.

EBHE-037	Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites	***
EBHE-039	Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour	***
EBHE-041	Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits	***

8.6.2.1 Causality

Information needed by visitors to better understand the natural and cultural environment are often lacking; providing background information and explanations to what they can observe in different areas is a useful way of engaging with the public about both the natural and cultural rural environment (Markiewicz-Patkowska *et al*. 2016). This action will increase the awareness of visitors and the public generally for cultural heritage. All three of these actions have a RAG rating of green***.

8.6.2.2 Co-benefits and Trade-offs

A key co-benefit from this action would be for the public to have a greater appreciation of the rural environment including cultural heritage; this is important as there is a strong cultural divide in the UK between urban and rural citizens. Trade-offs from providing this information have not been identified. Similarly to 8.6.1, a multi-facetted approach would be optimal to reach the widest range of the population.

8.6.2.3 Magnitude

This is applicable across all areas where the public has access to the rural environment including open access areas and rights of way especially.

8.6.2.4 Timescale

Once the action is implemented the benefits to visitors would be immediate.

8.6.2.5 Spatial Issues

No additional space is required for the action to be effective.

8.6.2.6 Displacement

Unlikely that there would be a displacement of activity unless information is provided more for some areas and less for others.

8.6.2.7 Maintenance and Longevity

Maintenance for signage and way markers would be ongoing, as would information updates to websites and other means of communications.

8.6.2.8 Climate Adaptation or Mitigation

N/A

8.6.2.9 Climate factors / Constraints

N/A

8.6.2.10 Benefits and Trade-offs to Farmer/Land manager

A greater awareness of cultural heritage may lead to some visitors seeking out locally made products.

8.6.2.11 Uptake

N/A

8.6.2.12 Other Notes

N/A

8.6.3 Nature based interventions

EBHE-040: Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture

This action **EBHE-040** aims to facilitate the delivery of nature based interventions for people with special needs in a rural natural environment. Provision of small scale infrastructure would be required to encourage visits.

EBHE-040	Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture	**

8.6.3.1 Causality

Nature based interventions to help improve the lives of people with health, educational or social needs are receiving greater attention (Wilkie & Davinson 2021). However, the availability of sites where this is facilitated are few. By providing sites with small scale infrastructure suitable for facilitating nature based intervention, this approach can be expanded. Action **EBHE-040** has a RAG rating orange T**, where T denotes the context dependency.

8.6.3.2 Co-benefits and Trade-offs

Co-benefits from this action are that people with specific needs, who might not normally visit rural areas, will do so more. It is also likely to help with their health from a physical activity perspective (Kelly *et al*. 2022). There is the opportunity to engage with these visitors about the wide range of interests seen in rural areas including around cultural heritage. No trade-offs are identified assuming this action is in addition to actions aimed at facilitating visits and improving the experience visitors generally.

8.6.3.3 Magnitude

This action would be targeted at a selection of sites based on their location near cities and or catering for a wide set of potential interests (e.g. wildlife, history, culture, foods).

8.6.3.4 Timescale

Once the action is implemented the benefits would be immediate.

8.6.3.5 Spatial Issues

A small amount of space is required for the action to be effective, primarily space for small scale infrastructure (toilet suitable for mobility aid users; multipurpose room or shelter of some kind).

8.6.3.6 Displacement

If carried out on a small scale at each selected site, there's unlikely to be much displacement.

8.6.3.7 Maintenance and Longevity

On-going maintenance is required to maintain facilities.

8.6.3.8 Climate Adaptation or Mitigation

The design and construction of the facilities should minimise climate change impacts and be adapted to future expected climate change.

8.6.3.9 Climate factors / Constraints

N/A

8.6.3.10 Benefits and Trade-offs to Farmer/Land manager

N/A

8.6.3.11 Uptake
N/A

8.6.3.12 Other Notes
N/A

8.6.4 Geological collection opportunities

EBHE-051: Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities

Action **EBHE-051** aims to provide collection opportunities for those interested in geology, to facilitate their enjoyment of their visit, but also to minimise unwanted disturbance that could be caused by searching for items in other areas.

EBHE-051	Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities	**

8.6.4.1 Causality
For people interested in geology and specifically rocks and fossils collecting, opportunities to pursue their interest is not always clear. By providing dedicated sites for geological collection opportunities (Clary 2020), visitors interested in this will have greater enjoyment of their visit and it could also attract interest from people who may not have considered geological aspects of the site. Action a RAG rating of orange T**, where T denotes context dependency.

8.6.4.2 Co-benefits and Trade-offs
The co-benefits from this action is to broaden the public awareness of different facets of the rural environment, including for example past human activities related to mining for particular rocks or minerals. There is an opportunity here to link the activity to cultural heritage of the area (Scazzosi 2018). Adding information notice boards or interactive exhibits could further engage the public. Care would need to be taken that the areas provided for geological collection do not expand with visitor number and encroach on nearby areas preserved for alternative characteristics (e.g. habitats).

8.6.4.3 Magnitude
The issue is widespread with regard to current areas where there is public access in rural areas, very few have dedicated areas where rock and fossil collection is encouraged.

8.6.4.4 Timescale
Once the action is implemented the benefits would be immediate.

8.6.4.5 Spatial Issues
Small areas within larger areas of public access would be required to be transformed into opportunities for rock and fossil collection. Some excavation might be required to remove surface soil layers and expose rocks and deposits of interest. Areas would also need to be made safe (e.g. stabilise rock faces where necessary present).

8.6.4.6 Displacement
By providing dedicated sites for rock and fossil collection, other areas should see less disturbance for this activity. A risk is the dedicated sites face expansion and movement of visitors to the periphery and out of the dedicated area in search of items to add to their collection. Measures should be taken to prevent this occurring.

8.6.4.7 Maintenance and Longevity
On-going maintenance is required to ensure the safety of the site and that surrounding areas are not being negatively impacted by activity spread.

8.6.4.8 Climate Adaptation or Mitigation

Care should be taken in locating the dedicated sites especially with regarding to erosion and (flash) flooding risk.

8.6.4.9 Climate factors / Constraints

N/A

8.6.4.10 Benefits and Trade-offs to Farmer/Land manager

N/A

8.6.4.11 Uptake

This would depend on the land owner and their key focus.

8.6.4.12 Other Notes

N/A

8.6.5 Geo-caching

EBHE-054: Create places for geo-caching
EBHE-057: Maintain places for geo-caching

Geo-caching is a relatively new activity where people, including young children, use GPS systems or a mobile phone to hide and find objects. The actions **EBHE-054** and **EBHE-057** aim to facilitate this activity by providing safe and defined areas in which to carry out this activity.

EBHE-054	Create places for geo-caching	**
EBHE-057	Maintain places for geo-caching	**

8.6.5.1 Causality

Geo-caching (Neustaedter *et al*. 2013) is unknown to many but would be an opportunity to engage with younger people and increase their interaction with the rural environment. Dedicating areas for geo-caching and advertising this would attract new visitors, including those with young children (Jones 2012). There would be an opportunity to inform and engage with a new set of visitors with regards different aspects of the rural landscape including historic buildings and remains, landscape features and cultural heritage. Both actions have a RAG rating of orange TD**, where T denotes context dependency and D denotes some possible disbenefits.

8.6.5.2 Co-benefits and Trade-offs

The main co-benefits from this action is the potential increase and broadening of type of people engaging with the rural environment. The main trade-off would relate to the size of the increase in visitor to particular sites and this would therefore need to be monitored. Linking in with online geocaching websites would be crucial to achieve maximum success.

8.6.5.3 Magnitude

This action is rather about an encouraging alternate activity in the rural environment, so would be implemented widely.

8.6.5.4 Timescale

Once the action is implemented the increase in geocaching activities in areas targeted is likely to be immediate.

8.6.5.5 Spatial Issues

Space required would depend on aims and target audience (e.g. children or young adults).

8.6.5.6 Displacement

Areas selected for geo-caching may see substantial increase in human disturbance impacting wildlife. Similarly geo-caching in close proximity to historical monuments may be best avoided.

8.6.5.7 Maintenance and Longevity

Limited maintenance is required, although this would depend on the vegetation and how clear this is required to be kept for geo-caching purposes.

8.6.5.8 Climate Adaptation or Mitigation
N/A

8.6.5.9 Climate factors / Constraints
N/A

8.6.5.10 Benefits and Trade-offs to Farmer/Land manager
Increased visitors could lead to opportunity in selling locally produced foods.

8.6.5.11 Uptake
Probably less suited to agricultural lands but other land owners or managers would likely see limited risks with this action.

8.6.5.12 Other Notes
N/A

8.6.6 Hosting visits

EBHE-060: Host school visits including forest schools and beach schools
EBHE-061: Host care farming visits; EBHE-062: Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities
EBHE-063: Host open days on farms, woodlands and country parks
EHBE-064: Host nature reserve visits

The actions **EBHE-060**, **EBHE-061**, **EBHE-062**, **EBHE-063** and **EBHE-064** all aim to enhance public awareness and interest in the rural environment by hosting visits or open days in woodlands, on beaches, on farms, in country parks and at nature reserves. **EBHE-062** specifically focusses on visitors with special needs.

EBHE-060	Host school visits including forest schools and beach schools	*
EBHE-061	Host care farming visits	*
EBHE-062	Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities	*
EBHE-063	Host open days on farms, woodlands and country parks	*
EBHE-064	Host nature reserve visits	*

8.6.6.1 Causality
People who don't normally visit rural areas or who wish to learn more about the rural environment have limited opportunities to do so (DGCMS 2021). Hosting visits to the rural environment would be an opportunity to engage with segments of the populations not always catered for. Hosting visits would engage the public on various aspects of the rural environment including historical and cultural heritage (Stolare *et al*. 2021) of the localities in question. All these actions have a RAG rating of orange TL*, where L denotes limited evidence and T denotes context dependency.

8.6.6.2 Co-benefits and Trade-offs
The key co-benefits from these actions would be to demonstrate the many facets of the rural environment and how they link together. Cultural heritage could be used as a thread to bind the various elements together (Hudecková & Sevcíková 2007). During visits, the public must be encouraged to ask questions and discuss answers.

8.6.6.3 Magnitude
Public understanding of rural issues and the rural environment is often limited. Engaging with the public at sites across the country would be highly beneficial in increasing awareness of what rural areas have to offer.

8.6.6.4 Timescale
Once the action is implemented impact would be immediate.

8.6.6.5 Spatial Issues
No additional space would be required, but sites with some infrastructure present would be beneficial (toilets and shelter).

8.6.6.6 Displacement
N/A

8.6.6.7 Maintenance and Longevity
Depending on engagement form the public, these activities could be ongoing, but need not be overly frequent and would depend on host availability and resources.

8.6.6.8 Climate Adaptation or Mitigation
These actions would be an opportunity to include engagement around how climate change could impact the local landscape and rural environment.

8.6.6.9 Climate factors / Constraints
N/A

8.6.6.10 Benefits and Trade-offs to Farmer/Land manager
Could be an opportunity for farmers to show the public their care for the environment.

8.6.6.11 Uptake
Farmers and other hosts will need some financial assistance to facilitate the hosting and the visit relaxed (e.g. drinks and biscuits).

8.6.6.12 Other Notes
N/A

8.6.7 Guided walks and engagement activities

EBHE-065: Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity
EBHE-066: Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity
EBHE-069: Provide guided geodiversity walks; EBHE-071: Provide fossil, mineral and rock hunting and collecting open events and days

In addition to hosting visits (see 8.6.6), the actions **EBHE-065** and **ENHE-069** aim to provided guided walks and activities, action **EBHE-066** aims to provide interactive engagement activities on a wide range of topics and geological, and **EBHE-071** aims to stimulate interest in geology with open events.

EBHE-065	Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity	*
EBHE-066	Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity	***
EBHE-069	Provide guided geodiversity walks	***
EBHE-071	Provide fossil, mineral and rock hunting and collecting open events and days	**

8.6.7.1 Causality
To increase public engagement with the rural environment especially from those less likely to visit, activities that facilitate the participation in rural based activities are provided. These activities should broaden the population segments who visit rural areas. Many visitors to rural areas may do so for wildlife or landscape reasons (Visit Scotland 2016), by providing interactive engagement activities (**EBHE-066**)

focussed on other aspects of the rural environment, a greater awareness of rural life and cultural heritage can be installed (Malaescu 2022). In particular, elements linked to human activities (cultural heritage, land management) may often be overlooked by visitors interested in wildlife. Similarly, engagement around geology would increase awareness and possibly interest in this underlying aspect of landscapes. The actions have the following RAG ratings: **EBHE-065** green*; **EBHE-066** green***; **EBHE-069** orange***; **EBHE-071** orange TD**, where T denotes context dependency and D denotes some possible disbenefits.

8.6.7.2 Co-benefits and Trade-offs

A key co-benefit from this action would be with regard physical health if more people spend time walking or doing other activities in the countryside. A key trade-off that would need addressing is linked to collection of rocks or fossils – it is imperative that any risk of excessive collecting or damage whilst digging is minimised (Scottish Geodiversity Forum 2022). A key element to consider is the size of the group (Corrégé & Michinov 2021) which undertakes a particular activity and to keep the group small enough to maintain good social interactions between group members.

8.6.7.3 Magnitude

See 8.6.6.3.

8.6.7.4 Timescale

Once the action is implemented benefits would be immediate assuming successful advertising and good response from the public.

8.6.7.5 Spatial Issues

No additional space is required.

8.6.7.6 Displacement

No displacement risk for these activities was identified.

8.6.7.7 Maintenance and Longevity

Activities could be provided for as long as there is interest from the public.

8.6.7.8 Climate Adaptation or Mitigation

Ideas and concepts around climate change adaptation and mitigation could be introduced during the guided activities.

8.6.7.9 Climate factors / Constraints

N/A

8.6.7.10 Benefits and Trade-offs to Farmer/Land manager

N/A

8.6.7.11 Uptake

N/A

8.6.7.12 Other Notes

N/A

8.7 Bundle: Maintenance and restoration of cultural heritage sites

8.7.1 Maintenance and restoration

EBHE-077: Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)
EBHE-298: Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-299: Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-305: Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)

Actions **EBHE-077** aims to maintain a weatherproof condition on historical listed assets; **EBHE-298** aims to carry out conservation or consolidation on historical assets on the SHINE database; **EBHE-299** aims to carry out drainage works on historical assets on the SHINE database; **EBHE-305** aims to carry out restoration work on selected listed buildings.

EBHE-077	Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***
EBHE-298	Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-299	Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-305	Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***

8.7.1.1 Causality

Many listed buildings and buildings on the SHINE database (Powell *et al*. 2020) are not in good condition and require attention if they are to be preserved for future enjoyment. These four actions are aimed at maintaining, improving or restoring the condition of building of historical or cultural interest. Enhancing the condition and appearance of these buildings will add value to the cultural heritage of the landscape (Gaskell *et al*. 2014, Powell *et al*. 2019a & b). All four of these actions have a RAG rating of green***.

8.7.1.2 Co-benefits and Trade-offs

Co-benefits from these actions could result in a proportion of the buildings being able to attract visitor fees, or some buildings being sensitively converted into other uses (e.g. for tourists) (Rossitti *et al.* 2021). Careful consideration should be made with wildlife needs in the vicinity of historic or cultural buildings (e.g. drainage). Any change of use or upgrade to allow use for alternate purposes would need to be done in a way not to detract from the historic or cultural value of the building.

8.7.1.3 Magnitude

Historic buildings across the country tend to be in poor condition in many cases, resulting in the task at hand being financially significant.

8.7.1.4 Timescale

Once the action is implemented the benefits should be immediate in terms of stopping further degradation of buildings and also attracting more visitors.

8.7.1.5 Spatial Issues

No additional space would be required.

8.7.1.6 Displacement

Limited risk of displacement issues.

8.7.1.7 Maintenance and Longevity

On-going maintenance is required as for any building if the aim is to stop any degradation in the appearance of the buildings.

8.7.1.8 Climate Adaptation or Mitigation

Future climate impacts may need to be considered for some buildings especially those in flood prone areas.

8.7.1.9 Climate factors / Constraints
See Climate Adaption or Mitigation above (8.7.1.8).

8.7.1.10 Benefits and Trade-offs to Farmer/Land manager
The owner may be able to re-purpose the building for alternative use including income generation, if done sensitively.

8.7.1.11 Uptake
Owners of buildings which require rectification works to be carried are likely to require financial assistance.

8.7.1.12 Other Notes
N/A

8.7.2 Protection from cultivation impacts

EBHE-079: Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation
EBHE-081: Minimise cultivation on Scheduled Monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments
EBHE-287: Do not harrow or roll Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EHBE-288: Do not plough, sub-soil, cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-079	Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation	***
EBHE-081	Minimise cultivation on Scheduled Monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	***
EBHE-287	Do not harrow or roll Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-288	Do not plough, sub-soil, cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

8.7.2.1 Causality
Agriculture and especially soil disturbance has had significant negative impact on scheduled monuments and heritage assets over the years. Cultivation and linked activities disturb the soil and can directly damage the asset of interest (Trow 2010). The actions **EBHE-079**, **EBHE-081**, **EBHE-287** and **EBHE-288** prohibit or minimise certain agricultural activities thus removing or minimising the risk of damage to the assets being protected. All four actions have a RAG rating of green***, actions best where accompanied by information.

8.7.2.2 Co-benefits and Trade-offs
One co-benefit from this action is with regard to the soil itself, which is likely to benefit in terms of biological diversity and soil health (Staddon *et al*. 2022) as soil disturbance is minimised. This has potential benefits for increased soil C sequestration (Kämpf *et al*. 2016). Careful consideration will need to be made to help the farmer adjust to the new requirements and financial assistance may be required (e.g. for change of equipment to direct drill).

8.7.2.3 Magnitude
Any site with a scheduled monument or heritage asset could be affected by these actions, making these actions relatively widespread if confined in area.

8.7.2.4 Timescale

Once the action is implemented, damage caused by the targeted agricultural activities should cease promptly.

8.7.2.5 Spatial Issues
The space required would roughly match the footprint of sites covering scheduled monuments or heritage assets.

8.7.2.6 Displacement
No negative impacts anticipated and there could be some positive impacts with regard to less erosion and thus less sediment entering freshwater courses.

8.7.2.7 Maintenance and Longevity
This change in how the land is managed would be long-term.

8.7.2.8 Climate Adaptation or Mitigation
Potential mitigation benefits if the land managed with minimal disturbance can sequester additional carbon. Also, from an adaptation point of view, less susceptibility of the sites to water erosion would be a benefit.

8.7.2.9 Climate factors / Constraints
N/A

8.7.2.10 Benefits and Trade-offs to Farmer/Land manager
Farmer would likely need assistance to transition to the new rules on the management of land under these actions, otherwise there is likely to loss of income in the short term.

8.7.2.11 Uptake
Financial assistance to farmers would likely be required.

8.7.2.12 Other Notes
N/A

8.7.3 Clearing and visibility

EBHE-083: Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EHBE-088: Maintain the visibility of upstanding Scheduled Monuments/ heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments

The aim of actions **EBHE-083** and **EBHE-088** is to keep vegetation trimmed and maintain visibility of scheduled monuments and heritage assets.

EBHE-083	Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-088	Maintain the visibility of upstanding Scheduled Monuments/ heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

8.7.3.1 Causality
Many scheduled buildings and heritage assets that are not listed buildings or scheduled monuments can suffer from vegetation encroachment which has both the capacity to degrade the asset and, also impact the visibility of the asset (Forest Research 2023). These actions aim to rectify this by keeping the vegetation under control. Visitors will thus enjoy the assets of historical or cultural interest better as their views will not be obstructed.

8.7.3.2 Co-benefits and Trade-offs

With buildings and heritage assets becoming more visible, the public will be more aware of their presence and importance. This will increase the awareness of cultural heritage as people take walks in rural environment or visit specific sites of cultural value. How the action is undertaken will be crucial for the buy-in of the public and it is recommended that natural or mechanical solutions are employed wherever possible negating the need to use herbicides (Papafotiou *et al*. 2010). There are three possible approaches that would seem appropriate depending on the task required: regular mechanical removal (by machine or manually), grazing with selected livestock (e.g. sheep or goats), or replanting with lower growing vegetation (e.g. grass or short shrubs).

8.7.3.3 Magnitude

Many heritage assets suffer from encroachment by vegetation so it is a relatively widespread issue.

8.7.3.4 Timescale

Once the action is implemented it will be effective immediately.

8.7.3.5 Spatial Issues

The immediate vicinity of scheduled monuments and heritage assets would be the focus of these actions.

8.7.3.6 Displacement

There may be some impacts on wildlife, and this will need to be minimised.

8.7.3.7 Maintenance and Longevity

On-going maintenance is required, most likely at yearly intervals.

8.7.3.8 Climate Adaptation or Mitigation

Any impact on local hydrology would need to be assessed – for example would the change in vegetation result in excessive drying of the soil (especially with predicted climate change adaptation) potentially impacting the stability of the assets being protected.

8.7.3.9 Climate factors / Constraints

See Climate Adaption or Mitigation above (8.7.3.8).

8.7.3.10 Benefits and Trade-offs to Farmer/Land manager

None were identified.

8.7.3.11 Uptake

Payment for any work that landowners are required to do would be necessary.

8.7.3.12 Other Notes

N/A

8.7.4 Restoring/maintaining high water level

EBHE-084: Restore/maintain high water levels to protect scheduled monuments and heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

Action **EBHE-084** aims to restore water levels and thus sub-surface water conditions favourable to long term preservation of ancient sites, including scheduled monuments and other heritage assets.

EBHE-084	Restore/maintain high water levels to protect scheduled monuments and heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

8.7.4.1 Causality

Drainage and other impacts to hydrology has resulted in some scheduled monuments or heritage assets being exposed to less favourable conditions for preservations (López-Bultó & Morera 2022). **EBHE-084** aims to rectify this by restoring and maintaining high water levels across affected sites. In addition, assets which would have been intimately linked with and dependent upon higher water levels (e.g. moats) are mostly

dry. **EBHE-084** would seek to restore such assets to how they would have been when in use. Having the intended water level at historical assets such as moats, will greatly increase public awareness of how those cultural assets would have looked in the past. Action **EBHE-084** has a RAG rating of green***.

8.7.4.2 Co-benefits and Trade-offs

Co-benefits from this action would primarily lie in recreating environmental conditions before widespread drainage took place and thus provide an opportunity for increasing habitats dependent on high water levels. Note that many such habitats have been lost.

8.7.4.3 Magnitude

The issue is widespread as many areas have been drained or have suffered altered hydrology as lands have been 'improved' for agriculture.

8.7.4.4 Timescale

Once the action is implemented there will be a period of several years before the full benefits become evident.

8.7.4.5 Spatial Issues

In many cases restoring hydrology for particular sites may require much wider modifications and as such will require the involvement of relevant landowners across the landscape. This may result in the action not being workable for some sites.

8.7.4.6 Displacement

Restoring high water level in one area will clearly impact neighbouring areas and will need to be decided and actioned at sub-catchment level. Increasing water level near productive farmland may not be acceptable.

8.7.4.7 Maintenance and Longevity

On-going maintenance would be required to keep the water level at the optimal level, and this would likely need ongoing activities (unless full natural hydrology can be restored in the selected area).

8.7.4.8 Climate Adaptation or Mitigation

Climate change complicates matters as hydrology will be altered by changes in precipitation, longer periods of drought and changes to vegetation as a result of this. In some cases, trying to restore water levels to what in were in the past will simply be a lost cause. Careful analysis will be needed to determine whether actions taken will result in success despite climate change pressures.

8.7.4.9 Climate factors / Constraints

See Climate Adaption or Mitigation above (8.7.4.8).

8.7.4.10 Benefits and Trade-offs to Farmer/Land manager

There are potential negative impacts to agriculture if local hydrology results in wetter fields, but how the farmer responds to this will determine the outcome; e.g. change of land use, of crop or of land management may overcome increased water level.

8.7.4.11 Uptake

If change in hydrology impacts farm businesses, they will likely require financial incentives and/or compensation to allow re-wetting of their land.

8.7.4.12 Other Notes

N/A

8.7.5 Removing eyesores

EBHE-089: Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-306: Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in

active use)
EBHE-296: Remove eyesores from Registered Battlefields

Actions **EBHE-089**, **EBHE-306**, and **EBHE-296** aim to remove eyesores from scheduled monuments, heritage assets and registered battlefields.

EBHE-089	Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-306	Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***
EBHE-296	Remove eyesores from Registered Battlefields	***

8.7.5.1 Causality
Eyesores are maybe present on or near sites containing assets of cultural or historical value such as scheduled monuments, heritage assets and battlefields. Eyesores detract from the beauty, atmosphere and ambience of the sites. Remove eyesores will heighten visitors' enjoyment of the cultural or historical asset and reinforce the importance of the asset. Improving the presentation of cultural or historical assets will also increase public awareness of cultural heritage. All three actions have a RAG rating of green***.

8.7.5.2 Co-benefits and Trade-offs
Removing eyesores will have wider benefits than just at the target site as they will no longer be visible from a landscape perspective too. Whilst removing the eyesores there is an opportunity to explain the action to the public and increase awareness of cultural heritage and how it can be enhanced.

8.7.5.3 Magnitude
Eyesores are widespread and some may be costly to remove. Prioritising types of eyesores or targeting specific cultural asset types will likely be required.

8.7.5.4 Timescale
Once the action is implemented the benefits should be immediate.

8.7.5.5 Spatial Issues
No additional space is required.

8.7.5.6 Displacement
No displacement risk is identified.

8.7.5.7 Maintenance and Longevity
If regulation is in place to prevent future eyesores, the main action would be to monitor for any changes.

8.7.5.8 Climate Adaptation or Mitigation
N/A

8.7.5.9 Climate factors / Constraints
N/A

8.7.5.10 Benefits and Trade-offs to Farmer/Land manager
N/A

8.7.5.11 Uptake
Landowners may need financial assistance to remove eyesores.

8.7.5.12 Other Notes
N/A

8.7.6 Grass cover maintenance

EBHE-289: Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands
EBHE-290: Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion
EHBE-292: Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EHBE-293: Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EHBE-294: Enhance the management and presentation of Registered Battlefields

Actions **EBHE-289** and **EBHE-290** aim to maintain or establish grass or herbaceous cover at scheduled monument or heritage assets sites. **EBHE-293** aims to manage permanent grassland at scheduled monuments or heritage assets sites. **EBHE-294** aims to improve the presentation of battlefield sites. **EBHE-292** aims to exclude burrowing animals from scheduled monuments and heritage assets.

EBHE-289	Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands	***
EBHE-290	Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion	***
EBHE-292	Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-293	Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-294	Enhance the management and presentation of Registered Battlefields	***

8.7.6.1 Causality

Many scheduled monuments and heritage assets can appear unkempt with either excess vegetation or poorly maintained grass cover showing bare patches and erosion as a result of excessive trampling. Within woodlands, there is the problem of tree and shrub encroachment (Forest Research 2023). Action **EBHE-289** seeks to maintain grass cover at sites of interests within woodland, which will enhance the awareness to asset being present. Establishing and maintaining grass cover will enhance visibility of the asset and raise awareness of the cultural heritage being protected. Better management of battlefield sites to keep vegetation under control and the site with a tidy appearance will also enhance the awareness of cultural heritage at the site (Historic England 2023). Rabbits, and to a lesser extent moles, foxes and badgers, by their burrowing activity can both damage the asset being protected as well as given the site an unkempt appearance. Preventing the presence of burrowing animals would therefore be beneficial to improving site presentation. All five actions have a RAG rating of green***.

8.7.6.2 Co-benefits and Trade-offs

The key co-benefits from these actions will be raise the apparent prestige of the sites and thus raise awareness of cultural heritage. A trade-off is that the sites may appear manicured and actually become of less interest to many visitors who might also be visiting for a connection with nature (Visit Scotland 2016) – this issue will need careful consideration. Care should be taken that the actions don't result in overly sanitised versions of how the sites looked previously. Vegetation and some encroachment can add character to the sites and even highlight the age of the sites. In addition, the removal of animals from sites would appear to go against the trend for increasing wildlife and encouraging nature.

8.7.6.3 Magnitude

Many sites are not as well maintained as they could so there is substantial scope for improvement.

8.7.6.4 Timescale
Once the action is implemented the benefits, especially in terms of site presentation, will be immediate.

8.7.6.5 Spatial Issues
No additional space would be required.

8.7.6.6 Displacement
The local impact on wildlife could have some impact in neighbouring areas.

8.7.6.7 Maintenance and Longevity
On-going maintenance would be required on a regular basis (e.g. mowing or grazing).

8.7.6.8 Climate Adaptation or Mitigation
Encouraging permanent cover such as grassland could lead to carbon sequestration.

8.7.6.9 Climate factors / Constraints
Care will need to be taken to ensure that the species making up the grass cover will cope with predicted future climate change. Grass cover should ideally a broad range of grasses, legumes and forbs.

8.7.6.10 Benefits and Trade-offs to Farmer/Land manager
This would depend on individual viewpoints as to whether more or less managed sites are appealing.

8.7.6.11 Uptake
Financial incentives may be required especially if there would be a land use change (e.g. from cultivation).

8.7.6.12 Other Notes
N/A

8.7.7 Preventing damage by vehicles and livestock

EBHE-295: Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-297: Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-295 aims to prevent use of vehicles around scheduled monuments and heritage assets. **EBHE-297** aims to minimise vehicle and livestock impacts where scheduled monuments and heritage assets are located on farmland.

EBHE-295	Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-297	Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

8.7.7.1 Causality
Vehicles and livestock can negatively impact the condition of belowground scheduled monuments or heritage assets (Historic England 2004). The actions **EBHE-295** and **EBHE-297** aim to remove risks from vehicles and minimise risks form livestock by preventing use of vehicles close to sites being protected and ensure that heavy livestock traffic does not occur in the immediate vicinity of site of heritage value. Less physical disturbance will thus occur. Both actions have a RAG rating of green***.

8.7.7.2 Co-benefits and Trade-offs
Co-benefits from these actions are that visitors and landowners will be more greatly aware of the cultural heritage and the need to minimise the disturbance of these assets if they are to remain for future generations. For farmers a potentially negative aspect is that they are less free to choose where to place

livestock feeders and water troughs, which are rarely placed randomly (Coimbra *et al*. 2012). In the case these items need to be moved away from say a shaded area, help may be required to assist the farmer in provided shade shelter for livestock. Close coordination with stakeholders will clearly be required, especially for any prescribed changes to how a farmer has organised fields for livestock.

8.7.7.3 Magnitude
Many sites are located on farmland, resulting in potentially a significant number of farmers needing to be agreeable to changes to the organisation of their livestock fields.

8.7.7.4 Timescale
Once the action is implemented, results should be seen promptly.

8.7.7.5 Spatial Issues
No additional space is required, the actions focus on the areas immediately above and around scheduled monuments or heritage assets.

8.7.7.6 Displacement
None identified.

8.7.7.7 Maintenance and Longevity
The changes will be ongoing, i.e. no reversion to previous practice.

8.7.7.8 Climate Adaptation or Mitigation
N/A

8.7.7.9 Climate factors / Constraints
N/A

8.7.7.10 Benefits and Trade-offs to Farmer/Land manager
See 8.7.7.2 above

8.7.7.11 Uptake
At the minimal close contact with stakeholders will be required, in some cases, financial assistance may be required (e.g. moving a field entrance; building a shelter).

8.7.7.12 Other Notes
N/A

8.8 Bundle: Actions for Geodiversity

8.8.1 Caves and mines

EBHE-236: Stabilise cave entrances
EBHE-251: Create/ enhance/ maintain access for caves or disused mines

Caves and disused mines are often closed to the public. Action **EBHE-236** seeks to make cave entrance safe by stabilising them, and **EBHE-251** aims to provide safe access to caves or disused mines.

EBHE-236	Stabilise cave entrances	*
EBHE-251	Create/ enhance/ maintain access for caves or disused mines	**

8.8.1.1 Causality
Mining is often a forgotten rural activity (Wheeler 2014) but many regions have a long tradition of mining in rural areas going back to the Bronze Age (e.g. tin mining in Cornwall, copper mining in Wales, coal mining in Yorkshire and County Durham). Improving access to mines and caves will heighten public awareness of past mining activities, a key aspect of cultural heritage (Tost *et al*. 2021). Action **EBHE-236** has a RAG rating of orange T*, and **EBHE-251** of orange TD**; where T denotes context dependency and D denotes some possible disbenefits.

8.8.1.2 Co-benefits and Trade-offs
The main co-benefit to this action, in addition to highlighting the mining heritage of rural regions, would be potentially a boost in tourism (Cheddar caves and Dan yr Ogof caves for example attract large numbers of visitors). This action, facilitating access to caves and disused mines, would require a safety first approach, which may limit the number of sites that could benefit from this action.

8.8.1.3 Magnitude
Caves and disused mines across Britain could benefit from this action.

8.8.1.4 Timescale
Once the action is implemented and awareness raised with the public the benefits should be relatively quick.

8.8.1.5 Spatial Issues
No additional space would be required.

8.8.1.6 Displacement
Unlikely that any displacement would occur.

8.8.1.7 Maintenance and Longevity
Maintenance of cave and mine entrances would be required as long as these remain open to the public.

8.8.1.8 Climate Adaptation or Mitigation
N/A

8.8.1.9 Climate factors / Constraints
Climate change impacts on rock/sediment stability and any change to risk of flash flooding would be the critical issues to consider.

8.8.1.10 Benefits and Trade-offs to Farmer/Land manager
Potential increase in tourist numbers would likely be the key effect.

8.8.1.11 Uptake
N/A

8.8.1.12 Other Notes
N/A

8.8.2 Tidying geodiversity features

EBHE-239: Remove fly tipped rubbish from geodiversity features
EBHE-244: Remove man-made barriers around active geodiversity features
EBHE-250: Remove graffiti on geodiversity features

EBHE-239 aims to remove rubbish from geodiversity features; **EBHE-244** aims to remove barriers around geodiversity features and **EBHE-250** aims to remove graffiti. All three actions together would significantly clean up and enhance the presentation of geodiversity features.

EBHE-239	Remove fly tipped rubbish from geodiversity features	***
EBHE-244	Remove man-made barriers around active geodiversity features	*
EBHE- 250	Remove graffiti on geodiversity features	***

8.8.2.1 Causality
Geodiversity sites can be marred by the presence of rubbish (Purdy *et al*. 2022) and/or graffiti given the features a less than pleasing feel. Tidying up the geodiversity feature will raise the esteem with which visitors view it and thus also raise awareness of the cultural value of the site as it being looked after. Man-made barriers detract from the feature and their removal would similarly enhance the perceived value of

the geodiversity feature. Action **EBHE-239** has a RAG rating of orange T***; EBH-244 of orange TD*; **EBHE-250** of green***; where T denotes context dependency and D denotes some possible disbenefit.

8.8.2.2 Co-benefits and Trade-offs

Tidying up geodiversity features and removing rubbish could have the positive effect of further flying tipping being less likely to occur. A disbenefit of removing man-made barriers is that the site may become less safe especially for children, so clear signage would need to present.

8.8.2.3 Magnitude

Many sites suffer from fly tipping but unclear how widespread the issue is with regards to sites with notable geodiversity features compared to other sites. Fly tipping is a country-wide issue that gets worse as the economy falters.

8.8.2.4 Timescale

Once the action is implemented the action should be immediate.

8.8.2.5 Spatial Issues

No additional space would be required.

8.8.2.6 Displacement

Unlikely that these actions would lead to any displacement.

8.8.2.7 Maintenance and Longevity

On-going tidying will be needed as fly-tipping, throwing away rubbish and other anti-social vandalism will not cease (unless the site can be protected by CCTV).

8.8.2.8 Climate Adaptation or Mitigation

N/A

8.8.2.9 Climate factors / Constraints

N/A

8.8.2.10 Benefits and Trade-offs to Farmer/Land manager

The landowner will benefit from removal of rubbish from their land.

8.8.2.11 Uptake

Assuming the cost is borne elsewhere, there's unlikely to be any objection form the landowner.

8.8.2.12 Other Notes

N/A

8.8.3 Facilitating collection

EBHE-049: Create rock piles for sample collection

Action **EBHE-049** aims to facilitate collection of geological objects including rocks, minerals and fossils. Action **EBHE-049** is strongly linked to action **EBHE-051** described in section 8.6.4. With regards to cultural heritage the information would be identical. The main difference is that for **EBHE-051**, an area for collection is provided, whereas for **EBHE-049** rock piles for collection are provided.

EBHE-249	Create rock piles for sample collection	*

Action **EBHE-249** has a RAG rating of orange TD*, where T denotes context dependency and D denotes presence of disbenefits.

9 THEME 7: CONDITION OF CULTURAL HERITAGE

Cultural heritage is defined in Theme 6. The focus of Theme 7 is to highlight the actions that can be taken to improve culture heritage and in particular the condition of cultural heritage assets, including buildings, structures and below ground archaeological sites, in the rural environment. Many buildings and other assets of cultural heritage value are poorly maintained or in need of repair and restoration (Powell *et al*. 2020). There are efforts being made in this area, including as part of environmental stewardship schemes, which contain elements on safeguarding and enhancing cultural assets especially as part of the agricultural landscape (Blumentrath *et al*. 2014; Emmett *et al*. 2017; Gaskell *et al*. 2014; Jones *et al*. 2019). A notable aspect to consider is the monitoring of the condition of cultural heritage assets and how this can be achieved in an efficient and timely manner (Barlindhaug *et al*. 2007; Buckland *et al*. 2018; Gaskell & Hughes 2010; Swetnam *et al*. 2017; Wood *et al*. 2018). Although monitoring is not a named action, it should underpin many of the actions being undertaken.

It is worth noting that there are some actions which although targeted primarily at another purpose will potentially benefit the preservation of cultural heritage assets. The first of these is the creation of wood pasture (9.2.1) and the management of individual trees within agricultural settings (9.4.1). Both of these actions, if carried wisely can result in permanent grass cover over buried archaeological remains. The importance of which is discussed in 9.5.6. In addition, actions aimed at tackling invasive plant species (9.3.1), although may be broadly targeted at wildlife and biodiversity protection, will also have benefits for many sites of cultural heritage importance by removing potential damage caused by woody or deep-rooted plants and by enhancing the visibility of the sites (9.5.3).

Theme 6 highlighted how landscape character (Czúcz *et al*. 2022) is determined by the actions of human activity on the natural environment, and that a particular example of this is as a result of boundary structures such as dry stone walls amongst others (Powell *et al*. 2019a). These are discussed in 9.4.2. Research has demonstrated how investment is restoring iconic landscape elements can significantly add value to the economy of a region (Courtney *et al*. 2007), including as a result of enhanced tourism, and specifically of tourism linked to regional cultural heritage.

Section 9.5 specifically investigates actions that can be taken to maintain and restore cultural heritage sites. Buildings may need different amounts of remediation depending on their condition (Blumentrath *et al*. 2014; Hyder & ADAS 2008), but key elements to include are weatherproofing, consolidation of the structure, any drainage requirements, along with the potential for full restoration and where appropriate a switch to an alternative use (such as tourist accommodation); this is presented in 9.5.1. For buried archaeological sites, especially sites on agricultural land, there is a need to minimise or remove soil disturbance (Spandl *et al*. 2010; Trow 2010) (9.5.2). In some cases, and especially for below ground archaeological assets increasing the water level to what it has been historically would help preserve the asset by keeping the soil environmental conditions anoxic (López-Bultó & Morera 2022) (9.5.4). This can also be helped by maintaining grass cover above cultural heritage sites (9.5.6), the additional benefit of which is that the site becomes more visible to visitors (9.5.3) and damage to buried assets by woody or deep-rooted plants can be prevented. Archaeological sites can also be affected by soil compaction (McBride & Mercer 2011) or disturbance caused by vehicles and livestock, which should be minimised or removed where possible (9.5.7).

Finally, there is a brief inclusion of actions for geodiversity with special relevance to mining heritage, although this element is discussed in detail elsewhere (9.6).

9.1 MANAGEMENT BUNDLES

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:

- Habitat creation
  - Habitat creation/woody features (1 action)
- Systems action
  - Systems action/invasive management (1 action)
- Restoration, management and enhancement
  - Restoration, management and enhancement/woody features (2 actions)
  - Restoration, management and enhancement/boundary features (1 action)
- Maintenance and restoration of cultural heritage sites
  - Maintenance and restoration of cultural heritage sites/ (21 actions)
- Actions for geodiversity
  - Actions for geodiversity/ (7 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

9.2 BUNDLE: HABITAT CREATION

9.2.1 Woody features & scrub

EBHE-205C: Create wood pasture (e.g. through appropriate grazing)

Wood pasture is land that is managed through grazing, with trees in these settings often pollarded. Many of the UK's ancient trees are in wood pasture or parkland settings, although wood pasture is currently quite a rare habitat. Wood pasture creates a different landscape character to more intensive forms of agriculture or grazing regimes and is associated with extensive grazing which provides GI benefits.

EBHE-205C	Create wood pasture (e.g. through appropriate grazing)	LTD***	LT***

Section 12.2.2 provides further details on wood pasture within landscapes.

9.2.1.1 Causality

Creating wood pasture, often for varied purposes (Emmett *et al*. 2017; Jones *et al*. 2019), could have beneficial impacts on cultural heritage (Czúcz *et al*. 2022), including archaeological assets; this would be especially the case if the pasture elements were above the heritage assets under preservation. Sections 8.3.2, 8.7.6 and 9.3.1 explain the value of grass cover over heritage assets. Grass and short vegetation cover help preserve below ground archaeological assets (Gaskell & Hughes 2010). Action **ENHE-205C** has a RAG rating of orange***, for further details see 12.2.2.

9.2.1.2 Co-benefits and Trade-offs

The wood elements of the wood pasture should not be located above the heritage assets located below ground as tree roots can cause damage to archaeological assets (Forest Research 2023). Similarly, care should be taken with the type of livestock, intensity of grazing and location of any troughs, feeders, and access paths (see 8.7.7).

9.2.1.3 Magnitude

This action would be beneficial to heritage assets in those cases where the heritage asset is currently under cultivation activities (see 8.7.2) or where vegetation regrowth is an issue (see 9.3.1).

9.2.1.4 Timescale

Establishing a wood pasture system will take several years as the trees establish.

9.2.1.5 Spatial Issues

No additional space is required, more a reorganisation of current sites.

9.2.1.6 Displacement

No displacement effects are identified.

9.2.1.7 Maintenance and Longevity

Once established, maintenance of wood pasture systems would be driven by the grazing needs and any tree husbandry required.

9.2.1.8 Climate Adaptation or Mitigation

This action is likely (but not necessarily) to have a net positive effect on carbon sequestration and thus climate change mitigation as agroforestry approaches tend to sequester more carbon than conventional agriculture (Kay *et al*. 2019).

9.2.1.9 Climate factors / Constraints

Type of species chosen will be critical in terms of adapting to climate change.

9.2.1.10 Benefits and Trade-offs to Farmer/Land manager

Potentially there could be more diverse income (e.g. livestock, fruit, timber) for the farmer or landowner.

9.2.1.11 Uptake

See 12.2.2.

9.2.1.12 Other Notes

N/A

9.3 BUNDLE: SYSTEMS ACTION

9.3.1 Invasive management

EBHE-301 Control invasive plant species by chemical means to help manage archaeological sites

EBHE-301 aims to control invasive plant species and thus help prevent vegetation encroachment at archaeological sites, which affects both long term preservation of the site as well as visitor enjoyment.

EBHE-301	Control invasive plant species by chemical means to help manage archaeological sites	**

9.3.1.1 Causality

Archaeological sites can be adversely affected by vegetation growth especially where the sites were previously relatively clear of vegetation (e.g. under cultivation or pasture, or actively managed) (Barlindhaug *et al*. 2007). Whether regrowing plants are native or not a means of easy monitoring vegetation at archaeological sites would be very useful for prioritising control efforts. Satellite remote sensing would seem an obvious choice as an early warning method (Barlindhaug *et al*. 2007; Buckland *et al*. 2018). Control vegetation growth, including that of invasive plant species (see 8.3.2.1), can be time consuming and require several passes. Chemical control is a proven method of controlling vegetation regrowth (see 8.3.2.1). Action **EBHE-301** has a RAG rating of green**.

9.3.1.2 Co-benefits and Trade-offs

The main trade-off is around safety of chemicals used especially with regards the biology of the local environment, including plant and animal life. With regards to cultural heritage itself there is also the consideration that pesticides can have nefarious impacts on the preservation of artifacts themselves (Carvalho *et al*. 2022) thus negating the whole purpose of using chemical pesticides. It is also worth noting that even when broken down pesticide residues could have unwanted effects over the long term (Silva *et al*. 2019).

9.3.1.3 Magnitude

The issue is primarily linked to land use change and in particular the shift of agricultural land use to tree planting, natural regeneration or rewilding; but also, to those sites located in woodland (see 9.5.3). In other places the issue is one of management of the site (see 9.5.6).

9.3.1.4 Timescale
Once the action is implemented it will be effective relatively quickly.

9.3.1.5 Spatial Issues
Space above the area being preserved and in the immediate vicinity would need to be treated.

9.3.1.6 Displacement
No displacement effect identified.

9.3.1.7 Maintenance and Longevity
On-going maintenance would be required, at least annually, depending on the type of vegetation in question.

9.3.1.8 Climate Adaptation or Mitigation
If vegetation is being removed and soil disturbed to some effect by the process, there would be a release of carbon and thus the action would go against carbon mitigation targets. There might be the opportunity to replace the vegetation with one adapted to climate change, such as a diverse permanent grassland.

9.3.1.9 Climate factors / Constraints
N/A

9.3.1.10 Benefits and Trade-offs to Farmer/Land manager
N/A

9.3.1.11 Uptake
Financial assistance would likely be required if this action was not to be carried out by the landowner in the course of their normal management.

9.3.1.12 Other Notes
N/A

9.4 BUNDLE: RESTORATION, MANAGEMENT AND ENHANCEMENT

9.4.1 Woody features

EBHE-192: Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction
EBHE-205EM: Enhance/ manage wood pasture (e.g. through appropriate grazing)

EBHE-192 aims to protect in-field trees – ensuring their maintenance over the long-term can contribute to protection of landscape character and provide some green infrastructure benefits. **EBHE-205EM** see **EBHE-205C** (9.2.1).

EBHE-192	Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction	**	**

9.4.1.1 Causality
See 9.2.1 for causality discussion, which applies to both action **EBHE-205EM** and **EBHE-192** in terms of condition of cultural heritage. Action **EBHE-192** has a RAG rating of green**, for further details see 12.5.2.

9.4.1.2 Co-benefits and Trade-offs
See 9.2.1.

9.4.1.3 Magnitude
Likely to be widespread across the country but of limited scale for each possible intervention (field level).

9.4.1.4 Timescale
Once the action is implemented, benefits should begin immediately.

9.4.1.5 Spatial Issues
No additional space is required as this is about managing elements already in place.

9.4.1.6 Displacement
None identified.

9.4.1.7 Maintenance and Longevity
On-going grazing and tree husbandry required.

9.4.1.8 Climate Adaptation or Mitigation
Limited impact on climate change although there could be positive impacts on carbon sequestration of reverting even a small amount of cultivated land back to permanent pasture.

9.4.1.9 Climate factors / Constraints
If the trees currently in place can't adapt to climate change, alternate species will need to be identified to replace any lost to climate change.

9.4.1.10 Benefits and Trade-offs to Farmer/Land manager
Less cultivation near large trees, which is not always easy.

9.4.1.11 Uptake
See 12.5.2.

9.4.1.12 Other Notes
N/A

9.4.2 Boundary features

EBHE-007: Create, restore or manage traditional field boundaries (e.g. dry stone walls, earth banks, stone faced earth banks, Cornish hedges)

Action **EBHE-007** aims to create, restore and maintain traditional boundary features to fields and paths including dry stone walls, earth banks, hedges.

EBHE-007	Create, restore or manage traditional field boundaries (e.g. dry stone walls, earth banks, stone faced earth banks, Cornish hedges)	**

9.4.2.1 Causality
As described in 8.4.3, the rural landscape has lost traditional field boundaries which gave the landscape more structure (Courtney *et al*. 2007). The loss of boundary markers has significantly affected the character of many landscapes (Powell *et al*. 2019a) and a restoration of appropriate boundaries is the aim of actions **EBHE-007**. Dry stone walls are those best known to the public and have received considerable attention in many areas across the UK including the North York Moors, the Peak District, Wales and the Cotswolds. The visual aspect of boundary features such as dry stone walls is central to the character of many landscapes (Swetman *et al*. 2017). There's clear evidence that dry stone wall restoration, including within the Countryside Stewardship scheme (Jones *et al*. 2019), has benefits for the local economy (Courtney *et al*. 2007) and wider community (Powell *et al*. 2018). Action **EBHE-007** has a RAG rating of green**.

9.4.2.2 Co-benefits and Trade-offs
A main co-benefit would be minimising erosion and providing shelter for livestock. Living boundaries also provide habitat for wildlife so reversing their loss would be of significant benefit to wildlife (Wood *et al*. 2018). In addition, there's the tourism angle of conserving landscape traditions which is covered in Theme 5 (tourism). Preferably the restoration should be carried using traditional method to fully maintain the character of the local landscape whilst preserving cultural heritage.

9.4.2.3 Magnitude
See 8.4.3.

9.4.2.4 Timescale
See 8.4.3.

9.4.2.5 Spatial Issues
See 8.4.3.

9.4.2.6 Displacement
None identified.

9.4.2.7 Maintenance and Longevity
See 8.4.3.

9.4.2.8 Climate Adaptation or Mitigation
See 8.4.3.

9.4.2.9 Climate factors / Constraints
N/A

9.4.2.10 Benefits and Trade-offs to Farmer/Land manager
See 8.4.3.

9.4.2.11 Uptake
See 8.4.3.

9.4.2.12 Other Notes
N/A

9.5 BUNDLE: MAINTENANCE AND RESTORATION OF CULTURAL HERITAGE SITES

9.5.1 Maintenance and restoration

EBHE-077: Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)
EBHE-298: Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-299: Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-305: Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)

Actions **EBHE-077** aims to maintain a weatherproof condition on historical listed assets; **EBHE-298** aims to carry out conservation or consolidation on historical assets on the SHINE database; **EBHE-299** aims to carry out drainage works on historical assets on the SHINE database; **EBHE-305** aims to carry out restoration work on selected listed buildings.

EBHE-077	Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***
EBHE-298	Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

EBHE-299	Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-305	Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***

9.5.1.1 Causality

Many listed buildings, scheduled monuments and other cultural assets on the SHINE database are in need of maintenance or restoration work (Powell *et al*. 2020). Agricultural subsidies aimed at helping farmers restore and maintain rural cultural heritage are available (Blumentrath *et al*. 2014; Hyder & ADAS 2008), but not to the same extent as for environmental protection. Much restoration work is also carried out by non-governmental bodies (Blumentrath *et al*. 2014). Government payments for restoring historic rural buildings tend to be relatively small (UK Gov 2018). Historic Farm Building restoration and maintenance options administered under Environmental Stewardship were effective in maintaining and enhancing public benefits (Gaskell et al. 2014). Improving the weatherproofing of historic buildings (**EBHE-077**), undertaking restoration, conservation or consolidation work (**EBHE-298** & **EBHE-305**), and maintaining any necessary drainage works (**EBHE-299**) will greatly enhance the long-term security of rural historic buildings. This in turn will increase the perceived of value of rural historic buildings (Powell *et al*. 2019b) and facilitate their conservation. All four of these actions have a RAG rating of green***.

9.5.1.2 Co-benefits and Trade-offs

The main co-benefit from this action is raising public awareness of the value of cultural heritage assets (see 8.7.1. In many cases there is the assumption that maintenance or restoration work should be carried out using traditional techniques, however there are situation where the end goal may not warrant this, such as supporting structures (Gaskell *et al*. 2014). Supporting and strengthening work (if done sensitively) using modern techniques would be more cost effective (Gaskell *et al*. 2014), whilst not detracting from the end goal of protecting the heritage asset.

9.5.1.3 Magnitude

Many historic buildings have been neglected and are in need of repair; this is true across the UK. Addressing this issue will therefore be a significant task at the national level.

9.5.1.4 Timescale

Once the action is implemented results should be immediate in terms of preventing any further deterioration of the cultural assets.

9.5.1.5 Spatial Issues

No additional space is required apart from the immediate vicinity of the cultural asset. For any drainage works however, the area being protected may extend away from the immediate site.

9.5.1.6 Displacement

No displacement impact per se, unless the funds are being removed from another area of rural environmental protection (e.g. alleviating the biodiversity or climate change emergencies).

9.5.1.7 Maintenance and Longevity

On-going maintenance would be required as for any building.

9.5.1.8 Climate Adaptation or Mitigation

N/A

9.5.1.9 Climate factors / Constraints

Any building work would need to take future climate predictions into account (e.g. expected precipitation).

9.5.1.10 Benefits and Trade-offs to Farmer/Land manager

On-site assets will receive protection, and some me suitable for alternative uses.

9.5.1.11 Uptake

If financial help is available, uptake is likely to be high.

9.5.1.12 Other Notes
N/A

9.5.2 Protection from cultivation impacts

EBHE-079: Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation
EBHE-081: Minimise cultivation on Scheduled Monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments
EBHE-287: Do not harrow or roll Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EHBE-288: Do not plough, sub-soil, cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

These actions aim to remove or minimise the threat that cultivation poses to scheduled monuments of heritage assets. In particular, **EBHE-079** removes assets from cultivation, **EBHE-081** minimises cultivation on assets, **EBHE-287** removes harrowing or rolling on asset sites, and **EBHE-288** removes ploughing, sub-soiling and re-seeding from asset sites.

EBHE-079	Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation	***
EBHE-081	Minimise cultivation on Scheduled Monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	***
EBHE-287	Do not harrow or roll Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-288	Do not plough, sub-soil, cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

9.5.2.1 Causality
It is well known that agriculture and especially soil disturbance by cultivation has significant negative impact on scheduled monuments and heritage assets buried belowground (Spandl *et al*. 2010) and therefore minimising soil disturbance is encouraged (Devon CC 2023). Cultivation and linked activities disturb the soil and can directly damage the asset of interest (Trow 2010); the damage can either direct by mechanical means or indirect via exposure to air and pollutants (such as pesticides). The actions **EBHE-079**, **EBHE-081**, **EBHE-287** and **EBHE-288** prohibit or minimise agricultural activities including cultivation, ploughing, sub-soiling, harrowing or rolling above archaeological cultural assets buried below ground and thus remove or at least minimise the risk of damage to the assets being protected. All four actions have a RAG rating of green***.

