

# Wessex-BESS

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## Exploring cultural ecosystem services in the Wessex region



Wessex-BESS WP5 Project Report I

Cranfield University and RSPB

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**bess** biodiversity &  
ecosystem  
service  
sustainability

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## Exploring cultural ecosystem services in the Wessex region

Wessex-Bess WP5 Project Report I: Exploratory Workshop Results  
12<sup>th</sup> November, 2013

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## EXECUTIVE SUMMARY

**Wessex BESS** is a four-year (2012-2016) multidisciplinary research project that explores the different ways that lowland biodiversity benefits local communities through the provision of ecosystem services. Specifically, it aims to characterise biodiversity-ecosystem service relationships in this multi-functional landscape. It is funded by the UK Natural Environment Research Council under the Biodiversity and Ecosystem Service Sustainability (BESS) research programme. It will produce results which help policy makers and land managers make decisions which ensure a healthy environment and a sustainable future. The Wessex region presents a wonderful opportunity to study ecosystem services generated by multifunctional chalk landscapes. Wessex-Bess has 5 work packages studying climate regulation, fish production and water quality, crop production, and cultural benefits. This report presents findings from work package five, which explores cultural benefits.

Three workshops took place in Salisbury, Seend and Amesbury during spring 2013. These were attended by local people interested in the natural environment. Participants took part in activities which explored landscape features, selected species groups and diversity associated with arable farmland, restoring grasslands, and ancient grasslands. The aim was to identify important features of the Wessex-Chalk landscape, how biodiversity is perceived, the key differences between arable, restoring grasslands and ancient grasslands, and variables which affect the generation of cultural benefits.

Whilst there was a clear differentiation between perceptions of arable farmland and grasslands, distinctions between ancient grasslands and restoring grasslands were less clear. Arable landscapes had a distinct cultural contribution based on food security and traditional countryside activities. Grasslands were seen as more varied, interesting, inspiring, and better for wellbeing, due to the colourful flowers, insects, rare species, and wildlife. Restoring grasslands were generally seen to be more accessible (especially for group educational visits) and symbolised human achievement through the successful rehabilitation of land. Results showed that ancient grasslands were often more closely associated with history than with biodiversity.

There were significant differences between participants' understanding of biodiversity and the dominant ecological definition of biodiversity. The majority of participants discussed biodiversity at the largest scales (i.e. between ecosystem and between species). Two large-scale forms of diversity not included in the ecological definition were mentioned; an urban-rural divide, and a land-sky divide. There was sparse reference to 'within species' diversity and 'genetic diversity', and a number of biodiversity groups were absent from results. There was some evidence to suggest these differences were linked to education and recreational identification activities.

Workshop participants showed no distinct preferences for any particular plant or invertebrate species, other than bees which were (in most cases) perceived especially favourably. Where people did express preferences for species, this tended to be for those with extraordinary sensory features such as bright colours, interesting markings, and species that hop or make sound. Whilst the visual features of different species were considered most important, the sound of a few specific species was especially appreciated. Some people advised they liked rare birds, whilst others advised of a fear of bees and spiders that did, in some cases, create a barrier to understanding.

There was some evidence of a relationship between levels of biodiversity and cultural benefits. All species groups offered a unique contribution to *cognitive benefits* (e.g. learning, scientific study). Different species were perceived to teach us about the natural world and about human society. Diverse visual stimuli (particularly associated with ancient grasslands) could inspire *creative benefits* (e.g. inspiration, aesthetics). *Regenerative benefits* (e.g. mental and physical wellbeing) were also linked to the richness of sensory stimuli and abundance, whilst arable farmland provided reassurance connected to food security.

*Intuitive benefits* (e.g. connection, faith) associated with biodiversity were linked to stewardship, energy, interconnectedness, and the 'basis of life'. *Retrospective benefits* (e.g. history, memories) related to both personal experience and cultural heritage (especially evidence of land-use change and past civilisations). Ancient grasslands were very strongly associated with prehistory, whilst arable farmland was linked with traditional activities. *Communicative benefits* (e.g. social cohesion, sense of place) from biodiversity were shaped by informal and formal education, and this affected the scale at which biodiversity was perceived. Sense of place was associated with 'cultural landscapes', a holistic concept that included biodiversity, topography, exceptional heritage assets and military connections as a whole.

Broad findings suggest that cognitive, creative and regenerative benefits are more likely to accrue from observation of distinct organisms and taxa (disaggregated biodiversity), whilst intuitive, retrospective and communicative benefits are linked to the concept of biodiversity as a whole (integrated biodiversity). Abundance was important to all cultural benefits, but particularly important for creative, regenerative and intuitive benefits. Other important variables found to effect the generation of cultural benefits included geodiversity, atmospheric conditions, time/ season, group activities, access, familiarity, childhood experience and baseline psychological state.

Results from these exploratory workshops will help inform the design of future Wessex-Bess WP5 research, and selected results will be explored further through an online questionnaire, public survey and farmer survey taking place in 2014-2016.

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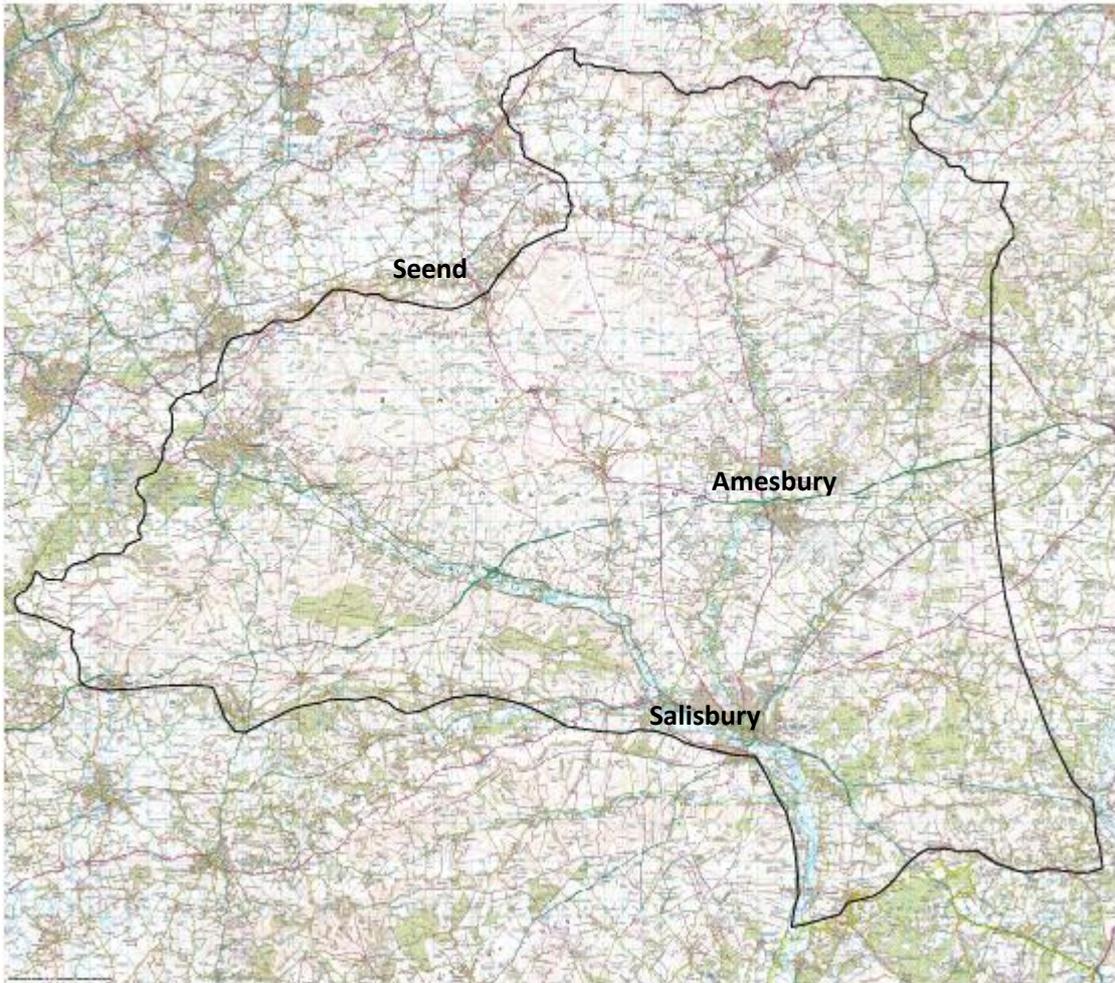
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## GLOSSARY OF TERMS

Biotic	Associated with or derived from living organisms (e.g. plants, wildlife, microorganisms, people)
Abiotic	Not associated with or derived from living organisms (e.g. bedrock, sunlight, wind, rivers)
Features	Individual features of natural places that generate cultural benefits
Biodiversity	The variability among living creatures, including diversity within species, between species and of ecosystems
Cultural benefits	Types of psychological and social benefit that people accord to natural places (e.g. education, creativity, sense of connection, health, and heritage)
Cultural ecosystem services	Environmental settings (and composite features) that from which people derive cultural benefits
Ecosystem	Plant, animal and micro-organism communities which work together (with the non-living environment) as a functional unit
Ecosystem services	Things deriving from ecosystems which benefit people (e.g. food production, clean air and water, places for recreation)

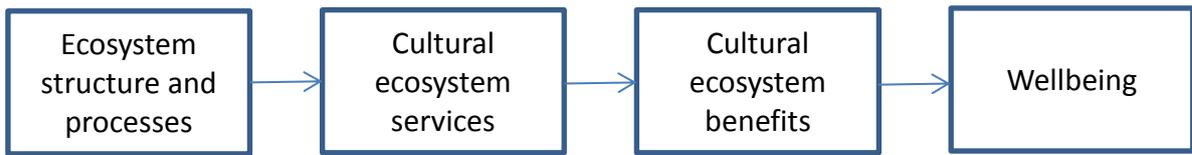
## 1 Introduction

Wessex-BESS is a four year research project exploring the range of ways in which biodiversity in the Wessex Chalk landscape benefits local communities. This prehistoric ritual landscape contains the largest expanse of chalk downland remaining in north-west Europe.



**Figure 1: The Wessex-Bess study-site**

Three workshops exploring social and psychological responses to biodiversity were held in Salisbury, Seend and Amesbury on the 19<sup>th</sup>, 20<sup>th</sup> and 21<sup>st</sup> February 2013. An *ecosystem services* framework was applied (MA, 2005; UK NEA, 2011) to highlight the different contributions that nature makes to wellbeing. The exploratory workshops sought to identify ‘cultural ecosystem services’, i.e. the interactions between people and features of natural places that give rise to cultural benefits. The ultimate aim of the project is to characterise linkages between biodiversity within Wessex-Chalk ecosystems and cultural wellbeing.



**Figure 2: Conceptual framework for cultural ecosystem services generation**

To aid understanding, this document uses the less technical term ‘natural place’ in place of cultural ecosystem services. Past studies show that people engage with natural places through different activities, and subsequently experience different types of cultural benefits (Table 1). This project seeks to differentiate between cultural benefits associated with biodiversity, and those associated with other features of natural places.

**Table 1: Typical features of natural places, outdoor activities, and cultural benefits**

Typical features of natural places	Outdoor activities	Cultural benefits	
		Benefit type	Examples
Ecosystems, habitat types, flora and fauna, biodiversity, topographic, atmospheric and hydrological features heritage assets etc.	Walking, painting, photography, hunting, picnicking, surveying, research etc.	Cognitive	Learning, scientific study
		Creative	Inspiration, aesthetics
		Regenerative	Mental restoration, biophysical health
		Retrospective	Heritage, memories, history
		Intuitive	Connection, faith
		Communicative	Social cohesion, sense of place

Biodiversity is defined as the “variability among living species from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems” (CBD, 1992). It is an important but understudied feature of natural place. The Wessex-Chalk landscape contains a mix of productive arable land, extensively managed restored grassland, and high conservation value ancient grasslands which may be understood to crudely represent area of low, medium and high biodiversity respectively. As such, it provides opportunities to study cultural benefits associated with a *gradient* of grasslands biodiversity on the same soil type. The exploratory workshops explored how people perceive these three types of natural place and the cultural benefits associated with each.

## 2 Method

A total of forty-two people participated in three evening workshops, each lasting two hours. The exploratory workshops were based around three activities (detailed in Section 2.3) and produced a mix of qualitative and spatially explicit results (presented in Section 3).

### 2.1 Key research questions

1. What are the important features of the Wessex-Chalk landscape?
2. At what scale(s) do people perceive biodiversity?
3. What are the key differences between arable, restoring grasslands and ancient grasslands:
  - a. Outdoor activities
  - b. Perceptions of features
  - c. Types of cultural benefits
4. What other variables affect the generation of cultural benefits?

### 2.2 Sample

Workshop participants needed to be accustomed with the Wessex-Chalk landscape, and subsequently a selection criterion was applied; for attendees to have lived or worked in the local area for at least 2 years and to be familiar with the local countryside. Recruitment was achieved through flyers (in town centres), posters (in schools, council offices, nature reserves, libraries) emails (faith groups, local nature organisations, student groups) and social media postings. Minority groups were specifically targeted (religious groups, university groups representing different nationalities) however the workshop cohort was ultimately dominated by white-British people. The gender split was 60% men, 40% women. Participant numbers at each workshop were Salisbury x17, Seend x14 and Amesbury x11.

#### 2.2.1 Participants' employment and group membership

The majority of participants who attended were involved in countryside/nature related employment, hobbies or groups (Table 2). Participants were employed in the following countryside/nature related jobs: farmers (x3), a shoot owner, sculptor, landscape artist, National Trust rangers (x2) and head ranger, RSPB reserve warden, natural environment/ military advisers (x2), senior planner, agricultural college curriculum manager, self-employed gardener, coordinator for an international conservation charity, academic landscape historian, Local Nature Partnership coordinator, Wildlife Trust head of conservation policy, and an AONB project development officer.

**Table 2: Proportion of workshop participants involved in countryside/nature related employment, hobbies or groups**

Workshop location	% who were members of countryside/nature groups	% of participants employed in countryside/nature sector	% of participants with countryside / nature education or training	% of participants with countryside/nature hobbies and activities
Salisbury	76%	35%	29%	76%
Devizes	71%	64%	57%	100%
Amesbury	82%	36%	46%	100%
<b>Total</b>	<b>76%</b>	<b>45%</b>	<b>44%</b>	<b>92%</b>

A high proportion (76%) of workshop participants were members of local, national or international groups. Notably, members of the National Trust, RSPB, Wiltshire Wildlife Trust and Butterfly Conservation attended all three workshops. A number of other groups were represented at the workshop (Table 3).

**Table 3: Groups represented by workshop participants**

<b>International groups:</b> Friends of the Earth, European Society for Environmental History and Local Places, Global Processes
<b>National groups:</b> Soil Association, Woodland Trust, Royal Forestry Society, Plant Life, Mammal Society, Society for Biology, British Ecological Society, Marine Conservation Society, Women's Institute, Royal Horticultural Society, National Sweet Pea Society, Bat Conservation Trust, British Deer Society, National Trust, RSPB, Butterfly Conservation, AHRC Funded Research Network
<b>Regional groups:</b> Wiltshire Bat Group, Wiltshire Ornithological Society, Wiltshire Botanical Society, Wiltshire Wildlife Trust, Wessex Civic Society, South Wiltshire Ramblers, South Wiltshire Agenda 21 Biodiversity Group
<b>Local groups:</b> Porton Down Conservation Group, Pewsey Environmental Action Team, Lacock Photographic Club, Devizes Cyclists' Touring Club, Salisbury Natural History Society, Salisbury Plain Training Area Conservation Group, Devizes Community Area Partnership, Imber Conservation Group, Friends of Bentley Wood, Salisbury Green Space Partnership, Slimbridge Wetland Trust

### 2.2.2 Participants' education and hobbies

Many participants had qualifications in countryside/nature related subjects, including a number of different BSc courses (Environmental Development, Environmental Science, Ecology, Geography, Environmental Biology, Rural Resource Management, Zoology, Conservation Management), a BA (Archaeology), two MSc's (Ecology Evolution and Conservation, Ecology), an MA (Environmental Management), a PhD (Environmental History), two BTEC National Diplomas (Countryside Management, Forestry and Woodland Management); various military training courses, and a number of part-time courses (land management, hydrology, flower arranging, species identification etc.).

A very high proportion of participants (92%) were involved in hobbies related to the countryside/nature, i.e. running, walking, hiking, orienteering, dog walking, cycling,

camping, riding, shooting, hunting, fishing, sketching, photography, floral art, sailing, scuba-diving, surfing, smallholding, horticulture, gardening, archaeology, natural history, reading, nature studies, species identification, ornithology/birding, botany and volunteering (for nature reserve work, countryside management, wardening, monitoring, surveying, promoting community involvement in biodiversity).

