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A review of large-scale conservation in England, Scotland and Wales

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A review of large-scale conservation in England, Scotland and Wales

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Foreword and overview

There has been a growing interest across the British conservation community in recent years in establishing conservation over large areas. Much of this thinking was crystallised in the *Making Space for Nature* report (Lawton and others 2010)[1], and has since become prominent in conservation policy. To maximise the success of future projects, there is a need to get a better overview of the many large-scale conservation (LSC) initiatives that already exist, and to investigate what can be learned from past experience. To date there has been no thorough study of the scope, spatial extent, management and planning approaches and effectiveness of LSC. This report summarises the results of a research study that provides the first comprehensive review of large-scale conservation initiatives in England, Scotland and Wales. The study was made up of a series of linked research projects with funding and support from Defra, Natural England, Scottish Natural Heritage and Natural Resources Wales and was carried out by the University of Southampton, University of Cambridge, Natural England and Atkins.

Within Natural England, the findings have already been used for a range of purposes, including: informing advice on improving large-scale conservaiotn, including in discussions with partners; contributing to the Improvement Programme for England's Natura 2000 Sites (IPENS); developing ideas for better monitoring of the effectiveness of protected areas and other conservation sites in the future; informing Natural England's Conservation Strategy; and as the basis for further research.

Conservation is an ever-developing area of activity: existing projects change, new projects start, policies and funding instruments evolve. The result of the EU membership referendum held in June 2016 is likely to result in further changes in the policy and funding landscape. Thus, as in any study of this type, some of the information presented here will be out of date before or soon after the report has been published. However, we have been able to identify some clear patterns, issues, conclusions and questions for further study that we hope will be valid and useful for researchers and practitioners in this field for a long time to come.

[1] Lawton JH, Brotherton PNM, Brown, VK, Elphick C, Fitter AH, Forshaw J, Haddow RW, Hilborne S, Leafe RN, Mace GM, Southgate MP, Sutherland WJ, Tew TE, Varley J & Wynne GR (2010) *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra. Defra, London

The report is structured as follows:

Chapter 1 provides an introduction to the topic of large-scale conservation, a summary of the aims and methods of the project, and a summary of all the main findings. These include an overview of the numbers, types and locations of large-scale conservation initiatives; the use of scientific information used in LSC planning and management; social and institutional factors relating to LSC partnerships, governance, funding and related issues; a synthesis of the factors that influence decision-making in large-scale conservation; and whether environment benefits could be detected.

Chapters 2-5 provide more detail on different elements of the project; these are structured as a series of self-contained technical reports:

> **Chapter 2. Building an overview of large-scale conservation.** This chapter outlines how a comprehensive database of LSC initiatives was designed, populated and analysed, with summary information about the different LSC initiatives identified.
>
> **Chapter 3. The planning and management of large-scale conservation initiatives: I. Online surveys** This chapter summarises the methods and findings of an online survey intended to complement the database by looking in more detail at factors relating to planning and management of large-scale conservation initiatives.
>
> **Chapter 4. The planning and management of large-scale conservation initiatives: II. in-depth interviews.** This chapter summarises in-depth interviews with managers of conservation initiatives; it explored similar topics to those in the online survey but through a semi-structured interview approach.
>
> **Chapter 5. The environmental outcomes of large-scale conservation in England, Scotland and Wales.** This chapter summarises analysis to assess the environmental outcomes achieved by large-scale conservation

Two related publications are also available:

A searchable online database of the conservation initiatives identified in this study is available at: www.geodata.soton.ac.uk/landscape_scale

The report 'Working together to make space for nature', a joint publication by Natural England, RSPB, the Wildlife Trusts, Butterfly Conservation and the National Trust, summarises recommendations developed from a conference of experts from across the conservation sector at which the results from this research study were presented and discussed:

JP011 - *Working together to make space for nature: Recommendations from a conference on large-scale conservation in England*

A note on terminology:

We use the phrase ‘large-scale conservation’ (LSC) to refer to the activity of planning and delivering nature conservation over large areas, including in terms such as ‘LSC managers’.

We generally refer to the physical conservation areas and projects created and managed as a result of these activities as ‘LSC initiatives’; this is synonymous with the term ‘large conservation area’ which is used in some of the authors’ other publications and occasionally in this report.

The term ‘LSC project’ is occasionally used synonymously with ‘LSC initiative’, particularly in the chapters about the database (Chapter 2) and online survey (Chapter 3, Annex II), and when referring to individual initiatives that refer to themselves as ‘projects’. However (and particularly in Chapter 4) we generally use ‘project’ to refer to a distinct activity with a clearly defined aim and time period, often associated with a single source of funding – in this sense a number of different projects (in some cases overlapping) can exist under a single large-scale conservation initiative.

A full list of acronyms and abbreviations used in the report is provided in Annex I.

Acknowledgements

We are extremely grateful to the many people from many different organisations who took the time to provide information about their conservation initiatives. We would also like to thank Phil Baarda, Humphrey Crick, Jilly Hall, James Latham, Rob McCall, Brian McDonald, and Helen Pontier for providing comments on drafts of this report. Janet Shaw and Liz Kinsey helped to gather initial information on large-scale conservation initiatives, and Sophie Day provided valuable assistance in producing summaries of some of the project findings.

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Chapter 1. Large-scale conservation: background to the study and summary of aims, methods and results

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This chapter outlines the background to the study: the factors that have led to large-scale conservation becoming more prominent in policy and practice in England, Scotland and Wales and a summary of the current situation in the three countries. It goes on to outline the rationale, aims and methods of the study. Finally, it provides a summary of the major findings, under the following headings: I. General patterns in large-scale conservation; II. The application of scientific information to planning and management; III. Social and institutional factors in planning and management; IV. The factors influencing decisions in large-scale conservation and; V. Environmental outcomes.

1. The growth of 'large-scale' thinking in conservation

As in other European countries (Jongman 1995, Jongman and others 2004), there has been a growing interest across the British conservation community in recent decades in the concept of 'ecological networks[2]' and establishing conservation over large areas. This interest has been driven by a range of inter-related factors, including:

- Concern over small and fragmented conservation sites, particularly if isolated by intensive land use, failing adequately to conserve biodiversity (Fahrig 2003). Especially in highly-fragmented landscapes such as those in Britain, no single site or patch of habitat - no matter how good – is likely to be sufficient in itself to maintain biodiversity over time (e.g. Hanski 1994) and so conservation of individual protected areas, while vital, is likely to be insufficient (Fonseca and others 2005). Given this need to consider the whole landscape mosaic (Lindenmayer and others 2008), large-scale conservation (LSC) approaches have been suggested to expand and link existing sites, provide zones of more sympathetic land use in the 'matrix' between them, and so better protect threatened species (Boyd and others 2008).

- A desire to restore large areas to a 'wilder' state (Kirby 2009; Manning 2009; Monbiot 2013; Rewilding Britain 2014; Sandom 2016), sometimes inspired by places such as Oostvaardersplassen in the Netherlands (Vera 2009) or by big 'connectivity conservation' projects further afield, such as in North America (Foreman 2004) and

[2] Ecological networks are defined by Lawton and others (2010) as "suite[s] of high quality sites which collectively contain the diversity and area of habitat that are needed to support species and which have ecological connections between them that enable species, or at least their genes, to move". See also Beier and Noss (1998), Jongman (1995)

Australia (Warboys and others 2010, Fitzsimons and Wescott, 2005, 2008, Fitzsimons and others 2013)

- Increasing awareness that conservation needs to take account of the benefits the environment provides to people – 'ecosystem services' (Daily 1997; MA 2005) – and recognition that some of these, such as drinking water, depend on large-scale ecological processes and need to be managed over large geographic areas such as whole river catchments

- A desire to reconnect people with the environment, reverse the homogenisation of landscapes and restore or create distinctive places that provide benefits for both wildlife and for people (Council of Europe 2000; Selman 2012)

- Growing concern about climate change and the need to adapt conservation strategies to some inevitable amount of change. In a future in which landscapes and ecosystems appear likely to be become increasingly dynamic and 'fluid' (Manning and others 2009), with a resulting need to consider landscape change, species movement and resilience across wide areas (Vos and others 2008; Morecroft and others 2012), large-scale approaches (both larger sites and better management coordination and functional links between them) will become increasingly important (Opdam & Wascher 2004; Hopkins and others 2007; Heller & Zavaleta 2009), including for the provision of 'ecosystem-based adaptation' for people (Doswald & Osti 2011). Landscape-scale conservation initiatives are vital for fulfilling four of the six guiding principles to practitioners set out by Hopkins and others (2007) in *Conserving biodiversity in a changing climate*: conserve existing biodiversity; reduce sources of harm not linked to climate; develop ecologically resilient and varied landscapes; establish ecological networks through habitat protection, restoration and creation

The "Lawton review", *Making Space for Nature* (Lawton and others 2010) assessed whether England's wildlife sites constitute an effective ecological network. It showed that the Sites for Special Scientific Interest (SSSI) network – sites with statutory protection for wildlife protection – plays an important role in conserving wildlife in England, but is in itself not a resilient and coherent[3] ecological network. Lawton and others (2010) showed that England's SSSIs and other wildlife sites are of inadequate size to ensure long term persistence of some elements of biodiversity, especially under a changing climate, are insufficiently protected and managed, and are insufficiently connected ecologically to enable species movement. Their overall recommendations were as follows:

"The essence of what needs to be done to enhance the resilience and coherence of England's ecological network can be summarised in four words: more, bigger, better and

[3] Lawton and others (2010) tested 'resilience and coherence' against five attributes: "i) The network will support the full range of England's biodiversity and incorporate ecologically important areas, including special biodiversity. (ii) The network and its component sites will be of adequate size, taking account of the needs of our natural environment to adapt to climate change. (iii) The network sites will receive long-term protection and appropriate management. (iv) Sufficient ecological connections will exist between sites to enable species movement. (v) Sites will be valued by, and be accessible to people, including sites close to where they live."

joined. There are five key approaches which encompass these, and also take account of the land around the ecological network. We need to:

(i) Improve the quality of current sites by better habitat management.

(ii) Increase the size of current wildlife sites.

(iii) Enhance connections between, or join up, sites, either through physical corridors, or through 'stepping stones'.

(iv) Create new sites.

(v) Reduce the pressures on wildlife by improving the wider environment, including through buffering wildlife sites."

Lawton and others (2010) went on to outline 24 recommendations to establish a coherent and resilient ecological network, in five broad themes, all of which are relevant to large-scale conservation initiatives. These are summarized below:

1) Existing wildlife sites must be managed to the highest standards;
2) Ecological networks must be properly planned, including restoration areas and efforts should be focused on areas where the benefits for wildlife and people will be very high – Ecological Restoration Zones;
3) The management and protection of surviving patches of wildlife habitat scattered across England outside SSSIs needs to be improved;
4) Areas where ecosystem service provision can provide policy win-wins scenarios in terms of delivering significant societal benefits need to be identified and a more effective ecological network established; and
5) A strong collaborative effort between government and society is required to achieve a robust and resilient ecological network.

The *UK National Ecosystem Assessment* (UNEP-WCMC 2011) echoed the message that biodiversity and many other aspects of the natural environment have declined or been degraded since the early-mid 20 century. It provided compelling evidence of the importance of reversing this trend in order to maintain and improve the services provided by the natural environment that support human wellbeing. It also noted the need for a more integrated approach to environmental management that acts at the appropriate spatial scales. The report *Think Big: how and why landscape-scale conservation benefits wildlife, people and the wider economy* published at around the same time by the England Biodiversity Group (comprising conservation, landowning, farming organisations and statutory bodies) emphasised the importance of large-scale action for conservation (England Biodiversity Group 2011).

The Independent Panel on Forestry, commissioned by the Government to provide advice on the future direction of forestry and woodland policy in England, recommended not only the further expansion of woodland cover, but also the creation of "a coherent and resilient ecological network at a landscape scale" (Independent Panel on Forestry 2012, p8).[4]

[4] The Lawton Report and the *Independent Panel on Forestry* focused on England,. The National Ecosystem Assessment covered the whole of the UK.

2. Prominence in recent English, Scottish and Welsh conservation policy

The government's response to the reports mentioned above has raised the issue to a prominent position in environmental policy across Great Britain.

England

Messages from *Making Space for Nature* and the *National Ecosystem Assessment* come through strongly in the two current most important conservation policy documents, the Natural Environment White Paper *The Natural Choice* (Defra 2011a) and the new conservation strategy for England, *Biodiversity 2020* (Defra 2011b).

The White Paper states that "past action has often taken place on too small a scale. We want to promote an ambitious, integrated approach, creating a resilient ecological network across England. We will move from net biodiversity loss to net gain, by supporting healthy, well-functioning ecosystems and coherent ecological networks". Among the commitments made in the paper, several specifically address large-scale conservation and ecological networks. These include Commitment 3 (on the goal for 2020), Commitments 4-6 (on Local Natural Partnerships), Commitments 8-11 (on Nature Improvement Areas), Commitment 13 (on agri-environment and woodland grant schemes), Commitment 28 (on catchment level partnerships), Commitment 32 (on transport), and Commitment 67 (on green infrastructure).

Biodiversity 2020 refers heavily to the recommendations in *Making Space for Nature* and states that "effectively establishing coherent and resilient ecological networks on land and at sea requires a shift in emphasis, away from piecemeal conservation actions and towards a more effective, more integrated, landscape-scale approach." The phrase 'integrated landscape-scale approach' (or 'large-scale approach') to conservation is used repeatedly throughout the document. This is reflected in the specific outcomes set out in the strategy, including outcome 1 (habitats and ecosystems on land) which mentions: "...more resilient and coherent ecological networks..." and "...more, bigger and less fragmented areas for wildlife..."; and outcome 3 (on species), which includes: "The strategy's integrated landscape-scale approach to improve ecological networks is the core means to conserve our wildlife" (while also noting that more targeted actions will also be required).

The most obvious and immediate application on the ground of these policy commitments was the establishment, in 2012, of 12 Nature Improvement Areas (NIAs). These are large areas chosen for ecological restoration through a national competition, with local partnerships submitting proposals for their area (a direct application of Lawton and others' (2010) recommendation for 'Ecological Restoration Zones'). The competition generated a great deal of interest, with a large number of applications submitted[5]. The NIAs' aims and objectives reflect two of the main themes that come out of the policy documents above – the need for better ecological networks, and the importance of ecosystem services/multiple

[5] 76 potential NIA bids applied for NIA status funded for 3 years, 12 winners shared £7.5million

benefits for people from nature conservation. There are also policies in place to support the establishment of 'local NIAs'; several of these have been set up.

The new Countryside Stewardship agri-environment scheme (which replaces Environmental Stewardship) also has an aspiration for landscape-scale conservation[6].

Scotland

In Scotland, there has been similar development of thinking around the need for landscape-scale projects. The Scottish Government's National Planning Framework identifies as an action 'Develop a National Ecological Network potentially encompassing large strategic habitat restoration projects' (Scottish Government undated). The lead partner in this is Scottish Natural Heritage, but other agencies have a role (Forestry Commission Scotland, Scottish Environmental Protection Agency, Forest Research, Central Scotland Green Network partners, Local Authority partnerships, Planning Authorities, Strategic Development Planning Authorities, Scottish Water, British Waterways, RSPB, Central Scotland Forest Trust, Green Network Partnerships and the Environmental Quality Directorate, Rural Directorate, Rural Payments and Inspections Directorate, Climate Change and Planning and Architecture sections of the Scottish Government). In 2013, Scottish Natural Heritage published a review of collaborative landscape-scale management initiatives (Boulton and others 2013).

The Scottish Biodiversity Strategy and the Scottish Forestry Strategy both discuss the need for landscape-scale restoration. A workshop initiated by Forestry Commission Scotland in 2011 on 'landscape scale ecological restoration', led to the establishment of a partnership project for Landscape Scale Ecological Restoration (LSER) (Land Use Consultants & Worrell 2012). The Scottish Forestry Strategy has a target of producing 25% forest cover in Scotland by 2050, requiring 10,000 ha of new planting each year. Choosing where to plant these new forests will be a major venture, inevitably involving linkages with existing plantings to create landscape scale units. This increase in forest cover feeds directly into one element of Scotland's Climate Change Delivery Plan which promotes forestry as a key carbon sink, as does Scottish Natural Heritage's Climate Change and the Natural Heritage Action Plan. Scottish Natural Heritage is also encouraging the use of landscape ecology within the management of heritage landscapes.

The second National Planning Framework has two environmental priorities alongside the large infrastructure projects: the Central Scotland Green Network (CSGN); and the National Ecological Network (NEN). The CSGN is designed to create a step-change in the area's environment and socio-economics by improving habitat connectivity, access and green infrastructure, leading to an improved sense of place, improved health and well-being, more sustainable communities and sustainable economic growth. The NEN is a Scotland-wide initiative (still under discussion) is likely to promote better targeted on-the-ground work and large catchment-scale initiatives. The Wildlife and Natural Environment (Scotland) Act 2011

[6] https://www.gov.uk/government/collections/countryside-stewardship-facilitation-funding

contains legislation to prevent the invasion of non-native species onto wild land, which potentially could lead to catchment-wide invasive control projects.

Wales

As for the rest of Britain, there have been major changes in the approaches to the environment in Wales in recent decades, with an increasing emphasis on more integrated approaches and large-scale conservation. The Wales Environment Strategy (2006) led the way in this respect, setting priorities for landscape scale biodiversity actions to enhance connectivity and environmental improvements. This included outcomes to reduce fragmentation increase extent and connectivity of habitats. Woodlands for Wales (2011), similarly established policy to manage Welsh woodlands integrating ecosystem services, biodiversity and enhancing landscape quality through targeting of woodland grants to enhance connectivity and woodland networks. These approaches have been informed by analysis of woodland habitat networks across the whole of Wales (Watts and others 2005). This work was extended by the former Countryside Council for Wales to include mapping of habitat networks for a range of terrestrial habitats and identification of priority areas to target habitat restoration and expansion to enhance ecological networks (Latham and others 2013a). The Climate Change Strategy (2010) for Wales also targets the expansion of woodland as carbon stores by up to 5000 ha per year.

The Welsh Government consultation *Sustaining a Living Wales* explored much greater integration between environmental sectors, noting that "Identifying new ways of working with natural processes will allow greater emphasis on positive investment in the environment, including large scale habitat creation and restoration" (Llywodraeth Cymru 2012). The consultation was followed by the formation of a new body, *Natural Resources Wales* (NRW) in April 2013, which replaced and took on the functions of Countryside Council for Wales, Forestry Commission (Wales), and Environment Agency (Wales). Following groundwork by Welsh Government's Living Wales Programme (2012-13), Natural Resources Wales adopted the concept of integrated 'area-based' natural resource management based on the Ecosystem Approach as a central tenet to its work. NRW continues to explore how to achieve this, notably within three catchment-based trial areas, Rhondda, Tawe and Dyfi.

Legislation in Wales has continued to reinforce environmental integration. Welsh Government's Well-being of Future Generations (Wales) Act 2015 sets the natural environment in a broad societal context, with one of its seven well-being goals being "A resilient Wales: A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change)."

The Environment (Wales) Act 2016 is intended to create the legislation needed to "plan and manage Wales' natural resources in a more sustainable and joined-up way". The Act also refers prominently to resilience, and following from a Living Wales Programme review of the subject (Latham and others 2013b) describes four broad attributes of the environment to be considered in building resilience: diversity, extent, condition and connectivity.

The Environment (Wales) Act is supported by Welsh Government's Nature Recovery Plan (2015). The Plan puts the Environment Bill's aspirations for resilience on a more practical footing and contains objectives for habitat restoration and creation to improve ecological networks and connectivity.

Many of these programmes were delivered in part through agri-environment actions funded by the Rural Development Plan for Wales 2007-2013. Whole farm schemes within Wales (Tir Gofal, Tir Cynnal, Tir Mynydd) were replaced by the Glastir payments from 2012. Glastir broadened the objectives for sustainable land management, particularly within the Glastir Advanced (targeted programmes) to promote landscape-scale and collaborative actions by groups of farmers. With significant parts of Wales being common land (8.4% of the land area) the Common Land Element of the Glastir scheme is also significant as it targets collaborative management, through the multi-landholder grazing association membership.

3. The need to learn from past experience

Large-scale conservation is not a new concept (Noss 1983) and this recent interest among policy-makers and conservation practitioners reflects ideas that had been developing in British conservation for some time. When *Making Space for Nature* was published, many LSC initiatives already existed. These included the Wildlife Trust's Living Landscapes programme (Wildlife Trusts 2007), the RSPB's Futurescapes programme (RSPB 2001, 2010), the England Biodiversity Group 'Integrated Biodiversity Delivery Areas' (Natural England undated), and a wide variety of other projects and programmes, for example those managed by Butterfly Conservation, the Woodland Trust and the National Trust. The recommendations in *Making Space for Nature* were strongly influenced by the thinking that underpinned some of these earlier initiatives.

With significant resources being put into Nature Improvement Areas and other new or existing initiatives, there is both an opportunity and a need to learn from the experiences and results of past LSC initiatives to inform the design and management of future initiatives. A better overview of the geographic locations of different LSC projects could help to improve coordination, and to avoid duplication of effort or important areas being missed. Better information about the different approaches that have been taken to issues such as partnerships, governance and community engagement and which approaches have been most successful would help new projects choose the appropriate approach to take and avoid past mistakes. And, although one might expect large-scale schemes to be more effective than small fragmented ones, it remains unclear how effective this approach to conservation has so far been in contributing to the establishment and maintenance of coherent ecological networks in the UK in the ways suggested by Lawton and others (2010).

Some earlier studies have begun to address these issues, generally focusing on a specific subset or collection of case studies of LSC initiatives. In some cases these studies evaluated

a particular organisation's projects and were done by or for that organisation to provide information for future planning. Previous studies include RSPB research looking at large-scale conservation in agricultural areas (Swales 2009), evaluations of individual programmes such as the Butterfly Conservation landscape target areas and the RSPB Futurescapes (Lee 2010, Ellis and others 2012), and a separate study of LSC initiatives across Great Britain by some of the authors of this current project (Elliott and others 2011, Adams and others 2014). McMorran and others (2006) undertook a review of the Scottish examples of rewilding initiatives, focusing on forest networks. Studies on large-scale rewilding initiatives have been undertaken by Taylor and Ayres (2003), Ward and others (2006) and Jeeves (2006). More recently, a study by LUC and Worrall (2012) reviewed projects carrying out large-scale ecological restoration (particularly of forest) in Scotland and evaluations were carried out of the objectives and implementation of the Integrated Biodiversity Development Area programme (Short and others 2012) and of the Heritage Lottery Funded (HLF) funded Landscape Partnership programmes (Clarke and others (2011). The Nature Improvement Areas programme included the development and implementation of a framework for monitoring and evaluation (Collingwood Environmental Planning 2015).

However, to date, no attempt has been made to explore the overall scope, geographic coverage, experiences and effectiveness of large-scale conservation efforts in Britain.

4. Aims of the study

This study aimed to build on and go beyond the findings of earlier studies by providing the first comprehensive review of large-scale conservation initiatives in England, Scotland and Wales. It was broad and ambitious in its scope, and had four general aims:

I. To build a good overview of landscape scale conservation projects and initiatives across Britain. The project aimed to determine how many LSC initiatives there were, their geographic locations, which organisations were involved, the different aims being addressed, and whether different 'types' of LSC project could be identified.

II. To explore the sources of scientific and other information used to inform design and management of initiatives, and how this information was applied. Given that LSC initiatives are potentially well-placed to address some aspects of adaptation to climate change, an important question was how important adaptation considerations are in influencing conservation goals and management decisions.

III. To explore the social and institutional aspects of LSC and how these affect success and failure in achieving conservation goals. Large-scale conservation frequently involves partnerships and cooperation among multiple partners, landowners and volunteers. The project aimed to improve our understanding of the types of approach to setting up and managing LSC initiatives that had worked best in different circumstances, and what some of the issues and challenges had been.

IV. To investigate whether better environmental outcomes have been achieved in areas with more large-scale conservation present. We know that some individual projects

have been very successful at, for example, restoring areas of land and promoting some species populations; the study aimed to test whether this was reflected in detectable improvements across larger areas of the country.

5. Overview of methods

5.1. Database and general data collection

A relational database of candidate LSC initiatives within Britain was developed in Microsoft Access, to summarise key information about potential LSC projects and programmes. This database covers a range of characteristic attributes of LSC projects including: their aims and objectives, location and scale, activities, organisation and operation, funding, partnerships and community involvement.

The database was populated by collecting information from a range of different sources, including an initial pilot questionnaire in 2010 to some conservation organisations, published information such as reports and websites, and from unpublished reports and other information obtained from staff working on the conservation projects. Funder websites and information on grant awards also provided information (e.g. SITA Trust and Heritage Lottery Fund websites). In addition, a spatial database was collated of the GIS files of the boundaries of LSC projects, where these were available. In cases where no GIS data were available, the XY coordinates of the centroid of the LSC projects, together with their area, were used to calculate the approximate spatial extent.

The database provided the foundation for the rest of the project, including by producing a categorisation of projects from which a sample for more detailed study was taken, and providing information to inform spatial analysis of the coverage of LSC initiatives in relation to other landscape and conservation areas and designations and observed environmental changes.

5.2. Online surveys

A more focused survey was run in early 2012, to collect information on a series of topics relating to how LSC initiatives are planned, initiated and managed. Specifically, the survey focused on i) the information (including views on climate change) that informs selection of sites, conservation goals and management actions in LSC, and how this information is used, and ii) social and institutional factors that are important in determining how LSC is put into practice (including approaches to partnerships, governance and decision-making, community engagement, approaches to land tenure and funding arrangements). An online questionnaire was sent to 630 contacts from within the LSC database (450 contacts related to a single LSC initiative and 180 contacts with multiple potential LSC initiatives), and produced 136 complete responses relating to individual projects.

5.3. In-depth interviews

More detailed qualitative data were obtained from in-depth interviews with the managers of 27 selected LSC initiatives, between January and September 2012. We selected initiatives in the database to capture a range of experience and approaches on the basis of size (10-

49km^2, 50-990 km^2 and >1000 km^2), and number of landowners (10 or less, or more than 10). Within these categories, initiatives were selected purposively, taking account of location (geographical spread) and logistics (time and travel costs), to include a range of habitats and lead organizations across England, Scotland and Wales. The final sample of 27 was made up of 16 initiatives in England, 8 in Scotland and 3 in Wales.

Managers of selected initiatives were contacted by telephone or email. Most interviews were conducted face-to-face (n=23), the rest over the phone or using *Skype* (n=4). Interviews were managed to try to create a rapport between interviewer and interviewee and a schedule of questions was used to guide conversation around pre-arranged topics. This enabled interviewees to use their own words to describe experiences and views, to make links to topics or issues not in the original list and to clarify and explain complex issues.

Both the online questionnaire and the interviews covered the full range of topics outlined above, but collected different sorts of information. The questionnaire focused mainly on questions that invited categorical (yes/no, multiple choice) answers, whereas the aim of the interviews was to invite LSC managers to use their own words to describe experiences and views, to make links to topics or issues not in the original list of questions and to clarify and explain complex issues.

5.4. Spatial analysis

To investigate how LSC activity is distributed across Britain in relation to patterns of biodiversity and landscape character and existing protected areas, and whether there is a relationship between high levels of LSC and greater environmental improvements than would be expected by chance, a range of spatial analyses were done. We ran all analyses at a grid resolution of 10 x 10 km due to the limitations in our knowledge of both the spatial extent of LSC initiatives and availability of ecological datasets. The approaches taken were:

1) A comparison of changes in human-perceived landscape 'character'– a cultural ecosystem service - and the distribution of LSC initiatives at the resolution of National Character Areas (NCAs). This analysis was based on the Countryside Quality Counts index.
2) A comparison of the differences in the relationships between key conservation indicators and LSC initiatives and the other English conservation strategies (SSSIs, NPs, AONBs) at the NCA resolution.
3) An analysis of the relationships between LSC activity and climate vulnerability in England at the NCA resolution. Vulnerability was measured based on measures of habitat fragmentation, sensitivity to climate change and overall vulnerability to climate change, all based on climate vulnerability modelling done by Natural England.
4) A comparison of *levels* of biodiversity and the extent of coverage of LSC initiatives across Britain. These analyses included statistical controls for environmental conditions. This analysis was based on data on bird diversity obtained from the British Trust for Ornithology, and data on non-bird BAP species obtained from the Biological Records Centre.
5) A comparison of the relationship between *changes* in measures of biodiversity and the extent of coverage of LSC initiatives across Britain. This analysis was based on data from the Countryside Survey.

6) A comparison of the relationship between *changes* in measures of biodiversity in ecologically similar areas with differing levels of LSC. This analysis required an initial step of identifying the degree of ecological similarity of all 10 x 10 km grid cells in Great Britain. A side product of this step was producing a 'geographical distinctiveness' map of Great Britain. Again, this analysis was based on data from the Countryside Survey.

The majority of the data collection and analysis outlined above was done between late 2010 and 2013, with some additional analysis and synthesis in 2014 and 2015.

5.5. Stakeholder conference

To begin communicating some of the most important emerging findings to the conservation community, and to help translate the project's results into recommendations for action, a conference was organised by Natural England, in collaboration with RSPB, the Wildlife Trusts, Butterfly Conservation and National Trust, in 2013. This event, with the title 'Working together to make space for nature', brought together almost 100 of the leading thinkers, researchers, decision-makers and practitioners in the field, from more than 50 organisations. The conference included a series of focused workshops and discussions, with the aim of helping the conservation community to move towards a common understanding of what we are aiming for in LSC and what needs to be done to get there. The main conclusions and recommendations from the conference, together with papers from plenary talks and some case studies, are summarised in a separate report (Macgregor and others 2015).

6. Summary of main findings

The following section of the chapter summarises some of the main findings and conclusions from the study. These are presented in five sections:

1. General patterns in large-scale conservation
2. Application of scientific information to planning and management
3. Social and institutional factors in planning and management
4. A synthesis of the factors influencing decisions in large-scale conservation
5. Environmental outcomes

In each of these sections, findings are summarised as answers to a series of questions.

6.1. General patterns in large-scale conservation

(For more information see Chapter 2)

How many LSC initiatives are there and where are they located?

We identified over 800 separate conservation initiatives that met the criteria for inclusion in the study – an area of at least 10km^2, with clear nature conservation objectives and involving management on the ground – and for which information about size and location could be found.

The majority of LSC initiatives identified were within England, with much smaller numbers in Scotland and Wales. These relative proportions are partly the result of including Higher Level Stewardship areas in England (arguably on the border of what can be considered a distinct and coordinated initiative) but even without these England still had far more than the other two countries combined. Few cross-border initiatives were recorded, with only three initiatives crossing the border between England and Scotland and three across the border between England and Wales.

Looking across the three countries, conservation initiatives are spread widely, but there are definite focal points of activity in which multiple large conservation areas have been established, such as the Fens in eastern England and the Cumbrian mountains in north-west England (Figure 1.1).

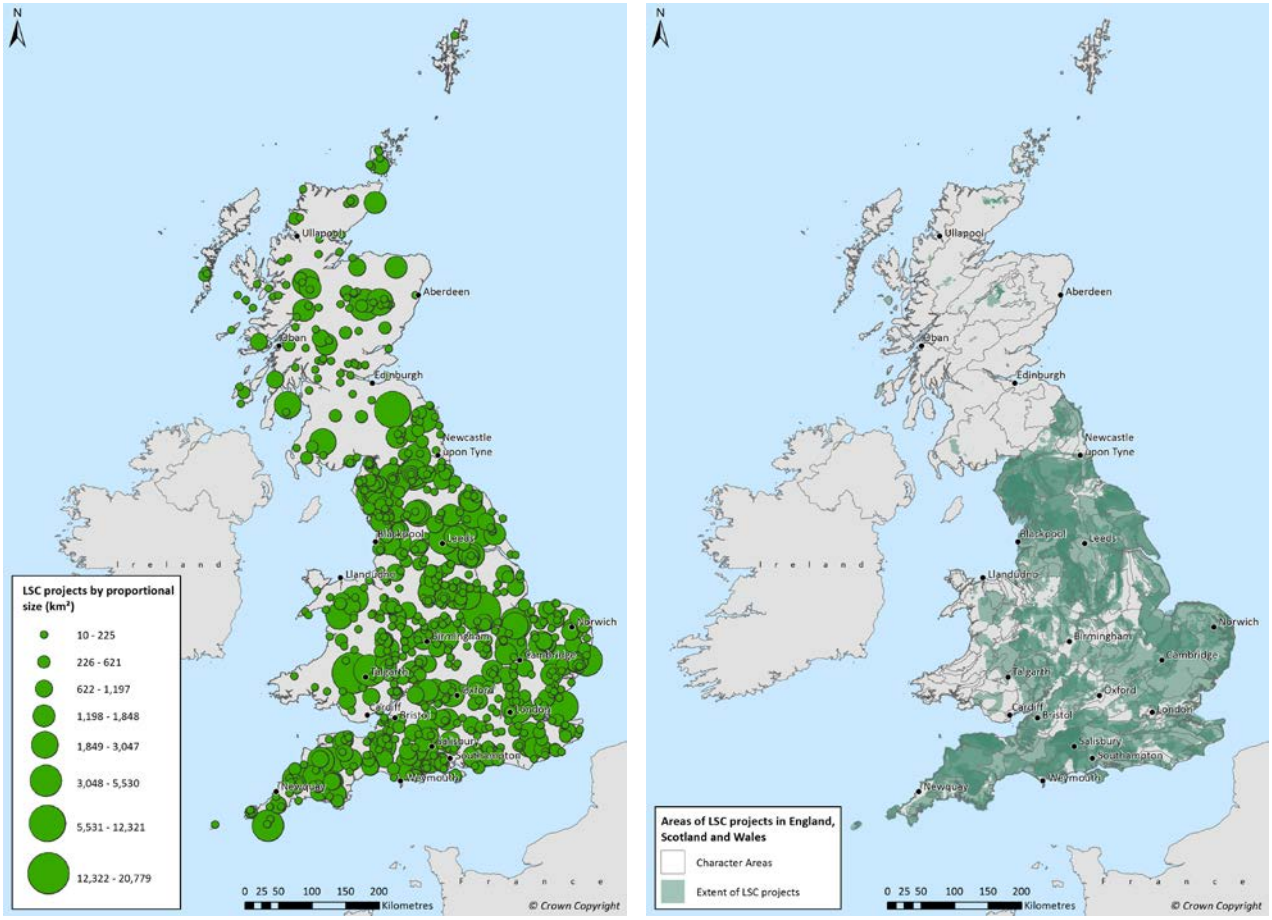

Figure 1.1 **LSC initiatives in England, Scotland and Wales a) by centre point and proportional size (829 initiatives); b) showing initiative boundaries, with darker green shading indicating areas where multiple initiatives overlap (609 initiatives; in particular omitting many initiatives in Scotland that could not be mapped)**

What different types of LSC initiative can be distinguished?

There is a very wide range of different types of LSC initiative. Many initiatives are part of larger programmes, the 14 largest of which (by number of initiatives) are shown in Table 1.1. This highlights some of the variety of large conservation areas that exist.

Table 1.1 **Summary of the fourteen programmes with the largest number of recorded initiatives, the number of initiatives they contain and average area of initiatives within each programme**

Programme	Number of Initiatives	Lead agency	Launch date	Total area (km^2)
Living Landscapes	120	Wildlife Trusts	2006	24,669
HLS target areas	110	Natural England	2005	48,268
Butterfly Conservation Landscape Target Areas	78	Butterfly Conservation	2000	47,898
Catchment Sensitive Farming	66	Natural England/ Environment Agency	2006	61,655
Futurescapes	32	Royal Society for the Protection of Birds	2010	24,461
Deer initiative	26	Deer Initiative Partnership	1995	19,792
RSPB Reserves	23	Royal Society for the Protection of Birds	1932	822
English NNR	22	Natural England	1981	664
Riverine Strategic River Restoration	19	Natural England	2008	588
Scottish NNR	18	Scottish Natural Heritage	1981	809
Landscape Partnership	17	HLF	2004	2,967
Community Forests	15	Forestry Commission	1990	12,313
National Trust Land	14	National Trust	1894	3,073
Nature Improvement Areas	12	Natural England	2012	6,181
Total number of initiatives	**572**	**Total area served (km^2)**		**254,160**

One factor that clearly differentiates initiatives is the land tenure arrangement and approach to management. On that basis four distinct categories can be identified:

1. *Conservation areas with a single landowner,* such as private estates or owned nature reserves

2. *Conservation areas or projects involving a small number of landowners* that are all active partners in the conservation initiative (for example organisations with adjacent land holdings that they are managing together as a big reserve)

3. *Target areas for government schemes* such as Higher Level Stewardship or Catchment Sensitive Farming, where the area is designated by the funding provider, with many landowners involved

4. *Projects led by a conservation partnership* but seeking to influence management of land owned by many other landowners (often a large number of individual farmers.)

These categories can cut across the programmes shown in the table above. For example, most of the Living Landscapes fall into the fourth category above, focusing on conservation on private land around existing owned reserves, but the Great Fen Project Living Landscape aimed where possible to buy land for conservation and create in effect a large nature reserve managed by the project partners.

What are they aiming to achieve?

The diverse range of approaches to LSC is reflected in a wide range of objectives across different initiatives. Wildlife and biodiversity were, not surprisingly, the most common objective, but many initiatives had wider objectives, in particular relating to environmental education, public access, engaging with local communities and inspiring and educating people in general (Figure 1.2).

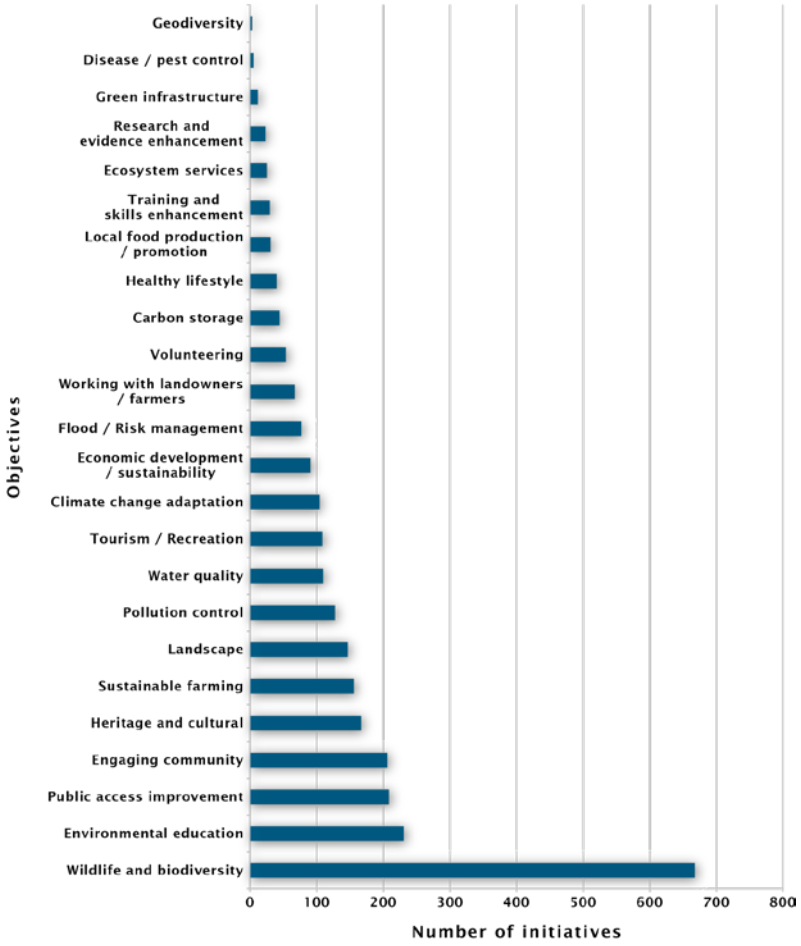

Figure 1.2 **Frequency of objectives across LSC initiatives (758 initiatives), gathered through the survey of managers. Respondents could indicate multiple objectives for a single conservation initiative.**

Responses to the surveys suggested that most initiatives had grown incrementally and that initial objectives had often changed or broadened over time as a result of experience, new scientific information, or changing circumstances (such as requirements of new funders).

How long have these initiatives been going?

The range of starting dates of the different initiatives shows that LSC has a long history in some cases. Some areas date back many decades, with the oldest initiative identified starting in the 1920s. However, there has been a great increase in the number of initiatives in the last two or three decades, when major programmes such as Living Landscapes, Futurescapes, Butterfly Conservation Landscape Target Areas, Catchment Sensitive Farming and others started. The majority of initiatives started from the 1990s onwards: 71 in the 1990s, 476 in the 2000s and 82 (so far) since 2010.

How large an area of land do different LSC initiatives focus on?

10km^2 (1000ha) was the arbitrary cut-off point for inclusion in this study, so all initiatives recorded were at least that size; some were much larger (Figure 1.3).

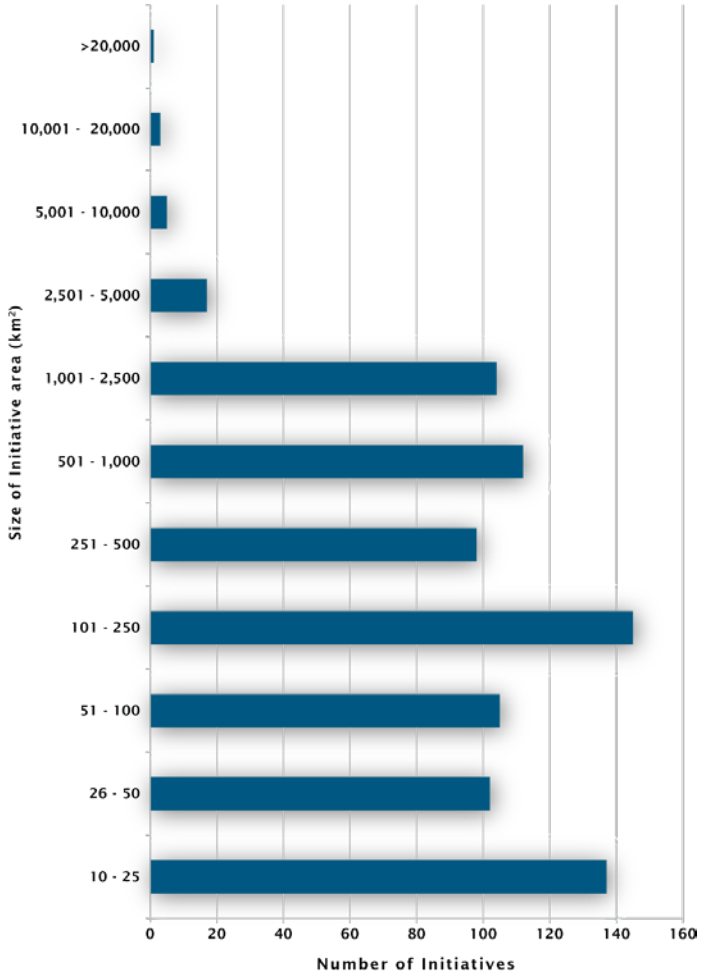

Figure 1.3 LSC initiatives by size classes (829 initiatives)

The initiatives in the 14 largest programmes (see Table 1) together cover over 250,000 km^2; when all initiatives are combined the total area rises to over 484,000 km^2. Both these areas are greater than the total area of Great Britain (229,848 km^2). This emphasises that there are a number of overlapping initiatives both in time and location. It also highlights that the 'area of interest' or focal area for many initiatives (i.e. what we recorded as their size) often greatly exceeds the area being actively managed within the initiative. It was difficult to collect reliable information on the areas of land being actively managed.

6.2. Application of scientific and other information to planning and management

(For more information see Chapters 3 and 4)

What are the motivations for approaching conservation at a large scale?

Managers of large-scale initiatives identified a range of reasons for working at a large scale, including coordinating management of species across multiple sites, buffering and extending sites and enhancing or creating large-scale networks for species movement. An extremely common motivation appears to be the better integration of conservation with local human communities, to enhance ecosystem services and enhance the provision of ecosystem services.

Most interviewees highlighted species of particular interest to their initiative, but few expressed overall conservation objectives purely in terms of species protection. In almost every interview there was a discussion about the barriers to habitat connectivity: almost 80% of the initiatives stated that ecological networks were important in their initiative, though it appeared that in many cases networks were being planned in a general way, without a formal delineation of different spatial components for particular species. Many interviewees identified the importance of the ecosystem services provided by the landscape, sometimes in terms of 're-wilding' or the creation of 'wild land'.