9.5.2.2 Co-benefits and Trade-offs
See 8.7.2.2.

9.5.2.3 Magnitude
Any site under land managed for crop production especially, but also improved grassland where cultivation takes place at regular intervals, would be affected by these actions. This action would therefore be country wide, but localised to individual sites requiring attention.

9.5.2.4 Timescale
Once the action is implemented the benefits in terms of safeguarding buried cultural assets would be immediate.

9.5.2.5 Spatial Issues
The space required would match the area known to contain below ground cultural assets.

9.5.2.6 Displacement

See 8.7.2.6.

9.5.2.7 Maintenance and Longevity
The change in management approach would be for the long term.

9.5.2.8 Climate Adaptation or Mitigation
See 8.7.2. 8.

9.5.2.9 Climate factors / Constraints
N/A

9.5.2.10 Benefits and Trade-offs to Farmer/Land manager
Not assessed

9.5.2.11 Uptake
See 8.7.2.10.

9.5.2.12 Oher Notes
N/A

9.5.3 Clearing and visibility

EBHE-083: Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EHBE-088: Maintain the visibility of upstanding Scheduled Monuments/ heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments

The aim of actions **EBHE-083** and **EBHE-088** is to keep vegetation trimmed and maintain visibility of scheduled monuments and heritage assets.

EBHE-083	Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-088	Maintain the visibility of upstanding Scheduled Monuments/ heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

9.5.3.1 Causality
Historic building and other heritage sites can be damaged by encroaching vegetation (see 9.3.1) and this is especially so for encroaching woody or deep-rooted plants (Forest Research 2023b). Removing vegetation and preventing regrowth either directly to protect the heritage asset or to increase visibility of the heritage asset will be beneficial for the long-term preservation of the cultural asset. Actions **EBHE-083** and **EBHE-088** both a RAG rating of green***.

9.5.3.2 Co-benefits and Trade-offs
Care should be taken not to directly damage any assets whilst clearing the vegetation. There is likely to be some local impacts on wildlife.

9.5.3.3 Magnitude
Clearing of vegetation is a localised issue to the assets being protected, but this will be seen nationwide.

9.5.3.4 Timescale
Once the action is implemented, benefits will be immediate.

9.5.3.5 Spatial Issues
The immediate vicinity of protected assets will need to be treated.

9.5.3.6 Displacement
Apart from impacts on wildlife, none identified.

9.5.3.7 Maintenance and Longevity
On-going maintenance is required, most likely at yearly intervals.

9.5.3.8 Climate Adaptation or Mitigation
See 8.7.3.8.

9.5.3.9 Climate factors / Constraints
See 8.7.3.8.

9.5.3.10 Benefits and Trade-offs to Farmer/Land manager
None identified.

9.5.3.11 Uptake
Payment for any vegetation clearing work likely to require some financial assistance unless it's work that would have been carried anyway.

9.5.3.12 Other Notes
N/A

9.5.4 Restoring/maintaining high water level

EBHE-084: Restore/maintain high water levels to protect scheduled monuments and heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

Action **EBHE-084** aims to restore water levels and thus sub-surface water conditions favourable to long term preservation of ancient sites, including scheduled monuments and other heritage assets.

EBHE-084	Restore/maintain high water levels to protect scheduled monuments and heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

9.5.4.1 Causality
Drainage and other impacts to hydrology has resulted in some scheduled monuments or heritage assets being exposed to less favourable conditions for preservations because of increasing air (oxygen) infiltration below ground (López-Bultó & Morera 2022; Forest Research 2023c). Maintaining high water level and therefore anoxic conditions will help preserve archaeological remains for future generations. **EBHE-084** aims to rectify this by restoring and maintaining high water levels across affected sites. Give the action a RAG rating.

9.5.4.2 Co-benefits and Trade-offs
See 8.7.4 for additional benefits especially around public awareness of cultural heritage.

9.5.4.3 Magnitude
Where drainage of modification of the local hydrology has affected the water level at archaeological sites, this action is relevant.

9.5.4.4 Timescale
Benefits of restoring the hydrology may take some years to become evident.

9.5.4.5 Spatial Issues
Restoring the water level at cultural asset sites will require changes at the local catchment scale, unless local geology is such that it can be affected at the field level.

9.5.4.6 Displacement
See Spatial Issues above (9.5.4.5).

9.5.4.7 Maintenance and Longevity
On-going maintenance and monitoring are likely to be required.

9.5.4.8 Climate Adaptation or Mitigation
See 8.7.4.8.

9.5.4.9 Climate factors / Constraints
See 8.7.4.8.

9.5.4.10 Benefits and Trade-offs to Farmer/Land manager
See 8.7.4.10.

9.5.4.11 Uptake
Financial assistance will be required both for the work itself to increase the soil water level but also for any income losses that ensue as a result of potentially waterlogged fields.

9.5.4.12 Other Notes
N/A

9.5.5 Removing eyesores

EBHE-089: Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-306: Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)
EBHE-296: Remove eyesores from Registered Battlefields

Actions **EBHE-089**, **EBHE-306**, and **EBHE-296** aim to remove eyesores from scheduled monuments, heritage assets and registered battlefields.

EBHE-089	Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-306	Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***
EBHE-296	Remove eyesores from Registered Battlefields	***

Eyesores don't generally impact the condition of a building of historical or cultural significance *per se* unless the eyesore is directly on or affixed to the building in question. Generally, eyesores however detract from the value of the building or asset. Section 8.7.5 provides details on the removal of eyesores (from a cultural awareness stand-point) as per the above actions.

9.5.6 Grass cover maintenance

EBHE-289: Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands
EBHE-290: Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion
EHBE-292: Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EHBE-293: Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EHBE-294: Enhance the management and presentation of Registered Battlefields

Actions **EBHE-289** and **EBHE-290** aim to maintain or establish grass or herbaceous cover at scheduled monument or heritage assets sites. **EBHE-293** aims to manage permanent grassland at scheduled monuments or heritage assets sites. **EBHE-294** aims to improve the presentation of battlefield sites. **EBHE-292** aims to exclude burrowing animals from scheduled monuments and heritage assets.

EBHE-289	Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands	***
EBHE-290	Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion	***
EBHE-292	Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-293	Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-294	Enhance the management and presentation of Registered Battlefields	***

9.5.6.1 Causality

Heritage assets located belowground can be negatively impacted by both woody or deep-rooted vegetation (see 9.3.1) and by soil disturbance from farming activities such as cultivation (see 9.5.2). A solution for both potential causes of damage is to keep the site under permanent grass cover (see 8.7.6). In addition, grass cover provides better soil hydrological conditions than for example woodland for archaeological preservation (Forest Research 2023c). Action **EBHE-292** by excluding burrowing from the site being protected also prevents direct damage to archaeological artefacts by animal activity. All five actions have a RAG rating of green***.

9.5.6.2 Co-benefits and Trade-offs

The main co-benefits from this action, are to raise public awareness and the perceived value of these cultural heritage assets (see 8.7.6).

9.5.6.3 Magnitude

Vegetation encroachment and/or lack of adequate grass cover maintenance is a widespread issue at sites across the country.

9.5.6.4 Timescale

Once the action is implemented the benefits, especially in terms of minimising site degradation, will be immediate.

9.5.6.5 Spatial Issues

No additional space would be required.

9.5.6.6 Displacement

Some limited impact on wildlife, resulting in the exclusion of some species, especially burrowing animals.

9.5.6.7 Maintenance and Longevity

Maintenance of grass cover by mowing or grazing will be required for the long term.

9.5.6.8 Climate Adaptation or Mitigation

Possible benefits for carbon sequestration depending on what the previous vegetation was.

9.5.6.9 Climate factors / Constraints

Species composition of the grass cover should be chosen to best enhance the resilience of the grassland to climate change (see 8.7.6.9).

9.5.6.10 Benefits and Trade-offs to Farmer/Land manager

See 8.7.6.10.

9.5.6.11 Uptake

Financial incentives may be required especially if there would be a land use change (e.g. from cultivation).

9.5.6.12 Other Notes
N/A

9.5.7 Preventing damage by vehicles

EBHE-295: Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-297: Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-295 aims to prevent use of vehicles around scheduled monuments and heritage assets. **EBHE-297** aims to minimise vehicle and livestock impacts where scheduled monuments and heritage assets are located on farmland.

EBHE-295	Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-297	Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

9.5.7.1 Causality
By actions of compaction and soil disturbance both vehicles and livestock can negatively impact the condition of belowground scheduled monuments or heritage assets (McBride & Mercer 2011; Historic England 2004). The actions **EBHE-295** and **EBHE-297** aim to remove risks from vehicles and minimise risks from livestock by preventing use of vehicles close to sites being protected and ensure that heavy livestock traffic does not occur in the immediate vicinity of site of heritage value. Less physical disturbance of the belowground soil environment will thus occur preventing damage to archaeological assets. Both actions have a RAG rating of green***.

9.5.7.2 Co-benefits and Trade-offs
See 8.7.7.2.

9.5.7.3 Magnitude
As many sites of archaeological interest are located on farmland, this will be widespread action to undertake.

9.5.7.4 Timescale
Once the action is implemented beneficial outcomes should begin to be seen.

9.5.7.5 Spatial Issues
No additional space is required, bar the actual areas needing protecting.

9.5.7.6 Displacement
None identified.

9.5.7.7 Maintenance and Longevity
The change to land management would be ongoing.

9.5.7.8 Climate Adaptation or Mitigation
N/A

9.5.7.9 Climate factors / Constraints
N/A

9.5.7.10 Benefits and Trade-offs to Farmer/Land manager
See 8.7.7.2.

9.5.7.11 Uptake
See 8.7.7.11.

9.5.7.12 Other Notes
N/A

9.6 Bundle: Actions for geodiversity

9.6.1 Caves and mines

EBHE-236: Stabilise cave entrances
EBHE-251: Create/ enhance/ maintain access for caves and mines
These actions aim to stabilise and secure access to caves and mines. The actions are discussed in detail in Theme 8: **EBHE-236** is described in 10.5.12 and **EBHE-251** in 10.5.11; they are also presented in section 8.8.1 with regards to cultural heritage.

9.6.2 Protecting geodiversity features

EBHE-246: Protect geodiversity features by protective cover
EBHE-247: Remove scree or spoil; EBHE-248: Protect geodiversity features by burial
These actions aim to protect geodiversity features from degradation. The actions are discussed in detail in Theme 8: **EBHE-246** is described in 10.5.13, **EBHE-247** in 10.5.8 and **EBHE-248** in 10.5.9.

9.6.3 Tidying geodiversity

EBHE-239: Remove fly tipped rubbish from geodiversity features; EBHE-250: Remove graffiti on geodiversity features

These actions aim to clean up the presentation of geodiversity features. The actions are discussed in detail in Theme 8: **EBHE-239** is described in 10.5.2 and **EBHE-250** in 10.5.5; they are also presented in section 8.8.2 with regards to cultural heritage.

10 Theme 8: Awareness of diversity - Geodiversity

Introduction
This review covers geodiversity as a provider of cultural services, as part of the wider Enhancing Beauty, Heritage and Engagement (EBHE) programme proposed as part of ELMS. Robson (2005) summarised the numerous definitions of geodiversity that exist. However, the form of words most often cited is from Gray (2004, 2013),

"Geodiversity: the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (landform, processes) and soil features. It includes their assemblages, relationships, properties, interpretations and systems".

Gray acknowledged the influence that geomorphologists working in the Tasmanian Forestry Service had on codifying the concept of geodiversity and using it in conservation management planning and decision-making. Several other proposed actions within the ecosystem services portion of the ELMS would fall within the geomorphological and soils part of this definition and it must be stressed that geodiversity encompasses all of abiotic nature. Gordon et al. (2021) emphasised the need to incorporate geodiversity in protected areas. To be clear, geodiversity is about more than geology. Fox et al. (2020; fig. 1) pictured these

facets as a 'geodiversity flower'. England has a national geodiversity charter that was launched in 2014, which was headlined on the Natural England/Defra website [21] as a,

"Vision unveiled for geodiversity to be recognised as an integral part of our environment, economy and heritage."

Robson (2005) also reviewed the cultural aspects of geodiversity, which have not always been acknowledged. The British Isles and Europe have been the main regions that have discussed a cultural dimension to geodiversity. Stanley (2001) made this bold statement about geodiversity,

"So what is geodiversity? It is the link between people, landscape and their culture: it is the variety of geological environments, phenomena and processes that make those landscapes, rocks, minerals, fossils and soils which provide the framework for life on Earth."

As geodiversity definitions have evolved, the concept of geoheritage as a subdivision of geodiversity has emerged. Geoheritage is perhaps a more apt term for the cultural services aspect of BHE that this review is considering and was developed in the ProGeo (2011) document on conserving shared geoheritage. Geoheritage focuses upon special and significant places (geosites) and objects that have a key role in understandings of the Earth (Erikstad 2013).

Gray et al. (2013: fig.1) proposed a modified model of abiotic ecosystem services derived from geodiversity. The ten broad classes of cultural ecosystem services were divided into two categories: cultural and knowledge services.

Cultural (access, recreation, aesthetics) service	***Knowledge services***
Environmental quality	***Earth History***
Geotourism and leisure	***History of research***
Cultural, spiritual and historic meanings	***Environmental monitoring and forecasting***
Artistic inspiration	***Geoforensics***
Social development	***Education and employment***

Table 1: Division of cultural services into two subgroupings as proposed in Gray et al. (2013).

Pijet-Migon & Migon (2022) used a mind map as summary of direct and cross-cutting links between aspects of geoheritage and cultural heritage interact across a range of cultural and knowledge services.

[21] https://www.gov.uk/government/news/geodiversity-charter-for-england-launched

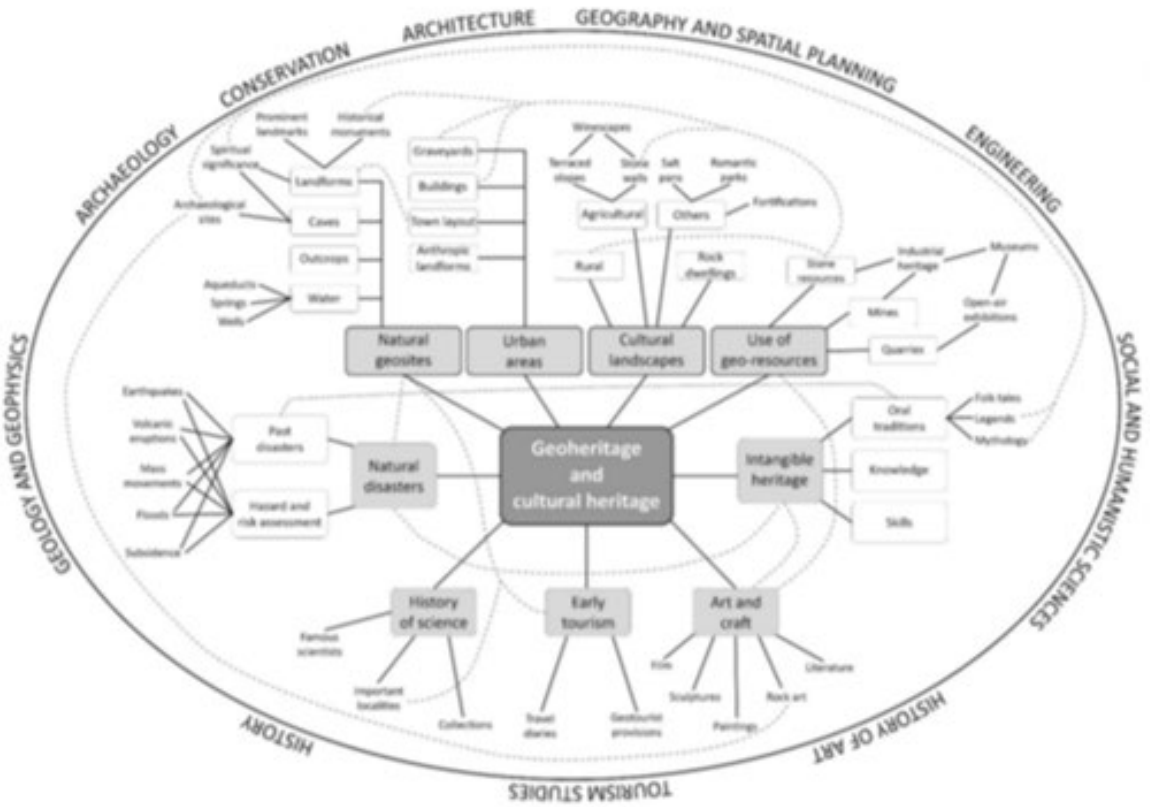

Figure 1: The summary of links between geoheritage and cultural heritage produced by Pijet-Mignon and Mignon (2020; figure 8). The disciplines around the outside are those that overlap with geoheritage and cultural heritage. Thicker lines are major nested themes within an aspect of geoheritage, while the dashed lines connect specific elements of themes across the major themes. CC-BY-SA 4.0.

Within the specific context of protected sites and landscapes in England, the importance of geodiversity in defining many National Character Areas (NCA) is clear in the names for numerous NCAs[22] and often plays significant role in defining landscapes and seascapes. Murray (2014; fig. 3) highlighted the interaction of three stacked layers, as proposed by the Dutch landscape architect Meto Vroom: the abiotic at the bottom; the biotic in the middle; human occupation patterns on top. Gray (2013, fig. 10.1) is a diagram along similar lines but with human occupation replaced by a cultural layer and more detail than Murray's very abstract diagram but Gray's figure shows a progression from a real landscape to an abstract 'block model'. Patrick Geddes summed up the factors that shape the top or cultural layer in the pithy phrase. "Place, Work, Folk" but these human elements have, until very recently, been tightly constrained by the abiotic and biotic layers. Reynard & Giusti (2018) combined these elements in a consideration of the landscape and cultural value of geoheritage.

Operationally, the use of PANS and (F)MPEOL do hold potential to capture some of the public benefits of the interaction of people with geodiversity and some of its rich cultural services benefits but a focus on SSSIs may be rather limiting and a wider consideration of local sites might capture more instances of cultural services provided by geodiversity and allow a wider uptake among farmers and land-owners in a broader range of protected landscapes.

[22] https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles

Prosser (2013: fig. 3) provided a useful, if dated, summary of geoconservation sites across the nations of the UK. In England, *c*. 25% of the 4714 geoconservation sites were SSSIs. The remaining 75% were Local Geodiversity Sites (LGSs), also known as Regionally Important Geological/Geomorphological Sites (RIGSs), which are afforded some protection through local development plans. Such local sites are usually monitored by volunteer groups, although these groups often have professional/academic geoscientists among their members, and the information is collated by local authorities, rather than at a national level. Prosser (2013) indicated that Natural England does have information on these Sites of Nature Conservation Interrest (SINCS) and it is important to establish what information will be in the new FMEOPL geodiversity layer. The Designated Sites portal[23] maintained by Natural England does list Local Nature Reserves (LNRs) and LGSs are a subset of LNRs. However, AJM was unable to find any information on the condition of LGSs, as opposed to biological LNRs, in areas of England he is familiar with. LGSs are distributed much more widely across England and would offer greater opportunities for participation in geodiversity actions for farmers and land managers compared to indicators based on SSSIs alone.

Recent reports by Horswill et al. (2019) and Martin & Guy (2022) highlighted the lack of systematic monitoring of protected landscapes at a local level. Another concern raised by the Glover Review (2019) is the sense that AONBs are regarded as 'second-class' protected landscapes, yet these are often the very landscapes or NCAs that have been shaped by human land-management activities.

The EBHE element of ELMS offers a significant opportunity to make good on the vision of the 2014 Geodiversity Charter for England by emphasising the role of geodiversity in place-making as a broader justification for introducing payments for geodiversity actions, as cultural services, which were costed in Webber et al. (2006).

The difficulty in promoting the actions to farmers and land-managers is that many of the actions are capital-intensive or difficult to integrate into regular working farms, although ELMS is aimed at all land-managers and owners, not just farmers. Prosser et al. (2006) noted that grants and other public subsidy are key to many long-term management operations on geodiversity sites, which has led to management of SSSIs being delegated to other organizations. The other major barrier to uptake is that relatively few of the actions are likely to directly benefit farm operations. However, by framing the ELMS in terms of 'public money for public goods', it may be that farmer-led actions will become more frequent.

The other actions that have been included in this theme report are a broader mixture of actions with some possible impacts on the geodiversity theme. The links to geodiversity of a number of these actions are operating through a rather more indirect route of raising awareness of geodiversity as a part of the natural world that needs protection. Many of the actions are aimed at providing interpretation and advocacy for the network of geological and geomorphological SSSIs. However, several actions do have the potential to contribute directly to maintaining geological SSSI features in favourable condition. Controlling access, well-designed signage and good interpretation of sites all have

Outcomes

The measurement of outcomes is defined in the accompanying matrix. The direct indicator focuses on the proportion of geological SSSIs in favourable condition. A distinct advantage of this measure is that much of the information is available to the public and the state of SSSIs is clearly listed, even if the reasons for a decision about condition may need more explanation. A range of other themes can be influenced by geodiversity, such as visits to carry out activities that are closely dependent on geological features. ‘Sense of place’ is an important element of cultural services delivered by geodiversity (Gray 2013 and Table 1). Perhaps a better way to think about geodiversity across the Cultural Services portfolio of themes would be to consider geodiversity as a type of supporting or provisioning service for many of the other themes within Cultural Ecosystem Services.

[23] http://designatedsites.naturalengland.org.uk

Cultural Service	Measure	Sources of data
Geodiversity	Number of geological SSSI unit features, & % in favourable or recovering condition.	Natural England database (see Prosser 2013)
		MAGIC map[24]
		Designated Sites Database[25]

10.1 Management Bundles

- Habitat creation
  - Habitat creation/ponds and wetlands (2 actions)
- Systems action
  - Systems action/landscape actions (2 actions)
- Restoration, management and enhancement
  - Restoration, management and enhancement/boundary features (1 action)
- Create and enhance access and PROW
  - Create and enhance access and PROW/ (2 actions)
- Signposting, information, facilities and events
  - Signposting, information, facilities and events/ (13 actions)
- Actions for geodiversity
  - Actions for geodiversity/ (17 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

10.2 Bundle: Habitat creation: Ponds and wetlands

10.2.1 EBHE-169 Restore/ manage ghost ponds

Ghost ponds represent lost parts of fluvial systems that have usually filled with sediment which has then not been transported further down the channel system for a range of hydrogeomorphological reasons. Restoring these ponds by removing infill can renew their role as temporary sinks for sediments between high flow events. Ghost ponds can also include artificial ponds that would be unlikely to be features of interest in the context of geological SSSIs. Probably the most pertinent natural ponds would be kettleholes, which are widely distributed in England. An example of a funded project on kettlehole ponds that has joint geodiversity and biodiversity objectives involves the Hereford and Worcestershire Earth Heritage Trust.[26]

10.2.1.1 Causality

Ponds that have become infilled by sediment, especially if due to human action will no longer be acting as temporary sediment sinks, in addition to their role as water stores. By restoring these ponds, the hydrogeomorphological regime will move back towards a more natural state (Lischeid et al. 2018). Restoration might also involve work to reconnect inflow or outflow channels.

[24] https://magic.defra.gov.uk/
[25] http://designatedsites.naturalengland.org.uk
[26] earthheritagetust.org/ice-age-ponds

10.2.1.2 Co-benefits and Trade-offs

Much of the co-benefit of restoring and managing ghost ponds would be focused on biodiversity and habitat outcomes, especially wetland and river restoration actions. A trade-off of creating new bodies of water will be potential risks to livestock and humans of accident.

10.2.1.3 Magnitude

Impact on geological features on SSSIs is, likely to be small to possibly non-existent. This action would be aimed at restoring elements of the hydrogeomorphical system to a more natural condition and benefits will small and localised.

10.2.1.4 Timescale

0-5 years: After a pond is cleared and reconnected to channel or aquifer systems, it recovers some of its hydrogeomorphological role.

10.2.1.5 Spatial Issues

Sediment removed from the pond would have to be moved to another place and, as pond sediments will often be fine-grained, these may require some management to avoid their re-entering river systems by erosion of sediment piles by wind or water action.

10.2.1.6 Displacement

None apparent.

10.2.1.7 Maintenance and Longevity

If the root cause of the infilling in a natural channel system cannot be dealt with, there may need to be continued management or engineered solution for removal of sediments. In some cases, where the water fill is from aquifers, it may not be possible to naturally rewet the ghost pond. The effects are likely to last for decades unless there is a large influx of sediment from an event.

10.2.1.8 Climate Adaptation or Mitigation

None

10.2.1.9 Climate factors / Constraints

None

10.2.1.10 Benefits and Trade-offs to Farmer/Land manager

Such ponds did have a role in providing water for livestock in the past and clearing such ponds could increase the number of watering points. New water features might require fencing and other management.

10.2.1.11 Uptake

Several projects focused on restoring or maintaining kettlehole pond systems have been undertaken and the wide distribution of these features could offer relatively widespread uptake, although relatively few projects are likely to be focused some on geodiversity benefit.

10.2.1.12 Other Notes

N/A

10.2.2 EBHE-211: Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials

Field ponds would only be of interest to the geodiversity theme in instances where the field ponds were of natural origin, although they are significant landscape character features in chalk and limestone uplands of England[27] conditions for there to be natural field ponds are quite limited, as the requirement is that there is a limestone or chalk bedrock that takes water down into the subsurface rather than feeding surface

[27] Highweald.org/downloads/publications/55-leaflet-ponds-1/file.html

streams, leaving much of the higher ground devoid of water. Ponds would form in areas where there is a natural depression that has accumulated impermeable sediments, usually clays, that prevent rainwater escaping into the subsurface systems. Such natural features, like the meres around Monyash[28] in Derbyshire, may have been used before the construction of dew ponds and have had significant influence on the origin and development of settlements.

EBHE-211	Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials	*

10.2.2.1 Causality

Any field ponds with natural origins that are left in a landscape and are part of a SSSI designation may be threatened by increased drying out, which can result in the cracking of the natural clay liner, which may then be lost to erosion by the wind. Engineered dew ponds incorporate straw or other materials to help prevent drying out and the clay may need to be replaced. See also **EHBE-169**.

10.2.2.2 Co-benefits and Trade-offs

Much of the co-benefit of restoring and managing field ponds would be focused on biodiversity and habitat outcomes, especially wetland and river restoration actions. A trade-off of creating new bodies of water will be potential risks to livestock and humans of accident.

10.2.2.3 Magnitude

Very limited and it may be there are no clear instances of SSSI sites that have natural field ponds.

10.2.2.4 Timescale

0-5 years: After a pond is cleared and reconnected to channel or aquifer systems, it recovers some of its hydrogeomorphological role.

10.2.2.5 Spatial Issues

Sediment removed from the pond would have to be moved to another place and, as pond sediments will often be fine-grained, these may require some management to avoid their re-entering river systems by erosion of sediment piles by wind or water action.

10.2.2.6 Displacement

Suitable local clay sources might have been worked out or can no longer be accessed, so there might need to be material sourced from other areas.

10.2.2.7 Maintenance and Longevity

If the pond feature needs restoration, it is likely to need continued monitoring and possibly further work. With such intervention, the feature could be maintained for centuries, based on the longevity of current ponds.

10.2.2.8 Climate Adaptation or Mitigation

None

10.2.2.9 Climate factors / Constraints

None

10.2.2.10 Benefits and Trade-offs to Farmer/Land manager

Such ponds did have a role in providing water for livestock in the past and clearing such ponds could increase the number of watering points, especially at high points in the landscape. New water features might require fencing and other management.

10.2.2.11 Uptake

[28] https://monyash.info/local-features/mere/

Given the limited number of sites where field ponds would be part of geological SSSIs, limited uptake for geodiversity reasons. However, there are wider arguments and actions that could benefit from pond restoration in calcareous landscapes.

10.2.2.12 Other Notes

N/A

10.3 Bundle Systems Actions: Landscapes Actions

10.3.1 EBHE-187 Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character

Assessments of farms and outbuildings within the context of the local landscape character are already used by Historic England in their work, although in a more generalised fashion than this action, which would work at the level of individual holdings (see Lake 2014 and related documents for farmstead characteristics in different regions in England[29]). Landscape appraisals take a very broad view and geology/geomorphology facets are firmly within the scope of such work. By identifying clear links between geodiversity features on SSSIs and the conservation and improvement of landscape character, this action has the potential to encourage management of geological SSSIs to better contribute to landscape character.

EBHE-187	Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character	**T

10.3.1.1 Causality

Morrison et al. (2018) reviewed the potential of landscape character assessments to operationalise ecosystem approaches as a means of understanding the functional aspects of landscape character. By placing geological SSSI features, especially extensive features/feature groups, into a landscape context, there may be instances where such a report will offer additional justification for implementation of more direct actions to improve the geodiversity feature. Reynard and Gusti (2018) and Gray (2013 p. 341-346) provide details of links between geodiversity and landscapes.

10.3.1.2 Co-benefits and Trade-offs

Geodiversity benefits are likely to be only part of the benefit within the very broad remit of such work. Reynard and Gusti (2018 p. 155) review several studies on natural stone for building and the character of vernacular buildings and boundary systems can be tied to geodiversity.

10.3.1.3 Magnitude

Likely to be quite limited but such appraisal can offer further validation for integrating management of geological SSSIs into wider landscape character management plans.

10.3.1.4 Timescale

0-5 years: Once the appraisal work is commissioned it is reasonable to expect the report to be completed in 12–18 months and this would identity future actions, although the amount of time to implement those further actions and reap the benefits might be more than five years from the initial work on a report.

10.3.1.5 Spatial Issues

None

10.3.1.6 Displacement

[29] https://historicengland.org.uk/advice/caring-for-heritage/rural-heritage/farm-buildings/

None

10.3.1.7 Maintenance and Longevity
None. Longevity will depend on review cycle of documents and if any major changes occur on the holding.

10.3.1.8 Climate Adaptation or Mitigation
None

10.3.1.9 Climate factors / Constraints
None

10.3.1.10 Benefits and Trade-offs to Farmer/Land manager
A clear articulation of how a geological SSSI fits into the landscape on their holding could help secure support and funding for future actions.

10.3.1.11 Uptake
As landscape character assessments are desk and field-study orientated rather than involving physical changes, the option is likely to be attractive especially in area with other designations such as AONBs.

10.3.1.12 Other Notes
N/A

10.3.2 EBHE-233 Control scrub or trees to maintain views

Most of the guidance from DEFRA to land managers in the Future Farming Blog article is focused on controlling trees and scrub growing on, or near, geodiversity features, and this class of action would be covered more aptly by action within the Geodiversity Actions bundle by **EHBE-316**. However, the blog article does make clear that actions to improve sightlines to a range of features, including large-scale geodiversity features, are part of a broader package of indicators that a feature is well-managed. The article makes specific mention of opening, or improving, sightlines to geodiversity features from public rights of way and accessible buildings.[30]

EBHE-233	**Control scrub or trees to maintain views**	*T

10.3.2.1 Causality
This action deals specifically with opening or improving sightlines to large-scale geodiversity features where the control or removal of vegetation is feasible. Specific reference is made to visibility from public rights of way and accessible buildings. Thus the range of sites that would meet the criterion of maintaining geological SSSIs in favourable condition is limited by the scale of features and whether there are public vantage points for the large-scale feature, which limits the usefulness of this action, compared to the control of trees and scrub on features themselves, where a wider range of features of interest may be visible or damage by roots would be the threat to site condition.

10.3.2.2 Co-benefits and Trade-offs
Depending on other features in a landscape, there is potential for multiple feature classes to benefit from control of trees and scrub. Trade-offs are similar to those for **EBHE-316**.

10.3.2.3 Magnitude
A limited number of sites will have the sort of features that would benefit from this action.

10.3.2.4 Timescale
0-5 years: Once clearance of a sightline has taken place, the benefit is realised.

[30] https://defrafarming.blog.gov.uk/remove-tree-and-scrub-cover-from-sensitive-features

10.3.2.5 Spatial Issues
See **EBHE-316**

10.3.2.6 Displacement
Potential impacts on sightlines or landscape character in the wider area.

10.3.2.7 Maintenance and Longevity
See **EBHE-316**

10.3.2.8 Climate Adaptation or Mitigation
None

10.3.2.9 Climate factors / Constraints
None

10.3.2.10 Benefits and Trade-offs to Farmer/Land manager
No clear benefits. The removal of trees could be a point of conflict with other users.

10.3.2.11 Uptake
Limited evidence on geodiversity aspect. Scrub control may be more attractive than removal of larger, mature trees. If there are benefits to other feature classes or actions, then this would increase the attractiveness of the action. Geodiversity alone is likely to be less of a driver to action, given its relatively lower public profile in most areas.

10.3.2.12 Other Notes
N/A

10.3.3 Restoration, management and enhancement: Boundary features

EBHE-219: Install/ manage invisible fencing

On some geodiversity sites, there is a need for visible safety fencing, and other geotechnical safety measures and signage. However, this can be a disbenefit, making the geological features of importance on a site harder to study or access. Macadam (2018) noted that this be off-putting for people coming to view the geological interest but there are wider visual impacts to fencing, especially in areas where it is out of keeping with local wall or fence styles. Invisible fencing can be of particular use where grazing by livestock is being used as a management tool but there is also scope to use invisible fencing to exclude grazers from the area of geodiversity interest without interfering with sightlines or sense of place. NoFence was developed for containing goat herds in mountainous areas of Norway and such systems do have significant potential[31].

EBHE-219	Install/ manage invisible fencing	*TL

10.3.3.1 Causality
The action discussed here is distinct from safety fencing and is aimed at maintaining or improving the condition of sites by eliminating or lowering the visual impact on sites that could have a detrimental visual impact. An invisible fencing system would have benefits if being used to avoid obscuring geological features. Systems can be used in areas that are too large, too steep or have other reasons why physical fencing would be unfeasible. On a limited number of fluvial sites, there could be benefits to the use of invisible fencing to excluded livestock from poaching activities near or in active channels. Poaching and resulting erosion on geodiversity features can also be an issue that requires management.

10.3.3.2 Co-benefits and Trade-offs

[31] https://www.farminguk.com/news/no-boundaries-livestock-farming-without-fencing_57240.html

Co-benefits are likely to be very site specific and relate to other actions on a particular site and the surrounding area. Most of the EBHE cultural services benefits would focus on visual and landscape character aspects but use of invisible fencing could allow a wider range of options for vegetation management by grazing animals. A trade-off with such systems is that they cannot exclude animals not fitted with collars and the lack of a physical fence cannot exclude other animals or people, which may be undesirable if there are other management considerations.

10.3.3.3 Magnitude
Variable and generally limited range of sites. At present, only sheep, cattle and goats have been fitted with collars for invisible fences.

10.3.3.4 Timescale
0-5 years: The deployment of virtual fencing could be quite rapid and then there is a period when the animals fitted with collars need to become conditioned to the audio and other cues.

10.3.3.5 Spatial Issues
In the case of completely virtual systems, none. Some systems in use in England have wires buried in the ground but there is no obvious spatial issue.

10.3.3.6 Displacement
None

10.3.3.7 Maintenance and Longevity
A virtual system would need maintenance of the software and hardware components. Changes in the perimeter of the exclusion area would require updates and there would be ongoing checks that any collars or other devices fitted to animals were not causing harm.

10.3.3.8 Climate Adaptation or Mitigation
None

10.3.3.9 Climate factors / Constraints
None

10.3.3.10 Benefits and Trade-offs to Farmer/Land manager
Work using invisible fencing in Glentrool in Dumfries and Galloway has shown the potential benefits in extensive upland areas where building and maintaining physical fences would be demanding. Some sorts of invisible fence system may be cheaper than physical fencing The system in place in Glentrool, an area popular for outdoor activities, is capable of informing walkers where the current cattle boundary is and thus offers an effective trade-off between responsible access and conservation objectives.[32]

10.3.3.11 Uptake
Invisible fencing systems are still relatively novel developments but the experience in Norway and early use in Glentrool do suggest that this technology would be attractive to some farmers and land-managers in areas with geological SSSIs.

10.3.3.12 Other Notes
N/A

10.3.4 Create and enhance access and PROW

EBHE-008: Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation

[32] https://www.dgwgo.com/rural-farming-news/grazing-cattle-in-glentrool-with-invisible-fence-technology/

The use of infrastructure within sites is not always required but an experience that has been repeated on many sites where there is an increase in visitor numbers is the need to combine the direct protection of key features by physical barriers with the management of the access routes. Not all geological SSSIs will be vulnerable and require such interventions but those site where a source of fragility is literal increased footfall can benefit with targeted infrastructure. Pijet & Pijet-Migon (2023) contains a pertinent case study on the cones of mud volcanoes at the geopark of Salse di Nirano in Italy.

EBHE-008	Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation	*TD

10.3.4.1 Causality

Simply put, sufficient human foot traffic can have detrimental effects on some, but not all, geological SSSIs. Some will be robust to foot traffic and on other sites, the exposures of interest will either be buried or on vertical faces. It must be stressed that with the effects of social media promotion, the increase in visitors to some sites can be massive in just a few years, possibly on a shorter time interval than routine site condition visits by Natural England staff. The use of boardwalks and other constructed paths and walkways can protect surface features, while the use of physical barriers or other techniques within the geodiversity actions list can protect key features of interest. Examples of both positive effects on controlling visitor movement and failures of infrastructure, even with quite limited visitor numbers, to control effects of visitor access have been discussed in a review by Dowling and Newsome (2017).

10.3.4.2 Co-benefits and Trade-offs

By guiding visitors on defined routes, locating other elements of signage, interpretation and other facilities becomes simpler. Viewpoints of key points of interest around the site will be fixed and thus it becomes easier to make clear diagrams available. Reducing disturbance if other aspects of nature, both living and non-living, can be beneficial to the overall quality of the site across a range of categories. Trade-offs centre on the introduction of new human structures into the area, a possible increase in visitor numbers and restrictions to route selection. Dowling and Newsome (2017) discuss the possible negative impacts of site management infrastructure on the very features they are intended to protect.

10.3.4.3 Magnitude

This will vary by the type of geodiversity features on the site and the vulnerability of features of interest to literal footfall on the site.

10.3.4.4 Timescale

On sites where the features are rocks or, in some cases, relict geomorphology, the benefits will happen immediately by excluding most people from sensitive features. Where the feature is active or there are erosion issues on relict landforms, recovery may take some time to stabilise and recover.

10.3.4.5 Spatial Issues

In some cases, land would be taken out of production or other uses if infrastructure is sited in a particular place.

10.3.4.6 Displacement

None

10.3.4.7 Maintenance and Longevity

Any infrastructure requires regular checking and a range of maintenance activity to make sure it remains safe to use. The longevity will vary by specific environments but a lifespan duration of 30–50 years would be typical. Monitoring the effectiveness is also an important task and other measures, such as guided geodiversity walks offer what is regarded as the best means of explaining why access controls are in place (Newsome & Dowling

10.3.4.8 Climate Adaptation or Mitigation

None

10.3.4.9 Climate factors / Constraints

None

10.3.4.10 Benefits and Trade-offs to Farmer/Land manager

A proactive decision to manage a site that is experiencing increased visitor numbers could avoid a legal order to implement such work being issued. This allows more time for planning, funding and other support to be sought and could lead to better long-term outcomes for those responsible for the condition of the site.

10.3.4.11 Uptake

Difficult to predict but sites that involve active processes, such as dunes, fluvial systems or relict geomorphological features are likely to be better targets than many sites with lithified deposits.

10.3.4.12 Other Notes

N/A

10.3.5 EHBE-211: Create/ maintain controlled access to sand dunes

Sand dunes are attractive areas in themselves and often need to be crossed to reach beaches. Within Europe, they are one of the most at-risk habitats and the decline of mixed farming has had a significant impact on dune systems in some areas of England[33]. Dune systems can be relict or active. In the case of relict systems, the dunes are no longer being replenished by sediment and are thus more at risk from erosion by uncontrolled access than active systems. Nonetheless, if an active dune system is being subjected to erosion at a greater rate than new sediment is being supplied, the result can be the degradation of the dunes. By creating or maintaining controlled access routes, the two benefits are the overall reduction in damage of dune vegetation and related erosion. By controlling access, this also allows the concentration of resources and actions in those areas where access is being taken. However, Jones et al. (2021) give good guidance that visitor access can be maintained by accepting there are lines and areas of desire for visitors. This 'honey-pot' effect can be a positive advantage, as it can allow erosion to be contained within a small, predictable area.

EHBE-211	Create/ maintain controlled access to sand dunes	**T

10.3.5.1 Causality

Sand dunes are vulnerable to erosion by wind and wave action but also need a continuing supply of sediment if they are to remain active systems. Control of access and maintaining controlled access where this is already in place can limit erosion by human activity. Increased erosion by people crossing sand dunes is usually either related to trampling of vegetation that binds the dune faces at steeper angles than would be possible without vegetation. The loss of the vegetation leads to collapse of the dune face. Where sand is unconsolidated in any part of the dune system, animals or people crossing these unconsolidated areas can allow the sediment to be remobilised and moved more rapidly. However, in some cases small-scale disturbances by humans can create areas of open sand, which has benefits for rare elements in the flora (Jones et al. 2021, p. 15). By controlling access, these impacts can be reduced or eliminated. Controlled access also allows targeted monitoring and restoration activities. Strandlines with embryonic dunes forming are probably another area where controlled access, on a temporary basis, can be beneficial and justifiable.

10.3.5.2 Co-benefits and Trade-offs

Strong similarities to **EBHE-008**. Reducing disturbance if other aspects of nature, both living and non-living, can be beneficial to the overall quality of the site across a range of categories. Trade-offs centre on the introduction of new human structures into the area, a possible increase in visitor numbers and restrictions to route selection.

10.3.5.3 Magnitude

[33] https://dynamicdunescapes.co.uk/about-sand-dunes/stats-and-facts/

Within the context of the geodiversity theme, the action would only impact upon a quite limited number of properties where there is a SSSI notification in relation to sand dunes. However, on such sites, the action could support other actions in the dune system. Equally, this action would benefit from other related actions for sand dune system management.

10.3.5.4 Timescale
Probably > 5 years, as the recovery period will be variable, although this can be speeded up by support from other restoration actions.

10.3.5.5 Spatial Issues
None

10.3.5.6 Displacement
None

10.3.5.7 Maintenance and Longevity
If the control of access can be successfully maintained, the only maintenance is likely to focus on signage, possibly supported by fencing and boardwalk systems. Access paths may need to be rotated to give relief to different areas of the dune system.

10.3.5.8 Climate Adaptation or Mitigation
None

10.3.5.9 Climate factors / Constraints
None

10.3.5.10 Benefits and Trade-offs to Farmer/Land manager
Controlling access to protect dune systems could allow for other measures to be introduced that would broaden the types of farming activity that might be undertaken, such as bringing in conservation grazing. Reducing the amount of windblown sediment would be another possible benefit.

10.3.5.11 Uptake
If the farmer or landowner is involved in other stewardship activities in relation to sand dunes, this action could support those actions.

10.3.5.12 Other Notes
N/A

10.4 Bundle Signposting, information, facilities and events

Firstly, although the actions in this bundle in this particular theme report vary in their potential to deliver direct geodiversity benefits, some are potentially much broader and could be applied to other themes in biodiversity and heritage contexts.

Moving to the specifics of the benefits of these actions and their implementation, there are those actions that have a clear, direct link to maintaining geological SSSIs in favourable condition. Guided geodiversity walks are an excellent example, where there can be messaging about a particular site and what actions can be taken by the people on the walk and why certain management actions are being undertaken.

A less direct route that could have broader impacts and work at the level of ‘existence value’ is making people aware of the fact that some sites are conserved for their geological interest, which is still not nearly as widely understood as the need for biodiversity and habitat conservation or the conservation of heritage and archaeological sites. By garnering support for the maintenance of the network of geological SSSIs, there is a diffuse benefit but how that translates into payments to individual scheme members would require further consideration by those with expertise in rural payment schemes. This group of actions would focus on what Prosser et al. (2006) defined as threat deflection, which is difficult to measure with reference to particular actions by a particular land manager as the absence of damage to the feature(s) is the outcome.

Figure 2 below gives some idea of how interpretation methods were used in a survey of geoparks in Germany. Although this information is now dated, as the survey took place in 2016, the distribution gives some idea of the relative use of different methods of communicating with visitors about geodiversity. Guided walks, trails and fixed interpretative boards and materials are preferred over the solutions based on mobile technologies. While there might be some increase in uptake of mobile technology-based solutions, the vast majority of interpretation is still done by the higher frequency methods.

Finally, there is the need to make visitors aware of the activities that the impressive geodiversity of England, in a relatively small land area, makes possible and promoting the value of such activities for tourism and physical and mental well-being. Many of the actions in this bundle would contribute to that outcome.

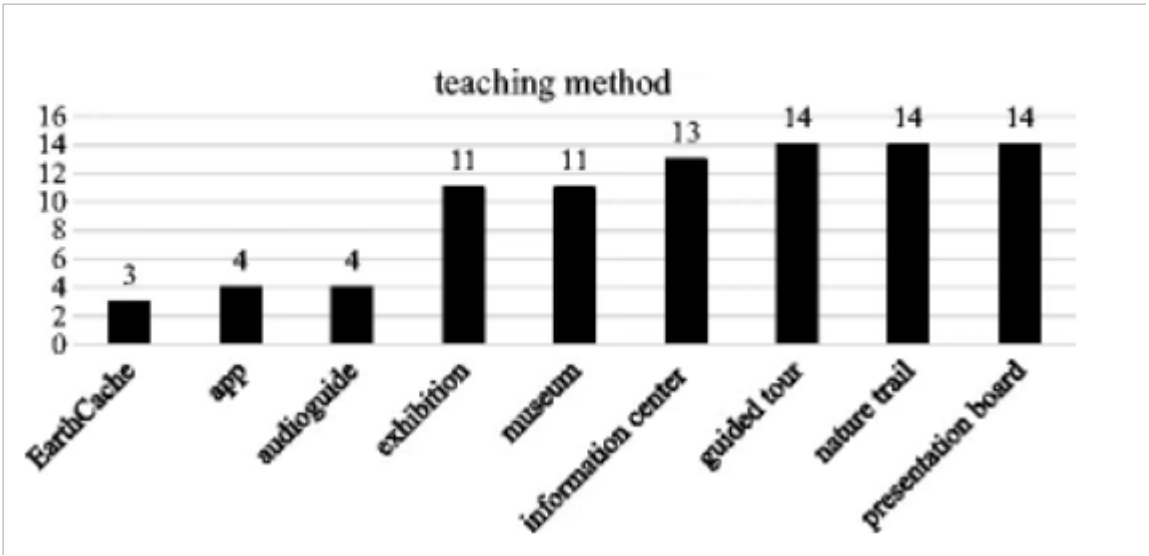

Figure 2: Breakdown of methods used by German geoparks to carry out interpretation from Zecha and Regelous (2018; fig. 4). CC-BY-SA 4.0

10.4.1 EBHE-069: Provide guided geodiversity walks

Walks guided by knowledgeable providers offer a key means of engaging with people about geodiversity and the significance of individual sites within the wider context of the network of SSSIs. Geodiversity and geoconservation efforts have been hampered by the difficulty of explaining why non-living nature needs protection at all. Geodiversity walks could also be incorporated into other events, such as science or walking festivals in suitable areas. Numerous authors regard the provision of guided walks or guiding services as the best means to inform and educate visitors while offering protection to the site features without having to rely solely upon infrastructure or interpretation materials. (Dowling and Newsome 2017; Gordon 2018; Macadam 2018).

EBHE-069	Provide guided geodiversity walks	***

10.4.1.1 Causality

The direct causal mechanism is by explaining to participants what a geological SSSI is, explaining why a given site, or group of sites, have been designated for geological or geomorphological interest and then explaining possible threats. At the same time, a guide can explain what is permissible on a site. An especially pertinent example would be explaining to a group why the use of hammers is not allowed on a site. Guided walks will often be part of a wider programme to promote knowledge and understanding of a site or a topic and the guides will be able to guide participants towards other resources. Guides can alter their approach to different groups and use non-technical approaches involving stories, art or poetry that

can avoid the trap of presenting the Earth Science view of the features as the only possible narrative (Gordon 2018).

10.4.1.2 Co-benefits and Trade-offs

The specialist knowledge and experience of providers of geodiversity walks will seldom be confined to Earth Sciences alone. Many providers will hold other qualifications, e.g. Mountain Training walking leadership awards or Blue Badge guides, and will be able to inform participants about other cultural services elements along the route or in the area. Guided walks can be demanding on staff time (Macadam 2018) but the use of specialist freelancers or volunteers can help with the costs on staff time.

10.4.1.3 Magnitude

Potentially one of the most significant actions, as guided walks have great potential to explain the topic in a face-to-face way with a great deal of flexibility in how the interpretation is carried out. Large impacts can be achieved with well-delivered guided walk programmes. Geopark programmes or geology festivals offer some of the best evidence of the potential impact.

10.4.1.4 Timescale

0-5 years: Once a walk has taken place, the impacts are likely to be immediate.

10.4.1.5 Spatial Issues

Walks tend to be about access only and there are no obvious spatial issues.

10.4.1.6 Displacement

None

10.4.1.7 Maintenance and Longevity

None

10.4.1.8 Climate Adaptation or Mitigation

None

10.4.1.9 Climate factors / Constraints

None

10.4.1.10 Benefits and Trade-offs to Farmer/Land manager

Guided walks by qualified people can offer the chance for other messages about the Countryside Code to be passed on. If there is scope for charging for walks, this could be a source of income.

10.4.1.11 Uptake

Uptake may be better as part of larger organised events, whether local or national, such as Open Farm Sunday. Involvement with larger events may also make participation on a voluntary or in-kind basis more likely.

10.4.1.12 Other Notes

None

10.4.2 EBHE-037: Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites

Interpretation displays and other supporting tools for interpretation are important for explaining why a site is significant and are well-established as a part of strategies for improving the visitor experience and understanding of sites, objects and exhibits in a wide range of settings (Ham 2013; Macadam 2018).
The geoparks around the UK and overseas will often be excellent sources of best practice and good ideas about how to implement these measures.

EBHE-037	Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites	**

10.4.2.1 Causality
Giving visitors clear guidance as to how to view or visit the site is a key to getting them to a site, or a suitable vantage point if access is restricted. At the site itself, interpretation that follows UNESCO guidance can improve the experience greatly, while giving clear guidance as to what activities are not permitted and why. (Macadam 2018). Visitors with specialist interests will have probably sought pre-visit information from more detailed guidebooks but the increasing use of digital technologies to create 'virtual heritage' and geovisualization tools are becoming increasingly important, as reviewed by Cayla and Martin (2018).

10.4.2.2 Co-benefits and Trade-offs
In situ signage and other materials can help to reduce possible problems resulting from a lack of understanding about why a site is sensitive and can curtail potential damage. A trade-off would be the issues that could attend increased visitor numbers in any context and more specific concerns about possible unwitting or deliberate damage to a SSSI. Vandalism of physical interpretation boards and signage is unfortunately a problem on some sites and these boards can also degrade due to weather and environmental factors over time. Such boards are often expensive to replace.

10.4.2.3 Magnitude
Most of the actions to keep SSSIs in favourable conditions are not going to be directly impacted through this action. However, raising awareness of why particular sites are designated and that such sites require and warrant protection is an important message to convey if wider support for the network of geological SSSIs is to be maintained.

10.4.2.4 Timescale
0-5 years: The amount of time to produce materials for visitors can vary considerably. In many cases, some material or information will already be available. The key to this action is making information accessible and apprehensible by a broader group of users.

10.4.2.5 Spatial Issues
Likely to be limited. Small areas may need to be set aside for signage or interpretation boards or changes to paths to widen access.

10.4.2.6 Displacement
None

10.4.2.7 Maintenance and Longevity
As with any information, there can be changes over time. Electronic resources and social media messaging can offer flexible means of updating users on changes. Printed material will sometimes be overtaken by events but an element of 'future-proofing' can be added by directing users to other resources to check their plans before a visit. Leaflets can stay in circulation for a long-time without updates, easily 10-20 years. Some organizations will have two sets of interpretation boards made at once, funds permitting, to allow rapid replacement and the spare set can be used for indoor exhibitions away from the site.

10.4.2.8 Climate Adaptation or Mitigation
None

10.4.2.9 Climate factors / Constraints
None

10.4.2.10 Benefits and Trade-offs to Farmer/Land manager
Providing information can help to manage visitor expectations and the access routes they take, as well as providing broader messages about activities in the area.

10.4.2.11 Uptake
Likely to be a sliding scale of uptake in terms of how much funding and effort goes into a site.

10.4.2.12 Other Notes
N/A

10.4.3 EBHE-051: Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities

EBHE-051	Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities	**

10.4.3.1 Causality
Duplicate evidence for **EBHE-249**

10.4.3.2 Co-benefits and Trade-offs
Similar but there is an issue around possible impacts that would need to be managed. Well-thought out and planned opportunities can help to remove pressure and unintended damage from collecting while offering help and guidance. In cases where the site(s) used to provide opportunities are unproductive or difficult to cultivate, e.g., old quarries or pits or spoil heaps, this sort of action could be done without sacrificing land suitable for food or fibre production.

10.4.3.3 Magnitude
Areas where there is a desire to collect material will derive more benefit by offering new places or maintaining current sites where collecting is permitted and safe.

10.4.3.4 Timescale
0-5 years: Once facility has been constructed it will begin to divert activity to the site and away from more sensitive sites. By maintaining facilities that already exist, this will make sure that interest in that location is maintained and remove the temptation to start prospecting for new sites where the activity might have a detrimental influence on site condition.

10.4.3.5 Spatial Issues
The creation of new spaces for these activities could require the repurposing of areas and work to make such areas accessible and safe for users. Activities that focus upon collecting will tend to generate varying amounts of spoil. Waste rock does have a range of possible uses, but it is likely to need some management to keep the area safe and inviting. With sites that are currently in use, only the management of spoil is likely to be an issue.