### 2.3 Workshop activities

All attendees participated in three workshop activities (Table 4). The terms cultural ecosystem services and biodiversity were defined for participants and a brief plenary discussion took place for these topics. Results from these activities were combined to provide integrated insights into the Wessex-Chalk landscape.

**Table 4: Overview of exploratory workshop data collection**

Workshop activity	Stimulus materials	Data gathered
Activity 1 (a) Landscape features exercise	A4 photographs: wildflowers, clover pasture, cracked earth, hillside, chalk whitehorse carving, hedge/track	Tabulated information on activities and cognitive (learning), creative (freedom), retrospective (reflection) and intuitive (connection) benefits
Activity 1 (b) Species montage exercise	A4 photo montages: bees, spiders, birds, butterflies/moths, mixed invertebrates	Tabulated information on preferences, sensory features, perceived functions, learning opportunities and values
Activity 2 Mapping exercise	Ordnance Survey study-site A0 maps x2, Google Earth study-site A0 photos x2	Map points (entered into GIS) and table of point related activities/perceptions created from commentaries
Activity 3 Landscape diversity exercise	Multiple photos (A1, A2, A3, A4) of ancient grasslands, restoring grasslands and arable farmland; biodiversity info	Qualitative statements on gradient identification, activities, options (for recreation, learning, inspiration), experiences, access, and values

#### 2.3.1 Activity One

Activity one was based upon providing keyword responses to study site photographs. Workshop participants were split into two groups, with one group given a set of six photographs of landscape features, and the other group given five species montages (5A.1). Participants filled in a matrix-style answer sheet for each set of photographs (Appendix 5A.25A.3). Groups later swapped these materials, enabling them to complete both parts of the task. The species montages were named Birds, Spiders, Butterflies and Moths, Bees, and Grasshoppers, Lacewing and Ladybird. Questions were asked to gather perspectives on preferences, sensory features, educational benefits, functions and values related to species groups. The landscape feature photographs were named Wildflowers, White Horse, Hillside, Cracked Earth, Clover,

and Hedge/Track. Questions were asked to gather perspectives on outdoor activities, and cultural benefits (cognitive, creative, retrospective, regenerative, intuitive) related to landscape features.

### **2.3.2 Activity Two**

Activity two was a mapping exercise, which aimed to collect comments relating to specific locations within the study site. Two extra-large Ordnance Survey maps and two extra-large Google Earth pictures (Appendix 5A.4) were pinned to the walls of the workshop venue. Participants placed numbered stickers on the locations of personal interest to them, and wrote comments on their individual answer sheets (Appendix 5A.5). The activity was unstructured to allow issues of high importance to emerge.

### **2.3.3 Activity Three**

Activity three gathered perspectives on biodiversity in the Wessex-Bess study site. Three types of natural place (ancient grasslands, restoring grasslands and arable farmland) were used to represent different gradients of grassland biodiversity. These were displayed using landscape photographs and short 'biodiversity statements' on various topics (Appendix 5A.6). Individuals answered questions related to the natural places on a question sheet (Appendix 5A.7). Questions were asked to elicit perspectives on the differences, options (for benefits and experiences), important features to change and preserve, and the balance between the three types of natural place (arable, restoring grasslands and ancient grasslands).

## **2.4 Analysis**

Question sheets from Activities one (a) and (b) and Activity three were transcribed and analysed using qualitative data analysis software. All map points from Activity two were digitised using ArcGIS software and comments were entered into Excel. All results were then coded according to key research questions (Section 2.1). Workshop results have been treated as one cohesive whole except where there emerged obvious differences between workshops held in different locations (in which case this is clearly indicated).

### 3 Results

Results from different activities have been merged to provide answers to key research questions (Section 2.1). These have been cross referenced with methods sections to show links between particular activities and subsequent findings.

#### 3.1 Important features of natural places

An overview of the important features of the study site was gained through the mapping exercise (Section 2.3.2). Analysis of results showed that participants identified nine feature categories significant to their experience of this area (Table 5).

**Table 5: Broad classes of environmental feature identified through exploratory workshop mapping activity**

Broad feature type	No. of map points	Typical features	Sample of location names marked on map
Urban	70	Settlements, housing developments, roads	'Bulford'; 'B390'; 'Proposed new housing'
Cultural	37	Viewpoints, charities, nature reserves	'Pewsey Downs NNR'; 'RGS walk'; 'Planned bird henge'
Heritage	36	Monuments, hill forts, memorials	'Long Barrow'; 'Old Shaftesbury Drove'; 'Old Sarum'
Hydrological	26	River, stream, lake	'Source of Wylye'; 'The 9 Mile River'; 'Waterways'
Geological	25	Chalk, hill, scarp	'Old quarry (chalk pit)'; 'Tan Hill'; 'Woodford Valley'
Military	25	Training areas, impact zones, airstrips	'Imber village'; 'Impact zone'; 'Military/Porton down training area'
Grasslands	22	Plains, downlands, grassland	'The plain'; 'Coate- meadows'; 'Unimproved grass'
Woodlands	19	Woods, plantation, trees	'Fargo Plantation'; 'Grovely Wood'; 'Savernake forests'
Spiritual	4	Churches, cemeteries, cathedrals	'Wilton church'; 'Everywhere'; 'Devizes cemetery'

These results indicate that whilst biotic (living) parts of ecosystems (woodland, grassland) are important providers of cultural benefits, abiotic (non-living) features (geology, hydrology) are also significant. This is important since Wessex-BESS needs to differentiate between cultural benefits associated with grassland biodiversity, and those associated with other features of natural places. The findings also reveal that people and human artefacts feature frequently in descriptions of settings and associated benefits. Since human societies are considered to be a component of ecosystems (with the urban/rural divide representing landscape diversity at the broadest scale) these findings are also included in this exploratory phase.

Further results are subsequently divided into four sections: i) biotic and ii) abiotic *non*-human features, and iii) biotic and iv) abiotic human features. Whilst it is accepted that the division between these categories is blurred (given human impacts and the co-produced nature of the English countryside) presenting the results this way is most conducive to the overall project aim; to characterise biodiversity-ecosystem service relationships in this multi-functional landscape.

### 3.2 Biotic features

During the mapping exercise, participants identified specific natural places in the study site and provided information on the features of these areas. Map points consequently represent emergent findings on the character of locations important to participants. Of the entire workshop cohort (42 people), 40 participants mentioned biotic features (of differing spatial scales) in their map point commentaries (Table 6).

**Table 6: Biotic features referenced by workshop participants in the Wessex-Bess exploratory workshop mapping activity**

Biotic features referenced by participants				
Landscape	Habitats	Class	Species	
Countryside, wild nature, nature, natural environment, rural, wildlife, landscape	Downlands, grasslands, meadows, plains, ancient grasslands	Birds (also 'rare' birds, 'endangered' birds)	Raven, Red Kites, Stone Curlews, Short Eared Owls, Kingfishers, Nightingale, Tree sparrows, Great Bustard, Sky Larks	
		Butterflies	Marsh Fritillary, Purple Emperor	
		Spiders		
			Fungi	
	Arable land, fields, pasture, grasslands	Flowers (also wildflowers)	Ragwort, borage, snipe, burnt orchids, pyramidal orchids, common spotted orchids, bluebells, corn buttercup, cowslips, blackberries, poppies, scarlet elf cups, himalayan balsam, cowslips, ramsons	
		Trees (also conifers, broadleaves)	Beeches, yews, firs, scots pines	
	Woods, plantation, ancient woodlands, forest			Wild brown trout, white clawed crayfish, algae blooms

These findings show that the *scale* at which participants identified biotic features of natural places is relatively broad when considered in light of core biodiversity definitions (Section 1) which includes diversity between habitats, between species, and within species (including genetic diversity). In the mapping exercise, the vast majority of participant commentaries related to habitat and *between* species diversity, with less reference to within species diversity and no reference to genetic diversity. In the

entire workshop, only 2 references were made to genetic diversity (as something important to protect for future generations).

By far the most pronounced awareness of diversity was linked to a basic dichotomy between urban and rural, seen as the most fundamental manifestation of biodiversity. Comments indicating human impacts such as the ‘naturalness’ of places, the ‘countryside’ (versus urban areas) and places seen as ‘unspoilt’ or ‘wild’ were widespread. Most participants highlighted differences between lowland calcareous grasslands and arable fields. Many participants noted diversity between species, with the biodiversity groups receiving most attention being land plants (80%), birds (36%), and invertebrates (mostly butterflies) (19%). Whilst smaller numbers of participants mentioned mammals, fish, fungi and lichens, and macroalgae (4% - 10%), some biodiversity groups (microorganisms, phytoplankton, bryophytes, amphibians, reptiles) were not present in any responses. Likewise there was a complete absence of reference to genetic diversity in this exercise. A small amount of interest in individual/population behaviour (e.g. starling murmurations, <5%) and single specimen behaviour (e.g. an owl, a fox <10%) was noted however.

Further analysis of comment sheets produced during the mapping activity showed a range of activities and descriptors featured specifically to broad grassland and woodland habitats (Table 7). References were overwhelmingly positive, with only three references to negative experiences (‘weird’, ‘sad’, and ‘disappointed’).

**Table 7: Activities and descriptors featured to broad grassland and woodland habitats**

Feature (habitat)	Outdoor activities		Descriptors	
	Multiple references	Single reference	Multiple references	Single reference
Woodland (19 map points)	Dog walking, walking, riding	Running, exploring, archaeology, education, solitude, social events, viewing, surveying, campaigning	Ancient, great, lovely, brilliant, fantastic	Alone, small, undulating, ancient, natural, superb, inspiring, amazing, stunning, different, changing, weird, sad
Grasslands (22 map points)	Military training, aviation, planning, looking, conservation, listening	Driving, thinking, walking, archaeology, history	Inspiring, great	Refreshing, preserved, fossilised, frozen, ancient, unspoilt, visible, vistas, vast, spectacular, stunning, brilliant, amazing, good, wonderful, lovely, valued, disappointed

These activities and descriptors provide insights into cultural benefits derived from study site situated woodland and grassland habitats. Both habitats are perceived positively by many people, as shown through multiple uses of the term 'great'. Numerous references to woodland as being ancient, and a place to walk and ride indicate that this habitat may provide retrospective and regenerative benefits for many people. Single references to other activities and descriptors indicate that cognitive (education, surveying), creative (exploring, inspiration), and communicative (social events, campaigning) benefits may be experienced by some. Woodlands provide a place to be alone, somewhere that is different and changing, but that can also be experienced as 'weird' or 'sad'. Grasslands may provide creative, cognitive and regenerative benefits for many people, as shown by multiple references to this habitat as being inspiring, as a place for military training, aviation and planning, and for looking, listening and conservation. Single references to other activities and descriptors indicate that retrospective (archaeology, history) benefits may be experienced by some. Grasslands are appreciated from a distance when driving, due to their visibility and vastness. Ancient grasslands are considered well preserved, fossilised, frozen, and unspoilt, and change in this landscape may provoke disappointment amongst some.

### **3.2.1 Biodiversity**

A search was performed on the comment sheet which accompanied map points (Section 2.3.2) for the words biodiversity, diversity, variety, abundance, richness and species. Two participants mentioned the word 'biodiversity'; one in the context of biodiversity being a feature of natural places, and the other related to a point entitled 'everywhere'- *'Each place is just as important as everywhere else, so as to offer a variety and balance within localities, countries and globally. Biodiversity and the support each offers the rest is vital for good human and natural well-being (including clouds, seas and air)'*. One person identified an 'ecologically diverse chalk stream'. Eight participants mentioned the word 'species'; as something that can be present at a place, that can be recorded, and that can be rare or rich. There were no other instances of the remaining words.

During the landscape diversity exercise (Section 2.3.3), participants were asked what natural features of the study site are important to preserve for future generations. Most participants mentioned biotic features at the landscape scale (Table 8). The second most common answer was biodiversity (15 participants). Participants commented that biodiversity should be present in all environments (2 participants), and that grassland biodiversity provides particularly rich flora and fauna (7 participants). The need to maintain biodiversity for future generations was observed by 2 participants (for spiritual wellbeing and food production), one of whom

mentioned the importance of genetic diversity for the future. There was also an observation that correct habitat management would maintain biodiversity, since if you *'manage the habitat correctly biodiversity will manage itself'*.

**Table 8: Features of the study site important to preserve for future generations**

<b>Broad feature type</b>	<b>Typical features</b>	<b>Sample of participants' comments</b>
Nature (6 participants)	Nature, naturalness, the countryside, ecosystems	'Urban sprawl can be a depressing sight, whereas the countryside is uplifting'; 'whole ecosystems need to be maintained-from flowers to insects to attention grabbing top predators like barn owls'
Biodiversity (15 participants)	Biodiversity, grassland biodiversity, flora/ fauna, habitats	'Ideally should be able to experience biodiversity in all environments'; 'we may need genetic variations in the future'; '...loss of pollinators will impact on our ability to grow quality food in the quantity that will be required'
Ancient grasslands (22 participants)	Ancient grasslands, ancient chalk meadows	'That 'open' quality is really rare in Britain'; 'difficult, if not impossible to create'; 'to inspire children...for future generations to study'; 'the most difficult to defend'; '...link them with restoring grasslands'
Restoring grasslands (3 participants)	Restoring grasslands	'Protect from being reverted to arable (otherwise a huge waste)'; 'needed for genetic variation'
Farming (12 participants)	Arable, farming, hedgerows, arable margins	' very important... the population grows the amount of land does not increase'; '...be in touch with where our food comes from, people need a link to the countryside and how their food is made, farms to visit'; 'need less chemicals used on the land-making farming sustainable'
Ancient woodlands (4 participants)	Ancient woods, old trees	'Old trees all gone (hundreds of years)'; 'We must preserve ancient woods as well as grasslands'
Riparian habitats (1 participant)	Riparian habitats	'So important to preserve...'

### 3.2.2 Landscape diversity

Workshop Activity three (Section 2.3.3) produced interesting views on the three types of natural place selected to crudely illustrate differing gradients of biodiversity: ancient grassland (high biodiversity), restoring grasslands (medium biodiversity) and arable farmland (low biodiversity). The workshop also considered two further features common to the study site in detail, those of wildflowers and clover pasture (Section 2.3.1).

Whilst over half the workshop cohort said that they recognised the differences between all three gradients, some participants (13 out of 42) could not distinguish

between restoring and ancient grasslands. Comments were made such as a 'blurring' or 'imprecise differences' between these two parts of the gradient. Other participants observed that the differences were related to *understanding* rather than the 'look' of the grasslands, since people may *'understand the difference but maybe could not identify'*. Some participants commented that discerning the differences between ancient and restoring grasslands requires additional knowledge, and as such *'many of my (untrained) friends would not register/recognise these'*, and *'restoring and ancient is difficult to discern for a layperson'*.

Furthermore, when asked if they considered the balance between arable farmland, restoring grasslands and ancient grasslands to be right, 14 participants said they did not know, six remarked they did not feel informed enough to answer, and one person said it was *'almost impossible to answer as it depends upon your perspective'*. Some of the participants that were able to distinguish between ancient and restoring grasslands (28 out of 42 people) provided helpful details regarding the basis for their recognition. Of these people, 5 revealed they worked in the countryside sector, 1 admitted having a *'passion for the environment'*, and 1 said they were able to discern differences with the help of the materials provided in the workshop.

All participants (except one) associated different cultural benefits with the different natural places. Two people said the *'feeling'* associated with these settings was different, and one said that this was related to *'crossing over energy thresholds'*. One person noted the settings provide 'slightly' different experiences, but that hill gradients were a more important factor than biodiversity. Notably many participants provided the same answers regarding cultural benefits associated with ancient grasslands and restoring grasslands. For these people (15 out of 42) the two merged parts of the gradient provided a 'varied' and 'interesting' environment, which was 'better for wellbeing', 'more inspiring', and provided more opportunities for recreation compared to arable farmland.

The cultural benefit most related to arable farmland was reassurance related to food supply- a type of regenerative benefit (see Table 1). Fields are *'where our food comes from'*; they are *'directly linked to the food chain'*, and associated with *'mass-produced cheap food'*. Some participants mentioned the importance of *experiencing* arable land so that *'people know how their food is produced'*. Other benefits included those from employment, education for school groups, paths for walking/running, adaptable conditions for motorsports, and the opportunities for traditional activities such as shooting and farming. Important features of arable settings were identified through the mapping exercise (14 participants), namely: farms, fields, field boundaries, grazing, crops, irrigation, intensive, organic farming, and crop types (i.e. barley, wheat, flax,

grain, golden corn, linseed). One person did not feel that arable farmland provided cultural benefits however, stating *'a field is just a field'*.