A range of different kinds of targets had been set for large scale initiatives, involving habitat, species, social and economic measures (see the summary of objectives above). It was clear that the requirements of donors were sometimes important influences in the choice of targets, and that sometimes these needed to be balanced with the aspirations of the conservation organisations. Most large conservation areas had grown incrementally, and initial objectives had often been modified through experience and as the projects had matured. Many initiative managers spoke explicitly about undertaking adaptive management.

How is scientific information used to inform site selection and management? What other factors influence these decisions?

Managers of large-scale conservation initiatives used a wide variety of forms of conservation knowledge. Published science was used, but was not the major source of information. Commissioned studies and national survey data were important, as was advice and expertise from people both inside and outside the conservation organisation, including from local people. Many initiatives had set up an advisory group of experts, while others drew on long-standing partnerships with research organisations. Respondents noted the costs of research, and the need to balance good scientific research with practical needs of projects.

When selecting sites and management options, ecological information was often balanced alongside local issues such as available land and what funders would pay for.

What monitoring and surveillance is undertaken?

Large-scale conservation initiatives have many characteristics that require monitoring and evaluation, including:

- Multiple objectives, some of which are not easy to measure.
- Baseline ecological data (including good spatial data on species distribution and abundance or location of other environmental attributes) as well as data on changing ecological status is required. This applies equally to 'targeted' and 'open-ended' restoration projects.
- Adaptive management (i.e. learning by doing, including experimenting with different approaches) is, or should be, an important part of many initiatives. New approaches to conservation are being developed and we need to document and learn from the results.
- Social and socio-ecological aspects - much large-scale conservation is novel and challenging in terms of partnerships and institutions as well as ecology. This includes the development, resourcing and management of partnerships, stakeholder engagement, considering the role of volunteers and addressing the needs of both local and more distant beneficiaries of ecosystem services.

Some initiatives had developed sophisticated long term environmental monitoring protocols. Others with more restricted resources faced challenges in maintaining monitoring, unless it was done as part of local or national programmes. Many initiatives also monitored against social and socio-economic targets, including recreational monitoring, visitor surveys and impact assessments. In most initiatives, volunteers were integral to monitoring, making labour-intensive and time-consuming monitoring possible on a tight budget, and probably increasing the sense of local 'ownership' of conservation outcomes.

However, despite recent efforts both to increase and improve monitoring in some large-scale conservation initiatives and to bring together the data collected, it appears that data were not sufficiently consistent, did not cover sufficiently long periods of time and are not sufficiently accessible. This hampered efforts to evaluate success.

How is adaptation to climate change being considered?

The online survey showed that 53% of initiatives (of the sample that responded to the survey) took account of climate change in their planning and management. However, only 8% had done any detailed climate change vulnerability assessment. There was a perception among some respondents that UK climate change predictions are not downscaled sufficiently reliably to be relevant to individual LSC initiatives. There was some scepticism about the usefulness of modelling of future climate change, although some initiatives had hosted doctoral studies of climate impacts.

Respondents to the online survey were asked to rank the climate change impacts of greatest concern. The top concerns were: changes in the distribution of species and resulting

changes to ecological communities; changes due to the effect of weather extremes; potential changes to land and water use and the impacts of to human behaviour change. When asked about adaptation goals, 82% of survey respondents highlighted 'increasing ecological connectivity', followed by 'reducing the non-climate pressures on the overall ecosystem (57%). The most common management action being taken to adapt to climate change were 'enlarging, buffering and linking habitat patches of creating new patches' (78% of initiatives), followed by 'managing the vegetation to maintain or increase heterogeneity'.

Respondents to the in-depth interviews identified a number of sources of climate change data and information, but many had unexpectedly little to say about the significance of climate change to their conservation initiative. Several interviewees emphasized the unknown consequences of climate change and cited the need to accommodate uncertain future changes as a justification for the need for large-scale conservation.

6.3. Social and institutional factors in planning and management

(For more information see Chapters 3 and 4)

What sorts of partnership arrangements are used, how are partnerships set up and managed, and how is governance and decision-making approached?

With the possible exception of some individual private estates and very large reserves, partnerships (i.e. multiple organisations working together towards a common objective) are ubiquitous in large-scale conservation initiatives. The online survey found that:

- About 95% of conservation initiatives surveyed involved partnership working.
- Most of the initiatives surveyed involved between two and nine partners, though some reported more than 20 partners.
- A wide variety of different organisations can be involved, in a range of roles including (but not limited to):
    - NGOs (particularly in direct conservation management, scientific advice, and monitoring);
    - Government agencies/Non-Departmental Public Bodies (NDPBs) (particularly by providing scientific advice and funding);
    - Government departments (particularly funding and scientific advice);
    - Private landowners (particularly by providing land and carrying out conservation management);
    - Private (e.g. utility) companies (particularly by providing funding and monitoring); and
    - Research institutes (particularly by providing scientific advice and monitoring).

The research showed that the building of genuine partnerships and relationships takes time. If well-coordinated, partnerships can be effective, drawing together people with different kinds of expertise and perspectives. The nature of relationships between individuals in partner organizations can be of central importance to the success of an initiative.

Formalised agreements (memoranda of understanding, management agreements) may not be needed in establishing partnerships and relationships, but initiatives can be vulnerable to staff turnover, changes of grants regimes or land ownership. The negotiation of formal agreements can depend heavily on direct inter-personal contact, familiarity, trust and friendship.

A strong and clear vision for an initiative is clearly important to allow partners, funders and other stakeholders to understand, negotiate and guide strategic decisions. However, our findings indicate that it is important to make time and space for flexibility so that initiatives can capitalize on opportunities, adapt to challenges that arise and incorporate lessons into the initiative over time.

What lessons can be drawn about communication and community engagement?

Communicating and engaging with a variety of audiences is of great importance to many LSC initiatives. In some cases teams of staff are devoted to this work. Key communication targets were local communities, the general public, and members of partner organisations. Communications may be by print media or electronic. However, communities are diverse, and hold diverse opinions, and simply 'consulting' the community does not guarantee a unified view of what an initiative should seek to achieve.

Time is important in building relationships between initiatives and landowners and local communities. Previous research (Inman, 2016; Fish, 2014; Blackstock and others 2010) has suggested that trust building in relation to Catchment Sensitive Farming approaches takes several years. The findings of our study indicate that that conservation objectives need to be pitched to landowners in a way that makes sense to them, and in a way that will make it in their interest to be involved. Time and extended interaction allows all parties to understand the involvement and perception of different stakeholders in the area.

In order to prevent misunderstandings and potentially complaints, it is important to foster local understanding about an initiative and encourage engagement at an early stage. Investment is therefore needed at an early stage to kick-start activities and implement actions on the ground. Different approaches are needed to engage and communicate with different audiences because people respond differently. Word-of-mouth, demonstration, working with community leaders (e.g. appropriate lead farmers) and site visits are useful approaches to encourage the participation of landowners. The appointment of an initiative project officer helps to link partners together, and can also support interactions between landowners and grant-giving agencies.

The results of both the online survey and interviews highlighted the importance of the social aspects of large-scale conservation. Every place has a social history (Ostrom 1990, 1998, 2000), and understanding the people with an interest and the appropriate mechanisms to engage them is essential to achieving desired outcomes. The achievement of ultimate conservation goals often requires achievement of intermediate social goals (Figure 1.4)

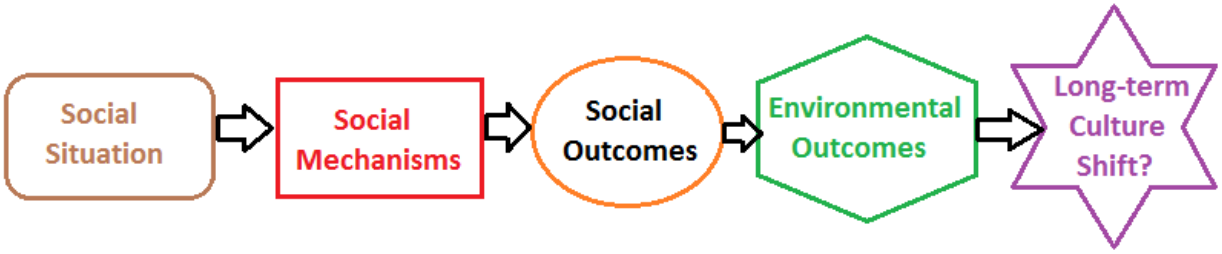

Figure 1.4 Environmental outcomes, especially in large-scale conservation, often come at the end of a long social process. Diagram courtesy of Jilly Hall

What roles do volunteers play?

Volunteers were important on most initiatives. The roles played by volunteers vary from general unskilled labour to more specialist and professional services (Figure 1.5). Frequently, volunteering provided a means to encourage public engagement in projects, as well as contributing to particular work tasks such as scrub-clearing.

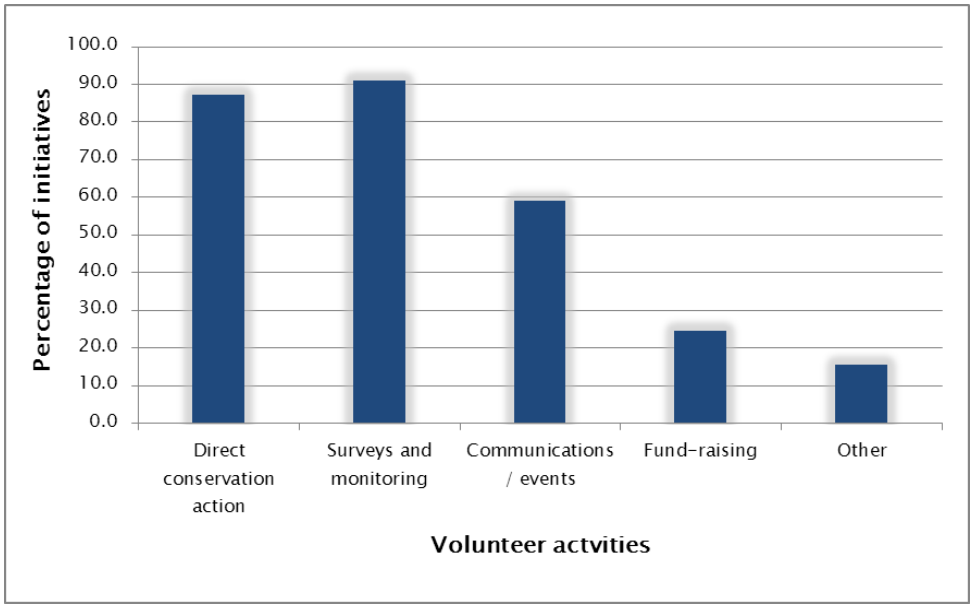

Figure 1.5 The percentage of initiatives using different types of volunteer engagement. Source: online survey n=110

Who owns the land?

Many large scale initiatives were based primarily on existing reserves or protected areas, and focused either on direct expansion or physical linking of these areas, or engagement with the nearby or surrounding landholders. In LSC initiatives with one or a small number of landowners, relatively complete management control could potentially be established over

the entire area. This made it possible for managers to pursue objectives such as 'rewilding', minimizing human impact and allow natural processes to take place.

Land tenure in many initiatives was a complicated mixture of private and public ownership, lease and management agreements (Figure 1.6). Many initiatives were therefore working with large numbers of farm owners and tenants to increase awareness and improve management of agricultural land – either to support the wildlife on farmland, or to improve the connectivity across the arable land that lies between patches of semi-natural habitat.

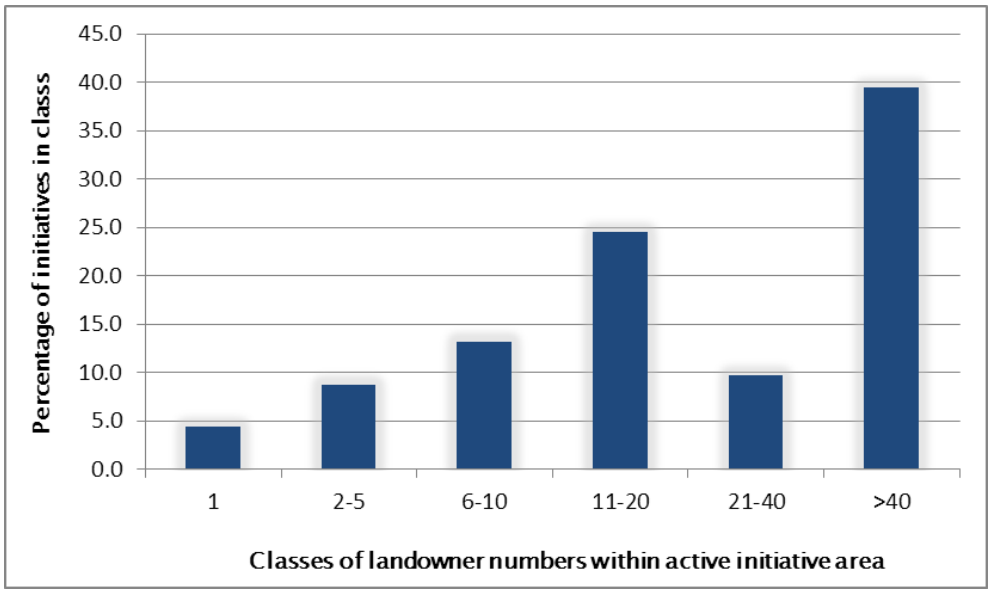

Figure 1.6 Percentage of initiatives by classes of numbers of landowners within the area under active conservation management. Source: online survey, n=114

Where does funding come from?

The research highlighted the importance of funding to the shape and success of large scale initiatives. The requirements of funders can constrain project planning, and there is a conflict between the commonly short-term nature of funding and the needs of long-term large-scale conservation projects – the majority of participants in both the online survey and interviews viewed securing ongoing funding as a major challenge for their initiative. Flexible funding sources appeared to be rare but extremely valuable. Successful projects often had a suite of different funders to fund the different aspects of a LSC initiative, but there appeared to be a risk of overstretch in terms of reporting requirements. Many large initiatives made good use of agri-environment scheme grants to provide an incentive for landowners to implement conservation management. Grants for land purchase were also important in some initiatives.

Common funding sources for large-scale conservation identified include:

- Lottery Funding, e.g. Heritage Lottery Funding (HLF) – reputation for providing large grants for advisory and heritage-related purposes with specific targets and requirements.

- Landfill funding, e.g. Biffa Award, SITA Trust, Waste Recycling Environmental (WREN).
- European funding e.g. EU LIFE, INTERREG – large grants with complex bidding processes.
- Charitable Trusts, e.g. Tubney Charitable Trust
- Public grant schemes, e.g. agri-environment, Woodland Grant
- Partner funding – funding from existing partner organisation programmes (including in-kind contributions) or raised through appeals, membership fees, campaigns etc.

In some cases opportunities had been identified to partner with organisations that could offer non-traditional funding routes. Examples include conservation organisations working with gravel extraction companies and water companies.

One important issue that emerged from the survey and interviews is that is not just physical conservation management that needs sustained funding. Funding is also needed for facilitation, coordination and communication, particularly in projects with large or complex groups of partners and stakeholders; and greater investment is needed in long-term monitoring of environmental and other benefits of LSC.

There is potential to improve key relationships with funders, for example working to increase flexibility, to develop longer-term funding sources and to make application processes less bureaucratic and time consuming, and working to reduce unproductive funding targets and requirements. However, large scale initiative managers must be prepared to turn down funding if the requirements and targets do not match the initiative's vision and objectives, or if they are too bureaucratic.

A dedicated and experienced fundraiser is a key member of staff, and many successful initiatives were able to call on the professional grants team of a national conservation organisation, working across multiple LSC initiatives, preparing grant applications and finding and securing additional funding sources

6.4. Interacting factors influencing decisions in large-scale conservation

Drawing together themes that emerged from the interviews and other surveys, there appear to be five major decisions that influence the design and development of LSC initiatives. Each of these is based on a range of factors (Figure 1.6).

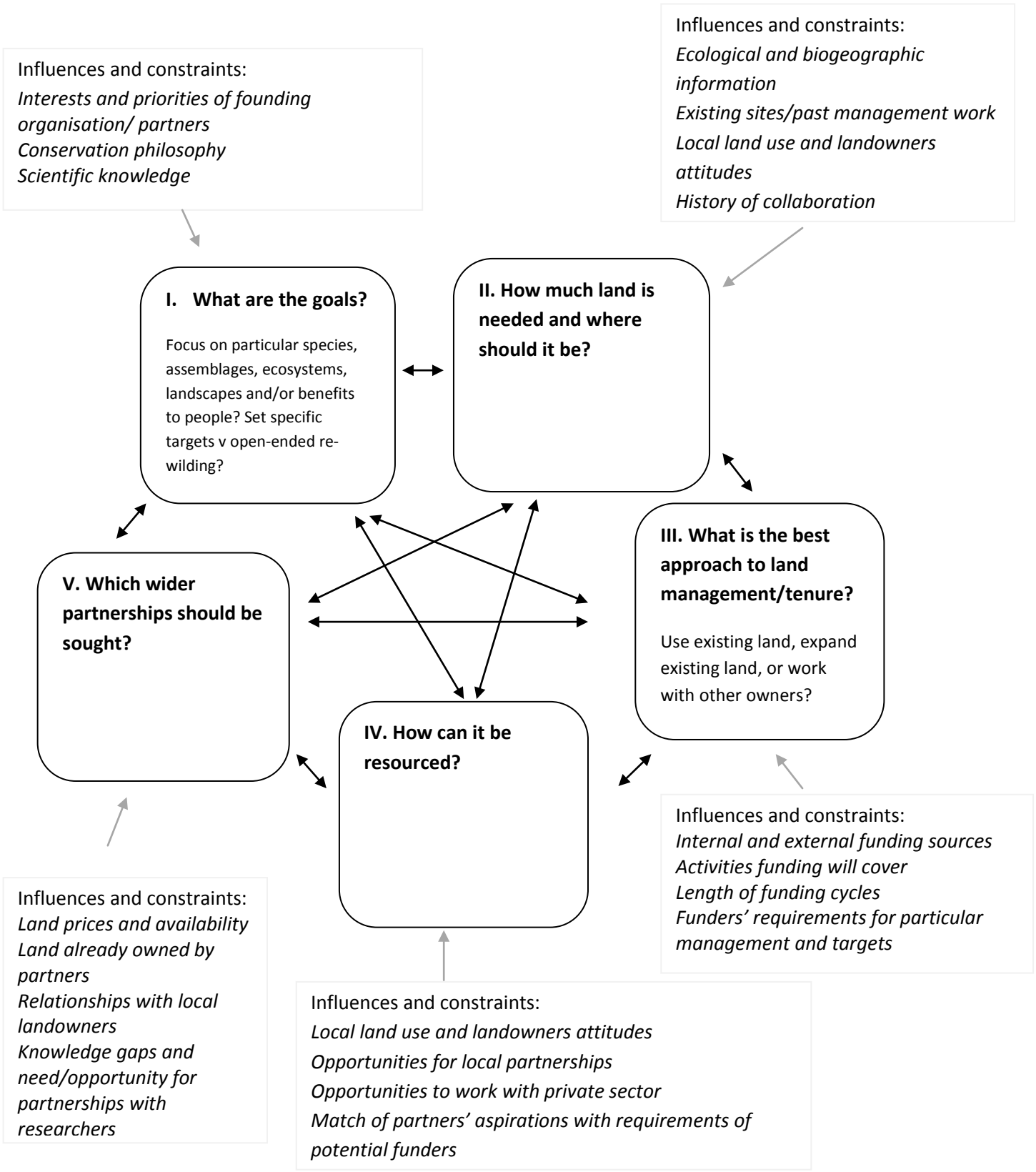

Figure 1.6 **Five interacting decisions, and some of the factors that influence them, that were apparent in LSC initiatives**

These decisions interact. A particular decision (or the options that are available, or a later change) can strongly influence (and in some cases constrain or enhance) decisions and options in other areas.

Goals will influence:

- the decision on *where to focus activity*, and over how large an area, because some areas will be more appropriate than others.
- desired *land tenure/management arrangements* (for example some restoration work, such as to restore wetlands, or a radical re-wilding approach, may not be compatible with existing land management and so favour buying land; whereas restoring grassland (requiring grazing) or the goal of integrating conservation and farming might be more compatible with farming (and even require it).
- *Partnerships* that need to be formed (for example bringing in partners with ownership or influence over the desired areas of land, or with their own sources of funding)
- which *funding sources* are most suitable to apply for.

Land requirements/availability and **land tenure** can:

- affect the feasibility of meeting *goals* and might cause them to be changed. (This could be because the appropriate locations and extent of land for the desired goals is not available, or because existing/previous management (including requirements to address statutory designations) constrains the management actions that can take place
- to a great extent determine *funding* requirements. Acquiring land is likely to require grants. Working with local farmers often requires agri-environment funding to be available.
- influence *partnership* requirements (the more additional land that needs to be brought into the project in addition to land owned by the founding partners, and the more varied the land tenure arrangements and land uses present) the more likely it is that a wider set of partners will need to be involved
- influence each other. The larger the total area required, the more likely it is that the project will need to operate on other people's land. This might also be the case even if the project is smaller but still requires a particular set of sites that the founding partners do not own and cannot buy. Conversely, the availability of land under particular tenure arrangements (particularly owned by partners or available to be bought by partners) could strongly drive site selection.

Resources are a crucial factor and are likely to have a strong influence on everything else:

- By determining resources (land, staff etc.) funding can constrain what goals are achievable and reduce the scope of the project. It could also force the project to prioritise some goals over others (if funding is available for a particular activity only) or add goals to satisfy funding criteria (an example might be ecosystem services), or particular targets

relating to a goal to be addressed and reported on. There is some evidence that short-term funding cycles might in some cases be driving the 'reinvention' of goals and proposed actions every few years in order to satisfy a perceived requirement for novelty.

- It could influence the decision about *where to operate*, if appropriate funding is available in one area (e.g. in one county, or for restoration of a particular vegetation/ecosystem type) and not another. Also, by determining available resources, the total amount of money available could limit the *area* of land that can be managed.
- Availability of particular sorts of funding might influence the approach to land tenure. For example, if funds for land purchase (if the desired option) are not available, it could require the project to operate by *working with other land managers* on their land
- It could require new *partners* to be brought in, to bring in *land* or *funding* (or the opportunity to apply for other sources of funding)

Partnerships can:

- influence the *goals* (targets, number/variety, and how they are pursued) of the project, as different partners have different priorities and perspectives on conservation. New partners can also provide opportunities to address additional goals
- open doors to new *funding* opportunities and provide other resources
- create opportunities to engage, communicate with and in some cases provide funding to additional groups of local landowners/stakeholders. This can enable expansion of the conservation *area* (e.g. to include farms outside an existing reserve)
- bring in new *land* directly (if partners own land)
- determine the *land tenure* arrangements that the project has to work with
- increase the influence and impact of the initiative (and therefore potentially its ability to secure more *resources*)

Examples of all the interactions above were found among the conservation initiatives studied. While conservation and social goals might seem to be the logical starting point (and often were), in reality it appeared that the initiation of a project was often also influenced by other factors (for example, availability of a certain source of funding, an opportunity in a particular location, a set of partners with shared aims, an existing area of land.) In most cases the subsequent setting up and ongoing management of the initiative is likely to be an iterative process in which all the factors above influence each other. Over time, changes in any one factor (e.g. the end of a particular funding grant, or new partners joining the initiative) can cause the initiative to evolve and change.

6.5. Environmental outcomes

(For more information see Chapter 5)

Where are large conservation areas located in relation to natural resources and what environmental outcomes have been achieved?

Biodiversity: Our strongest findings came not for individual species, but rather of early indications of positive changes in the quality of woodlands; data from the Countryside Survey suggest that increased woodland regeneration activity is occurring as a result of LSC. There were also relatively strong and statistically significant associations between LSC coverage and NCAs judged to be most important for BAP mammals. However, despite Britain having some of the best biodiversity monitoring programmes in the world, most of these have only limited utility for quantifying the biodiversity outcomes of LSC due to very limited coverage of the high-resolution time series datasets (i.e. Countryside Survey) that are required to answer these questions. These data limitations mean that these findings must be viewed with some caution.

Ecosystem Services: Our results suggest that LSC activity was highest in the parts of England whose landscape aesthetic character – a cultural ecosystem service – is improving. We were unable to assess the effectiveness of LSC initiatives for conserving other ecosystem services, due mainly to it being too early to assess whether (recently initiated) ecosystem service conservation initiatives are effective or not.

Complementarity with existing conservation strategies: Our results show that LSC activity was generally highly correlated with other conservation areas (such as Sites of Special Scientific Interest). This result is not surprising, given that LSC activity has similar objectives to other conservation initiatives in Britain, but it raises an interesting question: Should LSC activity should be more focused on 'neglected' areas of Britain, or are we correct to focus our resources on the most valuable areas of the country?

LSC activity and climate change: Our results show that LSC initiatives were generally in the parts of England that are considered most resilient to the impacts of climate change, such as areas of the uplands with relatively contiguous vegetation cover and high topographical variability. Again, this raises an interesting question: should more resources be focused on the more vulnerable areas, or are we right to focus on the most resilient areas as they are likely to provide the backbone of future conservation efforts?

Limitations of the analysis and recommendations for future work

Our findings suggest that a combination of the relative youth in ecological terms of many initiatives and their very diverse management goals combined with major data limitations mean that, despite some evidence of increased recruitment of deciduous trees, we still lack compelling evidence of the effectiveness of LSC overall in meeting biodiversity and other goals at a 'landscape scale' (as opposed to recorded successes on individual sites within individual initiatives). Our most important recommendation is therefore that future funding for LSC includes requirements (and resources) to monitor the effectiveness of such measures

at the wider landscape scale against consistent and quantitative measure of success that are linked to specific conservation goals. At the very least, good time series data collected in a consistent way, including before conservation interventions started to allow a before-after comparison, are essential. Ideally, matched control sites should also be identified and monitored, though we recognise that this could be a challenge.

Such monitoring could be linked to the national-scale datasets we use here (and others being developed on ecosystem services) as well as our distinctiveness map, and the information collected used to assess the degree to which changes in projects are indeed occurring at a more rapid rate than at other areas within Britain with similar socio-ecological characteristics.

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Chapter 2. Building an overview of large-scale conservation

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The starting point for the project was to bring together and analyse basic information on characteristics of the large number of LSC initiatives that were believed to exist to provide an overview of current large-scale conservation efforts in Britain. This formed the foundation of analysis in other parts of the project, as well as continuing in its own right throughout the duration of the project to build as comprehensive a database of information as possible, from which a publicly accessible online database was developed. This chapter describes the criteria that were used to include or exclude conservation areas from the collation of the landscape-scale initiatives and the approach to recording these within the database. It also presents an overall summary of the numbers, types and general characteristics of the LSC initiatives identified.

1. Approach and methods

1.1. What constitutes a large-scale conservation initiative? Definitions and criteria

Landscape scale conservation is not new and we were aware of relevant initiatives dating back to 1920s. This raised the question, what constitutes a 'large scale' or 'landscape scale' conservation initiative and how can it be distinguished from other conservation actions?

Attempts have been made to define LSC, such as by Bourn and Bulman (2005) "*the coordinated conservation and management of* habitats for a range *of species across a large natural area, often made up of a network of sites*". More recent descriptions of large scale conservation objectives, post 2010, have used the terms described by the Lawton review (Lawton et.al. 2010) calling for bigger, better and better connected biodiversity sites due to the current level of fragmentation and the lack of connection between, and buffers around, semi-natural areas. The Natural Environment White Paper (Defra 2011), noted that "There is no single accepted definition of 'landscape scale'; rather, it is a term commonly used to refer to action that covers a large spatial scale, usually addressing a range of ecosystem processes, conservation objectives and land uses. The 'right scale' might need to take account of the particular interest of those involved locally, aesthetic or cultural characteristics, natural features such as river catchment areas or particular habitats, or recognised areas such as the 159 National Character Areas[7]. Landscape scale conservation

[7] National Character Areas divide England into 159 distinct natural areas. Each is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries.

is characterised by the pursuit of multiple benefits across a defined area (e.g. water quality, biodiversity and access). The best examples also make links to wider economic and social priorities, where enhancing nature can provide benefits to the local economy and quality of life."

These high level definitions indicate that there can be a wide range of different approaches to conservation over large areas. However, they help to identify a series of attributes that LSC can have, and criteria for identifying initiatives that would qualify for inclusion in the study.

The following criteria were used to identify potentially relevant initiatives:

- Initiatives that covered a large geographic area, particularly across coherent and recognisable biogeographic, hydrological or geological areas rather than administrative boundaries.
- Initiatives that aimed to address problems that cannot be achieved by individual landowners or organisations.
- Conservation across diverse habitats and land uses within a wider landscape, with an aspiration to manage the whole area of interest in a coherent and coordinated way.
- A corresponding awareness of, and management for, ecological and physical processes (ecosystem functioning such as succession, ecological quality, and connectivity) rather than just individual species or vegetation assemblages.
- Initiatives that in addition to carrying out actions to manage, restore or create habitats for conservation had a range of other social and environmental objectives, including consideration of the interaction between people and nature.
- Conservation with a focus beyond individual 'sites' to understand the dynamics and interactions between them, and therefore possibly involving land under a range of different tenures and uses; broader than just a collection of individually managed sites, conservation sites and protected areas.
- Initiatives that sought to achieve coordination of multiple partners to accomplish common outcomes and/or to encourage community engagement and building of social capital in addressing environmental problems/achieving environmental goals.

The process of identifying initiatives and collecting information reinforced the conclusion that there is a wide variety of approaches and probably no single concise definition or set of criteria that can be applied. Rather, it seemed more important to capture the breadth and variety while identifying different categories or types within it. Therefore, for the practical purposes of compiling and refining a list of relevant conservation initiatives, only three 'hard' criteria were used to include/exclude initiatives:

- a focal area of at least 10 km^2 (1,000ha);
- having objectives that at least partly focused on conservation and appeared to be applied across the whole area (i.e. as a distinct single initiative rather than collection of sites);
- and involving management on the ground.

The size threshold established was arbitrary and almost certainly excluded some conservation areas that had most or all of the other attributes listed in the criteria above.

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https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making

However, it was necessary to set a threshold and 10km^2 appeared to be a reasonable value for representing the landscape scale.

1.2. Exclusions

Following the criteria above, several types of conservation areas or initiatives were excluded for various reasons.

Initiatives were excluded if they did not appear to involve significant direct conservation management activity. This included a number of research projects, as well as area plans and profiles, and some 'target' and 'opportunity' areas. For example, Biodiversity Opportunity Areas (BOAs)[8] and Conservation Target Areas (CTA)[9] were excluded on that basis. It was recognised that some authorities and biodiversity partnerships had developed practical actions from their biodiversity targeting programmes, but these were picked up by including in the database the individual initiatives rather than the target areas themselves. Advice to landowners, on its own, was not treated as an LSC initiative. For example, the Environmental Stewardship Training and Information Programme (ETIP[10]) formed part of the Natural England Entry Level Stewardship agri-environment programme[11], by promoting best practice through 'geographically differentiated' advice. The ETIP was divided into 152 area programmes; whilst the outcomes may be enhanced land management, in themselves the ETIP programmes were educational and at individual farm level, rather than directly targeting large-scale actions on the ground. A number of Green Infrastructure projects were also excluded on the basis that they appeared to be seeking to extend the evidence base and developing strategy and planning actions rather than delivery of conservation actions.

Initiatives were also excluded if they did not appear to hold specific objectives for conservation (for example, Total Place[12] pilots and projects). Equally, projects and programmes that focus on rural development and sustainable rural business and agriculture were excluded, unless there were also clear biodiversity delivery actions on the ground. A number of the Rural Development Programme (RDP) funded LEADER[13] projects fell into this category, although they may well have produced benefits to biodiversity their focus of support was sustainable rural economies and communities.

Initiatives were excluded if their area of interest was below 10km^2. As a result, some of the smaller areas in wider landscape-scale programmes, such as two Butterfly Conservation areas and eleven Living Landscapes, were not included. Country Parks and Regional Parks, of which 242 were initially identified and considered, were excluded as they were small (238 fall below 10km^2) and are not managed as networks.

[8] For example: http://www.buckinghamshirepartnership.gov.uk/biodiversity/biodiversity-opportunity-areas/

[9] https://www.oxfordshire.gov.uk/cms/sites/default/files/folders/documents/environmentandplanning/countryside/naturalenvironment/BAPnewsletterFINAL3.pdf

[10] ETIP programme was developed by Natural England in 2010 to provide targeted advice to Entry Level Stewardship through individual farm visits and farm learning events.

[11] https://www.gov.uk/guidance/environmental-stewardship

[12] Total place: a whole area approach to public services CLG, HM Treasury (2010)

[13] https://www.gov.uk/guidance/rural-development-programme-for-england-leader-funding

Many areas that met the size criterion were excluded if there did not appear to be a sufficient single 'project' or 'initiative' covering the whole area. Thus the fifteen National Parks (NPs) in the UK, and 36 Areas of Outstanding Natural Beauty (AONBs), were not included as database records. Such areas are rarely under single management or coordinated conservation action. However, in some cases these protected areas had been used as the basis for targeting specific landscape-scale conservation initiatives, in which case the initiative was recorded and the protected area was represented in whole or in part within conservation initiatives records (for example, the New Forest National Park area was included within the EU LIFE projects (Sustainable Wetland Restoration in the New Forest LIFE 3 [database record 553] project New Forest - Securing Natura 2000 objectives in the New Forest [2605] and the invasive plants project, New Forest non-native plants project [7]). Networks of designated conservation sites including Natura Sites, Sites of Special Scientific Interest and Local Nature Reserves were not included as these were assumed not to have co-ordinated management plans and actions on the ground that are addressed at the landscape scale across sites. There may have been exceptions to this, but generally where a large-scale action was taking place it sat additionally to the designation (and was recorded as a separate initiative). However, larger individual sites over 10 km^2 managed with coherent management plans for nature conservation *were* included; including large National Nature Reserves (NNRs), National Trust and National Trust for Scotland estates and the larger RSPB reserves.

Similarly, multiple smaller-scale actions under the successive agri-environment schemes, (Environmental Sensitive Areas (ESAs), Countryside Stewardship (CSS) and present schemes (e.g. Environmental Stewardship HLS/ELS and Glastir) were not included as large-scale conservation initiatives in their own right as they represented individual site actions over an area below the defined threshold. Other potentially relevant initiatives related to farm stewardship included voluntary actions under the Farmland Bird Initiative[14] and the Campaign for the Farmed Environment[15]. Again, these were not included, as actions were typically smaller-scale and not necessarily coordinated at the landscape scale. It should be noted that agri-environment funding and associated advice to landowners were frequently found to be important components of LSC initiatives; in these cases the role of the agri-environment agreements often were recorded as delivery elements of specific initiatives.

However, where there was geographical targeting of incentive schemes to identify coherent large-scale areas structured around landscape-level environmental objectives, these *were* included as LSC initiatives in their own right. These included HLS target areas (which focus multi-objective environmental outcomes) and the Catchment Sensitive Farming Delivery Initiative (CFS) targeting priority catchments (intended to reduce sources of harm to freshwater ecosystems).

The Forestry Commission Estate and the Defence Estate, as a whole, were not included, although this is a debateable exclusion; individual large projects within the Estates were recorded. The Forest Estate was at the time of writing developing Design Plans (see Bell

[14] Targeting Project (BCTP), a joint Natural England, RSPB, BTO and Forest Commission initiative integrated into the HLS targeting.
[15] The Campaign for the Farmed Environment (CFE) is a partnership programme that promotes existing stewardship schemes and encourages voluntary management that will benefit the environment. http://www.cfeonline.org.uk/home/

1998), focused on forestry management, but incorporating multi-objective woodland and forest management, including conservation and habitat restoration through clearance and broadleaved planting. Although their sites are typically single owner initiatives they nevertheless have wide stakeholder inputs in agreeing the design plans.

As these examples illustrate, it was not always easy to make a clear-cut decision about conservation initiatives and areas that should be included or excluded. Some conservation areas fell in a 'grey area' in which it was difficult to make a judgement about whether conservation goals and management were sufficiently coordinated across individual sites/land holdings for the whole area to be included as an 'LSC initiative' in the database. For example, HLS target areas, which were included, are arguably at the borderline of what can be considered a single conservation initiative, while some initiatives that were excluded did involve some degree of 'landscape-scale' planning.

1.3. Designing a database of LSC initiatives

A relational database of LSC initiatives in England, Scotland and Wales was developed in MS Access to summarise information about potential LSC initiatives and programmes. The database included a range of characteristic attributes of LSC initiatives including: their aims and objectives, location, age and scale, activities, organisation and operation, funding, partnerships and community involvement. In addition, a spatial database was collated of the geographic boundaries of initiatives; this was used to provide spatial analysis of the coverage of LSC (see Chapter 5). As it was clear from an early stage that there was a considerable variety of initiatives, the database was designed to allow the exploration of the criteria from multiple dimensions (e.g. spatial, temporal relationship between parcels, partnerships, land owners, etc.) and through GIS analysis the representation of protected areas and land cover types. As the project developed, the database scope and structure was reviewed and refined by the project team and steering group. Additional attributes were specified to help address particular issues and questions raised by data already collected, or research questions in other areas of the project.

The structure of the database was constructed around a series of themes: objectives, characterisation, organisation, location, actions, targets and resourcing. The broad structure of the database is summarised in Figure 2.1.

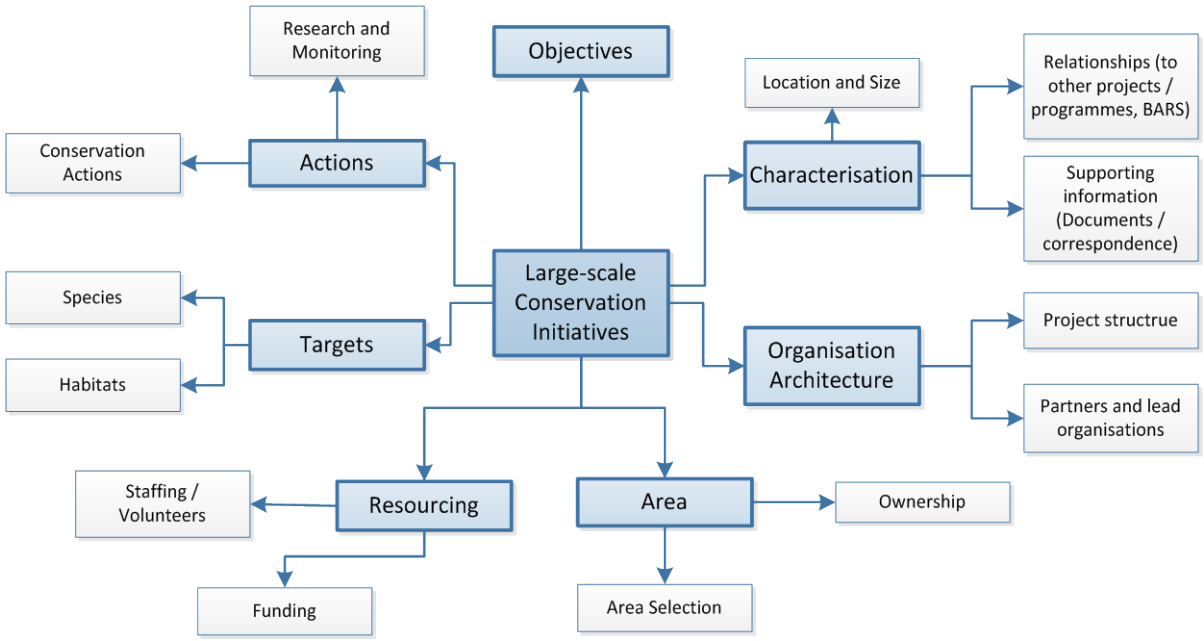

Figure 2.1 **Summary of the large-scale conservation initiatives database structure**

A series of automated extraction queries were built into the database to allow for defined data exports and reporting.

1.4. Compatibility with other conservation databases

The database sought compatibility with the Biodiversity Action Reporting System (BARS); the online system developed by JNCC/NE to record, monitor and report on the progress on delivery of UK Biodiversity strategies. It was anticipated that many of the programmes and initiatives identified within the LSC mapping would have corresponding records, albeit collected for different purposes, within the BARS database.

The new version of BARS (Ver2) was in development at the time that the LSC database was developed and thus there was not full compatibility between systems. BARS Ver2 sought to modify the records to include geographic point and area locations of site-based actions with interactive mapping and reporting, and allowed the recording of other Action Types, including education and awareness and research actions. The structure of the LSC database was mapped, as far as possible, to the new BARS structure and domain lists. The resulting changes to BARs Ver2 reduced the levels of discrimination of conservation actions and action sub-types to just 7 types, all of which are reflected in the LSC database.

This matching was anticipated to provide the basis for cross-referencing between records within BARs and those in the LSC database, to allow analysis of the LSC initiatives based on the finer level records of individual conservation action records held within BARS. However, BARS was closed in November 2016.

1.5. Programmes vs initiatives

Many of the initiatives identified within the database formed part of wider, coordinated programmes, with varying degrees of harmonisation and management across separate projects. These included:

- a loose association of initiatives that had some common organisational or promotional arrangements (Grazing Projects);
- initiatives associated by funding organisation or funding qualification criteria (HLF, Landfill Tax Credits, EU LIFE projects) – i.e. not defined by a conservation focused agency;
- conservation areas forming part of a programme of 'landscape-scale' action led by agencies or NGOs (such as RSPB's Futurescapes, The Wildlife Trusts' Living Landscapes, Butterfly Conservation Landscape Target Areas etc);
- programmes managed by a regulatory agency with broader multi-objective remits, including HLS target areas, Catchment Sensitive Farming (CFS) but delivered by multiple owners/managers
- large individual land holdings with a conservation or multi-objective remit that formed part of a wider national 'collection' of such areas (e.g. National Trust properties, National Nature Reserves, RSPB reserves)

There were overlaps within some of these categorisations. For example, the Futurescapes programme [1841], managed by the RSPB was developed as an EU-Life funded programme.

Higher level programmes (e.g. Futurescapes, EU LIFE, and Living Landscapes) which had multiple projects / initiatives under them were recorded in the database as 'programmes' (in addition to the separate records for individual projects/initiatives forming part of the programme). Twenty-one such programmes were identified and recorded.

The programme records in the database typically constitute a 'parent' relationship to a range of 'child' initiatives. For example, a programme record describes the scope of the national Wildlife Trust's Living Landscape Scheme that is represented by 130 initiative records. The objectives of the national programme are reflected in the individual initiatives, but often additional and locally-specific biodiversity and related objective had been set (e.g. partnership working, stakeholder engagement, socio-economic). Programmes in the database in some cases also included individual initiatives that fell below the area threshold used in this study (for example, the Isle of Portland [78] Butterfly Landscape Target Area (9.5km^2) and the Anglesey Wetlands [176] at Living Landscape 7.5 km^2). In this instance the smaller initiatives were excluded from the analysis and final database.

In turn, an individual initiative could have multiple components and multiple actions at site level, linked at the landscape scale by coherent objectives across the initiative. While the database records both programmes and their constituent projects, it does not record individual conservation or other actions at site level within a conservation initiative.

1.6. Populating the database

The database was initially populated from a spreadsheet of information on several hundred LSC initiative, programmes and spatial plans and visions, collated by Natural England and Atkins in 2010. Field structures for spreadsheet information had little constraint on the data recorded and was consequently standardised where possible, and look-up tables used to constrain entry where appropriate to allow categorisation of records. Inclusion focused first on initiatives involving Natural England staff before being broadened to include some external initiatives such as Wildlife Trust Living Landscapes. This initial data collection highlighted that both the number of potential conservation initiatives to consider and the amount of potential information to collect were much larger than had initially been envisaged and these lessons influenced the subsequent design of the relational database. A large number of new LSC initiatives were subsequently identified and new records created in the database.

Quantitative and qualitative information (for both existing and new records) was collected from a wide range of sources, reflecting the large number of conservation initiatives and organisations involved and the variety of questions this research project was interested in. Sources included publications, such as reports and websites, and unpublished reports and other information obtained from staff working on the conservation initiatives.

For programmes such as the RSBP's Futurescapes and the Wildlife Trust's Living Landscapes there was coordinated information online with site location and associated parameters. More widely, data on initiatives were collected from online information, from official programme websites and partner websites. Funder websites and information (e.g. SITA Trust and Heritage Lottery Fund) grant awards also provided information. Information on European grant aided projects was also available online – e.g. from Leader+ and LIFE[16] programme sources. This led to a 'virtuous circle' of one initiatives often leading to the identification of additional initiatives s or past initiatives led by the same organisation or within the same or coincident location.