10.4.3.6 Displacement
None

10.4.3.7 Maintenance and Longevity
Safety on such sites will require maintenance work of fences and other features put in place to safeguard users, along with any interpretative features or resources. The longevity of a site will depend on whether it is a self-renewing resource, such as a beach, or a more limited inland site such as a quarry. In cases where material is being placed or brought to a site, this would require more maintenance to retain the site as a viable place to collect specimens. An option to extend the longevity of sites would be to bring in material in line with **EBHE-249** Create Rock Piles action.

10.4.3.8 Climate Adaptation or Mitigation
None

10.4.3.9 Climate factors / Constraints
None

10.4.3.10 Benefits and Trade-offs to Farmer/Land manager
A potential way to diversify farm businesses. Quarries or areas close to cliffs will be difficult to manage for crops or livestock and turning these sites over to other actions could be an attractive option. In some other countries, landowners have been paid considerable sums for material found on their property. With minerals or rocks this tends to be less problematic but significant issues surround fossil discoveries. However, the legal position is clear in England that the owner of the mineral rights has title to material and it is their property to do with as they wish.

10.4.3.11 Uptake
Quite difficult to assess in England. Most collecting focuses either on coastal sites or disused quarries where there is a good history of the owner granting permission. Some farmers and land managers may be reluctant to promote collecting if there is a sensitive site nearby.

10.4.3.12 Other Notes
N/A

10.4.4 EHBE-060: Host school visits including forest schools and beach schools

School visits are often a key element of introducing young people to the wider world, especially through outdoor learning, education or other activities. The condition of geological SSSIs would be a subset of wider work to improve understanding of environmental matters, although there are some instances in which school visits would focus upon geological features. An additional benefit of engaging school groups is that the pupils may go on to inform family members and others in their community about geodiversity, widening opportunities to raise awareness and interest in the status of geological SSSIs.

EHBE-060	Host school visits including forest schools and beach schools	***

10.4.4.1 Causality
Hosting visits by schools offers an opportunity for pupils and accompanying adults to be introduced to geodiversity as a concept, with geological SSSIs as exemplar sites. Explaining why geological and geomorphological features need management and protection will have the positive effect of raising awareness of the topic, which may get relatively little coverage in the curriculum and, as the uptake of geology at school is quite limited, such visits may be the only instance in which a session focuses on this topic. The development of understanding about how the 'non-living' elements of ecosystems can be part of nature is often overlooked by a focus on biodiversity. Discussion of actions that can help maintain geological SSSIs in good condition should be a key part of such visits. This action could have long-term impacts on support for maintaining geological SSSIs and influence behaviour into adulthood. Children often influence their communities in respect to other aspects of environmental stewardship and this is another possible positive strand to the action. As such, this would be an extension of taking advantage of associations between pro-environmental behaviour and nature visits (Alcock et al. 2020; Zecha 2010).

10.4.4.2 Co-benefits and Trade-offs
Reinforcement of messages about stewardship actions that would be more familiar in the context of biodiversity or pollution. Some individuals or schools may want to become involved in monitoring or conservation actions on geological SSSIs. No obvious trade-offs.

10.4.4.3 Magnitude
This is action is likely to have its effect by raising awareness and changing attitudes, so this is likely to be a diffuse effect but would build support for the general principles of geoconservation, especially if the school is not local.

10.4.4.4 Timescale
Over 10 years: Most of the impact for children taking part in such visits may not be realised until they approach adulthood but some older pupils and adults taking part may be able to take or support actions that will benefit the condition of geological SSSIs in a shorter time.

10.4.4.5 Spatial Issues
Variable depending on group size and nature of visit.

10.4.4.6 Displacement
None

10.4.4.7 Maintenance and Longevity
No maintenance, as such an action is not about infrastructure or materials. The longevity of the impact of such experiences can be life-long.

10.4.4.8 Climate Adaptation or Mitigation
None

10.4.4.9 Climate factors / Constraints
None

10.4.4.10 Benefits and Trade-offs to Farmer/Land manager
Opportunity to engage with school pupils on other topics and build goodwill.

10.4.4.11 Uptake
Likely to be varied. Some sites will be too remote or difficult to access but others will be suitable for some groups.

10.4.4.12 Other Notes
N/A

10.4.5 EHBE-066: Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity and biodiversity

Cayla and Martin (2018) offered a useful discussion about interactivity and make the case that for site-based interpretation a well-designed interactive activity can offer playfulness and guide the target audiences to explore the information that is available to learn from a particular place. The geocaching actions discussed in this bundle (**EBHE-054** & 057) are good examples of such an approach.

EHBE-066	Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity and biodiversity	**

10.4.5.1 Causality
The key word in this action is 'interactive'. As Macadam (2018 p. 268) notes the dynamic interplay between what non-specialists already know, what they would like to know and what specialists, via a range of channels should aim to tell them. Although Macadam (2018) is focused on geodiversity, this observation is the case for all the topics mentioned within this action title. The interactivity element allows more scope for a dialogue between the specialists and the wider public. Macadam (2018) makes the value of allowing visitors to handle actual specimens as a means of working with the materials and sparking other questions, setting-up a reciprocal cycle of doing an activity, thinking about aspects of the activity and then asking for clarification or more information.

10.4.5.2 Co-benefits and Trade-offs
Depending on the exact nature of the activity, there can be benefits to nature survey or citizen science projects. A good example, relating to geocaching, is the potential for photos taken at Earthcache sites to provide a monitoring record for land managers (Zecha and Regelous 2018).

10.4.5.3 Magnitude
Many sites and topics will need interpretation for non-specialists and active engagement is often an excellent means of deriving support for a range of conservation activities.

10.4.5.4 Timescale
0-5 years: Some initial investigation of what people would like to know about specific sites could be done relatively quickly and then the time to deliver an activity will vary, depending on resources and whether there are 'off-the-shelf' activities that are suitable for a particular interpretive task.

10.4.5.5 Spatial Issues
None

10.4.5.6 Displacement
None

10.4.5.7 Maintenance and Longevity

Depends on the exact nature of the interactive activity.

10.4.5.8 Climate Adaptation or Mitigation
None

10.4.5.9 Climate factors / Constraints
None

10.4.5.10 Benefits and Trade-offs to Farmer/Land manager
Multiple topics can be covered, including those relating directly to the core activities on a site.

10.4.5.11 Uptake
More likely to be taken on by organizations with access to people who can help with the design and running of this sort of activity and by those with previous experience of running this sort of interactive activity. Specialist support would be needed for some topics.

10.4.5.12 Other Notes
N/A

10.4.6 EBHE-071: Provide fossil, mineral and rock hunting and collecting open events and days

Open events and days can create a sense of occasion that is different from simply offering opportunities to collect fossils or minerals on a site, although such sites can form a focus for events. Events can offer the increased visitor numbers that can make other actions, such as providing guided geodiversity walks more worthwhile, given the increased number of visitors.

EBHE-071	Provide fossil, mineral and rock hunting and collecting open events and days	**

10.4.6.1 Causality
Although this is allied to some of the other actions in this bundle, the action is distinctive as it focuses on an event rather than just offering the opportunity to carry out some fossil-hunting or rockhounding. An event or open day will focus on providing more interpretation and support than simply allowing access or opportunities to collect. Macadam (2018 p. 282-283) developed a good case for making real specimens and materials available for people to touch, hold and interact with. Open days are another approach to offering such experiences and can often draw in support from other individuals or organizations for events where a continual presence cannot be maintained.

10.4.6.2 Co-benefits and Trade-offs
Such events can act as a draw for first-time or infrequent visitors. Several geological festivals have been staged in areas with strong tourist economies to either start the season early or extend the season (e.g., Lyme Regis Fossil Festival). Events or open days can offer social interactions and the wider physical and mental benefits of going out into natural or semi-natural settings.

10.4.6.3 Magnitude
As this sort of open day would be aimed at promoting wider appreciation of geodiversity and why it needs to be protected, the size of the impact is likely to be quite small on individual sites. However, if there are small or easily impacted sites, there could be greater benefits to diverting visitors with activities that do not directly impinge on the site.

10.4.6.4 Timescale
0-5 years: Once the open day runs it will have had some impact. The question is how long the impact will persist and that is difficult to gauge.

10.4.6.5 Spatial Issues
If events are to be held, a suitable venue with enough capacity, access and facilities will be needed.

10.4.6.6 Displacement
None

10.4.6.7 Maintenance and Longevity
No maintenance as such. Longevity is difficult to assess, as the outcomes can be split into attitudinal changes and the direct protection of a site by threat deflection by shifting collecting activity (Prosser et al. 2006).

10.4.6.8 Climate Adaptation or Mitigation
None

10.4.6.9 Climate factors / Constraints
None

10.4.6.10 Benefits and Trade-offs to Farmer/Land manager
Possible alternative source of income. Loss of use of area for duration of event.

10.4.6.11 Uptake
Difficult to say. Larger organizations are more likely to be able to support the logistics and arrangements for interactive engagement events but this need not preclude small events run on a single property.

10.4.6.12 Other Notes
N/A

10.4.7 EBHE-050: Create/ maintain demonstration or outdoor classroom sites (e.g., for talks or lessons)

Demonstration or outdoor classroom sites can have two functions. Demonstration sites will tend to be focused on a particular topic or feature, while outdoor classrooms are much more flexible spaces that can be used in a range of ways. However, being able to run lessons on a site offers a chance for a richer experience. For example, The Burren Geopark has an ambition to build a network of outdoor classrooms to support understanding of a range of topics across Earth Sciences, ecology, archaeology and climate change[34].

EBHE-050	Create/ maintain demonstration or outdoor classroom sites (e.g., for talks or lessons)	**

10.4.7.1 Causality
The provision of demonstration sites or outdoor classrooms will give teachers, lecturers or guides a wider range of options as to how they deliver information about a site. Such provision allows interpretive materials to be used in a site-specific context while making it possible to use a wider range of materials in a more familiar classroom context for users and those running lessons or experiences. Knowing that such a facility is available can allow the use of methods and materials that would not be as easy if the interpretation relies on objects or materials being passed around from hand-to-hand. Larger posters or maps are also much better shared on a table or pinned up on a board. By improving communication about a site, which can include what actions are needed to maintain a site in favourable condition, there is the opportunity to improve understanding and awareness of geological SSSIs.

10.4.7.2 Co-benefits and Trade-offs
Other user groups can make use of such classrooms and they can also be open to more casual use as stopping points.

10.4.7.3 Magnitude
Difficult to assess without detailed survey of existing provision. The size of the impact is likely to be variable and the focus is likely to be upon better explanation and interpretation of a site. If the site does not have fixed interpretative materials that relate to the geological SSSI, then the classroom is unlikely to have as

[34] https://www.burrengeopark.ie/learn-engage/

great an impact but such spaces do need to be flexible to get the greatest aggregate result across all possible uses and users.

10.4.7.4 Timescale

0-5 years: Once facility has been constructed, it is likely groups will start making informal use straight away and a key issue would be making sure that possible user groups are aware of the facility and, if possible, making it bookable. Once programmes that have some geodiversity content begin to use the space, that is the point at which benefits will begin to be realised.

10.4.7.5 Spatial Issues

An area is likely to need to be devoted to a demonstration site or outdoor classroom facility and possibly an access route to the outdoor classroom facility.

10.4.7.6 Displacement

None

10.4.7.7 Maintenance and Longevity

Sites can vary in the materials used and the weather conditions they are exposed to and are likely to need monitoring for safety as well. Planning for maintenance and replacement of elements is important in maintaining an attractive and usable space. The longevity of the site will depend on such work and is likely to be limited by funding. However, the impact of awareness-raising among users is potentially long-lasting and can have wider impacts.

10.4.7.8 Climate Adaptation or Mitigation

None

10.4.7.9 Climate factors / Constraints

None

10.4.7.10 Benefits and Trade-offs to Farmer/Land manager

Such could have uses for the routine activities of farmers or land managers for aspects of their work. Depending on the size and quality of the facility, it could offer an alternative income stream.

10.4.7.11 Uptake

Quite difficult to assess, as the definition of an outdoor classroom is quite difficult to separate from the provision of types of infrastructure that would be usable as outdoor classrooms.

10.4.7.12 Other Notes

N/A

10.4.8 EBHE-052: Create/ maintain places for nature survey opportunities

Geodiversity is the expression of abiotic nature, whether as features or processes. As such similar opportunities exist for nature surveys of aspects of geodiversity as there are for the survey of biodiversity. The difference is in the type of survey and the need for more specialist knowledge and resources to identify fossils, minerals and rock types. However, much of this baseline knowledge is already available from geological, geomorphological and soil mapping. As organizations such as the British Geological Survey and national and regional geological societies have made material such as map memoirs and field guides freely available online, the access to information has become much easier. By framing geodiversity as a type of nature survey activity, this would widen understanding about rocks, landforms and soils as a component of the ecosystems and a resource that needs to be understood, managed and protected to some degree alongside biodiversity. The boundaries between this action and citizen science (**EBHE-053**) could be blurry but the line could be drawn between survey work that requires only access for appraisal, recording and monitoring and activities that have a particular question or group of questions that are to be studied as part of the project.

EBHE-052	Create/ maintain places for nature survey opportunities	*

10.4.8.1 Causality

In the context of geodiversity sites the nature survey work is likely to focus on site condition monitoring and possibly a 'watching brief' for significant changes to the site or items such as fossils or minerals weathering out. This could then lead to the preservation, recording and identification of this material.

10.4.8.2 Co-benefits and Trade-offs

Monitoring of sites of geodiversity interest would be beneficial for providing statutory bodies (e.g., Natural England) additional information about the condition of SSSI sites between visits from staff or volunteers (site wardens) acting directly on behalf of the statutory body. In the case of sites where there is change through natural processes, this could also provide early notification of scientifically significant events such as landslips exposing bedrock or fossils being eroded out. A broader co-benefit would be the opportunity for educational groups to have access to spaces where field observation and recording skills in Earth Sciences can be practised in a purposeful manner. A possible trade-off is raising awareness of sites of importance but this can be accompanied by benefits from making people in the vicinity aware of the significance of SSSIs and make them more inclined to report suspicious or illegal activity, which may enhance the security of the site. Other activities, such as investigations of local geodiversity sites, soils or geomorphological processes would not contribute directly to the service indicator but are able to make wider contributions to cultural services.

10.4.8.3 Magnitude

Improving nature survey work of all sorts has been of huge importance in biodiversity work in the UK in monitoring populations. Surveying of geodiversity sites could offer widespread and significant benefits to the condition of geological SSSIs.

10.4.8.4 Timescale

0-5 years: Benefits focused on developing skills in monitoring geodiversity could be realised rapidly, as these are about providing the training and understanding to carry out surveys, but the benefits to site condition of SSSIs may take longer to realise as there may be remedial action required but the benefit of having survey work being carried out will be reflected in early warning and, it is to be hoped, early action to restore the condition of the site, if possible.

10.4.8.5 Spatial Issues

Survey work tends to be about access only and there are no obvious spatial issues

10.4.8.6 Displacement

None

10.4.8.7 Maintenance and Longevity

Survey work will not place any direct maintenance burden on landowners or managers. However, for survey work to have longevity it needs to be supported and valued. In particular, giving feedback to surveyors about how their efforts are helping the understanding and protection of a site has been identified as a key element for maintaining volunteer engagement.

10.4.8.8 Climate Adaptation or Mitigation

None

10.4.8.9 Climate factors / Constraints

None

10.4.8.10 Benefits and Trade-offs to Farmer/Land manager

Having survey activity on SSSIs would be of direct benefit in providing an idea of the condition of the site and provide information on any problems that are developing, which would allow early contact with Natural England or other statutory advice for support and advice. Having survey information shared would assist in moving the relationship between farmers and land managers towards the more supportive co-

working relationship detailed in the Defra SSSI code of guidance that aimed at securing positive management[35]

10.4.8.11 Uptake

While having support in monitoring any geological SSSIs could be of value, it may be that famers and landowners want to limit access, so it is rather uncertain how great uptake would be.

10.4.8.12 Other Notes

N/A

10.4.9 EBHE-057: Maintain places for geo-caching

Geocaches that are already placed will usually require much less effort to maintain than the establishment of new caches. This action would focus upon maintaining those caches that already exist but also consider using sites for providing more opportunities to focus on caches that would support other themes in the cultural services remit. Earthcaches associated with sites that have geological SSSIs would be a priority for the geodiversity theme. An example is this site on Golden Cap on the Jurassic Coast World Heritage Site[36] There are at least 1000 Earthcaches in England already.[37]

EBHE-057	Maintain places for geo-caching	*

10.4.9.1 Causality

Similar to **EHBE-054** but, as the cache is already present, this is evidence that it is not causing any problems and the site is suitable. Given that there is a review process for Earthcaches (see Zecha & Regelous 2018) it is more efficient to focus upon retaining those that are already listed.

10.4.9.2 Co-benefits and Trade-offs

Geocaching does require access to reach the cache and could increase visitor numbers and cause traffic or parking issues in some cases. However, as the farmer or land-manager is going to have control of the siting of the geocache, this problem should be limited.

10.4.9.3 Magnitude

Geocaching would be likely to only have a small direct impact on geodiversity but the hobby is popular and it does have considerable potential for a range of cultural services indicators if used to its fullest potential.

10.4.9.4 Timescale

0-5 years:

10.4.9.5 Spatial Issues

Survey work tends to be about access only and there are no obvious spatial issues

10.4.9.6 Displacement

None

10.4.9.7 Maintenance and Longevity

Survey

10.4.9.8 Climate Adaptation or Mitigation

None

10.4.9.9 Climate factors / Constraints

None

[35] https://defrafarming.blog.gov.uk/2021/11/29/how-farmers-in-protected-landscapes-are-using-their-funding/
[36] https://www.geocaching.com/geocache/GC62QXX_golden-cap-the-highest-view-on-the-south-coast
[37] https://www.geocaching.com/bookmarks/view.aspx?guid=3eb848dd-e5d8-4ba5-b1a3-5fbf855b389b

10.4.9.10 Benefits and Trade-offs to Farmer/Land manager

Geocaching could be used to communicate other messages about cultural services or land management, especially if a linked trail of caches is in place. Zecha & Regelous (2018) also noted that photographs taken as part of such activities can be used as monitoring tools.

10.4.9.11 Uptake

Limited evidence, although a detailed analysis of 1000 Earthcaches already in place in England might offer some insights.

10.4.9.12 Other Notes

N/A

10.4.10 EBHE-011: Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people

Pre-visit information is a key means of raising awareness of significant geodiversity sites, which can remain obscure to the wider population. Provision of this information increases the possibility that users will include a site or area in their plans. Maintaining pre-visit information is an important step to making SSSIs visible to the wider public and managing the expectations of what visitors may be able to do on those sites. For instance, if fossil or mineral collecting is not possible suggesting alternative sites or facilities can offer indirect protection to a site by diverting those activities to suitable locations, which can be a means of promoting the uptake of other actions in this bundle.

Access and route information, including appropriate signage on the ground, will provide reassurance to users who are not confident navigators, especially in those cases where a site of interest lies away from a more-travelled route. A concern that PANS highlights is the worry of becoming lost. Information about the accessibility of the route for a range of users is also important, as some user groups can be excluded by path features such as stiles or motor vehicle barriers that unintentionally block access for wheelchairs or adapted bikes.

Highlighting cases where using access by paddle can offer visitors a different means of viewing a site, especially cliff sections on rivers. The use of sea kayaks to view exposures on coastal sections on is a good example of this type of activity[38] and re-enacts the way that many of these sections were initially approached. The geoparks around the UK and overseas will often be excellent sources of best practice and good ideas about how to implement these measures.

In the specific case of geodiversity features on SSSIs, the lack of wider awareness of the reasons as to why a site is important and what scientific information the features contain is often quite obscure to non-specialists. Providing good interpretation via a range of methods is important in communicating to a wider audience why a site has been designated and, in some cases, why site boundaries include areas with no current exposure. Prosser (2010) detailed a legal case where the lack of communication about the need to protect inland areas of an eroding cliff caused significant conflict with the local community and resulted in poor media coverage of the issues at stake.

EBHE-011	Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people	*LT

[38] https://www.geomon.co.uk/geopark-activities/geotourism/

10.4.10.1 Causality
Raising awareness of the existence of geological SSSIs is an important part of garnering wider support for their protection. Pre-visit information can play a role in raising awareness among people who never physically visit a site. For those people who do wish to visit in person, giving them clear guidance as to how to view or visit the site is a key to getting them to a site, or a suitable vantage point if access is restricted. At the site itself, interpretation that follows UNESCO guidance will improve the experience greatly (Macadam 2018). Visitors with specialist interests will have probably sought pre-visit information from more detailed guidebooks.

10.4.10.2 Co-benefits and Trade-offs
A trade-off would be the issues that could attend increased visitor numbers in any context and more specific concerns about possible unwitting or deliberate damage to a SSSI.

10.4.10.3 Magnitude
Most of the actions to keep SSSIs in favourable conditions are not going to be directly impacted through this action. However, raising awareness of why particular sites are designated and that these sites do need and warrant protection is important for the network of geological SSSIs.

10.4.10.4 Timescale
0-5 years: The amount of time to produce materials for visitors can vary considerably. In many cases, some material or information will already be available. The key to this action is making information accessible and apprehensible by a broader group of users.

10.4.10.5 Spatial Issues
Likely to be limited. Small areas may need to be set aside for signage or interpretation boards or changes to paths to widen access.

10.4.10.6 Displacement
None

10.4.10.7 Maintenance and Longevity
As with any information, there can be changes over time. Electronic resources and social media messaging can offer flexible means of updating users on changes. Printed material will sometimes be overtaken by events but an element of 'future-proofing' can be added by directing users to other resources to check their plans before a visit. Leaflets can stay in circulation for a long-time without updates, easily 10-20 years. Physical signage can be subject to vandalism and degradation due to weather and environmental conditions. Interpretation boards can be particularly expensive yet vulnerable to damage and vandalism.

10.4.10.8 Climate Adaptation or Mitigation
None

10.4.10.9 Climate factors / Constraints
None

10.4.10.10 Benefits and Trade-offs to Farmer/Land manager
Providing information can help to manage visitor expectations and the access routes they take, as well as providing broader messages about activities in the area.

10.4.10.11 Uptake
Likely to be a sliding scale of uptake. The entry-level would be providing additional interpretation beyond the site designation document that will explain the significance of a site to a broader audience. Where access is possible, there could be a range of actions but clear route information from access points offers a way to manage the routes visitors take while helping them to reach the site. The lowest level of uptake is likely to focus on the provision of physical interpretation boards, which can still cost upwards of £1000.

10.4.10.12 Other Notes
N/A

10.4.11 EBHE-053: Create/ maintain places for citizen science opportunities

The boundaries between this action and citizen science (**EBHE-053**) could be blurry but the line could be drawn between survey work that requires only access for appraisal, recording and monitoring and activities that have a particular question or group of questions that are to be studied as part of the project.

EBHE-053	Create/ maintain places for citizen science opportunities	*LTD

10.4.11.1 Causality

In the context of geodiversity sites citizen science is likely to focus on site condition monitoring and possibly a 'watching brief' for significant changes to the site or items such as fossils or minerals weathering out. This could then lead to the preservation, recording and identification of this material with a view to adding it to museum collections or preparing scientific publications. Larger excavations, along the lines of community archaeology projects are possible in some cases if a suitable focus is available, such as a large vertebrate fossil specimen. AJM took part in a FossilBlitz as part of the scientific team near Lyme Regis in 2015 as part of the Fossil Festival but such events are still quite rare. Scientific work aimed at knowledge services production (see Table 1) is also possible if access and permission for sampling is permitted by the landowner and the appropriate statutory body or bodies. As non-invasive techniques driven by technology, such as drone survey, LiDAR and photogrammetry become more widespread, some of the concerns around damage and collecting issues could be offset while significant new information and interpretation can be gathered (Cayala and Martin 2018).

10.4.11.2 Co-benefits and Trade-offs

Such activities can offer an alternative route into volunteering or social action that complements the more traditional site conservation activity. A possible trade-off is raising awareness of sites of importance but this can be accompanied by benefits from making people in the vicinity aware of the significance of SSSIs and make them more inclined to report suspicious or illegal activity, which may enhance the security of the site. Other activities, such as investigations of local geodiversity sites, soils or geomorphological processes would not contribute directly to the service indicator but are able to make wider contributions to cultural services.

10.4.11.3 Magnitude

Limited instances so hard to make a statement.

10.4.11.4 Timescale

5-10 years: Science-led work can take longer to produce results than nature surveys that are aimed at producing data or other information but the results are likely to come out within a decade.

10.4.11.5 Spatial Issues

Possible loss of the use of parts of a holding during work.

10.4.11.6 Displacement

None

10.4.11.7 Maintenance and Longevity

None

10.4.11.8 Climate Adaptation or Mitigation

None

10.4.11.9 Climate factors / Constraints

None

10.4.11.10 Benefits and Trade-offs to Farmer/Land manager

Having survey information shared would assist in moving the relationship between farmers and land managers towards the more supportive co-working relationship detailed in the Defra SSSI code of guidance that aimed at securing positive management (Defra 2003).

10.4.11.11 Uptake

While having support in monitoring any geological SSSIs could be of value, it may be that famers and landowners want to limit access or collecting activity, so it is rather uncertain how great uptake would be.

10.4.11.12 Other Notes

N/A

10.4.12 EBHE-054: Create places for geo-caching

Geocaching is an activity that combines older location and puzzle-based games, known as letterboxing, with satellite navigation tools, usually on mobile devices, to run a global 'treasure hunt'[39]. The information and apps are free, although there are paid premium services. The Geological Society of America (GSA) has co-opted geocaching in the form of Earth Caches, which require that a finder answers questions with some Earth Science content to be able to 'log' the cache.[40] The development of Earthcaches for geodiversity education is still developing but the review of caches by GSA for quality control before they are added to the international Earthcache listing offers a chance for high quality resources at little additional cost.

EBHE-054	Create places for geo-caching	*LTD

10.4.12.1 Causality

Geocaches do involve the placement of physical objects and require landowner permissions to place the cache. People visiting the cache also need to be able to access the cache site. Many caches will have information about local sites, history or other information and caches do have considerable informal education potential. The main website offers clear rules and advice. An example of the use of geocaching in Germany to support geodiversity education is discussed by Zecha & Regelous (2018).

10.4.12.2 Co-benefits and Trade-offs

Geocaching does require access to reach the cache and could increase visitor numbers and cause traffic or parking issues in some cases. However, as the farmer or land-manager is going to have control of the siting of the geocache, this problem should be limited. Although there are clear rules about what should go into caches and the smallest microcaches are around the size of a USB pen drive, the leaving of physical objects could be a problem for areas with livestock.

10.4.12.3 Magnitude

Geocaching would be likely to only have a small direct impact on geodiversity but the hobby is popular and it does have considerable potential for a range of cultural services indicators if used to its fullest potential.

10.4.12.4 Timescale

0-5 years: Geocaches can be created quite quickly and the awareness of visitors would be raised by searching for the cache.

10.4.12.5 Spatial Issues

Caches tend to be very small, maybe the size of a small food container. Earthcaches are entirely virtual.

10.4.12.6 Displacement

None

10.4.12.7 Maintenance and Longevity

Each cache is placed by a person, usually close to where they live or spend a lot of time, who is the owner of the cache and has a responsibility to maintain it. This could be the landowner or manager in the context of ELMS but it need not be.

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[39] https://www.geocaching.com/sites/education/en/

[40] https://hillsofhame.com/2017/02/04/earthcache-workshop/

10.4.12.8 Climate Adaptation or Mitigation
None

10.4.12.9 Climate factors / Constraints
None

10.4.12.10 Benefits and Trade-offs to Farmer/Land manager
Geocaching can turn a place into a destination for a new user/visitor group. The educational potential could be used to inform the public about the history and heritage of the site. Geocaching is popular but there are relatively few obvious monetary benefits for a farmer or landowner.

10.4.12.11 Uptake
Easier for farmers or landowners who already have public rights of access on their land where caches can be sited. Zecha & Regelous (2018) noted that the uptake of geocaching/Earthcaches is still somewhat limited compared to other actions such as provision of guided walks, trails and interpretation boards that have a longer record of being used in a wide range of heritage and wildlife settings.

10.4.12.12 Other Notes
N/A

10.4.13 EBHE-055: Create/ maintain site based information promoting the use of the natural environment for physical activity, health and wellbeing

Within the specific context of geodiversity and the condition of geological SSSIs, giving clear guidance on what activity may or may not take place on a site is important. A list of outdoor activities that are supported by geodiversity is given by Gray (2013, p. 128: table 4.5). The list below omits a few activities that would probably not be supported in England.

- Skiing (downhill and cross-country)
- Mountaineering
- Rock climbing (which also values rock diversity)
- Hillwalking
- Fell/Hill running
- Cross-country running
- Mountain biking
- Whitewater rafting/kayaking/canoeing
- Canyoning/ghyll scrambling
- Coasteering
- Caving/potholing

Many of these activities will be compatible with a site being maintained in favourable condition. Wellbeing covers a wider class of possible benefits and is covered by cultural services such as sense of place or spiritual values, although there is evidence that sites with high scientific importance are often appreciated by those with limited knowledge about the scientific aspects for other values. Carrying out other wellbeing or physical activities where a well-managed site could form the backdrop would be another means of realising the benefits.

EBHE-055	Create/ maintain site based information promoting the use of the natural environment for physical activity, health and wellbeing	*LTD

10.4.13.1 Causality
Some of the physical activities have clear alignment with some common geodiversity actions. For instance, rock climbers and mountaineers will be attracted to sites or routes that are clear of vegetation. Cavers will appreciate cave access that is clear and maintained safely. Other activities will have less direct links. The desire to conserve these spaces in good condition is likely to promote a degree of stewardship from users, ranging from removal of litter to possibly offering specialist skills to help maintain a site. Not all geological SSSIs will have potential for this action to be effective.

10.4.13.2 Co-benefits and Trade-offs

The stewardship element noted above could be a significant co-benefit. Some activities will not be suitable for some sites, either at all times, or during particular periods. This could be a source of conflict. Newsome and Dowling (2017) discuss the potential conflicts between general recreational access and control of erosion, especially around high-points or viewpoints where informal trails can become an issue. Other activities, such as 'geoclimbing', where routes can become overused can also have negative impacts.

10.4.13.3 Magnitude

Probably limited, win respect of the favourable status of geological SSSIs. However, there are likely to be some sites with a close link to particular activities where there are chances to develop co-designed schemes to maintain the site and also educate users about how to avoid damage to features in the course of undertaking their activity.

10.4.13.4 Timescale

0-5 years: Once users are being directed to the site by the materials to promote the site for aspects beyond the Earth Science, or other elements, the benefits are being realised.

10.4.13.5 Spatial Issues

Limited, as many of the activities likely to be undertaken value a sense of wildness and will not be as focused on infrastructure and facilities close to the site as some other actions.

10.4.13.6 Displacement

None

10.4.13.7 Maintenance and Longevity

Unless physical signage or infrastructure is used, no maintenance issues. The longevity will vary.

10.4.13.8 Climate Adaptation or Mitigation

None

10.4.13.9 Climate factors / Constraints

None

10.4.13.10 Benefits and Trade-offs to Farmer/Land manager

Opportunity to convey wider messages about access and manage user expectations. It is possible that promoting site-based approaches could initiate in-kind, volunteer or financial support for work to maintain the favourable status of the site. Having people using the site can also bring problems to the early attention of the farmer or land manager that might have gone unnoticed for some time.

10.4.13.11 Uptake

Likely to be highly dependent on the site and the activity or activities that are being promoted.

10.4.13.12 Other Notes

N/A

10.5 Bundle: Actions for Geodiversity

The 17 proposed actions within the Geodiversity Action bundle listed and brought forward for detailed review are largely uncontroversial and have already been discussed extensively as desirable from the point of view of the geodiversity community and nature or landscape conservation agencies or groups (e.g., Gray 2013; Reynard and Brilha 2018). Prosser et al. (2006) includes examples of incorporating most of the listed actions into best practice for managing and enhancing geodiversity sites, except for sample cores and rock piles for specimen collecting. As such, most of the actions have a supporting 'logic-chain'. The selected geodiversity actions would be unlikely to attract anything other than interest and support from individuals and organizations involved in conserving and promoting geodiversity.

10.5.1 EBHE-232: Maintain exposures of vertical or near-vertical faces

Exposures of bare rock and unconsolidated sediments are key elements for the understanding of Earth History and of great value to geologists and physical geographers and allow access to the environmental data recorded in these deposits. Vertical exposures are critical for demonstrating principles of stratigraphy. Faces exposing adjacent planes at right angles are particularly important, as such exposures permit a three-dimensional study of features. Such exposures are key to the knowledge services component of cultural services. A wider aspect of vertical or near-vertical faces is the impact on landscape values and aesthetics to all users. Limited evidence exists for a preference for landscapes with vertical faces, with greater values being placed on landscapes with higher vertical exposures. (Baczyńska et al. 2018). Some user groups involved in outdoor recreation require vertical or near vertical faces for their particular activity. Rock-climbing may be the most obvious example but other sports and activities do use such landscape features. Given the importance that Earth Scientists and the wider public place upon these features, this is an important action to encourage and promote.

EBHE-232	Maintain exposures of vertical or near-vertical faces	***

10.5.1.1 Causality

Vertical or near vertical faces are a class of key features on many geodiversity sites, especially sites with strong, durable indurated rocks, for the reasons discussed above. Such faces are more difficult to maintain in unconsolidated soft sediments (Shelton 2004). However, keeping faces cleared does require some effort, usually focused on vegetation clearance to allow the site or feature to remain in favourable condition. Weathering of the rock and other forms of biofouling can also reduce the quality of a site.

10.5.1.2 Co-benefits and Trade-offs

Some species and plant communities prefer steep faces of rock or unconsolidated sediments (e.g., cliff nesting birds; sand martins in near vertical sandy faces; chasmophytic plants)

10.5.1.3 Magnitude

Probably one of the most significant actions that can be undertaken. The loss of clear, clean vertical or near vertical exposures is one of the commonest problems on geological SSSIs.

10.5.1.4 Timescale

0–5 years. Any work will deliver, or continue to deliver, the benefit as soon as it is completed.

10.5.1.5 Spatial Issues

Given that many sites will be of a small spatial extent, the actions are likely to be targeted. Even within, for example, a quarry site may only have a small area of a face that represents the feature of interest. Larger, landscape-scale features or sites/features that are on more than one property or where access would need to be taken over the property of another landowner could have some potential for problems. Shelton (2004) highlighted that, in the case of unconsolidated sediments, steep slopes are a significant hazard and need to be in areas where the impact of a slope failure would be low.

10.5.1.6 Displacement

None

10.5.1.7 Maintenance and Longevity

Impact will be delivered once works are completed but ongoing work to maintain the features is required. Actions to maintain vertical or near-vertical exposures can vary depending on several factors. A number of other actions in this bundle would often be part of a maintenance programme on a vertical or near-vertical face or exposure to retain the site or feature in favourable condition. **EBHE-234** Create/ maintain safety fencing for geodiversity features; **EBHE-238** Scrape rock faces; **EBHE-247** Remove scree or spoil; **EBHE-316** Control scrub or trees on top or in front of geodiversity features. Such works could require considerable capital input or volunteer effort at the start of a programme but aspects such as vegetation control need to be carried out routinely. A site may decline quickly, especially finite inland sites (Prosser et al. 2006).

10.5.1.8 Climate Adaptation or Mitigation

None

10.5.1.9 Climate factors / Constraints

None

10.5.1.10 Benefits and Trade-offs to Farmer/Land manager

No obvious direct financial benefit. Routine inspection and maintenance could have safety benefits. In some cases, geotechnical specialists or engineering geologists would need to assess the site, which can be costly.

10.5.1.11 Uptake

Likely to depend on other activities on the property. A quarry owner or operator is likely to be well-positioned to take this sort of action, while many landowners would not be keen due to the potential costs and liability.

10.5.1.12 Other Notes

N/A

10.5.2 EBHE-239: Remove fly tipped rubbish from geodiversity features

Although litter is a general problem in many contexts, fly-tipping usually involves the dumping of larger volumes of waste ranging from a binbag or an old mattress to large volumes of material. For recent review of the definitions in the UK see Smith (2022). On geodiversity features, the problem is often that the feature is obscured and thus no longer accessible.

EBHE-239	Remove fly tipped rubbish from geodiversity features	***

10.5.2.1 Causality

Fly-tipping is routinely identified as a source of fragility on geodiversity sites, whether SSSI or LGS. Removal has a significant impact on the quality of a site and the work need not involve the complete clearance of a site, although this is desirable (Shelton 2004; Prosser et al. 2006).

10.5.2.2 Co-benefits and Trade-offs

Numerous co-benefits are associated with the removal of fly-tipped material. Animals and plants are often adversely affected by rubbish. The poor visual impact of rubbish is a major disbenefit. Once a site has had one incident of fly-tipping that has not been dealt with, further instances are more likely, as the impression is of a lack of stewardship or ownership of a site.

10.5.2.3 Magnitude

General improvement of area and this action contributes to favourable status in nearly all cases where the feature or features on the SSSI are visible at the surface. Avoids impression of neglect that may result in further fly-tipping.

10.5.2.4 Timescale

0–5 years. Any work will deliver, or continue to deliver, the benefit as soon as it is completed.

10.5.2.5 Spatial Issues

None

10.5.2.6 Displacement

Rubbish ha to be transported somewhere, probably to a local authority or private landfill site.

10.5.2.7 Maintenance and Longevity

Variable. Once the time and expense of removing rubbish has been invested, there is an incentive to keep the site free of dumped waste. However, this may require other operations and, as this is a criminal act, support and enforcement by agencies and the police that are outwith the immediate scope of BHE actions.

10.5.2.8 Climate Adaptation or Mitigation

None

10.5.2.9 Climate factors / Constraints

None

10.5.2.10 Benefits and Trade-offs to Farmer/Land manager

Removal of waste is good for farm management and reduces the risk of further episodes and detrimental effects from waste. Livestock can become unwell or die through ingesting waste materials.

10.5.2.11 Uptake

Likely to be high. Fly-tipping has become a significant problem that places a considerable financial burden on landowners. Volumes or weights of rubbish to be removed may be high and there may be cases where hazardous waste requiring specialist equipment and techniques is needed. Access to funding is likely to be broadly welcomed.

10.5.2.12 Other Notes

N/A

10.5.3 EBHE-240: Re-excavate sections of geodiversity features

Some geodiversity features are either buried under soil or drift deposits and require excavation of material to expose the geodiversity interest. A common means of loss of sites and features is where quarries have been flooded or used for landfill at the end of their working life. Quaternary sites are particularly ephemeral and 'high maintenance' and need to be re-excavated from time to time (Bridgland 2013).

EBHE-240	Re-excavate sections of geodiversity features	***

10.5.3.1 Causality

Geologists can undertake a watching brief during the reopening and record the section (Shelton 2004). Prosser et al. (2006) proposed that when work is carried out to make wider exposures of unconsolidated sediments in disused quarries or pits accessible for geodiversity reasons, that part of such a programme would be to re-excavate and maintain sections through geodiversity sections, which would also involve **EBHE-242** Create/ maintain trenches. Cross-sectional views of geodiversity features are an important source of information and re-excavation for new investigations with novel methods or enhanced understanding are another important reason to support this action.

10.5.3.2 Co-benefits and Trade-offs

On some sites, access for mobile plant could disturb or damage soil, vegetation or archaeological features. Temporary visual and noise impact on other BHE indicators.

10.5.3.3 Magnitude

When required, this action will often be required to return a SSSI to favourable condition, although some features may be excavated and the reburied almost immediately for protection.

10.5.3.4 Timescale

0–5 years. Any work will deliver, or continue to deliver, the benefit of exposing the key geological or geomorphological features as soon as it is completed. Further scientific research may take longer but any materials or analytical results (e.g., radiocarbon dates) will add to the overall scientific value of the site, probably within a 5–10 year timescale.

10.5.3.5 Spatial Issues

Likely to be small in extent with the main impact being holding spoil near the site if reburial is needed.

10.5.3.6 Displacement

Some material might need to be transported away from the site. Spoil must be managed and may need to be stored for future restoration. Gray (2004) has made a case for keeping material from different levels separate and replacing them in stratigraphic order during reburial. If the excavation is taking place close to a water course there may be a need to ensure that an Ecological Clerk of Works is appointed to avoid downstream effects of silt or clay entering the water course, which can have significant negative impacts on the hydrogeomorphology and channel bed habitats. Use of slit traps and netting is becoming widespread on sites in Scotland.

10.5.3.7 Maintenance and Longevity

Yes. Depends on the size and duration of the excavation work but this will require management. If unconsolidated sediments are to be left exposed for some time, geotechnical methods may need to be used. The longevity will be variable.

10.5.3.8 Climate Adaptation or Mitigation
None

10.5.3.9 Climate factors / Constraints
None

10.5.3.10 Benefits and Trade-offs to Farmer/Land manager
None apparent. Excavations will require safety management and can take land out of production or use.

10.5.3.11 Uptake
Low among farmers but there is higher potential for participation from quarry operators or other organizations with their own plant and geotechnical or engineering geological staff.

10.5.3.12 Other Notes
N/A

10.5.4 EBHE-243: Create casts or moulds of finite geodiversity features

Moulds of geological features and fossils have been of considerable importance for capturing important scientific data about sites, especially those where there are significant bedding planes or vertical faces. Three examples of sites of international importance that have undergone this process are: Mistaken Point, a coastal exposure in Newfoundland that preserves Ediacaran fossils and is designated as a UNESCO World Heritage Site (Thomas 2010); Siccar Point, a SSSI in the Scottish Borders, is the site of an angular unconformity that was one of the key exemplars used in James Hutton's development of his theory that the Earth orders of magnitude older than was generally accepted. A cast of the unconformity is on display in the American Museum of Natural History in New York[41]. A final, especially well-documented case is work by Edwards & Williams (2011) to use a set of rubber moulds as a means of replicating a finite inland exposure of Ediacaran fossils at Bradgate Quarry at the request of Jonathan Larwood of Natural England. All of these are examples of *ex situ* conservation, similar to the approach of having large trilobite specimens from the sites from arounds the Arouca Geopark in the interpretive centre, but without the need to remove key material from a site and its stratigraphic context (Brilha 2018).

EBHE-243	Create casts or moulds of finite geodiversity features	***

10.5.4.1 Causality
Mould and casts offer the chance to record the exposure in its present state, share scientific information and allow a wider audience to appreciate the geological and palaeontological interest without revealing the exact location of the site. The availability of casts can also relieve erosion and pressure on sites. Edwards and Williams (2011) and Williams and Edwards (2013) have argued that this is a key 'rescue palaeontology' technique for gathering key information without damaging the exposure. On sites where access or poor light are an issue, the use of casts can allow researchers to study the features of interest in better lighting conditions. The three examples cited of international importance offer powerful evidence that this action has significant benefits and very limited disbenefits.

10.5.4.2 Co-benefits and Trade-offs
The process of moulding often requires cleaning of the rock surfaces, which involves the removal of vegetation. Assessment of the impacts and protected status of any vegetation would be required before cleaning or making access routes to a site. Once a surface has been cast, the option to carry out further

[41] https://rescast.com/case-studies/gottesman-hall-of-planet-earth/

actions to protect the site, such as burial or applying a protective cover become easier to support and justify, as an alternative means of viewing or studying the material is available.

10.5.4.3 Magnitude

Moulding and casting key vulnerable sites before they are lost for whatever reason offers a very significant knowledge service. The use of casts offers possibilities to allow many more people to view and appreciate the features than might be the case otherwise if the moulding and production of casts did not take place. Potentially a very significant impact for preserving knowledge but not within the clear definition of keeping the original site in favourable condition.

10.5.4.4 Timescale

0–5 years. Once the moulding is complete and the cast(s) produced, the benefit has been realised. The mould can be stored, and casts taken repeatedly, so the benefits will continue to be realised.

10.5.4.5 Spatial Issues

Any such action is likely to be very local. The three examples cited are on the scale of tens of square metres.

10.5.4.6 Displacement

None.

10.5.4.7 Maintenance and Longevity

Not on site. Usually the moulding work is a single event on the site lasting weeks to months, as the object is to generate the mould and then conserve the mould and the first (master) cast in a suitable repository.

10.5.4.8 Climate Adaptation or Mitigation

None.

10.5.4.9 Climate factors / Constraints

None.

10.5.4.10 Benefits and Trade-offs to Farmer/Land manager

Edwards and Williams (2011) note that the use of moulding can help to limit knowledge of the exact location of sites and this helps to protect the site and reduce the likelihood of trespass and irresponsible collecting. Possible one-off payments from commercial activity or rights to produce moulds and casts.

10.5.4.11 Uptake

Relatively few sites are likely to warrant the cost and effort.

10.5.4.12 Other Notes

The use of LiDAR and other scanning technologies has become a significant part of such studies, such as work on the Ediacaran fossils from Charnwood (Dunn et al. 2022). However, moulds and casts offer a 1:1 physical replication and are complementary to the use of scanning techniques.

10.5.5 EBHE-250: Remove graffiti on geodiversity features

Graffiti is one of the more common causes of a decrease in the condition of geodiversity sites. Graffiti that has been generated by the application of charcoal, inks, chalk paints of various types can obscure features of interest. Incised graffiti, where the surfaces are damaged by the removal of material causes direct damage by destroying the material on the surface and below the surface. Incision in rock or soft sediment can also act as points for water ingress, which may have additional deleterious effects on the condition of a site.

EBHE-250	Remove graffiti on geodiversity features	***

10.5.5.1 Causality

Graffiti has several wider impacts that affect the broader BHE delivery through actions. 1) The presence of graffiti can create an impression that a site is neglected or not valued and there is a lack of active stewardship; 2) Once graffiti appears on a site, this seems to be followed by further instances of graffiti

(Historic England 2021); 3) Graffiti can be part of a complex of undesirable actions at a site, including littering and fly-tipping, a form of the oft-discussed, if contested, 'broken windows' effect 4) The perception of visitors can be that the site is an unwelcoming or unsafe place to visit. The latest PANS survey statistics for April-June 2020 (Table 3) on barriers has anti-social behaviour estimated the second greatest source of concern (20.4% ± 1.7% of adults in England), closely followed by other people that might be there (16.7% ± 1.6%). In some cases, the content of the graffiti may constitute a criminal act of hate speech and businesses and organizations will wish to remove it as quickly as is feasible due to justifiable fears of reputational risk. As the greatest concern in the latest PANS survey was coronavirus, these two barriers are likely to rise in rank. As this is likely to be a responsive action, it will be targeted where the graffiti has appeared. Focusing upon graffiti that is visible from roads and paths that is likely to be seen would be another guide as to where to focus limited resources.

10.5.5.2 Co-benefits and Trade-offs

Some types of graffiti media (charcoal, chalk) can be removed with water alone in a short amount of time. Painted graffiti will often require more time to assess and plan removal to avoid damage to the site or other aspects of the natural heritage from the chemicals used. The restoration of incised graffiti is regarded as the hardest task, as it can involve several considerations and approaches that can compromise the integrity of a site or feature. A trade-off is the use of chemicals on the sites and possible poor results and even cause further unintentional damage if specialist help is not consulted.

10.5.5.3 Magnitude

Graffiti is one the commonest problems on geological SSSIs. Prompt removal of graffiti, with expert support if needed, can prevent the deterioration of a site but even the removal of older graffiti can improve the condition of a site.

10.5.5.4 Timescale

0–5 years. Any work will deliver, or continue to deliver, the benefit as soon as it is completed.

10.5.5.5 Spatial Issues

None.

10.5.5.6 Displacement

None.

10.5.5.7 Maintenance and Longevity

Yes. The removal of surface graffiti tends not to need any further maintenance and the result at the end of the processes there may not be a complete restoration to the original state. Monitoring of the site is standard practice in the restoration of rock art sites and other archaeological/heritage assets. In cases where incised graffiti is being restored, a range of techniques, including painting and infilling with materials may have been used which need monitoring and possible further work to maintain. The longevity of these materials will vary and is likely to be shorter than most of the examples of work on rock art, which tend to be in arid environments not found in England. The other issue is how to deter further incidents, which may involve the use of site wardens or CCTV. The experience gained on urban sites such as Wren's Nest are an excellent source of information on how to deal with such issues (Worton and Gillard 2013).

10.5.5.8 Climate Adaptation or Mitigation

None.

10.5.5.9 Climate factors / Constraints

None.

10.5.5.10 Benefits and Trade-offs to Farmer/Land manager

Signs of active stewardship may deter a range of other activities detrimental to the appearance and operations on the farm/management area.

10.5.5.11 Uptake

Likely to depend on the type of graffiti, its extent and how accessible the site is. Some graffiti will be put in difficult to reach locations at height. The restoration of sites with incised graffiti is likely to be a long and expensive process with little obvious benefit.

10.5.5.12 Other Notes

Archaeological and heritage organizations have built up a considerable amount of experience with such actions and there may be benefits in seeking advice on techniques and contractors from specialists in these fields[42]. Such organizations will also be able to advise on cases of historic graffiti that may have heritage value and should not be removed.

10.5.6 EBHE-316: Control scrub or trees on top or in front of geodiversity features

Tree and scrub cover is a common problem on geodiversity sites, as it obscures the visibility. More significant impacts, as they are not reversible, can occur through tree-root effects increasing erosion and weather. At worst, the toppling of trees can damage unconsolidated sediments and become an active hazard.

EBHE-316	Control scrub or trees on top or in front of geodiversity features	***

10.5.6.1 Causality

Controlling scrub and trees that obscure the features of interest, limit access or put the feature at risk can be rectified with commonly used vegetation management techniques and the issue can be managed with relatively little difficulty. Keeping the geodiversity feature(s) visible is a key to favourable condition on many designated sites. Scrub and trees impact on the condition of many geological SSSIs and LGSs. Even selective removal of some scrub and trees can greatly improve the condition of a site (Prosser et al. 2006). Although much of the effect will be on single properties, there will be instances, usually on extensive geomorphological sites, where operations may be at a landscape scale, especially where distant views are considered. See also **EBHE-233**.

10.5.6.2 Co-benefits and Trade-offs

In some areas scrub is a valued habitat type in its own right or individual species are protected, e.g., juniper scrub in southern England (Gough and Fuller 1998). Possible conflict between biodiversity and geodiversity priorities. Lack of public understanding and support for the action.

10.5.6.3 Magnitude

Although the control of scrub and trees is one of the most called-for and carried out actions on sites with geodiversity interest there is a spatial element to such work. Lowland inland sites with finite geodiversity feature(s) often experience more rapid regrowth of vegetation than upland sites and a focus on these sites would be worthwhile (Prosser et al. 2006).

10.5.6.4 Timescale

0–5 years Depends on the size of the area to be cleared, the density of vegetation and the techniques, manual or machine-mounted tools, used to remove scrub and trees.

10.5.6.5 Spatial Issues

None.

10.5.6.6 Displacement

The vegetation cuttings, brash and larger tree branches and trunks will need to be either removed or incorporated into other land-management work, such as protecting coppiced stumps from browsing by animals in other places around the holding.

10.5.6.7 Maintenance and Longevity

[42] https://www.bradshawfoundation.com/rockartnetwork/removal_camouflage_of_graffiti.php

Yes. Variable time scale but scrub will often return in a couple of years. Trees will take longer to re-establish on a site and can be kept under control by periodic removal of saplings as part of scrub management. Generally lowland inland sites will become overgrown more quickly than upland sites.

10.5.6.8 Climate Adaptation or Mitigation
None.

10.5.6.9 Climate factors / Constraints
None.

10.5.6.10 Benefits and Trade-offs to Farmer/Land manager
Many farmers will find this action beneficial to general farm management.

10.5.6.11 Uptake
Possibly one of the best chances for co-working between farmers/land managers, biodiversity groups and geodiversity groups that could be a model of how geodiversity can contribute to 25 YEP indicator G5. See notes in Miles (2013) about willing landowners being a key element of successful projects.

10.5.6.12 Other Notes
N/A

10.5.7 EBHE-238: Scrape rock faces

The scraping of rock faces, which removes weathered and unstable rock from the exposure, reduces the risk of unexpected rockfall and maintains access to fresh, unweathered rock for study by Earth Scientists. Scraped faces can highlight the contrast between vegetation and bare rock, which can enhance a landscape. If the site is used by rock-climbers, the removal of weathered or loose rock can improve the safety and quality of their experience.

EBHE-238	Scrape rock faces	**

10.5.7.1 Causality
Removal of loose rock will expose the fresh, unweathered rock below, maintaining the site in favourable condition. Safety and access will also be improved. This is a quite routine operation on certain types of site (Prosser et al. 2006).

10.5.7.2 Co-benefits and Trade-offs
Safer access and a reduction in risk on the site. Possible disturbance of flora and fauna and any activity should ideally be managed in line with the timing of other restrictions, e.g., limited work during bird nesting season without prior survey. Access may need to be limited once the need for face scraping has been identified and during works. In some instances, there would be a reduction in sediment supply, as part of the natural geomorphological processes in the area.

10.5.7.3 Magnitude
Local but significant for any SSSI whose interest is based on being able to examine clean exposures of fresh rock.

10.5.7.4 Timescale
0–5 years. Any work will deliver, or continue to deliver, the benefit as soon as it is completed.

10.5.7.5 Spatial Issues
Some impacts. Rock face scraping would tend to be limited in extent to maintain the feature(s) of geodiversity interest. Access may be difficult and require specialist rope access techniques or the use of cherry picker platforms. In some cases, access may require the permission of other landowners for specialist equipment or teams to reach the site. Loose rock may need to be moved to other sites but also has potential uses.

10.5.7.6 Displacement

Some of the rock removed may need to be moved to other places on the landowner's property or to another place.

10.5.7.7 Maintenance and Longevity

Rock face stability can be hard to assess, as it is often dependent on a range of weather and climate factors. Use of a 'watching brief' and modern techniques such as drone surveys or LiDAR may be required in areas where there is extensive public access. Work by Historic Environment Scotland and their consultant at Salisbury Crags, Edinburgh are examples of how a landowner has managed such an issue over several years and the difficulties involved [43]

10.5.7.8 Climate Adaptation or Mitigation

None.