Ancient grasslands were said to be *'versatile'*, *'unspoilt'* and *'unaffected by human activity'*, offering all round better options for experiencing nature (4 participants). They were said to provide the *'best'* recreational experiences (5 participants) and were perceived as *'wonderful for walking'*. Some participants described deriving a sense of inspiration from ancient grasslands (7 participants) such as from *'seeing a colourful display of flowers and also many insects'*. Other cultural benefits associated with this gradient included a sense of history (3 participants), and positive experiences of rare or diverse species and wildlife (6 participants). This was subsequently perceived to be the best of the settings for cognitive and retrospective benefits (7 participants) since ancient grasslands reveal history and nature's *'complexity'*.

Restoring grasslands were perceived to be *'less vulnerable'* and *'not as precious'* as ancient grasslands. They provide creative benefits linked to *achievement* (3 participants) as provide examples of *'what can be achieved with human focus'*. Some participants noted that this gradient represents an *'improving'* setting, where humans are *'rectifying our mistakes'*. Easy access to restoring grasslands was observed to foster close contact where *'people are encouraged to go and get closer to nature'*. This access and the availability of wardens was highlighted as providing group cognitive learning benefits (4 participants) such as school visits *'to see environmental projects in action'*.

The landscape feature exercise also undertook a detailed exploration of outdoor activities and cultural benefits associated with specific features of Wessex-BESS natural places (Table 1): wildflowers, clover, hillside, cracked earth, white horse (chalk carving) and hedge/ track (Section 2.3.1).

**Table 9: Cultural benefits associated with specific landscape features**

Cultural benefit type	Number of participants receiving benefit type for each landscape feature					
	Wildflowers	Clover	Hillside	Cracked earth	Whitehorse	Hedge/ track
Creative	40	26	38	26	36	39
Cognitive	40	28	35	28	34	37
Regenerative	38	29	37	20	34	37
Retrospective	35	26	30	26	40	37
Intuitive	37	37	36	25	35	36
Total	190	146	176	125	179	186

Two of these feature types represent biotic phenomena that link landscape diversity and species diversity, namely: wildflowers and clover (see results summary in Appendix 5A.8). Wildflowers are present in ancient and restoring grasslands and

arable margins, and clover is associated with improved pasture so represents a potential intermediary step between farmland and grasslands.

**Table 10: Cultural benefits associated with wildflowers and clover**

Cultural benefit		Wildflower	Clover
<b>Creative</b>	<b>Inspired to</b>	Create (paintings, drawings, photos), be active (get out), conserve (manage, protect)	Be reflexive, (switch off), conserve (protect)
	<b>Inspired by</b>	Visuals (beauty, colours), diversity (of species, variety of flowers), shape (texture)	Nature (insects), visuals (beauty, light), diversity (of shapes), identity (links to childhood, obtain a different perspective)
<b>Cognitive</b>		Learn about biodiversity, abundance, rare species, plant functions of plants, botany, how to obtain pleasure, feel comforted	Learn about nature, diversity, farming, pollution, and identifying different species
<b>Regenerative</b>	<b>A sense of</b>	Rejuvenation, upliftment, nostalgia, absorption, interest, dreaming and getting away from it all	Switching off, relaxation, a sense of reassurance
	<b>From</b>	Vibrancy, beauty, colours, sounds, smells, diversity, wildflowers, meadows, nature, blue skies, the feeling of enjoyment	Memories of childhood, past summers, previous land-use, natural cycles, opportunities to use imagination
<b>Retrospective</b>		Places visited, past summers, childhood, previous land-use, the origins of the wildflowers, the past and potential for habitat degradation	Different aspects of childhood (e.g. songs, games, adventures and memories of bees), past land-use, archaeology, four leaf clovers
<b>Intuitive</b>		Connected to nature, to God, to life, and to the area	Connected to nature, to nature thus God, to God, the cycle of life, the basis of life, something greater, to the area

Responses for wildflowers were overwhelmingly positive, and participants recognised this feature as providing the highest amount of cultural benefits (Table 9). Notably seventeen people said the image made them feel connected to nature, the greatest of any feature. There was a direct linkage from diversity to creative and regenerative benefits. People particularly enjoyed the colours, beauty, abundance, sense of nostalgia and comfort associated with this image.

Clover inspired links to childhood for many participants, who had fond memories of sitting or lying in clover, or searching for four leaf clovers. This image was associated with farming, relaxing on summer days and picnics, and there were interesting connections to the ‘cycle of life’, the ‘basis of life’ and ‘something greater’.

Significantly more people said they did *not* receive cultural benefits from clover compared to wildflowers.

### 3.2.3 Iconic species

Perceptions of iconic invertebrate and bird species associated with lowland calcareous grasslands were explored through the species montage activity. This exercise identified preferences, sensory features, perceived functions, learning opportunities and values associated with selected lowland calcareous grassland butterfly/ moth, spider, bird, bee, invertebrate species, and supporting flora (5A.9 5A.9-5A.13). Whilst plant species were not the main focus of the exercise, participants were advised to indicate preferences and values for flora in photographs in addition to fauna.

#### 3.2.3.1 Preferences

The majority of participants liked all butterfly/moth, bee species and mixed invertebrate species equally. Generally those that *did* express preferences did so for the more aesthetically pleasing invertebrates with bright colours. 5 participants preferred butterflies to moths '*because of the colour*', and those participants that did prefer some spiders over others based this on aesthetic qualities such as markings, colours, and visual effects of webs covered with dew. Some preferred grasshoppers due to their ability to hop, and other liked ladybirds and bumblebees due to a childhood connection. Participants had well defined preferences for particular species of birds: 9 people said they preferred owls, 2 people Great Bustards, 1 person kestrels, another yellowhammers, and 2 people the 'rarer birds'. A fear of invertebrates prevented some participants from expressing a preference. Only half the workshop cohort said they preferred any of the spider species, and 10 participants stated they did not like any or were scared of all the spiders. Notably one participant with a fear of bees felt their only function was honey making, we cannot learn from bees, it is '*important to get out of their way*', and that '*technically they are friends but I personally think pests*'.

#### 3.2.3.2 Sensory features

Almost all participants liked to see all of the species presented in the montage exercise. The few that did not like seeing particular species (predominantly spiders and bees; mixed invertebrates to a lesser extent) also admitted not liking these creatures. Approximately half the workshop cohort said they liked to hear birds, bees and mixed invertebrates. Particular sounds singled out were bees buzzing, grasshoppers singing, owls hooting at night and the sound of stone curlews. Some people said they liked hearing butterflies/moths and spiders (8 and 2 participants respectively). However, 2 participants remarked you cannot hear butterflies/moths,

and another that you cannot hear UK spider species. Considerably less people liked to touch any of the species featured in montages (no more than 5 participants for any species group). Notably only one person said they liked to touch bees. Whilst 5 participants liked touching butterflies/moths and birds, others said that touching species was 'inappropriate' and 'interfering' with nature.

### **3.2.3.3 Functions**

A number of participants comments that the species presented have 'complex' roles, that we '*have not yet discovered*', and that subsequently '*we may not understand*'. Notably functions featured to bees showed more homogeneity than other species- most participants answered honey production, pollination and pleasure. The most common function featured to all species was to 'be part of' the ecosystem, biodiversity or the natural balance. One person said the function of butterflies and moths was to '*exist and be a part of our world*'. Other common functions were pest control (all species except bees), indicator species (all except bees), pollination (all except spiders), and to be part of the food chain (all except bees and butterflies/moths). Birds, bees and butterflies/moths were said to provide pleasure (particularly through aesthetics). Birds alone were featured with functions of different types of sensory stimulation, game keeping, and having an historic role. Spiders were less easy to ascribe functions to. Approximately half of the workshop cohort agreed spiders have a functional role but did not say what this was, 4 participants said they did not know a functional role of spiders, and two people said that spiders have no functional role.

### **3.2.3.4 Learning**

All participants said we can learn something from butterflies/moths and birds, and all except two agreed that we can learn from spiders and bees. However, almost half of the respondents declined to provide details of what can be learned from mixed invertebrates, indicating these creatures do not provide obvious learning opportunities. All species groups were advised to offer a unique contribution to learning however: butterfly and moths' complex life histories, spiders' web construction, birds' flight, bees' culture, and invertebrates' ability to adapt to their environment. Two types of learning were identified: ecological learning and cultural. All species contribute towards learning about ecosystem health/ quality and interdependencies (including predator/prey relationships). Butterflies/ moths, spider and birds offer opportunities to learn about species behaviour, whilst studying mixed invertebrates can teach us about natural pest management. Species behaviour was perceived to offer cultural learning opportunities. Spiders and mixed invertebrates offer lessons on perseverance, whilst spiders and bees offer opportunities to learn a good work ethic. Bees were observed to provide learning related to food provision,

being calm and living in family communities. Both spiders and birds provide insights used in engineering and aviation respectively, whilst butterflies and mixed invertebrates contribute to the arts.

Almost all participants viewed butterflies and moths as 'friends', because they are 'not harmful' and 'attractive'. Likewise bees were appreciated by all participants (except one) because they are 'crucial', and 'beneficial'. Despite the mixed reactions to spiders, most workshop participants still considered them to be friends. However, whether mixed invertebrates and birds were considered friends or pests was largely related to the effect on agriculture. Five participants said birds and invertebrates can be pests for farmers '*depending on their numbers*'. Nevertheless, the existence of all species groups was considered important (even if we cannot see, hear or touch them) by the vast majority of participants.

### **3.2.3.5 Plants**

In total, 15 references were made to plants shown in the photo montages. One participant advised that '*plants are my living and my hobby*', and subsequently it is plausible that 5 of these (anonymised) references were provided by this singular respondent. Of these references, only 3 identified specific plant species/ types: 'ragwort' (a 'pest'), grass (that animals graze), and wildflowers (without which '*plants butterflies and moths could not exist*'). Most references to plants positioned them in relation to how they support fauna (6 references) e.g. '*plants have a role in sustaining bees*', and '*provide food for animals and birds*'. It was observed that '*the existence of plants is especially important as without habitats can't support species*', and the word 'symbiotic' was used in relation to this. Plants were also positioned in relation to their dependence on invertebrates for pollination (2 references), and how this '*...helps to make the countryside plants survive*'. When associated with spiders, plants were used to offset aversions to these creatures, as 3 participants said they preferred the plants in the montage to the spiders. Plants were also noted to be wild, edible, and something you can smell (one reference each).

### **3.2.3.6 Summary**

The analysis of references to plants shows there were no distinct preferences for specific or combinations of plant species. The vast majority of participants did not comment on the flora in montages, only fauna- showing the dominance of animals in perceptions. Of those that did comment on flora, plants were seen as a whole- a functional group that exist in a symbiotic relationship with fauna as part of an entire ecosystem. The only exception to this was the participant for whom plants were both a hobby and a feature of employment.

There appeared to be a higher number of participants with distinct preferences for bird species than invertebrate and plant species. This may indicate that diversity within this group is of higher importance, and/or that differences between birds are more readily recognised. There was however a notable bias towards owls, which may be related to owls' cultural significance- linked to historical relationships between owls and man and their significance in mythology.

There was little discernment between most of the invertebrate species presented through the montages. Generally, invertebrates were 'all equally appreciated', and were seen as all part of nature. Where there *was* preference elicitation, this was based predominantly on prominent characteristics e.g. bright colours, those with interesting markings, species that hop or make sound. There was some evidence of aversion to spiders and bees, and this affected perceptions of their ecological function and related cultural benefits. Likewise, some invertebrates in large numbers were less appreciated due to impacts upon farming. Bees were, however, perceived especially favourably. Nevertheless, there was a general perception that 'bees make honey', indicating a functional merging of bee species. Again, the only exceptions to this appeared to be participants with a particular hobby, passion or employment linked to the species under review.

### **3.2.4 Cultural diversity**

Wessex-BESS is concerned with biodiversity and ecosystem services sustainability related to lowland calcareous grasslands. Within the ecosystem services framework, human societies are considered to be components of ecosystems. Subsequently, cultural diversity may be considered a subset of within-species (human) biodiversity. This position was echoed by a workshop participant who commented on the importance of acknowledging "*the needs and aspirations of the human part of the biodiverse community*".

Whilst ethnic minorities were not well-represented within the workshop cohort (only one person of African descent attended) participants provided insights into *sub*-cultural diversity relevant to the study site. Skillsets (such as hedge laying, ecological restoration, organic farming etc.) reflect particular discourses which are linked to broader social contexts and spatial locations. Activities and hobbies (such as cross country running, landscape art, horse riding etc.) are effectively sub-cultural groupings of people bound together by common interests. The study site is home to different religious/faith communities represented through the workshops, including Buddhists, Pagans, and Christians '*epitomised and personified by the Cathedral and the spire*'.

### 3.2.4.1 Human activity

During the landscape diversity activity (Section 2.3.3), participants were asked what they would change about the three biodiversity gradients (i.e. arable farmland, restoring grasslands and ancient grasslands). Notably all answers involved human *activities*, such as to restrict, to restore, to protect, or optimise, or to initiate social change. Suggestions included to restrict the area of ancient grasslands ‘*to some sites of value*’ in order to ‘*use more of the land in arable farming*’ (two participants), whilst others suggested increasing the amount of restored grasslands (five participants). A desire to protect ancient grasslands from ‘the plough’ and from ‘the MOD’ was identified (five participants) in addition to optimising multi-functional land-use (four participants). Reducing intensive farming practice was widely desired (fifteen participants) with suggestions to reduce chemical use, collaborate with wildlife organisations, design more mixed farms, use smaller field sizes and develop more field margins. Other desired changes were overtly social (five participants), such as to ‘increase awareness’ of different grasslands and the natural environment, and support farmers with information, encouragement and incentives. Altering social rules in order to increase access to grasslands was also noted (eight participants).

These diverse activities are indicative of the many ways that different human beings interact with natural places. Different sub-cultural perspectives affect different types of change in ecosystems. As such, cultural diversity (e.g. different skillsets, employment and pass times and indicated by outdoor activity types) arguably represent a form of *within species diversity* for humans. The mapping exercise (Section 2.3.2) identified seven broad areas of human activity occurring within the study site, namely: history, science, archaeology, education, farming, military and conservation. In addition to these broad areas of activity, 49 separate activities were identified through the mapping activity (Table 11).

**Table 11: Activity types associated with study site**

Activity type	Examples provided by participants
General outdoor activities	High Riding, running, cycling
	Moderate Walking, dog walking, tree climbing, exploring
	Low Sitting, picnicking, bird watching, writing, photography, painting, driving
Existential	Looking, listening, feeling, experiencing, thinking, remembering, being
Traditional	Game bird rearing, hunting, thatching, Morris dancing, foraging
Unconventional	Building crop circles, poaching, eviction, fly tipping, protesting
Military	Training, parachuting, flying
Conservation	Recording, surveying, planting, re-establishing, restoring
Social	Family days out, volunteering, working, meeting, campaigning, research
Land management	Planning, leasing, managing, funding

In general terms, traditional activities (e.g. game bird rearing, hunting, thatching and foraging) and some unconventional activities (crop circling and poaching) were associated with agricultural land and field margins. Multiple participants referred to other unconventional activities (e.g. protesting and eviction) in connection with military activities and a single site/ event: the occupation of Imber village situated within Salisbury Plain. Military activities were fundamentally linked to ancient grasslands, whilst conservation activities were linked both to restoring and ancient grasslands. Land management, social, general outdoor and existential activities were distributed between all three biodiversity gradients associated with the study site. Spiritual activities were underrepresented (four references), and where identified converged largely with heritage activities such as remembering, scattering ashes, and archaeology.

### 3.2.4.2 Language

Participants used a wide variety of adjectives to describe natural places within the study site (Table 12).