The project also took advantage of earlier reviews of landscape-scale actions (e.g. McMorran and others 2006, Adams and others 2011,) and other online databases of past initiatives, such as the Wildland network database (Ward 2007), where records met the LSC area thresholds. Any past initiative for which sufficient information was available and that met the criteria for inclusion were included in the database. Additional records were sought directly on specific topics by contacting a range of the larger coordinating organisations (RSPB, Butterfly Conservation, and National Trust for Scotland); this approach was used in particular to request locational information (either as GIS datasets or as coordinates and approximate size; see below). In addition, the list of initiatives was distributed through Natural England, Scottish Natural Heritage and the Countryside Council for Wales to invite further direct input from staff, particularly to provide information about those initiatives where the government agencies were leads or partners, and to help identify initiatives that had been missed.

[16] EU LIFE project website, accessed 09/04/2012 http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.search&cfid=435040&cftoken=df25c3da1d1ee3fc-7749A3A6-9042-C1B3-3B503CC8427345EB

The locations and where possible the geospatial files (GIS) of initiative extents were collected, although it was rare to find precise information on both the outer boundary of the initiative's area and the areas within it in which practical management action was taking place. Spatial files (as a geodatabase) were collected for 468 initiatives. Spatial data were collected from the managers of individual initiatives where there are multiple initiatives within a programme (e.g. Futurescapes, Wildlife Trust Living Landscapes, and Butterfly Conservation Target Areas) or from national information portals, such as MAGIC website and the Forestry Commission, Natural England, Scottish Natural Heritage, Countryside Council for Wales etc. For initiatives without accessible GIS files and where there was a paper map available these maps were digitised or the area centroid coordinates were generated for the initiative where the extents were not available (see Chapter 5).

Further information on specific topics was obtained through an online survey (see Chapter 3). This concentrated on three themes i) scientific principles underpinning large-scale conservation initiatives; ii) approaches used in relation to climate change within the initiatives; iii) social and institutional organisation. These records were complementary to the existing data from within the LSC database, but added further depth and detail. Where the respondents to the online questionnaire highlighted an initiative not in the LSC database, these were added to the database.

In some instances it was difficult to differentiate between initiatives within the same locality, and there were some overlaps and duplications of entry, where one initiative has appropriated the activities of earlier initiatives or shares the same area. Duplicates were somewhat inevitable given the large number of conservation initiatives and the fact that there may be no consistency of naming or numbering of conservation initiatives, although programmes such as EU LIFE provide a standard initiative number [*project_symbol* within the database]. Duplicates were subsequently identified and removed from the analysis.

In a number of cases initiatives were found to be extensions of other initiatives, for example where an earlier initiative had continued under a different name, or been succeeded by a new initiative (with varying levels of change to the initiative's name, objectives, partners etc.). N.B. this is distinct from a programme as defined in the database – i.e. a co-ordinated group of geographically separate projects and actions. Typically, these successional initiatives were treated for recording purposes as separate from the original initiative, if there were changes to partnerships or the lead organisation or objectives and activities were extended or changed. Where just the funding had changed but the partnerships, locations and objectives were coincident these were treated as extensions of a single initiative, and not separately recorded. For example, the Scottish Forest Alliance Great Trossachs Forest project [1945] is a multi-partner initiative; funding for a later stage of the initiative was awarded by the HLF (to the Woodland Trust for Scotland), but this was recorded as a single initiative because the objectives and the area of the initiative remained largely the same. However, in the case of an initiative like the Weald Meadows Initiative [1784] (led by the High Weald Landscape Trust) where many objectives remained the same but the partnerships and leads changed within the successor Weald Meadows Nectar Networks Initiative [2689] (led by The Grasslands Trust), the two were recorded as separate initiatives. This is a somewhat arbitrary distinction, but the database provides the possibility to link initiatives s based on location, date range and objectives. A filtered list of key attributes of the LSC initiatives has been created to populate the online version of the database through

a web-based map (*http://www.geodata.soton.ac.uk/landscape_scale/)* using the coordinate (point) records for each initiative Figure 2.2).

Figure 2.2 **Website mapping key attributes of large-scale conservation initiatives in Great Britain** (http://www.geodata.soton.ac.uk/landscape_scale)

Initially, the data collation included a range of initiatives that were below the area thresholds set (10,000 ha or 10km^2) as the scale of the initiative was not always known before starting to collate the information. These initiatives lower than 10km^2 were subsequently excluded from analysis and the online portal. However, the records were retained in the database to avoid losing any information.

1.7. Characterising initiatives in the database

The attribute fields within the database were derived from the characterisation of the initiatives and the research questions that the database was developed to help answer; although in some instances it has not been feasible to collect records for all attributes in the database structure. Some attributes transferred from the initial spreadsheet information (marked with an asterisk) are redundant as they have been replaced by categorical values more amenable to analysis.

Table 2.1 provides a list of the attribute fields and a description of the entries in the full database. Much of this information was compiled for internal project use only and cannot be released. As noted above, a summary version has been published online.

Table 2.1 Summary of database attribute fields and descriptions (* are attributes taken across from the initital spreadsheet). Type: Char = charatcter, autoNum = auto numbered, lkp = lookup list, flag = tickbox, link=hyperlinked documents., int=integer

Theme of attribute field	Field name	Description – may include multiple attributes	Type
General	Project name	Name of initiative	char
	Project Id	Auto generated number	autoNum
	Classification	Classification of initiative	lkp
	Project type	Type of initiative (redundant field)	lkp
	Project description	Description	memo
	Objectives	Objectives	memo
	Project structure	Organisations structure	memo
	Activity description	Overview of activities	memo
	Programme ID	Programme name for initiatives – if any	char
	Project symbol	Short name of initiative, if any	char
	Stage 2 flag	Flag for more detailed analysis	flag
	BARS URI	Bars potential link if the initiative is also on BARS	char
	Budget £k	Summary value of initiative (including all budget sources)	float
Dates / period	Project status	Operational status	lkp
	Project start date	Start of initiative (0101yyyy if not known)	date
	Project end date	Initiative end date (0112999 if not known)	date
Location summary	Location type ID	Nature of initiative location (classes)	char
	County	Country	lkp
	Region	Region - former Gov't regions	lkp
	Authority	Local Authority (main local Authority by area)	lkp
	Primary NCA	Primary NCA (by area)	lkp
	Boundary mapping	Is there boundary mapping?	char
	Acquired	Date that mapping has been acquired	date
Objectives	Summary objectives	Objectives listing and status	lkp
NCAs	NCA id	National character areas / type and NCA ID (across GB)	lkp
	Type	Primary or secondary coverage	
Activities	Activity category	Activities undertaken or planned (relates to BARS classes)	lkp
Habitat	Habitat (BAP PHT/BHT/Local)	Habitats - local, priority or broad	lkp
	Annex 1 Habitat	Annex 1 habitats	lkp

Species	BAP species	BAP species lists	lkp
	Taxon - species class	Taxon classes	lkp
	Annex 1 species	Annex 1 species	lkp
Partners	Partners	Partner organisations – name, type and address	lkp
Funding	Funding	Funding sources – Including: resource, provider, funding programme and value and nature of fund (e.g. Grant, in kind).	lkp
Docs	Documents	Publications – hyperlinked documents	link
Correspondence	Correspondence	Correspondence records for accessing requests for information (sub-form to enter and view correspondence)	sub-form
Monitoring	Monitoring	Monitoring – scope of monitoring across initiative period, type and approach	lkp
	Monitoring Comment	Text comment on monitoring	char
Entry records	Project contact	Name of contact in the conservation initiative	char
	Tel	Telephone no	char
	Email	Email address	char
	Implementing agency	Which agency is leading	char
	Project web	Initiative website	URL
	Implementing type	Type of organisation	char
	Data entry name	Who entered data	char
	Data entry date	Date of entry	date
	Information URL	URL of info sources	URL
	Information source	Description of source/s of data for record	memo
Ownership	Land Ownership	Detail of land ownership, ownership and percent class of area under each ownership	char
	Ownership description	Ownership description	char
Area selection	Areas selection reason	Reasons for selecting area - categorisation	memo
	Areas selection	Text description of areas selection reasons	memo
Staffing	Staffing	Staffing categories, number and FTE	lkp
	Staff resource FTE	Summary of staff FTE	int
	Volunteer resource (days)	Summary of volunteer days	int
Area	Project Extent	Extent of the initiative areas	memo

		(descriptive)	
	NGR Easting	Grid coordinates of site	int
	NGR Northing	Grid coordinates of site	int
	Size (sq km)	Size in square km	float
	Size*	Text description of size (redundant field)	memo
	% Actively managed	Percentage of areas managed	char
	Area actively managed	Areas actively managed (sq km)	float
	Continuous / fragmented*	Whether area is fragmented or continuous	lkp
	Protected areas*	Description protected areas within site	memo
	Other organisations involved*	Other organisations involved in programme	memo
	General comment	Allows for any notes including entry questions	memo
Community	Volunteer effort	Volunteer effort by task	int
	Engagement	Engagement mechanisms	memo
	Staff resource FTE	Summary of staff resource	memo
Funding (textual)	Funding description*	Description of funding	memo
	Resources*	Description of resources	memo
	Management planned*	Planned management activities	memo
	Progress description*	Initiative progress	memo
Conclusions	Conclusions*	Description of conclusions	memo
	Scale limitations*	Scale limitations	memo
	Trade-offs*	Trade-offs	memo
	Objectives change*	Did objectives change	memo
	Published outputs*	Published outputs (replaced with Documents)	memo
	Data access constraints*	Data access constraint	memo
	Data available*	Is geospatial data available?	memo
Consultation	Ownership consultation*	Consultation undertake with owners	memo
	Community engagement*	Community engagement actions	memo
	Monitoring*	Description of monitoring	memo
	Indicators*	Description of indicators	memo
	Other projects interacted with*	Other related initiatives	memo

The main fields/attributes within the database structure above, and the methods used to collect and record information, are summarised below. In addition, some of the characteristics have been calculated based on subsequent spatial processing (e.g. coastal/lowland).

Size

One of the principal inclusion criteria was the size of the initiative, which was set as a minimum of 10km^2, which is equivalent to 1000ha. This is clearly a subjective threshold and it excludes 111 records of initiatives that have an area between 1 km^2 and 10km^2, of which 11 were between 9.0-9.9 km^2. Different initiative designs took different views of spatial extent and in most cases an initiative area was defined as a landscape zone within which smaller scale management areas (often on individual reserves) represent the delivery area. We used the area within the outer boundary as the size/extent of the overall initiative, rather than the extent of actions on the ground; the latter was very difficult to collect reliable information on and rarely recorded within initiatives.

Contiguous/fragmented

We attempted to determine whether the management carried out was taking place over a single contiguous area or at multiple separate sites. It was not an assessment in any way of functional connectivity within the conservation area, or even of structural connectivity of different vegetation or other land-cover types. Rather, it was simply a (sometimes subjective) assessment of the spatial structure of conservation *actions* based on whether management was implemented across the whole area of the LSC initiative within a single site or whether actions were on separate sites, and whether the extent of the LSC initiative was itself divided.

Coastal/lowland/upland

The definition of an initiative as coastal, lowland or upland was calculated based on the location of the centre point of the initiative rather than collected directly from attribute information. Sites were selected as coastal based on a spatial buffer around the UK coastline that buffers internally to 3.56 km inland. This reflects the semi-circle diameter of an area of 10 km^2; the area of the minimum selected size for an LSC initiative. This means that if the centroid of the initiative fell within the 3.56 km buffer of the coast the site was classified as coastal The options for selecting an upland buffer were boarder, based on the concept of what is inferred by 'upland' (whether this is a terrain level, land cover category or suitability for agriculture). The Moorland Line and less Favoured Areas[17] boundaries were considered but due to coverage across the study area (including Scotland) the 300 m contour has been used as a substitute for upland land cover, and this in any case closely approximates the Moorland Line, although this fit varies with latitude and local situations. Alternative approaches to the coastal and upland classification could be based on the habitat types recorded within the database, but fewer LSC initiative entries have comprehensive priority habitat records from which to establish this. Many of the initiatives related to coastal and

[17] The Moorland Line dataset typically equates to the semi-natural areas above the agricultural enclosure and was developed by the Rural Payment Agency as part of the identification of the Less Favoured Area. The spatial data for Moorland Line are only available for England. The Less Favoured Area designation is similar in cover to the Moorland Line but covers wider areas and better represents eligibility for specific agricultural financial support; this is currently under review.

floodplain grazing marsh habitats have been categorised as 'coastal', reflecting the greater concentration on the coastal component of these habitats within LSC initiatives.

National Character Areas

The LSC initiative data on the coverage by NCA is subject to some generalisation as this records the 'primary' NCA (by area) covered by the initiative. Whilst some initiative areas have been defined to be match with the boundaries of an NCA (e.g. Suffolk Coasts and Heaths Butterfly conservation zone, Dungeness/Romney March BCZ) the majority of initiatives are not wholly coincident with NCA boundaries.

Records of the relationship to the NCA were recorded as a 'primary' and 'secondary' in the absence of full geospatial data from which to derive proportional area coverage figures through GIS analysis. Three 'Character Area' boundary datasets were used and although the definitions vary between countries the mapping objectives are comparable between the NCAs in England, the Landscape Character Areas of Wales and the Natural Heritage Zones (Scottish Natural Heritage 2002, Julie Martin Associates and Swanwick 2003) in Scotland.

Objectives

Conservation and other objectives of LSC initiatives were recorded using 27 classes of objective, based on the equivalent domains in the Biodiversity Action Reporting System (BARS)[18] and additional domains to reflect the multi-objective LSC initiatives. Not all objectives were given the same weight within an initiative, so the database allows for the recording of multiple primary and secondary objectives. 'Primary', in objective terms implies that there were one or more objectives that provided the foundation for the initiative, while 'secondary' objectives are those that are derived from the operation of the initiative. The distinction between primary and secondary was not always clear-cut from within the information available and there was a degree of interpretation of these classes, although for some records we had questionnaire returns from initiative managers containing direct information about objectives weighting.

Targets

Habitats and species data were collected on the basis of the habitat recorded by the initiatives themselves (i.e. from reports, websites, questionnaires) rather than from a spatial analysis of the habitat land cover maps within the area of the LSC initiative boundary. These are therefore likely to be the focal habitats for conservation actions within the initiative. For example, the South Downs NIA focuses on Lowland Calcareous Grassland even though many other habitats occur within the initiative area. Habitats were recorded as BAP priority habitat types, broad habitat types or local types to reflect both the focus of the initiatives and the way that they have been recorded by the initiatives themselves. A separate record was made for Annex I habitats and Annex II species, although the number of records with this information is low, as these classes were concentrated on actions on Natura 2000 sites, which have not in themselves been included as LSC initiatives, and on EU LIFE projects that specifically target Habitat Directive habitats or species (e.g. Border Mires and Restructuring of Kielder Forest [1870] LIFE project).

[18] http://ukbars.defra.gov.uk/ The BARS system developed a database of 45,000 conservation actions belonging to nearly 1500 organisations. It closed at the end of November 2016

Actions

For management activities and intervention types we sought to match information collected to the classes in BARS. However, good information was not available for all records and many of the multi-objective actions at the time were not well reflected in BARS records where the focus was on direct conservation actions. Thus a hybrid classification of actions was developed that reflect the main sources of information.

1.8. Summary of records within the database

Overall, the database contains 899 records of past and existing LSC initiatives that meet the criteria for inclusion outlined above and for which information about size and location could be found. This covered sites in England, Scotland and Wales. However, it was not always possible to collate information for all other attributes of these initiatives.

The database also includes 602 incomplete records of initiatives that were identified as candidates for inclusion early in the process. Subsequently, these were found not to meet one or more of the criteria, or for which no information (particularly about size and location) was available. These include initiatives such as ETIP training programmes and river restoration actions). In addition, 144 initiatives were identified for potential inclusion but were found to be below the area threshold. While these records were not included in later analysis, they have been retained in the database allow inclusion in future analysis (e.g. to explore the evolution of LSC initiatives from earlier, smaller initiatives) and to allow for different size thresholds to be used.

The database remains a live document with edits and additions occurring throughout the duration of the research project, and more likely to be made in future. The analysis of environmental outcomes (Chapter 5) used information from the database as it was in September 2012 (777 records), while the summary statistics presented below are based on the May 2013 version of the database (829 records). Not all the qualifying records have entries in each of the attribute fields and therefore the numbers of initiatives for which different aspects of summary data are present vary.

The majority of the initiatives recorded were operational at the time of publication, but only 469 had records of their current status, with a further 360 whose status was not available or not known (Table 2.2).

Table 2.2 Number of initiatives by their operational status (829 initiatives)

Initiative status	Number of initiatives
Operational	399
Pipeline	4
Closed	66
Not available / not known	360
Total	**829**

2. Main findings

This section gives a summary of some of the characteristics of the LSC initiatives identified, based on queries of the database. Not all records had complete information across all attribute fields, so the number of records within each query varies.

2.1. Distribution of LSC across England, Scotland and Wales

The majority of LSC initiatives identified were within England, with much smaller numbers in Scotland and Wales. These relative proportions are partly the result of including 110 HLS Target Areas in England but, even without these, England still had 568, far more than the other two countries combined. Few cross-border initiatives were recorded, with only three initiatives crossing the border between England and Scotland and three across the border between England and Wales (Figure 2.3.

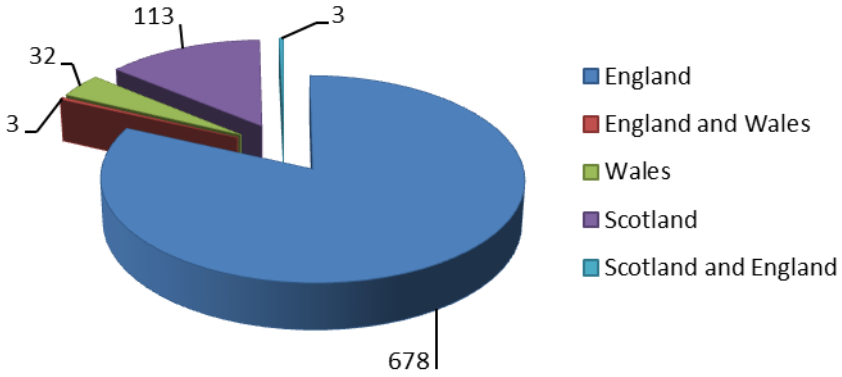

Figure 2.3 Number of initiatives by country (829 initiatives)

This implies that although there is a general principle that initiatives cover natural areas there is still a predominance of national initiatives.

2.2. Different 'types' of LSC initiatives

Table 2.3 indicates the number of initiatives within each of the key programmes (see section 1.5) their total and the average size of initiatives within the programme. Living Landscapes, the delivery mechanism for many Wildlife Trusts initiatives, had the largest number of initiatives associated with the programme (134), although not all of the recorded initiatives were active and additional initiatives have been added to this programme. Some other programmes were also dynamic and still actively introducing new initiatives, such as within the Futurescapes programme.

Table 2.3 **Summary of the fourteen programmes with the largest number of recorded initiatives in Great Britain and the number of initiatives supported under the programme**

Programme	Number of Initiatives	Lead agency	Launch date	Total area (km^2)
Living Landscapes	120	Wildlife Trusts	2006	24,669
HLS target areas	110	Natural England	2005	48,268
Butterfly Conservation Landscape Target Areas	78	Butterfly Conservation	2000	47,898
Catchment Sensitive Farming	66	Natural England/ Environment Agency	2006	61,655
Futurescapes	32	Royal Society for the Protection of Birds	2010	24,461
Deer initiative	26	Deer Initiative Partnership	1995	19,792
RSPB Reserves	23	Royal Society for the Protection of Birds	1932	822
English NNR	22	Natural England	1981	664
Riverine Strategic River Restoration	19	Natural England	2008	588
Scottish NNR	18	Scottish Natural Heritage	1981	809
Landscape Partnership	17	HLF	2004	2,967
Community Forests	15	Forestry Commission	1990	12,313
National Trust Land	14	National Trust	1894	3,073
Nature Improvement Areas	12	Natural England	2012	6,181
Total number of initiatives	**572**	**Total area served (km^2)**		**254,160**

As the table above shows, there is a great deal of variety among initiatives that can be considered to be ‘large-scale conservation’. One important difference among initiatives relates to land tenure arrangements. Despite the lack of detailed information on ownership of the individual LSC initiatives a categorisation was attempted to identify four classes (single

owner, few owners, targeting areas and many owners). So the comparison is then between ‘few owners, all actively engaged in conservation’, ‘target areas for incentive schemes’, ‘conservation across land owned by many private owners, coordinated by a conservation organisation or partnership’. Table 2.4 shows the different land ownership (i.e. number of owner) classes, with a significant difference between ownership classes and status as spatially fragmented or contiguous. Single and few owner classes were combined into a single category in this analysis due to count of single and few owners for fragmented initiatives.

Table 2.4 Summary of the ownership of land related to the fragmented or continuous status of the initiative (583 initiatives)

Type of land ownership	Fragmented	Contiguous
One or few owners, all actively engaged in conservation	5	68
Target areas for incentive schemes	101	80
Conservation across land owned by many private owners	191	138

2.3. Organisations involved

Records from the LSC database indicate that there are 186 separate organisations in leading roles in the different initiatives, with many of the programmes led by national bodies such as the RSBP, Wildlife Trusts, Natural England, National Trust etc.

These 186 organisations represent a range of different types (Figure 2.4); NGOs were the largest percentage, with 64 organisations (35%). The proportion of the initiatives led by each type of organisation is shown in Figure 2.5. A relatively small number of public bodies (e.g. Natural England, Environment Agency, Forestry Commission) led many initiatives. Thus public bodies represented only 7% of the 186 separate organisations but led 337 (41% of) initiatives.

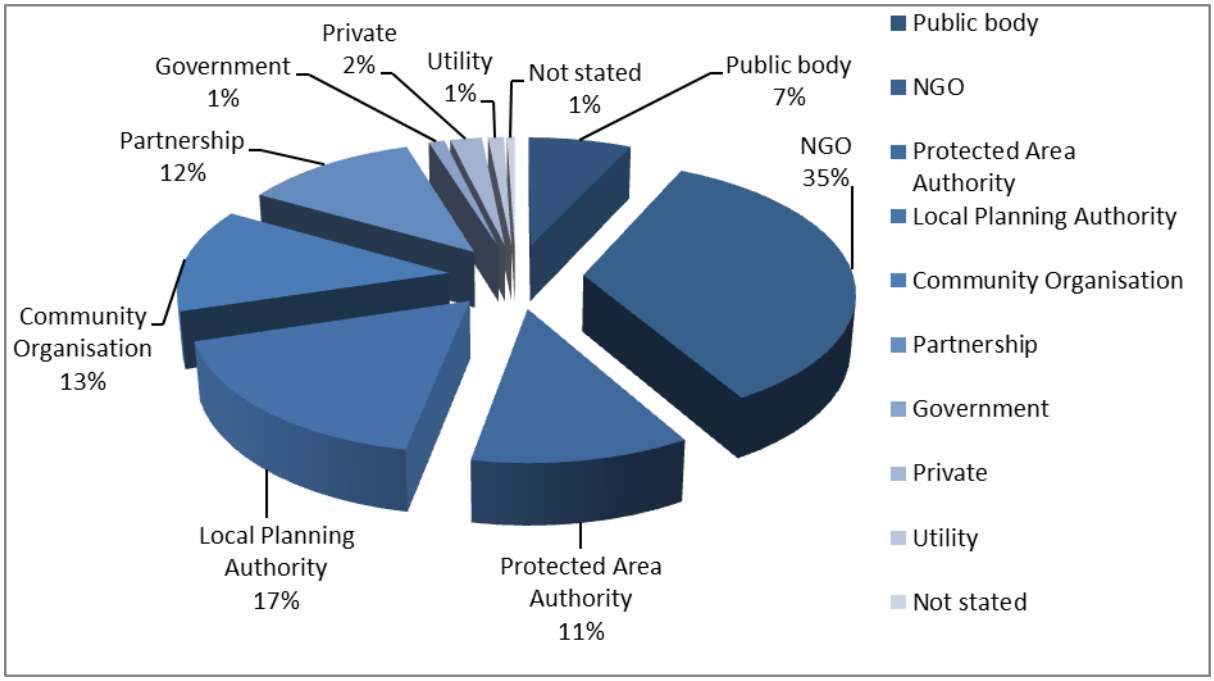

Figure 2.4 Percentage of the lead organisations in different categories (829 initiatives with 186 separate lead organisations). 'Government' refers to central government departments (principally Defra); 'Public body' refers to a government body such as the Environment Agency, Natural England, Forestry Commission or Historic England; 'Protected areas authority' refers to landscape and heritage organisations such as National Parks and AONBs; 'Partnership' refers to situations in which organisations had taken a consortium-based approach to delivery composed of multiple components but represented for the project as a partnership – typically with a partnership organisational structure rather than operating as individual agents; 'Community organisations' includes groups such as the Rivers Trusts and conservation volunteers

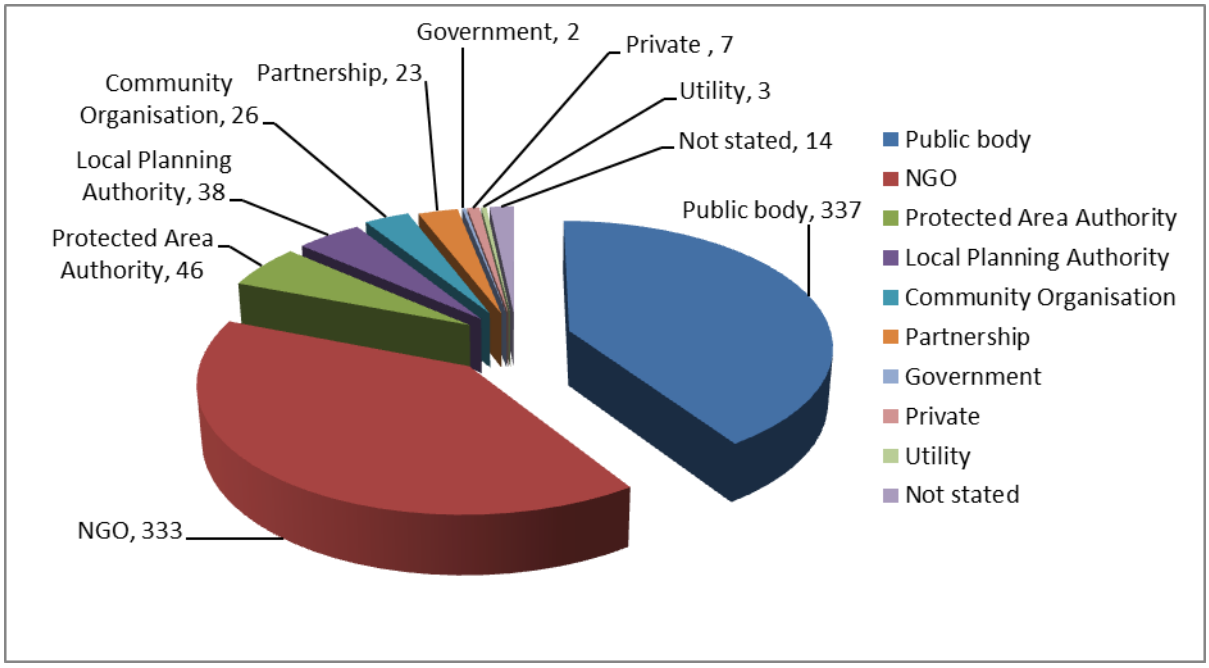

Figure 2.5 Number of initiatives implemented by different types of organisation (829 initiatives)

There was a lack of information from which to assess the staffing arrangements within the context of the initiative organisation and operation, as this information is rarely available within online reporting used to populate much of the record.

Increasing numbers of multi-objective initiatives which include biodiversity conservation objectives are run by non-biodiversity groups associated with the initiatives (PCTs, Housing Associations) where the conservation may be a secondary objective.

2.4. Size of partnerships

Records identified from the LSC database show that initiatives are predominately implemented by a single lead organisation (Figure 2.6) with 38% (311) of the 819 initiatives with partner information with one lead organisation. In most circumstances, where land is in multiple ownership, the delivery on the ground for LSC initiatives will inevitably include multiple landowners, tenants and managers but they may not always have been seen as partnership members. Individual landowners have typically not been included within the database as partners in the initiative (unless explicitly identified as such) and are recorded separately within the 'ownership' information, although this information is rarely available. Organisations within the initiatives may also form specific 'partnerships' for the initiative, as a more formal arrangement. These are recorded as a 'partnership' within the database, but the individual organisations constituting the partnership have also been recorded where this information is available. In these instances the number of organisations may be increased by one within the database.

There are 34 initiatives that have more than 12 partners accounting for only 4.15% of initiatives with these larger partnerships. One initiative recorded 53 partners.

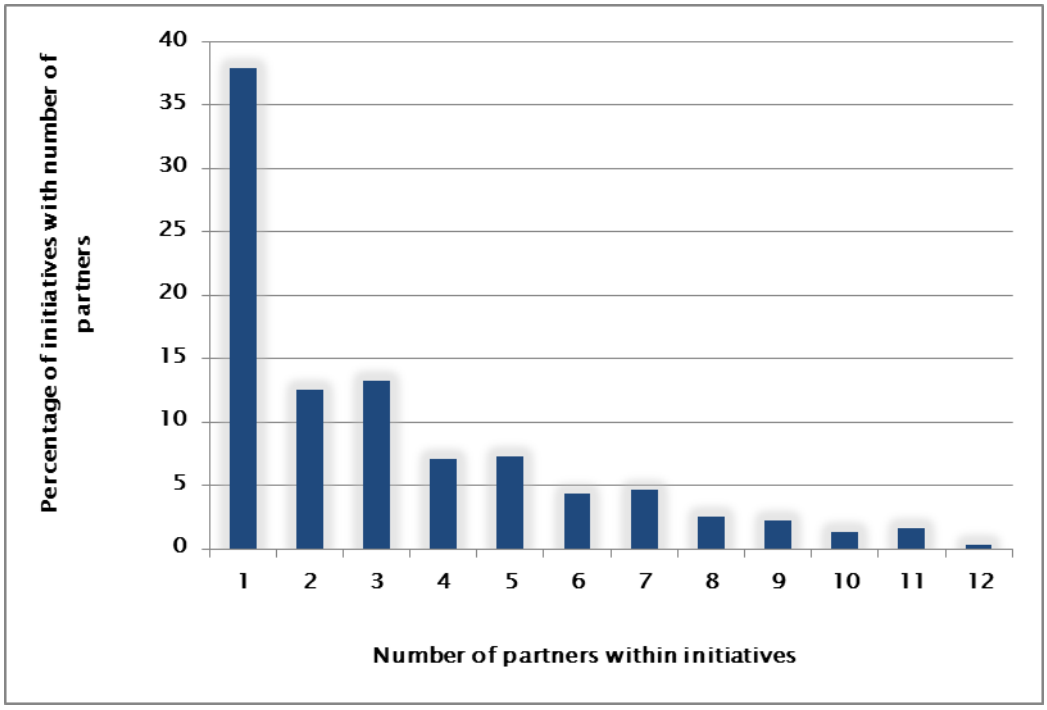

Figure 2.6 Percentage of initiatives with the number of partners (1= single lead organisation). Initiatives with more than 12 partners are not shown in this figure

The average number of partnership members increased with the extent of the initiative (Figure 2.7) with smaller initiatives (less than 25km^2) having on average around half the number of partners of larger initiatives (over 500 km^2).

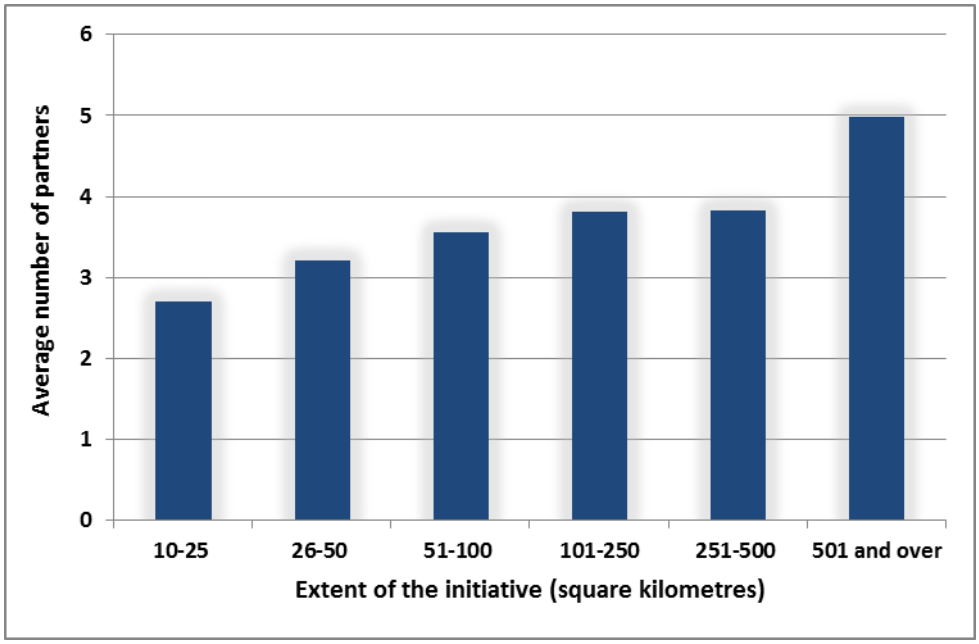

Figure 2.7 Average number of partners within LSC initiative by the size classes of initiative

2.5. Size of initiatives

A key issue in determining the structure of large-scale conservation initiatives was the spatial extent of the initiatives and the degree to which the spatial area identified reflected the extent of actions on the ground. In many senses we were interested in the coherence of the initiative in delivery of benefits across the wider landscape scale areas delivered through separate, smaller-scale actions. Consequently, one of the defining variables for LSC initiatives was their initiative area, defined as the outer bounding extent of the initiative.

The distribution of the size classes of initiatives is shown in Figure 2.8. Overall, the GB initiatives (829) cover 484,734 km^2, with a mean size of national initiatives of 584 km^2 and a median of 160 km^2.

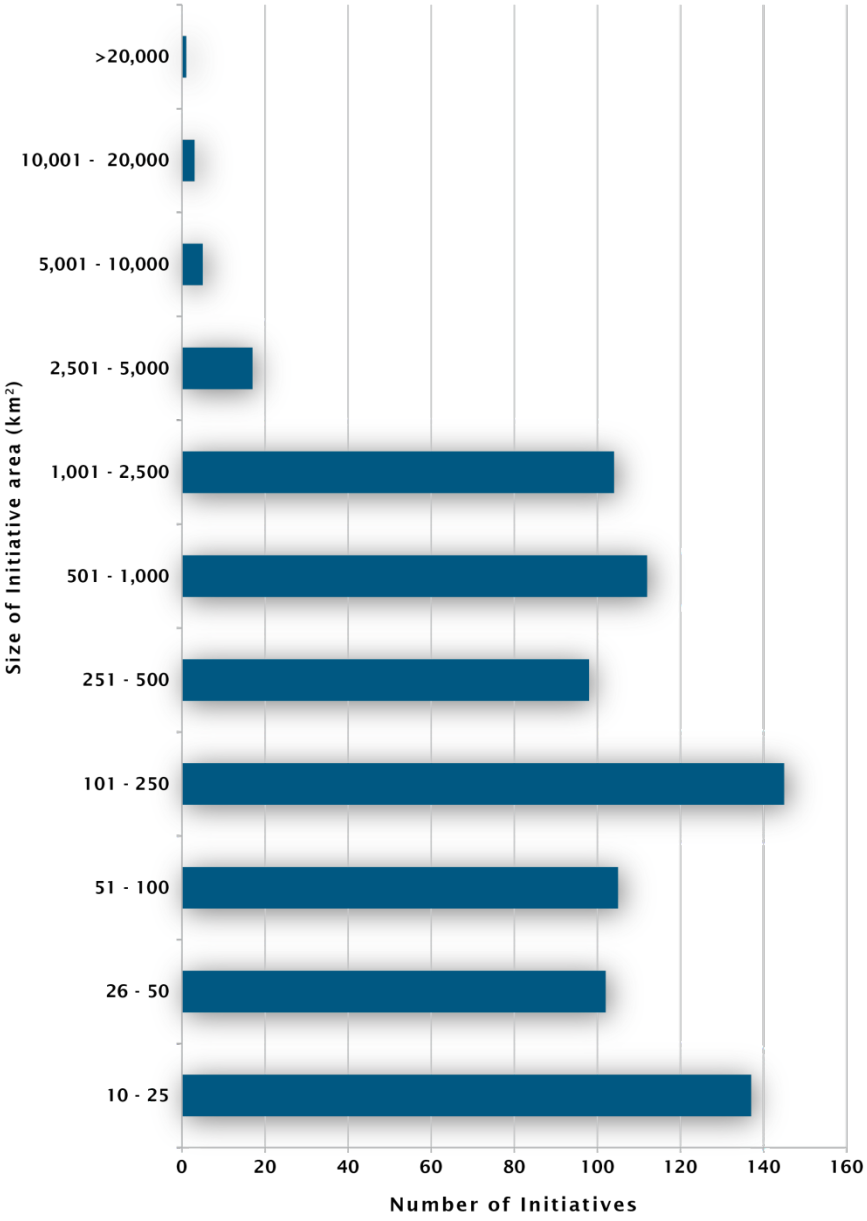

Figure 2.8 Initiatives by size classes (km^2); 829 initiatives

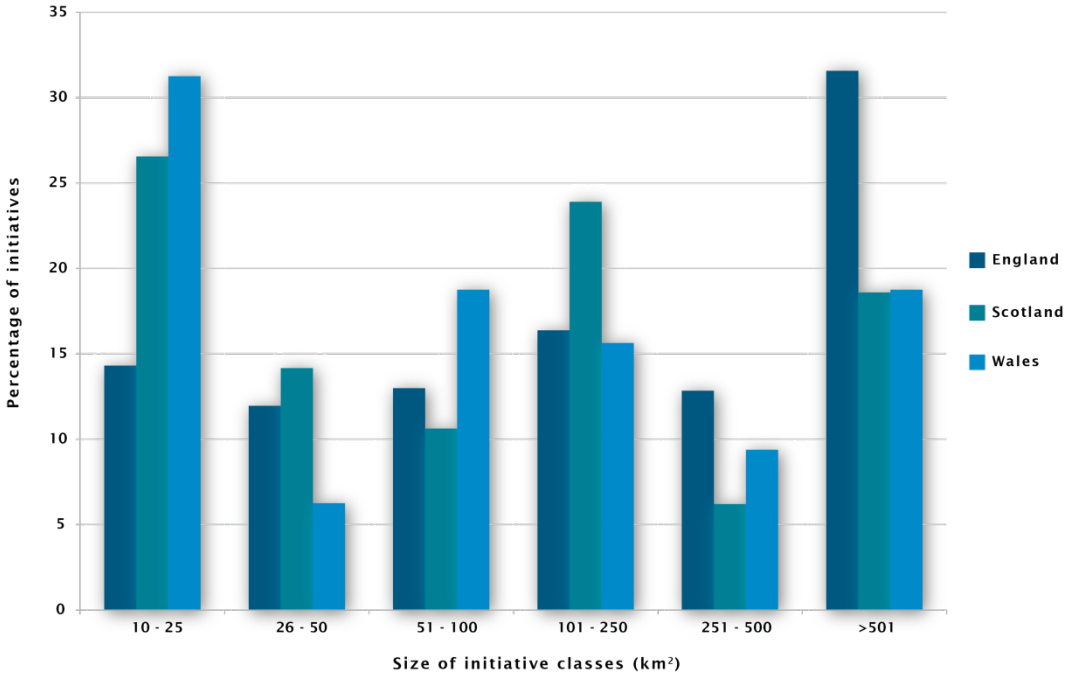

Figure 2.9 **Percentage of initiatives in each size class separated by country (823 initiatives: 678 in England, 113 in Scotland and 32 in Wales – the cross border initiatives have been omitted)**

The percentage of initiatives within different size classes differs between England, Scotland and Wales, as presented in Figure 2.9. The distributions are statistically significantly different (based on a one-way ANOVA) between England and Wales, (P=0.003) and England and Scotland (P = 0.007), but not between Wales and Scotland (P = 0.9). Not enough records had specific information relating to the area managed to report on how the area under management relates to the overall LSC initiative area.

2.6. Spatial area covered

As noted above, the initiatives in the 14 largest programmes together cover over 254,000 km^2; when all initiatives are combined the total area rises to over 484,000 km^2. Both of these areas are greater than the size of Great Britain (229,848 km^2). This emphasises that there are a number of overlapping initiatives both in time and location. It also highlights that the 'area of interest' or focal area for many initiatives greatly exceeds the area being actively managed within the initiative, although there are few records of extents of collected actions within landscape initiatives. There is no significant relationship between the programme's number of initiatives and the average size of initiatives.

The Nene Valley provides an example of this coincidence of initiatives within a single geographic area, in this case the River Nene in Northamptonshire. Here seven initiatives, including the recently-established Nature Improvement Area, were active in the main river corridor, part of which was covered by the River Nene SPA, riverine SSSI and the River Nene Regional Park. These initiatives were running concurrently within overlapping areas and overlapping timescales (Table 2.5; Figure 2.10); although the detailed conservation objectives and partners varied they all focused on biodiversity.

Table 2.5 Size and start dates of large scale conservation initiatives within the Nene Valley

LSC initiative	Date	Area (km^2)
River Ise Strategic River Restoration	2010	10.25
Upper Nene Valley Futurescape	2010	60.3
Nene Valley Vision Living Landscape	2009	40
River Nene HLS	2005	79
Peterborough HLS	2005	250
Rockingham HLS	2005	78
Nene Valley Nature Improvement Area (NIA)	2012	413.5

The Nene Valley example also highlights a number of adjacent initiatives (Stanford Loddington & Melton HLS, and the John Clare Country Living Landscape) that may contribute to the wider ecological connectivity objectives within the Nene and tributaries initiatives.

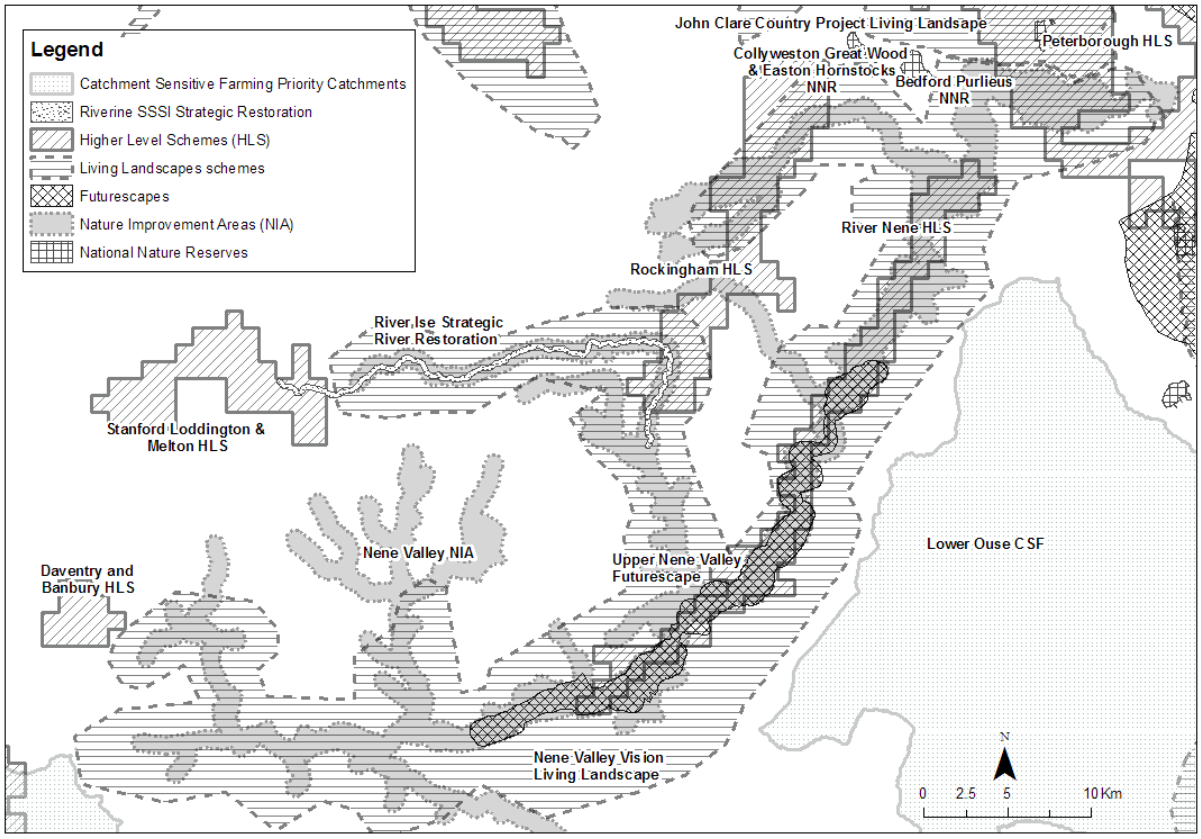

Figure 2.10 Summary of geographically and temporally overlapping large scale conservation initiatives within the Nene valley, Northampton

2.7. Fragmented / contiguous initiative locations

775 of the initiatives had classifications of contiguous or fragmented, with 54 initiatives not classified. About half fell into each category (Table 2.6).