10.5.7.9 Climate factors / Constraints

None.

10.5.7.10 Benefits and Trade-offs to Farmer/Land manager

Scraping rock faces should reduce unintended, unexpected rock falls or slides and routine inspection and scraping will help to manage risk, especially to infrastructure. In some instances, the rock removed could be used around in other projects.

10.5.7.11 Uptake

Likely to be limited unless potential rockfall or slides could block tracks or roads or damage buildings or other infrastructure. The costs could be a factor and it is unlikely that such work could be farmer-led and would probably require support from contractors and other specialists.

10.5.7.12 Other Notes

N/A

10.5.8 EBHE-247 Remove scree or spoil

Scree (loose rock fragments) and spoil (soil or waste rock from digging or landslips) can obscure the visibility of feature(s).

EBHE-247	Remove scree or spoil	**

10.5.8.1 Causality

Periodic removal helps to maintain sites in favourable status. Scree is the result of a natural geomorphological process in most cases, while spoil can be the result of human activity or natural processes. The work here is akin to vegetation removal to improve access to the features.

10.5.8.2 Co-benefits and Trade-offs

Possible damage to biodiversity and interference with active geomorphological processes. Easier than trenching/excavation, as the material is unconsolidated. Spoil can be a significant landscape feature in itself (such as shale bings in Central Scotland, mine tips or dumps that are part of the geoheritage of some former mining areas).

10.5.8.3 Magnitude

Largest impacts will be sites with relatively limited exposure of key features that are the basis of the listing or designation.

10.5.8.4 Timescale

0–5 years. Any work will deliver, or continue to deliver, the benefit as soon as it is completed.

[43] https://www.geplus.co.uk/news/solutions-being-considered-for-rockfall-prone-edinburgh-footpath-31-05-2022

10.5.8.5 Spatial Issues
None.

10.5.8.6 Displacement
Removed material will need to be stored or transported away from the site in some cases.

10.5.8.7 Maintenance and Longevity
Yes. Scree often takes decades to centuries to develop and build up. Spoil generated from landslides or erosion can blanket exposures rapidly, especially in single large events. In coastal settings, collapse of rock slopes is more common. Monitoring of the site and periodic removal is likely to be an ongoing task.

10.5.8.8 Climate Adaptation or Mitigation
None.

10.5.8.9 Climate factors / Constraints
None.

10.5.8.10 Benefits and Trade-offs to Farmer/Land manager
None obvious.

10.5.8.11 Uptake
Low. Scree, unlike rockfall, tends to be gradual and less of a problem or danger. Soil slumps are more likely. The work is likely to need specialist equipment and support from geotechnical specialists.

10.5.8.12 Other Notes
Scree slopes are active geomorphological features that may reach a point where a combination of decreased input of material, the lowering of the slope angle and stabilization by vegetation may lead to the natural cessation of the production of scree. At this point, the removal of the scree is likely to be a one-off operation.

10.5.9 EBHE-248 Protect geodiversity features by burial

Archaeological conservation uses the burial to protect sites and the practice is widely used. Unlike archaeologists, geologists and geomorphologists do not accept that sites buried by construction or landfill are protected. Such sites as regarded as lost to science. The instances where geodiversity features are protected by burial are limited and usually of two main types. 1) Bedrock features of interest that are completely covered by soils and drift, e.g. The Rhynie Chert in Scotland[44]. 2) Geomorphological features in a limited area. e.g., erratic boulder at Fairmilehead, Edinburgh[45].

EBHE-248	Protect geodiversity features by burial	**

10.5.9.1 Causality
Burial effectively provides protective cover in the same way as other types of cover discussed for **EBHE-246**. Standard practice on finite geological interest sites (Prosser 2006).

10.5.9.2 Co-benefits and Trade-offs
Possible dual use of the land once burial is complete and the impact of any operations on the site are assessed May require landscaping and marking to avoid accidental damage or re-exposure.

10.5.9.3 Magnitude
Impact likely to be greatest on sites with of finite features, so a single farm or field. Provides secure long-term protection.

[44] https://www.abdn.ac.uk/geosciences/departments/geology/what-is-the-rhynie-chert-1892.php
[45] https://www.edinburghgeolsoc.org/geological-site/fairmilehead-park/

10.5.9.4 Timescale
0–5 years. but could extend for decades. Burial can be done rapidly in some cases with techniques developed for the protection of archaeological sites using geotextile covers and then placing the materials selected for burying the features on top of the geotextile cover.

10.5.9.5 Spatial Issues
Variable, depending on the size of the feature(s) to be buried.

10.5.9.6 Displacement
Soil or spoil or other materials may need to be extracted from other sources and moved to the site for burial.

10.5.9.7 Maintenance and Longevity
Burial of geodiversity features will, by analogy with archaeological sites, need monitoring and preventative maintenance for a range of possible physical and chemical threats to the site. The burial solution itself is likely to be a successful long-term solution for decades if well-planned and the correct materials are used.

10.5.9.8 Climate Adaptation or Mitigation
None

10.5.9.9 Climate factors / Constraints
None

10.5.9.10 Benefits and Trade-offs to Farmer/Land manager
Can offer a way to protect a site while allowing a limited range of other uses and operations while keeping it protected for future investigations.

10.5.9.11 Uptake
Difficult to estimate, as there are relatively few cases of geodiversity sites being buried for protection. Farmers and land-managers that have experience of work to protect archaeological sites by reburial may be more willing to consider this option.

10.5.9.12 Other Notes
N/A

10.5.10 EBHE-249: Create rock piles for sample collection

Some visitors to sites will wish to collect samples to retain. While this can be a valuable means of engaging people with geodiversity, it can also lead to unintentional damage to protected sites, inexperienced people putting themselves at risk and conflicts. The removal of samples without the owner of the mineral rights is also theft in many instances. Page (2018) and Larwood and Prosser (2019) noted the essential role of specimen collecting, when it is done in a responsible and sustainable manner, in geological site use and successful geoconservation. The focus of the paper was on palaeontological sites but this is applicable to any site with material that has interest *ex situ* such as minerals or attractive pebbles.

EBHE-249	Create rock piles for sample collection	**

10.5.10.1 Causality
A range of organizations have provided access to rocks for people to collect samples from. Numerous instances of quarries, both working and disused, providing rock piles exist and there are often clear understandings that visitors will report finds of interest. Clary (2021) reviewed the provision of 'fossil parks' in Texas, which was based on the Fossil Park Model developed by Clary and Wandersee (2011, 2014), which aimed to provide authentic fossil collecting experiences while diverting those who wished to collect away from protected sites. In England there has been one notable study focused on the Jurassic Coast WHS and Wren's Nest NNR to investigate willingness to pay. Webber et al. (2006) carried out and found an interesting split in willingness to pay on the two sites. The Palaeozoic fossils of Wren's Nest NNR are from

less familiar taxonomic groups and people were less keen to collect on this site, although Townley and Larwood (2012) assessed allowing collecting to be worthwhile for the opportunities for the site wardens to engage with visitors about their finds. The Jurassic Coast WHS is extensive and collecting fossils from the beach is encouraged and many visitors expect to be able to bring home examples of the world-famous ammonoids, which are much more familiar. (King et al. 2010).

10.5.10.2 Co-benefits and Trade-offs
Some visitors may find rock piles unappealing and there are potential noise issues, so there may need to be screening.

10.5.10.3 Magnitude
The impact is likely to be limited but there is quite limited evidence about the provision of such dedicated piles for collecting, although there is a long tradition of collectors working over mine and quarry spoil tips. By diverting people from SSSIs where collecting is not permitted and avoiding unintentional damage, such sites could make a significant contribution to protecting and promoting the geoheritage of areas that are well-known for fossils, minerals or attractive rocks.

10.5.10.4 Timescale
0–5 years. Any work will deliver, or continue to deliver, the benefit as soon as it is completed.

10.5.10.5 Spatial Issues
Some space would need to be given over to the piles and allowing enough room for the use of handtools in some cases. In old quarries with spoil heaps or piles or rock, there would be less of a spatial issue.

10.5.10.6 Displacement
Some land on the site will need to be set aside to place rock piles in and that area will possibly need to be made safe by fencing and signage. The rock will need to come from somewhere and 'stone miles' are something to be considered. Given that there are instances of fossils being shipped internationally, making sure that rocks are from sustainable sources is another issue that needs to be assessed.

10.5.10.7 Maintenance and Longevity
Yes. If a site is popular, then routine inspection and maintenance will need to be carried out. The longevity of the action will depend on visitor numbers and collecting effort. A decision as to whether to keep replenishing the rock piles will need to be made.

10.5.10.8 Climate Adaptation or Mitigation
None

10.5.10.9 Climate factors / Constraints
None

10.5.10.10 Benefits and Trade-offs to Farmer/Land manager
Being able to charge for admission would allow some diversification of income to the business.

10.5.10.11 Uptake
Difficult to gauge, given limited instances in England.

10.5.10.12 Other Notes
Collecting with hammers could be problematic, as there are safety implications.

10.5.11 EBHE-251 Create/ enhance/ maintain access for caves or disused mines

Caves have multiple uses and stakeholders. Many combine biodiversity and geodiversity interest, as well as being attractive to recreational users. A peculiarity of access to underground systems is that there may be stipulations that users may not proceed beyond the distance to which natural daylight penetrates the cave or mine (Murphy and Chamberlain 2008). Allowing access further into the system would be another easy means of participating in this action. Maintaining known access is probably the easiest entry level and will

generate continued use and opportunities from user groups. See discussion for **EBHE-236**: Stabilise cave entrances.

EBHE-251	Create/ enhance/ maintain access for caves or disused mines	**

10.5.11.1 Causality
Enhancing access could cover a range of activities and would probably require working with special interest groups. The creation of new access could be difficult unless this involved making already available entrances within a permissive path. Alternative entrances are of especial significance for cave and mine rescue teams and as escape routes if the exit route has been cut off by rising water after heavy rain or, much less frequently, in instances of collapse and blockage. Co-operation between landowners, cavers and scientists also have considerable potential to yield scientific advances.

10.5.11.2 Co-benefits and Trade-offs
As noted for **EBHE-236**: Stabilise cave entrances many cave sites have a dual biodiversity and geodiversity designation. Actions to improve/maintain and enhance access will help a range of biodiversity actions and assist in monitoring of these relatively unusual habitats. Trade-offs: Possible disturbance of cave ecology and individual animals or plants. Need for safety fencing and signage. Livestock may need to be excluded from the area. Possible additional pressure on parking and access to mouth of cave or other entrance. However, caving user groups have made considerable efforts to manage visitor numbers among themselves.

10.5.11.3 Magnitude
Widening or enhancing access is likely to have a higher level of impact than **EBHE-236**. Loss of access to feature(s) in a cave system due to blocked routes is a significant problem for caves and mines.

10.5.11.4 Timescale
0–5 years on the basis of a cycle of planning, consultation with user groups and building new infrastructure.

10.5.11.5 Spatial Issues
None

10.5.11.6 Displacement
None

10.5.11.7 Maintenance and Longevity
Given the potentially serious consequences of any problems within a cave system, routine inspection and maintenance on planned schedule will be important.

10.5.11.8 Climate Adaptation or Mitigation
None

10.5.11.9 Climate factors / Constraints
None

10.5.11.10 Benefits and Trade-offs to Farmer/Land manager
Possible opportunities to charge for parking but probably limited.

10.5.11.11 Uptake
Low, given the need for specialist techniques and knowledge.

10.5.11.12 Other Notes
N/A

10.5.12 EBHE-236 Stabilise cave entrances

Caves entrances are often special places, both in terms of natural features and their ecology and their attractiveness and cultural interest and significance to visitors. Caves occur in a range of landscape settings but tend to be concentrated along either along coasts or rivers or in areas where the underlying geology is dominated by limestone. Karstic landscapes are recognised as having their own special characters.

Cavers and scientists maintain notably close co-operation and there is considerable overlap between the two groups. Maintaining access has benefits for knowledge services, especially Quaternary Science and archaeological work (Murphy & Allshorn 2018, Murphy & Chamberlain 2008). Vertical cave entrances (sinkholes or potholes) or features in coastal areas (blowholes) where there is a shaft present a different set of issues. If these features fail, there is a significant risk that the ground surrounding the entrance will collapse or become dangerously unstable, with damage spread across a wide area.

EBHE-236	Stabilise cave entrances	*

10.5.12.1 Causality

Cave entrances are a point of high risk of significant incidents, as they are the easiest part of a cave system for humans and livestock to reach, by their very nature as the entry and exit point to shelter or to take access to the system. The loss of access alone may be enough to render a SSSI unfavourable (e.g. caves in Lathkill Dale in Derbyshire). By making sure these areas are safe and secure, such sites can be promoted to more casual visitors.

10.5.12.2 Co-benefits and Trade-offs

Caves often have SSSI or other designations for biodiversity interest and maintaining the entrance can offer significant biodiversity benefits both to the species or ecological communities in their own right and for those tasked with monitoring species occurrence or abundance. With regard to safety and access, avoiding collapse of entrances reduces the limited risk to humans exploring the landscape and the attractiveness of caves, and karstic landscapes in general, is discussed in the geotourism literature. (Woo and Kim 2018; Benedetto et al. 2022). Given the delicate balance of many of the processes in caves, there is risk in encouraging access, although the processes most at risk usually occur further into cave systems.

10.5.12.3 Magnitude

A cave entrance is usually a very specific point on a single property, although cave networks, such as the 'Three Counties' system[46], can stretch for huge distances underground. Impact is likely to be local, although some cave systems are of national or international importance. However, as noted above, keeping access to cave sites is a vital part of maintaining the favourable status of the geological SSSI.

10.5.12.4 Timescale

0–5 years. Any work will deliver, or continue to deliver, the benefit as soon as it is completed.

10.5.12.5 Spatial Issues

Entrances are usually quite small in area and any spatial issues are likely to be limited in extent to a few square metres.

10.5.12.6 Displacement

None

10.5.12.7 Maintenance and Longevity

Yes. Once stabilisation work has taken place, it needs to be inspected and monitored. As there could be a significant input in capital and expertise, the work is likely to be maintained, especially where a safety or liability issue has been identified by individuals or bodies with specialist knowledge.

10.5.12.8 Climate Adaptation or Mitigation

None

[46] https://en.wikipedia.org/wiki/Three_Counties_System

10.5.12.9 Climate factors / Constraints

None

10.5.12.10 Benefits and Trade-offs to Farmer/Land manager

The benefits are likely to focus on issues of safety and liability where people, infrastructure or vehicles are concerned, especially where vertical entrances could collapse, leaving a sinkhole. Livestock farmers could realise some benefits with respect to loss of animals.

10.5.12.11 Uptake

Likely to be higher in areas of limestone pavement or karst where there is local knowledge and interest in caves in the landscape.

10.5.12.12 Other Notes

N/A

10.5.13 EBHE-246 Protect geodiversity features by protective cover

Protective cover ranges in type and purpose and can be an option to maintain visibility while protecting the feature(s) and represents a compromise between accessibility and protection. A wide range of techniques have been used, ranging from simple wooden structures to full permanent cover by buildings at sites such as Fossil Grove in Glasgow and Brymbo (Thomas 2016). The interpretive centre at Pedras Parideiras site in the Arouca UNESCO geopark is built directly over the granite exposure to prevent visitors from removing the micaceous nodules that have a strong cultural significance and are thus highly desirable, even if they do not have a high monetary value (Macadam 2018). Rock exposures such as the impressive ammonoid pavement at Digne, which has been protected by transparent coverings have also been the subject of moulding and casting to replicate the site in Japan (Page 2009).

EBHE-246	Protect geodiversity features by protective cover	*

10.5.13.1 Causality

Radley et al. (2013) documented the use of a tarpaulin screen coupled a wooden frame and winch system at Wood Farm Pit, Warwickshire. The experiment worked well but was ended abruptly due to flooding outwith the control of the monitoring team. Grouting, Perspex sheeting and liquid sealants are all less obvious forms that are of particular use in unconsolidated sediments (Shelton 2004). Permanently protected exposures are rare but do occur. Many sites in the literature are those that have fossil interest and using protective but transparent cover allows the fossils to be viewed but not accessed, which is of considerable benefit. Dinosaur National Monument in Utah has a large, purpose-built exhibit hall[47]. Such cover does not need to be expensive or highly technical. In one instance a wooden door, which is opened periodically to allow moisture to escape but the covering prevents the growth of vegetation and other forms of biofouling, has been used at a site at Abbeville in France (Shelton 2004).

10.5.13.2 Co-benefits and Trade-offs

Use of plastic and glass covers has been used to allow continued visibility of geodiversity interest, especially palaeontological sites. Covering sites where fossil or mineral specimens might be removed enhances the protection. Other types of protective covering have been used to reduce the need to remove scree or spoil from sites to allow easier access. Reducing weathering or erosion is another co-benefit. Potential for damage during construction of protective covering. Careful management is needed to prevent the build-up of moisture. The installation of protective covering will require access and there has been a recent high-profile case where US BLM contractors damaged a dinosaur trackway while building a walkway to protect the trackway[48].

[47] https://www.nps.gov/dino/planyourvisit/quarry-exhibit-hall.htm

[48] https://www.science.org/content/article/botched-construction-project-damaged-important-dinosaur-track-site-utah-paleontologists

10.5.13.3 Magnitude
Likely to be considerable on sites identified as fragile due to erosion or the actions of people (e.g., vandalism, irresponsible collecting).

10.5.13.4 Timescale
0–5 years: Successful projects may continue for many decades. Once completed, significant benefits will accrue from improved access and protection.

10.5.13.5 Spatial Issues
Variable, depending on the size of the features to be protected.

10.5.13.6 Displacement
Building activity could create spoil and some materials might be imported from outside the immediate area. In the case of highly specialist materials, this could involve shipping from outside England.

10.5.13.7 Maintenance and Longevity
Yes. In instances where the protective covering is transparent to allow viewing of the geodiversity features, it will require cleaning and possibly replacement at regular intervals. Other structures and materials may need to be replaced but only if their integrity is compromised, and although there may be considerable capital outlay on infrastructure at the start of a project, some Victorian era works have suffered neglect and deterioration that threatens the quality or integrity of a site or feature. The Crystal Palace Dinosaurs are a good example (Doyle 2008) and the recent problems with Fossil Grove[49], which is one of the first geoconservation sites in the world. The capital costs can vary considerably from hundreds for rudimentary structures such as those discussed in Radley et al. (2013) to millions in projects the provide permanent enclosure.

10.5.13.8 Climate Adaptation or Mitigation
None.

10.5.13.9 Climate factors / Constraints
None.

10.5.13.10 Benefits and Trade-offs to Farmer/Land manager
None.

10.5.13.11 Uptake
Likely to depend on other activities on the property. A quarry owner or operator is likely to be well-positioned to take this sort of action, while many landowners would not be keen due to the potential costs and liability.

10.5.13.12 Other Notes
In some cases, there could be significant potential for collaboration with archaeological bodies for Quaternary sediments.

10.5.14 EBHE-244 Remove man-made barriers around active geodiversity features

Active geodiversity features, usually geomorpholgical features such as fluvial, dune or coastal systems in England, are those where geomorphological processes are in operation. As such, these are natural processes but there can be significant conflict between styles of management of these features.

EBHE-244	Remove man-made barriers around active geodiversity features	***TD

10.5.14.1 Causality
The removal of barriers around active geodiversity (usually geomorphological) features in England would link into the wider drive to work with or make space for nature. Sites that have been designated for active

[49] https://news.stv.tv/west-central/rare-collection-of-fossil-trees-at-risk-of-being-destroyed

processes can be rendered unfavourable or be lost entirely due to barriers. Fluvial and coastal processes are being dealt with separately in the ecosystem services part of QEIA.

10.5.14.2 Co-benefits and Trade-offs

Some species and habitats require extensive, active systems and the protection of active geodiversity processes is part of making space for nature and conserving the stage for biodiversity (Anderson and Ferree 2010, Brazier et al. 2013). The processes will sometimes be self-limiting. Some active features, such as rockslides or landslides are geohazards and there may be a need to retain barriers.

10.5.14.3 Magnitude

Active geodiversity features tend to be spatially extensive and cover landscapes. Examples are beaches and coastal features of interest, dune systems, fluvial and active scree slopes. Fluvial systems are probably the most common active systems that will fall within the scheme and are covered by several actions already listed in ecosystem services. Allowing these features to behave naturally, given their rarity in England, is a very significant course of action.

10.5.14.4 Timescale

5–10 years. The recovery of active geomorphological processes can take considerable time. Even in the best cases of river restoration that I am aware of, the benefits have taken several years in terms of the restoration of processes. It is important that other benefits are not conflated with this action.

10.5.14.5 Spatial Issues

Considerable areas of land can be impacted by this action and modelling would be important to help to plan the action and give an estimate of the likely area to be impacted by the action.

10.5.14.6 Displacement

Impacts of change can be unpredictable and there would need to be monitoring for downstream or downslope effects. The experience of work on river restoration and natural flood management schemes may be the best way to frame discussions and possible scenarios where there are displacement effects. Barrier material may also need to be removed and stored or disposed of elsewhere.

10.5.14.7 Maintenance and Longevity

Questionable. Removal is likely to be a one-off event but monitoring may be needed.

10.5.14.8 Climate Adaptation or Mitigation

None.

10.5.14.9 Climate factors / Constraints

None.

10.5.14.10 Benefits and Trade-offs to Farmer/Land manager

None apparent.

10.5.14.11 Uptake

Low, although there may be more interest from farmers or land-owners interested in rewilding projects.

10.5.14.12 Other Notes

N/A

10.5.15 EBHE 241: Provide sample cores of geodiversity features/assets

Cores of a range of types of features add to environmental and Earth Science knowledge about sites. Cores can also provide a means of preserving data from threatened sites or those that are buried or to be buried by development. Larger cores may be placed in the British Geological Survey (BGS) National Geological Repository core store. BGS also collects core logs, which are documentary records of coring activity. All of these are examples of knowledge services, as outlined by Gray (2013). However, such activity would not be measured directly by the proposed indicators.

EBHE 241	Provide sample cores of geodiversity features/assets	**TD

10.5.15.1 Causality

Coring would be more likely to improve Local Geodiversity Site scoring than SSSI condition. Cores from post-glacial sediments (lake sediments, peat cores), soil and beach sediment samples are all potential sources of environmental information, especially for providing information on the 'Long Now' of ecological time (Carpenter 2002). Small bore geological coring is used for a variety of reasons but usually for palaeomagnetic studies or to access fresh samples of igneous or metamorphic rocks for further study. Cores can form part of displays for the wider public but this action would be very focused on knowledge services rather than wider BHE benefits.

10.5.15.2 Co-benefits and Trade-offs

Most coring of unconsolidated sediments has limited impact but rock coring can have significant visual impact and can devalue exposures, especially if key surface features are damaged, as in a flow-banded pitchstone exposure on Arran (AJM personal observation). Advice on best practice is available from the Geologists' Association[50] and Nature Scotland developed the Core Code[51].

10.5.15.3 Magnitude

The collection of additional data or samples can improve the quality of a site, as it can add to categories such as samples available for study and the published literature on a site. In some instances, findings may be of national or international importance but these are narrow outcomes in the context of BHE.

10.5.15.4 Timescale

0–5 years. Once the coring has been completed, the physical samples are immediately available and preserved. Depends on how well-studied the site is prior to the work and with what techniques are used to analyse cores and there is no obvious impact on wider BHE targets. Further scientific investigations may take some time and priority should be given to cataloguing the material and placing it in a suitable repository.

10.5.15.5 Spatial Issues

Coring work is spatially very limited and likely to be confined to a small area.

10.5.15.6 Displacement

None

10.5.15.7 Maintenance and Longevity

Impact will be delivered once works are completed but ongoing work to maintain the features is required. Actions to maintain vertical or near-vertical exposures can vary depending on several factors and a number of other actions in this bundle would often be part of a maintenance programme on a vertical or near-vertical face or exposure to retain the site or feature in favourable condition. **EBHE-234** Create/ maintain safety fencing for geodiversity features; **EBHE-238** Scrape rock faces; **EBHE-247** Remove scree or spoil; **EBHE-316** Control scrub or trees on top or in front of geodiversity features. Such works could require considerable capital input or volunteer effort at the start of a programme but aspects such as vegetation control need to be carried out routinely. A site may decline quickly, especially finite inland sites (Prosser 2006).

10.5.15.8 Climate Adaptation or Mitigation

None

10.5.15.9 Climate factors / Constraints

None

10.5.15.10 Benefits and Trade-offs to Farmer/Land manager

[50] https://geologistsassociation.org.uk/newgawpsite/wp-content/uploads/2017/07/GARockCoringGuide.pdf

[51] https://www.nature.scot/landforms-and-geology/protecting-our-geodiversity/codes-researchers-and-collectors/scottish-core-code

No direct benefit from the action but the information on soils and the past landscape can inform choices about land use and related environmental schemes such as tree-planting.

10.5.15.11 Uptake

Probably limited, as the focus would be on designated sites. Most farmers or land-managers would require input from Earth Scientists as to where to take cores or contract with scientific teams to undertake the work directly. Some hand-tools (peat probes, augers) can be used with relatively little training. Rock drills suitable for coring are also within the scope of those experienced in the operation of hand-held power tools. Larger coring systems are typically operated by geotechnical firms and would require specialist support to operate.

10.5.15.12 Other Notes

Drilling and coring with larger bore geotechnical rigs does have the potential to achieve some of the ends of **EBHE-240** Re-excavate sections of geodiversity features with less impact and long-lasting risk, especially where the aim is sampling of the site rather than exposing spatial relationship or features.

10.5.16 EBHE-242 Create/ maintain trenches

Trenches allow Earth Scientists to study cross-sections of features. These can be particularly informative, especially where there is considerable lateral variation in the geology or landform within a short distance. Pairs of trenches at right angles may be especially informative where there is a three-dimensional aspect to a site or feature. However, the usual purpose is to expose vertical faces to better understand the stratigraphy of a site, especially in relatively soft rock or unconsolidated sediments and their use is much more familiar in the context of archaeology.

EBHE-242	Create/ maintain trenches	**TD

10.5.16.1 Causality

Trenches are an appropriate means of accessing vertical sections or buried features in some cases (Prosser et al. 2006). Trenches are typically used in geotechnical or engineering geological site investigations[52], although trenches can be used in other sorts of geological specimen collection, usually of minerals or fossils. Knowledge might be increased but other methods are often available and, given the issues around trenching operations, the BHE benefits are uncertain.

10.5.16.2 Co-benefits and Trade-offs

Trenches, particularly those > 0.3 m deep, are a potentially significant hazard to people and livestock. Deep trenches need suitable support and such a feature would almost certainly require safety fencing and signage and are subject to additional health and safety regulations and advice[53]. Trenching can be visually unattractive.

10.5.16.3 Magnitude

Trenching tends to be local and would probably affect only the site, although there may be instances where the information gathered would influence the interpretation or understanding of other related features. Spoil from the trench would need to be managed and extra space given over to any required safety fencing.

10.5.16.4 Timescale

0–5 years. Any work will deliver, or continue to deliver, the benefit as soon as it is completed. Keeping the trench open could continue to deliver benefits over a longer period.

10.5.16.5 Spatial Issues

If a site has already been designated, it is likely there will be specific information about the location of features that would benefit from trenching work. In the case of sites that have not been designated, or new

[52] https://www.cmwgeosciences.com/geotechnical-services/site-investigation/trench-test-pit-sampling

[53] https://www.hse.gov.uk/construction/safetytopics/excavations.htm

discoveries, the use of geophysical techniques might be appropriate to delimit the area trenched, as shown in the example of finite buried interest in Prosser (2006 p. 69–70).

10.5.16.6 Displacement

Turf and spoil need to be managed during excavation. Depending on the depth of the trench, and the nature of the spoil, the spoil may need to be managed to prevent slips or failure, which can be a hazard. As with comments on re-excavation, **EBHE-240** Re-excavate sections of geodiversity features, there may need to be work to keep soils or sediment from different levels separate so that reinstatement work can be carried out in the most sympathetic manner possible.

10.5.16.7 Maintenance and Longevity

Yes, as even a temporary trench needs to be monitored and may require sides to be cleaned, propped or battened (Shelton 2004). On site benefit depends on duration of exposure but information gathered, or samples collected from a trench may have benefits for decades or centuries in a suitable repository.

10.5.16.8 Climate Adaptation or Mitigation

None.

10.5.16.9 Climate factors / Constraints

None.

10.5.16.10 Benefits and Trade-offs to Farmer/Land manager

None apparent. Open trenches could be a significant hazard for operations and to people and livestock. Removes land from production.

10.5.16.11 Uptake

Low among farmers but some other land uses could accommodate permanent or semi-permanent trenches, such as quarry sites with a conservation void left in place.

10.5.16.12 Other Notes

On consideration, it does seem that, in many cases, opening new trenches or maintaining current ones would place a considerable burden on many farmers or landowners for limited benefits for BHE. Encouraging the recording of temporary exposures through programmes such as BGS GeoExposures (Powell et al. 2013) could be a more productive approach.

10.5.17 EBHE-234: Create/maintain safety fencing for geodiversity features

Safety fencing is used in a range of contexts but the two main geosite types that need safety fencing are steep faces and the entrances to mines or caves, especially those sites where there is a danger of a significant vertical fall from a height or people or livestock being in the fall line of rocks.

EBHE-234	Create/maintain safety fencing for geodiversity features	*TD

10.5.17.1 Causality

A consideration for all sites is safe access (Scott et al. 2007). While SSSIs are designated based on scientific criteria alone, sites that are unsafe cannot be easily promoted to visitors and a lack of safety fencing may make owners reluctant to grant access. Physical barriers are likely to contribute to protection of sites with unconsolidated sediments, where people walking on the sediments may cause damage, or those with movable geoheritage assets such as fossils or minerals. By using fences, in combination with paths, to guide visitors safely to features of interest, fencing can make a positive impact beyond the purely functional (Prosser 2006).

10.5.17.2 Co-benefits and Trade-offs

Safety fencing would demonstrate a commitment to their duty of care to those working on the site or visiting with or without permission. This responsibility is laid down in Occupiers' Liability Acts and case law established in the Tomlinson versus Congleton Borough Council case (Scott et al. 2007). The action could offer a chance to enhance the landscape by using traditional walling or hedge-laying techniques that fit in

with the landscape. Such 'linescapes' can also offer benefits to biodiversity (Warwick 2017). Trade-offs: Some fencing can have negative impacts on biodiversity, either by blocking the movement of animals or leading to injury or death, e.g., birds flying into fences. However, there is scope to avoid these problems by good design and other modifications. The visual impacts of barriers could be detrimental to other aspects of BHE.

10.5.17.3 Magnitude
Safety is an important consideration but the magnitude of impact is likely to be quite low with regard to site condition.

10.5.17.4 Timescale
0–5 years: Dependent on the type of barrier, its extent and the ground conditions. Portable fencing, such as that used at events, can go up in hours, while a drystone wall or hedge may take months to years to complete.

10.5.17.5 Spatial Issues
Fencing work will be focused on the site or feature and is unlikely to be extensive.

10.5.17.6 Displacement
None

10.5.17.7 Maintenance and Longevity
Yes. This will vary depending on the type of fencing used. A schedule of inspection and maintenance could form part of an agreement. The amount of work to maintain the fencing would directly influence the longevity of the action but given that it is a safety issue and there would be an initial capital investment, the fencing is likely to be left in place and remain effective.

10.5.17.8 Climate Adaptation or Mitigation
None

10.5.17.9 Climate factors / Constraints
None

10.5.17.10 Benefits and Trade-offs to Farmer/Land manager
Safety fencing would be evidence of duty of care to those working on the site or visiting with or without permission. Some land may be lost from production or access to livestock, as the line of a barrier is likely to be set back from the site boundary for practical reasons of the construction work and, in some cases, to allow a run out space for falling material and ongoing clearance work by machinery (Prosser et al. 2006). In the case of steep faces or drops, there is also likely to need to be fencing along the top of the feature and possibly the fencing would need to encircle the feature if it is a quarry or mine/cave entrance. In some instances farmers and land-managers will benefit from the reduction or elimination of harm to livestock on steep faces and other hazards if they are able to offset costs of maintenance of fencing.

10.5.17.11 Uptake
The erection of safety barriers and fencing is a routine task for many farmers and land-managers and can be carried out on difficult ground by contractors with specialist skills. Given the potential benefits, it seems likely there would be uptake to improve land-management. Scott et al. (2007) is a free manual written with landowners as part of the target readership. In some cases, advice may be needed to avoid causing any damage to the site. SSSIs will have information on operations requiring consent (ORC).

10.5.17.12 Other Notes
N/A

10.6 KEY ACTION GAPS

None identified. The geodiversity bundle covers all the standard actions that are routinely undertaken on sites of geodiversity value from SSSIs down to sites with no designation but that are of local importance.

Interpretation and knowledge services are also covered by the bundles on Signposting, Information, Facilities and Events and Access and Create and Enhance Access and PROW.

10.7 Evidence gaps

No significant gaps in evidence but the amount of evidence is variable.

10.8 Top actions

A number of valuable actions are proposed but emphasis should be given to those actions that can have a wide uptake and have the strongest evidence of having a positive impact on many sites. On this basis, my recommendation of top actions would be:

EBHE-232	Maintain exposures of vertical or near-vertical faces
EBHE-316	Control scrub or trees on top or in front of geodiversity features
EBHE-239	Remove fly tipped rubbish from geodiversity features
EBHE-069	Provide guided geodiversity walks

11 THEME 9: AWARENESS OF ENHANCEMENT OF BIODIVERSITY/WILDLIFE

This theme focuses on exploring how awareness of the enhancement of biodiversity may provide cultural ecosystems services. The ecosystems services (ES) framework argues that the natural environment provides cultural ecosystems services through the intersection of material environment (woods, wetland, grassland etc.) and the human activities or practices we undertake in these settings that bring us into relation with them (watching, listening, walking, playing, meeting, gardening, fishing etc.) (Fish et al., 2016, O' Brien et al., 2017a). Place and practices together produce 'cultural ecosystem benefits', outcomes influencing our health and wellbeing (O'Brien et al., 2017a: 238).

Cultural ecosystem benefits have further been understood in terms of positive impacts to our: '*identities'* (through influencing our sense of our relationship with the environment, including our memories, sense of belonging, environmental attitudes, spiritual connections for example); *'experiences'* (via affective interactions with material environment, that may include feelings such as inspiration, expansiveness, appreciation, connectedness to nature and humanity); and *'capabilities'* (development of knowledge and abilities in relation to environmental interaction, including expertise and skills, and importantly physical health,) (Bryce et al., 2016: 260, O'Brien et al., 2017a). As Cultural benefits are effectively 'co-produced' through the interaction of people and nature (2017a: 237). These experiences of cultural value frequently overlap, interconnect and reinforce each other, so that despite our urge to categorise, it would be difficult to pin down where enjoyment of beauty becomes a spiritual experience for example or vice versa (Church et al., 2014:20).

This report comments on how awareness of enhanced biodiversity, emerging within/through some specific actions in relation to environment could result in cultural eco-system benefits, but also makes strong reference to how enhanced biodiversity may impact health and wellbeing by increasing opportunities for exposure to and contact with nature.

Actions that create, restore, manage or enhance habitats could positively enhance biodiversity and awareness of biodiversity with cultural benefits. These could include benefits for human 'capabilities' in terms of health and happiness for example. The evidence connecting biodiversity and human health and wellbeing is evolving. Whilst there is significant evidence connecting positive benefits of green environments for human happiness and wellbeing the influence of levels of biodiversity within that relationship and causality associated with degrees of species richness/abundance are being established (Fuller et a., 2007, Southon et al., 2018). A large part of this challenge is the diversity and consistency of study design in this area: methods and metrics employed and outcomes focused upon (Jorgensen & Gobster, 2010, Houlden et al., 2021, Hedin et al., 2022,).

Humans broadly appear to show a preference for more complex (diverse) natural settings (Kaplan & Kaplan, 1989). And as above, a number of studies demonstrate positive associations between biodiversity and self-reported assessments of health and wellbeing (Houlden et al., 2021, Hedin et al., 2021) However, many socio-cultural and individual variables can influence our environmental preferences and capacity to derive wellbeing benefits from biodiverse environments (Hedin et al., 2021). So, whilst a broad preference may exist, the relationships between positive wellbeing, mental health and biodiversity may be complicated and limited by such factors.

From a health perspective, the 'biodiversity hypothesis' argues that human health benefits from more biodiverse environments at the physiological level of the immune system, from exposure to more varied microbiomes (Houlden et al., 2021). The microbial biodiversity in farm's employing more traditional land management approaches has been associated with support of positive human immune function for instance, with evidence of this effect including several studies finding children raised in such settings less likely to have asthma (Sutton-Grier & Sandifer, 2019). The 'dilution hypothesis' suggests that increased species diversity impacts infection transmission, as pathogens spend more time being passed between species with the capacity to transmit the disease to humans (vector species such as ticks or mosquitoes) and other organisms, ultimately reducing human exposure to them (Houlden et al., 2021). Both these

theories suggest that levels of species richness and abundance can have direct influence on the risk of ill health and disease in humans (Ibid).

What is increasingly demonstrated through a sheer wealth of evidence is that exposure to and contact with nature (without specific consideration of its levels of biodiversity) can have important benefits for physiological, psychological and emotional health and wellbeing (Theme 2) and logically enrichment of biodiversity on any site could result in increased opportunities for such outcomes. In addition, meaningful, emotive 'experiences' with/in nature, including inspiration, appreciation, and a sense of empathetic relatedness could impact our sense of nature connectedness with benefits to our subjective sense of wellbeing and potential impacts on our motivation for undertaking pro-environmental behaviour (also in Theme 2) (Lumber et al., 2017, O'Brien et al., 2017a). The significant impacts of exposure to and contact with nature on human health and happiness are more and more recognised as 'natural health services. As such, supported access to them (commonly provided by third-sector organisations) is increasingly socially prescribed by health professionals (Cook et al., 2019).

Actions that may lead to increases in the biodiversity of environments could potentially also increase the likelihood of having a self-led learning experiences in that setting or that chances of others wanting to educate in relation to it (Theme 3), again positively impacting capabilities. Actions that potentially create, restore and enhance biodiversity through employing particular skills and practices in relation to environmental management could also increase capacity for such knowledge to be exchanged and preserved, impacting capabilities.

Actions increasing species abundance and diversity could also contribute to us being more likely to have significant experiences in the natural world that proves important in shaping and building our sense of our 'identity' as an individual in relation to the rest of the natural world. This 'environmental autobiography', potentially fuelled through meaningful memories and experiences of ourselves in relation to nature, may also inform our sense of caring and responsibility for the human and more than human world (Chalwa, 1995, Gaesser, 2013). Our involvement in pro-environmental activity such as volunteering in nature may both drive and derive from, our sense of identity in relation to the natural world (Theme 4).

The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

In terms of adaptation to or mitigation of climate change, actions associated with creating and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.1 Management Bundles

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:

- Habitat creation
  - Habitat creation/woodland (3 actions)
  - Habitat creation/woody features (2 actions)
  - Habitat creation/scrub (1 action)
  - Habitat creation/ponds and wetlands (2 actions)
  - Habitat creation/grassland (1 action)
  - Habitat creation/horticulture (1 action)
- Specific wildlife targeted actions
  - Specific wildlife targeted actions/ (3 actions)
- Restoration, management and enhancement
  - Restoration, management and enhancement/woodland (6 actions)
  - Restoration, management and enhancement/woody features (3 actions)
  - Restoration, management and enhancement/scrub (1 actions)
  - Restoration, management and enhancement/grassland (2 actions)
  - Restoration, management and enhancement/rivers (2 actions)
  - Restoration, management and enhancement/boundary features (7 actions)
- Actions for habitats with specific hydrological characteristics
  - Actions for habitats with specific hydrological characteristics/peatlands and wetlands (4 actions)
- Livestock management
  - Livestock management/selection and diversification (2 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

11.2 Bundle: Habitat creation

11.2.1 Woodland

EBHE-140: Create a woodland creation plan
EBHE-140C: Create ghyll woodland
EBHE-209C: Create traditional orchards with local varieties of fruit tree
EBHE-281: Set up or engage with community tree planting projects

EBHE-140: Create a woodland creation plan – woodland creation plans are required in order to receive governmental grants for woodland creation. The plan must include identification of landscape and visual sensitivities relevant to woodland creation, as well as identification of proximity to priority habitats or species, national or international designations, heritage assets etc. All new woodland must be UKFS (UK Forestry Standard) compliant.

EBHE-140C: Create ghyll woodland – ghyll woodlands are native woodland found on steep-sided valleys, predominantly in uplands area in western Britain (Flora local 2005). Creation could take place through either natural regeneration or planting approaches (ibid)

EBHE-209C: Create traditional orchards with local varieties of fruit tree – traditional orchards are structurally and ecologically similar to wood-pasture and parkland, having widely spaced fruit trees within wider grassland, that is either grazed or cut (JNCC 2008). They are important biodiversity hotspots and include UK BAP priority habitats and species. A feature of traditional orchards is the variety of the fruit

cultivars they contain and the low intensity management regimes applied (in contrast to more intensively managed orchards) (JNCC 2008).

EBHE-281: Set up or engage with community tree planting projects – this action refers to the specific engagement of communities in local tree planting projects, either through community-led planting, or residents volunteering to engage in tree planting activities.

The benefits from these above four actions are also described in Themes 2, 4 and 13. Below we set out specific impacts of the actions on awareness of biodiversity.

EBHE-104	Create a woodland creation plan	LT***
EBHE-140C	Create ghyll woodland	LT***
EBHE-209C	Create traditional orchards with local varieties of fruit tree	**
EBHE-281	Set up or engage with community tree planting projects	LT***

11.2.1.1 Causality

EBHE-104: Create a woodland creation plan

Whilst, as far as we know, there is not specific evidence for the cultural benefits of creating a woodland creation plan it seems logical that as an action it has the potential to result in protection and maintenance of existing cultural benefits. By helping to identify proximity and risk to existing cultural features and species rich/abundant habitats by any proposed woodland creation, it could protect against the potential disbenefits posed by landscape change (shifts in landscape character, risks to heritage features, sense of place and access features such as rights of way) (see other Themes including 6 & 13) and harm to significant ecosystems (such as priority habitats and species).

Through establishing and verifying with landowners that impacts of woodland creation near to or on biodiverse settings must be avoided and triggering funding for specialist survey of some aspects of species richness/abundance to ensure its protection, a woodland creation plan will enable people to continue benefiting from existing cultural benefits. Whilst a mature woodland can represent a biodiverse habitat, the establishment of new woodland on a site of existing species richness/abundance or that conserves a priority species could be considered to represent environmental degradation.

EBHE-140C: Create ghyll woodland

Again, whilst there is not established evidence specific to ghyll woodlands that we are aware of, relevant evidence would suggest that establishment of ghyll woodlands could result in benefits to physiological, psychological and emotional health and wellbeing of those accessing or viewing.

Upland areas, where ghyll woodland will be located, have experienced substantial declines in woodland cover as stock numbers have increased and shepherding and woodland industry decreased (Flora local 2005). In this context, they represent a significant treescape. Treescapes have been specifically associated with beneficial impacts on physiological health (including immune function, attention restoration and stress reduction) and psychological health (Marušáková & Sallmannshoferet, 2019, Goodenough & Waite, 2020). They can also decrease exposure to environmental harms including air and noise pollution and heat (Marušáková & Sallmannshoferet, 2019).

As described above, the heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural challenges conclusions around the impact of species richness and abundance, scale differences and types and degrees of exposure interlink in influencing these outcomes. However, it is useful to note that simply viewing treescapes can positively impact physiological health, reducing stress, whilst increasing relaxation, and benefiting emotional wellbeing (Lee et al., 2009). Evidence also suggests that perceived restorative value of treescapes may increase in line with perceived levels of naturalness or

wildness, indicating that how and where we create or restore such landscapes may have some influence on their restorative potential (Stigsdotter et al., 2017). It is also important to highlight that enclosed, dense treescapes may not be experienced as restorative (Gatersleben & Andrews, 2013).

EBHE-209C: Create traditional orchards with local varieties of fruit tree

Again, while there isn't specific evidence of the cultural benefits of enhancing biodiversity through this action, the creation of traditional orchards could confer physiological and psychological benefits associated with treescapes and greenspace (see above). As biodiversity hotspots, featuring BAP priority and scarce species, their creation could also result in benefits particularly associated with increased species richness and abundance, including increased opportunities for contact and connection with the natural world (as above).

The use of skills and knowledge in relation to nurturing a traditional orchard with local tree varieties may also have benefits to capabilities, keeping important competences relevant to maintenance of local biodiversity relevant and in practice. In addition, local varieties of fruit tree and fruit may have particular cultural relevance and symbolic meanings that are important to local and regional communities. It has been argued that the cultural relevance and meanings of biodiversity can provide 'psychological stimuli' towards feeling good, whilst it's loss or degradation may result in negative impacts on mental health (Clark et al, 2014).

EBHE-281: Set up or engage with community tree planting projects

Setting up or providing space for community tree planting projects, with the potential to enhance biodiversity, have the capacity to contribute cultural benefits to participant's planting in several ways. Opportunities to take part in environmental volunteering can generate social and mental health benefits (Patrick et al., 2022) (Theme 4) and contribute to our sense of ourselves in relation to other species and fulfil feelings of responsibility of care. Similarly, volunteering that specifically provides opportunities to plant and/or maintain trees may provide benefits for planter's subjective wellbeing through the cultural relevance and meaning of the action for them, including its direct capacity to satisfy responsibilities of care (Moskell et al., 2011, Waite et al., 2018).

Bringing communities into contact with and relation to nature, through projects that aim to enhance species abundance and richness also provides a route towards experiences and development of capacity for nature connection (an emotional/psychological relatedness), with positive impacts on subjective wellbeing including people's sense that they are developing as an individual (Pritchard et al., 2020). It is important to note that whilst time spent in nature can result in benefits to mental health and wellbeing, time spent actively engaging with ('noticing') nature is associated with increased benefit (Richardson et al., 2021). And that it is hypothesised that a capacity to connect with nature is developed over time from repeated engagements with the natural world (Carr & Hughes, 2021). Higher levels of nature connectedness have been associated with higher levels of pro-environmental behaviour and some evidence explores how tree planting may be a precursor of this, via its support of connection to nature, engagement with pro- environmental attitudes and time spent in a restorative environment (Waite et al., 2018, Whitburn et al., 2018).

Engaging a community with a treescape also has potential to confer physiological and psychological benefits associated with treescapes and greenspace (see above and Theme 2).

It is important to note that how communities are engaged with the creation of treescapes can be significant for their access to its cultural benefits. Involvement in early stages of community planting may be important to ensuring it does not conflict with community preferences and needs of the landscape, dis-benefiting cultural value (Carmichael et al., 2018).

11.2.1.2 Co-benefits and Trade-offs

Cultural co-benefits of creation of ghyll woodland could derive from their contributions to flood management, potentially helping to protect mental health as floods are associated with negative impacts on mental wellbeing (Paranjothy et al., 2011).

Traditional orchards are often part of local food projects (from local food presence in supermarkets, box schemes and farmers markets to community growing projects). Evidence suggests that wellbeing could be a co-benefit of such initiatives, with both active and more passive participation in the broad range of these types of project potentially able to contribute to outcomes including connection with nature, improved diet and satisfaction of psychological needs (Bharucha et al., 2020).

11.2.1.3 Magnitude

The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.2.1.4 Timescale

Actions that directly involve people in creating, managing or restoring enhanced biodiversity and/or bring them more closely into contact or relation with it (via access or activity), might be expected to generate cultural benefits earlier than actions that seek to enhance species richness and abundance without this engagement from communities.

Because the species richness and abundance of newly established/naturally colonised environments may take time to develop then it might be expected that benefits will also develop and grow over the time it takes for biodiversity to establish.

11.2.1.5 Spatial Issues

Not assessed.

11.2.1.6 Displacement

Woodland creation plans should help ensure that the development of new treescapes developed in relation to them do not displace other major habitat types, however not all types of treescape development will necessarily have an incentivised requirement for one. If existing habitats are supportive of priority species or are priority habitats or feature species or heritage of particular cultural significance, conversion to treescape could have a negative (at least initially) impact on cultural benefits associated with biodiversity. However, where treescape replaces more intensive land uses, there could be enhanced biodiversity and cultural benefits related to it.

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.2.1.7 Maintenance and Longevity

Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.2.1.8 Climate Adaptation or Mitigation

In terms of adaptation to or mitigation of climate change, actions associated with creating and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting bio-diversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.2.1.9 Climate factors / Constraints

Not assessed.

11.2.1.10 Benefits and Trade-offs to Farmer/Land manager

Farmers and land managers may find it challenging to make changes to agricultural landscapes that take them out of production, including tree planting/natural colonisation, as this can conflict with their current sense of identity and purpose (Staddon et al., 2021). However, there are opportunities to try and align actions involving tree and woodland management with farmers existing behaviours and sense of stewardship, but more research is required in this area (Ambrose et al., 2022).

11.2.1.11 Uptake

Not assessed.

11.2.1.12 Other Notes

N/A

11.2.2 Woody features & scrub

EBHE-191: Plant and establish appropriate species of field boundary trees
EBHE-205C: Create wood pasture (eg through appropriate grazing)

EBHE-191: Plant and establish appropriate species of field boundary trees – trees in hedgerows are significant for biodiversity, with evidence suggesting they support more priority species independently and in association with other hedgerow elements than any other individual hedgerow component (shrubs, margins, etc) (Wolton et al., 2013).

EBHE-205C: Create wood pasture (eg through appropriate grazing) - wood pasture is land that is managed through grazing, with trees in these settings often pollarded. Many of the UK's ancient trees are in wood pasture or parkland settings, although wood pasture is currently quite a rare habitat. Wood pasture is a less intensive, in comparison with some forms of agriculture or grazing regimes.

EBHE-191	Plant and establish appropriate species of field boundary trees	L**
EBHE-205C	Create wood pasture (eg through appropriate grazing)	LTD***

11.2.2.1 Causality

EBHE-191: Plant and establish appropriate species of field boundary trees
There is no evidence that we are aware of that refers specifically to the cultural benefits of establishing trees within hedgerows. However, relevant findings from other research suggests that through positively influencing species richness and abundance field boundary trees could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness (see above). Field boundary trees could also influence the extent to which a hedgerow is associated with qualities of naturalness and wildness increasing the restorative benefits of the landscape (as above, Stigsdotter et al., 2017).

EBHE-205C: Create wood pasture (eg through appropriate grazing)
As above relevant findings from other research suggests that through positively influencing species richness and abundance field wood pasture habitat could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness (see above, actions such as **EBHE-140C** Create ghyll woodland). If the setting is shifting from a more intensive agricultural use to the comparatively low intensity management regimes associated with woodland pasture, the changes in species richness and abundance and the associated cultural benefits could be significant.

If shifting the landscape aesthetic towards increased qualities of naturalness and wildness, they may also be potential for the habitat to be of increased restorative value (as above). This may contrast with the preferences of farmers for wood pasture's characteristics, however. Research looking across Europe suggests that environmental preferences for wood pasture differ across user groups and relate to cultural background and motivations for engaging with that habitat (farmer's preferring more open wood pasture, managed extensively for livestock, whilst tourists may prefer higher concentrations of shrubs for example) (Plieninger et al., 2015). Overall, however it has been suggested that historically wood pastures have long been a landscape of high aesthetic value, encouraging people into an appreciative relationship with this landscape (ibid), enjoyment of beauty one of five possible routes into connection with nature (Lumber et al., 2017).

As a longstanding farming system with the UK and Europe, wood pasture also presents opportunities for traditional and locally specific management practices and skills to be deployed and shared, positively impacting capabilities (ibid). The cultural benefits of wood pasture as a culturally significant heritage setting are also discussed in the Theme 6.

11.2.2.2 Co-benefits and Trade-offs
Co-benefits of creation of wood pasture as a widely appreciated, but relatively rare landscape could include encouragement of tourism and opportunities for visitors to access the cultural benefits associated with wood pastures.

11.2.2.3 Magnitude
The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.2.2.4 Timescale
As wood pastures systems may take time to become established it may be that the cultural benefits associated with are not established immediately but develop and increase during this period.

11.2.2.5 Spatial Issues
Not assessed

11.2.2.6 Displacement
Field boundary trees should not displace other major habitat types, however wood pasture could do. If the existing habitats is supportive of priority species or habitats or particularly species rich or abundant, or features species or heritage of particular, existing cultural significance, conversion to wood pasture could have a negative (at least initially) impact on cultural benefits associated with pre-existing biodiversity. However, where wood pasture replaces more intensive land uses, there could be enhanced biodiversity and cultural benefits related to it.

11.2.2.7 Maintenance and Longevity

Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.2.2.8 Climate Adaptation or Mitigation

In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.2.2.9 Climate factors / Constraints

Not assessed

11.2.2.10 Benefits and Trade-offs to Farmer/Land manager

Not assessed

11.2.2.11 Uptake

Not assessed

11.2.2.12 Other Notes

N/A

11.2.3 Ponds & wetlands

EBHE-169: Restore/ manage ghost ponds
EBHE-211: Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials

EBHE-169: Restore/ manage ghost ponds

From the 1950s pressure to increase food production has resulted in many ponds being filled in to increase the availability of farming land. These filled-in ponds can still sometimes be seen as crop marks or areas of damp referred to as 'ghost ponds'. This action seeks to restore and manage these. Research demonstrates that farm pond restoration can provide rich aquatic habitats with positive impacts for local birds and pollinators.

EBHE-211: Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials.

Ponds that remain on farmland are frequently overgrown or 'terrestrialised' offering poor habitat for wildlife. However traditional pond management including the removal of trees and sediment can restore these with significant benefits for biodiversity.

EBHE-169	Restore/ manage ghost ponds	L**
EBHE-211	Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials	L**

11.2.3.1 Causality

EBHE-169: Restore/ manage ghost ponds

There is little literature exploring the cultural benefits of restoring and managing ghost ponds, but it is likely to contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to

and contact with nature and associated impacts on health and happiness. Just as green settings have a positive stress reducing and restorative capacity, so do 'blue' ones for example (White et al. 2020). Indeed, blue environments have been demonstrated to be among the most restorative (ibid). It is important to note however that perceptions of poor water quality can negatively impact the cultural benefits of aquatic environments (ibid).