**Table 12: Words used to describe natural places within the study site**

Descriptors of landscape change and human impacts	Fixed, destroyed, extinct, flooding
	Ancient, historic, old-fashioned, relic, prehistoric, long ago, old
	Unspoilt, influence, natural, wild, countryside, spoiled
Landscape descriptors and associated sensations	Unintegrated, part of the landscape, all, NIMBY, inappropriate, linked, overshadowed, balance, close, ballooning
	Socially orientated, different groups, protest, campaigns, support, problems, alone
	Steep, sculptural, rolling, meandering, vistas, panoramic, open, undulating, deep, space, vast, extensive, great, imposing, small
Time and events	Sense, feel, smell, fragrant, atmospheric, visible, colder, beautiful, pretty, hideous, stunning
	Peaceful, quiet, tranquil, tranquillity, easy feel, relaxed, busy, haven, inspiring, refreshing, interesting, fascinating
	Magnificent, outstanding, spectacular, amazing, impressive, brilliant, superb, fantastic, awesome, wonderful, superb, good, nice, awful
Time and events	Different, variety, special, rarity, important, unusual, rare, internationally significant, typical, vital
	Previous use, land-use for hundreds of years, sense of history, the landscape of pre-modern times, fossilised landscape, ancient site Bronze Age, Iron Age, the 1960s, prehistory
	Birthplace of military aviation, processional route, archaeological site World War I, World War II, Control of the tribes 1985, Imber eviction

Language use can be understood as a form of cultural diversity, since it differentiates particular human populations from one another. As such, different discourses can be understood to reflect subsets of within species (i.e. human) biodiversity. Analysis of

language associated with the natural environment can be a way of understanding cultural benefits and associated emotions. This analysis shows that landscape change can create mixed emotional reactions, with the zones between urban and natural areas being of particular concern. In many cases, positive emotions were associated with landscape features providing a sense of vastness, magnificence, tranquillity, rarity, connection to the past, or exceptional sensory stimuli (such as beauty or fragrance).

### **3.2.4.3 Identity and emotion**

Analysis of map point commentaries revealed many references to personal experience, memories, or other features linked to participants' identities. Identity forming activities are indicative of cultural diversity at a micro level. Examples included map points entitled '*my home*', '*I work here*', or '*where I grew up*', and existential activities linked to particular locations- places to look, listen, feel, experience, think, remember, or be alone. For many participants, particular locations were repositories of memories, as shown by statements such as "*twelve years ago I saw the most magnificent blood red sunrise I had ever seen*", or "*memories of a warm summer evening, picnicking, listening to nightingales increasing in volume as dusk fell and other birdsong faded away*".

Some map point commentaries included references to emotional states, such as the deriving of 'pleasure', 'enjoyment', or conversely 'disappointment', 'sadness' or 'pity' related to specific spatial locations. Interestingly such emotions were often linked to land-use change which was perceived to make places 'better' or 'worse', and which people 'protested' against or 'appreciated'. Some locations were described as being 'familiar' and 'well used', or 'unknown', 'weird' and 'strange', and could invoke unusual sensations shown by the use of terms such as 'surreal', 'danger', 'magical', 'special' or 'spiritual'. Most significantly a number of polar opposites were detected amongst participants' statements, including the words 'love' and 'hate', features that 'detract' from or 'contribute' to happiness, features that are 'positive' or 'negative', and things that are 'valued' or 'undervalued'.

### **3.2.4.4 Access**

Access rights can be understood as the collective manifestation of social rules on tenure and land sharing. Since rights vary across locations, they may be regarded as a form of human behaviour (territoriality) which again provides insights into within species (human) diversity.

The workshop explored participants' feelings towards access in the study sites (Section 2.3.3). When asked whether access to natural places is necessary to obtain benefits,

eighteen participants replied no, eleven replied no but access provides more benefits are acquired with access, seven replied yes, and six people said yes but only limited access is needed (Table 13).

**Table 13: Is access to natural places necessary to obtain benefits?**

Is access to natural places necessary to obtain benefits?	
No, access is not needed (eighteen participants)	
Access is not required for multiple benefits	'we get 'secondary' benefits- clean air, clean water'; 'people who never visit... but receive water from the aquifer'
We receive benefits from biodiversity without access	'biodiversity will have benefits beyond these areas'
Benefits of food production without access	'I do not need to walk in a wheat field to eat bread'; 'arable farming should not be available for open access'
Access can be unhelpful for nature	'If we had access to all the landscape the disturbance to wildlife would be disastrous. You can appreciate the beauty and diversity from afar'
Yes, but only limited access needed (six participants)	
Spatial limits are acceptable	'walking alongside is almost as good'; 'some may need to be restricted for protection'; 'footpaths are not free walking space'
Temporal limits are acceptable	'We need access to arable for planting/ harvesting'; 'need short periods of access to restoring/ ancient for seeding and identification'
Social limits are acceptable	'I personally do (need access) but the wider population do not'
No, but access provides more benefits (eleven participants)	
More benefits are gained if there is access	'provides additional/benefits to individuals and society e.g. educational, health and well-being, spirituality, exercise'
First-hand experience is best	'for the best experience actually being there is the magic!'; 'there is nothing quite like the first-hand experience'
Access increases effect	'direct access can give a much stronger benefit'; 'people will not value what they don't experience'
Access is needed to increase understanding	'access and experience is vital to promote understanding, from food production to biodiversity'; 'Access improves understanding and experience of the nature of the world'
Yes, full access is needed (seven participants)	
First-hand experience (immersion) is essential	'you need to be 'in' them'
Access increases effect	'availability of access makes the ancient grasslands of Salisbury Plain better for recreation and learning'
Access is needed to increase understanding	'to understand the differences, pros/ cons and conflicting issues e.g. food supply re biodiversity'
Access is a right	'people should be able to access them. Even MOD offers access to the Salisbury Plain Training Area'; 'to ensure the public has a stake in the landscape'

Participants' comments show that access is positively linked to cultural benefits. Those participants who felt access was *not* needed listed clean air, fresh water, biodiversity

and food production as the benefits that can be derived without public access. Those that suggested only *limited* access is needed did so in the context of farming and conservation, not recreation. However, knowing that these ecosystem services were being provided gave a type of assurance that may be classed as a cultural benefit.

Those that suggested that access provides *more* benefits or is a prerequisite for benefits listed solely cultural gains, such as well-being, understanding, experience, and rights/values. Walking 'alongside' was perceived as '*almost as good*' as having full access. No participants suggested any cultural benefits that could be gained directly without any form of access, other than reassurance from knowing clean air, water, food and habitats are provided by nature. This indicates that primary experience of natural places is essential for most cultural benefits apart from that of 'reassurance' related to resource supply and the existence value of other species.

Despite the need for access to ensure flows of cultural benefits, all participants agreed that ancient grasslands, restoring grasslands and arable farmland would be considered important even if inaccessible. Reasons given include their importance as habitat for species (ten participants), for the maintenance of biodiversity (five participants), for food production (eleven participants) for ecosystem services (eight participants) and for future generations (six participants). All these reasons are associated with the survival of the human species. It was commented that without habitats '*individual species and humans are jeopardised*', and '*biodiversity in nature provides us with ecosystem services*'. Participants observed that '*arable farming equals food*', a 'vital' process since '*we depend on food*'. The word 'depend' was used in relation to biodiversity, to nature and to ecological functions. However, the intrinsic value of nature (aside from human needs) was also noted, since '*biodiversity is about more than human observation*'.

### **3.3 Abiotic features**

Emergent results (detailed in Table 5) showed that diverse abiotic (non-living) features (e.g. geology, hydrology) are also significant in the provision of cultural benefits. Abiotic features of natural places were identified at a landscape level through the mapping and landscape diversity activities (Sections 2.3.2 and 2.3.3), and at a detailed level through the landscape feature activity (Section 2.3.1).

When asked what non-biodiverse features of the Wiltshire countryside were important (workshop activity three), participants cited hydrological features such as rivers, chalk streams, canals (6 participants); topographic features such as landscape shape, contours, hills and scarps (9 participants); and atmospheric features such as light, space, fresh air, 'outdoorsyness' and views (9 participants). It was suggested that

space may be ‘more inspiring than the flora and fauna’ which was demarcated as a place “...uninhabited by humans’.

The importance of ‘geodiverse’, ‘hydrodiverse’ and ‘atmodiverse’ features also emerged through the mapping exercise (Table 14). Notably a temporal dimension was identified to be important, such as time of day, time of the lunar cycle, seasonality and ancientness.

**Table 14: Abiotic features referenced by participants in mapping exercise**

Abiotic feature type	Examples referred to by participants
Topography	Hills, hill tops, mountain, valley, open space, openness, escarpment, slopes, ridge, stone, scarp
Soils	Acid soil, chalk soil, clay soil, earth, mud
Hydrology	Water, river sources, river flow, floodplain, flooding, headwaters, watercourses, catchment, tributaries, canal, pond, lakes, fenland, pool, ford, sea, stream, swamp island, riverside, water meadows, wetlands, river system, fenland
Atmospheric conditions/ climate	Fresh air, open skies, mist, clouds, air, warmth, rain, gales, fire
Time	Dusk, evening, sunrise, moonlight, full moon
	Summer, winter, spring, autumn, seasonal variation
	Ancient woodland, ancient wood pasture, ancient wetlands, ancient chalk landscape, ancient yew trees

An analysis was undertaken of activities and descriptive language associated with geological and hydrological features (Table 15) identified through the mapping exercise (Section 2.3.2). Numerous participants associated both ‘views’ and ‘walking’ with these features of the Wessex landscape. Geological features were referred to as pretty, inspiring and great, whilst hydrological features were perceived as ‘unspoilt’ but under threat by multiple participants. Generally geological features of natural places important to participants were perceived as sculptural, awe inspiring and beautiful. Water features were known for bird watching and conservation, and perceived to be tranquil places that are under pressure from land-use change.

**Table 15: Activities and descriptors featured to geological and hydrological features**

Main feature type	Activities		Descriptors	
	Multiple references	Single reference	Multiple references	Single reference
Geological (25 match points)	Viewing, walking, cycling	Arts, education, conservation	Wonderful, inspiring, loved, great, good, pretty	Steep, sculptural, meandering, amazing, awesome, magnificent, atmospheric, quiet, ancient, appreciated, panoramic, pretty, beautiful, spoiled

Hydrological (26 map points)	Viewing, conservation, bird watching, walking	History, photography, planning, sitting, listening, swimming, farming, volunteering, planting, exploring	Unspoilt	Peaceful, tranquil, natural, changing, full-of-life, linked, special, protected, beautiful, attractive, lovely, enjoyed, nice, great, good, old-fashioned, old, extinct, drastic, worse, sadly
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Geological and hydrological features make an important contribution to the perceptions and cultural benefits associated with Salisbury Plain. Subsequently it is plausible that geodiversity and hydro-diversity provide cultural benefits both directly (through direct engagement), and indirectly as support for biotic features that people engage directly with.

Detailed responses were sought on two images associated with the study-site, these being a hillside and cracked earth (see summary in Appendix 5A.14).

Cultural benefit		Hillside	Cracked earth
<b>Creative</b>	<b>Inspired to</b>	Be active (climb, glide), discover (explore, experience)	Conserve (add mulch, be hopeful, concerned), to create (patterns, paintings, drawings, photos)
	<b>Inspired by</b>	Nature (wild landscape, raw nature, natural world, grassland), shape (sculptural quality of hills, open space)	Visuals (patterns, beauty), nature (surviving species), shape
<b>Cognitive</b>		Learn about land-use, geology, hydrology, botany, entomology, ecology, diversity, the importance of first-hand experience, peacefulness, enjoyment, curiosity and self	Learn about soil types, ecosystems, natural fluctuations, colonialisation, climate change, human impacts, efficient water use and survival
<b>Regenerative</b>	<b>A sense of</b>	Fun, imagination freedom	Despair, worry
	<b>From</b>	Open space, sky, hills, altitude, the breeze, the sound of the wind, the sound of wildlife, peacefulness, exertion and activity	
<b>Retrospective</b>		Childhood, places visited, the past, people of the past and previous land-use	Natural cycles (water and vegetation), climate change, places visited before, childhood, and self
<b>Intuitive</b>		Connected to nature, free as a bird, to God, to the wonder of the universe, simplicity,	Connected to nature, nature destroyed, our responsibility as caretakers not controllers of

	grounded and at one with the Earth, to the area, a sense of belonging, very much a Wiltshire feature	nature, despite the drought life will continue, connected to the area
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The image of a hillside was linked with active and adventure sports. Participants identified creative benefits from the ‘raw’, ‘wild’ and ‘sculptural’ landscape, whilst regenerative benefits were derived from features relating to ‘space’ (i.e. openness, sky, hills, altitude, the breeze, and the sound of the wind). Relatively high number of people felt no sense of retrospective benefits with this image. There were however some interesting intuitive benefits: feelings of being ‘free as a bird’, connected to the ‘wonder of the universe’, to ‘simplicity’, feeling ‘grounded and at one with the earth’, and a ‘sense of belonging’.

The image of cracked earth inspired many adverse comments- such as a sense of sadness, concern, and high numbers of people receiving no cultural benefits. The image was associated with drought, undesirable human impacts and climate change. Twenty-two people said no they associated no regenerative benefits with this image, the highest amount of negative answers for any feature/ benefit combination. It was the only image where nobody felt connected to God. This was effectively the opposite to the image of wildflowers, which was perceived to reflect abundance and high levels of regenerative benefits. However, there was some evidence of ‘hope’ associated with cracked earth, such as ‘despite the drought life will continue’. Participants were inspired by the small amount of vegetation, and one felt happy as spotted a spider hiding in the crevice. Many participants also derived a sense of creative beauty from the pattern created by the crack. Cracked earth was said to provide opportunities for learning about natural cycles, soil types and the efficient use of resources, and connected us to nature as ‘responsible caretakers’ not ‘controllers’.

### 3.3.1 Abiotic cultural features

One implication of including cultural diversity within the definition of ‘within species’ biodiversity is that the human built environment should also be considered part of ecosystem structure. Urban features were reported by twenty eight participants in the mapping exercise (Section 2.3.2) and were identified in forty-nine per cent of map points (Table 16).

**Table 16: Urban features referenced by participants in mapping exercise**

Urban feature types	Examples of features referenced by participants
Settlements	City, town, villages, settlement, urban encroachment, housing development, proposed housing, greenfield site, urbanisation, my home, people's homes, houses, where people live, housing estate, homes, gardens, light pollution

Green infrastructure	Green Infrastructure, gardens, parks, parkland, nature reserves, birdhenge, sports pitches
Transport infrastructure	Subway, bridge, road, main road, canal, footpath, railway line, locks, bypass, byway, track, road sign
Commercial infrastructure	Industrial area, commerce, place of work, local infrastructure, the council, quarry, racecourse, village hall, kennels, charity HQ
Military infrastructure	Army personnel recruiting centre, army base, UK land forces HQ, Porton Science Park, army air corps centre, airfield, MoD buildings, unexploded ordnance, garrison towns, MOD barracks, headquarters of defence estate infrastructure, military area
Absence of infrastructure	No roads, no buildings, lack of houses and dwellings, empty properties, aloneness public access,

The built environment is not exclusively abiotic, since it includes biotic features such as street trees, urban parks and private gardens. However, since urban natural places do not usually include arable farmland, restoring or ancient grasslands these settings are not the main focus of the Wessex-BESS project. However, given the importance given to the urban environment by participants (revealed by emergent mapping activity results) it may be necessary to consider whether cultural benefits derived from interacting with non-human features of natural places are substitutable with those from the built environment; e.g. inspiration from a landscape scene versus inspiration from an art gallery.

The most important aspect of the built environment related to heritage assets, and subsequent connections to past generations, Heritage features, (Table 17) were frequently referred to in both the mapping activity and landscape diversity activity (Section 2.3.2 and 2.3.3).

**Table 17: Heritage features referenced by participants in mapping exercise**

Heritage features types		Examples of features referenced by participants
Heritage assets	General	Historic mills, hill forts, barrows, long barrows, tumuli, earthworks, ancient sheep drove, roman road, castle, ruined cathedral, listed building, flying accident memorial, white horse, chalk carving, cemetery , graves, war graves, graves, church, manor house, museum
	Specific	Imber, Bulford Kiwi, The Robbers Stone, Old Sarum, Avebury, Stonehenge, Salisbury Cathedral, Giants Grave, Kings Barrows, Woodhenge, Wansdyke Earthworks, The Grange, Vespasian's Camp, Tedworth House, Clarendon Park, Figbury Rings Monument,

When asked for examples of important features of the Wiltshire countryside not related to biodiversity (landscape diversity activity), thirty eight references related to heritage assets such as Stonehenge, Avebury, chalk figures, hill forts, barrows, and drove roads. The view of white horse chalk figures cut into hillsides was advised to be

particularly significant for local people (six participants). The ‘cultural landscape’ of Wessex was noted to provide ‘historic context’ for the entire study site, by revealing the remains of previous occupation, land management and the early activities of man. One participant made the comment that ‘*Wiltshire has intensely cultural landscapes. The biodiversity itself is closely linked to past cultural use of the land*’. This is significant as shows that biodiversity and retrospective cultural benefits may be linked, since the presence of current biotic features may unlock insights into past human activities for some.