Table 2.6 **Initiatives by their classification of spatially fragmented or contiguous (829 initiatives) and the distribution of sizes of initiatives (distributions were calculated against a subset of 569 initiatives - 280 contiguous and 289 fragmented)**

Contiguous or fragmented area	Number of Initiatives	1st quartile km^2	Median km^2	3rd quartile km^2
Unknown	54	-	-	-
Contiguous	365	26.5	86	364
Fragmented	410	80	250	835

As noted earlier, this is simply a classification of whether the area a conservation initiative was focused on (not necessarily actively managing) a single 'block' or in multiple separate 'patches'; in other words, the spatial configuration of the areas that conservationists have chosen. It was not an estimate of the degree of fragmentation, connectivity or the quality of the land cover matrix between habitats, which is a quite separate issue. Few past or existing LSC initiatives had sought to calculate the degree of connectivity within the landscape action planning as a baseline and post intervention, although NIAs were doing so using local indicators of connectivity. Forest networks, opportunity areas mapping and 'visions', such as the Wetland Vision, had attempted to use various conservation prioritisation mapping landscape metrics and stakeholder identified 'landscape opportunities'. More recently, Catchpole (2006) has generated ecological network maps and Taylor and others (2014) have generated national level fragmentation maps through the National Biodiversity Climate Change Vulnerability Assessment. Regional programmes (e.g. South West Nature Map/ South East Regional BOAs) and non-departmental agency strategic programmes (Scottish Forest Strategy; Moseley and others 2008) have also sought to analyse connectivity across wide areas for conservation planning. To study this, it would be necessary to make national assessments of the degree of connectivity, connectedness or permeability of land covered by LSC initiatives by calculating landscape metric statistics using land cover data and the using geospatial boundaries of the LSC initiatives

2.8. Geographic location of the initiatives

The extent of the LSC initiatives is illustrated in Figures 11-13, based on the point based data (Figure 2.11), extent of the geospatial data that maps the extent of the LSC areas where the boundaries are known (Figure 2.12) and the representation of the initiatives based on the number reported within each NCA area (Figure 2.13).

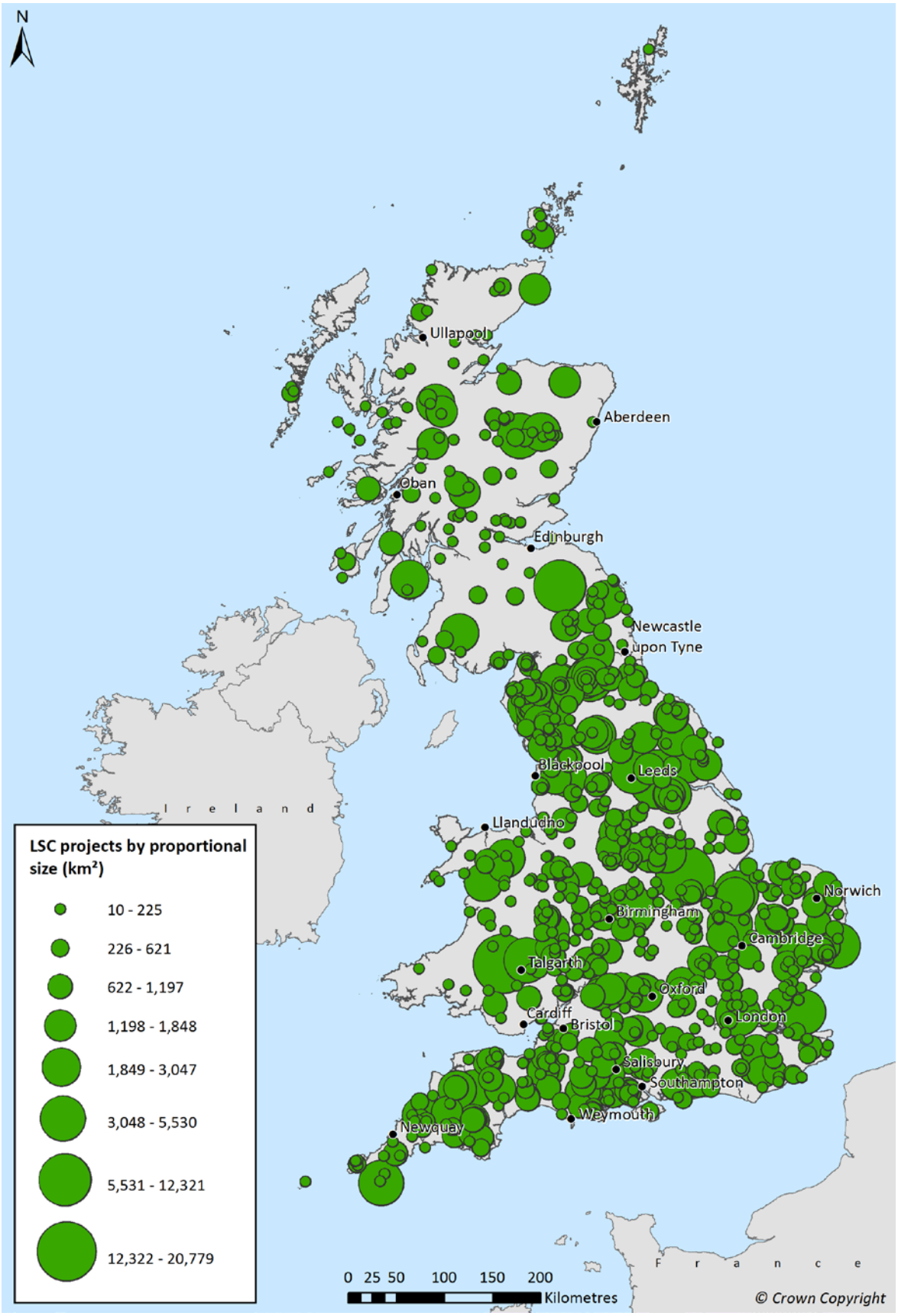

Figure 2.11 LSC initiatives in England, Scotland and Wales by proportional size, based on the point location of centroids (829 initiatives)

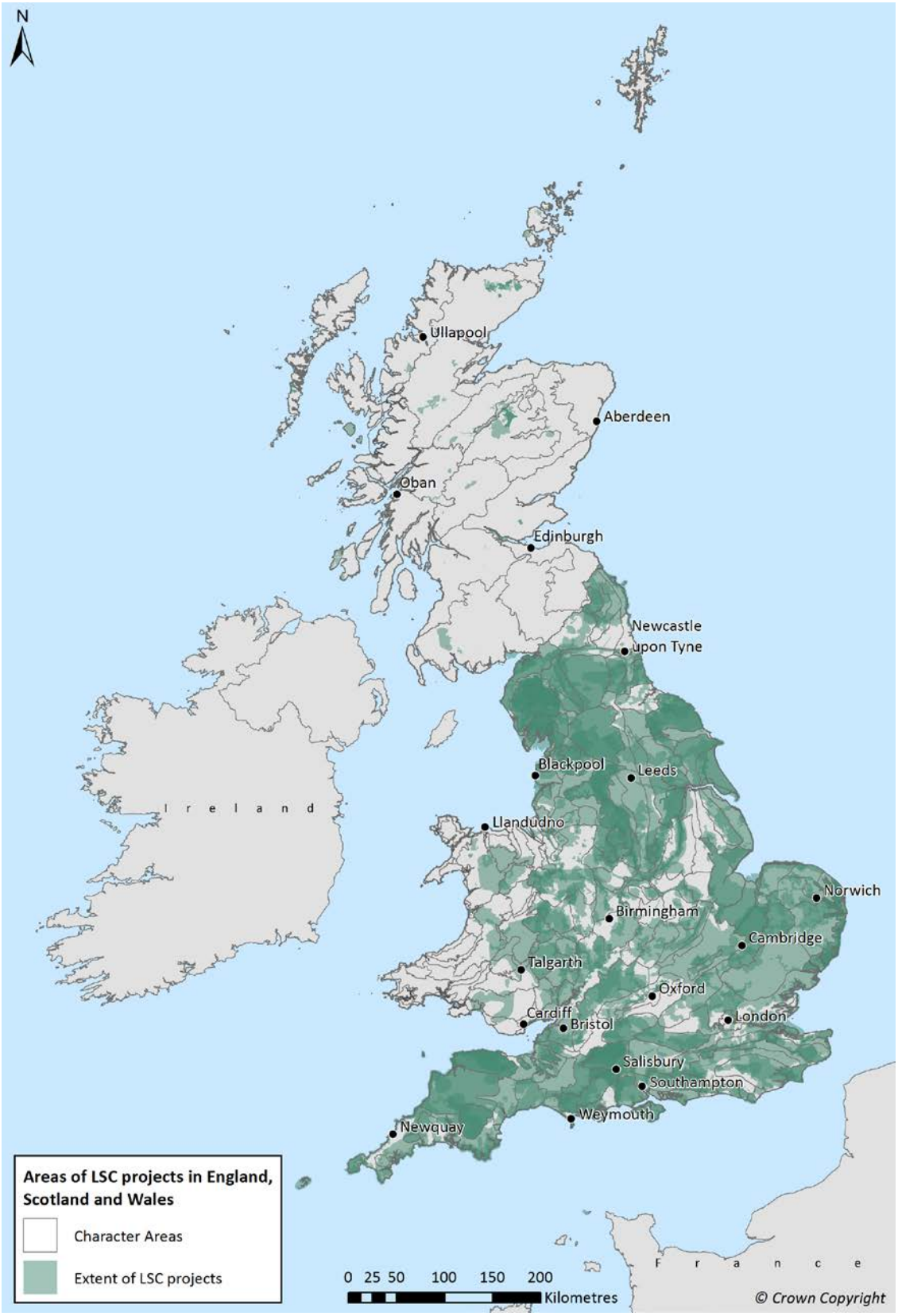

Figure 2.12 LSC initiatives in England, Scotland and Wales for which the spatial extent of GIS polygon boundary datasets are available (609 initiatives). Darker areas of shading indicate multiple overlapping initiatives

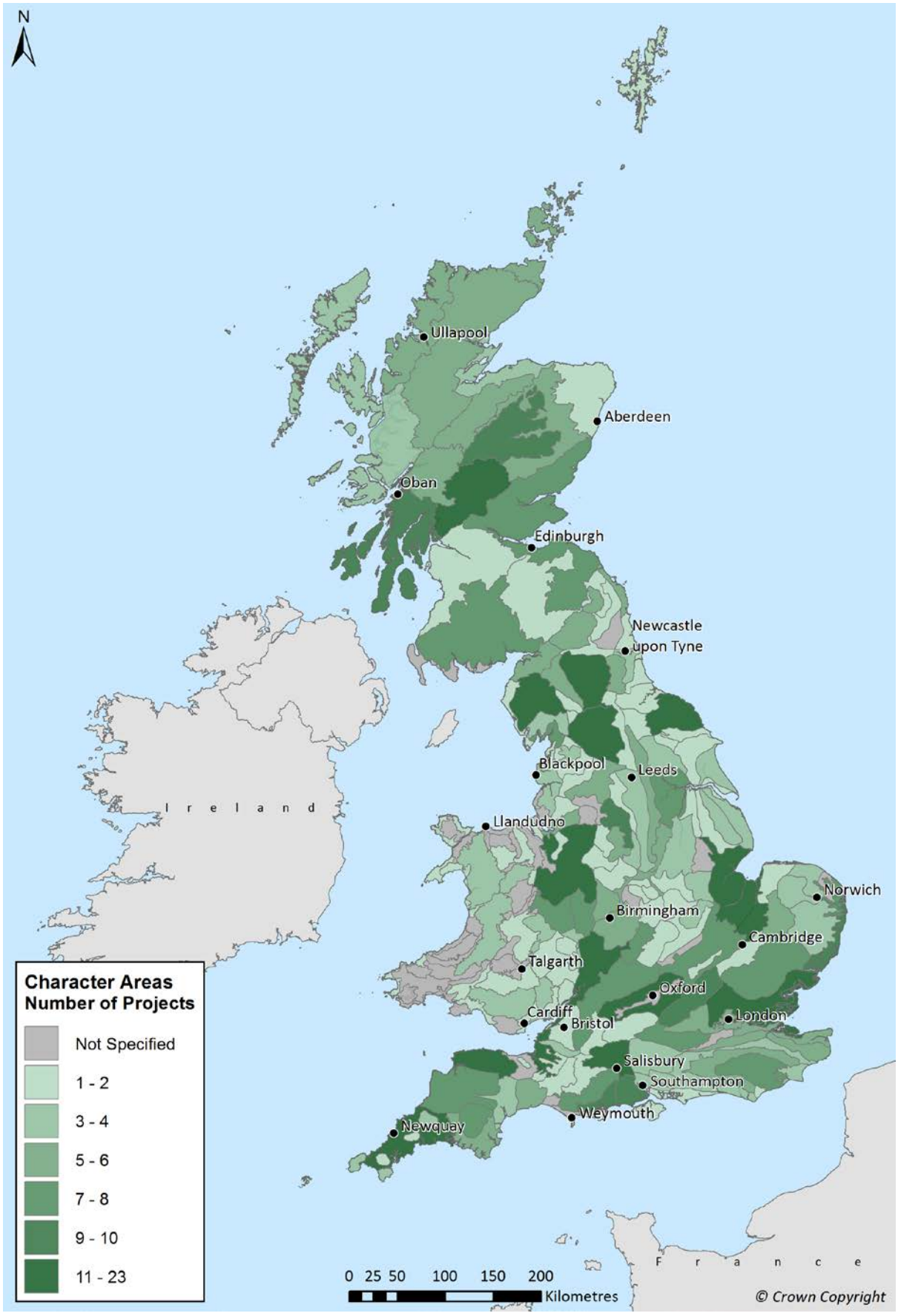

Figure 2.13 LSC initiatives in England, Scotland and Wales numbers by National Character Area (829 initiatives)

At a visual level the extents of the initiatives indicate that gaps in coverage of LSC initiatives tend to coincide with key lowland and clay vales when considered against the National Character Areas. Excluding the large Catchment Sensitive Farming initiatives there are particular gaps within the NCAs within the Avon Vales, Upper Thames Vales, Leicester Vales, Central and Southern Lincolnshire Vales, North Lincolnshire Edge, Trent and Belvoir Valley (outside of the river corridor) and the Bedford and Cambridgeshire Clay Vales and Suffolk and North Essex Clay lands and the Vale of Pickering. This may reflect the extents of semi-natural habitats and the proportion of agricultural pasture and intensive agriculture in these areas. In contrast, the hotspots of activity focus on upland areas, such as the Lake District, Peak District and North York Moors and lowland moors of the Southwest of England and the Fens and chalk lands of SE England.

2.9. Coastal, lowland and upland

Table 2.7 shows the distribution of sites that are coastal, lowland or upland. The upland sites are significantly larger than lowland and coastal initiatives.

Table 2.7 **Initiatives by their classification as coastal, lowland or upland (829 initiatives)**

Coastal, lowland and upland initiatives	Number of Initiatives	Cumulative area of initiatives (km^2)	Average area by type (km^2)
Coastal	117	28718	245.45
Upland	130	109747	844.21
Lowland	582	346269	594.96

One initiative was classified as both coastal and upland, the Skye Estate of the John Muir Trust [2328], although the habitats concerned are blanket bog and upland mixed ashwood, which can be found at lower altitudes on Skye. The number of coastal initiatives may underestimate some initiatives where the coastal influence extends far inland (e.g. up estuaries) – for example within the Suffolk Estuaries and South Downs Coastal Plain (Figure 2.14).

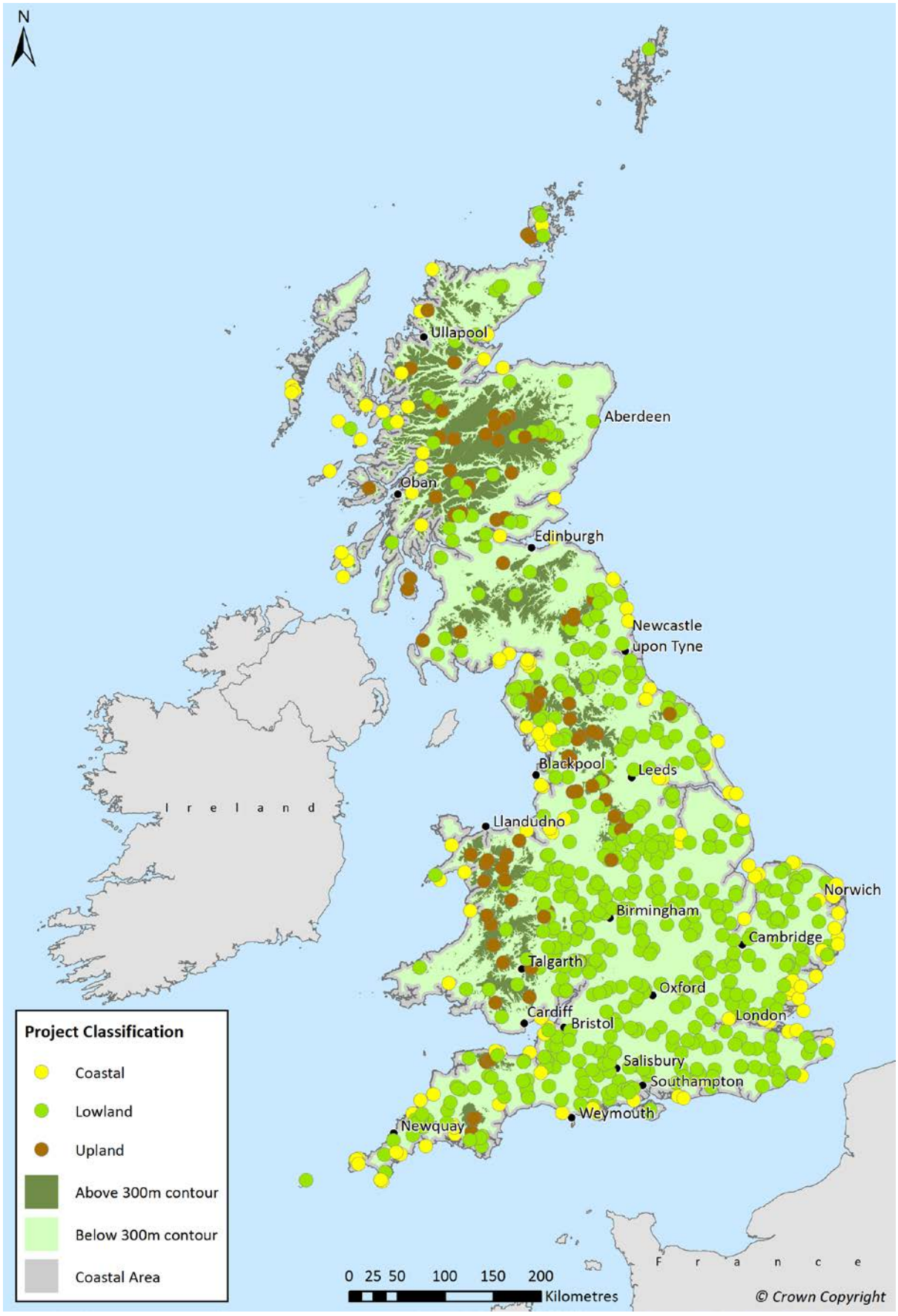

Figure 2.14 LSC initiatives by coastal, upland and lowland types

2.10. Location selection

The basis for LSC initiatives' area selection was recorded against a series of categories to evaluate whether the areas were being defined by administrative boundaries or by other habitat, conservation or targeting criteria. A single selection criterion was recorded for each initiative, although it is recognised that in some instances multiple reasons may determine the area choice. For example, 'target area' selection is one of the categories, and despite the number of initiatives that are within HLS target area (110) the majority of these are recorded as selected on basis of ecosystem or habitat level, as the HLS targets habitats / ecosystems. 643 records have defined the basis for the area selections.

Three selection criteria dominate; ecosystem/habitat level, protected areas and catchment level. Predominantly, the selection of sites for LSC is on the habitat and ecosystems. The high percentage of initiatives over 300 km^2 in the catchment category corresponds to the Catchment Sensitive Farming initiatives. Although National Character areas may set a landscape context across the UK LSC initiatives largely fall across multiple NCA areas. This emphasises that the LSC initiatives were working within areas that were, at least in part, defined by their relationship to conservation rather than administrative areas. Figure 2.15 shows the area selection of initiatives by the size of the initiative.

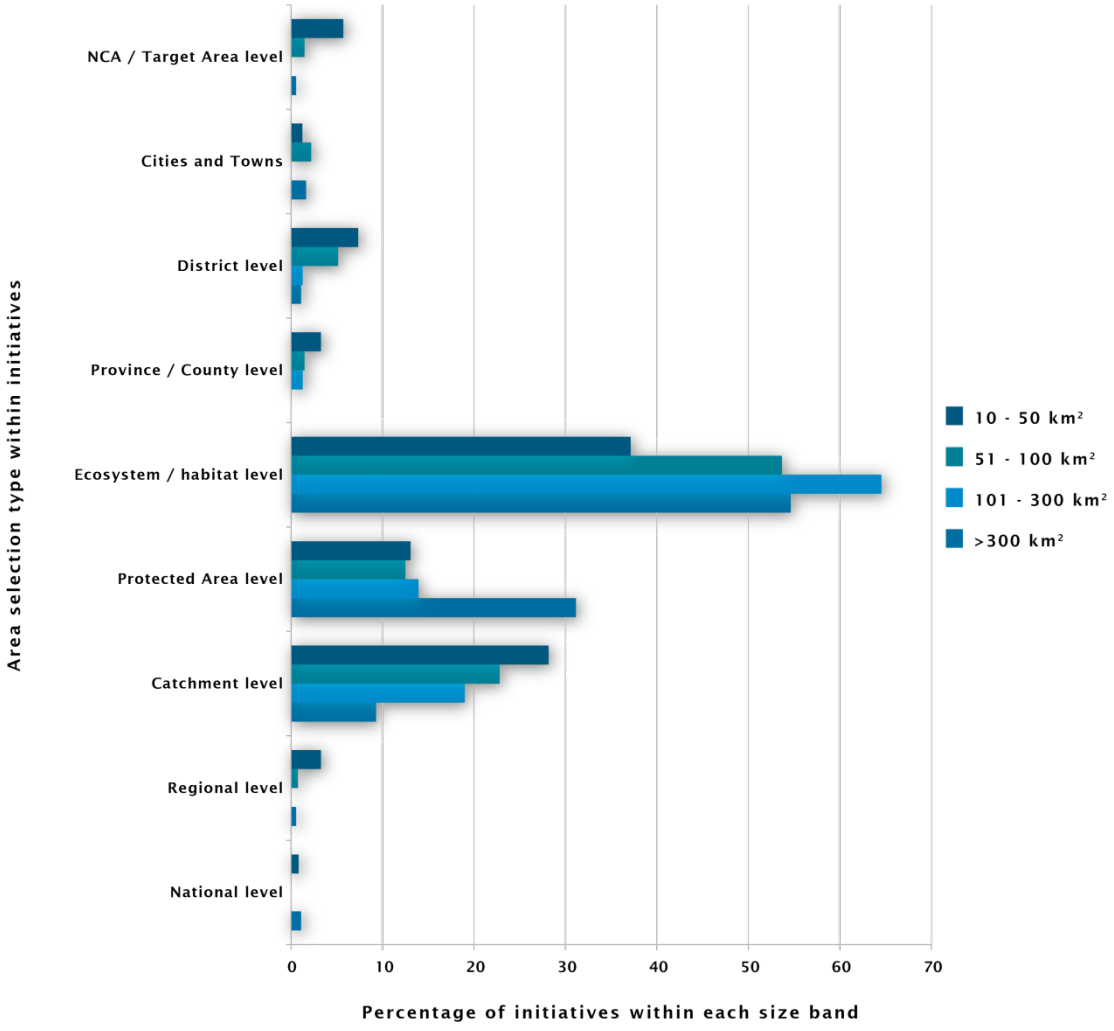

Figure 2.15 Selection of LSC initiative locations by size of initiatives (643 initiatives)

2.11. History and planned duration of initiatives

The date of the initiatives start from the 1920s with the pre-1960s managed landscapes being led by the National Trust and the National Trust for Scotland. The majority (63%) of the initiatives date from the 2000 decade, but given the current decade has 82 initiatives within 2 years (to 2012) if the trend continues the number of initiatives for this decade is likely to exceed the past decade (Table 2.8).

Table 2.8 Number of LSC initiatives started in each decade from 1920 to 2010 (758 initiatives)

Decade in which initiative started	Number of initiatives
Unknown	97
1920	1
1930	1
1940	2
1950	6
1960	5
1970	6
1980	11
1990	71
2000	476
2010	82

Figure 2.16 illustrates the number of initiatives in each duration class. 291 initiatives were on-going or had expected durations of greater than 100 years. 234 initiatives did not have records of the planned duration. The high proportion that was greater than 100 years includes those where there was no defined end date to the initiative, thus only those that are less than 100 years can really be treated as having established a defined project timescale and of these 304 records, 39% of the initiatives had lasted, or were expected to last, between 6 and 10 years.

There was a tendency for initiatives to remain on-going, with no end date fixed within the programme. It was often difficult to get a clear picture from the literature of the duration of an initiative as few were recorded as closed; only 14% (66) of the records where the status was known had been closed.

One of the aspirations of LSC is developing a long term vision. In some cases the vision can cross multiple initiatives as many projects are built from one initiative to another, with changes to objectives and activities, but with a longer term vision uniting separate projects and separate funding steams.

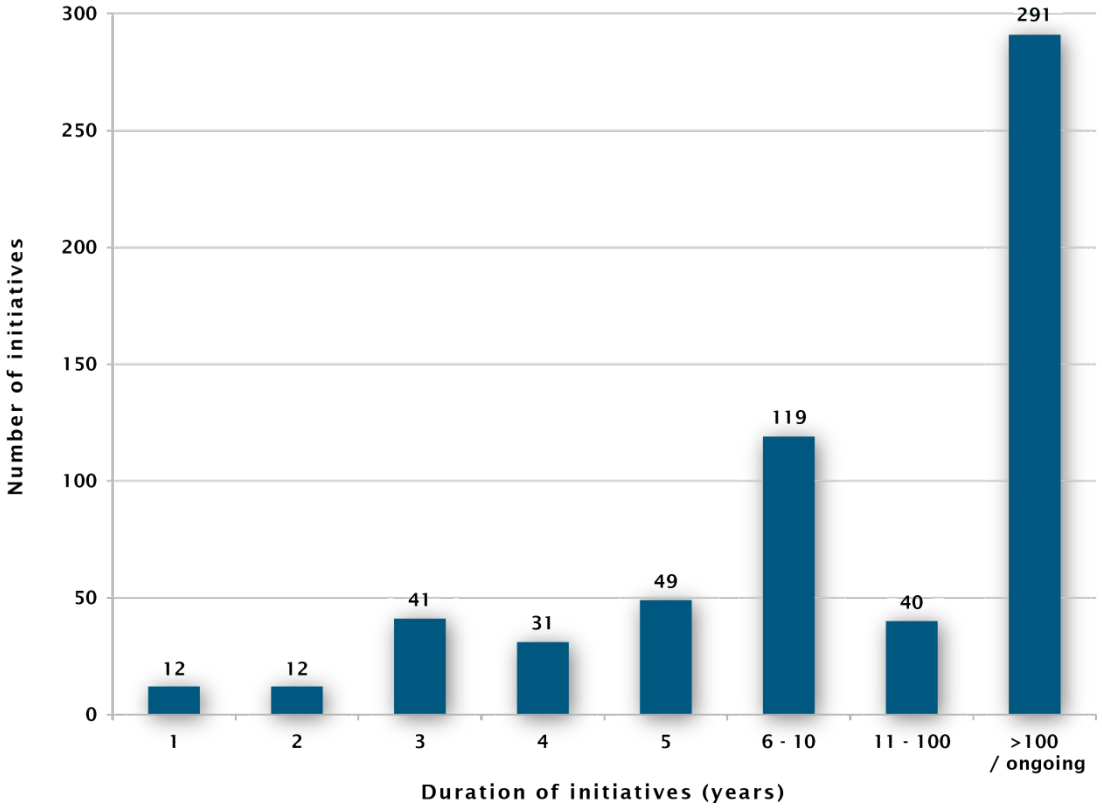

Figure 2.16 Duration classes of initiatives (595 initiatives)

2.12. Objectives of LSC initiatives

Not surprisingly, ‘wildlife and biodiversity’ dominated the objectives of the LSC initiatives, with 668 having wildlife and biodiversity as a primary objective (Figure 2.17). Social and access objectives were the next most frequent objectives, followed by environmental education and public access improvement.

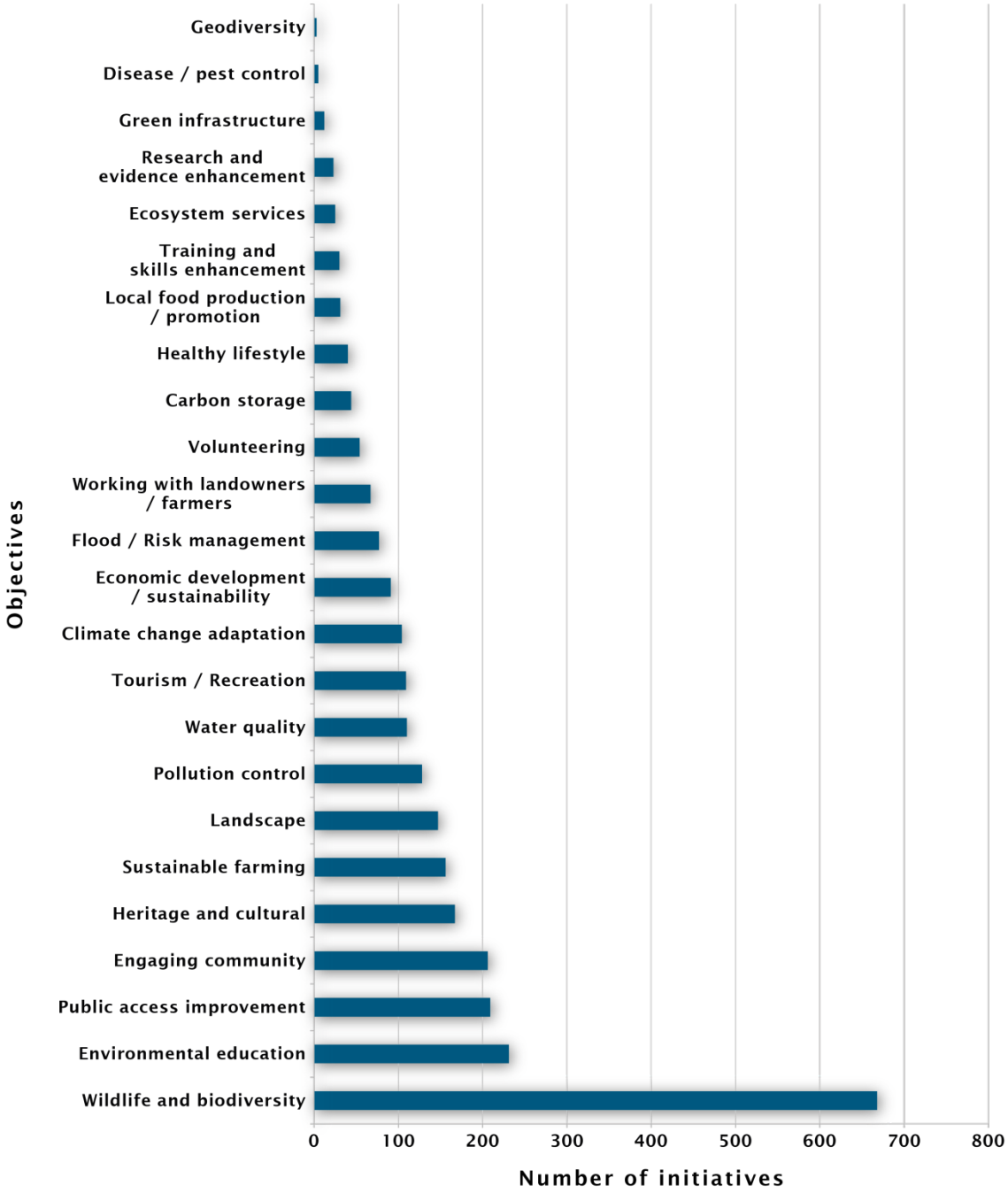

Figure 2.17 **Objectives related to the LSC initiatives (758 initiatives)**

The objective of many LSC initiatives reflected the objectives of the national programmes to which the individual initiatives belonged, such as with Catchment Sensitive Farming and Strategic River Restoration, where the objectives were subject to national guidance even if the actions were localised.

Other programmes had discrete sets of objectives, where both the initiative objectives and the actions were defined more locally, within an overarching programme 'vision'. Thus the individual initiatives within the larger charity-led landscape scale initiatives (e.g. Living Landscapes, Butterfly Conservation Landscape Target Areas and Futurescapes) had varied

objectives across the programme, based on the specific interest being promoted within the individual initiative. Objectives had sometimes also been set within a preceding national plan (e.g. Wetland Vision).

A number of other objectives with a smaller representation were noted within the database. These include 'disease and pest control', which was an objective of some multi-objective initiatives (though it should be noted that initiatives focused solely on this objective were generally not included in the database[19]). Similarly, green infrastructure was noted as an objective within the domain list although few initiatives recorded this; many candidate initiatives that did were excluded from the LSC analysis as they were more plan-related than 'on the ground' conservation actions.

Twenty-one percent of the initiatives (of 758) had just a single objective and this was predominantly a wildlife and biodiversity objective, with only 15 of the single objective initiatives related to other objective domains (related to flood risk management, evidence enhancement and tourism and recreation). The majority of the initiatives were multi-objective, with 66% of the records (498) having three or more objectives. Five initiatives had 11 or more objectives listed – these were Living Landscape or Landscape Partnership initiatives, together with two of the Integrated Biodiversity Delivery Areas (Figure 2.18). These multi-objective initiatives also may have multiple partners, for example the Wild Penwith West Cornwall Wetlands Living Landscape project [90] has 11 objectives and 11 partner organisaitons.

The most frequent multi-disciplinary objectives other than 'Wildlife and Biodiversity' were 'Environmental Education', and 'Public access improvement'.

[19] It may be argued that plant health programmes should be considered as qualifying as LSC initiatives, based on the protection of key tree species, (e.g. the control of Oak Processionary moth (in London and Pangbourne), control of *Pytophtera rammorum* across SW England that are wide-area actions that 'are removing the sources of harm' might therefore qualify and have ecological networks and connectivity as a central element in the planning of the response and scientific assessment of intervention and monitoring of effectiveness.

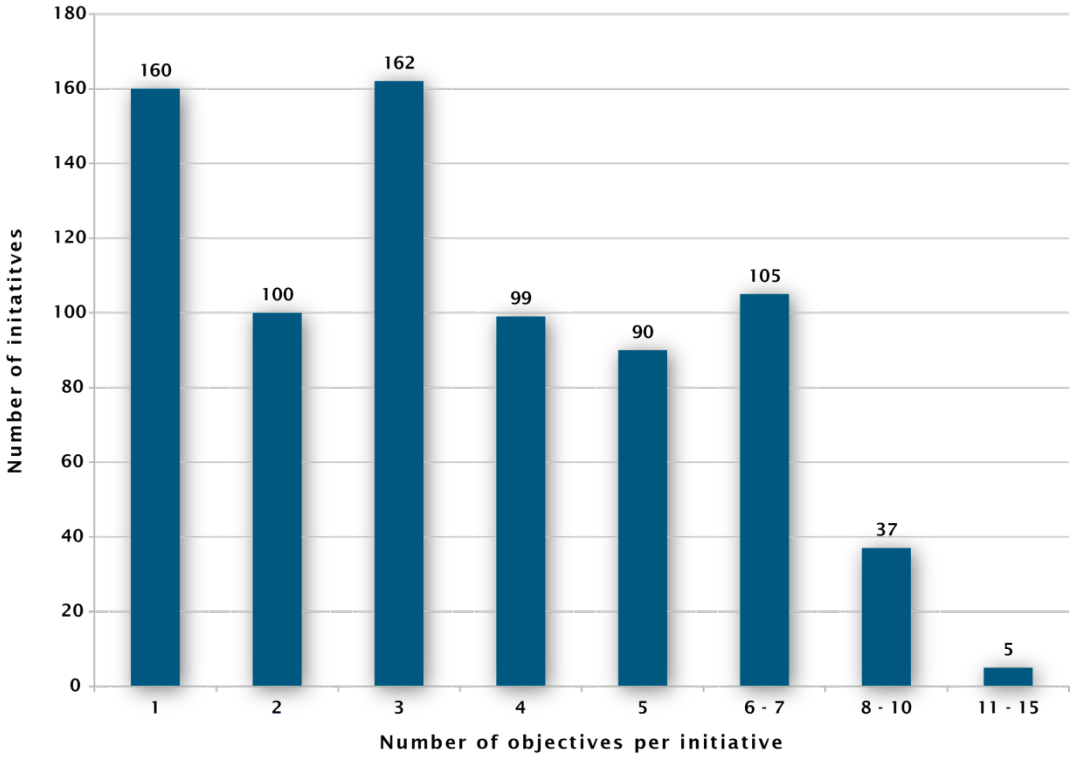

Figure 2.18 **Number of LSC initiatives by number of objectives within the initiative (758 initiatives)**

Bias may be inherent in the way the records have been collected. The database sought to collect information on conservation initiatives which may have led to an under-reporting in some objective areas. In particular, the low representation of 'working with landowners and farmers' is likely to under-represent the collaborative activity within initiatives that, while working with landowners, did not list that activity as part of their core objectives.

Within the objective setting of the initiatives there was a small trend towards a larger average number of objectives for initiatives with larger spatial area (Figure 2.19).

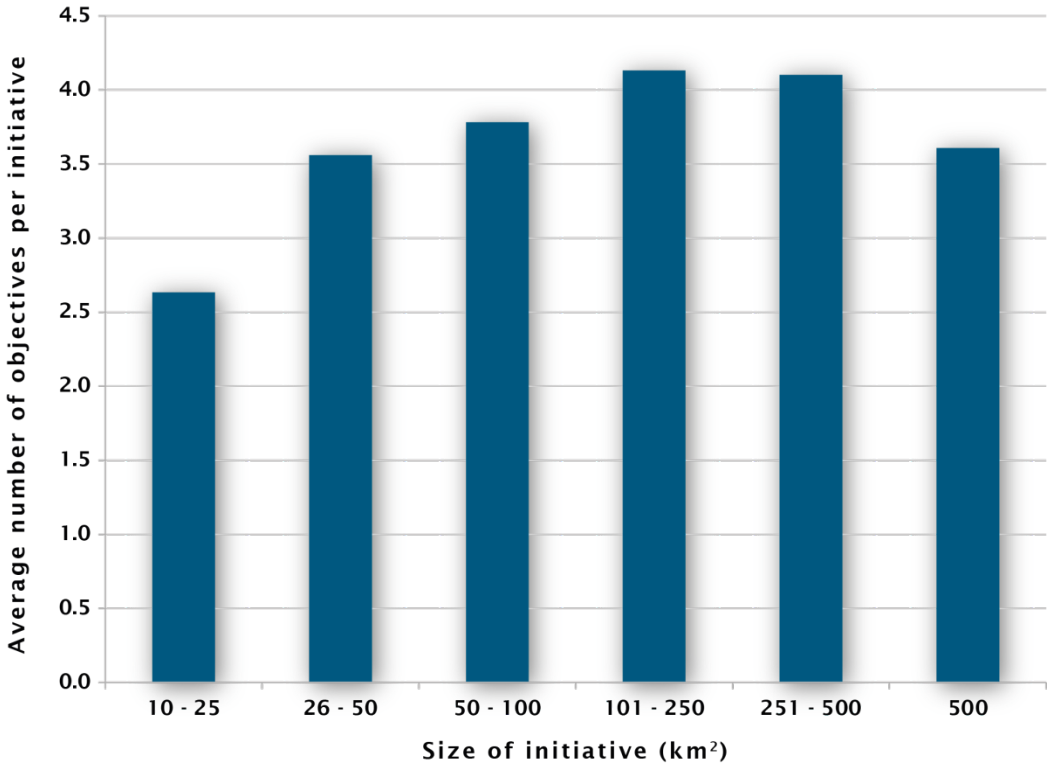

Figure 2.19 Average number of objectives by the initiative area categories (758 initiatives)

2.13. Habitats being conserved

Data on the habitats associated with the LSC initiatives was obtained for 715 records. Figure 2.20 shows the major priority and local habitats included within the LSC initiative area, for those habitats which were represented in over 40 LSC initiatives. The area of the habitats included within initiatives does not correlate with the representation of the habitats within the UK (as referenced to the priority habitat inventory). Lowland habitats dominate the scope of the initiatives with lowland heaths and lowland meadows, rivers, grazing marsh and hedgerows being the top five habitats represented by frequency. There is some indication that some habitats that are sparsely represented nationally are key targets for LSC initiatives, but often within a matrix of habitats, such as reedbeds that have a high representation in initiatives, but have a small representation in the UK habitats. JNCC estimate that there are only 50 lowland fen sites that are in excess of 20ha (Natural England 2011[20]), yet over 50 conservation initiatives had fenland actions.

The level of detail of habitat information that was possible to obtain was in many cases limited. For example, the habitats were sometimes only broadly described or the description did not match a consistent existing classification system. Habitats of local interest often reflected specific elements of the habitats (such as ancient woodlands, drainage ditches) or components of the wider matrix of the countryside; to a lesser extent urban areas were also represented (e.g. gardens and allotments and golf courses).

[20] Reedbed BAP Priority Habitat Inventory for England v2.0

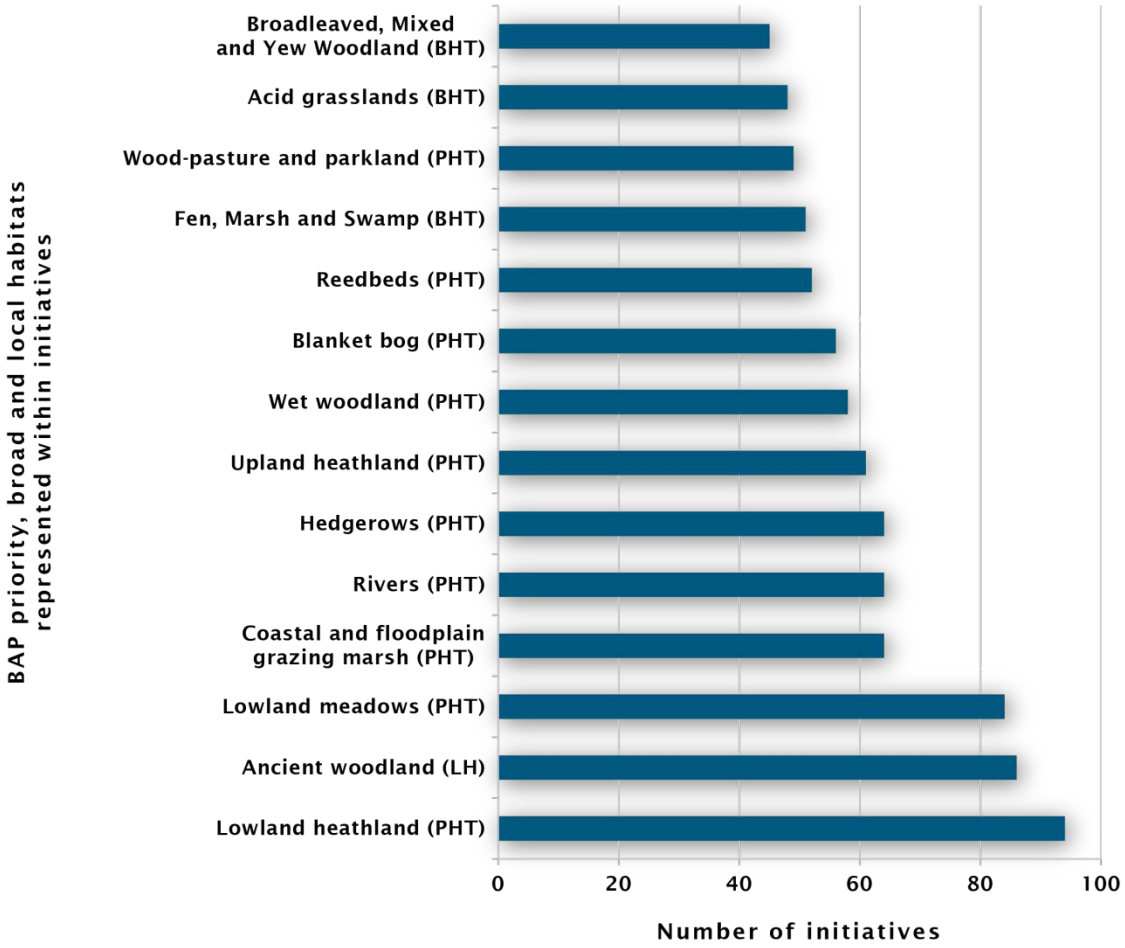

Figure 2.20 **Number of LSC initiatives that address specific habitats - based on the habitats that are present in more than 45 initiatives (715 initiatives). BHT refers to 'broad habitat type' and PHT to 'priority habitat type'[21]**

The dominance of habitats reported is partly dependent on the classifications used within the reporting. The database allowed for recording of Annex I, priority, broad and local habitat types (to reflect the objectives of the initiative). Thus there is greater representation of wetland / bog habitats and lowland calcareous grasslands within initiatives where habitats are recorded both as priority habitats and broad habitat types. Figure 2.21 shows the relative importance in habitats within initiatives once the BAP/PHT and LHT are combined (e.g. where records of calcareous grassland and lowland calcareous grass land are combined).