The impacts of perceived and actual levels of biodiversity within blue environments on human health and happiness are still being debated and surfacing, just as in the case of research exploring these relationships in green settings (ibid). And in alignment with the findings around green environments, background and individual preference have been shown to influence how we respond to blue cultural services (ibid).

Ponds may also help mitigate against environmental harms by influencing surrounding temperatures (ibid).

Whilst this action does not incorporate a reference to opportunities for public engagement with farmland ponds, one study on the cultural benefits of creating ponds on farms as an agri-environmental action suggests that these biodiverse features are aesthetically enjoyed by both nearby residents and visitors, and not perceived to conflict with productivity (Bullock et al., 2021). As described above, aesthetic appreciation used as the measure of cultural benefit in this research has been evidenced as one of five routes into nature connection, with associated benefits for mental health.

EBHE-211: Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials
See **EBHE-169**: Restore/ manage ghost ponds above. In addition, capabilities can be positively impacted if knowledge of techniques and materials of pond restoration and management are employed, shared and enhanced in this action.

11.2.3.2 Co-benefits and Trade-offs

Not assessed

11.2.3.3 Magnitude

The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.2.3.4 Timescale

It may take time for the species abundance and richness associated with restored farm ponds to be established so that not all cultural benefits associated with are not established immediately, but develop and increase during this period. However, Bullock et al's., 2021 research was undertaken approximately two years after pond creation, suggesting that aesthetic appreciation is established fairly rapidly.

11.2.3.5 Spatial Issues

Not assessed

11.2.3.6 Displacement

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.2.3.7 Maintenance and Longevity

Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.2.3.8 Climate Adaptation or Mitigation

Not assessed

In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.2.3.9 Climate factors / Constraints

As above, blue environments such as ponds can have cooling effects, contributing towards protection against environmental harms.

11.2.3.10 Benefits and Trade-offs to Farmer/Land manager

11.2.3.11 Uptake

11.2.3.12 Other Notes

N/A

11.2.4 Grassland

EBHE-214C: Create locally distinctive flower rich/hay meadows using traditional techniques

Change associated with intensified agriculture, including the development and extensive use of silage have dramatically reduced hay production and grazing pasture in the UK with significant impacts for biodiversity. This action aims to create flower rich/hay meadows through traditional practices with benefits to species richness and abundance.

EBHE-214C	Create locally distinctive flower rich/hay meadows using traditional techniques	L**

11.2.4.1 Causality

Relevant findings from other research suggests that through positively influencing species richness and abundance field the creation of locally distinctive flower rich/hay meadows using traditional techniques could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness. If the setting is shifting from a more intensive agricultural use to the comparatively low intensity management regimes associated with hay meadows and grazing pasture, the changes in species richness and abundance and the associated cultural benefits could be significant.

Little direct evidence around cultural benefits of creating flower rich/hay meadows exists as far as we are aware. One study exploring creation of urban meadows suggests that people can fairly accurately perceive

associated impacts on species richness and that these perceptions of enhanced biodiversity positively impact psychological wellbeing through facilitating connection to nature and satisfaction of landscape preferences (Southon, 2017). Other research exploring creation of meadows on farms finds that these are aesthetically enjoyed and a landscape preference for nearby residents and visitors, but visitors value them more highly than residents (Bullock et al., 2021). Flower rich margins were also a shared landscape preference and aesthetically enjoyed by residents and visitors (residents enjoying the change to a greater extent than meadows, possibly because margins are more noticed as a significant change in management regime). This (though limited) evidence substantiates that aesthetic preferences for and enjoyment of meadows and flower richness on farms could provide a pathway to connection with nature and psychological wellbeing.

11.2.4.2 Co-benefits and Trade-offs

In some locations wildflower measures may conflict with local community preferences, particularly due to their untidy nature in the autumn and the height of vegetation may impede human access resulting in cultural disbenefits

11.2.4.3 Magnitude

The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.2.4.4 Timescale

Meadow creation and enjoyment took place relatively rapidly in the evidence explored.

11.2.4.5 Spatial Issues

Not assessed

11.2.4.6 Displacement

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.2.4.7 Maintenance and Longevity

Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.2.4.8 Climate Adaptation or Mitigation

In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.2.4.9 Climate factors / Constraints

Not assessed

11.2.4.10 Benefits and Trade-offs to Farmer/Land manager

Not assessed

11.2.4.11 Uptake

Not assessed

11.2.4.12 Other Notes

N/A

11.3 BUNDLE: SPECIFIC WILDLIFE TARGETED ACTIONS

11.3.1 Specific wildlife targeted actions

EBHE-182: Create and use a wildlife management plan
EBHE-224: Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally

EBHE-182: Create and use a wildlife management plan
A wildlife management plan could include aims of land management in relation to wildlife, location specific habitat management approaches aimed at benefiting wildlife, and a program and timings for carrying out such habitat management

EBHE-224: Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally
Fallow plots are uncropped areas in arable fields that provide more open and sparsely vegetated habitat created by spring cultivation of the plot to create a rough fallow. This habitat has declined due to a widespread move from spring-sown to autumn-sown crops. It is particularly important for species of plant and ground nesting bird such as stone curlew and lapwing.

EBHE-302: Install/ maintain bird and insect houses
Bird and insect houses aim to increase the availability of places for birds and insects to live.

EBHE-182	Create and use a wildlife management plan	L**
EBHE-224	Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally	LT**
EBHE-302	Install/ maintain bird and insect houses	L**

11.3.1.1 Causality

EBHE-182: Create and use a wildlife management plan
Creating a wildlife management plan could have direct impacts on awareness of biodiversity on the farm and how best species richness and abundance can be enhanced in this location. Through its use in guiding and embedding practices that positively influence biodiversity, the creation of a wildlife management plan could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness.

If done well it has the potential to result in protection and maintenance of existing cultural benefits through helping identify, maintain and protect existing species rich and abundant habitats, where changings in management could represent environmental degradation and cultural disbenefits.

EBHE-224: Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally

Relevant findings from other research suggests that through positively influencing species richness and abundance, the creation of cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally using traditional techniques, could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness.

Research exploring which types of species richness (birds, trees and mammals) are most associated with human wellbeing across 26 European countries found that bird diversity was quite positively associated with life satisfaction, (a stronger association than with other taxonomic groups tested) (Methorst et al., 2020). The impact of bird species richness on perceptions of life satisfaction was similar to that of income with that of income (ibid). This important evidence of the influence that species richness has on human happiness was linked by the researchers to two experiences: multi-sensory encounters with birds themselves, and health and wellbeing benefits supplied by the kinds of landscapes that support bird diversity. This conclusion highlights that landscape management to enhance bird diversity and protect bird species have clear benefits to human health and wellbeing.

EBHE-302: Install/ maintain bird and insect houses
See above and **EBHE-224**Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally using traditional techniques. Relevant findings from other research suggests that through positively influencing species richness and abundance, installing and maintaining bird and insect houses could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness.

Whilst we are not aware of evidence specifically demonstrating the cultural benefits of bird and insect houses, a study using birds, bees and butterflies as markers of biodiversity found that visitors and residents close to farms found aesthetic enjoyment in all species, a potential pathway to nature connection and its benefits to wellbeing (Bullock 2021). However, residents were more equivocal about bees, contradicting findings elsewhere that bees are generally held in positive regard (Ibid). This perhaps reflects the role of individual and cultural factors in determining environmental preferences and the species we appreciate and find beauty.

11.3.1.2 Co-benefits and Trade-offs
Not assessed

11.3.1.3 Magnitude
The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.3.1.4 Timescale
Wildlife management plans will take time to enact and benefits will be realised over different time scales depending on the specific habitat creation, restoration, management and protection actions it instigates.

Bird and insect houses may be used fairly rapidly depending on how attractive they are to relevant species, and their proximity to intended occupants.

11.3.1.5 Spatial Issues
Not assessed

11.3.1.6 Displacement

As above, wildlife management plans will need to relate to existing to the management of exisitng species richness/abundance to protect against environmental degradation.

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.3.1.7 Maintenance and Longevity

Wildlife management plans will need to revisited, reviewed and refreshed in relation to evidence of impacts to ensure they continue to have beneficial effects on species abundance/richness.

11.3.1.8 Climate Adaptation or Mitigation

In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.3.1.9 Climate factors / Constraints

Not assessed

11.3.1.10 Benefits and Trade-offs to Farmer/Land manager

Not assessed

11.3.1.11 Uptake

Not assessed

11.3.1.12 Other Notes

N/A

11.4 Bundle: Restoration, management and enhancement

11.4.1 Woodland

EBHE-140EM: Enhance/ manage ghyll woodland
EBHE-196: Planted Ancient Woodland (PAWS) restoration
EBHE-198: Restore/ manage ancient woodland with native broadleaf species
EBHE-209: Create, restore or manage traditional orchards with local varieties of fruit tree
EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree
EBHE-314: Create a woodland management plan

EBHE-140EM: Enhance/ manage ghyll woodland - see **EBHE-140C**

EBHE-196: Planted Ancient Woodland (PAWS) restoration – PAWS are ancient woodland sites where semi-natural woodland has been replaced with a plantation. Most PAWS sites are either currently being restored or are likely to be restored to semi-natural woodland over the next few decades. The transition from plantation to semi-natural woodland is associated with an overall improvement in biodiversity.

EBHE-198: Restore/ manage ancient woodland with native broadleaf species – see **EBHE-196**

EBHE-209: Create, restore or manage traditional orchards with local varieties of fruit tree – See **EBHE-209C**

EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree - see **EBHE-209**

EBHE-314: Create a woodland management plan – see **EBHE-104**

EBHE-140EM	Enhance/ manage ghyll woodland	M **EBHE-140C**
EBHE-196	Planted Ancient Woodland (PAWS) restoration	***
EBHE-198	Restore/ manage ancient woodland with native broadleaf species	M **EBHE-196**
EBHE-209	Create, restore or manage traditional orchards with local varieties of fruit tree	M **EBHE-209** C
EBHE-209EM	Restore or manage traditional orchards with local varieties of fruit tree	M **EBHE-209C**
EBHE-314	Create a woodland management plan	M EBHE0-104

11.4.1.1 Causality

EBHE-196: Planted Ancient Woodland (PAWS) restoration

The restoration of semi-natural ancient woodland is likely to have significant impacts on species richness and abundance and relevant findings suggest that biodiverse treescapes contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness (see **EBHE-140C** for example).

There is a small UK evidence base that touches specifically on the cultural benefits of structurally and species diverse woodland. Broadly, the evidence suggests that structurally diverse, broadleaf woodland is frequently preferred to conifer, and mixed species woodland is favoured over monoculture) (Tew et al., 2019). Evidence suggests that people are fairly accurate in their assessments of biodiversity levels in woodland (Johansson et al., 2013) and perceive broadleaf woodland as supplying more cultural benefits associated with wildlife and nature than coniferous woodland (Inwood, 2015). Broadleaf and mixed woodland are more highly valued for provision of recreational and aesthetic benefits for example than conifer woods (Gosal et al.. 2018, Irvine & Herret, 2018).

Though there is a generalised preference for species rich and abundant woodlands as resources of cultural benefit, it is important to note that individual and cultural factors may impact this trend (Irvine & Herret, 2018). High levels of biodiversity in woodland are not necessarily favoured, for example, if they result in dense understory and too strong a feeling of enclosure (Johansson et al., 2013).

11.4.1.2 Co-benefits and Trade-offs

As noted above, though a general trend towards preference for species rich and biodiverse woodland for increased delivery of cultural services is evident in the literature woodland management regimes may need to respond to the needs and preferences of nearby communities to prevent cultural disbenefit.

11.4.1.3 Magnitude

The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with

associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.4.1.4 Timescale

It may take some time for PAWS woodlands to become more structurally complex and species richness and abundance to increase, and cultural benefit may increase in line with this transition.

11.4.1.5 Spatial Issues

Not assessed

11.4.1.6 Displacement

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.4.1.7 Maintenance and Longevity

Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.4.1.8 Climate Adaptation or Mitigation

In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.4.1.9 Climate factors / Constraints

Not assessed

11.4.1.10 Benefits and Trade-offs to Farmer/Land manager

Not assessed

11.4.1.11 Uptake

Not assessed

11.4.1.12 Other Notes

N/A

11.4.2 Woody features

EBHE-192: Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction
EBHE-205: Create, Enhance/ manage wood pasture (eg through appropriate grazing)
EBHE-205EM: Enhance/ manage wood pasture (eg through appropriate grazing)
EBHE-192: Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction – Trees out of woodland, particularly mature and veteran trees make a significant contribution

to supporting species richness and diversity and this action will help protect that contribution from in-field trees.

EBHE-205: Create, Enhance/ manage wood pasture (eg through appropriate grazing) – see **EBHE-205C**.

EBHE-205EM: Enhance/ manage wood pasture (eg through appropriate grazing) – see **EBHE-205C**.

EBHE-192	Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction	L*
EBHE-205	Create, Enhance/ manage wood pasture (eg through appropriate grazing)	M **EBHE-205C**
EBHE-205EM	Enhance/ manage wood pasture (eg through appropriate grazing)	M **EBHE-205C**

11.4.2.1 Causality

EBHE-192: Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction

Managing existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction will have benefits for biodiversity and cultural benefits associated with the creation, enhancement and management of wood pasture – see **EBHE-205C**.

11.4.2.2 Co-benefits and Trade-offs

Not assessed

11.4.2.3 Magnitude

The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.4.2.4 Timescale

Actions that directly involve people in creating, managing or restoring enhanced biodiversity and/or bring them more closely into contact or relation with it (via access or activity), might be expected to generate cultural benefits earlier than actions that seek to enhance species richness and abundance without this engagement from communities.

Because the species richness and abundance of newly established/naturally colonised environments may take time to develop then it might be expected that benefits will also develop and grow over the time it takes for biodiversity to establish.

11.4.2.5 Spatial Issues

Not assessed

11.4.2.6 Displacement

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.4.2.7 Maintenance and Longevity

Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.4.2.8 Climate Adaptation or Mitigation

In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.4.2.9 Climate factors / Constraints

Not assessed

11.4.2.10 Benefits and Trade-offs to Farmer/Land manager

Not assessed

11.4.2.11 Uptake

Not assesed

11.4.2.12 Other Notes

N/A

11.4.3 Scrub

EBHE-203EM: Enhance / manage targeted scrub – scrub is considered a 'successional' habitat as it is, naturally, a temporary habitat between more open habitat areas (e.g. grassland, heathland) and woodland. Therefore, the main purpose for scrub management is to maintain it as scrub, providing a habitat for those species which depend on it, and to also prevent scrub from invading other valuable habitats, such as grassland and heathland.

EBHE-203EM	Enhance / manage targeted scrub	L*

11.4.3.1 Causality

As above, relevant findings from other research suggests that through positively influencing species richness and abundance enhancing and managing targeted scrub could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness.

Through preventing scrublands incursion into other habitats of high or distinctive biodiversity value and associated cultural service provision, this action can prevent disbenefits posed by potential reductions in species richness/abundance that could be considered to represent environmental degradation.

11.4.3.2 Co-benefits and Trade-offs

Not assessed

11.4.3.3 Magnitude

The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species

richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.4.3.4 Timescale

Actions that directly involve people in creating, managing or restoring enhanced biodiversity and/or bring them more closely into contact or relation with it (via access or activity), might be expected to generate cultural benefits earlier than actions that seek to enhance species richness and abundance without this engagement from communities.

Because the species richness and abundance of newly established/naturally colonised environments may take time to develop then it might be expected that benefits will also develop and grow over the time it takes for biodiversity to establish.

11.4.3.5 Spatial Issues

Not assessed

11.4.3.6 Displacement

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.4.3.7 Maintenance and Longevity

Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.4.3.8 Climate Adaptation or Mitigation

In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.4.3.9 Climate factors / Constraints

Not assessed

11.4.3.10 Benefits and Trade-offs to Farmer/Land manager

Not assessed

11.4.3.11 Uptake

Not assessed

11.4.3.12 Other Notes

N/A

11.4.4 Grassland

EBHE-214EM: Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques
EBHE-214-X: Manage locally distinctive flower rich/hay meadows using traditional techniques

EBHE-214EM: Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques
Change associated with intensified agriculture, including the development and extensive use of silage have dramatically reduced hay production and grazing pasture in the UK with significant impacts for biodiversity. This action aims to enhance and manage flower rich/hay meadows through traditional practices with benefits to species richness and abundance.

EBHE-214-X: Manage locally distinctive flower rich/hay meadows using traditional techniques – see **EBHE-214EM**

EBHE-214EM	Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques	L**
EBHE-214-X	Manage locally distinctive flower rich/hay meadows using traditional techniques	M **EBHE-214EM**

11.4.4.1 Causality
Relevant findings from other research suggests that through positively influencing species richness and abundance action to enhance and manage locally distinctive flower rich/hay meadows using traditional techniques could contribute to positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness.

Little direct evidence around cultural benefits of enhancing and managing flower rich/hay meadows exists as far as we are aware, but relevant evidence substantiating that wildflower meadows/margins can positively impact psychological health and provide a pathway to connection with nature is discussed in **EBHE-214C**.

11.4.4.2 Co-benefits and Trade-offs
See **EBHE-214C**.

11.4.4.3 Magnitude
The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.4.4.4 Timescale
Actions that directly involve people in creating, managing or restoring enhanced biodiversity and/or bring them more closely into contact or relation with it (via access or activity), might be expected to generate cultural benefits earlier than actions that seek to enhance species richness and abundance without this engagement from communities.

Because the species richness and abundance of newly established/naturally colonised environments may take time to develop then it might be expected that benefits will also develop and grow over the time it takes for biodiversity to establish.

11.4.4.5 Spatial Issues
Not assessed

11.4.4.6 Displacement
Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.4.4.7 Maintenance and Longevity
Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.4.4.8 Climate Adaptation or Mitigation
In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.4.4.9 Climate factors / Constraints
Not assessed

11.4.4.10 Benefits and Trade-offs to Farmer/Land manager
Not assessed

11.4.4.11 Uptake
Not assessed

11.4.4.12 Other Notes
N/A

11.5 Bundle: Actions for habitats with specific hydrological characteristics

11.5.1 Peatlands and wetlands

EBHE-164C: Create wetland habitats
EBHE-164EM: Enhance/ manage wetland habitats
EBHE-216: Rewet moorland (including common land), eg through appropriate traditional grazing techniques

EBHE-164C: Create wetland habitats – wetlands are important for biodiversity, including endangered species and migratory birds. However, they are endangered habitats, disappearing three times as fast as forests.

EBHE-164EM: Enhance/ manage wetland habitats – see **EBHE-164C**.

EBHE-216: Rewet moorland (including common land), eg through appropriate traditional grazing techniques – Draining of upland bog and moorland to provide agricultural and forestry land has impacted biodiversity adapted to such habitat through lowering the water table, as well as influencing biodiversity in downstream rivers. Rewetting moorland typically occurs through physically blocking man-made drains and gulleys caused by erosion.

EBHE-164C	Create wetland habitats	***
EBHE-164EM	Enhance/ manage wetland habitats	***
EBHE-216	Rewet moorland (including common land), eg through appropriate traditional grazing techniques	L**

11.5.1.1 Causality

EBHE-164C: Create wetland habitats

The impacts of perceived and actual levels of biodiversity within blue environments on human health and happiness are still being debated and surfacing, just as in the case of research exploring these relationships in green settings (White et al.2020). The cultural value of blue space, particularly inland freshwater wetland, is relatively under-researched in comparison to that of green space (Reeves et al., 2021). However, the creation of wetlands, and their impact on species richness and abundance, are likely to be associated with significant positive health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness. Just as green settings have a positive stress reducing and restorative capacity, so do 'blue' ones, for example (ibid). Indeed, blue environments have been demonstrated to be amongst the most restorative (ibid). However, in alignment with the findings around green environments, background and individual preference have been shown to influence broader trends within our responses to blue space (ibid).

Wetlands regulating services can also protect against the impact of environmental harms like extreme heat and storms, erosion and flooding, helping to protect mental health and wellbeing from these stressors (Sutton-Grier & Sandifer, 2019, White et al., 2020). Wetland expansion has been proposed as an important natural solution for helping to mitigate and reduce the risk to human health and happiness posed by such events (Sutton-Grier & Sandifer, 2019).

Comparison of cultural benefits of urban wetlands and greenspace in Sweden, found wetlands perceived to satisfy needs linked to species richness and abundance most strongly (and to a greater degree than green space) (Pederson et al., 2018). These included contact with and learning about nature and enjoyment of beauty, substantiating the value of wetland biodiversity for connection to nature and its associated benefits to wellbeing (ibid). Recent research exploring visits to wetland in England found these were motivated most strongly by opportunities to access the biodiversity (particularly birds) characteristic of that habitat (rather than achieve exercise or access amenities for example (Reeves et al., 2021). The study also corroborates that time spent in wetland can restore, relax, satisfy landscape preferences and positively influence mood (2021).

It is important to note however that perceptions of poor water quality can negatively impact the cultural benefits of aquatic environments (White et al., 2020).

EBHE-164EM: Enhance/ manage wetland habitats

See above, EBHE- 164C: Create wetland habitats

EBHE-216: Rewet moorland (including common land), eg through appropriate traditional grazing techniques

Whilst there is no specific evidence of the cultural benefits of rewetting moorland (including common land) e.g. through appropriate traditional grazing techniques, associated positive impacts on species richness and

abundance are likely to be associated with health and wellbeing benefits, alongside increased opportunities for exposure to and contact with nature and associated impacts on health and happiness.

See **EBHE-164** for discussion of evidence of causation specific to wetland biodiversity. Evidence suggests visitors to moorland wetland can value biodiversity as a significant resource of cultural benefits (and a more influential component of such benefits than those perceived as cultural heritage), including aesthetic appreciation and contact with nature – pathways to connection with nature and its health and wellbeing benefits (Flint & Jennings, 2022).

11.5.1.2 Co-benefits and Trade-offs

Other benefits from wetland creation include the provision of freshwater and water quality improvement, pollutant removal, carbon sequestration, nursery sites for many commercial fish species, protection from flooding, supporting livelihoods, improve biodiversity (they are the most biodiverse habitat on earth), prevent coastal erosion and provide sites for recreation and tourism (WWT 2022; Pedersen et al. 2019). They can be located in both urban and rural areas, but wetlands near to residential areas are likely to have high sense of place values contributing to quality of life and wellbeing (Pedersen et al. 2019). (See Theme 13).

11.5.1.3 Magnitude

The heterogeneity of investigation and a tendency for experimental designs to contrast urban and rural (rather than varying types of rural environment for example), challenges conclusions around how species richness and abundance, scale differences, proximity and degree of exposure are interlinked in influencing any of the outcomes above and further research is required. It should be noted however that whilst direct contact with nature and the sensory, affective, meaningful, aesthetic and empathetic experiences enjoyed (Richardson et al., 2020) may enable us to develop a robust connection with the natural world with associated benefits to our mental health, views of green and blue space from a window can also result in significant restorative and relaxing effects.

11.5.1.4 Timescale

The species richness and abundance associated with wetland habitat could take time to re/establish and cultural benefits associated with increased biodiversity could develop and build in line with this timescale.

11.5.1.5 Spatial Issues

Not assessed

11.5.1.6 Displacement

Actions that create or restore and maintain species richness and abundance can by extension be anticipated to protect potential access to these benefits and against environmental degradation. Environmental degradation has been associated with negative impacts on human wellbeing and mental health (Clark et al, 2014). However, it will be important to attend to existing landscape context and ensure that valued heritage or biodiversity is not being displaced by such changes, disrupting the cultural benefits these are supplying.

11.5.1.7 Maintenance and Longevity

Actions that might be expected to enhance species richness and abundance on a permanent basis through creation, enhancement or restoration of habitat, could be expected to continue to provide cultural benefits throughout their existence if beneficial changes are managed/protected effectively. Actions that also enable access to cultural benefits through direct engagement with environment will need those engagement opportunities to be sustained and well managed in order maintain those specific effects.

11.5.1.8 Climate Adaptation or Mitigation

In terms of adaptation to or mitigation of climate change, actions associated with creating, restoring and enhancing species richness and abundance (such as planting trees or restabilising wetland) may help to protect against negative impacts on human health and happiness through both providing protection against environmental harms (extreme heat or flooding for example) and an ongoing source of support for mental health and wellbeing. However, climate effects should be noted as having the potential for negative impacts upon all the cultural benefits associated with species richness and abundance. Through disrupting

biodiversity, climate change will also disrupt the extent and range of human interactions with nature, disruption that will also alter and limit the extent and range of cultural benefits available (Dillman-Hasso, 2021).

11.5.1.9 Climate factors / Constraints

Not assessed

11.5.1.10 Benefits and Trade-offs to Farmer/Land manager

Not assessed

11.5.1.11 Uptake

Not assessed

11.5.1.12 Other Notes

N/A

12 THEME 10: LANDSCAPE CHARACTER

Landscape and waterscape character are defined as the distinct, recognisable and consistent pattern of elements in the landscape. Natural processes give rise to the physical structure of the landscape – geology, landform and soils. Cultural processes give rise to varying patterns and types of tree cover, field boundaries and settlement – they are a reflection of man's endeavours to live on and from the land. There are many local landscape character assessments as well as National Character Areas. However, this assessment focused on the potential impact of land management actions on landscape and waterscape character in a generic way. It is these patterns that give each locality its 'sense of place', making one landscape different from another, rather than better or worse. As a result, there is a link between this aspect of the Theme 10 and Theme 13 on Sense of Place. However, the distinct approach of this report is the impact of land and water management actions on the public and their views about these changes. Land management actions that have a positive impact on the environment are generally viewed positively, as are actions that seek to reverse environmental damage (Swanwick 2009). However, as Swanwick outlines views are often dominated by expert and professional views rather than those of the wider public. A study into the 'Public perceptions of Landscapes and Ecosystems in the UK' (Defra 2001) summarised social research evidence, focused on what people value from landscapes and how these values might be affected by future change. Visiting the countryside is considered by the majority to be "crucial" or "very important". The research found that people value landscapes for their intrinsic value and cultural services. The diversity in the value people put on landscape includes a sense of place, abundant wildlife, easy access and relative tranquillity. For example, in a survey of 430 individuals living in Ireland was conducted in the summer of 2010 (Howley 2012), while agricultural landscapes were rated highly traditional landscapes were preferred to more intensively farming landscapes. Moore and Tully (2017) examined the relationship between stakeholder values and cultural landscape management and found that stakeholders recognise (and desire) that landscapes include social and cultural 'services' and are not limited to the 'natural' environment or economic metrics.

Gobster et al (2007) discuss how landscape patterns elicit aesthetic responses of immediate pleasure or displeasure suggesting that there is a link between landscape and ecology within the public's conscious. The restoration of rivers was assessed by Berit and Buchecker (2007) who found that the naturalness of the visualisation, as perceived by the public, appears to influence the aesthetic appeal positively, implying that people enjoy most what appears natural to them in this context. There was a strong positive relationship in this study between ecological quality and aesthetic preferences. In terms of attractiveness of AES outcomes and options and what the notion of a 'good farmer' Cusworth and Dodsworth (2021) found in in-depth interviews with 40 farmers that tensions were most keenly felt with options that left the land not looking neat and 'well managed'. A study into 44 years of landscape change (ADAS & University of Leeds 2017) found that farmers' attitudes and perceptions of landscapes and landscape change were framed by:

- Intrinsic factors of the farmer that determine their attitudes to the landscape;

- External factors that structure their views of and decision-making in relation to the landscape, and farm business factors that determine their ability to make decisions and implement practices that impact on landscape quality.

Green infrastructure (GI) refers to trees, lawns, hedgerows, parks, fields, forests, etc. Blue infrastructure (BI) refers to water elements, like rivers, canals, ponds, wetlands, floodplains, water treatment facilities, etc. These terms originate from urban and land-use planning. These are now considered important as stepping-stones reducing ecological fragmentation and allowing connectivity for animals, plants, water, clean air, and so on, to move safely around the landscape. In a relatively densely populated country such as the UK the need to increase the amount of green and blue infrastructure within the grey of roads, buildings and other urban constructions becomes increasingly important. GI and BI can improve the delivery of ecosystem services, for example reducing air temperatures through shade, providing areas like parks for recreation, as well as reducing risks such as flooding and pollution in the air.

In terms of cultural services within the ecosystem services enhancement of GI and BI are to be found in better physical and mental health, educational opportunities, increased connection to nature and other social perspectives (Kim and Song 2019). Bowen and Lynch (2017) and Coutts and Hahn (2015) go further to focus on the public health benefits of GI and BI within cities and this help further in climate adaptation although the evidence base for improved health outcomes remains to be adequately quantified. This is one of the main reasons behind the amber ratings in RAG scores. The other reason is that of context, many of the actions are large scale and will have complex interactions with other aspects of the natural and social environments and these need to be considered carefully. Coutts and Hahn (2015) focus on the list of benefits in order to highlight the breadth of research needed in order to understand the breadth of potential benefits that need to be considered in landscape conservation in order to fully understand the connections with health and well-being. Some studies have focus on GI and BI outside of cities, for example Ruckelhoaus et al (2106) who focused on issues around coastal locations, noting the importance of location and LANDMAP, which provides a landscape baseline in Wales. There is little on this aspect from a seascapes perspective beyond coastal areas.

12.1 Management Bundles

The link to the 25 Year Environment Plan (YEP) is the ambition for '*Safeguarding and enhancing the beauty of our natural scenery and improving its environmental value while being sensitive to considerations of its heritage*'.

There are two indicators to consider:
G1: Changes in landscape and waterscape character; and
G3: Enhancement of green/blue infrastructure.
All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles.

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

12.2 Bundle: Habitat creation

12.2.1 Woodland

EBHE-140: Create a woodland creation plan – woodland creation plans are required in order to receive governmental grants for woodland creation. The plan must include identification of landscape and visual sensitivities relevant to woodland creation, as well as identification of proximity to priority habitats or

species, national or international designations, heritage assets etc. All new woodland must be UKFS (UK Forestry Standard) compliant.

EBHE-140C: Create ghyll woodland – ghyll woodlands are native woodland found on steep-sided valleys, predominantly in uplands area in western Britain (Flora local 2005).

EBHE-209C: Create traditional orchards with local varieties of fruit tree – traditional orchards are structurally and ecologically similar to wood-pasture and parkland, having widely spaced fruit trees within wider grassland, that is either grazed or cut (JNCC 2008). They are important biodiversity hotspots and include UK BAP priority habitats and species. A feature of traditional orchards is the variety of the fruit cultivars they contain and the low intensity management regimes applied (in contrast to more intensively managed orchards) (JNCC 2008).

EBHE-281: Set up or engage with community tree planting projects – this action refers to the specific engagement of communities in local tree planting projects, either through community-led planting, or local residents volunteering to engage in tree planting activities.

The main benefits from the above four actions are described in the Theme 9, as well as Theme 2 and 4 for action **EBHE-281**. Below we set out specific impacts of the actions on landscape and the associated indicators.

EBHE-104	Create a woodland creation plan	TD***	TD***
EBHE-140C	Create ghyll woodland	***	***
EBHE-209C	Create traditional orchards with local varieties of fruit tree	***	***
EBHE-281	Set up or engage with community tree planting projects	LD***	LD***

12.2.1.1 Causality

EBHE-140: There is some evidence that the creation of woodland can challenge perceptions of landscape character among local populations (Iverson 2019 and Iverson et al 2022) and landowners (Lawrence et al 2010). Therefore, the assumption is made that through the development of a plan consideration is given to a number of factors that might impact on landscape character and the enhancement of GI and BI and that these would be highly context dependent. The premise of undertaking a woodland creation plan is that new planting will be undertaken following best practice, thus positively impacting sense of place. In some locations, where communities are strongly attached to existing (less wooded) landscapes, woodland creation might have a negative impact on landscape character, although this should be accounted for and mitigated against in the woodland creation plan.

EBHE-140C: Create ghyll woodland – Ghyll woodlands have significant wildlife value and are important in a landscape and historical context (Flora locale 2005). Given their importance for native wildlife and their landscape importance, the creation of new ghyll woodlands is likely to provide major benefits to landscape character but their presence in upland areas is still contentious (Iverson et al (2022).

EBHE-209C: Create traditional orchards with local varieties of fruit tree **–** Traditional woodlands make an important contribution to landscape character and local distinctiveness, especially I areas where they form part of the existing and long-standing landscape character, as part of a mosaic of habitats in the landscape (JNCC 2008).

EBHE-281: Set up or engage with community tree planting projects – Although there is no direct evidence (that we are aware of) addressing how community tree planting projects contribute to the enhancement of landscape character and green infrastructure. We assume that there are likely to be indirect positive impacts on landscape character (i) improved biodiversity through new woodland habitat creation; and (ii) improved community awareness of biodiversity and landscape, leading to strong attachments to place. Outcomes are likely to be place-specific and contextually dependent. The Community Forest programme

has in part been re-focused to bring the imitative in line with the new focus on GI (Mell 2011) and increasing the quantity and quality of tree cover in and around cities is a major aspect of GI implementation.

12.2.1.2 Co-benefits and Trade-offs

As well as (mostly) improved landscape character and enhancing GI as a result of the four actions, there will be other co-benefits, including improved biodiversity through new or enhanced habitat provision (see Theme 9); carbon sequestration, air and water pollution control, flooding alleviation (see other QEIA reports), health and wellbeing benefits (see Theme 2) including recreation (see Theme 1), educational opportunities (Theme 3), volunteering opportunities (see Theme 4) and tourism opportunities (see Theme 5).

Potential trade-offs are generally limited but could be significant in some areas where landscape character is strongly connected to a non-woodland landscape (Iverson et al 2022).

12.2.1.3 Magnitude

In terms of tree cover some urban areas have lower proportions than the national average of 5%, this was highlighted in the Community Forest programme when originally introduced. The range of GI practices is also growing as our understanding of its impact and the associated practices (Mell 2017)

12.2.1.4 Timescale

From a cultural services perspective, some benefits, such as an increased sense of purpose in contributing to enhancement of GI and landscape character, are likely to be realised as soon as the action is undertaken. However, given the time it takes for woodlands and orchards to reach maturity, the full benefits in terms of sense of place are unlikely to be felt until 20+ years after establishment.

12.2.1.5 Spatial Issues

Large-scale woodland creation is likely to have more of a landscape impact than more localised ghyll woodland creation, or small-scale traditional orchard creation.

12.2.1.6 Displacement

The main impact is in terms of the habitat type that new woodland or orchard creation displaces. If these existing habitats are important contributors to landscape character (e.g. upland grassland) or GI (areas of rough grassland), new woodland could have a negative (at least initially) impact on both landscape character and GI. However, where woodland replaces more intensive land uses, the improvements could be significant (Sinnett et al 2015).

12.2.1.7 Maintenance and Longevity

All woodland and orchard creation will need long-term maintenance. Trees need watering and weeding, and protection from browsers, in their early years to allow them to establish. Orchard settings will need further ongoing pruning, harvesting and grassland cutting/grazing, in order to maintain the habitat and its sense of place. Woodlands are likely to require thinning and management for many decades.

12.2.1.8 Climate Adaptation or Mitigation

Climate change is likely to impact the type of tree species that will thrive, leading to some natural or assisted migration of tree species. Changes in familiar tree species in the landscapes and woodland settings has the potential to impact landscape character more than GI. However, the impact is likely to be small given that such changes occur over long timescales.

12.2.1.9 Climate factors / Constraints

N/A

12.2.1.10 Benefits and Trade-offs to Farmer/Land manager

This is covered in Theme 9 but it is worth noting that landowner attitudes to woodland creation are an important consideration (Lawrence et al. 2010)

12.2.1.11 Uptake

As above.

12.2.1.12 Other Notes
N/A

12.2.2 Woody features & scrub

EBHE-191: Plant and establish appropriate species of field boundary trees – trees in hedgerows are important components that give a landscape character and provide GI benefits

EBHE-205C: Create wood pasture (e.g. through appropriate grazing) - wood pasture is land that is managed through grazing, with trees in these settings often pollarded. Many of the UK's ancient trees are in wood pasture or parkland settings, although wood pasture is currently quite a rare habitat. Wood pasture creates a different landscape character to more intensive forms of agriculture or grazing regimes and is associated with extensive grazing which provides GI benefits.

EBHE-191	Plant and establish appropriate species of field boundary trees	LT***	LT***
EBHE-205C	Create wood pasture (e.g. through appropriate grazing)	LTD***	LT***

12.2.2.1 Causality
EBHE-191 Plant and establish appropriate species of field boundary trees – limited evidence to specifically support this action but increasing field boundary trees will have an impact on landscape character and contribute to GI (Natural England 2014). The loss of field boundaries over the past 50 years has reduced the number of trees within field boundaries, as has the increased use of mechanical machinery to management field boundaries, especially hedges (Barnes and Williamson 2008)

EBHE-205C Creating wood pasture (e.g. through appropriate grazing) – some evidence (from European studies) to suggest that wood pasture (and wider agroforestry) landscapes are important for quality of life, with *identity* particularly associated with agroforestry landscapes (Elbakidze et al. 2021).

12.2.2.2 Co-benefits and Trade-offs
Both actions are likely to have major benefits (mostly) to landscape character and GI, but there are likely to be other co-benefits, including, as reported in 12.2.1.2. This is particularly important as wood pasture is considered a rare habitat. Further benefits may also include recreation, health and wellbeing and other public health benefits (see Themes 1 and 2),

Potential trade-offs are generally limited but could be significant in some areas where landscape character is strongly connected to either a more open and expansive landscape (for **EHBE-191**) or to other forms of agricultural production such as upland grazing or arable (for **EBHE-205C**).

12.2.2.3 Magnitude
N/A

12.2.2.4 Timescale
As reported in 12.2.1.4. Also the benefits of introducing wood pasture are likely to be realised within a year or two of implementation, although the richest wood pastures have been in existence for hundreds of years. . However, it may take 10+ years for the benefits of field boundary trees to be realised.

12.2.2.5 Spatial Issues
Field boundary trees would not require additional space but can be included as part of ongoing existing hedgerow management. Larger areas of wood pasture are likely to have more of an impact on landscape character than small wood pastures, although even small areas of wood pasture could be impactful.

12.2.2.6 Displacement
Field boundary trees should not displace other major habitat types, however wood pasture is likely to. If the existing habitat is an important contributor to landscape character (e.g. upland grassland), conversion to wood pasture could have a negative (at least initially) impact. However, where wood pasture replaces more intensive land uses, landscape character and GI improvements could be significant.

12.2.2.7 Maintenance and Longevity
Newly planted field boundary trees will need watering and protection from browsers in their early years to allow them to establish. Trees in wood pasture will also need watering and protection from browsers, and may need management such as pollarding as their size increases.

12.2.2.8 Climate Adaptation or Mitigation
Climate change is likely to impact the type of tree species that will thrive, leading to some natural or assisted migration of tree species. Changes in familiar tree species in the landscapes in terms of hedgerow trees or trees in wood pasture has the potential to impact landscape character more than GI. However, the impact is likely to be small given that such changes occur over long timescales.

12.2.2.9 Climate factors / Constraints
N/A

12.2.2.10 Benefits and Trade-offs to Farmer/Land manager
See 12.2.1.10

12.2.2.11 Uptake
See 12.2.1.10

12.2.2.12 Other Notes
N/A

12.2.3 Ponds & wetlands

EBHE-169: Restore/ manage ghost ponds – see Themes 8 and 9.
EBHE-211: Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials – see Themes 8 and 9.

EBHE-169	Restore/ manage ghost ponds	**	**
EBHE-211	Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials	**	**

12.2.3.1 Causality
As a component in the landscape, ponds have some impact on landscape character, but it is likely to be limited. There are more important in terms of GI and BI. There is some evidence (Kopp and Preis 2019) that created storm water ponds are seen in a positive enhancement in the landscape by the pubic and have an amenity value. This could be extended to include former ponds lost from the landscape, although their storm water value will be reduced as the intake will not be managed.

12.2.3.2 Co-benefits and Trade-offs
See Themes 8 and 9.

12.2.3.3 Magnitude
Many ponds have been lost from the landscape either through neglect or being filled in.

12.2.3.4 Timescale
Ponds can be active very quickly.

12.2.3.5 Spatial Issues
Ponds traditionally take up relatively little space but have high biodiversity value and water environments are popular with the public Berit and Buchecker (2008), especially where there is a naturalness to the water feature.

12.2.3.6 Displacement
Very little land will be displaced from pond restorations

12.2.3.7 Maintenance and Longevity

Ponds need managing in order to be effective. See Themes 8 and 9.

12.2.3.8 Climate Adaptation or Mitigation
Retaining water will be the key challenge for restored ponds.

12.2.3.9 Climate factors / Constraints
N/A

12.2.3.10 Benefits and Trade-offs to Farmer/Land manager
Ponds tend to be attractive to land owners and managers

12.2.3.11 Uptake
Previously ponds have attracted very low payments considering the costs involved and the need for planning permission and consents from the Environment Agency is off-putting.

12.2.3.12 Other Notes
N/A

12.2.4 Grassland

EBHE-214C: Create locally distinctive flower rich/hay meadows using traditional techniques see Theme 9.

EBHE-214C	Create locally distinctive flower rich/hay meadows using traditional techniques	**	*

12.2.4.1 Causality
Any impact on landscape character and GI from the creation of locally distinctive flower rich/hay meadows will be contextual, dependent on the habitat it is replacing. However, overall impact is likely to be limited. See Theme 9 for more details. This themed report will focus on the benefits to GI where it is clear that species-rich meadows provide enhanced GI benefits (Sehrt et al 2020) particularly as current growth in GI is not sufficient to offset the loss of semi-natural habitats (Kimberley et al 2021)

12.2.4.2 Co-benefits and Trade-offs
The creation of locally distinctive flower rich/hay meadows will have significant biodiversity benefits and this will have social benefits too, see Theme 9. Increased biodiversity can enhance landscape character by providing improved opportunities for engagement with nature and landscape benefits. However, there may be biodiversity losses depending on the habitat it is replacing.

12.2.4.3 Magnitude
The loss of flower-rich/hay meadows is dramatic, see Theme 9.

12.2.4.4 Timescale
See above, the social benefits are quick, the ecology ones take longer.

12.2.4.5 Spatial Issues
N/A

12.2.4.6 Displacement
This is dependent on what was there before, but it is unlikely that it would be better for landscape character or GI than this action.

12.2.4.7 Maintenance and Longevity
Grasslands require management through grazing or cutting. Sehrt et al (2020) suggest that less cutting provides more diversity, especially in urban environments. Grazing can be difficult in urban settings so some replication of this activity is required to ensure the species-richness is retained and enhanced.

12.2.4.8 Climate Adaptation or Mitigation
See Theme 9

12.2.4.9 Climate factors / Constraints
N/A

12.2.4.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 9.

12.2.4.11 Uptake
See Theme 9.

12.2.4.12 Other Notes
N/A

12.3 BUNDLE: SYSTEMS ACTION

12.3.1 Landscapes Actions

EBHE-187: Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character – this action will ensure than any activity is sensitive to landscape character and associated GI by considering by documenting any specific features or existing activities that need to be protected.

EBHE-233: Control scrub or trees to maintain views – this action is specific to locations where there are highly valued viewpoints. Maintenance of views helps to preserve the landscape character but might not work so well for GI.

EBHE-269: Install/ maintain water features to facilitate positive soundscape and mask unwanted sound – used around sensitive sites that are prone to noise pollution, such as from motorways or other industrial activity.

EBHE-273: Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound – see **EBHE-269** – tree, shrubs and vegetation provide a sound buffer.

EBHE-275: Situate polytunnels at least 30m away from the boundary of the nearest residential dwelling, unless as a result of prior agreement with the neighbour concerned. Polytunnels can impact on landscape character both at the landscape scale (where there are large areas of polytunnel structures) and on individual properties. See **EBHE-262**.

EBHE-303: Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings. Over recent decades the use of large-scale polytunnels within horticulture has increased, in response to the demand for British-grown produce and to extend the growing season, improve fruit quality and yield and reduce labour needs. However, polytunnels can impact on landscape character both at the landscape scale (where there are large areas of polytunnel structures) and on individual properties (affecting property owners' enjoyment of their property and surrounding area, and potential impacts on property prices due to the landscape impacts).

EBHE-187	Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character	T**	T*
EBHE-233	Control scrub or trees to maintain views	T**	T**
EBHE-269	Install/ maintain water features to facilitate positive soundscape and mask unwanted sound	TD**	**
EBHE-273	Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound	LT***	LT***
EBHE-275	Situate polytunnels at least 30m away from the boundary of the nearest residential dwelling, unless as a result of prior agreement with the neighbour concerned	LTD*	N
EBHE-303	Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings	L***	L***

12.3.1.1 Causality

These landscapes actions are likely to have a range of mainly positive benefits on landscape character and GI, when done well, although for most actions there is limited evidence.

EBHE-187: Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character – this action is associated with Landscape Character Assessment (Natural England 2014), but focused on the scale of an individual land holding. When carried out appropriately, a landscape appraisal should capture important features and characteristics on the land holding that contribute to landscape character and GI. Any development on the site should be undertaken to preserve these characteristics. The impact of this action is reduced as it is a plan, and so it depends how the plan is implemented to be effective. See also Theme 8 and 9.

EBHE-233: Control scrub or trees to maintain views – this has been coded as having a moderate impact on landscape character and GI given that it will be contextually dependent to those locations with highly valued viewpoints. In these instances, this action will contribute to maintenance of but the loss of vegetation will not be positive for GI. See also Theme 1 and 5.

EBHE-269: Install/ maintain water features to facilitate positive soundscape and mask unwanted sound – as with **EBHE-233** this action will have a moderate impact on landscape character, providing positive benefits in areas where there is unwanted sound. However, it will be important to consider the nature of the water features, particularly in terms of their 'naturalness' and the impact this might have on perceptions of landscape character. As noted by Berit and Buchecker (2008) water features are positive from a GI perspective. See Theme 11 for main evidence, not covered any further here but also reference Theme 1, 2, 5 and 9.

EBHE-273: Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound – trees, shrubs and vegetation provide a sound buffer which can reduce noise by five to ten decibels for every 30m width of woodland (FR, undated). However, it is dependent on species choice and planting design. See Theme 11 for main evidence, not covered any further here but also reference Theme 1, 2, 5 and 9.

EBHE-275: Situate polytunnels at least 30m away from the boundary of the nearest residential dwelling, unless as a result of prior agreement with the neighbour concerned – the main landscape character benefits of located polytunnels away from residential buildings will be on the buildings' residents by ensuring that the polytunnel does not excessively overlook the property.

EBHE-303: Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings**.** However, it is dependent on species choice and planting design in terms of the impact on landscape character and GI.

12.3.1.2 Co-benefits and Trade-offs

EBHE-187 – landscape appraisals are a means of determining what the key landscape characteristics are in a participatory manner and therefore when conducted well should highlight a range of benefits (NE 2014). The approach is well used and has been across England and beyond. The outputs say less about GI but the identification of the local assets in the plan will be useful.

EBHE-233 – the caution here is that control vegetation for the purpose of maintaining views is not always in link with landscape character and the loss of vegetation can reduce the GI benefits.

EBHE-275 – the only benefit for this action is for the residents living close by, there is little impact on landscape character and GI through this repositioning.

EBHE-303 – there will be some benefit for GI from the additional vegetation but this will be dependent on species etc and this will impact the co-benefits for biodiversity etc.

12.3.1.3 Magnitude

While many of these actions are carried out at a fairly small scale, the impact could be realised at the landscape scale, especially when they are occur more than once in a small area (e.g. **EBHE-233**, **EBHE-303**). The impacts would also be dependent on the location – for instance, tree planting to mitigate the visual impact of polytunnels or to buffer noise that is located in a valley below urban/residential areas/recreation hotspots is likely to have a greater landscape impact than similar actions carried out further up hillsides.

12.3.1.4 Timescale

Most actions will be realised shortly after implementation, although actions involving tree planting will take some years to be fully effective

12.3.1.5 Spatial Issues

Not so relevant and areas concerned are small.

12.3.1.6 Displacement

N/A

12.3.1.7 Maintenance and Longevity

EBHE-233 – ongoing maintenance required in order to maintain views.
EBHE-269 – depending on the water feature, ongoing maintenance is likely.
EBHE-273 and **EBHE-303**– depending on location, trees will need watering and maintenance during the establishment phase, and occasional pruning thereafter to maintain the desired size.

12.3.1.8 Climate Adaptation or Mitigation

Not assessed

12.3.1.9 Climate factors / Constraints

Not assessed

12.3.1.10 Benefits and Trade-offs to Farmer/Land manager

EBHE-187 – landscape appraisal will identify appropriate land management actions that are sensitive to the current and potential cultural services provided by the land holding. For farmers and land managers this may provide evidence to leverage access to grants to enable enhanced provision of those cultural services.
EBHE-233 – controlling scrub or trees to maintain views will have little benefit to farmers and land managers.
EBHE-269 – installing water features to maintain soundscape is unlikely to have benefits for farmers and land managers, unless it can be incorporate into irrigation systems on the farm.

EBHE-273 – potential benefits if the screening mitigates sound (and pollution) on the farm. Tree belts have also been shown to have a positive impact on reducing air pollution from livestock building (e.g. chicken sheds), so potential for further benefits in such locations. Trade offs might include a reduction in land area available for production.
EBHE-275 and EBHE 303– no anticipated benefits to farmers or land managers, except for the avoidance of neighbour conflicts. Trade-offs include limitations of where polytunnels can be sited.

12.3.1.11 Uptake

Some of these actions might be required as a part of the planning process, where they are not it is unlikely that they will be undertaken unless there is some associate payment to do so.

12.3.1.12 Other Notes

N/A

12.3.2 Invasive management

EBHE-301 will have a very limited impact on landscape character and GI, however the control of invasive species is important wherever they occur. As such there is a small benefit, although this might be negated a little by the use of chemicals.

EBHE-301	Control invasive plant species by chemical means to help manage archaeological sites	*	*

This action is considered in Themes 8 and 9.

12.4 Bundle: Specific wildlife targeted actions

12.4.1 Specific wildlife targeted actions

EBHE-182: Create and use a wildlife management plan – see Theme 9.
EBHE-224: Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally – see Theme 9.
EBHE-302: Install/ maintain bird and insect houses - see Theme 9.

EBHE-182	Create and use a wildlife management plan	T**	T**
EBHE-224	Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally	**	T**
EBHE-302	Install/ maintain bird and insect houses	**	**

12.4.1.1 Causality

These actions are likely to have a moderate impact on landscape character and GI if they are undertaken in the right environmental settings concerning specific wildlife species or ecosystems that these actions address.

12.4.1.2 Co-benefits and Trade-offs

Broadly speaking these will have little impact on landscape character, either because they are a plan (**EBHE-182**) of they involve small areas (**EBHE-224** and 302). The concern about **EBHE-224** is the creation of bare ground plots as this is likely to reduce the GI benefits, however the presence of grass margins would reduce this. The siting of these will be important, keeping away from slopes and water courses in order to reduce the likelihood of soil erosion.

12.4.1.3 Magnitude

Small scale.

12.4.1.4 Timescale
Likely to be effective quickly.

12.4.1.5 Spatial Issues
Small scale.

12.4.1.6 Displacement
N/A

12.4.1.7 Maintenance and Longevity
Little management required.

12.4.1.8 Climate Adaptation or Mitigation
N/A

12.4.1.9 Climate factors / Constraints
N/A

12.4.1.10 Benefits and Trade-offs to Farmer/Land manager
N/A

12.4.1.11 Uptake
N/A

12.4.1.12 Other Notes
N/A

12.5 Bundle: Restoration, management and enhancement

12.5.1 Woodland

EBHE-140EM: Enhance/ manage ghyll woodland - see **EBHE-140C** (12.1.1 - 12.1.12)

EBHE-196: Planted Ancient Woodland (PAWS) restoration – PAWS are ancient woodland sites where semi-natural woodland has been replaced with a plantation. Most PAWS sites are either currently being restored or are likely to be restored to semi-natural woodland over the next few decades. The transition from plantation to semi-natural woodland is likely to have an impact on landscape character and GI. See Theme 9.

EBHE-198: Restore/ manage ancient woodland with native broadleaf species – see **EBHE-196** and Theme 9.

EBHE-209: Create, restore or manage traditional orchards with local varieties of fruit tree – Creating, restoring or managing traditional orchards can benefit landscape character I through the production of local varieties of fruit which are place-specific, enhancing the landscape by retaining and expanding a accepted characteristic. From a GI perspective the action is similar to creating, restoring or maintaining wood pasture (**EBHE-205**) See **EBHE-209C** (12.2.1.1 – 1.2.1.12)

EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree - see **EBHE-209** See **EBHE-209C** (12.2.1.1 – 1.2.1.12)

EBHE-314: Create a woodland management plan – see **EBHE-104** (12.1.1 - 12.1.12)

EBHE-196	Planted Ancient Woodland (PAWS) restoration	**	***
EBHE-198	Restore/ manage ancient woodland with native broadleaf species	**	***

12.5.1.1 Causality

The restoration of semi-natural ancient woodland is likely to have significant impacts on landscape character as it enhances an existing land standing feature in the landscape. There will also be benefits for GI as a result as the tree cover will provide improve the resilience of the landscape. This is particularly the case with PAWS restoration due to the resulting large-scale landscape change. Broadleaved woodland creates a different landscape character to plantation forestry with studies showing public preferences for mixed or broadleaf forests rather than conifers (Upton et al. 2012). Conifer forests are generally a darker green to broadleaved woodlands, and broadleaved woodlands have a seasonal dimension, with the colours changing throughout the year in tune with the landscape generally.

12.5.1.2 Co-benefits and Trade-offs

Restoring semi-natural ancient woodland will provide biodiversity benefits, recreational and wellbeing benefits, as well as long term carbon sequestration benefits. Trade offs are a reduction in productive forestry, with an impact on the availability of timber and other wood products.