Two iconic images of the environmental setting that related to cultural heritage were explored in more detail, these being a white horse chalk figure and a hedge and track (see summary in Appendix 5A.15).

Cultural benefit		Whitehorse	Hedge and track
<b>Creative</b>	<b>Inspired to</b>	Be active (walk), discover (visit other horses, explore) create (drawings, forms), be reflexive (reflect, think about future)	Discover (explore), be active (walk), create (paintings, drawings, sloe gin, photos), be reflexive (reminisce, think about things, obtain clarity)
	<b>Inspired by</b>	Identity (familiarity of horses, relationship to other horses, history, identity), nature, the unknown (what lies over the hill, the unseen)	Visuals (beauty, attractiveness, scenery, patterns) nature (trees, woodlands, sky,) shapes (within the landscape), diversity (of habitats), the track
<b>Cognitive</b>		Learn about nature, ecology, botany, ornithology, solitude, appreciation, wonder, timelessness, art, and self.	Learn about nature, birds, botany, wild edibles, the origins/history of the track and about peacefulness
<b>Regenerative</b>	<b>A sense of</b>	Specialness	Exploration, relaxation, losing yourself, being in touch with nature
	<b>From</b>	Hills, the altitude, open space, the sky, fresh air, sunshine, the horizon, the view, local history, Wiltshire whitehorses	What lies over the hill that is unseen, where the track leads, the peaceful surroundings, open space, nature, and activity people are involved in
<b>Retrospective</b>		The past, the people of the past, the origins of the Whitehorse	The past, places visited, childhood, identity, people of the past, previous land-use and the origins of the track and hedge
<b>Intuitive</b>		Connected to nature, grounded and at one with the Earth, connected to the area	Connected to nature, to God, to the area

The whitehorse was associated primarily with archaeological and historical activities. A number of participants mentioned the local symbolism of the image, and a sense of identity, and thirteen people said the image made them feel connected to the area. This horse was seen in the context of the *set* of white horses across Wiltshire. Creative benefits were linked with the horse, whilst a single specified regenerative benefit (specialness) was linked to the open setting of the horse- hills, altitude, open space, sky, air, sunshine and the horizon. Most people associated the image with retrospective benefits (only two participants experience no benefits of this type) such as reflections on ones' own past, the people of the past, and the origins of the horse.

For many people this image the hedge and track typified links between people and nature, and a convergence of past and present. It was queried whether this was a drovers' route, and the image was linked with working the land. There were three unique activities associated this image; farm access, bird watching and foraging. Almost equal numbers of participants felt a sense of connectedness to both the area and to nature from the hedge and track image, and creative benefits were derived from the diversity of habitats types. Regenerative benefits such as exploration, 'losing yourself' and being 'in touch' with nature were associated with questions raised by image (what lies over the hill, where the track leads, and what's in the hedge?) Retrospective benefits were connected to past land-use, people of the past, the origins of the track and participants' childhood memories.

## 4 Synthesis

### 4.1 What are the important features of the Wessex-Chalk landscape?

The design of the workshop mapping exercise (Activity 2) allowed features of importance to participants to emerge from results. This activity identified eight types of landscape feature salient in experiences of the Wessex-Bess area: geological, hydrological, woodlands, grasslands, heritage, spiritual, urban, cultural and military features.

If the number of map points allocated to each type of feature may be taken as an indication of that feature's relative importance, then these results indicate that human built features (urban, cultural, heritage and military) dominate perceptions of the study site. Abiotic (non-living) features are of next highest importance, whilst biotic features (grasslands and woodlands) carry the least weighting.

When cultural diversity is included within the definition of biodiversity (as a subset of within species biodiversity) then human built features could be regarded as part of ecosystem structure. However, since urban places do not usually include arable farmland, restoring or ancient grasslands, these do not form part of the main focus of the Wessex-Bess project. Nevertheless, these results may suggest that the project needs to identify whether cultural benefits derived from non-human features are substitutable with those from the human built environment.

The importance of grasslands was primarily linked to this being an ancient, preserved, fossilized landscape, associated with history and archaeology. Grasslands biodiversity was considered somewhat important, but was less referenced in unstructured parts of the workshop. This would indicate that, for many participants, biodiversity is not an immediate frame of reference used to detail the important features of this site, especially compared to heritage values. Other non-human features of particular importance were hills, riparian habitats, and openness. Biodiversity was considered an important feature to preserve for future generations (3.2.1) and is discussed in further detail below.

Workshop results show that heritage features were very important in this location (3.3.1), with timescales ranging from prehistoric through to World War I and II. The most important heritage assets were Stonehenge, Avebury, Wiltshire chalk figures, hill forts, barrows, and drove roads. For some of these assets, the natural (thus biodiverse) setting was seen as an important part of the heritage experience (link to white horse exercise). The presence of biotic features could, for some participants, unlock insights into past human activities and land use. This indicates that the project

may hence need to look at interrelationships between heritage and natural places, and whether levels of biodiversity enhance retrospective cultural benefits.

## **4.2 How do people perceive biodiversity?**

There appeared to be some differences between participants' understanding of biodiversity and the commonly cited definition (CBD, 192). For many participants, biodiversity was understood holistically, in terms of a 'whole ecosystem' (ref 2.3.2). Whilst there were a number of references to 'indicator species' (activity 1), on the whole, measures such as species richness and diversity were not mentioned by the majority of participants. The use of scientific biodiversity terminology appeared to be linked to formal and informal training. No participants referred to micro-organisms, phytoplankton, bryophytes, amphibians or reptiles in relation to this study site.

The dominant definition of biodiversity recognises diversity at three levels: between ecosystem, between species and within species (including genetic diversity). The vast majority of participants gave details of biotic (living) features at the larger of these three scales (3.2). Most participants identified particular habitat types and broad classes of species. There was, however, little reference to within species diversity, and only two mentions of genetic diversity in the entire workshop. Furthermore, two larger features of diversity were significant in participant comments, that of an urban-rural divide, and a land-sky divide. This might indicate that ecology experts may perceive biodiversity at a subtler level of detail than non-experts, who perceive diversity at a broader level. Natural features recognised at a larger scale (e.g. countryside, fields, grasslands) were generally connected with varied outdoor activities, whilst those recognised at a subtler scale (e.g. specific species) were associated with 'identification' activities, such as botany, entomology, ornithology and foraging.

## **4.3 What are the key differences between natural places within the study site?**

### **4.3.1 Outdoor activities**

There were seven broad areas of human activity occurring within the study site, namely: history, science, archaeology, education, farming, military and conservation, and forty-nine separate activities (categorised as high/ moderate/ low intensity, existential, traditional, unconventional, military, conservation, social and land management activities). Land management, social, general outdoor and existential activities were distributed between all three biodiversity gradients (arable, restoring grassland and ancient grassland). There were specific activities were associated with each habitat type. Agricultural land and field margins were linked with traditional activities (e.g. game bird rearing, hunting, thatching and foraging) and some

unconventional activities (crop circling and poaching). Military activities were fundamentally linked to ancient grasslands, and included protesting and eviction regarding the occupation of Imber village. On-going conservation activities were associated with restoring and ancient grasslands, and a desire for *more* conservation associated with farmland.

#### **4.3.2 Perceptions of natural features**

Just under half the workshop cohort had difficulties distinguishing between ancient and restoring grasslands, and many people advised that their experience of both these places was the same. This indicates that, for many people, the amount of biodiversity in grasslands is not perceptible and/or especially relevant to cultural benefit generation. There was however, a perceptible and important difference between experiences of arable and grasslands, with grasslands were seen as more varied, interesting, inspiring, better for wellbeing and providing more recreational opportunities than arable (3.2.1).

Where experiences of restoring and ancient grasslands did differ, this was crudely linked to biodiversity. Other than heritage, the features of ancient grasslands most appreciated by participants included colourful flowers, insects, rare species, and general wildlife (3.2.2), and these were often perceived as wild, raw and natural 3.2.1. The important features of restoring grasslands were predominantly cultural. Restoring grasslands provide particularly good access, and wardening services which support group educational activities. These were also seen as 'improving' places, place where humans 'rectify their mistakes' through management. Defining features of arable land were farms, fields, field boundaries, different crop types (i.e. barley, wheat, flax, grain, golden corn, linseed) and intensive management practices (3.2.2).

Workshop activities which explored specific landscape features showed some evidence of relationships between levels of diversity and cultural benefits (ref). Wildflowers were identified to provide the highest amount of cultural benefits, followed closely by the hedge and track. Participants described both these images as diverse, and there was a noticeable connection between biodiversity and creative/regenerative benefits. The mid-range of cultural benefits accrued from the white horse and hillside images, and the broad features of importance here were geodiversity, cultural diversity, and land/sky diversity. The least cultural benefits were related to what were arguably the least diverse images: namely clover and cracked earth. Comparison of the two images which represent the most and least amounts of biodiversity (wildflowers and cracked earth) also happen to present the highest and lowest scores for different cultural benefits.

Workshop activities which explored perceptions of different species groups showed that most participants had no distinct preferences for any particular plant species. There were very few comments which related to flora, and of those provided, plants were generally seen as part of a functional whole rather than distinct sources of cultural benefits. Only one participant provided detailed comments on plants, and this individual admitted having a particular passion for plant identification, and was employed in a related area.

The majority of participants liked all butterfly/moth, bee and mixed invertebrate species equally (3.2.3.1). Generally where people *did* express preferences for particular species, this was for those with extraordinary sensory features e.g. bright colours, interesting markings, species that hop or make sound. Regarding birds, some participants expressed a preference for rare birds, and there was also a notable bias towards owls which may be related to the symbolism and historical significance of these birds. Bees were perceived especially favourably, and there was considerable more homogeneity in the functions ascribed to bees than any other species. However, many participants noted that 'bees make honey', indicating (for some) a functional merging of *all* bee species.

Whilst almost all participants viewed butterflies, moths, bees and spiders as 'friends', the perception of mixed invertebrates and birds as friends or pests was largely related to the effect on agriculture, and numbers of creatures involved. The existence of all species groups was however, considered important by the vast majority of participants. Fear (e.g. of spiders and bees) noticeably affected preferences for particular species, and often feared species were also perceived by those participants as having less functional roles than attractive species. Almost all participants liked to see species (3.2.3.2). Approximately half the workshop cohort said they liked to hear different creatures, and some identified 'iconic sounds' such as bees buzzing, grasshoppers singing, owls hooting, and the call of stone curlews. Only a few participants expressed a desire to touch different creatures, and some felt touching species was 'inappropriate' and 'interfering' with nature.

### **4.3.3 Types of cultural benefits**

#### **4.3.3.1 Intuitive benefits**

Intuitive benefits related to biodiversity were expressed in different ways by different individuals. However, a key theme was that of holism- biodiversity as an inseparable part of a whole, unified feature rather than being one separable component of that whole. This was expressed through references to the importance of the connections between things, and relationships to the wider universe and something greater. Biodiversity was identified as the basis of life, that which sustains life, and as

representative of the cycles of life. Natural images provoked sensations of simplicity and belonging which helped people feel connected or grounded to the earth. In some workshop activities, intuitive benefits were expressed in relation to abundance, and there was a noticeable c

Three different religious perspectives were offered on biodiversity. A Buddhist contribution presented biodiversity as part of an interconnected and complete totality. A Pagan perspective on the three featured landscapes in the biodiversity gradient defined these as offering 'different energy thresholds'. A Christian perspective focused on the stewardship responsibilities of caring for as opposed to controlling biodiversity. One person reported feeling 'put off' by the question associating nature and God, whilst another felt these two were the same ('connected to nature and thus to God'). Interestingly some participants reported experiencing a sense of connectedness for all landscape features, whilst others reported no connectedness across all features. This may indicate that for some people, experiencing a sense of connectedness is a reflection of personal characteristics rather than something inspired by specific features of natural places.

#### **4.3.3.2 Cognitive benefits**

Cognitive benefits centred on two types of learning opportunity provided by biodiversity: ecological learning and cultural learning. Examples of ecological learning included using species as indicators of the health of ecosystems, monitoring and surveying activities, impacts and interdependencies, species behaviour and predator-prey relationships. All species and grassland types were perceived to contribute towards learning about ecosystems (generally), with ancient grasslands and wildflowers offering the most cognitive benefits. Interestingly the negative perceptions associated with the 'cracked earth' image still inspired desire to learn about nature, particularly soil types, natural fluctuations, colonisation and climate change.

Observing species behaviour was perceived to offer opportunities for cultural learning, such as perseverance, a good work ethic, well-functioning family communities, and informative contributions to engineering and the arts. Additionally all species groups were advised to offer a unique contribution to learning, such as butterfly and moths' complex life histories, spiders' web construction, birds' flight, bees' culture, and invertebrates' ability to adapt to their environment. Landscapes offered cultural learning related to identity, such as learning about pleasure and comfort, solitude, timelessness, peacefulness survival and the importance of experience.

#### 4.3.3.3 Regenerative benefits

Whilst some reference was made to the exertion and exercise related to outdoor activities, the majority of regenerative benefits described were psychological. Participants associated many of the images of natural places with feeling relaxed, and 'switching off'. The features of natural places enabled people to dream, use their imagination, 'get away from it all', and become absorbed in their surroundings. All natural images did this to some extent, although distinct experiences were associated with particular features. In all cases it appears that a richness of stimuli was related to regenerative benefits. The abundance, diversity, beauty, colours, sounds and smells linked with wildflowers made people feel 'rejuvenated'. Clover was connected to childhood, and summertime, invoking a deep sense of nostalgia that made some feel 'uplifted'. The whitehorse made some participants feel 'special', and this was connected to the significance of local chalk figures, and the hills, altitude, open space, sky, sunshine, and horizon.

A particularly interested finding emerged from analysis of the benefits associated with different biodiversity gradients. Many participants described a sense of *reassurance* connected to the continued and plentiful supply of ecosystem services. For arable farmland, this related to food supply, and for ancient grassland this related to biodiversity supporting 'vital' ecosystem services. This reassurance is understood to be a form of regenerative benefit since humans need to have access to high quality resources (such as food) for physical health. Growing food and eating are fundamentally linked to the regeneration of the physical body, whilst biodiversity regenerates land, and contributes towards clean water and other services. As such, confidence in (abundant) resource supplies could be an important component of wellbeing. Conversely, a *lack* of resource was found to cause the opposite of regeneration, as seen by responses to the image of 'cracked earth' which were associated with drought, 'despair' and 'worry', and the negative implications of not growing enough food to feed a growing population.

#### 4.3.3.4 Retrospective benefits

There were predominantly two different types of retrospective benefit identified in relation to natural places; those associated with participants' own history, and those connected to people of the past. One image, that of cracked earth, also stimulated an interest in historic natural cycles in order to understand and contextualise the 'drought'. History appeared to be a deeply embedded feature of the study-site, and ancient woodland and ancient grassland were both identified to provide a window into the past. Whilst historic features gave insights into human history, the preserved 'unspoiled' nature of ancient grasslands could also reveal land 'as it used to be'. For

many participants, *ancient* grasslands were easily linked to cultural heritage- more so than to biodiversity. Retrospective benefits were generated by the 'timeless' quality of ancient landscapes, and 'rare' archaeological features. Arable farmland also provided retrospective benefits linked to traditional activities (such as game bird rearing, hunting, thatching and foraging), whilst 'drovers roads' linked historic farm access to current.

Some natural features (particularly those with an obvious manmade element) sparked curiosity in 'the origins' of the feature (e.g. who planted the wildflowers, who created the white horse, and who created the track and planted the hedge?) Unsurprisingly the images of the whitehorse and hedge and track stimulated most interest in people of the past, whilst the images of wildflowers and clover inspired interest in previous land-use.

Where participants had experienced a landscape feature before, seeing that feature again often invoked memories of past visits. Associations were particular strong when the natural feature was experienced during childhood, such as bees, ladybirds or hills. Whilst less people attributed retrospective benefits with clover, those that did remembered a range of associated childhood activities, such as songs, games, going on adventures, memories of bees and searching for four leaf clovers.

There were tenuous links between retrospective benefits and biodiversity. Indirect links were made through concept of 'cultural landscapes', whereby some participants (with the relevant skillsets) described gaining insights into past human activities through current land cover. Noticeably less people described retrospective benefits relating to the images of clover and cracked earth, both of which contained less diversity than other feature types. There was tentative evidence that increased environmental stimuli (such as provided by diversity) might promote a state of 'absorption' which increases reflection and retrospection .