Local habitat types, excepting ancient woodlands, were only infrequently represented in initiatives; examples include drainage ditches, quarries mines and gravel pits although these may form part of larger landscapes. The extents of these habitats may be underrepresented partly by the exclusion of certain types of initiative in the database (such as urban greenspace and urban brownfield and open mosaic habitats) and potentially by the scale of such initiatives. There is clearly some overlap with local habitats and BAP BHT/PHT such as

[21] http://jncc.defra.gov.uk/page-1425

Shingle Rivers and transport corridors, depending on how these have been categorised. Few initiatives indicated a comprehensive baseline collation or collection of land cover/habitat data within the landscape area prior to developing management plans or undertaking conservation actions on the ground.

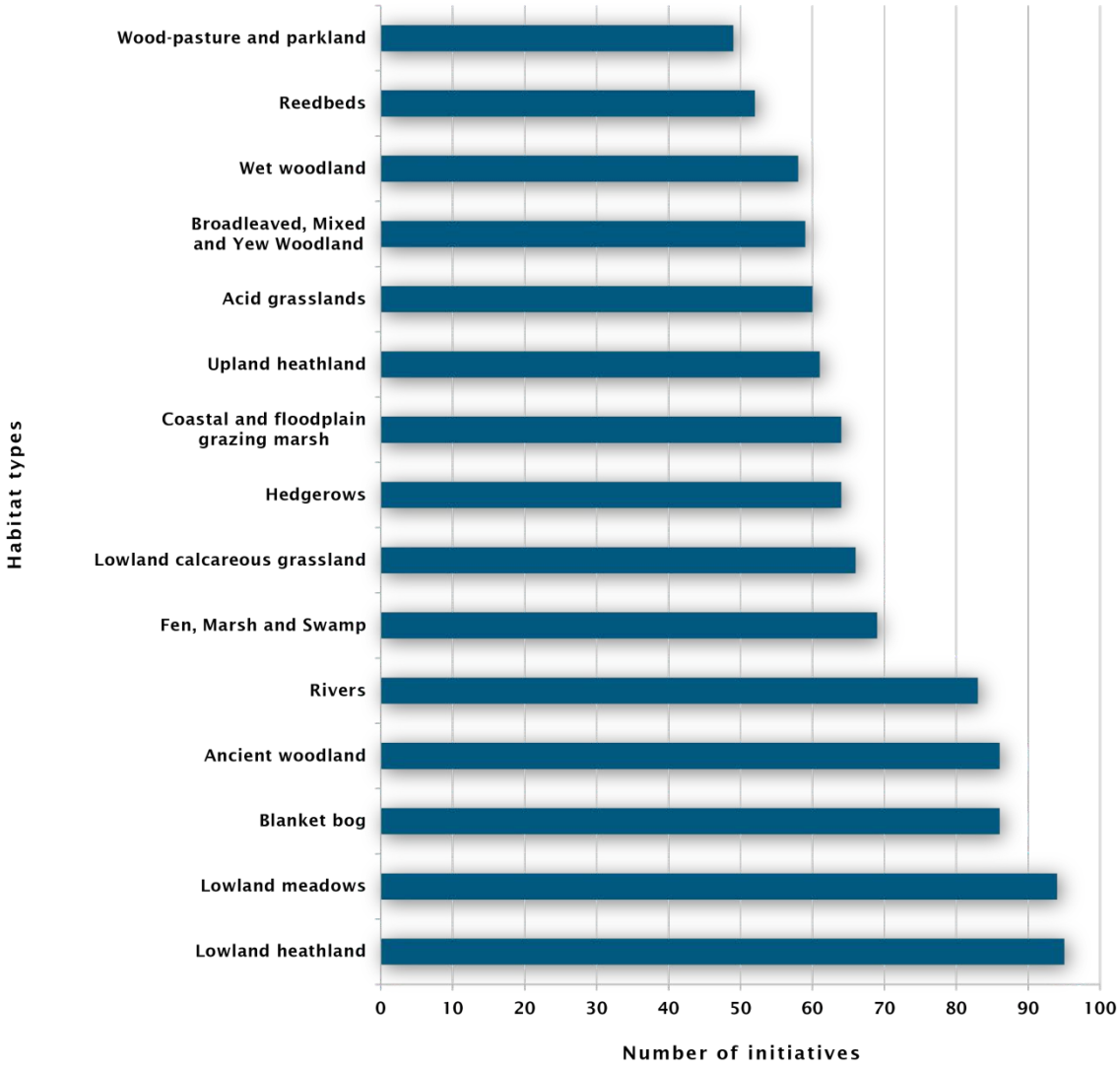

Figure 2.21 Number of initiatives with in particular habitats, where habitat classifications are combined

2.14. Management on the ground

The activities and intervention types associated with initiatives were dominated by habitat and site management, habitat creation and restoration actions. Because of the wide range of actions recorded, Figure 2.22 shows the number of initiatives with specific management actions recorded in 60 or more initiatives and Figure 2.23 shows the number of initiatives with actions recorded in 60 initiatives or fewer. The database does not break these categories down further into the more specific conservation actions, for example, 'habitat management' does not divide records into the nature of that management, which includes

management through grazing schemes (e.g. initiatives under the Grazing Animals Project GAP programme [2363]).

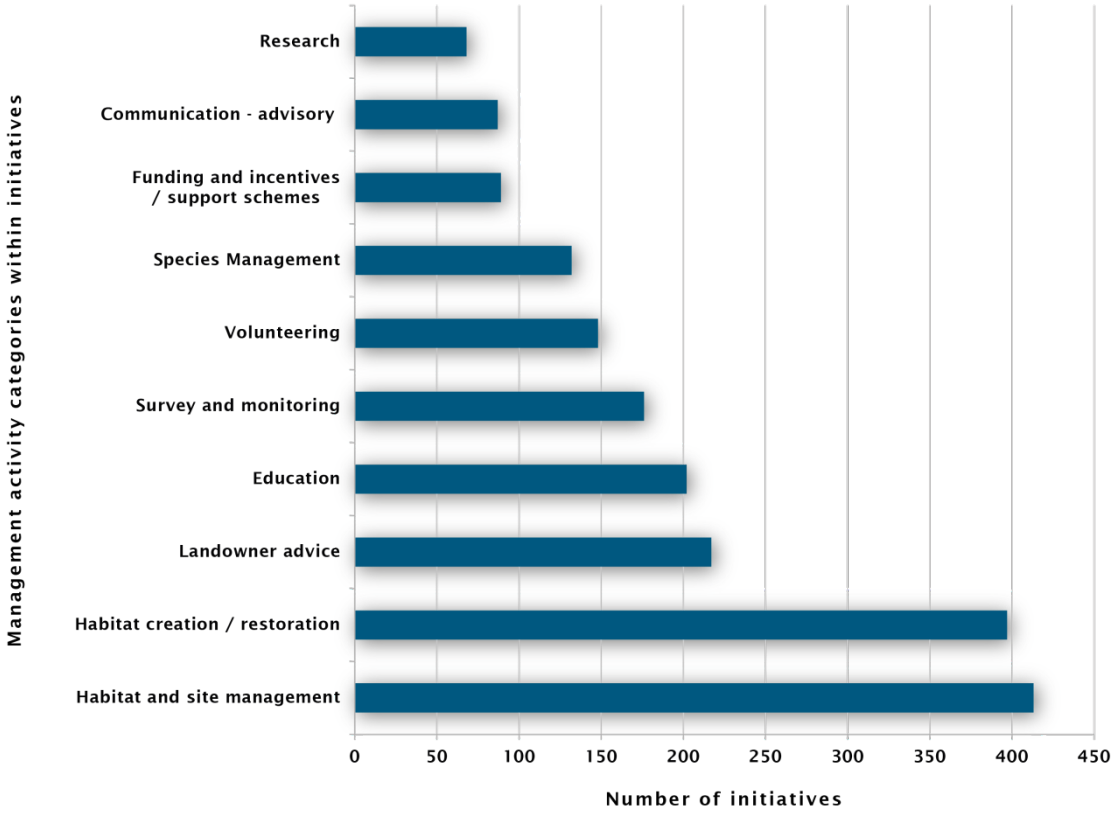

Figure 2.22 Number of LSC initiatives with a specific management actions recorded (>60 times)

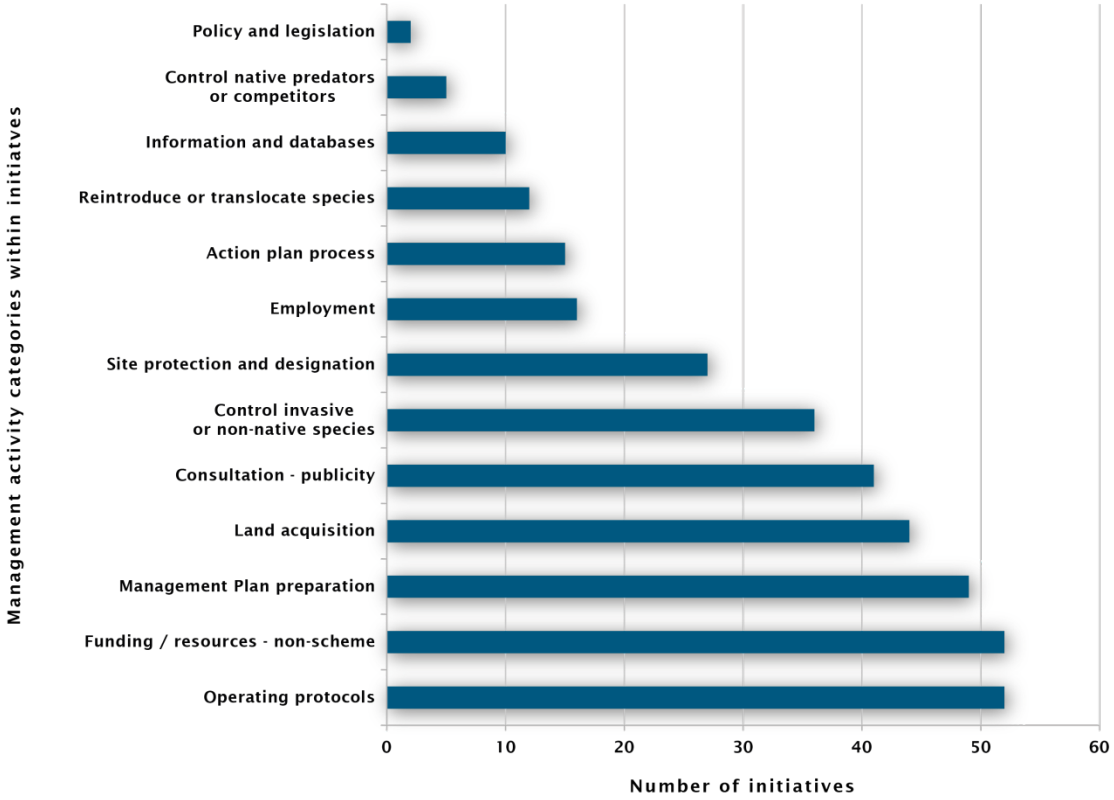

Figure 2.23 Number of specific management actions recorded (< 60 occurrences)

3. Future development of the database

There are a number of LSC database enhancements that are clear targets for future maintenance and development work, which could support research and the wider monitoring and evaluation of LSC initiatives. These future developments include maintenance of records for new LSC initiatives and updates, based on feedback, to complete records, together with effective linking of geospatial and attribute records.

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Chapter 3. The planning and management of large-scale conservation initiatives: I. Online surveys

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The aim of this part of the study was to explore through online surveys: i) how are large scale conservation (LSC) initiatives applying scientific information? ii) How is adaptation to climate change being approached in large scale conservation initiatives? And iii) what institutional models (such as partnership and governance models, approaches to land ownership, and community engagement) are being used in existing large scale conservation initiatives, and with what success? These aims mirror those of the work described later in Chapter 4, which addressed similar questions but through in-depth interviews of a smaller number of respondents.

1. Methods

1.1. Initial questionnaire (2010)

The LSC database was initially populated from a spreadsheet of information on several hundred LSC initiatives, programmes and spatial plans and visions, collated by Natural England and Atkins in 2010. This earlier survey was undertaken by written questionnaire sent to contacts in Natural England, the Wildlife Trusts, the National Trust, the National Parks and some other organisations known to be involved in large-scale conservation. Responses were limited but provided basic information about approximately 250 conservation initiatives. This initial survey was intended to explore some of the different aspects of LSC and frame the subsequent larger research project; it did not, and was not intended to sample across all known conservation initiatives. The qualitative data collected through the initial written questionnaire were not analysed in depth, but provided some useful comparative insights on the evolution of conservation objectives since initiatives were started; whether and how climate change was being considered; lessons learned and major challenges identified; whether all objectives had been met and whether any trade-offs needed to be made; and why the particular geographic area being conserved/restored was chosen and whether it was big enough to meet the objectives of the initiative.

The findings helped to inform a more comprehensive and consistent approach to subsequent surveys and data collection on LSC initiatives, including both the construction of the LSC database (reported in Chapter 2), and a more comprehensive and systematic online survey.

1.2. Online survey (2012)

In January 2012, an online questionnaire was sent (with a letter of introduction) to all the large scale conservation initiatives in the LSC database for which contact details could be obtained. A website link provided background information about the study, and email contact was established to allow respondents to ask questions. The questionnaire was restricted to 34 questions that took on average 20 minutes to answer; it was approved by the Defra Survey Control Unit and issued through the Survey Monkey platform.

Questions were tailored to provide a reasonable depth whilst seeking to ensure consistent responses and a manageable number of questions (see Annex II). Questions allowed categorical entry but also allowed the respondent to clarify or add additional information where appropriate. Data were downloaded in CSV format and incorporated within the existing LSC database. Data were analysed in MS Access and SPSS.

The questionnaire was released to 630 contacts from within the LSC database (450 contacts related to a single LSC initiative and 180 contacts with multiple potential LSC initiatives). Small sites below the 1,000 ha minimum (10 km^2) were excluded.

1.3. Surveyed initiatives

The online survey attracted 186 responses (response rate c. 30%). There were 181 valid records, although some were incomplete. Generic responses for national level programmes (e.g. Catchment Sensitive Farming) were excluded from the analysis, while responses on individual initiatives were retained. The final number of complete responses was 136. This excluded all programme records, duplicated initiative records and removed all the records outside the size threshold established by the LSC initiative definition.

Of the 136 initiatives for which responses were received, 74 were led by NGOs, 56 by public bodies and 6 by private estates and utilities. Comments suggested that a number of initiatives were ‘true’ partnerships with no discrete lead organisation and that decisions were made collaboratively amongst partners (e.g. the Long Preston Wet Grassland Project); in these instances the organisations are generally described as a host rather than a lead.

The nature of LSC initiatives often made it hard to identify accurate start dates. The data showed that some initiatives had been running for many years (e.g. early projects since 1947), while others were very recent (e.g. the Nature Improvement Areas, 2012) (Figure 3.1). This reflects a similar distribution to the LSC initiatives database with dominance after the 1990s, but with a tail of early actions dating back to at least the 1920s.

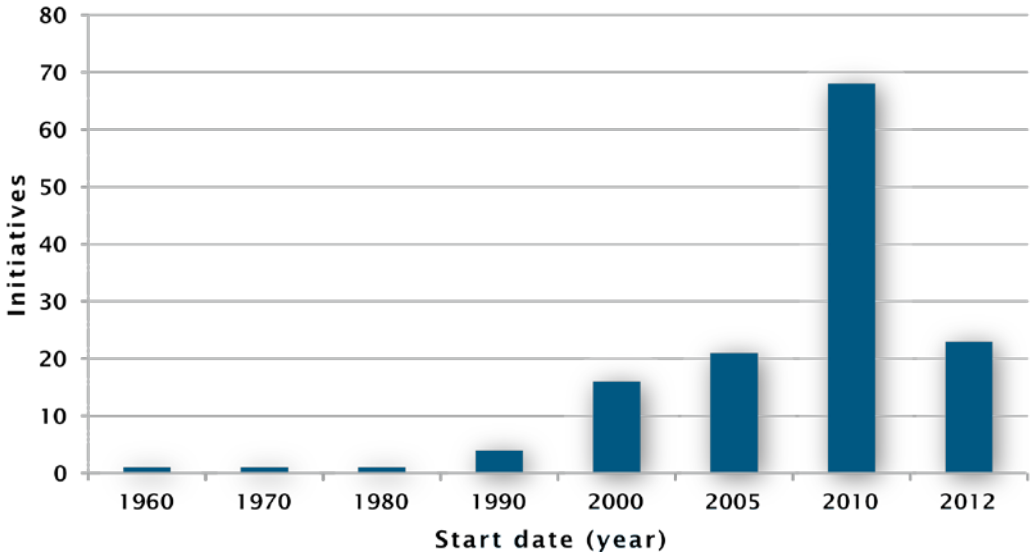

Figure 3.1 Start date of surveyed initiatives. Source: online survey, n=134

The information received on the duration of initiatives indicated that about half had a planned duration of up to 10 years (Figure 3.2) but with 20% over 50 years. Responses on the areas covered by LSC initiatives reflected both current extent and future planned area. Of the 64 respondents that gave both figures 47% (36) indicated that the current and future extents were the same. Some 16 initiatives were set to increase in size by more than 10km^2, 10 of these being of long duration (11 years and over). Only one shorter duration initiative (<5 years) was proposing to expand, but the growth was significant (1005 km^2). The largest planned increase related to a Caledonian forest programme with a proposed increase to 1500km^2 from the current extent of 200km^2 over more than 50 years.

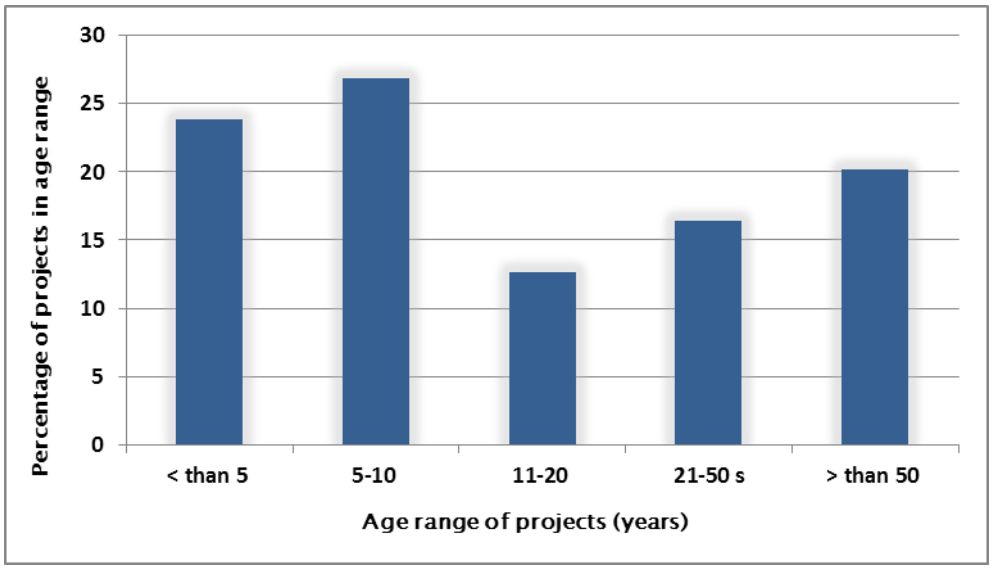

Figure 3.2 Percentage of surveyed initiatives in age duration classes. Source: online survey, n=134

2. Survey findings

The results reported here are primarily those of the online survey, but some quotes from respondents to the earlier questionnaire in 2010 are included where relevant (indicated by 'initial questionnaire' in brackets).

2.1 Conservation aims

Why approach conservation at a large scale?

The online questionnaire asked managers of LSC initiatives why conservation was being implemented at a large scale and what was hoped to be achieved that could not be done in existing small conservation areas. The 120 responses showed little differentiation in the reasons given (Table 3.1) One respondent wrote *"most of the above [the list of possible reasons given in the questionnaire] are desired outcomes of the work we're undertaking".*

Table 3.1 **Reasons for a large-scale approach to conservation. Source: online survey, n=120**

Reasons for large-scale conservation selected	% of initiatives
To better integrate conservation and human communities and enhance ecosystem services	75
To establish large scale networks for species movement	69
To create habitat over a bigger area than covered by existing small reserves	66
To have an increased influence over large-scale ecosystem processes	64
To buffer and extend existing reserves	61
To manage species populations outside formal reserves	59
To be able to coordinate management across multiple existing conservation sites	56
Other	24

A number of responses to the online survey suggested that LSC enables better integration of habitat protection with heritage, social and economic factors. For example, the Anglesey Grazing Animals Partnership reported a goal being: *"To integrate habitat management into farming systems, using livestock to manage for conservation benefit, working with farmers to use traditional and rare breed livestock which are sold into local markets to gain a premium and improve sustainability of management".*

Respondents typically identified more than one reason for their large-scale approach from the list given (Figure 3.3).

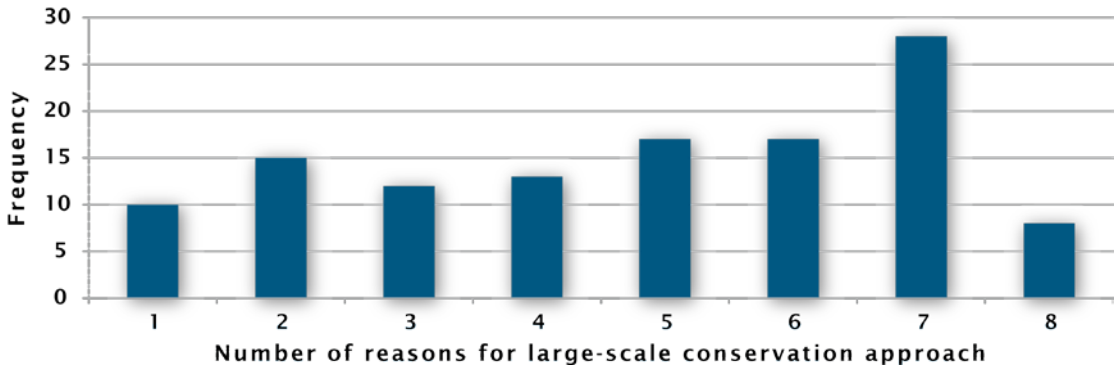

Figure 3.3 **Number of 'reasons for large-scale conservation' selected by respondents from the list given in the quationnaire. Source: online survey, n=120**

Although objectives selected occur together in diverse combinations, common combinations included managing species, buffering sites and enhancing networks (between 82-87% of initiatives) and networks and ecosystems process (83%). In the case of the HLF-funded Landscape Partnerships Schemes, there is an explicit goal to integrate of social and conservation objectives.

Sixty-two percent of respondents to the online survey indicated that they had a focal species or group of species in mind when designing the conservation landscape and planning management actions. In some cases this related to a specific species or group of species (e.g. ground nesting birds, wintering birds), in others to a more general species group associated with a habitat (e.g. calcareous grassland species). Species were also mentioned as a focus for management action, a means to attract funding (charismatic species), and to *"measure the success of targeted funding"*. Individual species appeared often to be mentioned as 'flagships' in justifying connecting landscapes. Species were also a focus where they had an impact on the habitats (e.g. deer) that affected the large-scale and site-specific ecology.

Ecological networks

In the online survey, question 10 asked 'Has your initiative been designed around explicit assumption about ecological networks?'

This question was developed using the list of ecological network components identified in Review *Making Space for Nature* (Lawton and others 2010;) and illustrated in Figure 3.4 (i.e. stepping stones, buffer zones, sustainable use areas, linear corridors, core areas, landscape corridors and landscape areas) The question made assumptions that the respondents would be familiar with the different terms and be able to recognise these approaches within their conservation actions.

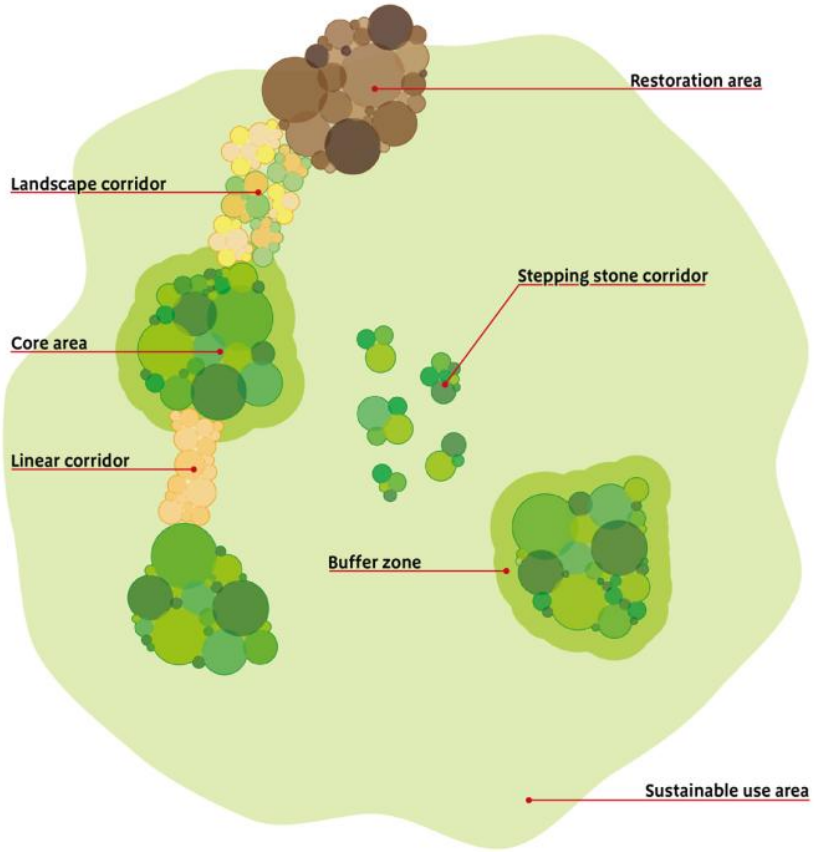

Figure 3.4 **Ecological network components mentioned in 'Making Space for Nature' report (Lawton and others 2010)**

Almost 80% of the initiatives that responded to this question stated that ecological networks, and at least one of the Lawton components, were considered in the spatial design of their conservation work. There was little variation in the frequency with which the different network components were mentioned, though core areas, habitat mosaics and restoration areas were the most commonly referenced (Figure 3.5). Developing habitat networks and restoring habitats are the top two ecological objectives within the responses.

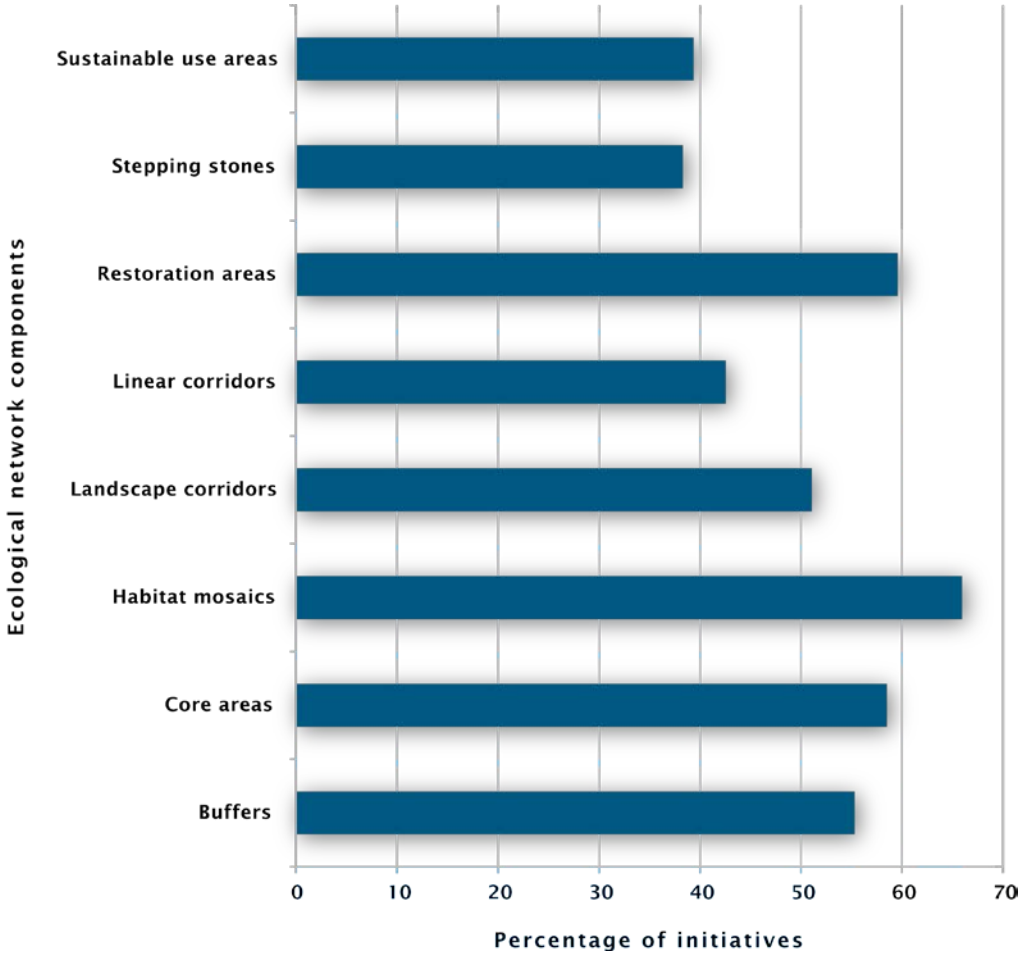

Figure 3.5 The percentage of initiatives planning conservation with reference to different ecological network components. Source: online survey, n=94. The respondents could choose one or more options from the list provided.

Of the LSC initiatives that responded, 70% reported taking into consideration three or more of the ecological network components (Figure 3.6).

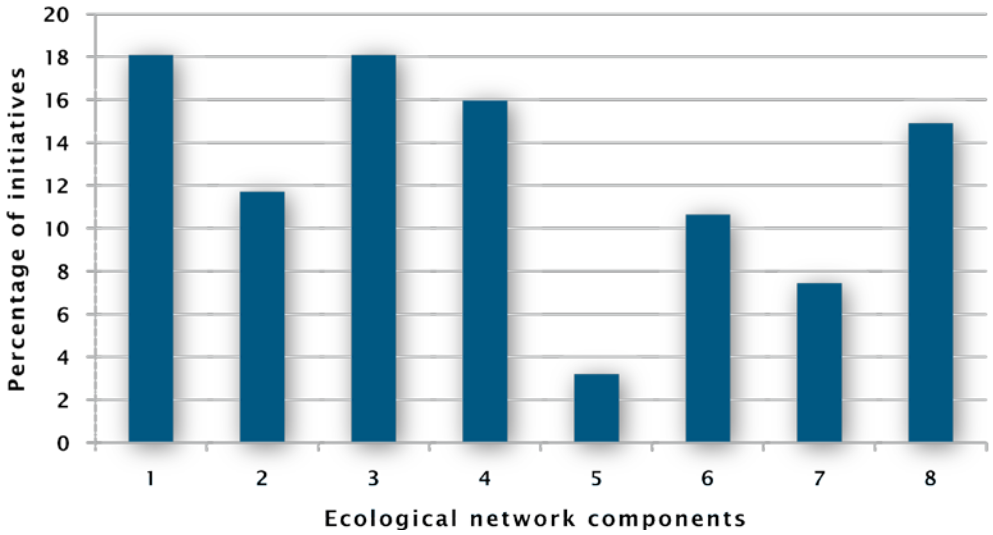

Figure 3.6 **Number of ecological network components (from the list shown in Figure 6) considered by individual initiatives. Source: online survey; n=94**

The survey question made assumptions that the respondents would recognise and separately distinguish these terms, but it appears that in many cases networks were being planned in a general way, without specific reference to the terms used by Lawton and others (2010) and sometimes without a formal delineation of different spatial components. Only one initiative highlighted within the description of its site selection and management actions that work had been undertaken to explicitly define the core, buffer and transitional components of the conservation area. Some responses highlighted the complexity of representing these idealised approaches in real applications.

Although large scale conservation initiatives have tended to focus on multiple habitats rather than species level activities there is still a strong emphasis within the initiatives of species-oriented actions and objectives. Of the 120 respondents answering this question (11), 62% indicated that they had a focal species or group of species in mind when designing the landscape actions. This probably overestimates the importance of a species focus as many of these are related to the habitat to support these species (e.g. ground nesting birds, wintering birds) where the interventions are at habitat level, or the species group were actually more indicative of the habitat (e.g. calcareous grassland species). In two instances the NVC community was noted as the focus for the conservation initiative in hay meadows and floristically rich grasslands and other responses relate to single habitats rather than the range of habitat variation anticipated at landscape scale.

Changing conservation objectives

The information collected through both the initial questionnaire and the online survey (and the later interviews; see Chapter 4) suggests that most large conservation areas in Great Britain are the result of initiatives that have grown incrementally. Initial objectives had often been modified through experience: *"All objectives were identified at the outset, but the detail and the best way to achieve them is developing as our work progresses"* (Initial questionnaire).

Most initiatives had broadened their objectives as they developed. One respondent to the initial questionnaire described how their initiative had started out with a focus on biodiversity *"but for the last ten years or so more widely focused to incorporate economic and social aspects".* Several others also noted an increased drive to focus on socioeconomic issues.

Many reasons were cited for changing objectives. Public engagement could lead them to shift, as could the emphasis of different funding sources, and new scientific knowledge and conservation policies. Several respondents mentioned that climate change had not been an initial consideration but had become more important over time.

A number of initiative managers noted trade-offs between objectives due to constraints on time and resources, and in one case because of a need to balance wildlife conservation and human access. In some cases, some objectives were simply easier to meet than others:

"[We] had three key messages [we were] trying to get across... The same effort was deployed for all three but it became obvious that the water efficiency message had not got through anywhere near as successfully as the other two messages." (Initial questionnaire)

"Objectives at smaller sites where works were simpler were easier to achieve."(Initial questionnaire)

"It proved easier to restore previously damaged heathland sites than recreate new ones" (Initial questionnaire)

Adaptive Management

The online survey (question 14) asked whether management actions were undertaken in an explicitly experimental way. Half of those bodies answering this question (114) said 'yes' and half said 'no'. Among the initiatives led by an NGO, just under half (47%) answered 'yes' that they were operating explicitly in an experimental fashion, whereas only 32% of the initiatives led by public bodies reported taking an explicitly experimental approach. Although the number of private bodies answering the question was small, 66% of these said they were using adaptive techniques responding to changes. This may suggest that private and NGO-led initiatives are more responsive to developing initiatives that are able to be more flexible and adaptive, and responsive to the results of monitoring.

A number of initiatives stated that it was too early to say whether they were taking an adaptive management approach. In many initiatives where adaptive management was taking place it was apparent that itself this was evolving as the initiative developed rather than being defined as the approach at the outset. This could be planned, but was often also reactive to events – e.g. changing planting methods in response to tree mortality or taking a *'suck it and see'* approach.

A number of responses interpreted the term 'experimental' in this question to include novel management techniques, and many examples were offered. Examples included soil stripping, deep ploughing, over-sowing and green-haying to enhance grass swards, use of wild boar and deer management in woodland regeneration, or, in the case of North Pennines AONB Partnership's Hay Time initiative, using different hay-making machines or different

types of meadow donor site. Many of these examples appeared to be experimental only in terms of trying new approaches, rather than in the scientific sense of carefully testing the effects of actions using before and after comparisons or control sites. Some initiatives did appear to be experimental in a more rigorous scientific sense, for example by setting up trial plots to assess field layer manipulations to enhance pine regeneration. Many of these experimental approaches related to developing grazing best practice, assessing stock type and stocking density to deliver on the conservation objectives, and the development of stock-based methods to develop sustainable management approaches rather than other forms of active intervention (cutting etc). A number of habitat connectivity enhancement, grassland and grazing regime initiatives were also using experimental management (e.g. Mendip Hills Living Landscape). Some initiatives also described themselves as experimental in the scope of their partnering work; such as the Living Don (new partnering approaches), Gaywood Valley SURF Project (engagement of urban fringe local communities), Watershed Landscape Project (which employed market research and focus groups to value environments).

2.2. Knowledge for site selection and management

Sources of information

Survey responses showed that managers of large-scale conservation initiatives used a wide variety of forms of conservation knowledge and evidence. A specific ecological assessment for the LSC initiative area had informed site selection in over 40% of cases and management in over 60%. Advice and expertise from people both inside and outside the conservation organisation was used even more often. Expert knowledge within the organisation was reported to have been used to select sites in 79% of initiatives, and to determine management actions in 90% (Figure 3.7). The 'other' classes of information used within site management included a wide range of other factors such as climate change considerations (e.g. Abernethy NNR Forest Expansion Project), geomorphological or geologically-defined extents (e.g. Bats under the Dales Karst landscape area, Limestone Landscapes Project, Life on the Verge: Lincolnshire Wolds) which may be closely related to the Natural Character Areas and extent of particular priority habitats where closely related to the geology (e.g. calcareous grasslands).

The extent of protected areas within target zones was also noted as the basis for site selection (e.g. Dorset Urban Heaths Grazing Partnership that selected SSSI areas, Forest of Clunie Moorland Management Scheme selected SPA area). The ecological assessments included use of existing survey data including past habitat and species data, green infrastructure data and connectivity assessments. The site selection approaches also included stakeholder workshops (e.g. Carrifran Wildwood held conference on Native woodland restoration in Southern Scotland). Given the nature of the LSC initiatives the actions to enhance conservation may include reducing negative impacts and a number of respondent organisations undertook specific surveys on the negative impacts on areas (e.g. fine sediment surveys within Catchment Sensitive Farming (CSF); specific landscape assessments were also recorded (e.g. Churnet Valley Living Landscape Partnership, Forest of Marston Vale) and site condition reports and existing strategic plans (e.g. Shoreline management plans in the Severn Estuary).

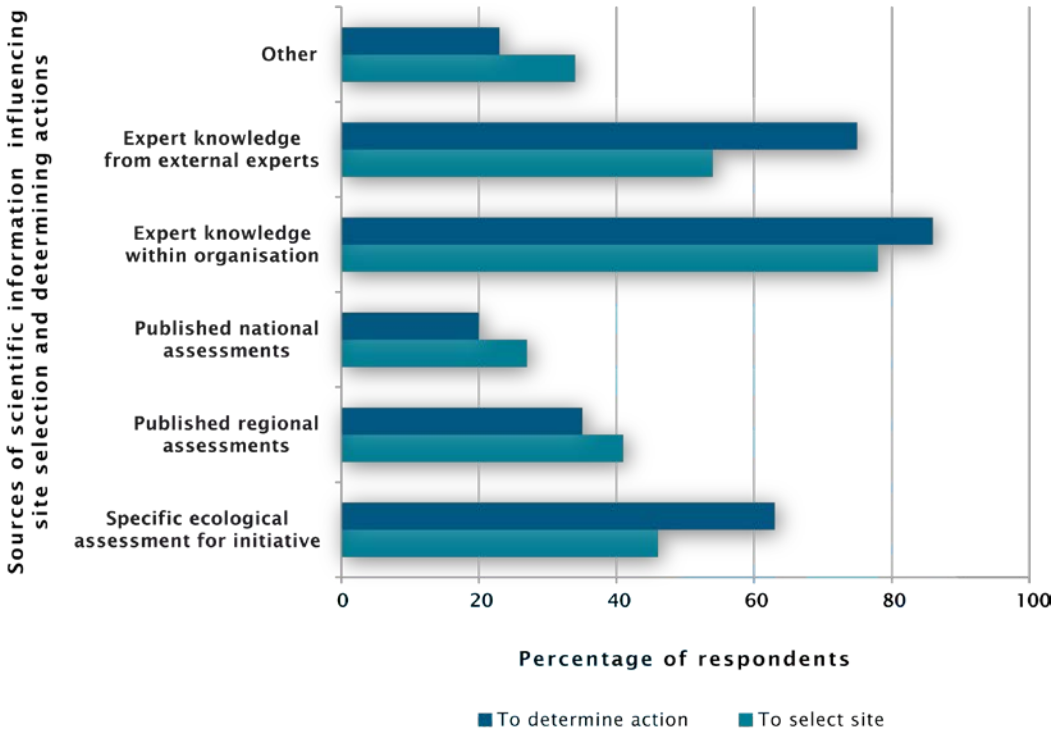

Figure 3.7 Proportion of initiatives using each type of scientific source of information. Source: online survey, n=137. Dark blue bars indicate the information used to select sites and light blue bars the information sources used to determine conservation actions on site

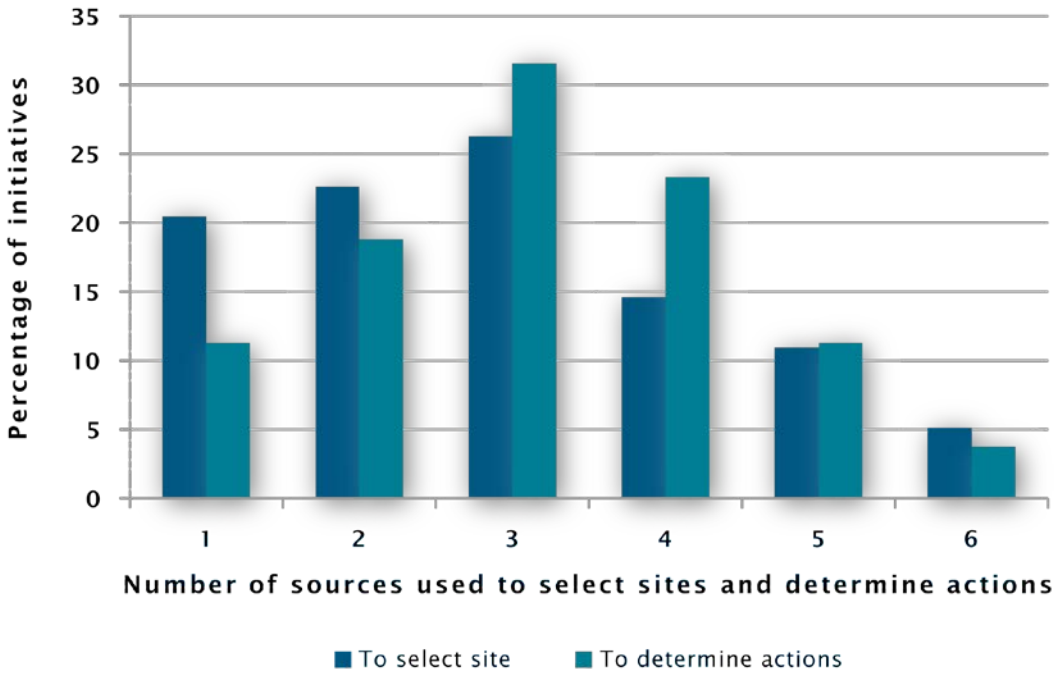

Figure 3.8 The number of sources of information used in initiative design. Source: online survey, n=137 for the site selection and n=133 for determination of conservation actions

Responses to the online questionnaire showed that most initiatives used more than one source of information from the options given in the questionnaire: 57% of initiatives used three or more sources to select sites and 70% used three or more sources to determine the conservation actions (Figure 3.8). Initiatives reporting use of only one type of information predominantly use expert knowledge from within the organisation itself or specific ecological assessment for the initiative.