12.5.1.3 Magnitude

Only a small extent of ancient woodland remains in the UK, just 2.5% of the UK's land area (Reid et al. 2021). The restoration of PAWS action seeks to restore all PAWS to semi-natural woodland over the next 20-30 years.

12.5.1.4 Timescale

This depends on whether PAWS restoration is realised through clearfelling and replanting/natural regeneration, or through gradual thinning with native trees allowed to establish under the plantation canopy. However, it will take several years for restored semi-natural woodlands to establish new habitats and ecosystems, with a resulting impact on landscape character and GI.

12.5.1.5 Spatial Issues

Potential to provide important connectivity between habitats if located near to other semi-natural woodland sites.

12.5.1.6 Displacement

The loss of plantation forestry through PAWS restoration could displace commercial forestry to other locations, with resulting positive or negative impacts depending the site location/context. For instance, if new commercial plantations are created on other landscape types with a highly valued sense of place this may have a negative impact.

12.5.1.7 Maintenance and Longevity

Once established, semi-natural woodland is permanent.

12.5.1.8 Climate Adaptation or Mitigation

Climate change is likely to impact the viability of native tree species to thrive. This may result in the natural range of some climate sensitive species moving further north and a shift in the suitability of tree species across different regions of the UK. South, central and eastern England are likely to have drier and warmers summers and will, therefore, require drought tolerant species.

12.5.1.9 Climate factors / Constraints

Need to consider alternative native and near-native species, see Theme 13 (15.5.1.8).

12.5.1.10 Benefits and Trade-offs to Farmer/Land manager

Mainly around restoring landscape character but likely to be a less productive woodland. Link to Theme 6.

12.5.1.11 Uptake

Woodland restoration is gaining in importance within schemes as their value is realised. See Theme 6.

12.5.1.12 Other Notes

N/A

12.5.2 Woody features

EBHE-192 - Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction (G**) - action will protect in-field trees – ensuring their maintenance over the long-term can contribute to protection of landscape character, and provided some green infrastructure benefits.
EBHE-205 - Create, Enhance/ manage wood pasture (eg through appropriate grazing) - see M **EBHE-205C**.
EBHE-205EM - Enhance/ manage wood pasture (eg through appropriate grazing) - see M **EBHE-205C**.

EBHE-192	Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction	**	**

12.5.2.1 Causality
EBHE-192 will have limited benefits for landscape character, although will help to ensure longevity of in-field trees. This will be important where such features form part of the landscape character. Such features also have some benefit for green infrastructure as they are well established in the landscape and will form part of the natural infrastructure. The creation, enhancement and management of wood pasture has the potential to influence sense of place, depending on the land use that it is replacing – see discussion on **EBHE-205C**. 12.2.2.1 - 12.2.2.12

12.5.2.2 Co-benefits and Trade-offs
Small range of GI benefits from existing in-field trees will be retained through this action and the introduction of permanent grassland around the base will further enhance the GI benefits.

12.5.2.3 Magnitude
Given this is individual trees this will be minor but collectively they can enhance landscape character.

12.5.2.4 Timescale
Fairly long-term but trees already present so will seem effective early in the action.

12.5.2.5 Spatial Issues
N/A

12.5.2.6 Displacement
N/A

12.5.2.7 Maintenance and Longevity
Long-term commitment.

12.5.2.8 Climate Adaptation or Mitigation
Existing trees will be impacted by climate change, especially in areas of cultivation where root damage can occur. Increasing hot and dry periods will lead to stress.

12.5.2.9 Climate factors / Constraints
N/A

12.5.2.10 Benefits and Trade-offs to Farmer/Land manager
Attractive features but can be difficult to navigate around with large machinery.

12.5.2.11 Uptake
Likely to be welcomed by land managers.

12.5.2.12 Other Notes
N/A

12.5.3 Scrub

EBHE-203EM - Enhance / manage targeted scrub - Scrub is considered a 'successional' habitat as it is, naturally, a temporary habitat between more open habitat areas (e.g. grassland, heathland) and woodland. Therefore, the main purpose for scrub management is to maintain it as scrub, providing a habitat for those

species which depend on it, and to also present scrub from invading other valuable habitats, such as grassland and heathland.

EBHE-203EM	Enhance / manage targeted scrub	T*	T*

12.5.3.1 Causality
Maintaining scrub will have a moderate impact on landscape character by maintaining the existing look and features within the landscape and associated habitats. The surface roughness has GI benefits, although these will be reduced when scrub is managed and this can lead to increased areas of bare ground.

12.5.3.2 Co-benefits and Trade-offs
In additional to landscape character and GI benefits, scrub management will also provide enhanced landscape, recreational and biodiversity benefits. There will be a trade off in habitat provision between scrub and other habitat types.

12.5.3.3 Magnitude
Difficult to quantify but as a successional state scrub is always in transition.

12.5.3.4 Timescale
Almost immediately

12.5.3.5 Spatial Issues
N/A

12.5.3.6 Displacement
Scrub management will impact on adjoining grassland/heathland habitats through preventing scrub incursion on these other open habitat areas.

12.5.3.7 Maintenance and Longevity
On-going maintenance is require to maintain scrub as it is a successional habitat. If left unmanaged, it will transition to woodland, and encroach on adjoining open habitats. This will change the landscape character.

12.5.3.8 Climate Adaptation or Mitigation
N/A

12.5.3.9 Climate factors / Constraints
N/A

12.5.3.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 6.

12.5.3.11 Uptake
See Theme 6.

12.5.3.12 Other Notes
N/A

12.5.4 Grassland

EBHE-214EM: Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques - wildflower meadows declined during the twentieth century due to changes in agricultural practices, such as increased field drainage, herbicide use and urban encroachment. Restoration of wildflower habitats occurs through, for example, agri-environment schemes and other targeted programmes.
EBHE-214-X: Manage locally distinctive flower rich/hay meadows using traditional techniques – as above.

12.5.4.1 Causality

EBHE-214EM	Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques	**	N
EBHE-214-X	Manage locally distinctive flower rich/hay meadows using traditional techniques	**	N

Where enhancement and management of locally distinctive flower rich/hay meadows occurs in areas where such habitats are important components of landscape character, their maintenance can have a major impact on retain these features in the landscape. Given the meadows are already present there is little benefit for GI. See Theme 6 and note section on **EBHE-214C** 12.2.4.1 – 12.2.4.12.

12.5.4.2 Co-benefits and Trade-offs

See Theme 6.

12.5.4.3 Magnitude

The action will reduce the loss of this habitat.

12.5.4.4 Timescale

From the first year onwards.

12.5.4.5 Spatial Issues

Locally important.

12.5.4.6 Displacement

N/A

12.5.4.7 Maintenance and Longevity

Such habitats always require management.

12.5.4.8 Climate Adaptation or Mitigation

Climate extremes over long periods will impact the species present.

12.5.4.9 Climate factors / Constraints

N/A

12.5.4.10 Benefits and Trade-offs to Farmer/Land manager

See theme 9.

12.5.4.11 Uptake

Such actions have been well received in specific areas (Peak District National Park 2015).

12.5.4.12 Other Notes

N/A

12.5.5 Rivers

EBHE-097: Enhance/ maintain designed or engineered water bodies - this action refers to the maintenance or improvement of water bodies with an artificially retained area of open standing water, and includes maintaining the banks, buffer strips and other associated features (such as ditches and culverts)
EBHE-126: Manage realigned rivers to maintain natural flow - managed realignment involves the deliberate process of realigning in order to maintain nature flow, improve flood plain defences or to reduce potential flood damage to nearby infrastructure or buildings.
Both actions will need to be informed by an expert understanding of fluvial geomorphology and hydrological processes within the catchment concerned

EBHE-097	Enhance/ maintain designed or engineered water bodies	**	***
EBHE-126	Manage realigned rivers to maintain natural flow	***	***

12.5.5.1 Causality

EBHE-097 – maintenance of engineered water bodies is designed to protect the banks and other water-control features of historic engineered water bodies to maintain their functionality and role in water quality management. Maintaining the archaeological and historic features of these water bodies will conserve their character and heritage, with impacts on landscape character where these are important features in the landscape or have other cultural values associated with them. Retaining and managing these water features has benefits for GI in retaining the benefits, leaving them unmaintained would have negative impacts on the GI resilience of the area, with potential impacts downstream.

EBHE-126 – Allowing the natural flow of rivers is a major benefit for GI. Over managed rivers, especially where they are constrained within a man-made channel has low GI value therefore realignment and subsequent management enhances the GI value and landscape character (Burgess-Gamble 2017).

12.5.5.2 Co-benefits and Trade-offs

EBHE-097 - Alongside landscape character, GI and sense of place (see Theme 13) benefits, maintenance of engineered water bodies with have benefits for the condition of cultural heritage (see Theme 7), tourism (Theme 5) and recreation (Theme 1). These can be mutually beneficial according to Berit and Buchecker (2008).

EBHE-126 – managing realigned rivers will have benefits for wildlife (Theme 6), tourism (Theme 5) and recreation (Theme 1). Opportunities for local involvement (Theme 4) and reducing flood risk downstream (Short et al 2018).

12.5.5.3 The benefits of realignment, if done well, may also include flood management: reintroducing meanders and restoring the functionality of floodplains can help to slow down the rate of flow and increase flood storage capacity, thereby reducing flood risk downstreamMagnitude

N/A

12.5.5.4 Timescale

EBHE-126 – evidence from the EA (Burgess-Gamble 2017 and update) suggests this can be quite fast acting.

12.5.5.5 Spatial Issues

Needs to be considered from a catchment point of view.

12.5.5.6 Displacement

Potential displacement of other land uses/habitats from river realignment but broadly speaking there is a nature benefit from this.

12.5.5.7 Maintenance and Longevity

Water body maintenance will be required on an ongoing basis, but river realignment is generally a one-off action.

12.5.5.8 Climate Adaptation or Mitigation

Water body maintenance, such as improvement of bank stability and enhancement of ditches and culverts, may need to be revised in order to adapt to climate change impacts (e.g. increased risk of flooding and fluctuating water levels).

12.5.5.9 Climate factors / Constraints

N/A

12.5.5.10 Benefits and Trade-offs to Farmer/Land manager

Good maintenance of water bodies will provide irrigation benefits to the land manager and will mitigate flood risk to agricultural land, or neighbouring properties.

12.5.5.11 Uptake

Farm businesses are more likely to take action where there is a local societal benefit and Natural Flood Management features have provided popular with land managers where properly funded. Issue of maintenance and liability remain an issue (Short et al 2018).

12.5.5.12 Other Notes

N/A

12.5.6 Boundary features

EBHE-007: Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges) - traditional field boundaries form an integral part in rural landscapes. Alongside their practical purpose (stock proofing, shelter for livestock), they are also important habitats for wildlife.
EBHE-007D: Create, restore or manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges) - as above.
EBHE-019: Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls – as above.
EBHE-019-D: Create or maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls – as above.
EBHE-219: Install/ manage invisible fencing - invisible fencing uses underground wires that transmit radio signals. or more recently satellite signals. to collars worn by livestock. Animals can be trained to stay inside a particular invisible fence area or to avoid particularly sensitive areas of land for a particular period of time.
EBHE-228: Remove redundant fencing (replace with invisible fences if desirable) - removal of fencing where is serves no purpose, or replace with invisible fencing (see **EBHE-219**).
EBHE-229: Remove non-traditional, redundant structures - in order to improve visual look of the landscape.

EBHE-007		Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges)	***	***
EBHE-007D		Create, restore or manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges	***	***
EBHE-019		Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls	***	***
EBHE-019D		Create or maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls	***	***
EBHE-219		Install/ manage invisible fencing	TL*	TL*
EBHE-228		Remove redundant fencing (replace with invisible fences if desirable)	*	N
EBHE-229		Remove non-traditional, redundant structures	*	N

12.5.6.1 Causality

The improvement or maintenance of traditional field boundaries is likely to have a major benefit to landscape character, as they enhance the landscape and represent the cultural heritage and distinctiveness of the area (Barnes and Williamson 2008). In additional there is a GI benefit to field boundaries in terms of increasing the resilience of the landscape in terms of extreme weather.

The introduction of livestock management that does not require fencing is a relatively new approach to livestock management and the impact on landscape character is unclear as a result. Should this approach

replace field boundaries then there is a loss of GI. However, the removal of non-traditional structures and redundant fencing will have some benefit on landscape character.

12.5.6.2 Co-benefits and Trade-offs

Maintenance of traditional field boundaries with also have benefits for recreation (Theme 1), tourism (Theme 5), cultural heritage (Themes 6 & 7) and biodiversity (Theme 9). Given a choice, individuals prefer traditional over more intensive farming landscapes (Howley et al 2010)

12.5.6.3 Magnitude

The loss of traditional field boundaries is well documented (Barnes and Williamson 2008) as is the local characteristics highlighted in the action itself. The creation, restoration and management of these features will enhance landscape character and have a positive impact on GI. (Flora Local 2005)

12.5.6.4 Timescale

Action is effective as soon as it is implemented.

12.5.6.5 Spatial Issues

N/A

12.5.6.6 Displacement

N/A

12.5.6.7 Maintenance and Longevity

On-going maintenance of traditional field boundaries is required, although would be required fairly infrequently depending on the type of boundary.

12.5.6.8 Climate Adaptation or Mitigation

N/A

12.5.6.9 Climate factors / Constraints

N/A

12.5.6.10 Benefits and Trade-offs to Farmer/Land manager

Traditional field boundaries (such as dry stone walls, hedges and earth banks) can provide shelter for livestock (against wind, rain and sun), and are a low-maintenance form of stock proofing.

12.5.6.11 Uptake

Farm businesses are more likely to undertake this action where there are clear benefits to livestock management. Previous evaluations of AES have shown that field boundaries of all types is a popular option (NE 2009), although there is less agreement about how hedges should be managed.

12.5.6.12 Other Notes

N/A

12.6 Bundle: Actions for habitats with specific hydrological characteristics

12.6.1 Peatlands and wetlands

EBHE-164C: Create wetland habitats - wetlands are important for biodiversity, including endangered species and migratory birds. However, they are endangered habitats, disappearing three times as fast as forests (WWT 2022).
EBHE-164EM: enhance/ manage wetland habitats – as above.
EBHE-212: Create/ maintain raised water level areas by appropriate installation and operation of water level controls (N/G) -** artificially manage water levels at a high level in order to extend the duration of water levels for the benefit of wildlife.
EBHE-216: Rewet moorland (including common land), eg through appropriate traditional grazing techniques - make it 'Enhance or manage moorland ...'? - rewetting moorland typically occurs through physically blocking man-made drains and gulleys caused by erosion.

EBHE-164C	Create wetland habitats	**	***
EBHE-007EM	enhance/ manage wetland habitats	**	***
EBHE-212	Create/ maintain raised water level areas by appropriate installation and operation of water level controls	N	**
EBHE-216	Rewet moorland (including common land), eg through appropriate traditional grazing techniques - make it 'Enhance or manage moorland	**	***

12.6.1.1 Causality

Living near to or visiting wetlands and experiencing its environment and wildlife is good for human wellbeing (WWT 2022) and these features for part of the landscape character. Wetland creation or management will deliver the greatest benefits in places where people have existing access to green or blue infrastructure (WWT 2022). The benefits of new and enhanced wetlands for GI and BI are that they are able to store water at times of high rainfall, which reduces peak flows in and around areas sensitive to flooding (Burgess-Gamble et al 2017).

12.6.1.2 Co-benefits and Trade-offs

Other benefits from wetland creation include the provision of freshwater and water quality improvement, pollutant removal, carbon sequestration, provide nursery sites for many commercial fish species, protection from flooding, support livelihoods, improve biodiversity (they are the most biodiverse habitat on earth), prevent coastal erosion and provide sites for recreation and tourism (WWT 2022; Pedersen et al. 2019). They can be located in both urban and rural areas, but wetlands near to residential areas are likely to provide higher GI and BI contributing to 'perceived naturalness' (Berit and Buchecker (2008).

12.6.1.3 Magnitude

Restoration of a habitat that has been lost from many landscapes (WWT 2022) and can contribute to climate adaptation.

12.6.1.4 Timescale

Benefits will accrue over of a short time scale.

12.6.1.5 Spatial Issues

Wetlands range from small sites (such as ponds or bogs in urban settings) to largescale wetland sites.

12.6.1.6 Displacement

Wetland creation alters land for the foreseeable future, so it cannot be used for other purposes (e.g. agriculture, development).

12.6.1.7 Maintenance and Longevity

Minimal ongoing maintenance required.

12.6.1.8 Climate Adaptation or Mitigation

Wetland creation will have important climate adaptation and mitigation benefits. It will enable protection against flooding and improve climate regulation in urban settings (Pedersen et al. 2019) – see also Theme 12.

12.6.1.9 Climate factors / Constraints

N/A

12.6.1.10 Benefits and Trade-offs to Farmer/Land manager

Little benefits for farmer or land manager unless it provides a buffer to protect other land areas, or there are other economic benefits from wetland creation (e.g. recreational/tourism opportunities) or benefits through carbon markets.

12.6.1.11 Uptake

Farm businesses are more likely to undertake wetland creation on land that is unproductive and where it offers wider economic benefits. There is evidence that land managers keen to contribute to societal need

where this is locally based, and can be **seen** as part of being a 'good farmer' (Cusworth and Dodsworth 2021).

12.6.1.12 Other Notes
N/A

12.7 BUNDLE: LIVESTOCK MANAGEMENT

12.7.1 Selection and diversification

EBHE-226: Use rare breeds for conservation grazing – rare breeds are often better suited to the grazing of species rich habitats at low stocking levels as part of a nature-focused management regime.
EBHE-227: Maintain genetic diversity by rearing rare breed livestock – many rare breeds are at risk and need to secure genetic diversity in order to survive.

EBHE-226	Use rare breeds for conservation grazing	*	*
EBHE-227	Maintain genetic diversity by rearing rare breed livestock	*	N

12.7.1.1 Causality
The use of rare breeds for conservation grazing is likely to have minimal impacts on landscape character and GI, however in landscapes dominated by grazing pasture the presence of traditional breeds will enhance the existing landscape character. There will be some minor benefits to GI through the conservation grazing of pasture as this will maintain the landscape at an optimal level for GI.

12.7.1.2 Co-benefits and Trade-offs
See Themes 9 and Theme 6. Potentially some benefits for tourism and recreation as well.

12.7.1.3 Magnitude
N/A

12.7.1.4 Timescale
N/A

12.7.1.5 Spatial Issues
N/A

12.7.1.6 Displacement
See Themes 9 and Theme 6.

12.7.1.7 Maintenance and Longevity
Not assessed

12.7.1.8 Climate Adaptation or Mitigation
N/A

12.7.1.9 Climate factors / Constraints
N/A

12.7.1.10 Benefits and Trade-offs to Farmer/Land manager
Some benefits in terms of enhanced produce if the rare breed produces a saleable product. This is not always the case, however such livestock are able to live outside longer and in more adverse conditions.

12.7.1.11 Uptake
Can be popular with land managers.

12.7.1.12 Other Notes
N/A

12.8 BUNDLE: SOIL MANAGEMENT AND PROTECTION

12.8.1 Cover cropping

EBHE-117: Create/ enhance/ manage contour grass strips: placed in areas of high risk of soil erosion to assist in the prevention of surface run-off.

EBHE-117	Create/ enhance/ manage contour grass strips	TL*	*

12.8.1.1 Causality
These are likely to have a small but largely unknown impact on landscape character and GI. If done well and surface run off is reduced this will have a GI benefit but it would be less than other forms of intervention such as a hedgerow or line of trees or reversing the land to pasture. It might not be beneficial for landscape character, but the impact is likely to be small due to the size of the feature and it will vary during the year.

12.8.1.2 Co-benefits and Trade-offs
Possibly some wildlife value but unlikely to have many other impacts.

12.8.1.3 Magnitude
Small feature.

12.8.1.4 Timescale
Effective once grass strip is established.

12.8.1.5 Spatial Issues
Small feature.

12.8.1.6 Displacement
Some loss of land to production.

12.8.1.7 Maintenance and Longevity
Some ongoing maintenance through cutting, but nothing to major.

12.8.1.8 Climate Adaptation or Mitigation
Aimed at reducing the impact of extreme wet events so likely to become more necessary, although this intervention alone might not be enough to reduce soil erosion.

12.8.1.9 Climate factors / Constraints
N/A

12.8.1.10 Benefits and Trade-offs to Farmer/Land manager
Farmers keen to retain topsoil, often lost at points of high surface run off.

12.8.1.11 Uptake
Largely unknown, although some productive land would be lost and management will incur costs.

12.8.1.12 Other Notes
N/A

12.9 Bundle: Litter and Waste

12.9.1 Litter and Waste

EBHE-267: Store unused polythene away from public view - polytunnel polythene should be stored securely when not in use in order to minimise visual impact.
EBHE-274: Remove polythene covering the frames of a polytunnel for a minimum period of six months in any calendar year - removal of polythene is in the interests of visual amenity.
EBHE-278: Remove waste plastics in an approved manner, wash, and segregate and store correctly and recycling. NB recycling scheme available locally required for compliance. - appropriate recycling of waste plastics is important to reduce pollution, litter and waste in the local environment.

EBHE-267	Store unused polythene away from public view	**	N
EBHE-274	Remove polythene covering the frames of a polytunnel for a minimum period of six months in any calendar year	**	N
EBHE-278	Remove waste plastics in an approved manner, wash, and segregate and store correctly and recycling. NB recycling scheme available locally required for compliance	**	N

12.9.1.1 Causality
While extensive areas of polytunnels can have a significant impact on landscape character, particularly when they are highly visible, the specific actions relating to removal, storage and disposal of polythene are likely to have a limited impact on the overall character of landscape. What is more important to consider is the location and prominence of large areas of polytunnels, particular in sensitive landscapes or where they impact on long distance views. There is no impact on GI.

12.9.1.2 Co-benefits and Trade-offs
Polythene removal, storage and disposal will have benefits for recreation (Theme 1), tourism (Theme 5), biodiversity (Theme 9). Erection of large scale polytunnels, while contributing to improved food production, has potential impacts on local tourism and leisure industries. These actions should only be considered where they require actions over and above what is necessary to meet regulations.

12.9.1.3 Magnitude
Likely to be small.

12.9.1.4 Timescale
Effective almost immediately.

12.9.1.5 Spatial Issues
Small.

12.9.1.6 Displacement
N/A

12.9.1.7 Maintenance and Longevity
Minimal.

12.9.1.8 Climate Adaptation or Mitigation
Removal of polythene is likely to be increasingly required in order to avoid damage during storms, meaning there is a benefit to the land manager from reduced damage. Removal of polythene during the wetter months of the year can also help with flooding alleviation, but this will also reduce damage and loss for the land manager.

12.9.1.9 Climate factors / Constraints
N/A

12.9.1.10 Benefits and Trade-offs to Farmer/Land manager
There will be a labour input for the removal, storage and disposal of polythene but this would be necessary anyway at some point in the year. Removal of polythene for a minimum of 6 months per year is unlikely to align with many horticultural crop cycles so consideration needs to be given to the economic costs and benefits.

12.9.1.11 Uptake
Farm businesses are more likely to undertake these actions when they align to crop cycle needs, but in diversified businesses with tourism activities these would be beneficial.

12.9.1.12 Other Notes
N/A

12.10 Bundle: Create and enhance access and PROW

12.10.1 Create and enhance access and PROW

This set of actions relates to infrastructure and access to improve public access to green and blue space. This includes the provision of facilities (such as parking, toilets, refreshments) and accessible rights of way in both rural, urban and coastal settings. The descriptions as self-explanatory.

EBHE-005: Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW)
EBHE-006: Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety
EBHE-008: Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation
EBHE-015: Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)
EBHE-020: Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)
EBHE-021: Create public access (on foot, on horse or on bike) to open access land and common land
EBHE-022: Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users
EBHE-023: Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users
EBHE-026: Dedicate land as access land
EBHE-029: Create/ maintain alternative routes on paths and greenspaces liable to inundation (flooding and erosion)
EBHE-031: Create or dedicate new replacement routes of the same or higher status where inundation or erosion will be permanent
EBHE-042: "Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles
EBHE-255: Create/ maintain small scale access facilities supporting travel to site via road (e.g. Small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)
EBHE-265: Dedicate new Byways Open to all Traffic
EBHE-282: Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)
EBHE-300: Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)

EBHE-005	Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW	*	*
EBHE-006	Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety	LDT*	LDT*
EBHE-008	Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation	LDT*	LDT*

EBHE-015	Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)	LDT*	LDT*
EBHE-020	Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)	LDT*	LDT*
EBHE-021	Create public access (on foot, on horse or on bike) to open access land and common land	*	*
EBHE-022	Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users	LDT*	LDT*
EBHE-023	Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users	LDT*	LDT*
EBHE-026	Dedicate land as access land	*	
EBHE-029	Create/ maintain alternative routes on paths and greenspaces liable to inundation (flooding and erosion)	LDT*	LDT*
EBHE-031	Create or dedicate new replacement routes of the same or higher status where inundation or erosion will be permanent	LDT*	LDT*
EBHE-042	"Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycle	*	*
EBHE-255	Create/ maintain small scale access facilities supporting travel to site via road (e.g. Small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)	LDT*	LDT*
EBHE-265	Dedicate new Byways Open to all Traffic	*	*
EBHE-282	Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)	*	*
EBHE-300	Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)	*	*

12.10.1.1 Causality

The main impact of these actions on landscape character is that infrastructure and access improvements, while allowing more people to enjoy green and blue spaces. However, in some instances the scale of the actions appears to be large-scale and, in these instances, there will be a visual impact on the landscape that needs to be considered. As indicated in the Theme 13 involvement with and appreciation of these spaces contributes to the attachments and meanings that people form with those places (Zlender & Gemin 2020). The increase in existing access network would help this process but only if it is in keeping with the landscape. Unnatural access furniture can detract from landscape character, especially if in a prominent position. Changing existing access to allow different levels of access, such as mountain bikes or motorised might have a negative impact on the landscape through increased use and erosion through access points like gateways. Finally, in some cases such actions may have a negative impact on GI, if the actions mean the replacement of land surfaces sensitive to natural processes with ones that reduce the resilience of the landscape to rainfall and naturalness.

12.10.1.2 Co-benefits and Trade-offs

Increased access and infrastructure is also likely to have benefits on recreation (see Theme 1), mental health (see Theme 2), educational opportunities (see Theme 3), tourism (see Theme 5), as well as awareness of cultural heritage (see Theme 6) and awareness of wildlife (see Theme 9) where such sites are better connected to the access network.

12.10.1.3 Magnitude

Increasing opportunities for people to have access to and enjoy green and blue spaces.

12.10.1.4 Timescale
Immediate once completed.

12.10.1.5 Spatial Issues
Small scale.

12.10.1.6 Displacement
Some impacts are likely on wildlife as a result of increased public access, although with good design this can be minimised. See Theme 1.

12.10.1.7 Maintenance and Longevity
Maintenance will be required, and some interventions will have a limited lifespan. Once introduced into the landscape access infrastructure needs to be maintained and checked.

12.10.1.8 Climate Adaptation or Mitigation
N/A

12.10.1.9 Climate factors / Constraints
N/A

12.10.1.10 Benefits and Trade-offs to Farmer/Land manager
Benefits greatest where there are links to existing tourism or recreation enterprises, but increased access does increase footfall meaning some activities might become more challenging e.g. livestock or trampling of crops.

12.10.1.11 Uptake
Access options not always the most attractive to land managers (NE209).

12.10.1.12 Other Notes
N/A

12.11 BUNDLE: SIGNPOSTING, INFORMATION, FACILITIES AND EVENTS

12.11.1 Signposting, information, facilities and events

This set of actions relates to signposting, information, facilities and events that aim to increase information available for visitors so they can make the most out of their visit. **EBHE-004** aims to improve signage and way markers, which will assist visitors in finding their way around the pathways provided; this is followed up by the aim of **EBHE-013** which will provide maps of the area showing key points of access and key features. **EBHE-009** aims to provide additional information about elements found at the site and in the vicinity, this would include aspects of cultural and historical heritage. **EBHE-011** and **EBHE-012** aim to make better use of digital information sharing using websites, apps and social media to provide detailed information about public access opportunities and useful information concerning ease of access. All self-explanatory

EBHE-040: Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture
EBHE-043: Create/ maintain dedicated space for forest school opportunities
EBHE-050: Create/ maintain demonstration or outdoor classroom sites (e.g. for talks or lessons)
EBHE-055: Create/ maintain site based information promoting the use of the natural environment for physical activity, health and wellbeing
EBHE-056: Create/ maintain publicly accessible natural play spaces
EBHE-057: Maintain places for geo-caching
EBHE-058: Create small-scale cultivation opportunities

EBHE-059: Create/ maintain sites and small scale infrastructure for community therapeutic horticulture or food growing
EBHE-066: Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity
EBHE-069: Provide guided geodiversity walks
EBHE-257: Create/ maintain small scale facilities/street furniture on site (e.g. bins/recycling facilities, seats)
EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value
EBHE-268: Install/ maintain visual and aural art features

EBHE-040	Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture	D*	D*
EBHE-043	Create/ maintain dedicated space for forest school opportunities	LDT*	***
EBHE-050	Create/ maintain demonstration or outdoor classroom sites (e.g. for talks or lessons)	LDT*	***
EBHE-055	Create/ maintain site based information promoting the use of the natural environment for physical activity, health and wellbeing	*	T*
EBHE-056	Create/ maintain publicly accessible natural play spaces	**	*
EBHE-057	Maintain places for geo-caching	*	T*
EBHE-058	Create small-scale cultivation opportunities	N	*
EBHE-059	Create/ maintain sites and small scale infrastructure for community therapeutic horticulture or food growing	N	*
EBHE-066	Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity	**	T**
EBHE-069	Provide guided geodiversity walks	TL*	N
EBHE-257	Create/ maintain small scale facilities/street furniture on site (e.g. bins/recycling facilities, seats)	TL*	N
EBHE-266	Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value	*	N
EBHE-268	Install/ maintain visual and aural art features	*	N

12.11.1.1 Causality

As with access and infrastructure actions, signage, information, facilities and events can allow more people to enjoy the natural environment, with associated benefits of increased understanding of GI through increased involvement with these spaces (Zlender & Gemin 2020). In addition, signage, interpretation and the provision of information about nature or the cultural heritage associated with sites can contribute to the experience of being in a particular place and the meanings and attachments that people form with those places and the associated landscape character (Paths for All, undated). Small areas of cultivation can be benefit for GI in terms of increased infiltration and associated land management, but the impacts are small.

Outdoor learning environments can contribute to enhancing an understanding of landscape character and natural processes important to GI, particularly in the context of connection to nature (Harris 2021). Care needs to be taken to ensure the GI is not impeded in this process of engagement activities with permanent installations or excessively exposed features. The benefit is on the approaches applied to develop children's understanding of natural processes and Themes 3 & 13 highlight the benefits of this for long-term understanding and attachment to place.

Involvement of the local community in how existing areas of tranquillity can be improved (Action **EBHE-266**) will ensure that the actions incorporated represent the preferences of the local community and preserve the sense of place. See Theme 11.

12.11.1.2 Co-benefits and Trade-offs
Increased signage, information, facilities and events will also have benefits on recreation (see Theme 1), mental health (see Theme 2), educational opportunities (see Theme 3), tourism (see Theme 5), awareness of cultural heritage (see Theme 6) and awareness of wildlife (see Theme 9).

12.11.1.3 Magnitude
Likely to be small scale.

12.11.1.4 Timescale
Effective as soon as install or active.

12.11.1.5 Spatial Issues
Relatively small spaces.

12.11.1.6 Displacement
Little if any.

12.11.1.7 Maintenance and Longevity
Any man-made feature will need checking and maintenance and will need replacement in time.

12.11.1.8 Climate Adaptation or Mitigation
N/A

12.11.1.9 Climate factors / Constraints
N/A

12.11.1.10 Benefits and Trade-offs to Farmer/Land manager
Can be linked to local recreation and tourism enterprises.

12.11.1.11 Uptake
Access options not the most attractive to land managers (NE 2009).

12.11.1.12 Other Notes
N/A

12.12 Bundle: Maintenance and restoration of cultural heritage sites

12.12.1 Maintenance and restoration of cultural heritage sites

These actions aim to preserve historical and cultural sites ensuring that they remain in good condition. There are self-explanatory.

EBHE-077: Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)

EBHE-079: Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation

EBHE-080: Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation

EBHE-083: Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments

EBHE-084: Restore/ maintain high water levels to protect heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments

EBHE-084-XXX: Restore/ maintain high water levels to protect scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments

EBHE-088: Maintain the visibility of upstanding Scheduled Monuments/heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-089: Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-288: Do not plough, sub-soil cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-289: Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands
EBHE-290: Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion with no ground disturbance, bare patches or erosion.
EBHE-292: Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-293: Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-294: Enhance the management and presentation of Registered Battlefields
EBHE-295: Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-296: Remove eyesores from Registered Battlefields
EBHE-297: Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-298: Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-299: Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-305: Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)
EBHE-306: Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)

12.12.1.1 Causality

EBHE-077	Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***	N
EBHE-079	Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation	***	**
EBHE-080	Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation	***	**
EBHE-083	Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	***	N
EBHE-084	Restore/ maintain high water levels to protect heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	***	N
Ebhe-084XX	Restore/ maintain high water levels to protect scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monument	***	N
EBHE-088	Maintain the visibility of upstanding Scheduled Monuments/ heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments		

EBHE-089	Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***	N
EBHE-288	Do not plough, sub-soil cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***	**
EBHE-289	Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands	***	N
EBHE-290	Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion with no ground disturbance, bare patches or erosion	***	**
EBHE-292	Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***	N
EBHE-293	Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***	*
EBHE=-294	Enhance the management and presentation of Registered Battlefields	***	N
EBHE-295	Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monument	***	N
EBHE-296	Remove eyesores from Registered Battlefields	***	N
EBHE-297	Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***	N
EBHE-298	Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***	N
EBHE-299	Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***	N
EBHE-305	Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use	***	N
EBHE-306	Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***	N

Many listed buildings and buildings on the SHINE database are not in good condition (see Theme 6) and require attention if they are to be preserved for future enjoyment. These actions are aimed at maintaining, improving or restoring the condition of building of historical or cultural interest. Enhancing the condition and appearance of these buildings will add value to the cultural heritage of the landscape, which will have a major impact on the preservation of the distinctiveness of these locations and therefore enhance the landscape character.

There are links between the historic environment and landscape character, particularly in terms of place distinctiveness (what makes a place distinctive), place continuity (the way a place support people's sense of continuity) and place dependency (how a place enables people to realise their goals) (Graham et al. 2009).

Only those activities which create, enhance or maintain permanent vegetation cover will have any impact of GI or BI. Where this is the case there will be moderate to minor benefits as the vegetation provides better infiltration that might contribute to reducing peak flows and therefore the risk of flooding.

12.12.1.2 Co-benefits and Trade-offs
There will be benefits to tourism from better maintained heritage assets. See Theme 6.

12.12.1.3 Magnitude
See Theme 6.

12.12.1.4 Timescale
Will depend on the action but could be effective quite quickly.

12.12.1.5 Spatial Issues
See Theme 6.

12.12.1.6 Displacement
N/A

12.12.1.7 Maintenance and Longevity
See Theme 6.

12.12.1.8 Climate Adaptation or Mitigation
Climate adaption and mitigation needs to be built into the actions.

12.12.1.9 Climate factors / Constraints
N/A

12.12.1.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 6.

12.12.1.11 Uptake
Long-term management of these assets can be costly and farmers are cautious about losing land in the long-term when AES support is not available (LUC 2020).

12.12.1.12 Other Notes
N/A

12.13 Bundle: Maintenance, restoration of habitat features in Parks and Gardens

12.13.1 Maintenance, restoration of habitat features in Parks and Gardens

These actions relate to the maintenance of habitat features in Registered Parks and Gardens in order to both maintain their functionality for biodiversity, but also their landscape, recreational and tourism value.
EBHE-090: Establish/ maintain a continuous grass sward in Registered Parks and Gardens.
EBHE-231: Enhance/ manage landscape character in urban parks
EBHE-307: Retain mature and veteran standing trees in Registered Parks and Gardens
EBHE-308: Re-plant trees in Registered Parks and Gardens
EBHE-309: Maintain standing/fallen deadwood in Registered Parks and Gardens
EBHE-310: Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens
EBHE-311: Enhance/ maintain parkland features in Registered Parks and Gardens
EBHE-312: Maintain the current water regime in Registered Parks and Gardens
EBHE-313: Remove eyesores from Registered Parks and Gardens
EBHE-315: Enhance/ manage biodiversity in urban parks

EBHE-090	Establish/ maintain a continuous grass sward in Registered Parks and Gardens		*
EBHE-231	Enhance/ manage landscape character in urban parks	L***	*
EBHE-307	Retain mature and veteran standing trees in Registered Parks and Gardens	L**	N
EBHE-308	Re-plant trees in Registered Parks and Gardens	L*	N
EBHE-309	Maintain standing/fallen deadwood in Registered Parks and Gardens	N	*
EBHE-310	Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens	N	*
EBHE-311	Enhance/ maintain parkland features in Registered Parks and Gardens	L**	*
EBHE-312	Maintain the current water regime in Registered Parks and Gardens	L*	*
EBHE-313	Remove eyesores from Registered Parks and Gardens	L*	*
EBHE-315	Enhance/ manage biodiversity in urban parks	N	*

12.13.1.1 Causality
Actions to maintain habitats in registered park and gardens will impact on landscape character insomuch as these environments contribute to the general landscape and historical context for an area. Where there is the enhancement or maintenance of vegetation there will some GI benefits of those actions, depending on the detail of the management.

12.13.1.2 Co-benefits and Trade-offs
Most of the benefits will be for recreation (Theme 1) and Tourism (Theme 5) as well as making people more aware of the heritage assets (Theme 6) and improving their condition (Theme 7)

12.13.1.3 Magnitude
Theme 1.

12.13.1.4 Timescale
Theme 1.

12.13.1.5 Spatial Issues
Theme 1.

12.13.1.6 Displacement
Theme 1.

12.13.1.7 Maintenance and Longevity
Will require maintenance depending on the action.

12.13.1.8 Climate Adaptation or Mitigation
Theme 1.

12.13.1.9 Climate factors / Constraints
Theme 1.

12.13.1.10 Benefits and Trade-offs to Farmer/Land manager
Often under local authority ownership.

12.13.1.11 Uptake
N/A

12.13.1.12 Other Notes
N/A

12.14 BUNDLE: ACTIONS FOR GEODIVERSITY

12.14.1 Actions for geodiversity

The 17 geodiversity actions represent current thinking in best practice in terms of preserving geodiversity (see Theme 8) in order to maintain these features for educational, recreational or heritage purposes.

EBHE-232: Maintain exposures of vertical or near-vertical faces
EBHE-234: Create/ maintain safety fencing for geodiversity features
EBHE-236: Stabilise cave entrances
EBHE-238: Scrape rock faces
EBHE-239: Remove fly tipped rubbish from geodiversity features
EBHE-240: Re-excavate sections of geodiversity features
EBHE-242: Create/ maintain trenches
EBHE-244: Remove man-made barriers around active geodiversity features
EBHE-246: Protect geodiversity features by protective cover
EBHE-247: Remove scree or spoil
EBHE-249: Create rock piles for sample collection
EBHE-250: Remove graffiti on geodiversity features
EBHE-251: Create/ enhance/ maintain access for caves or disused mines
EBHE-316: Control scrub or trees on top or in front of geodiversity features

EBHE-232	Maintain exposures of vertical or near-vertical faces	***	N
EBHE-234	Create/ maintain safety fencing for geodiversity features	*	N
EBHE-236	Stabilise cave entrances	T*	N
EBHE-238	Scrape rock faces	*	N
EBHE-239	Remove fly tipped rubbish from geodiversity features	***	N
EBHE-240	Re-excavate sections of geodiversity features	T*	N
EBHE-242	Create/ maintain trenches	*	N
EBHE-244	Remove man-made barriers around active geodiversity features	T*	TD**
EBHE-246	Protect geodiversity features by protective cover	TD*	N
EBHE-247	Remove scree or spoil	TD*	N
EBHE-249	Create rock piles for sample collection	TD*	N
EBHE-250	Remove graffiti on geodiversity features	***	N
EBHE-251	Create/ enhance/ maintain access for caves or disused mines	***	N
EBHE-316	Control scrub or trees on top or in front of geodiversity features	TD*	*

12.14.1.1 Causality

One of the cultural services that geodiversity provides is a contribution to landscape character. Thus the actions that help frame the unique elements of the geodiversity of a place are likely to be of significant value in highlighting the distinctive character of the area. A good example for England is the National Character Areas (NE 2014), quite a few of which are defined by geological units, so being able to view the rocks in good, clear sections is important. Likewise, the ability to take moulds or casts of certain features, particularly fossils, and be able to bring them into a museum or interpretive centre offers an opportunity for publics to better understand and appreciate the distinctiveness of local natural geological environments.

Where the actions maintain existing exposures (**EBHE-232**), remove graffiti (**EBHE-250**) or create, enhance or maintain access to geodiversity features (**EBHE-316**) then the benefits to landscape character are

greatest. If new structures, such as fencing (**EBHE-234**) are introduced, this may impact landscape character.

There is little befit for GI unless the actions increase the naturalness of the area I question. This could be removal of man-made structures (**EBHE-244**) but these need to be assessed carefully to ensure GI is not reduced (e.g. with potential impacts downstream). Actions to reduce scrub would impact GI.

12.14.1.2 Co-benefits and Trade-offs
See theme 8.

12.14.1.3 Magnitude
See theme 8.

12.14.1.4 Timescale
See theme 8.

12.14.1.5 Spatial Issues
See theme 8.

12.14.1.6 Displacement
See theme 8.

12.14.1.7 Maintenance and Longevity
See theme 8.

12.14.1.8 Climate Adaptation or Mitigation
See theme 8.

12.14.1.9 Climate factors / Constraints
See theme 8.

12.14.1.10 Benefits and Trade-offs to Farmer/Land manager
See theme 8.

12.14.1.11 Uptake
See theme 8. There are few options under AES for geodiversity features (LUC 2021).

12.14.1.12 Other Notes
N/A

13 THEME 11: NOISE MITIGATION

Noise pollution is particularly prevalent in urban environments, where noise sources such as traffic, construction works and overhead aircraft, are numerous. Road traffic is one of the key sources of noise pollution (Bolund & Hunhammar, 1999), and traffic noise is the second greatest environmental risk to health in Western Europe (Hänninen et al., 2014). Exposure to noise pollution can have many consequences, including reduction in sleep quality and quantity, elevated stress and mental health-related conditions, and increased risk of cardio-vascular (Hammer et al., 2014; Münzel et al., 2014; Münzel et al., 2017; Hammer et al., 2018). Traffic noise results in at least one million healthy years of life lost annually, in the western part of Europe alone (Hurtley, 2009).

Vegetation, in particular trees, can have a substantial mitigating impact on the level of traffic noise experienced at receptors (e.g. residential properties) (van Renterghem, 2014), with a tree belt of 25 m depth capable of providing up to 7 dB reduction in noise levels (HOSANNA, 2013). Plants mitigate noise through two main mechanisms: The absorption of sound energy by soft green vegetation, which is largely restricted to higher frequencies (Tang et al., 1986; van Renterghem, 2014); and the redirection and scattering of sound waves by more substantial woody structures (i.e. trunks, branches and stems). Redirection and scattering of sound leads to greater absorption by the atmosphere and also by the ground, which tends to be softer under trees and absorbs more sound compared with harder manmade surfaces such as roads or paving (van Renterghem et al., 2012). In general, in order for vegetation to have a mitigating effect, it must be located between a noise source and a receptor; where 'receptor' refers to a potentially impacted feature, such as homes, offices, schools, hospitals, etc.

13.1 MANAGEMENT BUNDLES

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:
Habitat creation
Habitat creation/woodland (3 actions)
Habitat creation/woody features (2 actions)
Habitat creation/scrub (1 action)
Systems action
Systems action/landscape actions (6 actions)
Restoration, management and enhancement
Restoration, management and enhancement/woodland (6 actions)
Restoration, management and enhancement/rivers (2 actions)
Restoration, management and enhancement/boundary features (7 actions)
Signposting, information, facilities and events
Signposting, information, facilities and events/ (38 actions)
Maintenance and restoration of cultural heritage sites
Maintenance and restoration of cultural heritage sites/ (23 actions)
Maintenance, restoration of habitat features in Parks and Gardens
Maintenance, restoration of habitat features in Parks and Gardens/ (10 actions)
Actions for geodiversity
Actions for geodiversity/ (17 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

13.2 BUNDLE: HABITAT CREATION

13.2.1 Woodland

EBHE-140: Create a woodland creation plan
EBHE-140C: Create ghyll woodland
EBHE-209C: Create traditional orchards with local varieties of fruit tree
EBHE-281: Set up or engage with community tree planting projects

EBHE-104	Create a woodland creation plan	*T
EBHE-140C	Create ghyll woodland	*
EBHE-209C	Create traditional orchards with local varieties of fruit tree	*
EBHE-281	Set up or engage with community tree planting projects	**

EBHE-140: Create a woodland creation plan – woodland creation plans are required in order to receive governmental grants for woodland creation. The plan must include identification of landscape and visual sensitivities relevant to woodland creation, as well as identification of proximity to priority habitats or species, national or international designations, heritage assets etc. All new woodland must be UKFS (UK Forestry Standard) compliant.

EBHE-140C: Create ghyll woodland – ghyll woodlands are native woodland found on steep-sided valleys, predominantly in uplands area in western Britain (Flora local 2005).

EBHE-209C: Create traditional orchards with local varieties of fruit tree – traditional orchards are structurally and ecologically similar to wood-pasture and parkland, having widely spaced fruit trees within wider grassland, that is either grazed or cut (JNCC 2008). They are important biodiversity hotspots and include UK BAP priority habitats and species. A feature of traditional orchards is the variety of the fruit cultivars they contain and the low intensity management regimes applied (in contrast to more intensively managed orchards) (JNCC 2008).

EBHE-281: Set up or engage with community tree planting projects – this action refers to the specific engagement of communities in local tree planting projects, either through community-led planting, or local residents volunteering to engage in tree planting activities.

The main benefits from the above four actions are described in the Theme 9, as well as Theme 2 and 4 for action EBHE-281. Below we set out specific impacts of the actions, as they relate to noise mitigation.

13.2.1.1 Causality

Noise mitigation as the result of creating a woodland action plan (EBHE-104) is entirely contingent upon implementation of that plan. However, the addition of woodland at locations between noise sources and receptors would mitigate noise, by acting as a barrier and by reflecting and scattering the sound (HOSANNA, 2013; Tang et al., 1986; van Renterghem et al., 2012). Such a woodland creation plan could be designed to maximise noise mitigation through spatial configuration, choice of tree variety, and planting density. In general, it is optimal to plant trees in dense stands (< 3 m separation), for these trees to be > 0.11 m in trunk diameter, and for the depth of trees to be 15 m or more (measures in the direction of sound propagation) (van Renterghem et al., 2012).

Ghyll woodland (EBHE-140C), by its nature is likely to be located where it will provide negligible noise mitigation because it is in a steep valley or ravine, and not directly between noise sources and receptors. It may block noise from a river or stream, however that noise might not be seen as negative, or unwanted (Schwarz, 2013).

Creating traditional orchards (EBHE-209C) would involve the addition of trees, which possess the potential to mitigate noise, where they are located between noise sources and receptors, by acting as a barrier and by reflecting and scattering sound, however their effectiveness is likely to be moderate if they are spaced further than 3 m apart (van Renterghem et al., 2012).

Setting up, or engaging with, tree planting projects (**EBHE-281**) is assumed to ultimately result in the planting of trees. Where these trees are located between noise sources and receptors, they have the potential to provide mitigation, through blocking, reflecting and scattering the sound (van Renterghem et al., 2012).

13.2.1.2 Co-benefits and Trade-offs

All of the above actions (**EBHE-104**, **EBHE-140C** & **EBHE-209C**) relate to the addition of trees. There are many co-benefits of planting trees; from carbon sequestration and air pollution removal, to atmospheric cooling and biodiversity gains (Akbari et al., 2001; Bonan, 2008; Nowak et al., 2018). However, planting trees in inappropriate locations, e.g. previously non-forested areas, can have unintended negative impacts (Di Sacco et al., 2021).

13.2.1.3 Magnitude

In terms of tree cover some urban areas have lower proportions than the national average of 5%, this was highlighted in the Community Forest programme when originally introduced.

13.2.1.4 Timescale

All of the above actions (**EBHE-104**, **EBHE-140C** & **EBHE-209C**) relate to the addition of trees. For new planting, timescale for trees to grow to a functional size varies according to size/age at planting, variety of tree planted, as well as the local conditions, including temperature, moisture and shade (Monteiro et al., 2017). However, it would typically take several years for newly planted trees to be large enough to start providing discernible noise mitigation, and perhaps 15-20 years for this to develop to a substantial level (Monteiro et al., 2017; van Renterghem et al., 2012; Walters & Sinnett, 2021).

13.2.1.5 Spatial Issues

With regard to trees providing noise mitigation, in general, substantial space is required in order to maximise their impact. Individual, isolated trees will provide negligible noise mitigation – dense stands of trees having a much greater potential for providing substantial reductions in noise levels (van Renterghem et al., 2012). However, potential for impact is contingent upon there being an issue present at that location in the first place (i.e. presence of noise and people). Optimal placement is near to the noise source, between source and receptor (van Renterghem et al., 2012; van Renterghem, 2014). For a linear noise source, such as a straight stretch of road, optimal placement/configuration would be adjacent and parallel to the road, between the road and any occupied buildings. This belt of trees should be at least 5-10 m, and ideally, >15 m in depth (i.e. perpendicular to the direction of traffic flow) (van Renterghem et al., 2012).

13.2.1.6 Displacement

None, as it acts as a barrier rather than reducing the source directly (i.e. not redirecting traffic elsewhere).

13.2.1.7 Maintenance and Longevity

The provision of mitigation should continue, most likely even without maintenance, for the duration that the trees are standing (but see Climate Adaptation or Mitigation (13.2.1.8) below). However, maintenance of traditional orchards (e.g. linked to **EBHE-209C**) may require periodical management actions, such as mowing between trees, pruning trees, etc.

13.2.1.8 Climate Adaptation or Mitigation

Climate change could have implications through some potential interactions with tree death through drought and pathogens (e.g. ash die back) (Goberville et al., 2016; Rooney et al., 1998); leaf-on season is becoming longer but leaves provide relatively little noise mitigation (see van Renterghem et al., 2012).

13.2.1.9 Climate factors / Constraints

This is an important consideration at the planning phase of any tree planting actions. Climate change has potential implications regarding the long-term growth and survival of trees (Monteiro et al., 2017). When climatic shifts are too rapid for trees to adapt, the trees are likely to suffer and/or die (Ciais et al., 2005; Hoffmann & Sgrò, 2011; Peng et al., 2011). Where new trees are planted, care should be taken to choose appropriate varieties and to source them from suitable climatic conditions, so that their survival is not put at risk from shifts in the local climatic conditions over the lifetime of the trees (Aitken & Bemmels, 2016; Marris, 2009).

13.2.1.10 Benefits and Trade-offs to Farmer/Land manager

Low capital cost for planting and minimal maintenance cost, plus longer life-span, compared with artificial noise barriers, are benefits (see also co-benefits, in 13.2.1.2 above). There is, however, a potential trade-off due to larger land area required compared with an artificial barrier.

13.2.1.11 Uptake

Greater uptake is likely where the multiple co-benefits are emphasised, particularly in urban settings where issues such as air pollution and cooling are most important.

13.2.1.12 Other Notes

None

13.2.2 Woody features & scrub

EBHE-191: Plant and establish appropriate species of field boundary trees
EBHE-205C: Create wood pasture (eg through appropriate grazing)
EBHE-203C: Create targeted scrub

EBHE-191	Plant and establish appropriate species of field boundary trees	***
EBHE-203C	Create targeted scrub	*
EBHE-205C	Create wood pasture (eg through appropriate grazing)	*

EBHE-191: Plant and establish appropriate species of field boundary trees – trees in hedgerows are important components that give a landscape character and provide GI benefits

EBHE-203C: Create targeted scrub – Scrub is considered a 'successional' habitat as it is, naturally, a temporary habitat between more open habitat areas (e.g. grassland, heathland) and woodland. Therefore, the main purpose for scrub management is to maintain it as scrub, providing a habitat for those species which depend on it, and to also present scrub from invading other valuable habitats, such as grassland and heathland.

EBHE-205C: Create wood pasture (e.g. through appropriate grazing) - wood pasture is land that is managed through grazing, with trees in these settings often pollarded. Many of the UK's ancient trees are in wood pasture or parkland settings, although wood pasture is currently quite a rare habitat. Wood pasture creates a different landscape character to more intensive forms of agriculture or grazing regimes and is associated with extensive grazing which provides GI benefits.

13.2.2.1 Causality

Planting and establishing appropriate species of field boundary trees (**EBHE-191**) is unlikely to have a substantial noise mitigating impact, unless they are planted in belts of at least 15 m depth (i.e., see van Renterghem et al., 2012). Furthermore, a typical species for field boundaries is the blackthorn, which is not particularly tall, so will have limited noise mitigating potential, unless planted on top of other existing structures (e.g. dry-stone walls).

Creation of targeted scrub (**EBHE-203C**) could provide some noise mitigation, where it is located between noise sources and receptors. However, the general diminutive form of shrubs and bushes will mean that mitigation is limited, even if they are dense, thick and near to the noise source (van Renterghem et al., 2015), unless combined with soil banks/berms to give height.

The creation of wood pasture (**EBHE-205C**) from pasture/grassland, through the planting of trees, would provide noise mitigation where the new wood pasture is located between noise sources and receptors. However, the sparse nature of the woodland in such habitats would necessitate large areas in order to have a substantial mitigating impact, as trees should be planted <3 m apart for optimal impact (van Renterghem et al., 2012). Where established trees are pollarded, to raise the canopy above the reach of grazing cattle,

this could further reduce the effectiveness of the tree's noise mitigation, by reducing the amount of vegetation through which sound must travel.