#### **4.3.3.5 Creative benefits**

Creative benefits were mostly related to visual stimuli- particularly colours, texture, and patterns; however a small number of participants also made reference to the sound of insects, birds and the wind. There appeared to be a strong link between creative benefits and diversity. Grasslands were described as particularly inspiring due to the biodiversity. Creative benefits linked to diversity manifested at a small scale (e.g. creativity inspired by markings on insects, different flora) to large scale (creativity linked to landscape diversity). There was also some evidence of creative benefits linked to diverse abiotic features, such as hills, altitude and gravity. Restoring grasslands were advised to provide creative benefits since are a prime example of inspirational human achievement.

Scenes perceived as 'beautiful' (e.g. wildflowers, hedge and track, clover pasture, ancient grasslands) caused many participants to feel *artistically* creative, and inspired to draw, paint or take photos. This was most often due to visual features (colour, texture) and the different species and habitats observed. Artistic creativity associated with beautiful scenes was often linked to a desire to conserve the environment/species under observation. Interestingly the image which caused many to feel concern (patterns of the cracks were perceived as being interesting and beautiful). Some participants also observed that the surviving species made them feel hopeful and inspired an urge to fix or improve the feature. Images with obscured elements could promote an urge to explore.

#### **4.3.3.6 Communicative benefits**

Communicative benefits were identified in relation to group membership, activities, education, language and sense of place. Within the workshops, 76% of participants were members of nature groups, 92% engaged in nature related hobbies, and just under half were employed in the countryside sector. It is likely that most participants' share information with colleagues, and that participant views (in part) reflected perspectives generated through group membership. Evidence was found of linkages between education/ training and the scale at which biodiversity was recognised. Skillsets and associated discourses (language) shaped interpretations of the different biodiversity gradients, and may explain differences between stakeholders' understandings of biodiversity.

Specific activities which occur at the study site (e.g. monitoring, surveying) are acknowledged to support databases which assist social processes such as land management, ecological restoration and planning. Artistic pursuits (such as painting) can create art and media forms which enable indirect experiences of natural places for those not present. As such, communicative benefits are shaped by education/training and access to influence social processes.

Distinct communicative benefits were associated with particular species considered to be 'indicator species', and some participants felt a particular affinity to rare and locally distinct birds. A sense of place was identified in relation to the undulating landscape, mosaic of ancient grasslands, woodlands, and arable farmland, exceptional heritage assets and military associations. Whilst white (chalk) horses were a particularly significant landscape feature, it was the combination of these features which were understood to together comprise a 'cultural landscape' distinct to Wiltshire.

#### 4.4 What other variables effect the generation of cultural benefits?

Results of this workshop show that cultural benefit generation is influenced by a number of intangible abiotic, sociological and psychological variables. In addition to physical biotic and abiotic features of the natural environment, participants' accounts referred to atmospheric features, forces, and temporal effects as influencers of experience. Variables such as light, space, fresh air, temperature, the weather, and the wind were significant in benefit generation. A number of participants mentioned 'altitude' as a feature which adds to landscape experiences, whilst activities (such as rolling down hills, cheese rolling and tobogganing) make use of gravitational forces. Time at multiple scales (e.g. time of day, lunar cycle, season, epoch) was also mentioned frequently as a contributory factor to cultural benefits generation.

Sociological variables such as group activities/ processes, access and cultural diversity were also found to influence cultural benefits generation. As previously mentioned, the majority of workshop participants were members of groups and organisations. Group membership is likely to inform and enable certain modes of interactions with natural places, and member experiences feed back into the group in a reciprocal relationship. Numerous activities were identified as occurring within the study site, many of which had a social dimension (e.g. organised events, family outings, education trips). A number of social processes were suggested as ways to improve local grasslands and arable, such as to protect/ restrict (through policy), restore (non-government organisations), increase awareness (communication networks) and support farmers (through incentives and information dissemination).

Institutions which enable access to natural places were particularly important. Whilst access is not needed for supporting and provisioning services (and in some cases actively discouraged), participants unanimously agreed that access is positively linked to cultural benefits. There was a consensus that access provides more diverse cultural benefits in higher amounts, and first-hand experience of natural places was considered essential for most cultural benefits. The only exception to this was a type of regenerative benefit; a feeling of 'reassurance' related to continuity of resource supply and the existence value of other species. Seen through a biodiversity lens, access can be considered a form of human behaviour (territoriality) which provides insights into within-species (human) diversity.

Notably however, all participants agreed that ancient grasslands, restoring grasslands and arable farmland are important even if inaccessible, both for food production (arable), and for biodiversity (grasslands). These perspectives are emblematic of human centred (anthropocentric) and nature-centred (biocentric) value sets, e.g. humans needing biodiversity to survive versus biodiversity being valued for its own

sake. Whilst ethnically diverse perspectives were not captured by the workshops, there emerged evidence that other forms of sub-cultural diversity were highly relevant to the generation of cultural benefits. The scale at which biotic features were identified appeared linked to education and training, and participants' skillsets and hobbies informed interactions and subsequent benefits. The orientation of different faith communities towards biodiversity was also highlighted by Buddhist, Pagan, and Christian contributions.

Psychological and individual factors were also noted to influence the generation of cultural benefits. Familiarity with a place/feature significantly influenced the experience of that (or similar) places/ features, with childhood experience appearing to have the strongest effect on cultural benefits formation. Frequent references were made to personal experience, memories, and other matters linked to participants' identities. Terms such as familiar, well used, unknown, weird and strange gave insights into *ways of relating* to features, and landscape change (particularly in familiar places) was noted to invoke negative responses for some participants. Since sensory stimuli formed the basis of many benefits, then sensory capacity will also affect these. Exploring reactions to landscape and cultural benefits may require baseline assessment of (emotional and psychological) state/ trait.

## 5 Conclusion

There were significant differences between participants' understanding of biodiversity and the dominant ecological definition of biodiversity, "variability among living species from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems" (CBD, 1992). Participants commonly discussed between-ecosystem and between-species diversity. There was little reference to within-species diversity and genetic diversity. Where biodiversity was discussed at a subtler scale, this tended to be associated with 'identification' activities such as surveying, botany, entomology, bird watching and foraging.

Biodiversity was understood by many participants in a holistic sense- as an inseparable part of a whole ecosystem rather than as disaggregated functional groups and distinct species. A number of biodiversity groups were absent from results, namely microorganisms, phytoplankton, bryophytes, amphibians, and reptiles. There were two *additional* types of diversity mentioned by participants that are not included in the ecological definition of biodiversity, these being the urban-rural divide, and the land-sky divide. The issue of perceptible scales/types of biodiversity appeared to be linked to formal and informal education. This will be explored in future research phases.

During the mapping exercise, it emerged that the most commonly mapped points were human built features. Biotic features were the least mapped. Ancient grasslands were, for many participants, more closely associated with history than with biodiversity. This raises questions of whether biodiversity is an important frame of reference for members of the public, and whether cultural benefits from natural places may be substitutable with those from the human environment. Future research will attempt to identify the unique contributions of biodiversity to cultural benefits.

Approximately half the workshop cohort had difficulties distinguishing between ancient and restoring grasslands. Many people advised that their experience of ancient grasslands and restoring grasslands was the same. However, there was a clear differentiation between perceptions of arable farmland and grasslands. Arable landscapes were associated with food provision and traditional activities, thus had a distinct cultural contribution despite being less biodiverse. However, grasslands were seen as more varied, interesting, inspiring, better for wellbeing and recreation compared to arable. This was due to the colourful flowers, insects, rare species, and wildlife associated with this habitat type. The most important characteristics of restoring grasslands were the cultural aspects: accessibility, wardening, and perceptions of human achievement through restoration activities. Future research

needs to ensure that restoring and ancient grasslands are adequately represented in media and narrative form, and will explore the reasons for any perceptual merging.

Most participants had no distinct preferences for any particular plant or invertebrate species. Bees were, however, perceived especially favourably. Where people *did* express preferences for particular species, this tended to be for those with extraordinary characteristics e.g. bright colours, interesting markings, species that hopped or made sound. There was some preference for rare birds, especially owls. Fear of species affected perceptions species' 'usefulness' and function in ecosystems. The visual features of different species were most important. Sound was only relevant for specific species producing 'iconic sounds', and in these cases was as (if not more) important than visual features. Few participants expressed a desire to touch different creatures, and some felt touching species was interfering inappropriately with nature. Future research stages will concentrate on visual sense and may explore the diversity of sounds in different natural places.

There was some evidence of relationships between levels of biodiversity and cultural benefits. Geodiversity and atmospheric diversity were also considered important. Strong links were found between biodiversity and cognitive benefits, creative benefits and regenerative benefits. All species groups offered a unique contribution to cognitive benefits. Indicator species, impacts and interdependencies tell us about the natural world, whilst species behaviour was perceived to teach us about qualities such as perseverance, hard work, and successfully functioning communities. Exploring scientific, educational and conservation monitoring activities associated with different habitats may be taken forward as a mini-case-study in future research.

Creative benefits related mostly to diverse *visual* stimuli, i.e. colours, texture, and patterns. Grassland and abiotic features (e.g. hills, altitude, sky) were particularly inspiring, whilst restoring grasslands represented inspirational human achievement.

Regenerative benefits were linked to the richness of sensory stimuli and diversity. Arable farmland provided a sense of reassurance connected to the continued and plentiful supply of food. A lack of resource (including water) could cause regenerative dis-benefits (worry and concern). Identifying regenerative benefits associated with different biodiversity gradients will provide important insights into the cultural value of food production and conserving biodiversity.

Intuitive benefits related to biodiversity focused on abundance and the basis of life. Religious perspectives on biodiversity included principles of stewardship (Christian), energetic qualities (Paganism) and interconnectedness (Buddhism). Retrospective benefits were found to be related to both personal and cultural history. Childhood memories and the origins of landscape features held particular interest. Ancient

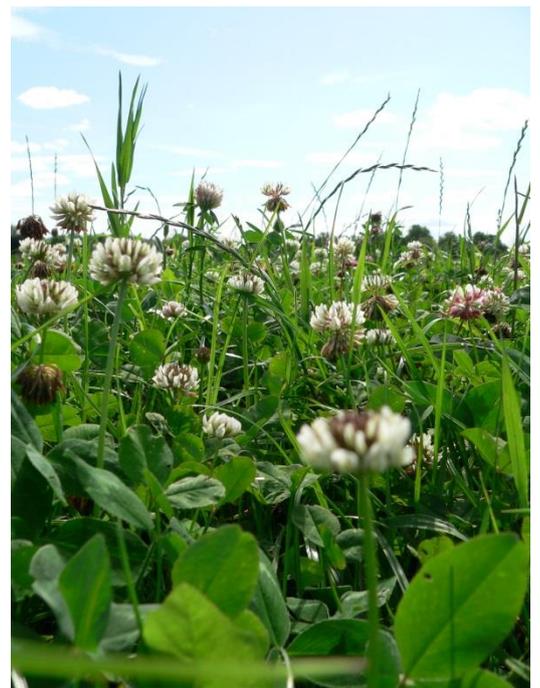
grasslands were very strongly associated with heritage, and arable farmland was linked with traditional activities. Intuitive and retrospective benefits are considered highly relevant in the Wessex region and so will be explored sensitively in further research.

Communicative benefits related to biodiversity were shaped by informal and formal education. Training was found to affect the scale at which biodiversity is perceived and will be explicitly explored in future research. Sense of place was associated with the concept of 'cultural landscapes', comprising topography, habitat mosaics, exceptional heritage assets (e.g. Stonehenge, white chalk horses) and military connections. It is recognised that isolating biodiversity from other features of natural places will be challenging and this will be carefully considered for future research.

Other variables were found to effect the generation of cultural benefits and so will also be included in future survey: time (of day, year), group activities, and socio-economic and cultural diversity. It was unanimously agreed that access is positively linked to cultural benefits, providing more diverse cultural benefits in higher amounts. First-hand experience of natural places was considered essential for most cultural benefits except a reassurance (a type of regenerative benefit) related to continuity of resource supply and the existence value of other species. All participants agreed that ancient grasslands, restoring grasslands and arable farmland are important even if inaccessible, both for food production (arable), and for biodiversity (grasslands). Access issues will thus form part of future research. Lastly, psychological factors found to be significant will also be explored, namely familiarity (with natural places and features), childhood experience, sensory capacity, and baseline emotional/psychological states.

## APPENDICES

### A.1 Activity 1 a) & b) sample of stimulus materials: species montages/ landscape features



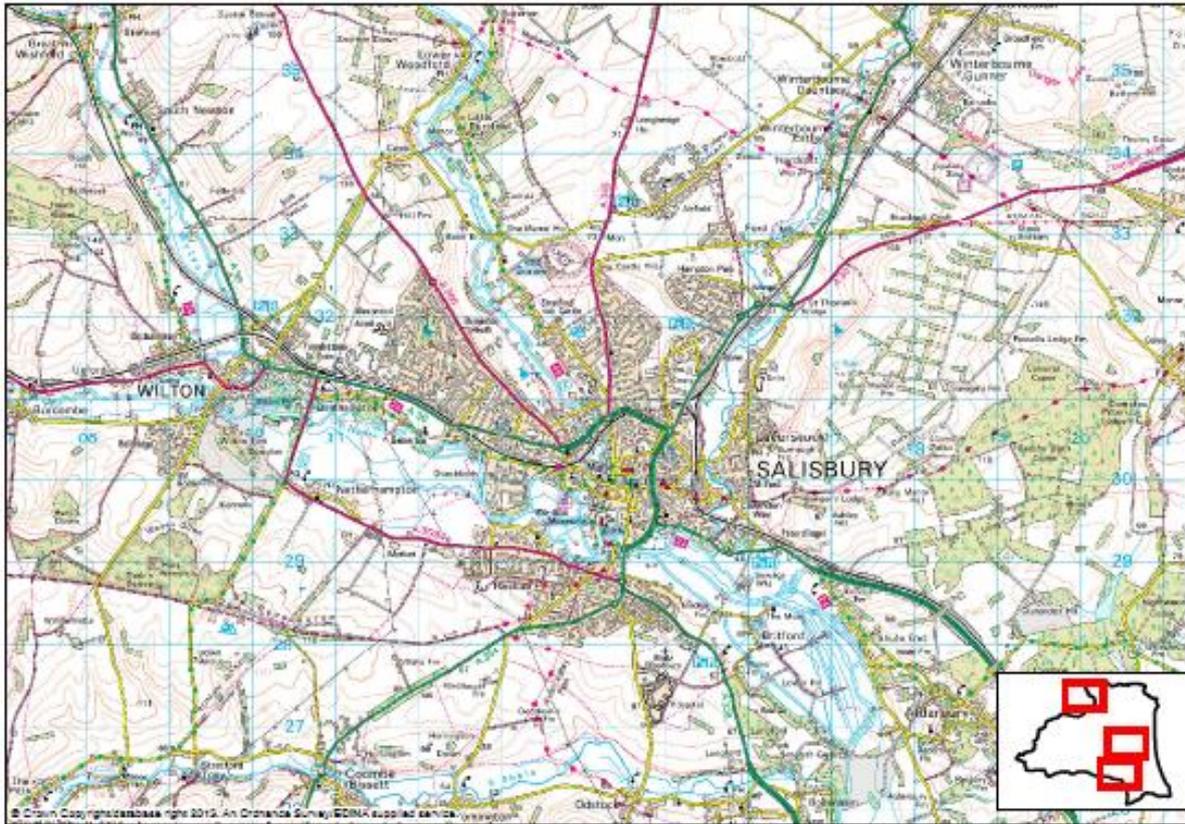
**A.2 Activity 1 (a) landscape features question sheet**

Photo	Do you associate any activities with this image?	Is there anything about this image that might help you to...				
		Feel creative or inspired?	Learn about nature or about yourself	Feel free or a sense of release?	Reflect on the past	Feel connected to the area, nature or God?
Clover						
Cracked earth						
Wildflowers						
Hedge /track						
White horse						
Hillside						

**A.3 Activity 1 (b) species montage question sheet**

Photo	Do you prefer some, all or none of these creatures?	Do you consider these creatures to be friends or pests?	Do these creatures and plants have any function or role to play?	What do you prefer, to see, hear or touch these creatures?	Is it important to know these creatures exist even if you can't see/hear/feel them?	Can we learn anything from these creatures and plants?
Butterflies, moths and plants						
Spiders and plants						
Grasshopper ladybird, lacewing and plants						
Bees and plants						
Birds and plants						

#### A.4 Activity 2 sample of mapping materials



### A.5 Activity 2 mapping exercise question sheet

Using the maps and Google earth images provided, please tell us anything of interest about the 'study site'. This could be on any topic- e.g. something about a particular place, landscape features or wildlife, places you go/ what you do there, experiences, places that are special, issues such as planning, flooding etc. Comments can be both positive and negative.