Published scientific research was mentioned relatively infrequently as a source of knowledge in the online survey, but may be underrepresented as the questions did not isolate this specifically.

National and regional surveys

Formal surveys at national or regional scale had evidently provided useful datasets, especially when an initiative could not commission a baseline survey of its own. Examples used include:

- Natural England (Ecological Habitat Networks – Catchpole 2007)
- Diffuse Pollution from Agriculture (DWPA)
- WFD Protected Areas assessments.
- BAP inventory data (especially for wetland initiatives)
- Biodiversity Opportunity Area data (e.g. Grazing for Wildlife in North East Hampshire).
- SW Nature Map (for site selection e.g. Culm Working Wetlands, Selwood Living Landscape)
- Framework of the Landscape Character Area / National Character Areas (e.g. initiatives in the Lincolnshire Wolds and Durham Magnesian Limestone Plateau)
- Regional Green Infrastructure mapping
- Local Record Centres and BAP Atlas (e.g. Dartmoor Mires Project)
- Existing ‘plans’ such as the Shoreline Management plans (Gwent Levels Futurescapes).
- Maps from Natural England on agri-environment schemes and conservation designations,
- Forestry Commission grant schemes and programmes
- National Vegetation Classification survey data
- National species surveys (e.g. BTO/JNCC/RSPB Breeding Bird Survey and Butterfly Conservation’s *Millennium Atlas of Butterflies in Britain*).

- National assessments and policy (e.g. CCW Upland Framework and Lawton Report).

"In 2006 the South West Nature Map was published by the South West Regional Biodiversity Partnership. It identifies the best areas in the region to conserve, create and connect terrestrial wildlife habitats at a landscape scale. It has selected landscape-scale blocks of land, known as Strategic Nature Areas. Through a series of consultations with our partners we have selected a total of 20 separate patches (totalling 25,509 hectares) for our project area." (Initial questionnaire)

In some target area programmes (e.g. Catchment Sensitive Farming and HLS Target Areas) sites had been established through national assessments and private and public landowners drew on these for target objectives, information, advice and management assistance (e.g. Oxfordshire Woodland Project).

Area-specific assessments

Specific assessments of initiatives appear to be very important sources of information. They can include a wide range of survey types at differing spatial scales. Such area-wide assessments included data from specific landscape character assessments (e.g. Churnett Valley) down to National Vegetation Classification assessments of specific habitats (e.g. Coigach and Assynt Living Landscape) and soil nutrient assessments (e.g. Growing Wild). In addition, ecological network studies for individual species are used in planning actions (e.g. butterflies in Biodiversity in Common).

Data on habitat quality and condition were widely used, either from routine surveys (e.g. river quality assessment on the Cornwall Rivers Project) or through specific habitat and physical condition assessments (e.g. Conserving Machair Habitats). Some initiatives had been specifically created to address an area's degraded condition, for example the Eddleston Water Project or Dearne Valley NIA, or the national programme of river restoration on SSSI rivers:

"A PhD was carried out initially and this highlighted concerns relating to diffuse pollution, riparian management and water quality. As a result a Rapid Assessment of River Environments was carried out which then defined the boundaries of this study" (Initial questionnaire)

Some initiatives were tied to a specific landscape by virtue of its uniqueness (for example, karst areas, unique landscape elements), but in other cases specific geomorphological or process-based surveys had been conducted, for example in wetland sites (for groundwater dominated systems, hydrological assessments) or river restoration.

Over 60% of respondents to the online survey highlighted the use of surveys of plant or animal distributions (Figure 3.9). Slightly fewer respondents used current or potential ecosystems services and landscape character assessments. However, some did so (e.g.

Dearne Valley Green Heart and the Dartmoor Mires Project), including pipeline Nature Improvement Areas (NIAs) that use the ideas of payment for ecosystem services and offsetting approaches (e.g. Marlborough Downs Nature Improvement Area, set up by local farmers as a company). A number of responses to the initial questionnaire indicated proximity to large human populations as a factor in site selection. Few initiatives noted a fully integrated assessment of natural, physical and socio-economic data.

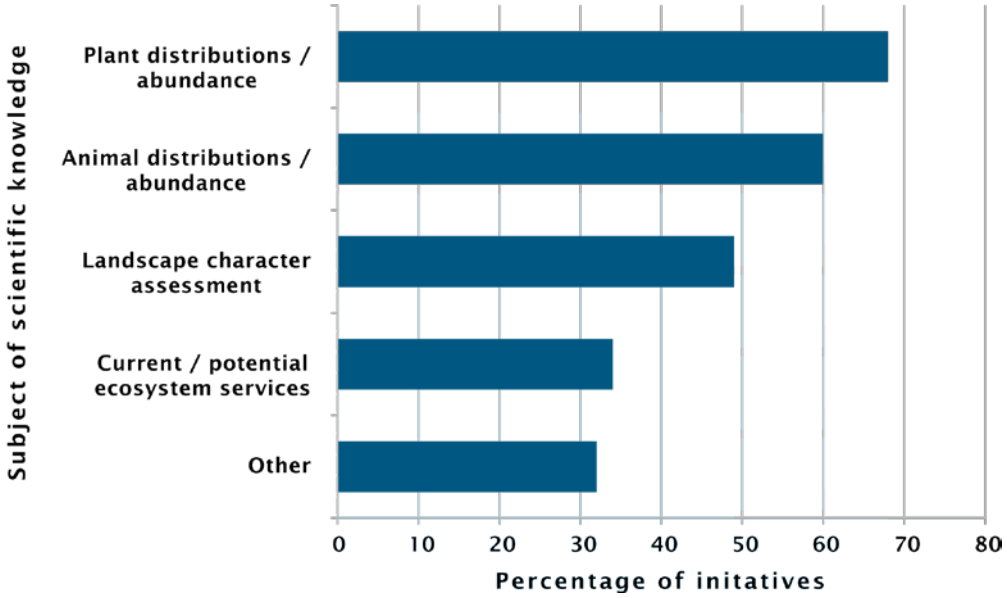

Figure 3.9 **Percentage of initiatives using specific types of information. Source: online survey, n=136**

Many initiatives had commissioned studies to inform or underpin their work, for example if biological survey information was not available or was too basic. In some cases initiatives reported commissioning surveys or used local voluntary surveyors' data (e.g. Callander Black Grouse Project). It was also common to commission research for a specific purpose after the initiative has been established. A number of conservation initiatives noted the input of specialist consultants (e.g. East Ayrshire Coalfield Environment Initiative).

Institutional and local knowledge

Expertise and evidence generated internally by the lead organisation or partners was the most frequently selected information source in the responses to the online survey (Figure 7). Many large conservation organisations with well-established large-scale conservation programmes had experts in ecology, hydrology and planning at the national level who could be called upon for advice when needed. Initiatives within a larger LSC programme could also draw from the experience of other initiatives. For example, the Wildlife Trusts' online 'intranet' platform enabled conservation managers from different initiatives to share experiences.

Frequently, local knowledge and familiarity with the area and its ecology had been very important in informing site selection and management. Experience built up from past programmes and *"previous initiative experience across the area was the primary reason, as well as well-known ecological importance of area"* (Online survey).

Research organisations

Knowledge and expertise was also gained from sources outside the initiative, for example from specialists in government agencies (e.g. peat specialists from statutory nature conservation agencies or water specialists from the Environment Agency), other experts (e.g. veterinarians, philosophers, photographers, etc.), and from researchers and research institutions (e.g. Centre of Ecology and Hydrology and numerous Universities).

Some online survey responses (e.g. Kintail and West Affric Habitat Restoration Project, Moors for the Future) mentioned direct links to university research (e.g. University of Leicester, Anglia Ruskin University, University of Oxford, Open University and the University of Bournemouth). Initiatives were benefiting not only directly from the findings of such research, but also through the ongoing relationships with the academics and institutions involved. Some initiatives were hosting Masters and Doctoral research initiatives, and a few reported receiving so many requests to conduct research within the initiative area that they had to be selective about whom they accepted. Other initiatives had established partnerships with universities, or were looking for opportunities to work more closely with academic institutions. The Moors for the Future Partnership in the Dark Peak exemplified the integration of university-based research through its Moorland Research Fund, to provide evidence based management and monitoring.

Links with academic research had been strongly developed within the NIA programmes where the monitoring and evaluation framework, use of ecosystem service indicators and other technical aspects benefitted from expert external advice and research collaborations. Among links to academic and research institutions that had been developed were Birmingham and Black Country NIA with Wolverhampton University, the Dearne Valley NIA with Forest Research, Humberhead Levels with York and Sheffield, the Mersey Gateway with Salford and the Dartmoor and Exmoor Mires with Exeter).

Other models of engagement with research include fora, such as the Annual Meres and Mosses Forum within the NIA attracting academics or through exchange events such as the Ecosystems Knowledge Network.

Although universities had frequently become collaborators on conservation initiatives, they seemed rarely engaged as core initiative partners. One exception was the Nene Valley NIA, in which Nottingham University was a member of the NIA partnership.

2.3. Monitoring

What is being monitored?

Monitoring may relate specifically to conservation objectives (baseline, status and trend monitoring), or to management 'monitoring and evaluation' reporting of the outcomes of the initiative. Monitoring was far from universal and many of the funding routes for actions, such as HLS, even when within an LSC initiative, do not require any monitoring of condition or the populations of target species. Nevertheless there were many examples of extensive monitoring programmes and community science and volunteer effort in monitoring.

Figure 3.10 indicates the results of the online survey with respect to monitoring related to the conservation and on the ground activities. Individual initiatives may have multiple monitoring themes. Although initiatives primarily included habitat, species and ecological recording, over 50% of the initiatives were also concerned with monitoring the scale of community engagement with the initiative.

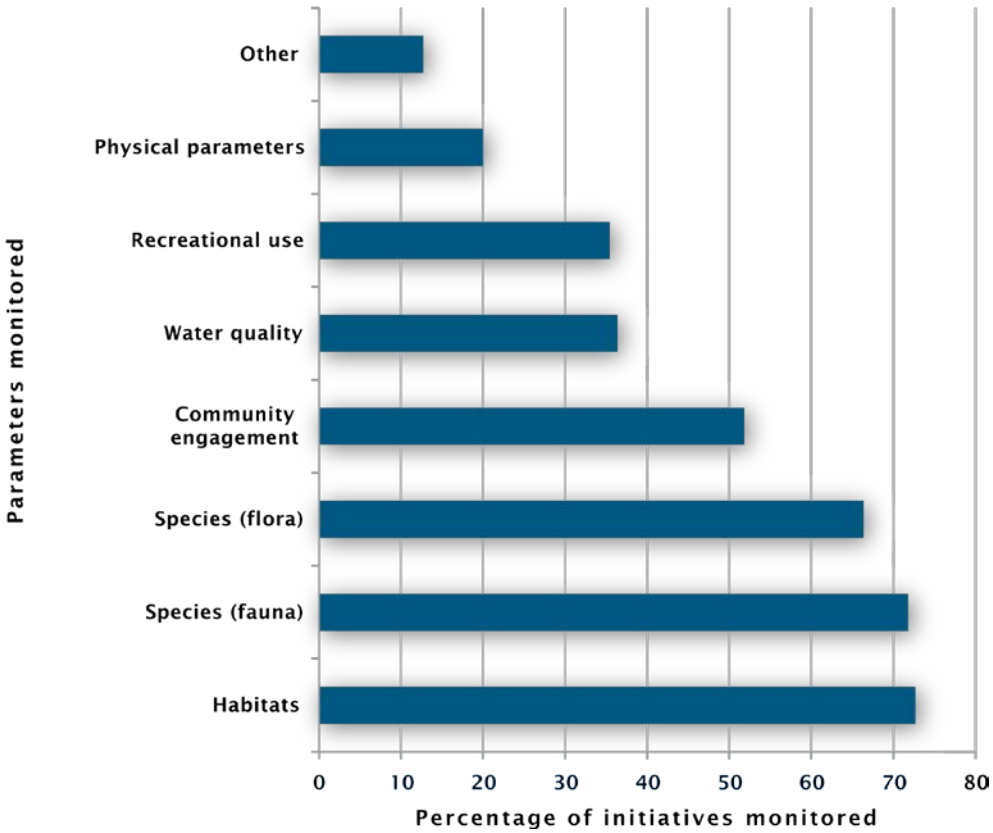

Figure 3.10 The percentage of initiatives with particular monitoring (multiple entries per initiative). Source: online survey, n=110

Some initiatives relied on the existing monitoring by partner organisations, including SSSI Common Standards Monitoring of condition and national water quality monitoring (e.g. Durham Coast partnership) and the UK Butterfly Monitoring Scheme. The scope of monitoring in some cases relied on what was already being undertaken as part of past or parallel initiatives monitored by external agencies. Some initiatives (particularly NIAs) included (or were planning) research projects scheduled within the scope of the initiative often through partnerships or contracted research organisations.

Some initiatives had developed sophisticated monitoring protocols and provided exemplars for other programmes. Initiatives such as *Moors for the Future* had intensive research and monitoring activity, cross referenced by other initiatives as best practice. The Research Fund established by the Moors for the Future specifically funds research and monitoring studies within the Dark Peak. Other initiatives, such as the Butterfly Conservation projects, had also established long term environmental monitoring – through transects, use of control plots and enclosures. A detailed monitoring protocol was being developed by the British Trust for Ornithology for the Wildlife Trusts' Living Landscape programme.

With the exception of some well-coordinated programmes, the sampling framework and frequency of monitoring varied across initiatives and for different indicators; not all initiatives were adopting effective baselines or control areas. Therefore it is rarely feasible to compare one initiative and another even if they have similar conservation objectives and physical habitats (see Chapter 5).

Baseline surveys, either commissioned specifically for an initiative or amalgamating existing data including long-term species data and National Vegetation Classification (NVC, long-term vegetation survey data), had been used in many initiatives as a reference point for subsequent monitoring. This involved strategic and technical decisions about the most appropriate monitoring strategy – one that is specific enough to measure against set targets, but also sustainable in terms of cost and labour.

A number of initiatives reported collecting initial baseline survey information (either during initiative development or early phase monitoring) and repeat ecological surveys. The NIA programme includes a commitment to monitoring – setting monitoring objectives, implementing monitoring and evaluating the outcomes.

2.4. Climate change

General impressions of and approaches to climate change

The online survey showed that just 53% (73) of initiatives incorporated climate change and its impacts into their planning and management. When asked whether a specific and detailed assessment of the vulnerability to climate change of the natural environment within the boundary of the LSC initiative had been carried out, around 60% of responses said no; only 8% had done any detailed climate change vulnerability assessment for the specific area. Where any climate vulnerability assessment of this sort had been conducted (22%) this was typically at a general level (81%) based on existing broad ecological knowledge rather than new survey related to the LSC area. There was also reliance on assessments done by

others, (e.g. Environment Agency, protected area authority) but little evidence of these being targeted to the areas of initiatives. Most initiatives that had used an assessment of vulnerability to climate change had used one prepared by someone else, for example the Environment Agency or Met Office, academic research (e.g. Watershed Landscape Project) or broader plans (e.g. Shoreline Management Plans). This perhaps reflects a perceived lack of data to support local analysis and a perception that UK climate change predictions are not downscaled sufficiently reliably to be relevant to individual LSC initiatives.

There appeared to be no significant association between the start date of an initiative and whether an assessment of vulnerability to climate change had been conducted (*t-test, p 0.49; n=88).*

Some specific climate vulnerability assessments had been conducted through PhDs (e.g. Kintail and West Affric Habitat Restoration Project), or the use of an online tool (e.g. the CEH Climate Change Assessment Tool for Wetlands).

Impacts of concern and perceived risks

The online survey asked respondents (Question 18) to rank habitats in terms of the seriousness of climate change impacts (Table 3.2). Calculated scores provide a picture of the perceived sensitivity of different habitats to climate change, equivalent to the classification by Mitchell and others (2007). The rating score is based on the average frequency with which the habitat was scored, normalised for the response count. Thus a habitat that was relatively infrequently reported (as it may not represent a habitat frequently occurring in LSC initiatives) may still have a high risk of being affected by climate change (for example, littoral sedimentary habitats ranked highly in terms of risk despite occurring in only 17 responses). Not surprisingly, wetland habitats were seen as being highly sensitive to the impacts of climate change. The review ‘England Biodiversity Strategy: towards adaptation to climate change’ (Mitchell and others 2007) provides expert group assessment of the sensitivity of different habitat types to climate change. Table 3.2 includes their assessment for habitat types compared with the views of the managers of conservation initiatives collected through the online survey.

Table 3.2 Rank of habitats considered most affected by climate change (source: online survey; n=46) compared with the expert group based assessment of impact from Mitchell and others (2007)

Habitat Type	Rating Score	Rank	Mitchell and others (2007) assessment or risk of direct impact
Fen	2.64	1	Medium
Bog	2.64	2	Medium
Rivers and Stream	2.62	3	Medium
Montane Habitats	2.60	4	High
Littoral sediment	2.53	5	Low
Water	2.40	6	High
Arable	2.23	7	Low
Supra littoral sediment	2.14	8	Low
Dwarf Shrub Heath	2.10	9	Medium
Calcareous grassland	1.97	10	Low
Supra Littoral Rock	1.88	11	Medium
Neutral grassland	1.85	12	Medium (lowland meadow)
Acid grassland	1.80	13	Low
Broadleaf woodland	1.75	14	Low / medium
Conifer woodland	1.66	15	NA
Littoral rock	1.56	16	Medium
Improved grassland	1.53	17	NA
Boundary – Linear	1.42	18	Low
Inland Rock	1.29	19	NA

Online survey respondents were asked to list impacts of climate change likely to affect their conservation initiative (nine impacts were itemised in the questionnaire, plus an 'other' category): 73% of responses reported four or more impacts of concern.

The climate change impacts of greatest concern were: changes in the distribution of species and resulting changes to ecological communities; changes due to the effect of weather extremes; and the potential changes to land and water use resulting from climate change. Changes due to human behaviour change were the second highest recorded concern of climate change (Figure 3.11). This included changes to agriculture and water use, but may have included many other indirect influences of socio-economic changes on biodiversity.

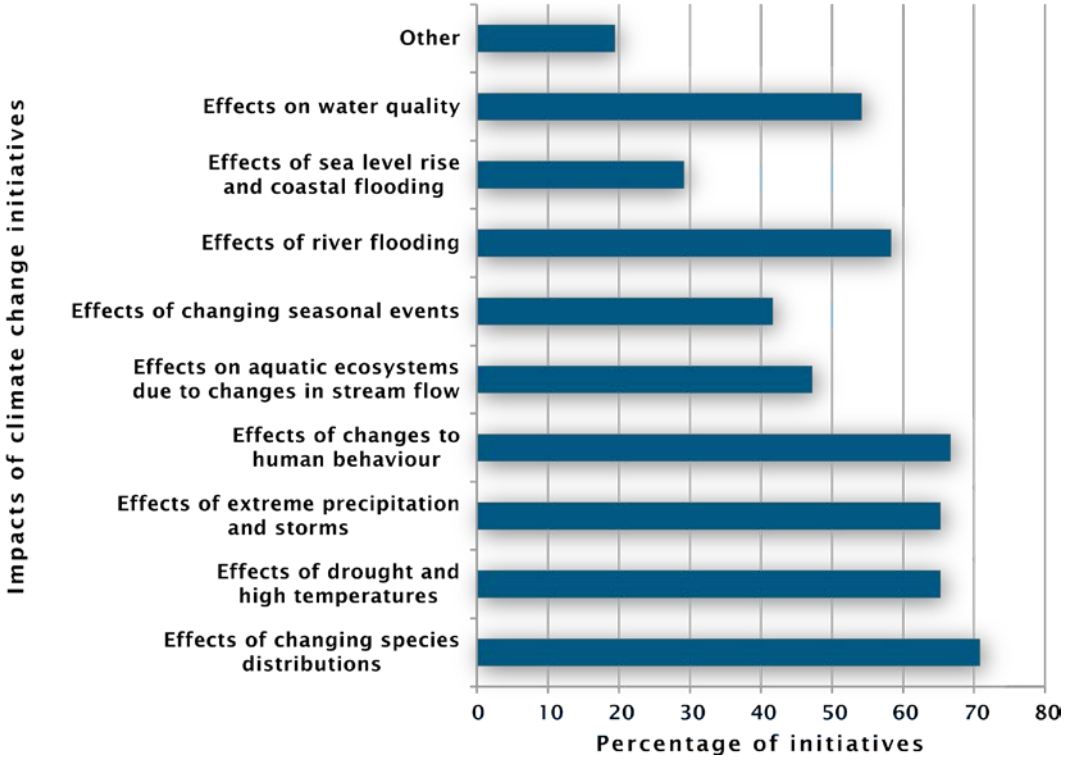

Figure 3.11 **Percentage of initiatives that cited each potential impact as being of concern in relation to their conservation objectives. Source: online survey, n=110**

Climate change impacts were seen to represent *"significant additional risks over and above the existing major pressures of land use change/development, local population isolation and severance within the overall meta-population*" (Online survey).

Concern of impacts on species ranges (particularly the range restrictions for butterflies), were mentioned especially in cases in which there was no potential to connect up or create new habitats, or threats from extreme events (flooding, fires, storms). High altitude and glacial relic species were noted in eight online survey responses as being at particular risk, where they are *"currently at the top of the altitude [range] with nowhere to move to adjust to temperature"* (Online survey).

Positive impacts of climate change were recorded in a couple of responses to the online survey and were indirect, related to the potential change in land management and farming

practices that might arise as existing approaches became less viable – opening an opportunity for habitat creation.

Adaptation goals

Online survey respondents were also asked about adaptation goals (question 20). Eighty-two per cent of respondents (85 initiatives) highlighted 'increasing connectivity' as a specific goal (Figure 3.12), followed by 'reducing the non-climate pressures on the overall ecosystem (57% of respondents). One of the purposes of this question was to gauge to what extent conservation planners and managers were aiming to maintain the 'status quo' versus accommodating change. While more indicated a focus on conserving current species than on enabling new species to establish, it is striking that far more (over 40%) selected the goal 'Letting the ecosystem change, or actively helping it to do so' than the goal of 'Maintaining the overall ecosystem in its current structure/state'

The 'other' responses identified by respondents highlighted the dynamism of landscapes with change being an inevitable ("seeking to establish a robust ecosystem that can withstand the pressures that future climate change may bring. This includes a recognition that some species may 'move out' as the climate changes, but that others will 'move in'" (Online survey). Similarly, large scale connectivity and resilience were common themes in responses to the initial questionnaire:

"The project is working to create a robust landscape, flexible and resilient to climate change and permeable for wildlife so wildlife can move and adapt" (Initial questionnaire).

"By working at a landscape scale to create a robust and well-connected network of habitats, the project aims to help with adaptation to climate change" (Initial questionnaire).

Some initiatives did not think about the future in terms of existing ecosystem states (e.g. "*we are future natural focused not purest ecological, accepting the initiative area is not perfect and will change into the future. The focus is on maximising opportunities for natural processes with less concern about what the outcome looks like*" (Online survey).

Furthermore, responses noted the removal of constraints within rivers and floodplains and reconnection between floodplain and channel to allow natural processes to provide adaptation, and be '*better able to withstand climate change'* (Online survey). Monitoring and acting on findings was recognised as a key factor in the delivery of dynamic adaptation under current uncertainty about impacts. There may be some degree of double-counting here in that increasing ecological connectivity can also be seen as reducing non-climate ecological pressures (e.g. removal of stream barriers).

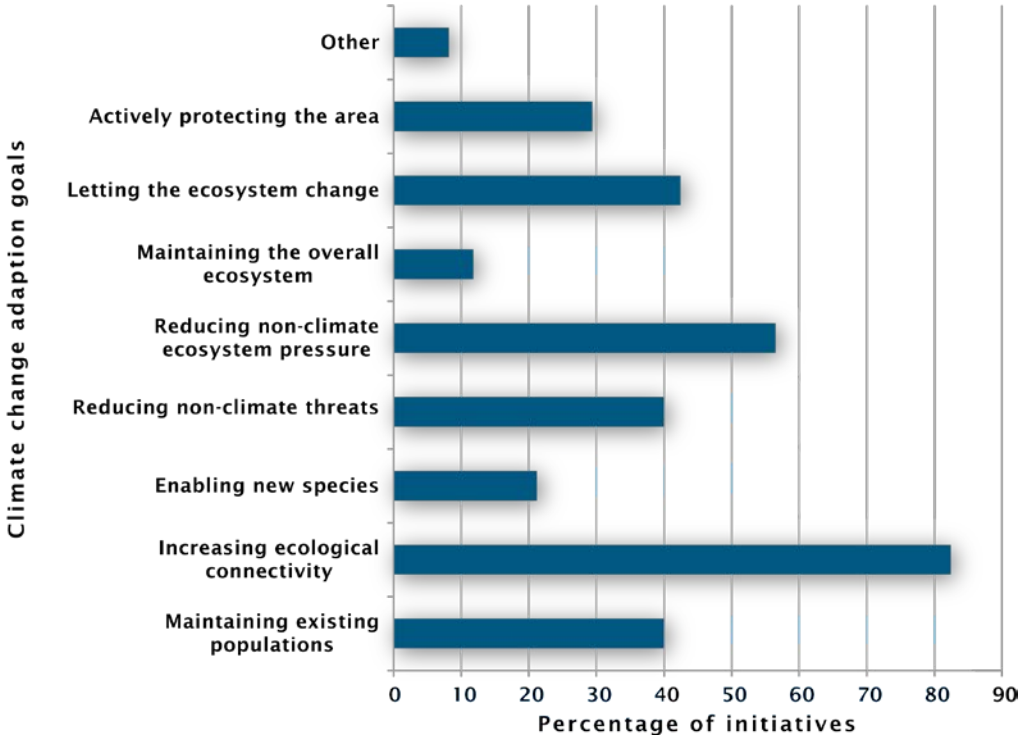

Figure 3.12 Percentage of initiatives with different goals for adapting to climate change

Management in response to climate change

The online survey (Question 21) asked respondents to describe whether and to what extent conservation management in LSC initiatives had responded to climate change (Figure 3.13). Often management had been modified in response to climate change only at a broad level:

"A section of our management plan document is devoted to addressing climate change, but does so in broad general terms rather than as a detailed action plan" (Online survey).

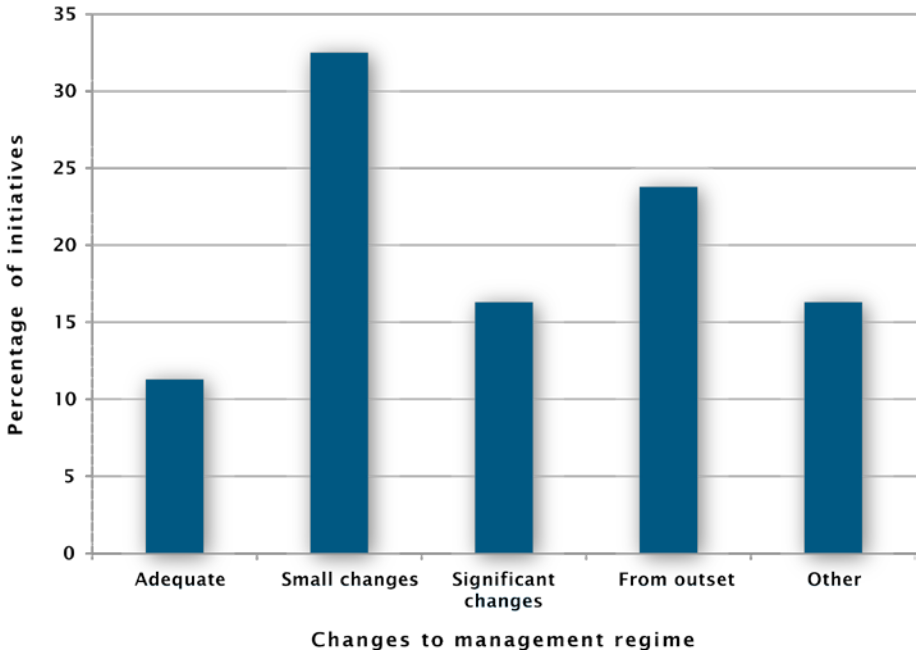

Figure 3.13 **Level of changes to management regimes in response to climate change. Source: online survey, n=80**

In initiatives that had been managing conservation for some time there was recognition of the *"situation having moved on in terms of awareness within organisation" (*Online survey), leading to changes in goals to incorporate climate change issues and associated changes to management. Partners within initiatives in some cases had their own internal objectives for mitigation and adaptation, that were being applied in initiative management (e.g. *"More recently, as the initiative is developing over additional sites, the issues around climate change are becoming more significant and will affect management"*; Online survey), or *"We, as a partnership, are not managing climate change management but our partners are in their own areas";* Online survey).

Figure 3.14 illustrates the types of specific management actions being taken to adapt to climate change (Question 22). The most frequently mentioned were 'enlarging, buffering and linking habitat patches of creating new patches' (78% of initiatives), followed by 'managing the vegetation to maintain or increase heterogeneity'. The vast majority of initiatives taking action were undertaking multiple actions (88%).

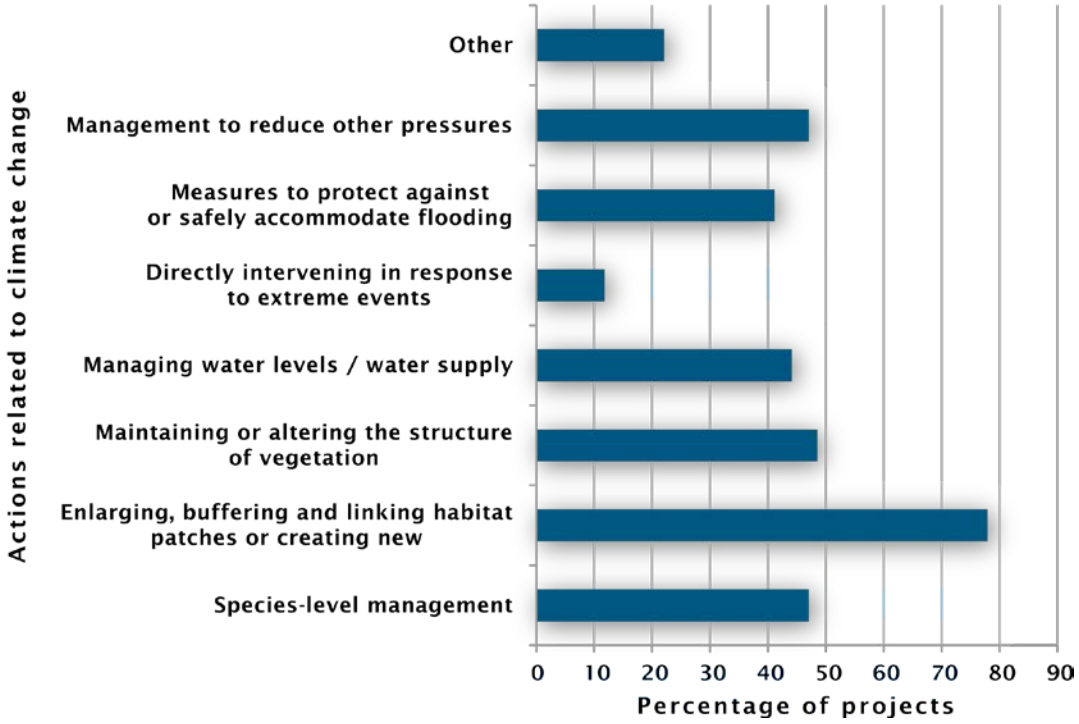

Figure 3.14 **Percentage of initiatives implementing different types of climate change and adaptation actions. Source: online survey question 22, n=68**

'Other' classes of actions included management to improve soils structure (e.g. use of organic fertilisers (seaweed) to improve soil structure and mitigate against wind blow), and both increasing grazing levels for management (calcareous grasslands) and reducing grazing pressure (sub-alpine areas). Some actions noted were specifically migratory (increasing the likelihood of carbon sequestration through bog restoration) than adaptation.

Survey respondents often indicated that adaptation, and to some degree mitigation, benefits were expected to flow from more general management aimed at making the environment more robust and resilient; for example:

- Damming man-made ditches to improve the water retention of the moorland and reduce the risk of flooding, this also has enabled improved carbon capture in the bog system" (Online survey),
- *"Reconnecting rivers with their floodplains will potentially create flood storage capacity. Reed beds and wet woodlands will also dissipate the energy of flood waters."* (Initial questionnaire)
- Control of non-native species whose invasions may be linked to climate change;
- Removal of physical barriers (e.g. the longitudinal connectivity upstream) and extension of riparian vegetation to reduce stream temperatures.

- *"Provision of water storage for controlling wild fires that may become more prevalent with warmer, drier summers"* (Initial questionnaire)

Respondents also noted actions to promote 'changing mindsets' to incorporate climate measures into future management and recognising and working with change and natural processes; eg "*step away from our historic need to 'conserve as is in situ' and work with natural processes to create the right habitat in the right place*" and "*accepting that some [wetland] habitats may move towards becoming dry habitats, and accepting this and managing accordingly*". These types of compensatory actions also promoted "*communicating with the public, to get a readiness to act for change"*.

Constraints on responses to climate change

Constraints on capacity to adapt were also recognised. Responses to the online survey noted that adaptation and mitigation may not be within the capacity of a single organisation (or partnership) and that climate change adaptation may be part of a bigger strategy, recognising that the initiative may *be "only one of many management actions for these sites. Other means of habitat management are carried out by individual partners and policing & visitor education by Urban Heaths Partnership staff"* (Online survey).

However, even with enhanced appreciation of climate change there may be constraints on the modification of objectives and actions, for example such as Higher Level Stewardship prescriptions.

2.5. Partnerships and collaborative arrangements

Partnerships

Of the LSC initiatives that responded to the online survey, c 95% of initiatives involved working with partners. Only 5% said they worked alone, although in some instances the websites of these initiatives suggested otherwise. This is rather at odds with the LSC database which suggested that 38% of initiatives were single agency and may reflect the extent to which other organisations are recognised within presentational materials used to populate the database and the way that partners are defined.

Roles within partnerships

The online survey (Question 25) showed that the nature of the partnership and the roles of different partners vary widely. It can be difficult to define the full range of roles that partners play. Table 3.3 shows the two most common roles of each type of partner organisation. Sometimes roles within partnerships were dynamic, changing as an initiative develops (e.g. Wild Ennerdale).

Table 3.3 The two most commonly mentioned roles for different types of partner organizations within initiatives. Source: online survey

Organisation Type	Primary Role	Secondary Role
Government Department	Funding (81%)	Scientific advice (62%)
Agency / NDPB	Scientific Advice (76%)	Funding (68%)
NGO	Direct conservation management (73%)	Scientific Advice (62%) Monitoring (62%)
Private landowner	Provider of land (91%)	Direct conservation management (62%)
Utility	Funding (66%)	Monitoring (51%)
Research Institute	Scientific Advice (91%)	Monitoring (55%)
Other	Funding (57%)	Direct conservation management (48%)

Perhaps not surprisingly, some roles were more distinct than others. For example research institutes predominantly contributed scientific advice and monitoring to the initiatives where they were partners. Sometimes organizations contributed to initiatives on a contractual basis rather than as partner organizations (e.g. research institutes as contractors).

Expert Advisory Groups had been set up in a number of initiatives and again these were generally not seen as part of the partnership, but as advisors to the partnership: *'Other roles … are filled in an unofficial advisory capacity or by self-employed advisor and short-term contracted individuals for monitoring purposes'* (Online Survey*).* Some respondents saw key funders as part of the delivery partnership, others considered these as external to the landscape scale initiative delivery. Most initiatives had mixed funding sources, while in some authorities and statutory agencies played multiple roles as funding bodies and partners.

Several respondents noted the *"need to get the right mix of people and organisations including land owners, farmers, conservation organisations, business organisations"* (Initial questionnaire).

Sizes of partnerships

The results of the online survey indicate a wide range of numbers of partners in different partnerships, with 2-9 appearing to be the most common (Figure 3.15). This also shows that a higher proportion (60%), of the partnerships has been founded specifically to develop the initiative as opposed to existing partnerships. There are two potential views here, that new initiatives are encouraged to adopt larger partnerships or that existing partnerships have had time to add more members. The interpretation of 'partnerships' varies between initiatives, where some see partnerships including the landowners / farmers. In those cases, landowners were treated as a single partner group rather than counting individual landowners.

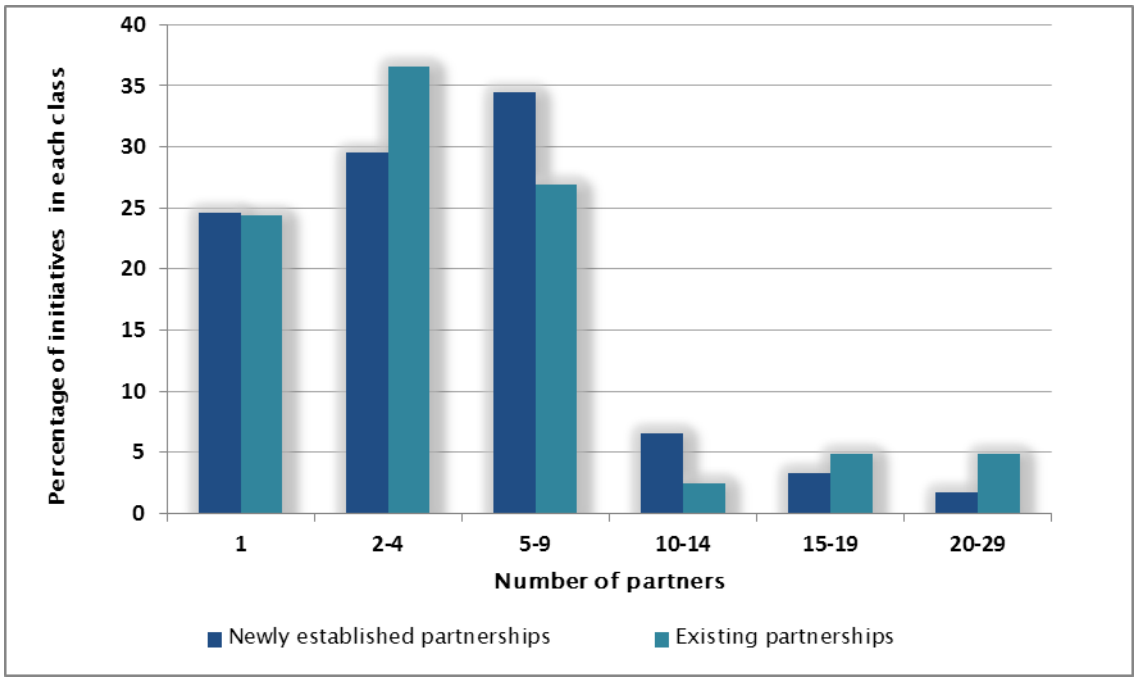

Figure 3.15 **Percentage of partnerships 'newly established' or 'existing' initiative partnerships. Source: online survey, n=102**

Interestingly, among the many responses to the initial questionnaire noting the challenges and benefits of working in partnership, one person said *"Large partnerships do not work, little gets achieved. Keep it simple."* By contrast, another suggested that "*The bigger the partnership the more security the project has, as there is more trust."*

Coordination across conservation initiatives

Many LSC initiatives had grown out of previous initiatives, often smaller in extent, and many were related to wider current initiatives (81% of initiatives reported in the Online Survey); one response commented: *"Some catchments had similar projects running previously, some now have the Defra Test Catchments and the Defra Catchment Based Approach projects on*

them, running parallel to CSF [Catchment Sensitive Farming]"). It is clear from the on-line survey that conservation initiatives can have considerable longevity. Programmes linking particular initiatives may be connected to higher level objectives (such as Catchment Sensitive Farming with common objectives but operated in different river basins). Responses indicate a range of types of relationship with past, existing and future initiatives.

- Initiatives that share the same high level objectives as part of a programme – e.g. Wetland Vision, Futurescapes, or Butterfly Conservation Target Areas
- Initiatives that share the same specific objectives – e.g. Catchment Sensitive Farming, or Community Forests
- Initiatives that share the same location, or target areas – HLS Target Areas, National Character Areas, or Protected area initiatives such as within AONBs or NNRs
- Initiatives that extend objectives or area or both – e.g. follow-on initiatives, extensions into new objectives and developing similar objectives in neighbouring areas (neighbours to NNR / NT property e.g. Glen Affric Kintail and West Affric Habitat Restoration Project)
- Initiatives that are explicitly pilot or demonstration projects with the objective of roll-out to other areas – e.g. Demonstration Test Catchments, IBDAs, ecosystem service pilots; or that act as 'sister initiatives' where experience of one initiative leads to similar initiatives elsewhere
- Indirect association and sharing of methods, ideas and experience

LSC initiatives often appeared to run in parallel with existing site management by landowners and partners that may not in themselves be particularly large scale (e.g. SPAs or SSSIs). Online Survey respondents also emphasised links between government initiatives (or example agri-environment schemes) and the objectives of individual initiatives. Some National Character Areas have provided the strategic focus for LSC activity (e.g. Nature Improvement Areas). Related initiatives in overlapping areas may be offering other objectives such as recreation and access or socio-economic development: *'Initial planning has attempted to find synergies with a range of other programmes/projects" [Severn - Vyrnwy Living Landscape 38].*

Initiatives may also be run in parallel with other externally-funded management programmes and initiatives developed by partners and partner organizations, although not necessarily with the same structure or partnership members in place (e.g. partnerships with local BAP initiatives). Often, through such arrangements, the same partners had been involved in projects within the same area for longer periods than at first appears. The continuity of partners through a sequence of 'precursor' projects also assists with developing experience and submission of proposals for new initiatives, as indicated in bids to establish Nature Improvement Areas (both successful and unsuccessful). The continuity of partnerships and continuity of activities in a specific area was typified by the Nene Valley, which has had *'some sort of Nene Valley Project'* (Online Survey) since the 1980s spread across a range of

initiatives that pre-date the Nene Valley NIA. The same situation is true of protected area sites (e.g. South Down, Peak District).

It was clear that in longer running initiatives there had often been an evolution of scope of activities. Not all the precursor initiatives might qualify as landscape scale initiatives, by virtue of the size or the nature of the initiative objectives, but nevertheless they may help build partnerships.

In a few cases, respondents noted potential conflicts between associated initiatives: *"Where wider ecological programmes can benefit from studying aspects of the project without compromising the core strategy of the project, such participation is encouraged, but not if such programmes wish to impose habitat modifications that would negatively impact on observation of changes driven by herbivores"* (Online Survey).

Arrangements for governance and making decisions

Figure 3.16 shows how online survey respondents described the decision-making process within their initiative (Question 30). The dominant approach (38% of respondents) was of day-to-day management undertaken by a lead organization, with strategic decisions being made by a steering group of partnership members.

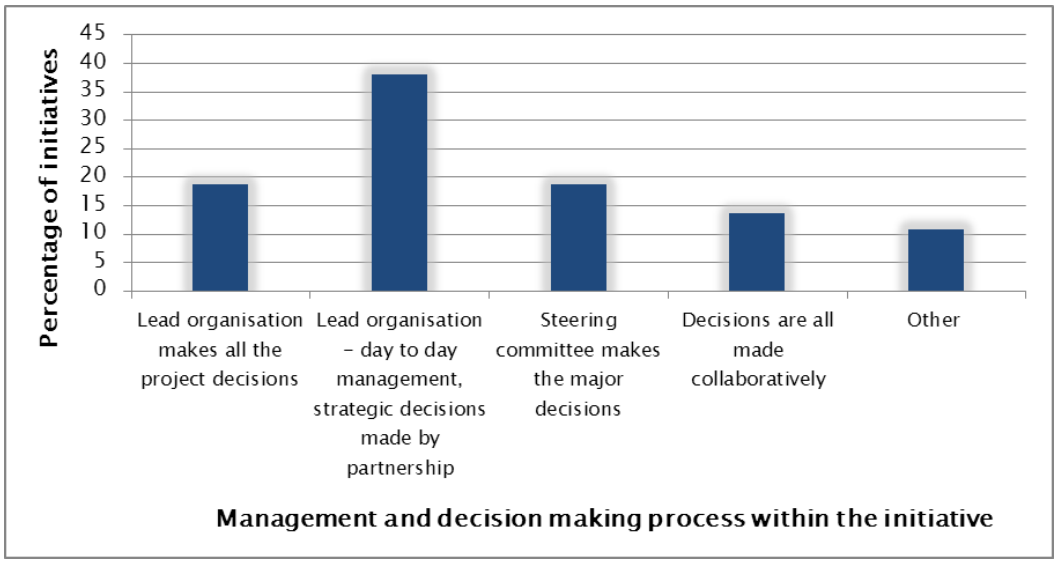

Figure 3.16 **Percentage of initiatives by the management and decision making process adopted. Source: online survey n=106**

2.6. Agreements

The online survey (Question 26) asked about the kinds of agreements that formed the basis of partnerships: 60% used a Memorandum of Understanding (MoU), whilst 57% were based on less formal agreements (this question allowed for multiple responses such that a single initiative could report multiple arrangements with different partner organizations).