13.2.2.2 Co-benefits and Trade-offs

There are many co-benefits of planting trees and shrubs; from carbon sequestration and air pollution removal, to atmospheric cooling and biodiversity gains (Akbari et al., 2001; Bonan, 2008; Nowak et al., 2018). However, planting trees in inappropriate locations, e.g. previously non-forested areas, can have unintended negative impacts (Di Sacco et al., 2021).

13.2.2.3 Magnitude

Wood pasture has long been under threat, through the discriminatory nature of the Common Agricultural Policy as it relates to maximum tree density guideline on pastural land (Beaufoy, 2014). Much of the remaining wood pasture is degraded and/or fragmented (Bergmeier et al., 2010). Other sources have suggested that for specifically EBHE-191 (Plant and establish appropriate species of field boundary trees) the magnitude of the possible mitigation impact of this action is likely to be small.

13.2.2.4 Timescale

For new planting of trees or shrubs, timescale for plants to grow to a functional size varies according to size/age at planting, variety of tree planted, as well as the local conditions, including temperature, moisture and shade (Monteiro et al., 2017). However, it would typically take several years for newly planted trees to be large enough to start providing discernible noise mitigation, and perhaps 15-20 years for this to develop to a substantial level (Monteiro et al., 2017; van Renterghem et al., 2012; Walters & Sinnett, 2021). Shrubs provide limited noise mitigation, even when fully grown (van Renterghem et al., 2015), so one would expect newly planted individuals to have a negligible impact on noise.

13.2.2.5 Spatial Issues

The sparse configuration of trees in wood pasture would necessitate large areas in order to have a substantial mitigating impact, as trees should be planted < 3 m apart for optimal impact (van Renterghem et al., 2012). Field boundary trees tend to be planted in single rows, as a linear feature of the landscape, so the length of the boundary would determine the area planted. Because of the limited effectiveness of scrub in mitigating noise (even when dense) (van Renterghem et al., 2015), a large area would be necessary in order to provide a discernible impact.

13.2.2.6 Displacement

None, as it acts as a barrier rather than reducing the source directly (i.e. not redirecting traffic elsewhere).

13.2.2.7 Maintenance and Longevity

Field boundary vegetation is typically cut back annually or biannually, using mechanical means (e.g. tractor-mounted flail). Reducing the volume of thickness of boundary features in such a way would reduce their noise mitigating potential. Ongoing maintenance of woodland pasture is mainly through the grazing of cattle, although some management of the trees may be necessary (e.g. pollarding). Management of scrub could involve annual sapling-pulling, where succession is not desired. Such management would have minimal impact on the noise mitigating potential of scrubland.

13.2.2.8 Climate Adaptation or Mitigation

Climate change could have implications through some potential interactions with tree or shrub death through drought and pathogens (e.g. ash die back) (Goberville et al., 2016; Rooney et al., 1998); leaf-on season is becoming longer but leaves provide relatively little noise mitigation (see van Renterghem et al., 2012).

13.2.2.9 Climate factors / Constraints

This is an important consideration at the planning phase of any planting actions. Climate change has potential implications regarding the long-term growth and survival of trees and shrubs (Monteiro et al., 2017; Nolan et al., 2021). When climatic shifts are too rapid for plants to adapt, they are likely to suffer and/or die (Ciais et al., 2005; Hoffmann & Sgrò, 2011; Peng et al., 2011). Where new trees or shrubs are planted, care should be taken to choose appropriate varieties and to source them from suitable climatic

conditions, so that their survival is not put at risk from shifts in the local climatic conditions over the lifetime of the trees (Aitken & Bemmels, 2016; Marris, 2009).

13.2.2.10 Benefits and Trade-offs to Farmer/Land manager

Low capital cost for planting and minimal maintenance cost, plus longer life-span, compared with artificial noise barriers, are benefits (see also co-benefits, in 13.2.1.2 above). There is, however, a potential trade-off due to larger land area required compared with an artificial barrier.

13.2.2.11 Uptake

Greater uptake is likely where the multiple co-benefits are emphasised, particularly in urban settings where issues such as air pollution and cooling are most important.

13.2.2.12 Other Notes

N/A

13.3 BUNDLE: SYSTEMS ACTION

13.3.1 Landscapes Actions

EBHE-233: Control scrub or trees to maintain views
EBHE-269: Install/ maintain water features to facilitate positive soundscape and mask unwanted sound
EBHE-273: Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound
EBHE-303: Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings

EBHE-233	Control scrub or trees to maintain views	**T
EBHE-269	Install/ maintain water features to facilitate positive soundscape and mask unwanted sound	***
EBHE-273	Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound	***
EBHE-303	Plant trees and hedges to mitigate the visual impact of poly-tunnels from the immediate view of neighbouring residential dwellings	**

EBHE-233: Control scrub or trees to maintain views – this action is specific to locations where there are highly valued viewpoints. Maintenance of views helps to preserve the landscape character but might not work so well for GI.

EBHE-269: Install/ maintain water features to facilitate positive soundscape and mask unwanted sound – used around sensitive sites that are prone to noise pollution, such as from motorways or other industrial activity.

EBHE-273: Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound – see **EBHE-269** – tree, shrubs and vegetation provide a sound buffer.

EBHE-303: Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings. Over recent decades the use of large-scale polytunnels within horticulture has increased, in response to the demand for British-grown produce and to extend the growing season, improve fruit quality and yield and reduce labour needs. However, polytunnels can impact on landscape character both at the landscape scale (where there are large areas of polytunnel structures) and on individual properties (affecting property owners' enjoyment of their property and surrounding area, and potential impacts on property prices due to the landscape impacts).

13.3.1.1 Causality

Removal of scrub or trees (**EBHE-233**) will also remove any noise mitigation benefits provided by those plants (for information on noise mitigation benefits of these vegetation types, see 13.2.1.1 & 13.2.2.1).

Water features to mask unwanted sound (**EBHE-269**): Naturalistic sounds, such as flowing water can influence overall perception of the soundscape in a positive way, even if undesirable noise (e.g. from traffic) is still audible over the naturalistic sounds (Watts et al., 2009). The scope for the water feature to mitigate the effects of negative noise, depends primarily of the type and size of the water feature in question (reinstating a river vs small water fountain), but also on the ambient noise levels at the site (a small fountain is unlikely to have a discernible mitigating impact next to a large busy motorway).

Planting and managing trees and shrubs to mitigate noise from transport (**EBHE-273**): The addition of woodland at locations between traffic noise sources (e.g. roads, railways) and receptors would mitigate noise, by acting as a barrier and by reflecting and scattering the sound (HOSANNA, 2013; Tang et al., 1986; van Renterghem et al., 2012). Such a woodland creation plan could be designed to maximise noise mitigation through spatial configuration, choice of tree variety, and planting density. In general, it is optimal to plant trees in dense stands (< 3 m separation), for these trees to be > 0.11 m in trunk diameter, and for the depth of trees to be 15 m or more (measures in the direction of sound propagation) (van Renterghem et al., 2012). An addition of an understorey of shrubs may add to the noise mitigating effects by absorbing more of the reflected sound (van Renterghem et al., 2015).

Planting trees and hedges to mitigate the visual impact of poly-tunnels from the immediate view of neighbouring residential dwellings (**EBHE-303**), could have incidental noise mitigating benefits, where those trees are located between noise sources and receptors (e.g. homes). However, planting to block line-of-sight doesn't require significant depth of vegetation, whereas shielding against noise requires at least several metres of depth, to be an effective barrier (van Renterghem et al., 2012).

13.3.1.2 Co-benefits and Trade-offs

There are many co-benefits of planting trees and shrubs; from carbon sequestration and air pollution removal, to atmospheric cooling and biodiversity gains (Akbari et al., 2001; Bonan, 2008; Nowak et al., 2018). However, planting trees in inappropriate locations, e.g. previously non-forested areas, can have unintended negative impacts (Di Sacco et al., 2021).

Water features can constitute an important resource for wildlife, as a drinking source, but also as an important habitat for species with aquatic life-cycle stages. If large enough, water feature can have a substantial cooling effect on the surrounding atmosphere (Völker et al., 2013).

13.3.1.3 Magnitude

Noise pollution is particularly prevalent in urban environments, where noise sources such as traffic, construction works and overhead aircraft, are numerous. Road traffic is one of the key sources of noise pollution (Bolund & Hunhammar, 1999), and traffic noise is the second greatest environmental risk to health in Western Europe (Hänninen et al., 2014). Exposure to noise pollution can have many consequences, including reduction in sleep quality and quantity, elevated stress and mental health-related conditions, and increased risk of cardio-vascular (Hammer et al., 2014; Hammer et al., 2018; Münzel et al., 2014; Münzel et al., 2017). Traffic noise results in at least one million healthy years of life lost annually, in the western part of Europe alone (Hurtley, 2009).

13.3.1.4 Timescale

For new planting of trees or shrubs, timescale for plants to grow to a functional size varies according to size/age at planting, variety of tree planted, as well as the local conditions, including temperature, moisture and shade (Monteiro et al., 2017). However, it would typically take several years for newly planted trees to be large enough to start providing discernible noise mitigation, and perhaps 15-20 years for this to develop to a substantial level (Monteiro et al., 2017; van Renterghem et al., 2012; Walters & Sinnett, 2021). Shrubs provide limited noise mitigation, even when fully grown (van Renterghem et al., 2015), so one would expect newly planted individuals to have a negligible impact on noise.

The impact of a water feature would be immediate and last for the duration of the operation of the water feature.

13.3.1.5 Spatial Issues

With regard to trees providing noise mitigation, in general, substantial space is required in order to maximise their impact. Individual, isolated trees will provide negligible noise mitigation – dense stands of trees having a much greater potential for providing substantial reductions in noise levels (van Renterghem et al., 2012). However, potential for impact is contingent upon there being an issue present at that location in the first place (i.e. presence of noise and people). Optimal placement is near to the noise source, between source and receptor (van Renterghem et al., 2012; van Renterghem, 2014). For a linear noise source, such as a straight stretch of road, optimal placement/configuration would be adjacent and parallel to the road, between the road and any occupied buildings. This belt of trees should be at least 5-10 m, and ideally, >15 m in depth (i.e. perpendicular to the direction of traffic flow) (van Renterghem et al., 2012).

13.3.1.6 Displacement

None, as it acts as a barrier rather than reducing the source directly (i.e. not redirecting traffic elsewhere).

13.3.1.7 Maintenance and Longevity

The provision of mitigation provided by vegetation should continue, most likely even without maintenance, for the duration that the vegetation is standing (but see 13.2.1.8).

13.3.1.8 Climate Adaptation or Mitigation

Climate change could have implications through some potential interactions with tree death through drought and pathogens (e.g. ash die back) (Goberville et al., 2016; Rooney et al., 1998); leaf-on season is becoming longer but leaves provide relatively little noise mitigation (see van Renterghem et al., 2012).

Droughts could cause water features to dry up seasonally (e.g. streams, rivers), or necessitate them to be switched off.

13.3.1.9 Climate factors / Constraints

This is an important consideration at the planning phase of any planting actions. Climate change has potential implications regarding the long-term growth and survival of trees and shrubs (Monteiro et al., 2017; Nolan et al., 2021). When climatic shifts are too rapid for plants to adapt, they are likely to suffer and/or die (Ciais et al., 2005; Hoffmann & Sgrò, 2011; Peng et al., 2011). Where new trees or shrubs are planted, care should be taken to choose appropriate varieties and to source them from suitable climatic conditions, so that their survival is not put at risk from shifts in the local climatic conditions over the lifetime of the trees (Aitken & Bemmels, 2016; Marris, 2009).

13.3.1.10 Benefits and Trade-offs to Farmer/Land manager

Low capital cost for planting and minimal maintenance cost, plus longer life-span, compared with artificial noise barriers, are benefits (see also co-benefits, in 13.2.1.2). There is, however, a potential trade-off due to larger land area required compared with an artificial barrier.

13.3.1.11 Uptake

Greater uptake is likely where the multiple co-benefits are emphasised, particularly in urban settings where issues such as air pollution and cooling are most important.

13.3.1.12 Other Notes

N/A

13.4 Bundle: Restoration, management and enhancement

13.4.1 Woodland

EBHE-140EM: Enhance/ manage ghyll woodland
EBHE-196: Planted Ancient Woodland (PAWS) restoration
EBHE-198: Restore/ manage ancient woodland with native broadleaf species
EBHE-209: Create, restore or manage traditional orchards with local varieties of fruit tree

EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree

EBHE-140EM	Enhance/ manage ghyll woodland	*
EBHE-196	Planted Ancient Woodland (PAWS) restoration	**
EBHE-198	Restore/ manage ancient woodland with native broadleaf species	**
EBHE-209	Create, restore or manage traditional orchards with local varieties of fruit tree	*
EBHE-209EM	Restore or manage traditional orchards with local varieties of fruit tree	*

EBHE-140EM: Enhance/ manage ghyll woodland - see **EBHE-140C** (13.2.1.1).

EBHE-196: Planted Ancient Woodland (PAWS) restoration – PAWS are ancient woodland sites where semi-natural woodland has been replaced with a plantation. Most PAWS sites are either currently being restored or are likely to be restored to semi-natural woodland over the next few decades. The transition from plantation to semi-natural woodland is likely to have an impact on landscape character and GI. See Theme 9.

EBHE-198: Restore/ manage ancient woodland with native broadleaf species – see **EBHE-196** and Theme 9.

EBHE-209: Create, restore or manage traditional orchards with local varieties of fruit tree – Creating, restoring or managing traditional orchards can benefit landscape character I through the production of local varieties of fruit which are place-specific, enhancing the landscape by retaining and expanding a accepted characteristic. From a GI perspective the action is similar to creating, restoring or maintaining wood pasture (**EBHE-205**) and **EBHE-209C**.

EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree - see **EBHE-209** and **EBHE-209C**.

13.4.1.1 Causality

Ghyll woodland (**EBHE-140EM**), by its nature is likely to be located where it will provide negligible noise mitigation because it is in a steep valley or ravine, and not directly between noise sources and receptors. It may block noise from a river or stream, however that noise might not be seen as negative, or unwanted (Schwarz, 2013). The enhancement or management of such woodland is unlikely increase the noise mitigation provided, as the low potential of such woodland is largely due to its location.

The restoration/management of ancient woodland (**EBHE-196** & **EBHE-198**) may lead to increased coverage and/or density of trees and woody shrubs. The addition of woodland at locations between noise sources and receptors would mitigate noise, by acting as a barrier and by reflecting and scattering the sound (HOSANNA, 2013; Tang et al., 1986; van Renterghem et al., 2012). Such a woodland creation plan could be designed to maximise noise mitigation through spatial configuration, choice of tree variety, and planting density. In general, it is optimal to plant trees in dense stands (< 3 m separation), for these trees to be > 0.11 m in trunk diameter, and for the depth of trees to be 15 m or more (measures in the direction of sound propagation) (van Renterghem et al., 2012).

Creating, restoring or managing traditional orchards (**EBHE-209** & **EBHE-209EM**) could involve the addition of trees, which possess the potential to mitigate noise, where they are located between noise sources and receptors, by acting as a barrier and by reflecting and scattering sound, however their effectiveness is likely to be moderate if they are spaced further than 3 m apart (van Renterghem et al., 2012).

13.4.1.2 Co-benefits and Trade-offs

There are many co-benefits of planting trees and shrubs; from carbon sequestration and air pollution removal, to atmospheric cooling and biodiversity gains (Akbari et al., 2001; Bonan, 2008; Nowak et al., 2018). However, planting trees in inappropriate locations, e.g. previously non-forested areas, can have unintended negative impacts (Di Sacco et al., 2021).

13.4.1.3 Magnitude

Only a small extent of ancient woodland remains in the UK, just 2.5% of the UK's land area (Reid et al., 2021). The restoration of PAWS action seeks to restore all PAWS to semi-natural woodland over the next 20-30 years.

13.4.1.4 Timescale

For new planting, timescale for trees to grow to a functional size varies according to size/age at planting, variety of tree planted, as well as the local conditions, including temperature, moisture and shade (Monteiro et al., 2017). However, it would typically take several years for newly planted trees to be large enough to start providing discernible noise mitigation, and perhaps 15-20 years for this to develop to a substantial level (Monteiro et al., 2017; van Renterghem et al., 2012; Walters & Sinnett, 2021).

13.4.1.5 Spatial Issues

With regard to trees providing noise mitigation, in general, substantial space is required in order to maximise their impact. Individual, isolated trees will provide negligible noise mitigation – dense stands of trees having a much greater potential for providing substantial reductions in noise levels (van Renterghem et al., 2012). However, potential for impact is contingent upon there being an issue present at that location in the first place (i.e. presence of noise and people). Optimal placement is near to the noise source, between source and receptor (van Renterghem et al., 2012; van Renterghem, 2014). For a linear noise source, such as a straight stretch of road, optimal placement/configuration would be adjacent and parallel to the road, between the road and any occupied buildings. This belt of trees should be at least 5-10 m, and ideally, >15 m in depth (i.e. perpendicular to the direction of traffic flow) (van Renterghem et al., 2012).

13.4.1.6 Displacement

None, as it acts as a barrier rather than reducing the source directly (i.e. not redirecting traffic elsewhere).

13.4.1.7 Maintenance and Longevity

The provision of mitigation should continue, most likely even without maintenance, for the duration that the trees are standing (but see 13.2.1.8). However, maintenance of traditional orchards (e.g. linked to **EBHE-209**) may require periodical management actions, such as mowing between trees, pruning trees, etc.

13.4.1.8 Climate Adaptation or Mitigation

Climate change could have implications through some potential interactions with tree death through drought and pathogens (e.g. ash die back) (Goberville et al., 2016; Rooney et al., 1998); leaf-on season is becoming longer but leaves provide relatively little noise mitigation (see van Renterghem et al., 2012).

13.4.1.9 Climate factors / Constraints

This is an important consideration at the planning phase of any tree planting actions. Climate change has potential implications regarding the long-term growth and survival of trees (Monteiro et al., 2017). When climatic shifts are too rapid for trees to adapt, the trees are likely to suffer and/or die (Ciais et al., 2005; Hoffmann & Sgrò, 2011; Peng et al., 2011). Where new trees are planted, care should be taken to choose appropriate varieties and to source them from suitable climatic conditions, so that their survival is not put at risk from shifts in the local climatic conditions over the lifetime of the trees (Aitken & Bemmels, 2016; Marris, 2009).

13.4.1.10 Benefits and Trade-offs to Farmer/Land manager

Low capital cost for planting and minimal maintenance cost, plus longer life-span, compared with artificial noise barriers, are benefits (see also co-benefits, in 13.4.1.2). There is, however, a potential trade-off due to larger land area required compared with an artificial barrier.

13.4.1.11 Uptake

Greater uptake is likely where the multiple co-benefits are emphasised, particularly in urban settings where issues such as air pollution and cooling are most important.

13.4.1.12 Other Notes

N/A

13.4.2 Rivers

EBHE-126 **Manage realigned rivers to maintain natural flow**

EBHE-126	Manage realigned rivers to maintain natural flow	**

EBHE-126: Manage realigned rivers to maintain natural flow - managed realignment involves the deliberate process of realigning in order to maintain nature flow, improve flood plain defences or to reduce potential flood damage to nearby infrastructure or buildings.

13.4.2.1 Causality

When managing realigned rivers to maintain natural flow (**EBHE-126**), added riparian vegetation, shrubs and/or trees would provide noise mitigation where they are located between noise sources and receptors. The addition of woodland at locations between noise sources and receptors would mitigate noise, by acting as a barrier and by reflecting and scattering the sound (HOSANNA, 2013; Tang et al., 1986; van Renterghem et al., 2012). Such a woodland creation plan could be designed to maximise noise mitigation through spatial configuration, choice of tree variety, and planting density. In general, it is optimal to plant trees in dense stands (< 3 m separation), for these trees to be > 0.11 m in trunk diameter, and for the depth of trees to be 15 m or more (measured in the direction of sound propagation) (van Renterghem et al., 2012).

13.4.2.2 Co-benefits and Trade-offs

There are many co-benefits of planting trees and shrubs; from carbon sequestration and air pollution removal, to atmospheric cooling and biodiversity gains (Akbari et al., 2001; Bonan, 2008; Nowak et al., 2018). However, planting trees in inappropriate locations, e.g. previously non-forested areas, can have unintended negative impacts (Di Sacco et al., 2021).

13.4.2.3 Magnitude

N/A

13.4.2.4 Timescale

For new planting, timescale for trees to grow to a functional size varies according to size/age at planting, variety of tree planted, as well as the local conditions, including temperature, moisture and shade (Monteiro et al., 2017). However, it would typically take several years for newly planted trees to be large enough to start providing discernible noise mitigation, and perhaps 15-20 years for this to develop to a substantial level (Monteiro et al., 2017; van Renterghem et al., 2012; Walters & Sinnett, 2021).

13.4.2.5 Spatial Issues

With regard to trees providing noise mitigation, in general, substantial space is required in order to maximise their impact. Individual, isolated trees will provide negligible noise mitigation – dense stands of trees having a much greater potential for providing substantial reductions in noise levels (van Renterghem et al., 2012). However, potential for impact is contingent upon there being an issue present at that location in the first place (i.e. presence of noise and people). Optimal placement is near to the noise source, between source and receptor (van Renterghem et al., 2012; van Renterghem, 2014). For a linear noise source, such as a straight stretch of road, optimal placement/configuration would be adjacent and parallel to the road, between the road and any occupied buildings. This belt of trees should be at least 5-10 m, and ideally, >15 m in depth (i.e. perpendicular to the direction of traffic flow) (van Renterghem et al., 2012).

13.4.2.6 Displacement

None, as it acts as a barrier rather than reducing the source directly (i.e. not redirecting traffic elsewhere).

13.4.2.7 Maintenance and Longevity

The provision of mitigation should continue, most likely even without maintenance, for the duration that the trees are standing (but see 13.2.1.8).

13.4.2.8 Climate Adaptation or Mitigation

Climate change could have implications through some potential interactions with tree death through drought and pathogens (e.g. ash die back) (Goberville et al., 2016; Rooney et al., 1998); leaf-on season is becoming longer but leaves provide relatively little noise mitigation (see van Renterghem et al., 2012).

13.4.2.9 Climate factors / Constraints

This is an important consideration at the planning phase of any tree planting actions. Climate change has potential implications regarding the long-term growth and survival of trees (Monteiro et al., 2017). When climatic shifts are too rapid for trees to adapt, the trees are likely to suffer and/or die (Ciais et al., 2005; Hoffmann & Sgrò, 2011; Peng et al., 2011). Where new trees are planted, care should be taken to choose appropriate varieties and to source them from suitable climatic conditions, so that their survival is not put at risk from shifts in the local climatic conditions over the lifetime of the trees (Aitken & Bemmels, 2016; Marris, 2009).

13.4.2.10 Benefits and Trade-offs to Farmer/Land manager

Low capital cost for planting and minimal maintenance cost, plus longer life-span, compared with artificial noise barriers, are benefits (see also co-benefits, in 13.4.1.2). There is, however, a potential trade-off due to larger land area required compared with an artificial barrier.

13.4.2.11 Uptake

Greater uptake is likely where the multiple co-benefits are emphasised, particularly in urban settings where issues such as air pollution and cooling are most important.

13.4.2.12 Other Notes

N/A

13.4.3 Boundary features

EBHE-007: Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges)
EBHE-019: Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls

EBHE-007	Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges)	*
EBHE-019	Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls	*

EBHE-007: Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges) - traditional field boundaries form an integral part in rural landscapes. Alongside their practical purpose (stock proofing, shelter for livestock), they are also important habitats for wildlife.

EBHE-019: Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry-stone walls – as above

13.4.3.1 Causality

Creation of new field boundaries, such as dry-stone walls, earth banks, stone-faced earth banks and Cornish hedges could provide noise mitigation, if they are located between noise sources and receptors. Creation of such solid boundary features (e.g., dry-stone walls, earth banks) along rights of way, where such rights of way carry noise sources (i.e., motor vehicles), could also have positive noise mitigating benefits. However, we are unaware of any relevant literature where these benefits have been quantified. The height of the

boundary structure, relative to noise source, will be important; if the main noise sources are tractors and large farm machinery, then the structure may need to be tall to provide substantive mitigation.

13.4.3.2 Co-benefits and Trade-offs

Boundary features, such as dry-stone walls and Cornish hedges can provide habitat for a number of species, including those that provide important functions, such as pollination (e.g. wall mason bees in calcareous grassland[54]. Although boundary features are typically linear, so cover a limited extent, traditional structures such as dry-stone walls, take up substantially more space than a modern posted wire livestock fence.

13.4.3.3 Magnitude

The loss of traditional field boundaries is well documented (Barnes and Williamson 2008) as is the local characteristics highlighted in the action itself. The creation, restoration and management of these features will enhance landscape character and have a positive impact on GI.

13.4.3.4 Timescale

Impacts on noise should be immediate and last for as long as the structure remains standing.

13.4.3.5 Spatial Issues

Although boundary features are typically linear, so cover a limited extent, traditional structures such as dry-stone walls, take up substantially more space than a modern posted wire livestock fence.

13.4.3.6 Displacement

N/A

13.4.3.7 Maintenance and Longevity

Although the construction of these structures takes time and expertise (which is increasingly rare), they can last for very long periods of time (see Sanderson & Wilkins (2017) for a study including a dry-stone wall dating from the 13th century).

13.4.3.8 Climate Adaptation or Mitigation

N/A

13.4.3.9 Climate factors / Constraints

N/A

13.4.3.10 Benefits and Trade-offs to Farmer/Land manager

Boundary features, such as dry-stone walls and Cornish hedges can provide habitat for a number of species, including those that provide important functions, such as pollination (e.g. wall mason bees in calcareous grassland[53]. Although boundary features are typically linear, so cover a limited extent, traditional structures such as dry-stone walls, take up substantially more space than a modern posted wire livestock fence.

13.4.3.11 Uptake

Greater uptake is likely where the multiple co-benefits are emphasised, particularly those that might improve crop yield.

13.4.3.12 Other Notes

N/A

13.5 BUNDLE: SIGNPOSTING, INFORMATION, FACILITIES AND EVENTS

13.5.1 Signposting, information, facilities and events

[54] https://www.buglife.org.uk/resources/habitat-management/upland-calcareous-grassland/

EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value

EBHE-266	Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value	T***

EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value – self explanatory.

13.5.1.1 Causality

Engaging with the local community on the creation and improvement of areas of tranquillity will help to ensure that preferences and concerns of the local community are incorporated in any actions. The addition of woodland at locations between noise sources (e.g. roads, railways) and areas of tranquillity would mitigate noise, by acting as a barrier and by reflecting and scattering the sound (HOSANNA, 2013; Tang et al., 1986; van Renterghem et al., 2012). Woodland creation plans could be designed to maximise noise mitigation through spatial configuration, choice of tree variety, and planting density. In general, it is optimal to plant trees in dense stands (< 3m separation), for these trees to be > 0.11 m in trunk diameter, and for the depth of trees to be 15 m or more (measures in the direction of sound propagation) (van Renterghem et al., 2012). An addition of an understorey of shrubs may add to the noise mitigating effects by absorbing more of the reflected sound (particularly higher frequency ranges) (van Renterghem et al., 2015). Naturalistic sounds, such as flowing water can influence overall perception of the soundscape in a positive way, even if undesirable noise (e.g. from traffic) is still audible over the naturalistic sounds (Watts et al., 2009). The scope for the water feature to mitigate the effects of negative noise, depends primarily of the type and size of the water feature in question (reinstating a river vs small water fountain), but also on the ambient noise levels at the site (even relatively small features may have a substantial impact in an already quiet/tranquil area).

13.5.1.2 Co-benefits and Trade-offs

There are many co-benefits of planting trees and shrubs; from carbon sequestration and air pollution removal, to atmospheric cooling and biodiversity gains (Akbari et al., 2001; Bonan, 2008; Nowak et al., 2018). However, planting trees in inappropriate locations, e.g. previously non-forested areas, can have unintended negative impacts (Di Sacco et al., 2021). Water features can constitute an important resource for wildlife, as a drinking source, but also as an important habitat for aquatic species, or those with aquatic life-cycle stages. If large enough, water feature can have a substantial cooling effect on the surrounding atmosphere (Völker et al., 2013).

13.5.1.3 Magnitude

N/A

13.5.1.4 Timescale

N/A

13.5.1.5 Spatial Issues

N/A

13.5.1.6 Displacement

N/A

13.5.1.7 Maintenance and Longevity

Periodical engagement will help to ensure that where views change over time, these are taken into account. Furthermore, priorities may change over time, particularly with agreed management actions being implemented.

13.5.1.8 Climate Adaptation or Mitigation

Not assessed

13.5.1.9 Climate factors / Constraints
N/A

13.5.1.10 Benefits and Trade-offs to Farmer/Land manager
The benefit of engaging with the local community is that it is that any work undertaken is more likely to be supported and accepted if they feel they have had a part in that decision.

13.5.1.11 Uptake
This mode of operation is more likely to be taken up where it has been shown to work elsewhere (e.g. case studies, showing success in similar situations).

13.5.1.12 Other Notes
N/A

13.6 Bundle: Maintenance and restoration of cultural heritage sites

13.6.1 Maintenance and restoration of cultural heritage sites

EBHE-295: Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-295	Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	*

13.6.1.1 Causality
Vehicular traffic is a substantial source of noise pollution (Bolund & Hunhammar, 1999). Where vehicle access is prevented, this could mitigate noise by removing the source from the local area. There are possible displacement issues, though.

13.6.1.2 Co-benefits and Trade-offs
Air pollution and road traffic accident reduction, and possible reduction in damage to the monument in question (e.g., through reduced vibrations). However, it may reduce footfall at local businesses, if vehicular access to them is also prevented.

13.6.1.3 Magnitude
Many sites are located on farmland, resulting in potentially a significant number of farmers needing to be agreeable to changes to the organisation of their livestock fields.

13.6.1.4 Timescale
Impacts would be immediate, and would last for the duration of the access prohibition.

13.6.1.5 Spatial Issues
N/A

13.6.1.6 Displacement
Prevention of vehicle use around particluar sites may displace this road traffic to other routes, increasing traffic on those roads, with concomitant increases in noise, pollution and traffic-related incidents.

13.6.1.7 Maintenance and Longevity
N/A

13.6.1.8 Climate Adaptation or Mitigation
N/A

13.6.1.9 Climate factors / Constraints
N/A

13.6.1.10 Benefits and Trade-offs to Farmer/Land manager

N/A

13.6.1.11 Uptake
N/A

13.6.1.12 Other Notes
N/A

13.7 Bundle: Maintenance, restoration of habitat features in Parks and Gardens

13.7.1 Maintenance, restoration of habitat features in Parks and Gardens

EBHE-307: Retain mature and veteran standing trees in Registered Parks and Gardens
EBHE-308: Re-plant trees in Registered Parks and Gardens
EBHE-310: Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens
EBHE-312: Maintain the current water regime in Registered Parks and Gardens

EBHE-307	Retain mature and veteran standing trees in Registered Parks and Gardens	LT*
EBHE-308	Re-plant trees in Registered Parks and Gardens	LT*
EBHE-310	Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens	LT*
EBHE-312	Maintain the current water regime in Registered Parks and Gardens	LT*

EBHE-307-308, 310 & 312: These actions relate to the maintenance of habitat features in Registered Parks and Gardens in order to both maintain their functionality for biodiversity, but also their landscape, recreational and tourism value.

13.7.1.1 Causality
These actions involve the addition (**EBHE-308**), retention (**EBHE-307**), or protection (**EBHE-310**) of trees in registered parks or gardens. Woodland located between noise sources and receptors would mitigate noise, by acting as a barrier and by reflecting and scattering the sound (HOSANNA, 2013; Tang et al., 1986; van Renterghem et al., 2012). Such a woodland could be designed to maximise noise mitigation through spatial configuration, choice of tree variety, and planting density. In general, it is optimal to plant trees in dense stands (< 3m separation), for these trees to be > 0.11 m in trunk diameter, and for the depth of trees to be 15 m or more (measures in the direction of sound propagation) (van Renterghem et al., 2012). Mature and veteran trees will tend to have larger woody structures (i.e., trunks, branches) and will therefore have greater potential for providing mitigation than younger, smaller, trees (van Renterghem et al., 2012). However, individual, isolated trees will provide negligible noise mitigation – dense stands of trees having a much greater potential for providing substantial reductions in noise levels (van Renterghem et al., 2012).

Maintaining the current water regime (**EBHE-312**) in Registered Parks and Gardens is likely to influence the provision of noise mitigation by vegetation (primarily trees), through maintaining the moisture conditions to which the vegetation is accustomed, thus facilitating the survival of the vegetation components providing the service (Gillner et al., 2014).

13.7.1.2 Co-benefits and Trade-offs
There are many co-benefits of planting trees; from carbon sequestration and air pollution removal, to atmospheric cooling and biodiversity gains (Akbari et al., 2001; Bonan, 2008; Nowak et al., 2018). Mature

and veteran trees, in particular, are important keystone organisms (Nolan et al., 2020). However, planting trees in inappropriate locations, e.g., previously non-forested areas, can have unintended negative impacts (Di Sacco et al., 2021).

13.7.1.3 Magnitude

See Theme 1

13.7.1.4 Timescale

Maintenance and protection impacts are largely immediate and enduring (i.e., survival of trees). However, for new planting, timescale for trees to grow to a functional size varies according to size/age at planting, variety of tree planted, as well as the local conditions, including temperature, moisture and shade (Monteiro et al., 2017). However, it would typically take several years for newly planted trees to be large enough to start providing discernible noise mitigation, and perhaps 15-20 years for this to develop to a substantial level (Monteiro et al., 2017; van Renterghem et al., 2012; Walters & Sinnett, 2021).

13.7.1.5 Spatial Issues

With regard to trees providing noise mitigation, in general, substantial space is required in order to maximise their impact. Individual, isolated trees will provide negligible noise mitigation – dense stands of trees having a much greater potential for providing substantial reductions in noise levels (van Renterghem et al., 2012). However, potential for impact is contingent upon there being an issue present at that location in the first place (i.e. presence of noise and people). Optimal placement is near to the noise source, between source and receptor (van Renterghem et al., 2012; van Renterghem, 2014). For a linear noise source, such as a straight stretch of road, optimal placement/configuration would be adjacent and parallel to the road, between the road and any occupied buildings. This belt of trees should be at least 5-10 m, and ideally, >15 m in depth (i.e. perpendicular to the direction of traffic flow) (van Renterghem et al., 2012).

13.7.1.6 Displacement

N/A

13.7.1.7 Maintenance and Longevity

The provision of mitigation should continue, most likely even without maintenance, for the duration that the trees are standing (but see 13.7.1.8 (Climate Adaptation or Mitigation) below).

13.7.1.8 Climate Adaptation or Mitigation

Climate change could have implications through some potential interactions with tree death through drought and pathogens (e.g. ash die back) (Goberville et al., 2016; Rooney et al., 1998); leaf-on season is becoming longer but leaves provide relatively little noise mitigation (see van Renterghem et al., 2012).

13.7.1.9 Climate factors / Constraints

This is an important consideration at the planning phase of any tree planting actions. Climate change has potential implications regarding the long-term growth and survival of trees (Monteiro et al., 2017). When climatic shifts are too rapid for trees to adapt, the trees are likely to suffer and/or die (Ciais et al., 2005; Hoffmann & Sgrò, 2011; Peng et al., 2011). Where new trees are planted, care should be taken to choose appropriate varieties and to source them from suitable climatic conditions, so that their survival is not put at risk from shifts in the local climatic conditions over the lifetime of the trees (Aitken & Bemmels, 2016; Marris, 2009).

13.7.1.10 Benefits and Trade-offs to Farmer/Land manager

Low capital cost for planting and minimal maintenance cost, plus longer life-span, compared with artificial noise barriers, are benefits (see also co-benefits, in 13.7.1.2). There is, however, a potential trade-off due to larger land area required compared with an artificial barrier.

13.7.1.11 Uptake

Greater uptake is likely where the multiple co-benefits are emphasised, particularly in urban settings where issues such as air pollution and cooling are most important.

13.7.1.12 Other Notes

N/A

13.8 Bundle: Actions for geodiversity

13.8.1 Actions for geodiversity

EBHE-316: Control scrub or trees on top or in front of geodiversity features

EBHE-316	Control scrub or trees on top or in front of geodiversity features	T**

EBHE-316: The geodiversity actions represent current thinking in best practice in terms of preserving geodiversity (see Theme 8) in order to maintain these features for educational, recreational or heritage purposes.

13.8.1.1 Causality

Removal or reduction of scrub or trees (EBHE-316) will also remove any noise mitigation benefits provided by those plants (for information on noise mitigation benefits of these vegetation types, see 13.2.1.1 & 13.2.2.1).

13.8.1.2 Co-benefits and Trade-offs

N/A

13.8.1.3 Magnitude

Studies have shown the impact of scrub on geodiversity but these are often site based and linked to management plans, As a result the magnitude of the issue is not clear. See Theme 8.

13.8.1.4 Timescale

Impacts of management action will be immediate.

13.8.1.5 Spatial Issues

N/A

13.8.1.6 Displacement

N/A

13.8.1.7 Maintenance and Longevity

N/A

13.8.1.8 Climate Adaptation or Mitigation

N/A

13.8.1.9 Climate factors / Constraints

N/A

13.8.1.10 Benefits and Trade-offs to Farmer/Land manager

See Theme 8.

13.8.1.11 Uptake

See Theme 8.

13.8.1.12 Other Notes

N/A

14 Theme 12: Local Temperature Regulation

Local temperature regulation is largely an urban issue, where the lack of vegetation and the proliferation of grey infrastructure (i.e. lots of concrete and other dense materials with high thermal capacitance and low albedo) combine, leading to the phenomenon known as Urban Heat Island (UHI), where the temperature can be significantly higher than the rural surroundings (Monteiro et al., 2016). Vegetation, and trees in particular, can provide a cooling effect to counter this UHI effect, through shading and through evapotranspiration (Bowler et al., 2010; Manteghi et al., 2015; Reis and Lopes, 2019).

14.1 Management Bundles

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:
Maintenance, restoration of habitat features in Parks and Gardens
Maintenance, restoration of habitat features in Parks and Gardens/ (7 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

14.2 Bundle: Maintenance, restoration of habitat features in Parks and Gardens

14.2.1 Maintenance, restoration of habitat features in Parks and Gardens

EBHE-090: Establish/ maintain a continuous grass sward in Registered Parks and Gardens
EBHE-231: Enhance/ manage landscape character in urban parks
EBHE-307: Retain mature and veteran standing trees in Registered Parks and Gardens
EBHE-308: Re-plant trees in Registered Parks and Gardens
EBHE-310: Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens
EBHE-311: Enhance/ maintain parkland features in Registered Parks and Gardens
EBHE-312: Maintain the current water regime in Registered Parks and Gardens

EBHE-090	Establish/ maintain a continuous grass sward in Registered Parks and Gardens	*
EBHE-231	Enhance/ manage landscape character in urban parks	T**
EBHE-307	Retain mature and veteran standing trees in Registered Parks and Gardens	***
EBHE-308	Re-plant trees in Registered Parks and Gardens	***
EBHE-310	Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens	***
EBHE-311	Enhance/ maintain parkland features in Registered Parks and Gardens	**
EBHE-312	Maintain the current water regime in Registered Parks and Gardens	***

EBHE-90, 231, 307-308, 310-312: These actions relate to the maintenance of habitat features in Registered Parks and Gardens in order to both maintain their functionality for biodiversity, but also their landscape, recreational and tourism value.

14.2.1.1 Causality

These actions involve the addition (**EBHE-308**), retention (**EBHE-307**), or protection (**EBHE-310**) of trees (or all three, i.e., **EBHE-231**) in registered parks or gardens. Trees can provide a substantial cooling effect on the surrounding area (Bowler et al., 2010; Manteghi et al., 2015; Reis and Lopes, 2019), helping to ameliorate the intensity of heatwave conditions, which are becoming more frequent and intense due to climate change (Macintyre et al., 2018). The cooling effects of trees can be especially noticeable in urban environments, where the Urban Heat Island effect intensifies heat extremes (Gunawardena et al., 2017). Trees and other vegetation provide cooling via two key mechanisms: shading – preventing the sun's rays

from heating the ground and other objects – particularly important in urban environments where many manmade surfaces have high thermal capacitance and low albedo (Monteiro et al., 2016); Evapotranspiration – plants transpire, but also help to maintain moisture at ground level. The change of water to water-vapour requires energy, so this process uses up heat energy, with a resulting cooling effect. Maintaining water regime (i.e. **EBHE-312**) is important to support the evapotranspirative cooling process of trees and other vegetation (Armson et al., 2012), as they require water to transpire. Proportional coverage of grassland (relevant to **EBHE-090**) in small to medium (≈ 0.1 - 4 ha) urban parks is linked to level of cooling provided, whereas proportional coverage of trees in more closely linked to cooling distance (Monteiro et al., 2016). Parkland features can also include blue space, i.e. water features. Features such as: urban rivers (Hathway & Sharples 2012), ponds & lakes (Schwarz et al. 2012), and seafront areas (Shudo et al., 1997; Tuller, 1995), can have a substantial cooling impact on the local area.

14.2.1.2 Co-benefits and Trade-offs

There are many co-benefits of planting trees; from carbon sequestration and air pollution removal, to biodiversity gains (Akbari et al., 2001; Bonan, 2008; Nowak et al., 2018). Mature and veteran trees, in particular, are important keystone organisms (Nolan et al., 2020). However, planting trees in inappropriate locations, e.g., previously non-forested areas, can have unintended negative impacts (Di Sacco et al., 2021).

14.2.1.3 Magnitude

N/A

14.2.1.4 Timescale

The impacts of maintenance, enhancement and protection of features within parks and gardens will largely immediate and enduring (i.e., survival of trees). However, for new planting, timescale for trees to grow to a functional size, for shading, varies according to size/age at planting, variety of tree planted, as well as the local conditions, including temperature, moisture and shade (Monteiro et al., 2017). However, it would typically take several years for newly planted trees to be large enough to start providing discernible levels of shade, and perhaps 10, or more, years for this to develop to a substantial level (Monteiro et al., 2017; Walters & Sinnett, 2021).

14.2.1.5 Spatial Issues

Size of green space impacts the level of cooling and the cooling distance from the boundary of the greenspace, as does the proportional make-up of various vegetation types and man-made features; particularly paved surfaces and buildings (Monteiro et al., 2016). Even when green spaces are small and disjunct, their cumulative effects can still have a discernible impact on neighbourhood temperatures (Kong et al., 2014).

14.2.1.6 Displacement

N/A

14.2.1.7 Maintenance and Longevity

The impacts of the action will continue for as long as the trees are still standing, but the evapotranspirative process can be reduced, or stopped through excessive heat and/or lack of moisture (Scherrer et al., 2011).

14.2.1.8 Climate Adaptation or Mitigation

Climate change could have implications through some potential interactions with tree death through drought and pathogens (e.g. ash die back) (Goberville et al., 2016; Rooney et al., 1998); leaf-on season is becoming longer but droughts are also becoming more frequent and severe (IPCC, 2014), which will have an impact on the cooling capacity of vegetation, if the water regime is not maintained (Scherrer et al., 2011).

14.2.1.9 Climate factors / Constraints

This is an important consideration at the planning phase of any tree planting actions. Climate change has potential implications regarding the long-term growth and survival of trees (Monteiro et al., 2017). When climatic shifts are too rapid for trees to adapt, the trees are likely to suffer and/or die (Ciais et al., 2005; Hoffmann & Sgrò, 2011; Peng et al., 2011). Where new trees are planted, care should be taken to choose

appropriate varieties and to source them from suitable climatic conditions, so that their survival is not put at risk from shifts in the local climatic conditions over the lifetime of the trees (Aitken & Bemmels, 2016; Marris, 2009).

14.2.1.10 Benefits and Trade-offs to Farmer/Land manager

For benefits, see 14.13.1.2.

14.2.1.11 Uptake

Greater uptake is likely where the multiple co-benefits are emphasised, particularly in urban settings where issues such as air and noise pollution are most important.

14.2.1.12 Other Notes

N/A

15 THEME 13: SENSE OF PLACE

'Sense of place' is recognised in the Millennium Ecosystem Service assessment (MEA 2005), along with other cultural ecosystem services, as a 'non-material benefit of ecosystems' which people value through 'recognised features of their environment, including aspects of the ecosystem' (p. 40). As Ryfield et al. (2019) assert, there are two reasons for its inclusion within the ecosystem services framework. Firstly, managing ES involves recognising and accounting for how people use, perceive and value ecosystems. Secondly, different perceptions of place across different scales can lead to potential conflicts in ecosystem use and values (Ryfield et al. 2019).

However, tacit values, such as sense of place, can be difficult to define and measure (Anthony et al. 2009). Indeed, understanding the complex relationships that people form with places and environments can be challenging, particularly as approaches to understanding 'sense of place' draw upon a range of disciplines such as environmental sociology, psychology, human geography, architecture and environmental humanities. However, sense of place is frequently understood as encompassing the emotional, affective, cognitive and behavioural interactions that people (either as individuals or collectively) have with places (at different scales) (Urquhart & Acott 2014). It is often concerned with the role of places in shaping individual and community identity through the meanings that people associate with particular environmental settings or landscapes, the attachments that people form with places such as feelings of belonging and rootedness, or the extent to which people depend on places for activities such as recreation, tourism, work or places to live. Similarly, the UK's National Ecosystem Assessment (Church et al. 2014) describes cultural ecosystem services as the relationship between 'environmental settings' and feelings of attachment, belonging or identity associated with place. However, alongside the subjective values that people associate with places, human perception and experience related to places is also defined by the physical environment itself and the attributes of those environmental settings will contribute to place satisfaction and the symbolic values associated with those places (Stedman 2003). Sense of place is, therefore, the coming together in the landscape of the interactions between people and nature, with nature involving different landforms, geology, geomorphological processes biodiversity, land use, settlement patterns, forestry practices and cultural associations with those places.

This report also links closely to the landscape theme addressed in Theme 10. Landscape character makes an area unique, thus contributing to a sense of place and identity linked to that place (Gkartzio et al. 2022). Sense of place also has particular relevance for tourism (Theme 5), with tourism trading on the particular distinctiveness, including environmental and cultural identity, of places (Dredge 2010).

The suggested indicator for sense of place, willingness to pay, is problematic in that it will only capture some elements of sense of place that can be attributed to an economic metric. As outlined above, sense of place is associated with complex human-environment relationships that reflect the social and cultural values that people ascribe to a place, the social relationships that occur in those environmental settings and the ecological or physical conditions that influence people's attachments to them (Tuan 1974; Relph 2008; Ryfield et al. 2019). Therefore, we define sense of place in its widest possible sense and draw on evidence in this review that considers both the material and subjective dimensions of sense of place, rather than a narrow focus on economic indicators (such as willingness to pay for a particular action that enhances sense of place).

15.1 MANAGEMENT BUNDLES

All actions will be assessed according to the following breakdown of EBHE actions, using the Tier 1 and Tier 2 management bundles:
Habitat creation
Habitat creation/woodland (4 actions)
Habitat creation/woody features (2 actions)
Habitat creation/ponds and wetlands (2 actions)

Habitat creation/grassland (1 action)
Systems action
Systems action/landscape actions (6 actions)
Specific wildlife targeted actions
Specific wildlife targeted actions/ (3 actions)
Restoration, management and enhancement
Restoration, management and enhancement/woodland (6 actions)
Restoration, management and enhancement/woody features (3 actions)
Restoration, management and enhancement/scrub (1 actions)
Restoration, management and enhancement/grassland (2 actions)
Restoration, management and enhancement/rivers (2 actions)
Restoration, management and enhancement/boundary features (7 actions)
Actions for habitats with specific hydrological characteristics
Actions for habitats with specific hydrological characteristics/peatlands and wetlands (3 actions)
Livestock management
Livestock management/selection and diversification (2 actions)
Litter and waste
Litter and waste/ (3 actions)
Create and enhance access and PROW
Create and enhance access and PROW/ (18 actions)
Signposting, information, facilities and events
Signposting, information, facilities and events/ (34 actions)
Maintenance and restoration of cultural heritage sites
Maintenance and restoration of cultural heritage sites/ (23 actions)
Maintenance, restoration of habitat features in Parks and Gardens
Maintenance, restoration of habitat features in Parks and Gardens/ (10 actions)
Actions for geodiversity
Actions for geodiversity/ (17 actions)

Note on the colour/code tables: The structure of the CES assessment tables in the sections below and the 'letter and star' scoring is described in Section 2.1 of this report. They are provided here as a partial view of the full scoring available in the IA table presented in QEIA Report-2.

15.2 Bundle: Habitat creation

15.2.1 Woodland

EBHE-140: Create a woodland creation plan – woodland creation plans are required in order to receive governmental grants for woodland creation. The plan must include identification of landscape and visual sensitivities relevant to woodland creation, as well as identification of proximity to priority habitats or species, national or international designations, heritage assets etc. All new woodland must be UKFS (UK Forestry Standard) compliant.

EBHE-140C: Create ghyll woodland – ghyll woodlands are native woodland found on steep-sided valleys, predominantly in uplands area in western Britain (Flora local 2005).

EBHE-209C: Create traditional orchards with local varieties of fruit tree – traditional orchards are structurally and ecologically similar to wood-pasture and parkland, having widely spaced fruit trees within wider grassland, that is either grazed or cut (JNCC 2008). They are important biodiversity hotspots and include UK BAP priority habitats and species. A feature of traditional orchards is the variety of the fruit cultivars they contain and the low intensity management regimes applied (in contrast to more intensively managed orchards) (JNCC 2008).

EBHE-281: Set up or engage with community tree planting projects – this action refers to the specific engagement of communities in local tree planting projects, either through community-led planting, or local residents volunteering to engage in tree planting activities.

The main benefits from the above four actions are described in Theme 9. Below we set out specific impacts of the actions on sense of place.

EBHE-104	Create a woodland creation plan	TD***
EBHE-140C	Create ghyll woodland	***
EBHE-209C	Create traditional orchards with local varieties of fruit tree	**
EBHE-281	Set up or engage with community tree planting projects	LT***

15.2.1.1 Causality

EBHE-140: Create a woodland creation plan – While there is no direct evidence relating to the impact of woodland creation plans on sense of place, the assumption is made that through the development of a plan consideration is given to a number of factors that might impact on sense of place, but these would be highly context dependent. The premise of undertaking a woodland creation plan is that new planting will be undertaken following best practice, thus positively impacting sense of place. In some locations, where communities are strongly attached to existing (less wooded) landscapes, woodland creation might have a negative impact on sense of place, although this should be accounted for and mitigated against in the woodland creation plan.

EBHE-140C: Create ghyll woodland – Ghyll woodlands have significant wildlife value and are important in a landscape and historical context (Flora locale 2005). Given their importance for native wildlife and their landscape importance, the creation of new ghyll woodlands is likely to provide major benefits to sense of place.

EBHE-209C: Create traditional orchards with local varieties of fruit tree **–** such woodlands make an important contribution to landscape character and local distinctiveness, creating a particular sense of place, as part of a mosaic of habitats in the landscape (JNCC 2008).

EBHE-281: Set up or engage with community tree planting projects – Although there is no direct evidence (that we are aware of) addressing how community tree planting projects contribute to sense of place, we assume that there are likely to be indirect positive impacts on sense of place through (i) improved biodiversity through new woodland habitat creation; and (ii) improved community awareness of biodiversity and landscape, leading to strong attachments to place. Outcomes are likely to be place-specific and contextually dependent.

15.2.1.2 Co-benefits and Trade-offs

In addition to (mostly) improved sense of place as a result of the four actions, there are likely to be other co-benefits, including improved biodiversity through new or enhanced habitat provision (Theme 9); carbon sequestration, air and water pollution control, flooding alleviation, health and wellbeing benefits (Theme 2) including recreation (Theme 1) and tourism opportunities (Theme 5).

Potential trade-offs are generally limited, but could be significant in some areas where sense of place is strongly connected to a non-woodland landscape.

15.2.1.3 Magnitude

N/A

15.2.1.4 Timescale

Some benefits are likely to be realised as soon as the action is undertaken. However, given the time it takes for woodlands and orchards to reach maturity, the full benefits in terms of sense of place are unlikely to be felt until 20+ years after establishment.

15.2.1.5 Spatial Issues
Large-scale woodland creation is likely to have more of a landscape impact than more localised ghyll woodland creation, or small-scale traditional orchard creation. Hove in terms of local significance size may not be important.

15.2.1.6 Displacement
The main impact is in terms of the habitat type that new woodland or orchard creation displaces. If these existing habitats are important contributors to sense of place (e.g. upland grassland), new woodland could have a negative (at least initially) impact on sense of place. However, where woodland replaces more intensive less environmental land uses, sense of place improvements could be significant (Short et al 2022).

15.2.1.7 Maintenance and Longevity
All woodland and orchard creation will need long-term maintenance. Trees need watering and weeding, and protection from browsers, in their early years to allow them to establish. Orchard settings will need further ongoing pruning, harvesting and grassland cutting/grazing, in order to maintain the habitat and its sense of place. Woodlands are likely to require thinning and management for many decades.

15.2.1.8 Climate Adaptation or Mitigation
Climate change is likely to impact the type of tree species that will thrive, leading to some natural or assisted migration of tree species. Changes in familiar tree species in the landscapes and woodland settings has the potential to impact sense of place. However, the impact is likely to be small given that such changes occur over long timescales.

15.2.1.9 Climate factors / Constraints
N/A

15.2.1.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 9.

15.2.1.11 Uptake
See Theme 9.

15.2.1.12 Other Notes
N/A

15.2.2 Woody features & scrub

EBHE-191: Plant and establish appropriate species of field boundary trees – trees in hedgerows are important components that give a landscape character, creating a sense of place.

EBHE-205C: Create wood pasture (eg through appropriate grazing) - wood pasture is land that is managed through grazing, with trees in these settings often pollarded. Many of the UK's ancient trees are in wood pasture or parkland settings, although wood pasture is currently quite a rare habitat. Wood pasture creates a different landscape character to more intensive forms of agriculture or grazing regimes.