If possible, please put a numbered sticker *roughly* on the place you are commenting on. Write the corresponding number and comment below.

Sticker number	Place/ landscape feature	Comment

**A.6 Activity 3 sample of landscape stimulus materials**



### Features particular to ancient grasslands

- **Typical land use:** MoD , nature reserves
- **Species diversity:** high levels of plant, mammal, bird and invertebrate diversity- both in terms of numbers of species and numbers of individuals
- **Rare species:** ancient grasslands provide habitat for many rare species not present on arable farmland, e.g. *plants*- burnt orchid, early gentian; *butterflies*- marsh fritillary, Adonis Blue, Silver-spotted Skipper, Chalk-hill Blue; *birds*- Great Bustard, Whinchat; various grasshoppers, bumblebees, **Soil microbe communities:** ancient grassland has intact, 'resilient' microbe communities that are associated with better soil structure and increased ability to retain water
- **Soil nutrients:** are low due to heavy leaching
- **Climate regulation:** good climate control due to higher levels of carbon storage in soils
- **Pollination and pest control:** increased pollinator provision and pest control for local crop production even in years with poor weather
- **Food and feed production:** provides terrain for foraging and hunting
- **Resilience:** High levels of biodiversity provide resilience of the above ecosystem services in the face of perturbations

### Features particular to restoring grasslands

- **Typical land-use/ management:** nature reserves, environmental stewardship areas (can include field margins)
- **Species diversity:** Species richness of all groups (e.g. birds and terrestrial and aquatic plants and invertebrates ) is intermediate between ancient and intensive system – a degree of similarity with ancient depends on duration and level of success of the restoration
- **Rare species:** Total abundance in some species groups may be similar to ancient- e.g. large number of pollinating insects, but with lower levels of diversity
- **Soil microbe communities:** Soil microbial diversity might be lower, and associated processes slower
- **Soil nutrients** Possibly more nutrients and chalk pieces in the soil from previous management/ disturbance. Soil might be deeper because of a layer of organic matter
- **Climate regulation:** lower ability to regulate climate compared to ancient. Photosynthetic rate and carbon stocks could be lower than the ancient
- **Pollination and pest control:** Lower ability to provide pollination and pest control function for local crops compared to ancient.
- **Food and feed production:** terrain for foraging and hunting
- **Resilience:** more vulnerable to disturbances than ancient and slower recovery time especially if the vegetation has already been in a state of succession

### Features particular to arable farmland

- **Typical land-use/ management:** intensive agriculture-
- **Species diversity:** significantly fewer species in all taxonomic groups (i.e. plants, birds, invertebrates, mammals) due to lower habitat availability and quality
- **Rare species:** none
- **Soil microbe communities:** highly disturbed causing fragility of communities and subsequent soil structure.
- **Soil nutrients** Soil is likely to be a mixture of organic matter but much chalkier soil from being ploughed up. Very high nutrient loading from fertiliser
- **Climate regulation:** lower ability to regulate climate
- **Pollination and pest control:** fields of insect pollinated crops receive fewer visits from pollinators, and lower levels of pest control by natural enemies.
- **Food and feed production:** very successful large volume crop production, terrain for foraging and hunting
- **Resilience:** Poor resilience in the face of perturbations (e.g. drought, flooding, disease). If one species is vulnerable, there will be very few others to compensate

**A.7 Activity 3 landscape diversity question sheet**

Move around the room at your own pace looking at the photos, statements and conversing with each other.

**PART A:** Stick your *star stickers* on the statements you think are particularly importance.

**PART B:** Please answer the *following questions* related to arable farmland, restoring grasslands and ancient grasslands.

1. Do you feel you recognise the difference between the three countryside types? \_\_\_\_\_  
 \_\_\_\_\_

2. What human activities do you associate with these countryside types?

Arable farmland	Restoring grasslands	Ancient grasslands

3. Do any of these three countryside types provide more or better options for recreation, learning, or inspiration? \_\_\_\_\_  
 \_\_\_\_\_

4. Do these three countryside types provide different types of experience? \_\_\_\_\_  
 If yes, what?

Arable farmland	Restoring grasslands	Ancient grasslands

5. Are the three countryside types still important if people cannot access them? \_\_\_\_\_  
 \_\_\_\_\_

6. Do you need to have access to these landscapes to benefit from them? \_\_\_\_\_

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7. Are there other important features of the Wiltshire countryside that are not related to aspects of biodiversity? \_\_\_\_\_

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8. In Wiltshire, would you say the balance between ancient grasslands, restoring grasslands and arable farmland is right? \_\_\_\_\_

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9. If you could change anything about these countryside types, what would you change and why? \_\_\_\_\_

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10. Are there certain features of the three countryside types that you think are particularly important to preserve for children or future generations? \_\_\_\_\_

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## A.8 Wildflowers and clover: summary of associated cultural benefits

### Outdoor activities and cultural benefits associated with wildflowers

Wildflowers	
Outdoor activities associated with the image of wildflowers	
Activities mentioned by more than one participant	Walking, low intensity/organic farming, botanising, conservation, surveying, photography, painting, relaxation, viewing
Activities mentioned by a single participant	Picnicking, gardening, house building, driving and military activities
Creative benefits associated with the image of wildflowers	
The image inspired people to want to paint, draw, take photographs, to 'get out there', and to manage and protect areas of wildflowers	
People felt creative and inspired because of the beauty, colours, sense, diversity of species, the texture and the variety.	
2 people did not feel creative or inspired by the image	
Cognitive benefits associated with the image of wildflowers	
The image was felt to provide opportunities to learn about biodiversity, abundance, rare species, the functions of plants, botany, how to obtain pleasure and how to feel comforted	
2 people felt nothing could be learned from the image	
Regenerative benefits associated with the image of wildflowers	
The image made people experience feelings of rejuvenation, upliftment, nostalgia, absorption, interest, dreaming and getting away from it all.	
Specific sources of freedom/release included the vibrancy, beauty, the colours, sounds, smells, diversity, wildflowers, meadows, nature, blue skies, the feeling of enjoyment and the activities people are involved in	
4 people did not feel any sense of release/freedom associated with the image	
Retrospective benefits associated with the image of wildflowers	
The image of clover made people reflect on places visited, memories of past summers, childhood, previous land-use, the origins of the wildflowers, the past and potential for habitat degradation	
7 people did not reflect on anything	
Intuitive benefits associated with the image of wildflowers	
Connectedness to nature	17 people said the image made them feel connected to nature
Connectedness to God	3 people said the image made them feel connected to God, and 1 said it made them feel connected to life
Connectedness to the area	9 people said the image made them feel connected to the area
5 people specified they did not experience any sense of connection relating to the image	

## Outdoor activities and cultural benefits associated with clover

Clover	
Outdoor activities associated with the image of Clover	
Activities mentioned by more than one participant	Farming, cattle grazing, honey production, relaxation, picnicking, walking, photography, disease, entomology (especially bees), searching for four leaf clovers
Activities mentioned by a single participant	Education, conservation, surveying, reflection and nitrogen release
Creative benefits associated with the image of clover	
The image inspired people to switch off, and want to protect this landscape	
People feel creative and inspired because of the insects, beauty, diversity of shapes, light, links to childhood, and opportunities to obtain a different perspective on life	
16 people did not feel creative or inspired by the image of clover	
Cognitive benefits associated with the image of clover	
The image of clover provided opportunities to learn about nature, diversity, farming, pollution, and identifying different species	
14 people felt nothing could be learned from the image of clover	
Regenerative benefits associated with the image of clover	
The image of clover helped people experience feelings of switching off, relaxation, a sense of reassurance and provided opportunities to use their imagination	
Specific sources of freedom/release included memories of childhood and past summers associated with Clover, thinking about the previous land-use, and reflecting upon natural cycles	
13 people did not feel any sense of release/freedom associated with the image of clover	
Retrospective benefits associated with the image of clover	
The image of clover made people reflect on different aspects of their childhood (e.g. songs, games, adventures and memories of bees), past land-use, archaeology, and four leaf clovers.	
16 people did not reflect on anything	
Intuitive benefits associated with the image of clover	
Connectedness to nature	Seven people said the image of clover made them feel connected to nature.
Connectedness to God	One person said it made them feel connected to nature and thus God. One person said it made them feel connected to God, and others said they felt connected to the 'cycle of life', 'something greater', and 'the basis of life'
Connectedness to the area	One person said this image made them feel connected to the area
Five people specified they did not experience any sense of connection relating to the image of clover	

## A.9 Butterflies and moths: summary of preferences, sensory features, functions, learning opportunities and values

Butterflies, moths and plants		
Preferences for butterflies and moths		
Most participants said they had no preference for any particular one butterfly or moth species, Participants commented that 'all are lovely', 'all are beautiful', they are 'all fascinating' and 'all equally appreciated'. A small number of participants preferred butterflies over moths due to the colour, and one especially preferred the blue butterfly.		
Sensory features of butterflies and moths		
Visual	All participants enjoyed the visual aspects of butterflies and moths	
Audial	Eight participants mentioned enjoying hearing butterflies and moths. Two questioned whether we can hear these species, stating 'you cannot hear these creatures as they are silent'	
Touch	Five people stated they liked to have these creatures land on them, describing this experience as a 'rare treat' - one which they preferred 'given the chance'. However, others said it is 'inappropriate' to touch these creatures, and that ' <i>touching would damage them</i> '	
Other comments	Two people gave said seeing and hearing these creatures was 'very therapeutic' and could promote 'enlightenment'.	
Perceived functions of butterflies and moths		
Functions mentioned by more than one participant	Pollination, part of an ecosystem, part of biodiversity, natural pest control, to give people pleasure, aesthetic role	
Functions mentioned by one participant	Indicator of ecosystem health, symbiotic relationship, to exist and be a part of our world	
Other comments	'very important role', 'complex role', 'many or perhaps all have roles that we have not yet discovered'	
Learning from butterflies and moths		
<b>All participants said we can learn from butterflies and moths.</b> Three people also highlighted the importance of plants as ' <i>without these butterflies and moths could not exist</i> '.		
Types of learning	Ecological	habitat quality/ health, biodiversity, species behaviour, impacts and interdependencies
	Cultural	artistic, how to live simply and sustainably
What we learn from	Complex life histories, design in nature, patterns on the wings observing evolution- 'like us, they evolve and change'	
Consideration of butterflies and moths as friends or pests		
Friends or pests	Almost all participants viewed butterflies and moths as 'friends'	
Why they are friends	They are 'not harmful'; 'life would be significantly poorer without them'; they are 'attractive'; they are 'my passion'	
Other comments	Moths are friends 'as long as they stay out of my bedroom'; they are 'not friends, rather are true providers of ecosystem services'; 'human nature leans towards friends but they are all part of the web'	
Existence value of butterflies and moths		
Intrinsic value	The majority of participants felt that it is important to know that butterflies and moths exist even if you cannot see or hear them	
Non-intrinsic value	One person said that existence without sensory perception was <i>not</i> important.	

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	Three linked existence to function, such as our ability to understand how ecosystems work, species monitoring, and aesthetic pleasure.
Other comments	'Humanity does not rate the existence of these creatures as important but should do'

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## A.10 Spiders: summary of preferences, sensory features, functions, learning opportunities and values

Spiders and plants	
Preferences for spiders	
Approximately half of participants said that they liked all of these creatures, and that 'each is wonderful in its own right'. However, five people categorically stated they did not like spiders, three said they could appreciate spiders but were scared of them, and two said they preferred the plants in the photos to the spiders. Four people stated specific aesthetic preferences related to spiders, such as the ' <i>markings of the wasp spider</i> ', ' <i>webs covered in dew</i> ', and the ' <i>colour of the cucumber spider</i> '.	
Sensory features of spiders	
Visual	All except two participants said they like to see spiders.
Audial	Two participants said that they like to hear spiders. One person remarked that the question of hearing spiders is irrelevant in the UK.
Touch	Many participants mentioned their views on touching spiders, but overall only two said they were happy to touch spiders. Four participants stated they did not wish to touch spiders.
Other comments	'I like to see them from a distance'; 'I'm completely indifferent to spiders'; 'I'm not bothered by spiders'; 'I'm okay with that' (touching spiders)
Perceived functions of spiders	
Functions mentioned by more than one participant	The food web (food for birds and predators), pest control (control populations, small insects, and 'get rid of bugs'), maintaining ecosystem health
Functions mentioned by one participant	To indicate climate change, to exist, to maintain the natural balance
Other comments	Approximately half the workshop cohort agreed spiders have a functional role to play but did not say what this was. Four people said they did not know if spiders had a functional role to play. The two people who did not like spiders considered these to be pests said that these creatures had no functional role to play.
Learning from spiders	
All participants except one agreed that we can learn from spiders, but some felt that 'what we can learn is not entirely clear'.	
Types of learning	Ecological    habitat quality, behaviour, ecosystems and predator/prey relationships Cultural        Engineering, technical developments, perseverance, hard work, conquering fears, and 'tenacity from them-not giving up when something goes wrong'.
What we learn from	Web construction and materials, interspecies relationships, character traits
Consideration of spiders as friends or pests	
Friends or pests	Despite the mixed reactions to spiders, most workshop participants still considered them to be friends
Why they are friends	'Because they eat pests'
Other comments	Two participants who admitted not liking spiders also considered them to be pests
Existence value of spiders	
Intrinsic value	All except two participants said that it is important to know that spiders exist even if you can't see hear or touch them

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Non-intrinsic value	One person hat did not like spiders said the existence of spiders was not important. Another said they did not know if the existence of spiders was important
Other comments	xx

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## A.11 Birds: summary of preferences, sensory features, functions, learning opportunities and values

Birds and plants		
Preferences for birds		
Whilst most people liked all bird species, nine mentioned having a preference for owls. Two people liked great bustards, one had a fondness for kestrels, and another yellowhammers. Two people preferred to see the 'rarer' birds, specifically Stone Curlew, Bustard and Short Eared Owl which were perceived to be ' <i>iconic endangered species</i> ' that had ' <i>rare value</i> '		
Sensory features of birds		
Visual	All participants liked to see birds	
Audial	Over half of participants said they liked to hear birds	
Touch	Five people said they liked to touch birds. One remarked 'I think wildlife is best viewed and not affected by interference'	
Other comments	Two people specified liking the sound of owls at night and stone curlews	
Perceived functions of birds		
Functions mentioned by more than one participant	Different roles we may not understand, natural balance of ecosystems, part of the food chain, pest control (e.g. mice and voles), give people pleasure/aesthetic function, game keeping, variety of sensory stimulation	
Functions mentioned by one participant	Part of biodiversity, help to make the countryside work, pollination, indicators of ecosystem health, historic role	
Learning from birds		
Birds were seen to provide learning by all workshop participants.		
Types of learning	Ecological	Biodiversity, habitat quality, natural cycles, thresholds, predator/prey relationships, ecosystem functioning, the role of birds' in ecosystems. About birds (food, music, protection of young, extinction)
	Cultural	About ourselves, our own responses, aerodynamics
What we learn from	The existence of birds, survival, birds' evolution, their freedom, their flight, birds as indicators of ecosystem health and of diversity, changing migration patterns	
Consideration of birds as friends or pests		
Friends or pests	The majority of participants considered all birds to be friends	
Other comments	Two participants said birds can be pests for farmers ' <i>depending on their numbers</i> '. Two species were marked out as potential pests (starlings and magpies) and one person considered the hawk as a 'foe'.	
Existence value of birds		
Intrinsic value	Most participants felt the existence of birds to be important even if we cannot see, hear or touch them,	
Non-intrinsic value	One person said the existence of birds was not important, and a further two said they did not know if existence was important	
Other comments	'Knowing they exist provides reassurance that all is well in the world'	

## A.12 Bees: preferences, sensory features, functions, learning opportunities and values

Bees and plants		
Preferences for bees		
All except one participant liked bees. There was some preference for bumblebees over other bee types (four participants). Interestingly the participant that did not like bees felt their only function was honey making, that we cannot learn anything from bees, that it is ' <i>important to get out of their way</i> ', and that ' <i>technically they are friends but I personally think pests</i> '.		
Sensory features of bees		
Visual	Most participants enjoyed seeing bees	
Audial	Nineteen people stated they liked to hear them, and some specifically mentioned the 'buzzing' sound	
Touch	Only one people mentioned enjoyment from touching bees- the least of all species featured in the photo montages.	
Perceived functions of bees		
Functions mentioned by more than one participant	Honey production, pollination, part of the ecosystem, our enjoyment	
Functions mentioned by one participant	Homogeneity in answers- all participants answered with one of the functions above	
Other comments	'I love honey'; bees 'enrich our lives'	
Learning from bees		
All workshop participants except one said that we can learn something from bees. Remarks such as we can ' <i>learn masses</i> ' and ' <i>they have lots to teach us</i> ' were reflected by the diversity of answers related to learning from bees.		
Types of learning	Ecological	Finding out about habitats, ecosystem health, the equilibrium of the natural world, food provision, honey production, agriculture and the 'productivity of the food chain'
	Cultural	Good work ethic/ hardworking, being calm, family communities Obtaining learning through study and education was also featured to bees.
What we learn from	Declining bee numbers/ indicator species, co-dependence and symbiotic relationships, how bees share work, the relationships between bees, their 'culture and society' and 'way of living'	
Consideration of bees as friends or pests		
Friends or pests	Bees were unequivocally appreciated by all participants. All other participants liked bees and several used the word 'love'. Other than the aforementioned participant, nobody considered bees to be pests.	
Why they are friends	They are 'crucial pollinators', 'important parts of the ecosystem', and have a 'beneficial function'	
Other comments	They are 'friends to be treasured and protected'; 'important and endangered friends'	
Existence value of bees		
Intrinsic value	Without exception, all participants felt that the existence of bees was important or even 'vital', even if we cannot see, hear or touch them.	