The online survey also recorded other kinds of agreements, for example between landowners and granting bodies (e.g. agreements under Scottish Rural Development Programme (SRDP) or Higher level or Entry Level Schemes (HLS/ELS) or woodland grants with individual landholders), or agricultural tenancies. The potential variety of formal and informal associations is illustrated by initiatives such as 'Biodiversity in Common', with formal agreements with funders (e.g. Heritage Lottery Fund), actions linked to strategies (e.g. transport strategies, BAPs) and grazing contracts.

Agreements may be used to *"lend greater credibility to the project organisation"* in funding bids, and to offer a degree of accountability, especially where public funds are contributed and where more formal programme management approaches are adopted. A number of initiatives had been set up as charitable foundations or trusts in their own right as vehicles for moving the activity out of the public authority domain, not just run by existing charities. This appeared both to be for financial reasons and so that the initiative could better support delivery with a range of partner organizations (e.g. Marston Vale Community Forest).

Respondents described a number of other classes of management and decision making actions, including the development of decision by negotiation or being made by the landowner and agri-environment funding body (e.g. Natural England for ELS or HLS). Thus land owners often make their own decisions but with the support and guidance (and some management help) from the lead organizations or initiative partners. The online survey only allowed one answer, but a number of the respondents indicated that decisions were taken by a steering committee in consultation with the community. Responses therefore suggest a more negotiated and inclusive and collaborative decision making process in some cases. For those initiatives that have specifically set up charitable status, trustees may ultimately be financially and legally responsible but the decisions on day-to-day actions may be taken more broadly. One initiative [Dorset Urban Heaths Grazing Partnership] had adopted a more infrequent model in which project management was contracted to an external consultant who had day-to-day management role, but based on recommendations by a steering committee.

2.7. Land tenure and management

Land tenure in LSC initiatives

As discussed above, land tenure was one of the most important factors in distinguishing different 'types' of LSC initiatives, because of the influence it had on all other aspects of delivery and management of initiatives. In the initiatives that responded to the survey, private owners predominated, but often there were different classes of owner/occupier within the areas actively managed for conservation as opposed to the wider initiative target area (Figure 3.17).

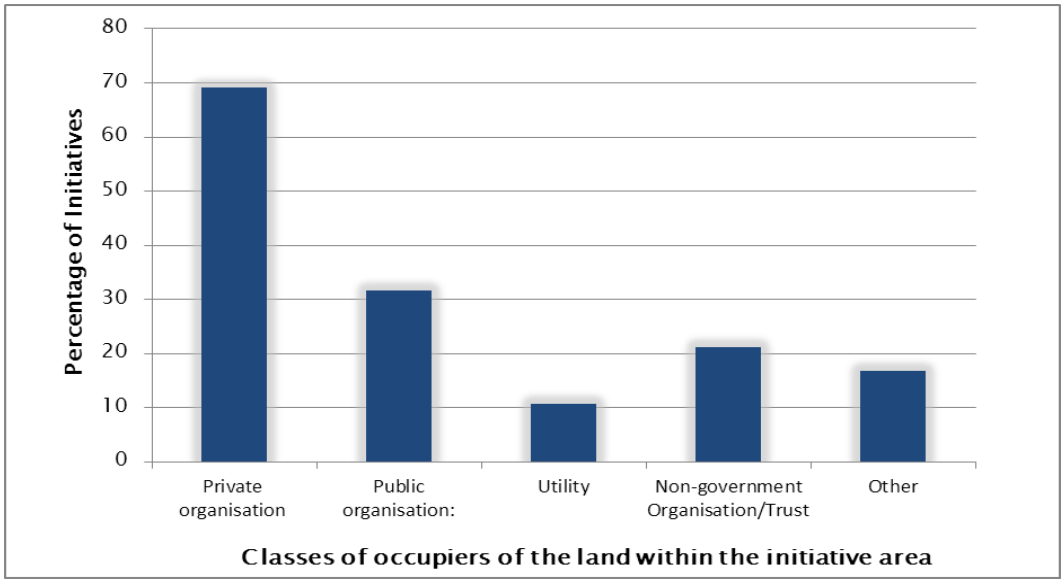

Figure 3.17 Percentage of initiatives with different kinds of landowners. Source: online survey, n=114

Initiatives mostly involved a large number of land owners / occupiers, with nearly 34% of the initiatives that responded to the online questionnaire having over 40 landowners within their active area (Figure 3.18). Initiatives with single owners accounted for only 5% of the responding initiatives and included road verge initiatives where the highways agency owns the area, protected areas such as those owned by organisations like the National Trust, RSPB, Forestry Commission (although parts of these areas may be tenanted), and initiatives comprising single private estates (e.g. John Muir, Knepp Estate). Large, single owner properties comprise a significant proportion of LSC initiatives in Scotland, held both by private owners and conservation trusts (Land Use Consultants & Worrell 2012, Adams 2012).

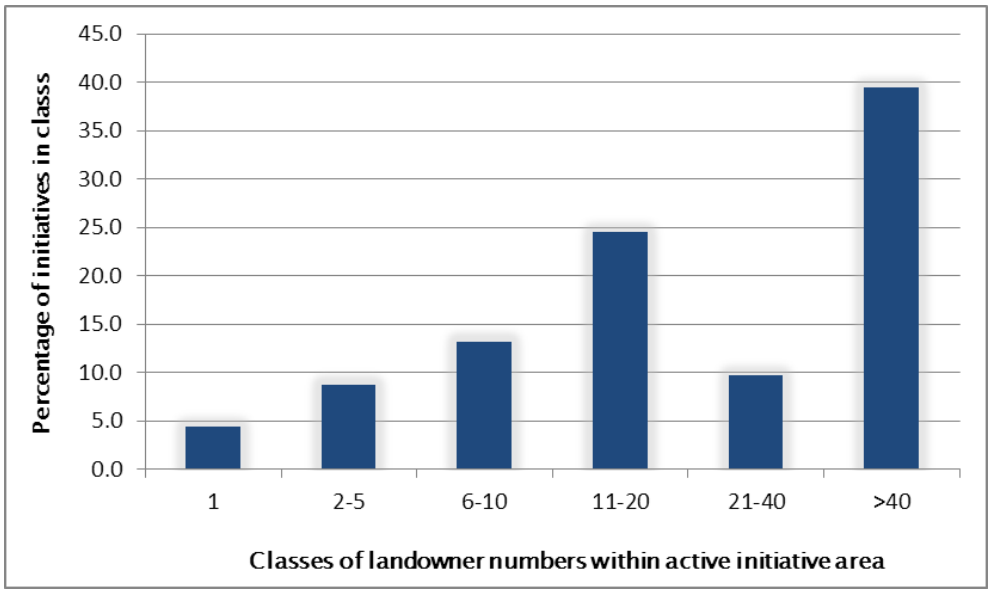

Figure 3.18 Percentage of initiatives by classes of numbers of landowners within the area under active conservation management. Source: online survey, n=114

2.8. Communication, engagement and volunteers

Communication and community engagement

"I suggest that any project operating at a landscape scale has to consider very seriously at the outset the most appropriate means and amount of resources required to engage properly with the diverse community living and working in that landscape" (initial questionnaire).

Online survey respondents were asked (Question 33) with whom their initiative communicated. Most initiatives responding (112 valid responses) communicated with multiple groups of a range of types (Figures 3.19 and 3.20).

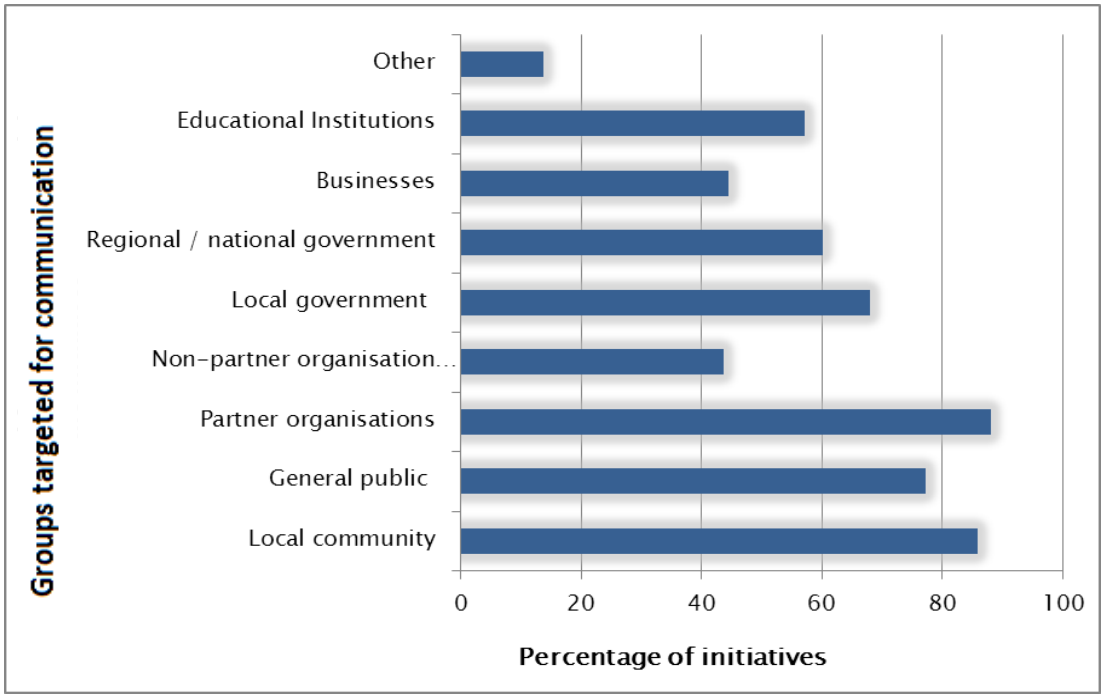

Figure 3.19 Types of organisation with which LSC initiatives communicate. Source: online survey, n=112

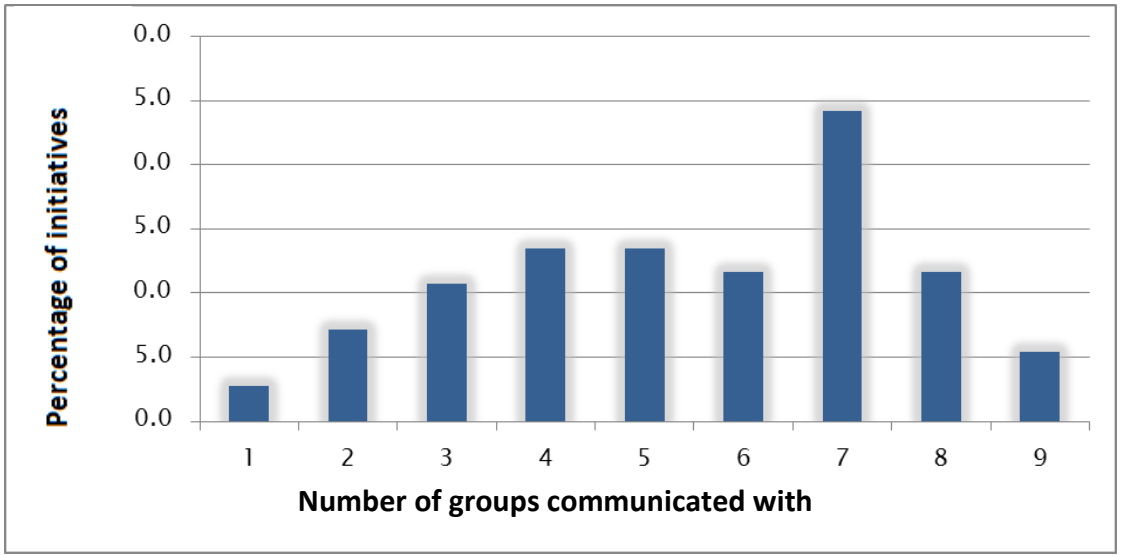

Figure 3.20 **Percentage of LSC initiatives communicating with different numbers of groups (from the list in Figure 3.18. Source: online survey, n=112**

Reported communications included actions that aimed to deliver some of the conservation objectives, such as visitor and recreational user engagement or awareness raising actions. 'Other' classes noted in responses included tourists and farmers/ land owners/ commoners and farmer organisations.

Communication channels noted in responses included direct contact (particularly with landowners/managers), site events, workshops, forums and newsletters, as well as email and web communication.

Use of volunteers

Replies to the online survey showed that direct conservation actions and survey and monitoring were the most common volunteer activities (Figure 3.21).

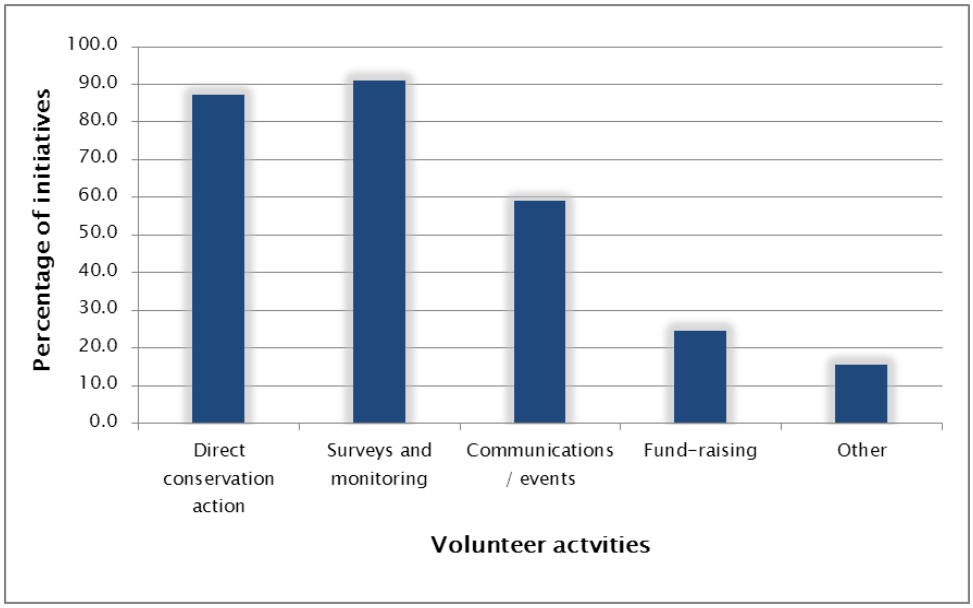

Figure 3.21 Percentage of initiatives using different types of volunteer engagement. Source: online survey n=110

Figure 3.22 presents data on the annual numbers of volunteer days used for different activities. Most tasks were undertaken by small numbers of volunteers. The overall picture is one of large number of initiatives engaging with a large number of volunteer days for direct conservation actions (physical site management) to a large number of initiatives involving fewer volunteer days on other activities such as survey and communication and event actions. One third of initiatives used over 250 volunteer days per year on direct conservation action. For some actions number and percentage of initiatives using volunteers was small; for fundraising only 24% of initiatives used volunteers and then typically for fewer days (81% used 25 or less volunteer days per year). A high percentage of initiatives when using volunteers used their input for survey and monitoring (91%), although using less than 100 volunteer days per year (90% used between 1-100 volunteer days per year).

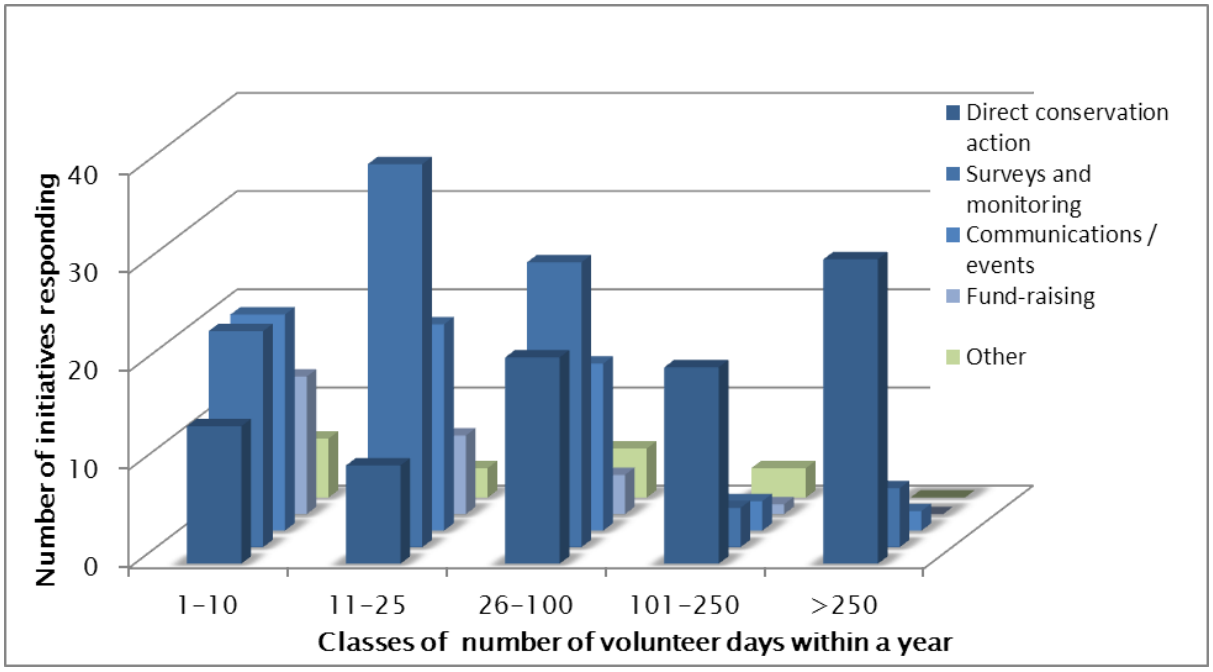

Figure 3.22 **Distribution of the number of volunteer days undertaking different support activities. Source: online survey, n=110**

Some initiatives treated volunteering and public access as related issues: one respondent to the online survey commented *"over the life of the project we have taken approx. 4000 volunteers into the Highlands for an inspirational experience!"* (Restoration of the Caledonian Forest; online survey.

2.9. Funding

The total funding obtained by LSC initiatives varied significantly and the online survey indicated that 29% of the initiatives had received more than one million pounds (Figure 3.23).

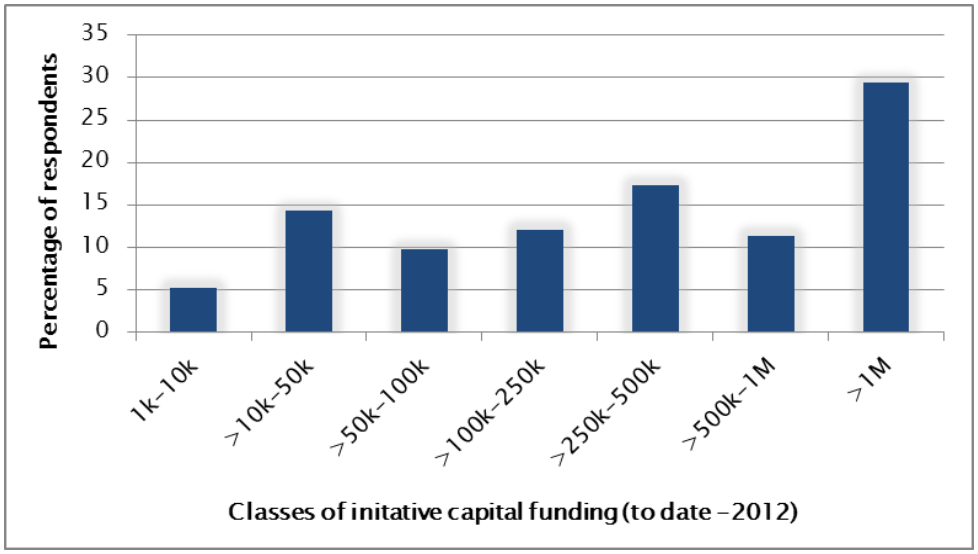

Figure 3.23 Percentage of initiatives within capital funding income classes. Source: online survey, n=110

Sources of funds

Although funding sources were diverse, and many were specific to a particular circumstance, a number of general trends were drawn from the surveys (including the interview-based study presented in Chapter 4), as summarised in Table 3.4, which shows the broad categories of funding and a summary of characteristics that describes them.

Table 3.4 The broad categories of funding sources identified from the surveys and a summary of characteristics that describes them

Category	Sources / examples	Category Characteristics
Lottery Funding	Heritage Lottery Funding (HLF)	National (dealing with the largest bids) and Regional Boards and an 'application window' each year Need to raise match funding, which can occur throughout the life of the initiative. Lengthy and complex multi-staged application process, with development grants available to fund a dedicated officer for a year to prepare applications (e.g. 18 months). Have a reputation of providing large grants for advisory and heritage-related purposes, and having specific targets and requirements. Currently operating multi-objective programmes through the Landscape Partnership Scheme.

Landfill Funding	Biffa Award, SITA Trust, Waste Recycling Environmental (WREN)	Funds raised through Landfill Communities Fund formerly the Landfill Tax Credit Scheme, the taxing of operators per tonne of landfill. Often restricted to funding more practical site-based activities (within a determined proximity to a landfill site). Used to fund baseline surveys, to trial new techniques, to maintain and expand visitor access and for practical reserve management. Often an important source of funding up-front to kick start activities on the ground.
European Funding	EU LIFE, INTERREG, WAVE	Large-scale grants with complex bidding processes INTERREG - *a financial instrument of the European Union's Cohesion Policy to support transnational cooperation.* Water Adaptation is Valuable for Everybody (WAVE) is an INTERREG project to prepare regional water systems for future climate change, it involves securing 50% match funding and has a strong climate change focus LIFE funding is an EU funding instrument that contributes to the implementation of the Birds Directive and Habitat Directive through nature and environment programmes.
Partner Funding	RSPB Wildlife Trusts Local Authority Protected area authorities	From existing programmes or activities of partner organizations, that is channelled into the initiative. Funds raised by partner organizations through appeals, membership fees, campaigns, etc. 'In kind' contributions, often in the form of office space or the cost of hosting staff. Potentially more flexible as a funding source, with fewer targets and requirements but can have restrictions or policies set by the partner organisation itself (e.g. only funding activities on land owned by the organisation)
Charitable Trusts / Donations	Tubney Charitable Trust	Funds often available (from legacies and other sources) via application at any time of year. Funding generally with the reputation of being more flexible than other sources. The Tubney Charitable Trust, which was an important source of funding for many activities, required specific targets – closed March, 2012 Sponsorship through donations generally smaller scale funding contributing to projects.
Public Grant	Agri-environment	Discussed as a funding source or as a mechanism to deliver

Schemes	schemes (Scottish Rural Development Programme, Glastir, Entry Level Stewardship, Higher Level Stewardship, Organic Entry Level Stewardship), Woodland Grant Scheme, Wetland Vision	conservation outcomes. Contracts between a public body and an individual or organisation, often over a 10 year period. Public grants are dynamic and sensitive to political change (e.g. Environmental Stewardship, including Entry Level and Higher Level Stewardship schemes; CAP reform). Agri-environment schemes are administered by Natural England, CCW or SNH – they provide a critically important source of funding, but this alone is not enough to implement coordinated large scale conservation. Wetland Vision is administered by Natural England to support wetland creation and restoration in landscape-scale projects, it requires partnership working and sets detailed and time-constrained targets. The Forestry Commission administers woodland grants for forest management and restoration, access and infrastructure.

3. Brief conclusions

The characterization and description of landscape scale initiatives from the questionnaire responses illustrates a varied picture of development and operation of these large scale and multi-objective conservation initiatives. The questionnaire sought to answer three questions:

- how are large scale conservation initiatives applying scientific and other information?
- how is adaptation to climate change is being approached in large scale conservation approaches used in relation to climate change?,
- what institutional models (such as partnership and governance models, approaches to land ownership, and community engagement) are being used in existing large scale conservation initiatives, and with what success?

There is no clear, single picture of the role of conservation science in project development and conservation decision-making, consistent monitoring or the integration of climate change drivers within the strategic planning and project development. Despite the many examples of the effective use of science and the wide range of varied datasets and information used that reflect the principles of conservation science there was less evidence of effective use of tools to integrate these principles into the design of large scale programmes and into ongoing actions and monitoring. There are, however, some notable exceptions within the c 800 LSC initiatives. There may be many explanations for this situation, related to accessible analytical tools, capacity of the project teams, suitable national and accessible datasets and the fundamental issues of understanding of the relationship between land cover/ land use, conservation actions and the status of the ecology. The adoption of ecosystem services

based approaches and connectivity-based planning is in its infancy – and although the methods appear to be deployed in targeting and in developing some newer programmes there is typically a lack of repeat assessment to monitor and evaluate the outcomes of these initiatives. These methods are expensive and require expertise to operate and have often only been achieved through academic partnerships which may not be supported by longer term partnering needed to offer repeat analysis of connectivity outcomes of actions. Ecosystem service methods applied are often unique, with little transfer of approaches, analysis and integration into the subsequent conservation action decision-making. Even within a post-Lawton Review programme, which promotes thinking in terms of habitat connectivity, there is little evidence of the adoption of analysis of connectivity measures or even the consistent access to and update of land cover data that drives the connectivity metrics.

While there was much interest in ecological networks within the conservation initiatives, partnerships often lacked access to relevant land cover data or did not have effective capacity to analyse and interpret connectivity, either to feed into the design of the conservation initiative or to monitor the outcomes.

Despite generally high awareness of ecological networks, there was little distinction made between the Lawton typology of ecological components within project planning; a more generalist, broader approach appeared often to be adopted. This might simply reflect the reality of applying a conceptual model to real complex landscapes. Emphasizing multiple habitats rather than single habitat action focus may be important in developing LSC initiatives, especially in multi-objective programmes.

The results suggest that planning LSC initiatives often needs to be less prescriptive than single site actions both to take advantage of opportunities and to remain flexible to allow conservation information to direct or re-direct actions. Half of the LSC initiatives were inherently ‘experimental’, in the loose sense of allowing response to changes. Experimental actions were also interpreted by survey respondents as novel approaches to conservation (and partnering and social engagement). Experience from monitoring and evaluation in programmes such as for the Nature Improvement Areas will provide useful opportunities for reassessing priorities and accommodating social as well as conservation objectives. Key messages from the survey suggested small-scale actions, and actions to recreate and restore rather than to create, are easier to achieve.

The survey highlights the importance of expert knowledge within and outside the LSC programmes to inform both the site selection and to determine the actions within the sites. Typically, this came from lead organisations and partners, particularly for the programmes led by larger NGOs. This reflects the concentration of experience in the partnerships developed, practical experience, and the experience of existing projects and probably the cost-effectiveness of expert knowledge over surveys. Multiple sources of information and guidance were used in the majority of cases. This underlines the access to and guidance on using multiple data and information resources can help frame the projects and in particular, the access to national datasets and assessments provides partnerships benefits in developing target objectives and actions.

The survey suggests that there is no one solution to information the site selection and management options. It was evident that broadening partnerships to academic and research groups helps support evidence based planning and design to provide mutual benefits and there is potential opportunity to bring research organisations into the partnerships at an early stage.

Monitoring and repeat surveys have been an important component of many LSC initiatives, although these may not always be systematic or strongly related to the site objectives. Existing monitoring within partnership organisations may not always meet the needs for project monitoring even if it does for conservation monitoring, long term and intensive research and monitoring activity is the exception and tends to be achieved by the larger programmes. There is a need to ensure that the sampling framework and repeat monitoring commitments are made to generate information of use to the projects and beyond; often this requires a robust baseline but the sustainability challenge in terms of costs was noted limiting the ability to make effective comparative evaluations.

Linked to monitoring is the issue of putting in place active adaptive management – gaining knowledge about appropriate management interventions through rigorous scientific experimentation and incorporating lessons back into management plans. While, as noted above, there was clearly a lot of interest in trying out new approaches it was unclear how often this was being done in a rigorous scientific way (though there were notable exceptions). This was possibly the result of capacity and resources not matching aspirations, and could be helped through greater contributions to conservation initiatives by scientific researchers (within or outside partner organisations) to develop appropriate designs for experiments and data analysis. A crucial point here is that adaptive management and monitoring should go hand in hand – monitoring of LSC initiatives (and indeed any conservation area) should be planned and implemented as a carefully-designed long-term research project (Lindenmayer and Likens 2010).

The extent to which climate change was a major consideration appeared to vary across initiatives; in particular, few had conducted a detailed local climate vulnerability assessment to help inform objectives. A reliance on existing evaluations is understandable in terms of cost and capability; typically those engaging with climate change used national level assessments. Effective associations with research departments allowed more localized assessments but again the lack of local data and support for analysis affects the ability to carry out repeat assessments. Water, wetland and montane habitats were perceived to be most sensitive and at risk of climate-induced adverse changes. It was appreciated that climate change impacts are superimposed on existing pressures and that working within the principles of a well-connected network of diverse habitats is likely to enhance resilience and contribute both to immediate conservation goals and adaptive management. Benefits to climate change adaptation appeared in some cases to be expected to flow from more general conservation management.

Large scale conservation initiatives by definition include collaborations and partnerships but the interpretation of who is involved in the partnership is often not well-defined where landowners and funders may or may not be included in the partnership facilitating a project. Numbers of organisations within partnerships varied substantially, but the relationships with size of project, with age of project or with relationship of the partnering arrangements with

the effectiveness of project delivery were not clear. Neither was it possible with the data available to establish whether new partnerships or established partnerships were more successful at achieving project objectives, although the evidence for successful continuity of projects within specific landscape areas often is built on established partnership successful maintenance of funding though successive projects. Successive or parallel projects may involve different partner memberships to reflect the multiple objectives and evolving scope of project activities that characterize the LSC initiatives, although biodiversity conservation at the heart of many of these projects includes continuity of lead groups. A wide range of governance models used in management and governance of project activities are developed to suite the local project circumstances and the range of approaches provides options for new LSC initiatives. Land tenure and numbers of landowners has a significant impact on other aspects of governance and decision making within projects.

Communication and engagement formed part of the actions within all LSC initiatives but the means and scale of resources devoted to these actions varied with the objectives of the initiative. These actions usually included substantial use of volunteers, typically for survey and monitoring and for support of direct conservation actions. It was clear that volunteers had a very significant role in contributing to the success of many initiatives. There appears to be scope for promotion of greater engagement of volunteers in other activities within initiatives such as communications, assisting at events and further fund raising.

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Chapter 4. The planning and management of large-scale conservation initiatives: II. In-depth interviews

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Complementing the online survey outlined in Chapter 3, this part of the project further investigated the planning and management of large-scale conservation initiatives through in-depth interviews with the managers of a sample of initiatives. The scope of the interviews included: general information about the conservation initiative; the way the initiative was set up and managed; scientific concepts and information that had been used to inform the initiative; whether climate change was being considered; funding issues; and barriers and opportunities.

1. Introduction

This chapter explores the social and institutional dimensions of large-scale conservation. In the UK, the need for ambitious approaches to conservation is widely recognised. Colston (1997) called for large-scale ecological restoration to address a conservation 'black hole' in the counties of east and central England. Projects such as the National Trust's 'Wicken Fen Vision' in the East Anglian fenland (Colston 2003) were in part a response to such calls. Non-governmental organisations including the RSPB (2001) and the Wildlife Trusts (2007) have begun to develop large-scale conservation programmes, and the idea of 'rewilding' has begun to get increasing attention (Adams 1995, Taylor 2005, Monbiot 2013).

In 2008, Natural England proposed adoption of 'an ecosystem approach' to 'achieve biodiversity enhancements across whole landscapes and seascapes' England Biodiversity Group 2008. Natural England went on to develop eight 'Integrated Biodiversity Delivery Areas', representing 'entire landscapes' (Natural England 2008). *Making Space for Nature* (Lawton and others 2010) built on these initiatives, recommending the creation of a series of 'Ecological Restoration Zones' (ERZs), operating 'over large, discrete areas within which significant enhancements of ecological networks are achieved, by enhancing existing wildlife sites, improving ecological connections and restoring ecological processes' (Lawton 2010, 70). By 2011, British conservationists were accustomed to being told to 'think big' (England Biodiversity Group 2011). The focus on large-scale conservation in the UK is part of a wider international movement: Fitzsimons and Wescott (2005) argue that 'to maintain current levels of biodiversity, it is widely recognised that conservation efforts cannot be constrained to the public reserve system and that a landscape-scale approach to management is required across all land tenures' (p. 75).

Large-scale conservation initiatives offer opportunities that conservation on smaller conservation sites do not (Lawton and others 2010, England Biodiversity Group 2011). They also offer challenges in terms of planning and management, and in the coordination of multiple partners under novel institutional arrangements. These are discussed here.

Large-scale conservation initiatives attempt to coordinate land use and conservation management over a larger area than can generally be acquired by a single conservation landholder (private owner or manager or governmental or non-governmental owner (Adams and others 2014). While some LSC initiatives are confined to land held by a single large owner (often a conservation NGO or a private estate), most are composed of a number of different pieces of land, held by a variety of owners and occupiers, with land held privately, by lease or rental agreement. These areas reflect a complex blend of public and private interests. For their continued existence, they typically involve novel patterns of state regulation and payments (Hodge and Adams 2012, 2013). Many are effectively multi-reserve networks (Fitzsimmons and Wescott 2008), with areas managed for biodiversity conservation connected by other pieces of public and private land.

There are considerable challenges in bringing together diverse partners and landowners to coordinate land management for conservation over large areas. These institutional factors are critical to the success of large-scale conservation initiatives. This chapter reviews the various aims of LSC initiatives (section 3), the way they are planned (section 4), the knowledge base used in their management (section 5), their use of formal monitoring of change (section 6) and the extent to which climate change has influencing their design and management (section 7). The chapter then discusses the way large conservation initiatives are they are organized and governed, looking at partnerships (section 8), governance (section 9) and land tenure (section 10). Finally it explores two key challenges for large conservation area management, communication and engagement (section 11) and funding (section 12). Conclusions are presented in section 13. First, we review the methods used in the survey on which the chapter is based (section 2).

2. Methods

A qualitative survey of managers of large-scale conservation (LSC) initiatives was carried out between January and September 2012. In-depth interviews were completed with the managers of 27 selected LSC initiatives. The insights of qualitative analysis of this sort are dependent not on sample size, but on the range of cases included and the depth of insights obtained. In-depth interviews allow a sensitive approach to research questions (Valentine 2005). They potentially allow complex behaviours and motivations to be investigated (Dunn 2000).

We selected initiatives in the Southampton University database (see Chapter 2)) to capture a range of experience and approaches on the basis of size (10-49km^2, 50-990 km^2 and >1000 km^2), and number of landholders (10 or less, or more than 10). Within these categories, initiatives were selected purposively, taking account of location (geographical spread) and logistics (time and travel costs), to include a range of habitats and lead organizations across England, Scotland and Wales. The final sample of 27 was made up of 16 initiatives in England, eight in Scotland and three in Wales.

Managers of selected initiatives were contacted by telephone or email. Most interviews were conducted face-to-face (n=23), the rest over the phone or using *Skype* (n=4). Interviewing is inevitably influenced by the interviewer's ideas, experiences and interpretations, and constrained because the interviewer has shaped the interview agenda (Robson 2007, Valentine 2005). To minimise this shaping of discussion, interviews were managed to try to create a rapport between interviewer and interviewee, and so that the interviewee did not feel unduly interrogated; a list of topics was used to guide conversation. This enabled interviewees to use their own words to describe experiences and views, to make links to topics or issues not in the original list and to clarify and explain complex issues.

By agreement, all interviews were recorded on a digital voice recorder as .mp3 files, to ease the flow of conversation during the interview. Basic notes were taken of interviews as a backup and to inform analysis. Interviews were transcribed verbatim as soon as possible after the interview. Interviews were analysed using *Atlas.ti*[22], with common themes identified through repeat reading.

In this report all interview quotes are anonymous, identified by a simple numerical code [in square brackets]. In the analysis of interviews, descriptive terms are used to identify broadly held views ('the majority', 'many', 'some', 'few', 'often', 'rarely', etc.). The aim of the analysis is not to identify empirically the proportion of interviewees in support of any point, but to identify how LSC managers understand and talk about their initiatives. A point made by a single interviewee, or made in reference to a particular initiative, can provide a valuable insight.

Interviewees used the terms *large-scale*, *long term*, *wild*, or *natural* in a diversity of ways and with a variety of assumptions. We have retained their usage in quotations. The diversity of organizations, objectives and activities makes the definition of consistent terms for large-scale conservation important. The following definitions have been used

Initiative: purposeful conservation action within a delineated area directed by an organisation or partnership. (Thus large-scale conservation initiative).

Project: a distinct activity with a clearly defined aim and time period, often associated with a single source of funding. It is common to have a number of different projects (in some cases overlapping) under a single large-scale conservation initiative.

Programme: the coordination of conservation initiatives at a regional or national scale by a single or group of organizations (e.g. the Living Landscapes *programme* of the Wildlife Trusts, or the Futurescapes *programme* of the RSPB.

Interview respondents are referred to as *interviewees* or generically as *conservation managers*, despite the fact that they may have different roles within an initiative.

[22] Qualitative analysis software, see http://atlasti.com/

3. Conservation aims of LSC initiatives

Interviewees identified a variety of aims for LSC initiatives, relating to the importance of species and habitats, of ecological networks, ecosystem services and rewilding.

Most interviewees highlighted species of particular interest to their initiative, but few expressed overall conservation objectives in terms of species protection, and none expressed solely species-based objectives. Some species (e.g. butterflies, birds and bats) provided indicators of habitat condition, for example bats (‘*Barbestelle bats are dependent upon woody vegetation and… because they are using the landscape they were a useful species to use’ [Interview 11]),* or butterflies*: ‘the question at the start was “can you restore woodland landscapes?” …. and turning that around “can you use these rare [butterfly] species as indicators of well managed woodlands?” I think we’ve got very good evidence that you can: that it takes quite a lot of effort, but that you can do that’* [Interview 2]*.*

Species were also mentioned as a focus for management action, as a means to attract funding (charismatic species), and as ‘flagships’ in justifying connecting landscapes. Species were also a focus where they had an impact on the habitats (e.g. deer) that affected the large-scale and site-specific ecology. Indeed some interviewees suggested that species-based conservation was not suitable at a large-scale: ‘*But the single species management, I’m not greatly keen on because it can lose sight of the bigger issues*’ [Interview 1].

There was a general emphasis on habitat and process-based conservation objectives for large-scale initiatives. Habitat management included removal or control of dominant species (such as *Molinia* in upland peat areas, or felling of conifer trees for grazing) to maintain a certain habitat or species assemblage: ‘*Looking at tools or ways that we could… get a better balance of species and structure within these quite uniform vegetation types*’ [Interview 1]. Habitat management takes a variety of forms. At one end of the spectrum, habitat had been created through highly mechanized methods, creating engineered landscapes such as naturalized ponds from disused quarries or reed beds from flooded arable fields: *‘the conservation work is not just about looking after what we’ve already got, it’s about trying to enhance and put back… and the area does afford big opportunities for that’* [Interview 7]. At the other end of the spectrum, some initiatives had involved the creation of habitat by encouragement of natural processes over large areas, rather than tightly planned and engineered approaches. In both cases, landowners were widely encouraged to use agri-environment payments to take land out of arable production or change land management to improve soil and water quality and provide habitat for wildlife.

One initiative employed staff in separate roles to cover two complementary objectives: ‘*one member of staff concentrates on the expansion, connectivity and restoration of two core … nature reserves, while another focuses on the improvement of general land management outside of reserves through the provision of advice and assistance with subsidy applications*’ [Interview 11].

Designated areas (SSSIs, SACs, SPAs, etc.) may constrain management options in large-scale conservation. A number of initiatives were zoned, with different conservation objectives in different areas, reflecting the location of rare species, designated areas, and public access; determination of the appropriate level of management intervention in each area was an important strategic decision:

There will be areas of high conservation value, for instance [a reedbed]… this will be a quiet area. Whereas other parts of the initiative area, we're hoping to develop a visitor centre and that will be an area where you can walk your dog, you can drive… So again, the Master Plan sets out a zoning map and we've got to work through exactly how that will play out on the ground [Interview 8].

Habitat-based conservation objectives were often expressed in terms relating to habitat connectivity or ecological networks (c.f. Lindenmeyer and Fisher 2006, Lawton and others 2010). Several interviewees were clearly knowledgeable about these areas of ecology, and saw LSC initiatives as a way of delivering a response to ecological fragmentation: '*If you have a more joined up landscape, then obviously species can move a lot easier between quality patches of habitat rather than becoming isolated*' [Interview 3]. In almost every interview there was a discussion about the barriers to habitat connectivity, either for a particular species, or for a group of species associated with a habitat:

'*What you have to do is build what you call a resilient landscape with lots of habitat variability, lots of heterogeneity and let the butterflies come and go from the landscape. Obviously, with this landscape scale and metapopulation approach it becomes much more about the rate of colonisation/extinction than about whether they are doing well on a particular site… Really it's about building that resilience and that habitat mosaic and letting them respond* [Interview 2].

Many interviewees identified improvement of the functioning of the wider landscape as a conservation objective. Some did so using the language of ecosystem services. A number of different services were identified as important, including flood storage and control, carbon storage and in some cases sequestration, water quality, biodiversity, and green infrastructure in relation to human health and recreation (cultural services). One initiative had commissioned a baseline study of ecosystem services within the initiative area.

However, many interviewees expressed frustration with the trendiness of the term 'ecosystem services', or identified the challenges involved with the practicalities of measuring and monitoring these services over a large scale:

There was this convergence of issues from different organisations in terms of what the uplands could provide, in terms of biodiversity, water quality, I suppose more recently carbon protection and possibly sequestration… and what we ended up doing for the initiative was to take those headline issues, but maybe to look at the more practical things that we could really achieve on the ground [Interview 1].

In a few interviews, the future potential of payment for ecosystem services as a sustainable source of funding was raised (e.g. '*We've got to work out a system that will… bring in different [funding] streams and maybe that's looking at… carbon credits or ecosystems services in some way providing something that someone wants to buy into*' [Interview 10]). However, there was some scepticism: '*As the whole question of payment for ecosystem services notches up a gear, obviously that's an area which we'd be interested in as well… the 'great golden goose', we hope, is ecosystem services. Who knows, but don't hold your breath on that one*' [Interview 8].

Several interviewees identified their initiatives as involving ‘re-wilding’ or ‘wildland’, with the primary objective of enabling natural processes to occur more freely within a landscape. This was being achieved by methods such as converting to less intensive forms of management (for example extensive grazing with native breeds); removing barriers such as human-made infrastructure (fences, roads, bridges, dams) to improve connectivity in the landscape; removing non-native/ alien or invasive species; and/or converting to more natural hydrology. Two ‘wildland’ initiatives actively sought to encourage recreational use:

This is all about allowing the land to develop as a wilder place, accepting that it’s already wild, but allowing it to develop as a wilder place for the benefit of people. So there are three elements to our vision; it’s wilder, it’s for people and it’s allowing natural processes [Interview 9].

It’s about building relationships between people and landscapes, that’s what ‘wildness’ is really. Wildness is a relationship between modern-day humanity and the natural landscape [Interview 9].

These initiatives, by definition, were adopting a more open-ended approach with fewer or no targets, but all had extensive monitoring programs in place to record the changes taking place scientifically.

In some other initiatives, rewilding was not seen to be either possible or appropriate, for example because of the amount of land needed. One interviewee explained that rewilding was not possible in their area ‘*due to the practicalities of not owning the entire area and not having management control over the whole area*’ [Interview 8]. Another commented: ‘*I don’t think you can do that without a lot of control. You can do that if you buy up large pieces of land… and I can see how that could be used to deliver natural processes, but not possible in these areas*’ [Interview 2]. One interviewee could not see ‘re-wilding’ ever occurring in areas with complex ownership arrangements (i.e. with many private owners).

However, it would be a mistake to assume that all large-scale projects involve deliberate rewilding. Some interviewees deliberately distanced themselves from these ideas. One said*:*

Personally my view is that the story of Britain’s landscape is about those forms of traditional management and we need to stay true to that story and re-wilding is just nonsense on this island. Having said that, I can see the argument that we’re trying to prop up something that is just unsustainable… in social and economic terms [Interview 6].