EBHE-191	Plant and establish appropriate species of field boundary trees	LTD***
EBHE-205C	Create wood pasture (eg through appropriate grazing)	LTD***

15.2.2.1 Causality
EBHE-191 Plant and establish appropriate species of field boundary trees – limited evidence to specifically support this action, but increasing field boundary trees will have an impact on landscape character, which in turn can influence sense of place (Natural England 2014). See Theme 10 for further details.

EBHE-205C Creating wood pasture (e.g. through appropriate grazing) – some evidence (from European studies) to suggest that wood pasture (and wider agroforestry) landscapes are important for quality of life, with *identity* particularly associated with agroforestry landscapes (Elbakidze et al. 2021).

15.2.2.2 Co-benefits and Trade-offs

Both actions are likely to have major benefits (mostly) to sense of place, but there are likely to be other co-benefits, including, in particular, improved biodiversity through new or enhanced habitat provision (Theme 9). This is particularly important as wood pasture is considered a rare habitat. Further benefits may also include health and wellbeing benefits (Theme 2) assuming enhanced access is included.

Potential trade-offs are generally limited, but could be significant in some areas where sense of place is strongly connected to either a more open and expansive landscape (for **EHBE-191**) or to other forms of agricultural production such as upland grazing or arable (for **EBHE-205C**).

15.2.2.3 Magnitude

N/A

15.2.2.4 Timescale

Benefits of introducing wood pasture are likely to be realised within a year or two of implementation. However, it may take 10+ years for the benefits of field boundary trees to be realised.

15.2.2.5 Spatial Issues

Field boundary trees would not require additional space but can be included as part of ongoing existing hedgerow management. Larger areas of wood pasture is likely to have more of an impact on sense of place than small wood pastures, although even small areas of wood pasture could be impactful in the right setting.

15.2.2.6 Displacement

Field boundary trees should not displace other major habitat types, however wood pasture is likely to. If the existing habitats is an important contributor to sense of place (e.g. upland grassland), conversion to wood pasture could have a negative (at least initially) impact on sense of place. However, where wood pasture replaces more intensive, less environmentally sensitive land uses, sense of place improvements could be significant (Short et al 2022).

15.2.2.7 Maintenance and Longevity

Newly planted field boundary trees will need watering and protection from browsers in their early years to allow them to establish. Trees in wood pasture will also need watering and protection from browsers, and may need management such as pollarding as their size increases.

15.2.2.8 Climate Adaptation or Mitigation

Climate change is likely to impact the type of tree species that will thrive, leading to some natural or assisted migration of tree species. Changes in familiar tree species in the landscapes in terms of hedgerow trees or trees in wood pasture has the potential to impact sense of place. However, the impact is likely to be small given that such changes occur over long timescales.

15.2.2.9 Climate factors / Constraints

N/A

15.2.2.10 Benefits and Trade-offs to Farmer/Land manager

See Theme 9.

15.2.2.11 Uptake

See Theme 9.

15.2.2.12 Other Notes

N/A

15.2.3 Ponds & wetlands

EBHE-169: Restore/ manage ghost ponds – see Theme 9.
EBHE-211: Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials – see Theme 9.

EBHE-169	Restore/ manage ghost ponds	*
EBHE-211	Restore traditional field ponds, such as dew ponds in calcareous landscapes, using appropriate techniques and materials	*

15.2.3.1 Causality
As a component in the landscape, ponds have some impact on sense of place, but it is likely to be limited in terms of scale but can be significant within the landscape.

15.2.3.2 Co-benefits and Trade-offs
N/A

15.2.3.3 Magnitude
N/A

15.2.3.4 Timescale
N/A

15.2.3.5 Spatial Issues
N/A

15.2.3.6 Displacement
N/A

15.2.3.7 Maintenance and Longevity
N/A

15.2.3.8 Climate Adaptation or Mitigation
N/A

15.2.3.9 Climate factors / Constraints
N/A

15.2.3.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 9.

15.2.3.11 Uptake
See Theme 9.

15.2.3.12 Other Notes
N/A

15.2.4 Grassland

EBHE-214C: Create locally distinctive flower rich/hay meadows using traditional techniques – see Theme 9.

EBHE-214C	Create locally distinctive flower rich/hay meadows using traditional techniques	*

15.2.4.1 Causality
Any impact on sense of place from the creation of locally distinctive flower rich/hay meadows will be contextual, dependent on the habitat it is replacing. However, overall impact on sense of place is likely to be limited. See Theme 9 for more details.

15.2.4.2 Co-benefits and Trade-offs

The creation of locally distinctive flower rich/hay meadows will have significant biodiversity benefits. Increased biodiversity can enhance sense of place by providing improved opportunities for engagement with nature and landscape benefits. However, there may be biodiversity losses depending on the habitat it is replacing.

15.2.4.3 Magnitude
N/A

15.2.4.4 Timescale
Benefits experience upon habitat creation.

15.2.4.5 Spatial Issues
N/A

15.2.4.6 Displacement
N/A

15.2.4.7 Maintenance and Longevity
N/A

15.2.4.8 Climate Adaptation or Mitigation
N/A

15.2.4.9 Climate factors / Constraints
N/A

15.2.4.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 9.

15.2.4.11 Uptake
See Theme 9.

15.2.4.12 Other Notes
N/A

15.3 BUNDLE: SYSTEMS ACTION

15.3.1 Landscapes Actions

EBHE-187: Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character – this action will ensure than any activity is sensitive to landscape character and its sense of place by considering by documenting any specific features or existing activities that need to be protected.

EBHE-233: Control scrub or trees to maintain views – this action is specific to locations where there are highly valued viewpoints. Maintenance of views helps to preserve the sense of place.

EBHE-269: Install/ maintain water features to facilitate positive soundscape and mask unwanted sound – used around sensitive sites that are prone to noise pollution, such as from motorways or other industrial activity – see Theme 11.

EBHE-273: Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound – see **EBHE-269** – tree, shrubs and vegetation provide a sound buffer – see Theme 11.

EBHE-275: Situate polytunnels at least 30m away from the boundary of the nearest residential dwelling, unless as a result of prior agreement with the neighbour concerned – over recent decades the use of large-scale polytunnels within horticulture has increased, in response to the demand for British-grown

produce and to extend the growing season, improve fruit quality and yield and reduce labour needs. However, polytunnels can impact on sense of place both at the landscape scale (where there are large areas of polytunnel structures) and on individual properties (affecting property owners' enjoyment of their property and surrounding area, and potential impacts on property prices due to the landscape impacts).

EBHE-303: Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings - see **EBHE-275**.

EBHE-187	Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character	T***
EBHE-233	Control scrub or trees to maintain views	LT**
EBHE-269	Install/ maintain water features to facilitate positive soundscape and mask unwanted sound	LT**
EBHE-273	Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound	LT***
EBHE-275	Situate polytunnels at least 30m away from the boundary of the nearest residential dwelling, unless as a result of prior agreement with the neighbour concerned	LT**
EBHE-303	Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings	M **EHBE-275**

15.3.1.1 Causality

These landscapes actions are likely to have major or moderate positive benefits on sense of place, when done well, although for most actions there is limited evidence.

EBHE-187: Create a landscape appraisal of the holding in the context of the local area to identify key characteristics that will inform integrated implementation of actions to conserve and enhance the landscape character – this action is associated with Landscape Character Assessment (Natural England 2014), but focused on the scale of the individual land holding. When carried out appropriately, a landscape appraisal should capture important features and characteristics on the land holding that contribute to landscape character and sense of place. Any development on the site should be undertaken to preserve these characteristics.

EBHE-233: Control scrub or trees to maintain views – this has been coded as having a moderate impact on sense of place given that it will be contextually dependent to those locations with highly valued viewpoints. In these instances, this action will contribute to maintenance of sense of place.

EBHE-269: Install/ maintain water features to facilitate positive soundscape and mask unwanted sound – as with **EBHE-233** this action will have a moderate impact on sense of place, providing positive benefits in areas where there is unwanted sound. However, it will be important to consider the nature of the water features, particularly in terms of their 'naturalness' and the impact this might have on perceptions of sense of place.

EBHE-273: Plant/ manage trees and shrubs to mitigate noise from transport and facilitate positive sound – trees, shrubs and vegetation provide a sound buffer which can reduce noise by five to ten decibels for every 30m width of woodland (FR, undated). However, it is dependent on species choice and planting design.

EBHE-275: Situate polytunnels at least 30m away from the boundary of the nearest residential dwelling, unless as a result of prior agreement with the neighbour concerned – the main sense of place benefits of located polytunnels away from residential buildings will be on the buildings' residents by ensuring that the polytunnel does not excessively overlook the property.

EBHE-303: Plant trees and hedges to mitigate the visual impact of polytunnels from the immediate view of neighbouring residential dwellings - see **EBHE-275**.

15.3.1.2 Co-benefits and Trade-offs

In addition to sense of place benefits from these landscape actions, positive benefits on other cultural services are likely:
EBHE-187 – landscape (Theme 10), cultural heritage (Theme 8 & 9).
EBHE-233 – landscape (Theme 10), recreation (Theme 1), tourism (Theme 5).
EBHE-269 – noise mitigation (Theme 11), recreation (Theme 1), tourism (Theme 5), biodiversity (Theme 9).
EBHE-273 - noise mitigation (Theme 11), recreation (Theme 1), tourism (Theme 5), biodiversity (Theme 9), mental health (Theme 2).
EBHE-275 – landscape (Theme 10).
EBHE-303 – landscape (Theme 10), noise mitigation (Theme 11).

15.3.1.3 Magnitude

While many of these actions are carried out at a fairly small scale, the impact could be realised at the landscape scale (e.g. **EBHE-233**, **EBHE-303**). The impacts would also be dependent on the location – for instance, tree planting to mitigate the visual impact of polytunnels or to buffer noise that is located in a valley below urban/residential areas/recreation hotspots is likely to have a greater landscape impact than similar actions carried out further up hillsides.

15.3.1.4 Timescale

Most actions will be realised shortly after implementation, although actions involving tree planting will take some years to be fully realised.

15.3.1.5 Spatial Issues

N/A

15.3.1.6 Displacement

N/A

15.3.1.7 Maintenance and Longevity

EBHE-233 – ongoing maintenance required in order to maintain views.
EBHE-269 – depending on the water feature, ongoing maintenance is likely.
EBHE-273 – depending on location, trees will need watering and maintenance during the establishment phase, and occasional pruning thereafter to maintain the desired size.
EBHE-303 – see **EBHE-273**.

15.3.1.8 Climate Adaptation or Mitigation

See section 15.2.2.8 for climate related factors for actions involving tree planting.

15.3.1.9 Climate factors / Constraints

N/A

15.3.1.10 Benefits and Trade-offs to Farmer/Land manager

EBHE-187 – landscape appraisal will identify appropriate land management actions that are sensitive to the current and potential cultural services provided by the land holding. For farmers and land managers this may provide evidence to leverage access to grants to enable enhanced provision of those cultural services.
EBHE-233 – controlling scrub or trees to maintain views will have little benefit to farmers and land managers.
EBHE-269 – installing water features to maintain soundscape is unlikely to have benefits for farmers and land managers, unless it can be incorporate into irrigation systems on the farm.
EBHE-273 – potential benefits if the screening mitigates sound (and pollution) on the farm. Tree belts have also been shown to have a positive impact on reducing air pollution from livestock building (e.g. chicken sheds), so potential for further benefits in such locations. Trade offs might include a reduction in land area available for production.

EBHE-275 – no anticipated benefits to farmers or land managers, except for the avoidance of neighbour conflicts. Trade offs include limitations of where polytunnels can be sited.
EBHE 303 – see **EBHE-275**.

15.3.1.11 Uptake

Farm businesses are more likely to undertake the above actions when regulated to do so (e.g. **EBHE-275**/**EBHE-303**) or where there are improvements to farm management (e.g. **EBHE-273** in some contexts) rather than for more general landscape or public good benefits. Maintaining tree in hedgerows can be difficult where hedges are maintained by contractors or hedges are allowed to grow untrimmed for 3 years.

15.3.1.12 Other Notes

N/A

15.4 BUNDLE: SPECIFIC WILDLIFE TARGETED ACTIONS

15.4.1 Specific wildlife targeted actions

EBHE-182: Create and use a wildlife management plan – see Theme 9.

EBHE-224: Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally – see Theme 9.

EBHE-302: Install/ maintain bird and insect houses - see Theme 9.

EBHE-182	Create and use a wildlife management plan	**
EBHE-224	Create cultivated fallow plots for arable flora and ground-nesting birds, potentially in association with grass margins, and areas where spring crops have been grown traditionally	**
EBHE-302	Install/ maintain bird and insect houses	T*

15.4.1.1 Causality

These actions are likely to have a moderate impact on sense of place if they are undertaken in environmental settings where sense of place is closely associated with specific wildlife species or ecosystems that these actions address.

15.4.1.2 Co-benefits and Trade-offs

See Theme 9.

15.4.1.3 Magnitude

N/A

15.4.1.4 Timescale

Impacts on sense of place are likely to accrue over time.

15.4.1.5 Spatial Issues

See Theme 9.

15.4.1.6 Displacement

See Theme 9.

15.4.1.7 Maintenance and Longevity

Ongoing maintenance will be needed to maintain the habitat created.

15.4.1.8 Climate Adaptation or Mitigation

See Theme 9.

15.4.1.9 Climate factor/constraints

N/A

15.4.1.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 9.

15.4.1.11 Uptake
See Theme 9.

15.4.1.12 Other Notes
N/A

15.5 Bundle: Restoration, management and enhancement

15.5.1 Woodland

EBHE-140EM: Enhance/ manage ghyll woodland - see **EBHE-140C**.

EBHE-196: Planted Ancient Woodland (PAWS) restoration – PAWS are ancient woodland sites where semi-natural woodland has been replaced with a plantation. Most PAWS sites are either currently being restored or are likely to be restored to semi-natural woodland over the next few decades. The transition from plantation to semi-natural woodland is likely to have an impact on sense of place.

EBHE-198: Restore/ manage ancient woodland with native broadleaf species – see **EBHE-196**.

EBHE-209: Create, restore or manage traditional orchards with local varieties of fruit tree – Creating, restoring or managing traditional orchards can add to a sense of place through the production of local varieties of fruit which are place-specific.

EBHE-209EM: Restore or manage traditional orchards with local varieties of fruit tree - see **EBHE-209**.

EBHE-314: Create a woodland management plan – see **EBHE-104**.

EBHE-140EM	Enhance/ manage ghyll woodland	M **EBHE-140C**
EBHE-196	Planted Ancient Woodland (PAWS) restoration	***
EBHE-198	Restore/ manage ancient woodland with native broadleaf species	***
EBHE-209	Create, restore or manage traditional orchards with local varieties of fruit tree	M **EBHE-209** C
EBHE-209EM	Restore or manage traditional orchards with local varieties of fruit tree	M **EBHE-209C**
EBHE-314	Create a woodland management plan	M EBHE0-104

15.5.1.1 Causality
The restoration of semi-natural ancient woodland is likely to have significant impacts on sense of place. This is particularly the case with PAWS restoration due to the resulting large-scale landscape change. Broadleaved woodland creates a different sense of place to plantation forestry with studies showing public preferences for mixed or broadleaf forests rather than conifers (Upton et al. 2012). Grose (2012) suggests that “if a local green is replaced by a non-local green, our sense of place is altered” (p. 159). Conifer forests are generally a darker green to broadleaved woodlands, and broadleaved woodlands have a seasonal dimension, with the colours changing throughout the year.

15.5.1.2 Co-benefits and Trade-offs

Restoring semi-natural ancient woodland will provide biodiversity benefits, recreational and wellbeing benefits, as well as long term carbon sequestration benefits. Trade offs are a reduction in productive forestry, with an impact on the availability of timber and other wood products.

15.5.1.3 Magnitude
Only a small extent of ancient woodland remains in the UK, just 2.5% of the UK's land area (Reid et al. 2021). The restoration of PAWS action seeks to restore all PAWS to semi-natural woodland over the next 20-30 years.

15.5.1.4 Timescale
This depends on whether PAWS restoration is realised through clearfelling and replanting/natural regeneration, or through gradual thinning with native trees allowed to establish under the plantation canopy. However, it will take several years for restored semi-natural woodlands to establish new habitats and ecosystems, with a resulting impact on sense of place.

15.5.1.5 Spatial Issues
Potential to provide important connectivity between habitats if located near to other semi-natural woodland sites.

15.5.1.6 Displacement
The loss of plantation forestry through PAWS restoration could displace commercial forestry to other locations, with resulting positive or negative impacts depending on the site location/context. For instance, if new commercial plantations are created on other landscape types with a highly valued sense of place this may have a negative impact.

15.5.1.7 Maintenance and Longevity
Once established, semi-natural woodland is permanent.

15.5.1.8 Climate Adaptation or Mitigation
Climate change is likely to impact the viability of native tree species to thrive. This may result in the natural range of some climate sensitive species moving further north and a shift in the suitability of tree species across different regions of the UK. South, central and eastern England are likely to have drier and warmers summers and will, therefore, require drought tolerant species.

15.5.1.9 Climate factors / Constraints
Need to consider alternative native and near-native species, as suggested in 15.5.1.8 (Climate Adaption or Mitigation) above.

15.5.1.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 6.

15.5.1.11 Uptake
See Theme 6.

15.5.1.12 Other Notes
N/A

15.5.2 Woody features

EBHE-192: Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction – action will protect in-field trees – ensuring their maintenance over the long-term can contribute to protection of landscape character, although the direct impact of the action on sense of place is likely to be limited.

EBHE-205: Create, Enhance/ manage wood pasture (eg through appropriate grazing) – see **EBHE-205C**.

EBHE-205EM: Enhance/ manage wood pasture (eg through appropriate grazing) – see **EBHE-205C**.

EBHE-192	Manage existing in-field trees situated within areas of cultivated land by reversion to permanent pasture to beyond extent of tree canopy to protect tree roots from cultivation and compaction	*
EBHE-205	Create, Enhance/ manage wood pasture (eg through appropriate grazing)	M **EBHE-205C**
EBHE-205EM	Enhance/ manage wood pasture (eg through appropriate grazing)	M **EBHE-205C**

15.5.2.1 Causality

EBHE-192 will have limited benefits for sense of place, although will help to ensure longevity of in-field trees. However, the creation, enhancement and management of wood pasture has the potential to influence sense of place, depending on the land use that it is replacing – see **EBHE-205C**.

15.5.2.2 Co-benefits and Trade-offs

See **EBHE-205C**.

15.5.2.3 Magnitude

N/A

15.5.2.4 Timescale

See **EBHE-205C**.

15.5.2.5 Spatial Issues

See **EBHE-205C**.

15.5.2.6 Displacement

See **EBHE-205C**.

15.5.2.7 Maintenance and Longevity

See **EBHE-205C**.

15.5.2.8 Climate Adaptation or Mitigation

See **EBHE-205C**.

15.5.2.9 Climate factors / Constraints

N/A

15.5.2.10 Benefits and Trade-offs to Farmer/Land manager

See Theme 6.

15.5.2.11 Uptake

See Theme 6.

15.5.2.12 Other Notes

N/A

15.5.3 Scrub

EBHE-203EM: Enhance / manage targeted scrub – scrub is considered a 'successional' habitat as it is, naturally, a temporary habitat between more open habitat areas (e.g. grassland, heathland) and woodland. Therefore, the main purpose for scrub management is to maintain it as scrub, providing a habitat for those species which depend on it, and to also present scrub from invading other valuable habitats, such as grassland and heathland.

EBHE-203EM	Enhance / manage targeted scrub	T**

15.5.3.1 Causality
Maintaining scrub will have a moderate impact on sense of place by maintain existing landscape character and habitats.

15.5.3.2 Co-benefits and Trade-offs
In additional to sense of place benefits, scrub management will also provide enhanced landscape, recreational and biodiversity benefits. There will be a trade off in habitat provision between scrub and other habitat types.

15.5.3.3 Magnitude
Loss of scrub habitat, and adjoining grassland/heathland habitats.

15.5.3.4 Timescale
Immediate.

15.5.3.5 Spatial Issues
N/A

15.5.3.6 Displacement
Scrub management will impact on adjoining grassland/heathland habitats through preventing scrub incursion on these other open habitat areas.

15.5.3.7 Maintenance and Longevity
On-going maintenance is require to maintain scrub as it is a successional habitat. If left unmanaged, it will transition to woodland, and encroach on adjoining open habitats.

15.5.3.8 Climate Adaptation or Mitigation
N/A

15.5.3.9 Climate factors / Constraints
N/A

15.5.3.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 6.

15.5.3.11 Uptake
See Theme 6.

15.5.3.12 Other Notes
N/A

15.5.4 Grassland

EBHE-214EM: Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques – wildflower meadows declined during the twentieth century due to changes in agricultural practices, such as increased field drainage, herbicide use and urban encroachment. Restoration of wildflower habitats occurs through, for example, agri-environment schemes and set-aside programmes.

EBHE-214-X: Manage locally distinctive flower rich/hay meadows using traditional techniques – see **EBHE-214EM**

EBHE-214EM	Enhance and manage locally distinctive flower rich/hay meadows using traditional techniques	***
EBHE-214-X	Manage locally distinctive flower rich/hay meadows using traditional techniques	***

15.5.4.1 Causality
Not assessed

15.5.4.2 Co-benefits and Trade-offs
Additional benefits from this action include improved biodiversity and landscape benefits. However, in some locations wildflower measures may conflict with local community preferences, particularly due to their untidy nature in the autumn and the height of vegetation may impede human access (FR, undated).

15.5.4.3 Magnitude
The action is trying to prevent the loss of this habitat.

15.5.4.4 Timescale
Impacts are realised in the first year.

15.5.4.5 Spatial Issues
N/A

15.5.4.6 Displacement
N/A

15.5.4.7 Maintenance and Longevity
On-going maintenance is required to maintain the habitat.

15.5.4.8 Climate Adaptation or Mitigation
Potential impacts on the habitat, in particular for drought-sensitive species.

15.5.4.9 Climate factors / Constraints
N/A

15.5.4.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 6.

15.5.4.11 Uptake
See Theme 6.

15.5.4.12 Other Notes
N/A

15.5.5 Rivers

EBHE-097: Enhance/ maintain designed or engineered water bodies – this action refers to the maintenance or improvement of water bodies with an artificially retained area of open standing water, and includes maintaining the banks, buffer strips and other associated features (such as ditches and culverts).

EBHE-126: Manage realigned rivers to maintain natural flow – managed realignment involves the deliberate process of realigning in order to maintain natural flow, improve flood plain defences or to reduce potential flood damage to nearby infrastructure or buildings.

Both actions will need to be informed by an expert understanding of fluvial geomorphology and hydrological processes within the catchment concerned

EBHE-097	Enhance/ maintain designed or engineered water bodies	**
EBHE-126	Manage realigned rivers to maintain natural flow	*

15.5.5.1 Causality
EBHE-097 – maintenance of engineered water bodies is designed to protect the banks and other water-control features of historic engineered water bodies to maintain their functionality and role in water quality management. Maintaining the archaeological and historic features of these water bodies will conserve their character and heritage, with impacts on sense of place where these are important features in the landscape or have other cultural values associated with them.

15.5.5.2 Co-benefits and Trade-offs

EBHE-097 – alongside sense of place and landscape (see Theme 10) benefits, maintenance of engineered water bodies with have benefits for the condition of cultural heritage (see Theme 7), tourism (Theme 5) and recreation (Theme 1).

15.5.5.3 Magnitude

N/A

15.5.5.4 Timescale

N/A

15.5.5.5 Spatial Issues

N/A

15.5.5.6 Displacement

Potential displacement of other land uses/habitats from river realignment.

15.5.5.7 Maintenance and Longevity

Water body maintenance will be required on an ongoing basis, but river realignment is generally a one-off action.

15.5.5.8 Climate Adaptation or Mitigation

Water body maintenance, such as improvement of bank stability and enhancement of ditches and culverts, may need to be revised in order to adapt to climate change impacts (e.g. increased risk of flooding and fluctuating water levels).

15.5.5.9 Climate factors / Constraints

N/A

15.5.5.10 Benefits and Trade-offs to Farmer/Land manager

Good maintenance of water bodies may provide irrigation benefits to the land manager and will mitigate flood risk to agricultural land, or neighbouring properties.

15.5.5.11 Uptake

See Theme 6.

15.5.5.12 Other Notes

N/A

15.5.6 Boundary features

EBHE-007: Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges) – traditional field boundaries form an integral part in rural landscapes. Alongside their practical purpose (stock proofing, shelter for livestock), they are also important habitats for wildlife.

EBHE-019: Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls -see **EBHE-007**.

EBHE-219: Install/ manage invisible fencing – invisible fencing uses underground wires that transmit radio signals. or more recently satellite signals, to collars worn by livestock. Animals can be trained to stay inside a particular invisible fence area or to avoid particularly sensitive areas of land for a particular period of time.

EBHE-228: Remove redundant fencing (replace with invisible fences if desirable) – removal of fencing where is serves no purpose, or replace with invisible fencing (see **EBHE-219**).

EBHE-229: Remove non-traditional, redundant structures – the context here is to improve visual look of the landscape.

EBHE-007	Create/ restore/ manage traditional field boundaries (eg dry stone walls, earth banks, stone faced earth banks, Cornish hedges)	***
EBHE-019	Create/ maintain appropriate boundary features alongside rights of way such as hedges, bird watching cover and dry stone walls	M **EBHE-007rep**
EBHE-219	Install/ manage invisible fencing	TL*
EBHE-228	Remove redundant fencing (replace with invisible fences if desirable)	*
EBHE-229	Remove non-traditional, redundant structures	*

15.5.6.1 Causality
Actions that involve the improvement or maintenance of traditional field boundaries are likely to have a major benefit to sense of place, as they enhance landscape character and represent the cultural heritage and distinctiveness of the area. There is limited evidence regarding the impact of invisible fencing, but if successful that lack of fencing will improve the visual appearance of an area.

15.5.6.2 Co-benefits and Trade-offs
Maintenance of traditional field boundaries with also have benefits for recreation (Theme 1), tourism (Theme 5), cultural heritage (Themes 6 & 7 reprts) and biodiversity (Theme 9).

15.5.6.3 Magnitude
Maintenance of traditional field boundaries at a landscape scale.

15.5.6.4 Timescale
Action is effective as soon as it is implemented.

15.5.6.5 Spatial Issues
N/A

15.5.6.6 Displacement
N/A

15.5.6.7 Maintenance and Longevity
On-going maintenance of traditional field boundaries is required, although would be required fairly infrequently.

15.5.6.8 Climate Adaptation or Mitigation
N/A

15.5.6.9 Climate factors / Constraints
N/A

15.5.6.10 Benefits and Trade-offs to Farmer/Land manager
Traditional field boundaries (such as dry stone walls, hedges and earth banks) can provide shelter for livestock (against wind, rain and sun), and are a low-maintenance form of stock proofing.

15.5.6.11 Uptake
Farm businesses are more likely to undertake this action where there are clear benefits to livestock management.

15.5.6.12 Other Notes
N/A

15.6 Bundle: Actions for habitats with specific hydrological characteristics

15.6.1 Peatlands and wetlands

EBHE-164C: Create wetland habitats – wetlands are important for biodiversity, including endangered species and migratory birds. However, they are endangered habitats, disappearing three times as fast as forests (WWT 2022).

EBHE-164EM: Enhance/ manage wetland habitats – see **EBHE-164C**.

EBHE-216: Rewet moorland (including common land), e.g. through appropriate traditional grazing techniques – rewetting moorland typically occurs through physically blocking man-made drains and gulleys caused by erosion as well as by traditional grazing (e.g. by cattle)

EBHE-164C	Create wetland habitats	***
EBHE-164EM	enhance/ manage wetland habitats	***
EBHE-216	Rewet moorland (including common land), eg through appropriate traditional grazing techniques	**

15.6.1.1 Causality

Living near to or visiting wetlands and experiencing its environment and wildlife is good for human wellbeing and creates a sense of place (WWT 2022). Sense of place through wetland creation or management will deliver the greatest benefits in places where people currently access to green or blue spaces (WWT 2022).

15.6.1.2 Co-benefits and Trade-offs

Other benefits from wetland creation include the provision of freshwater and water quality improvement, pollutant removal, carbon sequestration, provide nursery sites for many commercial fish species, protection from flooding, support livelihoods, improve biodiversity (they are the most biodiverse habitat on earth), prevent coastal erosion and provide sites for recreation and tourism (WWT 2022; Pedersen et al. 2019). They can be located in both urban and rural areas, but wetlands near to residential areas are likely to have high sense of place values contributing to quality of life and wellbeing (Pedersen et al. 2019).

15.6.1.3 Magnitude

Restoration of habitat and climate adaptation.

15.6.1.4 Timescale

Benefits will accrue over of a short time scale.

15.6.1.5 Spatial Issues

Wetlands range from small located sites (such as ponds or bogs in urban settings) to largescale wetland sites.

15.6.1.6 Displacement

Wetland creation alters land for the foreseeable future, so it cannot be used for other purposes (e.g. agriculture, development).

15.6.1.7 Maintenance and Longevity

Minimal ongoing maintenance required.

15.6.1.8 Climate Adaptation or Mitigation

Wetland creation will have important climate adaptation and mitigation benefits. It will enable protection against flooding and improve climate regulation in urban settings (Pedersen et al. 2019) – see also Theme 12.

15.6.1.9 Climate factors / Constraints

N/A

15.6.1.10 Benefits and Trade-offs to Farmer/Land manager

Little benefits for farmer or land manager unless it provides a buffer to protect other land areas, or there are other economic benefits from wetland creation (e.g. recreational/tourism opportunities) or potential benefits through emerging carbon markets.

15.6.1.11 Uptake

Farm businesses are more likely to undertake wetland creation on land that is unproductive and where it offers wider economic benefits.

15.6.1.12 Other Notes

N/A

15.7 Bundle: Livestock management

15.7.1 Selection and diversification

EBHE-226: Use rare breeds for conservation grazing – see Themes 9 and 10.

EBHE-227: Maintain genetic diversity by rearing rare breed livestock – see Themes 9 and 10.

EBHE-226	Use rare breeds for conservation grazing	*
EBHE-227	Maintain genetic diversity by rearing rare breed livestock	*

15.8 Bundle: Litter and Waste

15.8.1 Litter and Waste

EBHE-267: Store unused polythene away from public view – polytunnel polythene should be stored securely when not in use in order to minimise visual impact.

EBHE-274: Remove polythene covering the frames of a polytunnel for a minimum period of six months in any calendar year – removal of polythene is in the interests of visual amenity.

EBHE-278: Remove waste plastics in an approved manner, wash, and segregate and store correctly and recycling. NB recycling scheme available locally required for compliance – appropriate recycling of waste plastics is important to reduce pollution, litter and waste in the local environment.

EBHE-267	Store unused polythene away from public view	*
EBHE-274	Remove polythene covering the frames of a polytunnel for a minimum period of six months in any calendar year	*
EBHE-278	Remove waste plastics in an approved manner, wash, and segregate and store correctly and recycling. NB recycling scheme available locally required for compliance.	*

15.8.1.1 Causality

While extensive areas of polytunnels can have a significant impact on landscape character, and thus sense of place, particularly when they are highly visible, the specific actions relating to removal, storage and disposal of polythene are likely to have a limited impact on sense of place. What is more important to consider is the location and prominence of large areas of polytunnels, particular in sensitive landscapes or where they impact on long distance views.

15.8.1.2 Co-benefits and Trade-offs

Polythene removal, storage and disposal will have benefits for recreation (Theme 1), tourism (Theme 5), biodiversity (Theme 9) and landscape (Theme 10). Erection of large scale polytunnels, while contributing to improved food production, has potential impacts on local tourism and leisure industries.

15.8.1.3 Magnitude
N/A

15.8.1.4 Timescale
Immediate.

15.8.1.5 Spatial Issues
N/A

15.8.1.6 Displacement
N/A

15.8.1.7 Maintenance and Longevity
N/A

15.8.1.8 Climate Adaptation or Mitigation
Removal of polythene is likely to be increasingly required in order to avoid damage during storms. Removal of polythene during the wetter months of the year can also help with flooding alleviation.

15.8.1.9 Climate factors / Constraints
N/A

15.8.1.10 Benefits and Trade-offs to Farmer/Land manager
There will be a labour input for the removal, storage and disposal of polythene. Removal of polythene for a minimum of 6 months per year is unlikely to align with many horticultural crop cycles so consideration needs to be given to the economic costs and benefits.

15.8.1.11 Uptake
Farm businesses are more likely to undertake these actions when they align to crop cycle needs.

15.8.1.12 Other Notes
N/A

15.9 Bundle: Create and enhance access and PROW

15.9.1 Create and enhance access and PROW

This set of actions relates to infrastructure and access to improve public access to green and blue space. This includes the provision of facilities (such as parking, toilets, refreshments) and accessible rights of way in both rural, urban and coastal settings.

EBHE-005: Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW)
EBHE-006: Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety
EBHE-008: Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation
EBHE-015: Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)

EBHE-020: Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)
EBHE-021: Create public access (on foot, on horse or on bike) to open access land and common land
EBHE-022: Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users
EBHE-023: Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users, dis
EBHE-026: Dedicate land as access land
EBHE-042: "Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles
EBHE-044: Create/ maintain safe access to beach schools sites
EBHE-154: Create/ maintain controlled access to sand dunes
EBHE-255: Create/ maintain small scale access facilities supporting travel to site via road (e.g. Small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)
EBHE-256: Create/ maintain small scale access facilities supporting travel to site via horse riding (e.g. hitching points and water for horses)
EBHE-265: Dedicate new Byways Open to all Traffic
EBHE-282: Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)
EBHE-284: Create launch points for recreational activities by such as paddle sports, fishing, wild swimming, for able-bodied and disabled users
EBHE-300: Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)

EBHE-005	Create/ maintain larger scale access facilities (e.g. parking for coaches and cars including hardstanding, toilets including composting, plumbed structures requiring building regs, and affordable overnight accommodation near key PROW)	TD**
EBHE-006	Create or dedicate new rights of way for footpaths, bridleways, cycle tracks, and restricted byways to make or complete community circuits of off road routes, link to community places and spaces, public transport, waterways, access land, common land, National Trails and fill gaps in the off road network or improve public safety	TD**
EBHE-008	Create/ maintain infrastructure needed to mitigate the effects of access (boardwalks over wetlands, hedges and banks to hide walkers from birds, hedges to keep dogs from straying etc) where not already required by regulation	TD**
EBHE-015	Create new permissive paths (any payment needs to be time bound after which landowner either dedicates as permanent or stops receiving payment, starting point 3 years)	TD**
EBHE-020	Maintain area of access land through dedication when land use change is publicly subsidised (no net loss)	L*
EBHE-021	Create public access (on foot, on horse or on bike) to open access land and common land	M **EBHE-023**
EBHE-022	Improve access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users, disa	M **EBHE-023**
EBHE-023	Maintain access infrastructure including path surfaces and widening on PROW cycle tracks and informal paths on publicly accessible greenspace (including access land, common land and TVGs) so that they are accessible all year round for all legal users, dis	M **EBHE-023**

EBHE-026	Dedicate land as access land	TD*
EBHE-042	Provide/ maintain access to mobility aids, e.g. trampers, adapted bicycles	M **EBHE-006**
EBHE-044	Create/ maintain safe access to beach schools sites	L*
EBHE-154	Create/ maintain controlled access to sand dunes	L*
EBHE-255	Create/ maintain small scale access facilities supporting travel to site via road (e.g. Small areas of hardstanding parking for cars and bicycles, cycle racks and shelters etc.)	M **EBHE-005**
EBHE-256	Create/ maintain small scale access facilities supporting travel to site via horse riding (e.g. hitching points and water for horses)	LT**
EBHE-265	Dedicate new Byways Open to all Traffic	TD**
EBHE-282	Create higher access rights on Open Access land (i.e. allow for activities currently restricted open access land by Schedule 2 of the CROW Act)	M **EBHE-023**
EBHE-284	Create launch points for recreational activities by such as paddle sports, fishing, wild swimming, for able-bodied and disabled users	D**
EBHE-300	Coordinate new public access with adjacent land managers (to link to transport hubs and community spaces, access land, National Trails and other parts of the off-road and quiet road network)	LD**

15.9.1.1 Causality

The main impact of these actions on sense of place is that infrastructure and access improvements allow more people to enjoy green and blue spaces, and that involvement with and appreciation of these spaces contributes to the attachments and meanings that people form with those places (Zlender & Gemin 2020). However, in some cases such actions may have a negative impact on sense of place, if the character and feel of those environments is changed to something no longer wild or associated with 'untouched nature'.

15.9.1.2 Co-benefits and Trade-offs

Increased access and infrastructure is also likely to have benefits on recreation (see Theme 1), mental health (see Theme 2), educational opportunities (see Theme 3), tourism (see Theme 5), awareness of cultural heritage (see Theme 6) and awareness of wildlife (see Theme 9).

15.9.1.3 Magnitude

Increasing opportunities for people to have access to and enjoy green and blue spaces.

15.9.1.4 Timescale

Immediate.

15.9.1.5 Spatial Issues

N/A

15.9.1.6 Displacement

Some impacts are likely on wildlife as a result of increased public access, although with good design this can be minimised. See Theme 1.

15.9.1.7 Maintenance and Longevity

See Theme 1.

15.9.1.8 Climate Adaptation or Mitigation

See Theme 1.

15.9.1.9 Climate factors / Constraints

N/A

15.9.1.10 Benefits and Trade-offs to Farmer/Land manager

See Theme 1.

15.9.1.11 Uptake

See Theme 1.

15.9.1.12 Other Notes

N/A

15.10 BUNDLE: SIGNPOSTING, INFORMATION, FACILITIES AND EVENTS

15.10.1 Signposting, information, facilities and events

This set of actions relates to signposting, information, facilities and events that aim to increase information available for visitors so they can make the most out of their visit. **EBHE-004** aims to improve signage and way markers, which will assist visitors in finding their way around the pathways provided; this is followed up by the aim of **EBHE-013** which will provide maps of the area showing key points of access and key features. **EBHE-009** aims to provide additional information about elements found at the site and in the vicinity, this would include aspects of cultural and historical heritage. **EBHE-011** and **EBHE-012** aim to make better use of digital information sharing using websites, apps and social media to provide detailed information about public access opportunities and useful information concerning ease of access.

EBHE-004: Create/ maintain signage, way markers - see EBHE-011
EBHE-009: Create/ maintain improved public information signage (safety information, warnings biodiversity and environmental protection etc) above basic information / directions - see EBHE-011
EBHE-010: Remove signs when no longer applicable - see EBHE-011
EBHE-011: Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or people
EBHE-012: Provide information on websites, apps and social media informing the public of access opportunities - see EBHE-011
EBHE-013: Distribute maps of access in and around the area including links to associated access ways - see EBHE-011
EBHE-037: Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites
EBHE-039: Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour - see EBHE-037
EBHE-040: Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture
EBHE-041:Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits - see EBHE-037
EBHE-043: Create/ maintain dedicated space for forest school opportunities
EBHE-050: Create/ maintain demonstration or outdoor classroom sites (e.g. for talks or lessons)
EBHE-051: Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities
EBHE-052: Create/ maintain places for nature survey opportunities
EBHE-053: Provide/ maintain places for citizen science opportunities
EBHE-054: Create places for geo-caching
EBHE-055: Create/ maintain site based information promoting the use of the natural environment for physical activity, health and wellbeing
EBHE-056: Create/ maintain publicly accessible natural play spaces
EBHE-057: Maintain places for geo-caching
EBHE-058: Create small-scale cultivation opportunities
EBHE-060: Host school visits including forest schools and beach schools
EBHE-061: Host care farming visits - see EBHE-063

EBHE-062: Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities - see EBHE-063
EBHE-063: Host open days on farms, woodlands and country parks
EBHE-064: Host nature reserve visits - see EBHE-063
EBHE-065: Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity
EBHE-066: Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity
EBHE-069: Provide guided geodiversity walks
EBHE-071: Provide fossil, mineral and rock hunting and collecting open events and days
EBHE-074: Provide support (faciltators, supplies) for community food growing
EBHE-257: Create/ maintain small scale facilities/street furniture on site (e.g. bins/recycling facilities, seats)
EBHE-266: Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value
EBHE-268: Install/ maintain visual and aural art features
EBHE-271: Create/ enhance/ manage sites for wildlife watching

EBHE-004	Create/ maintain signage, way markers	M **EBHE-011**
EBHE-009	Create/ maintain improved public information signage (safety information , warnings biodiversity and environmental protection etc) above basic information / directions	M **EBHE-011**
EBHE-010	Remove signs when no longer applicable	M **EBHE-011**
EBHE-011	Create/ maintain pre-visit and onsite/on route information including maps to meet the needs of all users, including on foot, by bicycle, by paddle or by horse, and especially infrequent visitors, and those with particular needs such as families, the elderly or peop	**
EBHE-012	Provide information on websites, apps and social media informing the public of access opportunities	M **EBHE-011**
EBHE-013	Distribute maps of access in and around the area including links to associated access ways	M **EBHE-011**
EBHE-037	Create/ maintain in situ interpretation displays, signage and other materials on land management and the natural and cultural environment as well as leaflets, apps and websites	***
EBHE-039	Create/ maintain digital opportunities to enhance the public's experience of their visit, e.g. apps to enhance enjoyment of or learning about nature, geodiversity, heritage and land management and promote positive behaviour	M **EBHE-037**
EBHE-040	Create/ maintain sites and small scale infrastructure suited to nature based interventions for those with a defined health, educational or social need, e.g. care farming, social and therapeutic horticulture	TD**
EBHE-041	Create/ maintain interpretation displays, signage and other materials for educational, physical mental and social wellbeing visits	M **EBHE-039**
EBHE-043	Create/ maintain dedicated space for forest school opportunities	L***
EBHE-050	Create/ maintain demonstration or outdoor classroom sites (e.g. for talks or lessons)	L***
EBHE-051	Create/ maintain places for fossil, mineral and rock hunting and collecting opportunities	T**
EBHE-052	Create/ maintain places for nature survey opportunities	*
EBHE-053	Provide/ maintain places for citizen science opportunities	*
EBHE-054	Create places for geo-caching	T*

EBHE-055	Create/ maintain site based information promoting the use of the natural environment for physical activity, health and wellbeing	T**
EBHE-056	Create/ maintain publicly accessible natural play spaces	LTD*
EBHE-057	Maintain places for geo-caching	T*
EBHE-058	Create small-scale cultivation opportunities	*
EBHE-060	Host school visits including forest schools and beach schools	TD**
EBHE-061	Host care farming visits	M **EBHE-063**
EBHE-062	Host visits for groups with special needs e.g. dementia, learning disabilities, physical disabilities	M **EBHE-063**
EBHE-063	Host open days on farms, woodlands and country parks	
EBHE-064	Host nature reserve visits	M **EBHE-063**
EBHE-065	Host guided walks, rides, paddles, and other nature-based activities that encourage social interaction and physical activity	*
EBHE-066	Provide interactive Engagement activities relating to natural features, heritage, landscape, land management, geodiversity, and biodiversity	*
EBHE-069	Provide guided geodiversity walks	***
EBHE-071	Provide fossil, mineral and rock hunting and collecting open events and days	TD*
EBHE-074	Provide support (faciltators, supplies) for community food growing	**
EBHE-257	Create/ maintain small scale facilities/street furniture on site (e.g. bins/recycling facilities, seats)	TL*
EBHE-266	Engage local community on how existing areas of tranquillity could be improved or new areas created, and the type of soundscape they would most value	**
EBHE-268	Install/ maintain visual and aural art features	**
EBHE-271	Create/ enhance/ manage sites for wildlife watching	**

15.10.1.1 Causality

As with access and infrastructure actions, signage, information, facilities and events can allow more people to enjoy the natural environment, with sense of place benefits through increased involvement with these spaces (Zlender & Gemin 2020). In addition, signage, interpretation and the provision of information about nature or the cultural heritage associated with sites can contribute to the experience of being in a particular place and the meanings and attachments that people form with those places (Paths for All, undated).

Outdoor learning environments can contribute to enhancing a sense of place, particularly in the context of a sense of belonging and connection to nature (Harris 2021). Cumming and Nash (2015) identified sense of place benefits from the forest school approach to learning in a primary school setting in Western Australia. In particular, the approaches applied in the forest school developed children's place attachment and place meaning.

Involvement of the local community in how existing areas of tranquillity can be improved (Action **EBHE-266**) will ensure that the actions incorporated represent the preferences of the local community and preserve the sense of place.

15.10.1.2 Co-benefits and Trade-offs

Increased signage, information, facilities and events will also have benefits on recreation (see Theme 1), mental health (see Theme 2), educational opportunities (see Theme 3), tourism (see Theme 5), awareness of cultural heritage (see Theme 6) and awareness of wildlife (see Theme 9).

15.10.1.3 Magnitude

N/A

15.10.1.4 Timescale
See Theme 1.

15.10.1.5 Spatial Issues
See Theme 1.

15.10.1.6 Displacement
See Theme 1.

15.10.1.7 Maintenance and Longevity
See Theme 1.

15.10.1.8 Climate Adaptation or Mitigation
See Theme 1.

15.10.1.9 Climate factors / Constraints
N/A

15.10.1.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 1.

15.10.1.11 Uptake
See Theme 1.

15.10.1.12 Other Notes
N/A

15.11 Bundle: Maintenance and restoration of cultural heritage sites

15.11.1 Maintenance and restoration of cultural heritage sites

These actions aim to preserve historical and cultural sites ensuring that they remain in good condition.
EBHE-077: Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)
EBHE-079: Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation
EBHE-080: Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation – see EBHE-079
EBHE-081: Minimise cultivation on Scheduled Monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments
EBHE-083: Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments
EBHE-084: Restore/ maintain high water levels to protect heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments
EBHE-084-XXX: Restore/ maintain high water levels to protect scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments -see EBHE-084
EBHE-088: Maintain the visibility of upstanding Scheduled Monuments/ heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-089: Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-287: Do not harrow or roll Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments

EBHE-288: Do not plough, sub-soil cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-289: Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands under grass cover within woodlands
EBHE-290: Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion with no ground disturbance, bare patches or erosion.
EBHE-292: Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-293: Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-294: Enhance the management and presentation of Registered Battlefields
EBHE-295: Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-296: Remove eyesores from Registered Battlefields
EBHE-297: Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-298: Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-299: Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments
EBHE-305: Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)
EBHE-306: Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)

EBHE-077	Maintain in a weatherproof condition the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***
EBHE-079	Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation	***
EBHE-080	Remove Scheduled Monuments or heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments from cultivation	M **EBHE-079**
EBHE-081	Minimise cultivation on Scheduled Monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	***
EBHE-083	Remove and prevent the regrowth of scrub, bracken, sedge or reed and keep understorey vegetation trimmed back around shceduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	***
EBHE-084	Restore/ maintain high water levels to protect heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	***
EBHE-084-XXX	Restore/ maintain high water levels to protect scheduled monuments/ heritage assets on the shine database that are not Listed Buildings or Scheduled Monuments	M **EBHE-084**
EBHE-088	Maintain the visibility of upstanding Scheduled Monuments/ heritage assets that are on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-089	Remove eyesores from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***

EBHE-287	Do not harrow or roll Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-288	Do not plough, sub-soil cultivate or re-seed across Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-289	Maintain Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments under grass cover within woodlands under grass cover within woodlands	***
EBHE-290	Establish/ maintain a continuous grass sward/vegetation cover over Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments with no ground disturbance, bare patches or erosion with no ground disturbance, bare patches or erosion.	***
EBHE-292	Exclude burrowing animals from Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-293	Manage a permanent grassland for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-294	Enhance the management and presentation of Registered Battlefields	***
EBHE-295	Prevent the use of vehicles around Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-296	Remove eyesores from Registered Battlefields	***
EBHE-297	Re-site vehicle and stock access routes, supplementary feed areas, water troughs etc for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-298	Undertake necessary conservation or consolidation works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-299	Maintain necessary drainage works for Scheduled Monuments/ heritage assets on the SHINE database that are not Listed Buildings or Scheduled Monuments	***
EBHE-305	Undertake restoration works for the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***
EBHE-306	Remove eyesores from the following types of Listed Buildings (provided they are not also Scheduled Monuments): traditional farm buildings (non-residential); industrial buildings (that are not in active use)	***

15.11.1.1 Causality

Many listed buildings and buildings on the SHINE database are not in good condition (see Theme 6) and require attention if they are to be preserved for future enjoyment. These actions are aimed at maintaining, improving or restoring the condition of building of historical or cultural interest. Enhancing the condition and appearance of these buildings will add value to the cultural heritage of the landscape, which will have a major impact on the preservation of the distinctiveness and sense of place of these locations.

There are links between the historic environment and sense of place, particularly in terms of place distinctiveness (what makes a place distinctive), place continuity (the way a place support people's sense of continuity) and place dependency (how a place enables people to realise their goals) (Graham et al. 2009).

15.11.1.2 Co-benefits and Trade-offs

See Theme 6.

15.11.1.3 Magnitude

See Theme 6.

15.11.1.4 Timescale

See Theme 6.

15.11.1.5 Spatial Issues
See Theme 6.

15.11.1.6 Displacement
See Theme 6.

15.11.1.7 Maintenance and Longevity
See Theme 6.

15.11.1.8 Climate Adaptation or Mitigation
See Theme 6.

15.11.1.9 Climate factors / Constraints
N/A

15.11.1.10 Benefits and Trade-offs to Farmer/Land manager
See Theme 6.

15.11.1.11 Uptake
See Theme 6.

15.11.1.12 Other Notes
N/A

15.12 Bundle: Maintenance, restoration of habitat features in Parks and Gardens

15.12.1 Maintenance, restoration of habitat features in Parks and Gardens

These actions relate to the maintenance of habitat features in registered parks and gardens in order to both maintain their functionality for biodiversity, but also their landscape, recreational and tourism value.

EBHE-090: Establish/ maintain a continuous grass sward in Registered Parks and Gardens
EBHE-231: Enhance/ manage landscape character in urban parks
EBHE-307: Retain mature and veteran standing trees in Registered Parks and Gardens
EBHE-308: Re-plant trees in Registered Parks and Gardens
EBHE-309: Maintain standing/fallen deadwood in Registered Parks and Gardens
EBHE-310: Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens
EBHE-311: Enhance/ maintain parkland features in Registered Parks and Gardens
EBHE-312: Maintain the current water regime in Registered Parks and Gardens
EBHE-313: Remove eyesores from Registered Parks and Gardens
EBHE-315: Enhance/ manage biodiversity in urban parks

EBHE-090	Establish/ maintain a continuous grass sward in Registered Parks and Gardens	LT*
EBHE-231	Enhance/ manage landscape character in urban parks	LT*
EBHE-307	Retain mature and veteran standing trees in Registered Parks and Gardens	LT*
EBHE-308	Re-plant trees in Registered Parks and Gardens	LT*
EBHE-309	Maintain standing/fallen deadwood in Registered Parks and Gardens	LT*
EBHE-310	Protect existing trees to prevent damage from livestock and wild animals in Registered Parks and Gardens	LT*
EBHE-311	Enhance/ maintain parkland features in Registered Parks and Gardens	LT*
EBHE-312	Maintain the current water regime in Registered Parks and Gardens	LT*

EBHE-313	Remove eyesores from Registered Parks and Gardens	LT*
EBHE-315	Enhance/ manage biodiversity in urban parks	LT*

Actions to maintain habitats in registered park and gardens will impact on sense of place insomuch as these environments contribute to the general landscape character and historical context for an area. The actions may have a positive impact but are context specific. See Theme 1.

15.13 BUNDLE: ACTIONS FOR GEODIVERSITY

15.13.1 Actions for geodiversity

The 17 geodiversity actions represent current thinking in best practice in terms of preserving geodiversity (see Theme 8) in order to maintain these features for educational, recreational or heritage purposes.

EBHE-232: Maintain exposures of vertical or near-vertical faces
EBHE-234: Create/ maintain safety fencing for geodiversity features
EBHE-236: Stabilise cave entrances
EBHE-238: Scrape rock faces
EBHE-239: Remove fly tipped rubbish from geodiversity features
EBHE-240: Re-excavate sections of geodiversity features
EBHE-241: Provide sample cores of geodiversity features / assets
EBHE-242: Create/ maintain trenches
EBHE-243: Create casts or moulds of finite geodiversity features
EBHE-244: Remove man-made barriers around active geodiversity features
EBHE-246: Protect geodiversity features by protective cover
EBHE-247: Remove scree or spoil
EBHE-248: Protect geodiversity features by burial
EBHE-249: Create rock piles for sample collection
EBHE-250: Remove graffiti on geodiversity features
EBHE-251: Create/ enhance/ maintain access for caves or disused mines
EBHE-316: Control scrub or trees on top or in front of geodiversity features

EBHE-232	Maintain exposures of vertical or near-vertical faces	***
EBHE-234	Create/ maintain safety fencing for geodiversity features	**
EBHE-236	Stabilise cave entrances	**
EBHE-238	Scrape rock faces	TD*
EBHE-239	Remove fly tipped rubbish from geodiversity features	***
EBHE-240	Re-excavate sections of geodiversity features	**
EBHE-241	Provide sample cores of geodiversity features / assets	**
EBHE-242	Create/ maintain trenches	*
EBHE-243	Create casts or moulds of finite geodiversity features	***
EBHE-244	Remove man-made barriers around active geodiversity features	***
EBHE-246	Protect geodiversity features by protective cover	TD*
EBHE-247	Remove scree or spoil	TD*
EBHE-248	Protect geodiversity features by burial	*
EBHE-249	Create rock piles for sample collection	TD*
EBHE-250	Remove graffiti on geodiversity features	***
EBHE-251	Create/ enhance/ maintain access for caves or disused mines	***
EBHE-316	Control scrub or trees on top or in front of geodiversity features	*

15.13.1.1 Causality

One of the cultural services that geodiversity provides is a contribution to sense of place. Thus the actions that help frame the unique elements of the geodiversity of a place are likely to be of significant value in place-making. A good example for England is the National Character Areas, quite a few of which are defined by geological units, so being able to view the rocks in good, clear sections is important. Likewise, the ability to take moulds or casts of certain features, particularly fossils, and be able to bring them into a museum or interpretive centre offers an opportunity for publics to better understand and appreciate the distinctiveness of local natural geological environments.

See theme 8 for assessment of other factors.

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