### A.13 Mixed invertebrates: preferences, sensory features, functions, learning opportunities and values

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Mixed invertebrates and plants: grasshoppers, ladybirds and lacewings

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Preferences for grasshoppers, ladybirds and lacewings

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This mixed species photo montage seemed to illicit different preferences, probably given the greater choice afforded to participants in their selection. At Salisbury some people preferred ladybirds, whilst others preferred grasshoppers, and this seemed to be in relation to grasshoppers 'hopping', and being able to make sound. At Amesbury half of participants showed a definite preference for ladybirds. Two of these participants related their preference for ladybirds something stemming from childhood, and another stated they liked English ladybirds. At Seend, the answers were varied; some people preferred (or were 'especially fond' of), lacewings, others of ladybirds, and some preferred grasshoppers. The remaining participants liked all of these creatures, making comments such as they are '*all equally appreciated*', '*all fascinating*', '*they all appeal*', and '*I love all of parts of nature*'

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Sensory features of grasshoppers, ladybirds and lacewings

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Visual	Most participants liked to see grasshoppers, ladybirds and lacewings
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Audial	Seventeen people mentioned a desire to hear these insects, and an additional eight said they specifically like to hear grasshoppers
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Touch	Four people said that they like to touch these creatures
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Other comments	'Touch them if the opportunity arises'
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Perceived functions of grasshoppers, ladybirds and lacewings

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Functions mentioned by more than one participant	Part of the food chain/ predation, keep down pest numbers (e.g. controlling populations, 'getting rid of smaller pest creatures', predators of insects harmful to crops'. Two participants said that they had a role in pollination
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Functions mentioned by one participant	'Fascinating', to 'be part of grasslands, a 'vital indicator' of habitats
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Other comments	Two people describing these creatures as an 'important' or 'essential' part of ecosystems. One participant suggested that these creatures have no functional role, whilst a further two people said they didn't know of a functional role.
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Learning from grasshoppers, ladybirds and lacewings

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Approximately half of the respondents declined to provide an expanded answer for what we can learn from grasshoppers, lacewings and ladybirds, indicating these creatures do not provide obvious learning opportunities.

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Types of learning	Ecological	Natural pest management, predator/prey relationships and interdependencies, ecosystem health, and learning
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	Cultural	Aesthetic experiences, education, perseverance
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What we learn from	From the way they adapt to their environments, from their beauty, their colour, learn through study, and through observation
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Consideration of grasshoppers, ladybirds and lacewings as friends or pests

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Friends or pests	There were mixed views whether ladybirds, lacewings and grasshoppers should be considered friends or pests, and some divergence between workshop cohorts. At both Salisbury and Amesbury, the majority of workshop participants considered these creatures to be friends. However, at Seend only six participants said that these creatures can all be considered friends. One person stated out rightly that ' <i>these creatures are pests</i> '. Other participants had more divided opinions, stating that ' <i>they are friends but I'm aware that insects can be pests</i> ', and another saying 'friends' but adding ' <i>or do</i> '
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	<i>grasshoppers damage something?</i>
Why they are friends/pests	Being considered a friend or pest was largely related to the effect on agriculture. It was recognised that ' <i>some species may cause economic damage and others may reduce damage</i> '. These insects were considered friends if they were predators of insects that are harmful to crops', but pests if in large numbers, or if they cause a problem for farmers.
Other comments	They are 'providers of positive services'
Existence value of grasshoppers, ladybirds and lacewings	
Intrinsic value	Most participants felt it is important to know that grasshoppers, ladybirds, and lacewings exist.
Non-intrinsic value	One participant said they existence is not important and another that it is 'possibly important'. A larger amount of people declined to answer this question than for species.
Other comments	Existence was views as importance as these creatures ' <i>provide biodiversity</i> ', are ' <i>important to the natural world balance</i> ', and need to be accounted for 'when developing the countryside'. One person commented that 'plants are especially important since without (these) habitats can't support species'.

## A.14 Hillside and cracked earth: summary of associated cultural benefits

### Outdoor activities and cultural benefits associated with hillside

Hillside	
Activities associated with the image of Hillside	
Activities mentioned by more than one participant	Walking, gliding, tobogganing, cycling, active sports, recreation, cattle grazing
Activities mentioned by a single participant	Shooting, cheese rolling, parachuting, hill rolling, family days out, climbing, painting, photography, history
Creative benefits associated with the image of Hillside	
The image inspired people to want to climb, glide, explore, experience the view, walk, and botanise	
People felt creative and inspired because of the wild landscape, raw nature, the sculptural quality of the hills, open space, natural world, grassland, and activity the person is involved in	
4 people did not feel creative or inspired by the image	
Cognitive benefits associated with the image of Hillside	
The image was felt to provide opportunities to learn about land-use, geology, hydrology, botany, entomology, ecology, diversity, the importance of experience, peacefulness, enjoyment, curiosity and self	
7 people felt nothing could be learned from the image	
Regenerative benefits associated with the image of Hillside	
The image made people experience feelings of fun, imagination and a sense of freedom	
Specific sources of freedom/release included the open space, sky, hills, altitude, the breeze, the sound of the wind, the sound of wildlife, peacefulness, exertion and activity	
5 people did not feel any sense of release/freedom associated with the image	
Retrospective benefits associated with the image of Hillside	
The image made people reflect on childhood, personal experience, places visited, the past, people of the past and previous land-use	
12 people did not reflect on anything	
Intuitive benefits associated with the image of Hillside	
Connectedness to nature	4 people said the image made them feel connected to nature. One added that it made them 'connected to nature and feel free as a bird'
Connectedness to God	Two people said the image made them feel connected to God. A further three said it made them feel connected to 'the wonder of the universe', 'simplicity' and 'grounded and at one with the Earth'
Connectedness to the area	8 people said the image made them feel connected to the area. A further two said they felt a 'sense of belonging', and that the image was 'very much a Wiltshire feature'
6 people specified they did not experience any sense of connection relating to the image. A further four people said they felt a sense of connection but did not specify with what.	

### Summary of outdoor activities and cultural benefits associated with cracked earth

Cracked Earth	
Activities associated with the image of Cracked Earth	

Activities mentioned by more than one participant	Drought, water efficiency, negative human impacts, farming, irrigation, surveying, walking, feeling hot, summer and an absence of activity
Activities mentioned by a single participant	Rising food prices, carbon generation, cycling, sitting, painting, flooding, farming, military use, and the changing seasons
Creative benefits associated with the image of Cracked Earth	
The image inspired people to feel concerned, sad, to feel hopeful, to want to add mulch, and to create artwork such as patterns, paintings, drawings, and photographs.	
People feel creative and inspired because of the patterns, the shapes, the beauty of the image, the surviving species and the summer.	
16 people did not feel creative or inspired by the image	
Cognitive benefits associated with the image of Cracked Earth	
The image was felt to provide opportunities to learn about soil types, ecosystems, natural fluctuations, colonialisation, climate change, human impacts, efficient water use and survival	
14 people felt nothing could be learned from the image	
Regenerative benefits associated with the image of Cracked Earth	
The image made people experience feelings of despair and worry	
There were no specific sources of freedom/release for this image	
22 people did not feel any sense of release/freedom related to this image	
Retrospective benefits associated with the image of Cracked Earth	
The image made people reflect on natural cycles (water and vegetation), climate change, places visited before, childhood, and self.	
16 people did not reflect on anything	
Intuitive benefits associated with the image of Cracked Earth	
Connectedness to nature	Two people said the image made them feel connected to nature. One person said it made them feel nature was destroyed. One person said it reminded them 'our responsibility is as caretakers not controllers of nature'
Connectedness to God	No people said this image made them feel connected to God. One person said that 'despite the drought life will continue' indicating a sense of hope.
Connectedness to the area	One person said this image made them feel connected to the area
17 people specified they did not experience any sense of connection relating to the image	

## A.15 Whitehorse and hedge and track: summary of associated cultural benefits

### Summary of cultural benefits associated with whitehorse chalk figure

Whitehorse chalk figure	
Activities associated with the image of Whitehorse	
Activities mentioned by more than one participant	Walking, picnicking, special occasions, archaeology, history, symbolism, photography, gliding and cement production
Activities mentioned by a single participant	Climbing, camping, sailing, trail making, driving, education, family days out, painting, and no specific activities
Creative benefits associated with the image of Whitehorse	
The image inspired people to want to go for a walk, visit other white horses, explore, draw and create forms, reflect upon the past and think about the future.	
People felt creative and inspired because of the familiarity of the horses, the relationship to other horses in the area, history, a sense of identity, nature, the setting and what lies over the hill that is unseen	
6 people did not feel creative or inspired by the image	
Cognitive benefits associated with the image of Whitehorse	
The image was felt to provide opportunities to learn about nature, ecology, botany, ornithology, solitude, appreciation, wonder, timelessness, art, and about self.	
8 people felt nothing could be learned from the image	
Regenerative benefits associated with the image of Whitehorse	
The image made people experience feelings of specialness. Many other people agreed they felt something but did not define what it was.	
Specific sources of freedom/release included the hills, the altitude, open space, the sky, fresh air, sunshine, the horizon, the view, local history and the collective of Wiltshire whitehorses	
8 people did not feel any sense of release/freedom associated with the image	
Retrospective benefits associated with the image of Whitehorse	
The image of clover made people reflect on the past, the people of the past, and the origins of the Whitehorse	
2 people did not reflect on anything	
Intuitive benefits associated with the image of Whitehorse	
Connectedness to nature	One person said the image made them feel connected to nature
Connectedness to God	Nobody said the image made them feel connected to God. One person said the image made them feel 'grounded and at one with the Earth'
Connectedness to the area	13 people said the image made them feel connected to the area
7 people specified they did not experience any sense of connection relating to the image	

## Summary of cultural benefits associated with hedge and track

Hedge/Track	
Activities associated with the image of Hedge/Track	
Activities mentioned by more than one participant	Walking, farming, farm access, bird watching, birds nesting, hedge laying, and foraging
Activities mentioned by a single participant	Hunting, cycling, riding, running, making dens, exploring, camping, walking the dog, driving, photography and military activities
Creative benefits associated with the image of Hedge/Track	
The image inspired people to want to explore, walk, to paint, draw or take photos, to make sløe gin, to reminisce and think about things, to feel happy and to obtain clarity	
People felt creative and inspired because of the beauty and attractiveness of the scenery, the trees/woodlands, sky, the patterns of the habitats, the shapes within the landscape, and the track	
3 people did not feel creative or inspired by the image	
Cognitive benefits associated with the image of Hedge/Track	
The image was felt to provide opportunities to learn about nature, birds, botany, wild edibles, the origins/history of the track and about peacefulness	
5 people felt nothing could be learned from the image	
Regenerative benefits associated with the image of Hedge/Track	
The image made people experience feelings of exploration, relaxation, losing yourself, and being in touch with nature	
Specific sources of freedom/release included what lies over the hill that is unseen, where the track leads, the peaceful surroundings, open space, nature, and activity people are involved in	
5 people did not feel any sense of release/freedom associated with the image	
Retrospective benefits associated with the image of Hedge/Track	
The image of clover made people reflect on the past, places they visited, childhood, self, people of the past, previous land-use and the origins of the track and hedge.	
5 people did not reflect on anything	
Intuitive benefits associated with the image of Hedge/Track	
Connectedness to nature	8 people said the image made them feel connected to nature
Connectedness to God	One person said the image made them feel connected to God
Connectedness to the area	7 people said the image made them feel connected to the area
6 people specified they did not experience any sense of connection relating to the image	

	Creative		Cognitive	Regenerative		Retrospective	Intuitive
	Feel inspired to	Feel inspired by		A sense of	Regenerated by		
<b>Wildflower</b>	To create (paintings, drawings, photos), to be active (get out), to conserve (manage, protect)	Visuals (beauty, colours), diversity (of species, variety of flowers), shape (texture)	Biodiversity, abundance, rare species, plant functions of plants, botany, how to obtain pleasure and how to feel comforted	Rejuvenation, upliftment, nostalgia, absorption, interest, dreaming and getting away from it all	Vibrancy, beauty, colours, sounds, smells, diversity, wildflowers, meadows, nature, blue skies, the feeling of enjoyment	Places visited, past summers, childhood, previous land-use, the origins of the wildflowers, the past and potential for habitat degradation	Connected to nature, to God, to life, and to the area
<b>Clover</b>	To be reflexive, (switch off), to conserve (protect)	Nature (insects), visuals (beauty, light), diversity (of shapes), identity (links to childhood, obtain a different perspective)	learn about nature, diversity, farming, pollution, and identifying different species	Switching off, relaxation, a sense of reassurance, opportunities to use imagination	Memories of childhood, past summers, previous land-use, natural cycles	Different aspects of childhood (e.g. songs, games, adventures and memories of bees), past land-use, archaeology, and four leaf clovers	Connected to nature, to nature and thus God, to God, the cycle of life, to something greater, to the basis of life, to the area
<b>Hillside</b>	To be active (climb, glide), to discover (explore, experience)	Nature (wild landscape, raw nature, natural world, grassland), shape (sculptural quality of hills, open space)	learn about land-use, geology, hydrology, botany, entomology, ecology, diversity, the importance of first-hand experience, peacefulness, enjoyment,	Fun, imagination freedom	Open space, sky, hills, altitude, the breeze, the sound of the wind, the sound of wildlife, peacefulness, exertion and activity	Childhood, places visited, the past, people of the past and previous land-use	Connected to nature 'free as a bird', to God, to the wonder of the universe, simplicity, grounded and at one with the Earth, o the area, a sense of belonging, very much a Wiltshire feature

			curiosity and self				
<b>Cracked earth</b>	To conserve (concerned, hopeful, add mulch), to create (patterns, paintings, drawings, photos)	Visuals (patterns, beauty), nature (surviving species), shape	learn about soil types, ecosystems, natural fluctuations, colonialisation, climate change, human impacts, efficient water use and survival	Despair, worry		Natural cycles (water and vegetation), climate change, places visited before, childhood, and self	Connected to nature, nature was destroyed, our responsibility as caretakers not controllers of nature, 'despite the drought life will continue, connected to the area
<b>White horse</b>	To be active (walk), to discover (visit other horses, explore) to create (drawings, forms), to be reflexive (reflect, think about future)	Identity (familiarity of horses, relationship to other horses in the area, history, a sense of identity), nature, the unknown (what lies over the hill, the unseen)	to learn about nature, ecology, botany, ornithology, solitude, appreciation, wonder, timelessness, art, and about self.	Specialness	Hills, the altitude, open space, the sky, fresh air, sunshine, the horizon, the view, local history, Wiltshire whitehorses	The past, the people of the past, the origins of the Whitehorse	Connected to nature, grounded and at one with the Earth, connected to the area
<b>Hedge and track</b>	To discover (explore), to be active (walk), to create (paintings, drawings, sloe gin, photos), to be reflexive (reminisce, think	Visuals (beauty, attractiveness, scenery, patterns) nature (trees, woodlands, sky,) shapes (within the landscape), diversity (of	learn about nature, birds, botany, wild edibles, the origins/history of the track and about peacefulness	Exploration, relaxation, losing yourself, being in touch with nature	What lies over the hill that is unseen, where the track leads, the peaceful surroundings, open space, nature, and	The past, places visited, childhood, identity, people of the past, previous land-use and the origins of the track and hedge	Connected to nature, to God, to the area

	about things, obtain clarity)	habitats), the track			activity people are involved in		
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