4. Conservation planning

4.1 Target setting

Many LSC initiatives had established specific conservation targets and associated monitoring. Sometimes targets and monitoring of targets were set at the start of an initiative, and sometimes developed as the programme progressed.

Biological targets were specified in a number of ways including: the total area of targeted habitat; the area of habitat in a particular condition (with a specified form of management, or

containing certain species or features); or population numbers for a particular species. Indicator species targets were used to assess increases in net area or function of targeted habitat.

Social, institutional and economic targets had also been set for some initiatives, including: number of people advised or reached through public engagement; number of training events, talks, and school visits held; volunteers numbers and day; number of education packs, leaflets, and newsletters produced. Thus one initiative had a target of '*1,500 people involved overall, more than 1,000 at the general public level*', [Interview 2]. In some cases targets even stipulated the number of partners that need to be involved and the frequency of steering group meetings.

Targets were often demanded by donors. In some cases targets were directly set by a funding body, in others they were adopted by an applicant in order to secure funding:

The targets for the Biffa [award] funding were a bit scary… they were obviously targeted to hit habitats and species within biodiversity action plans, which I suppose in the broadest sense we have… [Interview 1].

We set ourselves – to our funders – we set some targets about how much habitat there was going to be or how much we could change. Now, we worked on all sorts of habitat, including grassland and other things, but we were only really reporting on the woodland because that's what the funders paid for [Interview 2].

As these quotes indicate, some funding sources tend to have a reputation in terms of the types of targets they require. Some Charitable Trusts and legacy funding sources are known to be more flexible, while others, such as HLF and EU, typically require more specific and time-bound targets to be met:

For [Funder X] I wrote much more detailed targets but again, they are time-constrained. By the end of two years we will either have restored or have the agri-environment funding in place to restore x size of habitat; x [area of] habitat improved on the same basis; x [area of] of habitat created [Interview 6].

Specific targets attached to the HLF contract… I think we are contracted to having 740 ha under restoration by 2013… we're well on target for doing that [Interview 8].

Many survey participants noted that it takes time after setting targets to design and implement monitoring strategies, and that often it takes time for species, habitats or natural processes to respond to conservation actions. It was clear that initiatives were under time pressure to deliver results, and were vulnerable to any factors that caused delay (such as an unusually dry season or adverse weather during annual monitoring):

It's a very short period of time [three years]. We got our funders to agree to set targets in terms of area managed, and we pledged different things to different funders, but we pledged that we would raise the area managed by a certain amount. We pledged we would give advice to a certain landscape area, a certain area of woodland, and a certain number of landowners, and then we measured against those targets [Interview 2].

The setting of strict species or habitat targets in areas with complex land tenure arrangements also has the potential to be problematic:

Once you start setting targets, you have to have some kind of control over initiative partners or control of the whole areas, so, who would be pushing that? It could possibly cause conflicts... It could be counter-productive if [landowners] saw us trying to push people towards things rather than just providing support and information [Interview 11].

Ultimately, the distinction between an initiative exceeding or failing to reach its targets is only valuable if the targets were suitable in the first place. Appropriate target setting requires skill and experience and benefits greatly from prior knowledge of the work involved and the locality of the initiative. Setting overly ambitious targets could put the initiative under high pressure and potentially limit future funding opportunities if targets are not met. Overly specific targets may limit an initiative's flexibility and ability to capitalize on opportunities that arise. However setting easily achievable or vague unspecific "notional" targets could limit an initiative's ambition:

I very much believe in appropriate targets and I've seen other initiatives, don't wish to bad mouth [an organisation], but sometimes they'll do these 'wishy-washy' targets, 'oh, we'll have to get more volunteer effort', without specifying what they want to do… 'we're going to improve so much habitat,' without actually saying what that actually means. Whereas I come from a culture that says… 'bottom line is, if the initiative is going to work we need more colonies than we've got now [Interview 4].

As discussed above, re-wilding initiatives, by definition, tended to have fewer targets as they are designed to provide opportunities for natural processes to take course by "letting go" or decreasing human control of the landscape. Refusal to set specific targets could create challenges:

There are functional parts of the organisation that are very focused on delivering just one thing over a set timescale, then that can be quite challenging to engage with [Interview 9].

There's never been any targets… but having said that, Natural England wants to see targets. They want to see that we're not going to lose the BAP species that we had [Interview 10].

4.2 Evolving conservation objectives

The idea of conservation planning (e.g. Margules and Pressey 2000, Sanderson and others 2002) suggests an approach to large-scale conservation that proceeds logically through a series of stages from data collection to implementation. In practice, most British large conservation areas are the result of projects that have grown incrementally. Initial objectives had often been modified through experience, and most projects had broadened their objectives as they developed. (For example, one respondent described how their initiative had started out with a focus on biodiversity but had developed to address socioeconomic issues.)

Many reasons were cited for changing objectives. Public engagement could lead them to shift, as could the emphasis of different funding sources (see also discussion below), and

new scientific knowledge and conservation policies. Several people mentioned that climate change had not been an initial consideration but had become more important over time. A number of project managers noted trade-offs between objectives due to constraints on time and resources, and in one case because of a need to balance wildlife conservation and human access.

Many LSC managers saw the evolution of objectives in terms of engagement in some kind of adaptive management. According to Perkins and others (2011, p. 515), adaptive management "combines research with action on the ground, enabling practitioners to learn from successes and failures and adapt actions accordingly, [and] is essential if we wish for better conservation". More broadly, it may be taken to include the use of monitoring and evaluation to redirect actions based on feedback. In LSC initiatives, adaptive management involved flexibility and a willingness to experiment with approaches, to learn from successes and failures and adapt actions, and obtaining the necessary funding and time to do so. In many cases, management evolved as initiatives developed (e.g. changing planting methods in response to tree mortality) rather than an 'adaptive management' approach being explicitly adopted at the outset.

Interviews threw up examples of trying new approaches and 'learning through doing':

You can't just go and put a fence around a common… so basically what we've done to get around that to introduce grazing is to use temporary electric fencing. So we had funding for one year… for a initiative to buy the infrastructure and then test the viability of grazing using electric fencing… it was also done to test public reaction to seeing grazing… and people love ponies, and they are dog-proof, so they work extremely well… we're going to extend it to this area here… so we're just in the process of putting together a funding bid [Interview 5]

I think there has been some criticism of the techniques of cutting as a means of restoration – that's the problem when you start trying things out – it was never the intended aim as a restoration tool, but other people have seen it as that. And I suppose we perhaps adapted it to see if it would work [Interview 1].

We certainly learned the difficulties that can come with producing them [leaflets]. In discussion with the partners we've been able to adapt them [Interview 3].

In some cases a time restriction had persuaded conservation managers to take more risks in order to get results within a short period:

A lot of this was unknown, so we wanted to find out… we also found out that there was nothing left in the seed bank… we haven't got the luxury to say "you know, we'll leave it five years to see if it does come…". We thought "no, we'll bite the bullet, we've tried it for a year, it hasn't worked, we'll move on" [Interview 4].

Another element of adaptive management that was identified was an ability to take advantage of opportunities. This may be facilitated by less restrictive funding sources, larger areas over which opportunities may arise, and larger numbers of like-minded partners or people between whom synergies can develop:

What it did lead on to was discussions with the […], because they had been doing work for CCW on the Important Bird Areas in […], and by chance the cutting work that we were doing coincided with one of the core population areas for golden plover, and we just then tweaked the second year's cutting to coincide with some of the breeding and feeding areas [Interview 1].

The way we work together sort of reflects the philosophy of working with natural processes. Natural processes are opportunistic, they aren't always defined, they aren't always very clear… To a degree we are a bit like that, we sort of react to demands and look at who's got the skills and abilities and time to do it [Interview 9]

Initiatives may have more freedom to adapt approach and strategy if they have relatively simple land tenure arrangements (a small number of landowners); long-term or flexible funding; extensive, low-cost or natural process-based management; or are based on well-established long-term trusting partnerships. Each of these factors appeared to add stability to an initiative and affords room for adaptation to take place.

Opportunities for assessment and potential adaptation arise when a funding source comes to an end, or when new funding is sought. It is easier to incorporate lessons learned when short initiatives follow in succession in the same area, or are implemented by the same organisations:

We are at the point of reviewing where we are going next because the Biffa money has now run out. There have been some interesting lessons learnt in terms of what we could do: access, cutting, and cattle grazing is definitely possible with the right person and the right support, but the key then is how you might replicate that up onto a bigger scale or sustain it [Interview 1]

Finally, the longer the initiative's timescale, the greater the opportunity to adapt:

You can't build a relationship with people and with a landscape over a year or two years. It takes years of doing that and responding to change as that happens [Interview 9]

If you look back you'd see the description of our partnership has changed… The partnership has developed, it's sort of thinking about who it is and what it is [Interview 9]

5. Knowledge and information used to select and manage conservation areas

Interviews showed that managers of large-scale conservation initiatives used a wide variety of forms of conservation knowledge and evidence, including formal knowledge (published science, commissioned studies and national survey data), and the knowledge of individuals (staff, outside 'experts' and local people).

Published scientific research was an important source of knowledge for some initiatives, and used to guide objectives, management methods and choice of indicators or targets.

Examples include mark and recapture studies on butterflies, long-term studies of invasive pests such as ragwort, reviews of habitat-specific conservation management techniques, metapopulation biology, and evidence of the impacts of climate change on breeding requirements of key species. Some initiatives saw themselves as testing models and theories presented in published research against practice:

We're looking at "ok that's the theory, let's test has it happened? Let's see how far things have moved". And there's been a couple of papers this year about how butterflies and birds are lagging behind. They are moving north, but they are 20-30km south of where they should be according to the models because there is obviously a practical lag in terms of things like landscape connectivity [Interview 2]

Formal surveys provide useful datasets, especially when an initiative cannot commission a baseline survey of its own: *'It was a [regional]. report done by the [organisation] a few years ago now, but that came up with the 'strategic nature areas'... we've got, for all the different habitats in the [region], these little areas we've defined as being strategically important for restoration' [Interview 14].*

A number of initiatives were able to draw on specific surveys of various types and spatial scales, including Landscape Character Assessments, National Vegetation Classification assessments of specific habitats or soil nutrient assessments. Data on habitat quality and condition were widely used, either from routine surveys (e.g. river quality assessment) or through specific habitat and physical condition assessments.

In some some projects, habitat and species monitoring had been initiated years before the initiative officially began, and these data had been valuable in informing the design and strategic direction of the conservation initiative: '*We've got a specific goal to base management decisions on comprehensive data, to share all this information between ourselves and the landowners and use it to change what we're doing, or not change what we're doing*' [Interview 11]. On the other hand, it could be a challenge to access existing data or information about an area:

There was a reasonable amount known about the SSSIs, but it was known by Natural England and access to that data wasn't always easy… The rest of the initiative area we knew very little about, so the first year to eighteen months of the initiative was spent doing a mixture of getting hold of other data from other sources like Natural England and digitizing it into a comparable format [Interview 6].

Many initiatives had commissioned studies to inform or underpin their work, for example if biological survey information was not available or was too basic. In some cases initiatives reported commissioning surveys or used local voluntary surveyors' data. Such surveys can '*provide a further list of actions, and guidance in terms of what would be good for management',* [Interview 1], and assist in setting objectives, targets and implementation strategies at a landscape scale.

It was also common to commission research after the initiative had been established for a specific purpose. Thus one initiative contracted a report on eco-hydrological modelling with

the aim of, *determining what plant communities can be established where basically and looking at the whole question of the water resource and the impact of climate change* [Interview 8]. A number of conservation initiatives had used specialist consultants.

Expertise and evidence generated internally by a project's lead organisation or partners was frequently used as an information source. Many large conservation organisations with well-established large-scale conservation programmes have experts in ecology, hydrology and planning at the national level who could be called upon for advice when needed. Initiatives within a larger LSC programme could also draw from the experience of other initiatives. For example, the Wildlife Trusts' online 'intranet' platform enabled conservation managers from different initiatives to share experiences. Many organisations leading LSC initiatives have a long history of conducting ecological research on habitat requirements for specific species. One in-depth interviewee commented '*We are applying the results of that research to the work that we do'* [Interview 7].

Organisations also made use of the expertise gained and lessons learned from previous related initiatives, and in many initiatives directly built on and applied what was previously learnt: '*We've already trained a lot of surveyors so we'd got a lot of local surveyor groups in different parts of the country*' [Interview 3].

An important source of knowledge was what was being done in other conservation initiatives. Many interviewees expressed a desire to increase exchange with managers of other conservation areas and identified a need for facilitated interchange of ideas and experiences. Sharing was occurring informally through initiative visits and meetings, but also during workshops, seminars and other events (e.g. agricultural shows, conferences, the Institute for Ecology and Environmental Management meetings, and national days or workshops where people from different parts of the country present work).

Visits to other areas or initiatives were seen to be important as sources of ideas and expertise. Visits abroad had provided ideas and inspiration about what might be possible, for example the Oostvaardersplassen Nature Reserve in the Netherlands, an iconic wildland initiative. A couple of initiatives had organised exchanges for landowners within the initiative to visit other initiatives or sites: '*[The Project Officer] set up an exchange for four graziers… So they had an exchange to northern Spain to look at common land management… I think that gave them food for thought, and it certainly got them talking amongst themselves',* [Interview 1]

The importance of personal relationships and advice rather than formal science came through clearly in many interviews:

It's not the studies that you read that really kick start things, it's the people and their ideas and meeting those people and getting those ideas [Interview 10]

We've got inspiration from those people. Sometimes, that science isn't science that's necessarily written down; or it's science that's developing. What other people are thinking and doing and it's not been recorded yet: it's happening [Interview 9]

Local knowledge and familiarity with an area and its ecology had frequently been important in informing site selection and management. One interviewee highlighted the importance of local knowledge, and asking '*systematic questions about what works and what doesn't work, and then using that to inform the initiative'* [Interview 2]. Many interviewees were themselves local, or had lived and worked nearby for a number of years, and therefore brought local understanding to strategic decisions as well as a connection to the local community. The knowledge of staff involved in similar work in the past or in the same area helped make targets accurate and achievable. Some initiatives had benefitted by hosting their initiative officer at a partner organisation's office, or by allowing them to split their time among different partner organisations, enabling them to gain expertise and local contacts from their hosts.

Many initiatives interviewed had formalised their relationships with external experts by organising some form of Advisory Group or Committee to provide advice and support to the strategic decision makers: '*On the monitoring we get completely led… by the science team within the Advisory Group*' [Interview 10]. Thus the Joint Technical Advisory Committee for one initiative included scientists (a hydrologist, a geologist, a habitat creation expert, a monitoring officer, amongst others), members from the partnership, and other skilled volunteers. It '*grew out of a desire to provide the best scientific and technical support for [the initiative]* [Interview 8]. Another initiative hosted their Advisory Group every three years for a workshop to provide scientific input:

We recognised that we needed some expert advice on a range of areas so we put together this Advisory Group of experts who we picked… for what they know and what they had done. So they come from a range of organisations across the country and externally… On a day to day basis for science stuff we rely on our Advisory Group and people like Natural England [Interview 9]

The advisory committee for another initiative was made up of 32 people, which included senior scientists from a range of organisations, who met once a year to volunteer their expertise. Although many of these advisory committees and groups met infrequently, interviewees often contacted members by phone and email for their particular expertise when the need arose. Some advisory groups focused on a specific element of the initiative, for example ecosystem services, monitoring strategy design, or climate change.

Knowledge and expertise was also gained from sources outside the initiative, for example from specialists in government agencies (e.g. peat specialists from statutory nature conservation agencies or water specialists from the Environment Agency), other experts (e.g. veterinarians, philosophers, photographers, etc.), and from researchers and research institutions (e.g. Centre of Ecology and Hydrology and Universities).

Some respondents mentioned direct links to university research. Initiatives benefitted not only directly from the findings of such research, but also through the ongoing relationships with the academics and institutions involved. Some initiatives were hosting Masters and Doctoral research initiatives, and a few reported receiving so many requests to conduct research within the conservation area that they had to be selective about whom they accepted. There were opportunities in working more closely with academic institutions: one interviewee spoke of "*good academic cross-over*" where staff worked part-time in a

University [Interview 6]. Although universities had frequently become collaborators on projects, they seemed rarely engaged as core initiative partners. Other models of engagement with research include annual fora, or exchange events such as the Ecosystems Knowledge Network.

For many initiatives the high cost of commissioning studies put new research out of reach, and some conservation managers did not see research as feasible, or even as the most effective approach: '*It would be great to have an understanding of those sorts of issues but it's not something that we as an organisation would be in a position to fund or source*', [Interview 5].

Interviewees expressed acute awareness of the cost of research, and the need for external funding. Thus one initiative had contracted a consultant, at a cost of £24,000, to conduct a baseline assessment of ecosystem services, using socio-economic scenarios. The interviewee was pleased with the product but acknowledged that it remained a challenge to apply the findings to determine strategy:

When you look at the way consultants approach this, they read the brief and say, 'how can we adapt our experience and expertise to delivering this initiative?' and often, it's trying to fit a square peg into a round hole [Interview 6].

One interviewee described an application to the Natural Environment Research Council (NERC) for a 3-year initiative on ecosystem services and carbon sequestration. Another initiative with £50,000 of seed funding from a green infrastructure budget, started by commissioning three studies: a visitor survey, a review of large-scale grazing to deliver their conservation objectives, and a development plan. Unfortunately funding was not available to support the project once planning was complete.

Funders may specify particular information needed to prepare an application. Many funding schemes are competitive (e.g. Community Forests, Nature Improvement Areas, IBDA and Ecosystem Pilot Areas). A good information base can be critical to a successful funding bid, and a sound scientific rationale could be a valuable asset to leverage funding. As one interviewee expressed it, '*you couldn't ask for a better data set to go to the Lottery… because it's as comprehensive as it can possibly get*' [Interview 5]

Yet initiative managers perceived a trade-off between the costs of acquiring the science or evidence to plan LSC initiatives, and the need to spend resources on action on the ground. It was important to strike an appropriate balance between research and practical work:

I have witnessed initiatives which have spent a lot of time, five years in some cases, using ecological consultants to map out exactly where you should establish a new hedgerow or where you should put a new woodland planting. And frankly you can do that on the back of an envelope in the pub. [Interview 2].

We try to use science to underpin our broad strategies, and then we get on with it [Interview 2].

We're never going to have time to measure all these sites and show that it works, and we wouldn't want to. We want to spend our time doing, not measuring. So getting that balance is

tricky, but we find that it is very valuable to kind of show that it works, demonstrate a technique works, and then go and apply it [Interview 2].

One interviewee described how their approach was adapted to make it more practical. They started with a very technical approach (overlaying different types of data from different sources) but when they presented this approach to the stakeholders they were told that it wasn't "realistic": '*It's about farm systems and things like that, and without addressing those issues, there's no point in looking at the water level. So they very much encouraged us to take a much more anecdotal pragmatic approach, not a technical, scientific approach*', [Interview 6]. This initiative therefore developed an 'opportunities map' combining technical recommendations (from LIDAR data, habitat mapping, hydrological considerations, etc.) with practical farm-level considerations (such as landownership, and socio-economics). Practical considerations also played a part in site selection and choosing where to carry out conservation management, with the availability of matched funding or an interfested landowner being important.

6. Monitoring of large-scale conservation initiatives

Monitoring may relate specifically to conservation objectives (baseline, status and trend monitoring), or to management 'monitoring and evaluation' reporting of the project outcomes. Monitoring is far from universal and many sources of funding, such as HLS, do not require any monitoring of condition or target species populations. Nevertheless there were many examples of extensive monitoring programmes and community science and monitoring by volunteers. Any insights of what they learned from this?

Some initiatives relied on the existing monitoring by partner organisations (e.g. SSSI Common Standards Monitoring of condition or the UK Butterfly Monitoring Scheme), undertaken as part of past or parallel initiatives by external agencies. Many initiatives used baseline surveys, either commissioned specifically for an initiative or using existing data on vegetation as a reference point for monitoring. One interviewee observed '*We have been doing some baseline surveys, which we can then repeat… using the Common Standards Monitoring*' [methodology by Natural England] [Interview 1]. Strategic and technical decisions needed to be taken about the monitoring strategy to ensure it was specific enough to measure against targets, but also sustainable in terms of cost and labour. One interviewee described how their baseline combined digitization of available survey data (NVC data, designated areas, hydrology, and ditch quality data) and surveys to fill gaps and aerial photo interpretation for the final 15-20% of the area [Interview 6].

Initiatives routinely carried out repeat monitoring, most commonly on an annual basis, to measure habitat area, ecological processes operating or occupancy of a particular species in an area: '*So I go out every year and assess the habitat and the occupancy of these patches… and we can really use this to test the metapopulation theories in the field…* ', [Interview 2].

Many initiatives also monitored against social and socio-economic targets, including recreational monitoring, visitor surveys and impact assessments. However, measuring behaviour and perception could be challenging and requires creativity. Feedback forms, volunteer and visitor surveys, and even GPS tracking of recreational use were some strategies identified:

If we are trying to speak to so many people – is that actually generating more support? That's quite a difficult thing to measure… Something I'd be quite interested to do is to look at whether there is a change in what people are saying about the area… positive, negative or fewer comments? [Interview 12].

In the majority of initiatives, volunteers formed an integral part of monitoring strategies, making labour-intensive and time-consuming monitoring possible on a tight budget (see further discussion below on volunteering within LSC initiatives). Indeed some conservation managers admitted that their initiative would not function if it were not for the volunteers. Many initiatives had invested time and money into recruiting and training volunteers in survey methods. One initiative had organised a '*series of species surveying workshops" for which they were partnering with different organisations with expertise on each species (including bats, amphibians, wildfowl, etc.)*', [Interview 3]. Another commented: '*[We] phoned them up, like cold calls: 'do you mind telling us the butterflies you've got again? Have you got a local park by you? Can you tell us what's in there?' And most people [were] really sort of enthused, so we got about 350 people*' [Interview 4].

A major monitoring challenge was short project timescales, sometimes relates to unrealistic or overly ambitious targets: '*Expecting to see those species to have a response in three years is pretty hard, but we pulled out one species for each landscape that is already showing a response within three years and we started to present some of that data*', [Interview 2]. Shorter initiatives with time-bound funding often struggled to implement actions and monitor change to report: '*That's another frustrating thing in a way about the initiative approach – is that trying to change places within three years, and trying to detect any changes, is not really realistic*', [Interview 1]. In one case an interviewee described how the organisation was providing funding after completion of the initiative to carry on monitoring, '*because we want to know the answers'* [Interview 2].

New technology provided opportunities for monitoring at a large-scale:

Then we also surveyed every known extinct [species], which was quite innovative in those days… we surveyed every potential site… every disused railway… we did this by actually Google Earth-ing to sort of see if we could see any patches that might be remnant grass [Interview 4].

We put collars on, I think it was four of [the cattle], with GPS transmitters so that we could get point data for where they were over the grazing period over 2011… They tend to be drawn to the dried acid grassland [Interview 1].

The sharing of information amongst partners and the establishment of data centres are also important for data collection at a large-scale and over long periods:

The data we get coming in linked through the record centre and other things, that we're building networks now that can easily access that data. This should start showing us changes on nature reserves. We would hope we can prove, or we can show that where these woodlands have been increased over a larger area, the effects have been lessened in comparison to smaller isolated sites [Interview 11].

One LSC programme had developed programme-wide monitoring to assess their ability to work over large areas outside reserves:

"working at such a large-scale it is very hard to attribute one action to a reaction, but hopefully we can at least track if… in that area you will see a corresponding change. [Interview 12].

7. Climate change and large-scale conservation initiatives

Respondents had relatively little to say about how climate change impacted on their thinking about their initiative. Only a few interviewees reported that climate change considerations had been important in the initiative design. One commented "*in the time I have been involved, I have never heard any mention of climate change* [Interview 28]. Several respondents emphasized the unknown consequences of climate change and the need to accommodate uncertain future changes, citing this as a justification for the need for large-scale conservation and resilient landscapes ('The overall position is that we just don't know enough about what the likely impact is going to be', [Interview 5]). There was a general assumption that larger areas would be more resilient to climate change impacts:

We are looking at the landscape scale so that we can mitigate for whatever the impacts are [Interview 3].

You can't just work on that nature reserve mentality of, 'this is the site where [the species] will always be, this is where they've always been'… you have to build that variability and let them move around [Interview 2].

Climate change is going to cause changes across the country. The only way we believe we can mitigate against that would be to do landscape scale work [Interview 11]

A number of climate impacts were specifically mentioned by respondents. The most frequent related to alterations of precipitation and temperature leading to water deficit and/or surplus. Unsurprisingly, concerns about drought were commonly associated with wetland habitats that are naturally sensitive to moisture or hydrological changes: '*Because of the nature of the [wetland] landscape, it's obviously more vulnerable to climate change than maybe some other places*', [Interview 6].

Initiatives containing wetland and coastal habitat seemed to be most acutely aware of potential climate change impacts because impacts were expected to be larger and to occur sooner than in other habitats. Concerns included sea level rise, coastal squeeze and flood defence. Respondents noted the problem of identifying impacts. One respondent concerned with an upland initiative commented "*there are indications, from some of our*

monitoring, that some of the species are being affected by climate change, although it's quite difficult to pin these things down. You know … there are so many variables [Interview 23].

A number of respondents highlighted the need for habitat connectivity to minimize climate impacts on species ranges and assemblage. One interviewee pointed out that even conservation at a landscape-scale was not extensive enough to tackle climate change impacts for migratory species: '*For our migratory species, the fact that climate change is going on elsewhere… it's about making this… area as good as it can be but perhaps making it more [through] advocacy in terms of different areas… It's a global issue [with] local impact*' [Interview 12].

Few specific socio-economic impacts of climate change were identified, although one interviewee mentioned the potential impact of climate change on water abstraction and farming:

Significant changes in rainfall, enough to influence the agricultural abstraction of water could have profound implications because if they change so much that the Environment Agency has to stop licensing water abstraction, it will put a huge different complexion on the viability of most agriculture… The alternative… could actually be hugely beneficial [for conservation] [Interview 5].

A few interviewees questioned whether it was appropriate to consider the direct ecological impacts of climate change in isolation from social, economic and political factors: '*It's not just what climate change will do, it's how farmers will react',* [Interview 6].

Respondents identified a number of sources of climate change data and information, such as the NERC [Natural Environment Research Council] Thames Estuary 2100 initiative, and the UK Climate Change Risk Assessment *('fairly generic but potentially could be really useful',* [Interview 12]).

Other sources of information and insights on climate change were: i) Researchers (e.g. '*some University [was recently] offering to do some more work for us* '[Interview 8], and *'We did have someone do their PhD on climate a few years ago. You know, it's an obvious place for people to come because of the body of data and because of the nature of the interesting features'* [Interview 23]; ii) Other projects (e.g. *"[The] County Council have got a coastal climate change initiative going on…* [Interview 12]; iii) Direct experience: *'We're currently in a drought situation now. That's going to be quite a powerful driver I think in terms of how we manage water',* [Interview 12].

Some initiatives had commissioned studies of climate change impacts and potential adaptation strategies, for example considering ecosystem services under two climate change scenarios to develop storylines for each of the habitats present [Interview 6]. The scope of such studies tended to be broad:

We're about to receive the final report … determining what plant communities can be established where, basically, and looking at the whole question of the water resource, the impact of climate change [Interview 8].

[The commissioned] work… it was a very broad-brush study and showed the use of carbon and the difference between the old [management] system and the new system [Interview 10].

We just got somebody on a two month contract… an officer looking at what climate change scenarios are for the… area and to try and shed some light for us on what future climates might look like and we then hope to carry that thinking through into what might the human responses to that be, and that might be the consequences of that be for the land management that we're seeking to promote at the moment [Interview 7].

Several interviewees criticised the investment of what in their opinion was too much time and funding into modelling future climatic conditions:

Other landscape initiatives I've been involved with, some of which have been very good, spend a lot of time navel gazing and modelling climate envelopes… [one initiative] spent three years examining climate resilience in this sort of landscape and they are not doing anything different than they would have done at the start [Interview 2].

There's no point getting consumed about trying to predict what it will look like in 50 years' time because you'll be wrong [Interview 2].

Some conservation managers saw other threats (e.g. policy change, development) as of greater or more immediate concern: '*The problem when you've got such a highly managed water system like this is that you very quickly realise that while climate change will have an impact, it won't have as big an impact as decisions that the Environment Agency makes about water control infrastructure*', [Interview 6].

There were several examples of plans or actions to adapt to or mitigate climate change. One initiative was actively working with the Environment Agency to look at water storage to try to create and sustain new habitats: "*There's plenty of water here in the winter, the problem is storing it so that we can use it in the summer*. [Interview 8]. Another was thinking about priorities: '*It's about managed retreat and selecting the areas that you're protecting… and the areas that you actually let go*' [Interview 12].

Several initiatives had responded to projected impacts on species ranges. One initiative had experimented with and designed scrapes and bunds to increase the tolerance of important food plants to experienced microclimate changes. Another initiative took account of future climate in choices about which tree species to plant:

This area is predicted not to be very good for beech in 50 – 100 years' time, and the other aspect is… a disease of Corsican pine which is thought to be increasing because of drying out through climate change. The Forestry Commission is no longer stocking with Corsican pine because of this [Interview 2].

Another interviewee commented: 'We would like to connect things up *'as soon as possible because, you know, things are going to get hotter in 50 years, there's no point waiting 200 years to connect them – [that's] not going to work… but we have to balance that against the evidence that things are actually changing, so there is a lot of monitoring going on',* [Interview 11].

More often, initiatives interviewed had either consciously decided not to alter their management after considering the potential impacts of climate change, or felt that their existing activities and plans were already sufficient or appropriate to tackle this added threat:

Other than allowing a mobility of species to the landscape, we're not envisaging that we need to do anything. We are relying on the genetic variability within the woodland and within species… and adaptability is inherent in the habitats and the species present [Interview 11].

8. Partnerships in large-scale conservation initiatives

8.1 Creating partnerships

Large conservation initiatives typically involve numerous partners and stakeholders. Partnership working is deemed by many LSC initiatives to be the only practicable way to implement conservation action across a large-scale:

Each partner is not only able to contribute different skills but also gain something from it… the project partners… all have their own strategic plans and their own targets and goals they have to deliver against, and so they hope [the initiative] can help them deliver… It's a sort of happy symbiotic relationship [Interview 8].

Partnerships, however, are not a solution to all problems: '*It's about making partnerships that make sense instead of partnerships for the sake of a partnership!',* [Interview 12].

Partnerships are often demanded by funding organisations. One interviewee commented:

when we applied, it had to be a very quick process… I talked to all our partners, most of them saw a copy of the [funding] application before it went. After I submitted the application, I found out that [another organisation] had submitted an application for doing virtually the same thing about five miles away… when [the funder] saw this they said, 'oh, not working in partnership, bunch of clowns!' [Interview 6].

A number of different kinds of organizations were involved as partners in large initiatives, including individual landowners (from small-scale up to large estates), charities, trusts, non-governmental organizations, clubs, research institutions, national conservation agencies, utilities, and private companies (e.g. mining companies, ports, railway, water and energy companies). Some initiatives were built on existing partnerships; others were newly established specifically for the purpose of the initiative. However, it should be noted that interviewees used the term *partner* broadly, to refer to close collaborators, broader stakeholders (e.g. landholders in the initiative area), those who influenced strategic decisions, and even funders or supporters. Such 'partners' may or may not be formally recognised as a partner through an agreement. Partners also played various roles, some being more distinct than others (e.g. research institutes contributing scientific advice and monitoring, sometimes on a contractual basis).

The number of partners at any one time may be limited by factors such as the timetable of a funding application, where some potential partners have the capacity to get involved and others do not:

In 18 months we got a very clear message from stakeholders and we kind of felt… that… it would not be possible to do this in 18 months. So we had to stick to the conservation sector. This is a conservation sector story [Interview 6].

Partnerships could overlap, such that any given organisation may have different roles in different partnerships. Some initiatives build around a partnership for bidding and delivery purposes which may include other partnerships in their own right, for example a number of the NIA proposals included Local Enterprise Partnerships as members ('partnerships of partnerships').

It was clear from all projects that it takes time to establish effective partnerships, that build upon (and further develop) social capital among partners. Partnerships are dynamic and over time can be changed or completely re-formed:

The wider partnership project, as opposed to just the [organisation's]… started in 2005 by the landowners, kind of completely separately… there was [another organisation's] project as well, that started before the landowners' one and that's been amalgamated [Interview 11].

Restructuring demands flexibility. For example, an existing partnership was re-formed into a Nature Delivery Group for the purposes of a Nature Improvement Area bid:

With the new structure they are putting into place, I imagine we will be one of the actual partners in this bigger partnership. But [another organisation], they sort of take charge of that partnership… direct and oversee decisions made [Interview 3].

Some initiatives reviewed partners at intervals. One did so roughly every 2-3 years, asking: '*Who are the stakeholders, the people who are interested in what we're doing? When did we last engage with them? Have people within those groups changed?... Do we need to re-engage with that group to make sure that [a] senior manager or [a] particularly influential person is up to speed on what we're doing?*' [Interview 9].

Many LSC initiatives had grown out of previous projects, often smaller in extent. Conservation initiatives can therefore have deep roots. Particular initiatives may be linked to higher level or national programmes (such as Catchment Sensitive Farming, RSPB Futurescapes, or Butterfly Conservation Target Areas), or fit within government conservation zoning schemes (Nature Improvement Areas, HLS Target Areas, National Character Areas, or Protected area initiatives such as AONBs). Some initiatives were explicitly pilot or demonstration projects with the objective of roll out to other areas (e.g. IBDAs, ecosystem service pilots). Some linked adjacent conservation properties (e.g. the Wild Ennerdale project, Browning and Yanik 2004).

The continuity of partnerships and of activities in a specific area through a sequence of 'precursor' projects assists with developing experience and submission of proposals for new initiatives, as indicated in bids to establish Nature Improvement Areas (both successful and unsuccessful). An example is the Nene Valley, which has been the focus of conservation

projects since the 1980s, long predating the current Nene Valley NIA (Figure 4.1; see also Chapter 2 in this report, and Macgregor and others 2012). Smaller precursor projects and conservation areas had often provided the core of partnerships that later launched bigger and more ambitious initiatives.

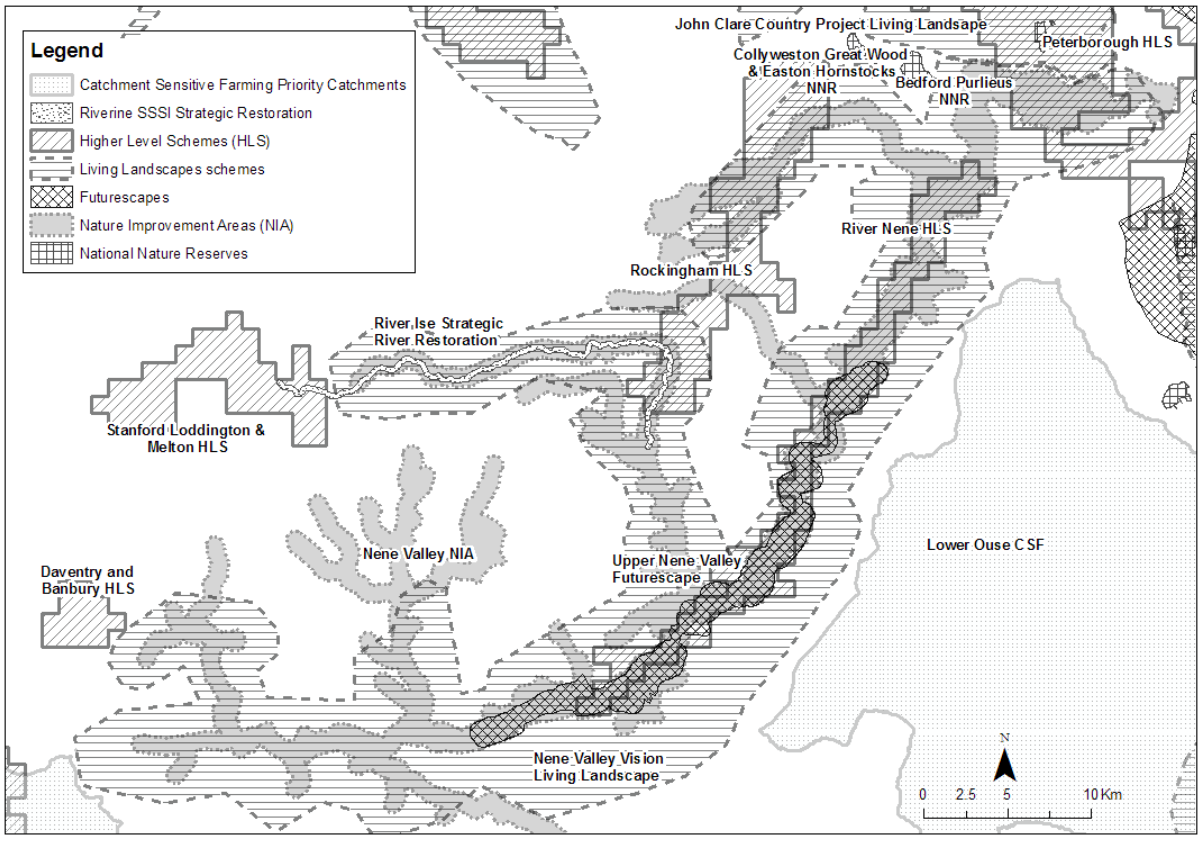

Figure 4.1 **Map showing the boundary of the Nene Valley Nature Improvement Area and the conservation areas that already existed in or near the new NIA when it was established. The boundary of the Wildlife Trust's Living Landscape has since been adjusted to match the NIA boundary**

Organizations bring their own unique experience and established policies into partnerships. Inevitably these differ among partners, requiring compromises. There were no definitive examples among the initiatives studied of well-established negotiation or conflict resolution mechanisms, but interviewees identified some of the strategies that facilitate negotiation among partners. The coordination of frequent meetings (whether formal or informal) between partners and other stakeholders was deemed to be an important negotiation strategy and method to avoid the duplication of effort across a large area. In initiatives having an advisory component it may also be important to coordinate with non-partner actors in the area to provide a consistent message to landholders:

With these landscape-scale things, a private landowner here… doesn't want 15 people coming on 15 different days telling him contradictory things. So… we tried to let [other organizations] know what we were doing and invite them along [Interview 2].

[The partners] had monthly meetings set up, and [according] to the guys that project manage… that was actually really important to kind of keep the relationship going [Interview 12].

It's a case of making sure that I'm not doing what one of the partners is already doing because then confusion can arise and you don't want to replicate what is already being done [Interview 3].

A number of interviewees highlighted that working at a large-scale affords partners room and flexibility to take advantage of different opportunities, and to work to their strengths. An unexpectedly high proportion of interviewees suggested that differences of opinion between partners had not been a problem to date in their initiative. Many described minor issues that they were able to work through either collectively at meetings and workshops, or through a series of one-to-one consultations:

The good thing about working at a landscape scale it that you don't have to obsess so much about an individual site. It takes the pressure off, you can say, 'well ok, we'll do it next door.'… there's no point pushing on closed doors [Interview 2].

We had a discussion… and we basically said, 'well, we can say this, you can say that, so if you're going to write this response, then it has to come from these named members and not from the partnership as a whole, and then this separate thing can come from us'. And that seemed to work [Interview 11].

That is not to say that conflicts don't exist in large-scale conservation. Conservationists can have drastically different opinions about what form of management is most suitable for an area and about the ultimate conservation objectives (for example in woodlands, with respect to the balance of felling and replanting). Interviewees spoke of the importance of continued engagement with other partners to create consensus over management approaches. In a few cases differences could not be resolved and conflicts had led partners to part ways and work independently; however this was rare:

We've had our fingers slightly burnt with [an organisation] because they did take the work that was done… and almost hold it up as a [project of their own]… But then you don't want to end up in the position that you completely burn your bridges… so they are not formal partners [Interview 1].

With the result that our involvement at [the Parish Council] has ended because they've decided that they would like to do it themselves… they didn't like the scale of tree clearance we were pushing for… after years of investment in the site and trying to restore it, it is now looking in pretty poor shape [Interview 5].

*[*Organisation*] have been a very very difficult organisation to engage with. Their organizational structure is impenetrable. You don't understand who reports to who, how the departments fit together, the language they use is awful [Interview 6].*

9. Governance and strategic decision making

Interviews suggested that strategic decisions were made by different people and at different levels depending on the governance structure of an initiative. Most initiatives commonly had a 'Project Manager' or 'Project Officer' from the lead organisation or partnership in charge of the strategic direction of an initiative:

My role [as Head of Property and Projects] is to sort of oversee that. I don't line manage them directly but what I do is provide the strategic steer, so in terms of working with our partners: Forestry Commission, Local Authorities and a large private landowner, I provide the link there really [Interview 5].

We have an Action Plan and I try to develop different elements of the action plan to achieve the wishes of the [initiative] partners [Interview 8].

A number of initiatives were part of broader programmes (for example: Futurescapes or Living Landscapes), and through these were influenced by policies and ideas from national, regional or even local offices of national conservation organizations and agencies. As one interviewee commented "*they pay for that*." [Interview 7]. On the other hand, local discussion was extremely important:

The Programme Manager… sits on all of our project boards, and so that's kind of setting the overall direction, but in terms of how we make those decisions, it's working internally with our knowledge of the partners on the ground and what the opportunities [are] [Interview 11].

Various kinds of agreements formed the basis of partnerships, including formal contracts, management agreements, memoranda of understanding and letters of support. Agreements were most commonly financially driven – either a requirement for funding bids or to confirm existing financial commitments:

We do have agreements with [the District Council and the EA] covering their financial support… They want something for their money… which we deliver [Interview 7].

The project partners are bound together by a legal agreement called a Collaborative Agreement and that binds them to financially support the project and to meet, at least six times a year... It's only been in existence about three or four years [into a well-established initiative]… I think probably the project got to the point where commitment had to be expressed in financial terms [Interview 8].

In the majority of cases interviewees pointed out that existing agreements were fairly informal and few were actually legally binding. Some conservation managers openly

acknowledged the risk associated with informal agreements, yet it did not seem that formalizing agreements was seen as a priority:

As part of the bid, we got people like Natural England, and [….], to sign a letter of support. So all the project site owners, we got them to say, 'yes, we support this project,' without, you know, committing themselves to whatever… it's word of mouth rather than a formal agreement [Interview 4].

I wouldn't say it's quite formalised, it's a page and a half of A4… It was a case of… having the document in place to bring the three partners together… that all the Directors signed up. Again, that took time… I think about a year and a half in total really [Interview 9].

It's a fairly loose agreement [with the cattle grazer], he didn't want to sign up to a very formal agreement, and I think we just took the risk that we'd go with it… up to now it has proved to be fine." [Interview 1].

There are not any contracts, we have the business plan, which was set for the bid stage, that I imagine every partner was involved with and did see [Interview 3].

We are intending to refresh and update that memorandum; we just haven't got around to it yet [Interview 7].

For one initiative, discussion between partners was deemed to be a more sustainable and meaningful approach than having a legally binding memorandum:

The biggest threat to [the initiative] is organizational change, and one of the partners being transformed into something else. But our hope is that the more we become embedded into all of those organizations and the community, then whatever [entity] flows on… that that entity will be so impressed by [the initiative] that they will want to be a part of it, they'll want to carry it on [Interview 9].

Most initiatives had some kind of Steering Committee or Group made up of partner representatives, landholders, and other stakeholders. In some cases the Steering Committee was directly involved in strategic decision-making, while in other initiatives it was more a tool for keeping stakeholders informed. Partnership arrangements sometimes struggled with asymmetries of power (and wealth, especially in terms of staff time) among partners. One interviewee from an organisation with a national presence commented '*Yeah. I think its safe to say that we are the people with the money . . . at the moment*, [Interview 27]; another that *we're trying to make it less of a dominant partnership* [Interview 22].

The frequency, structure and purpose of meetings varied considerably between initiatives:

The Steering Committee meets six times a year and I [the Project Manager] manage that Committee… it's at that Committee that high level strategic decisions are taken and then I feed back to them, which areas of strategy or policy are being developed and how it's actually playing out on the ground [Interview 8].

There is only ever about five or six people at the meetings, maybe one or two representatives from each [partner organisation]. Generally it has just been a case of giving updates and then saying what the plan is [Interview 3].

We had a project Steering Group… and we would go back to them every year and check. But I think it's fair to say that the Steering Group was quite involved in the early stages, and then backed off and were happy to leave us to get on with it [Interview 2]

Where initiatives had multiple partners, negotiation strategies were important to resolve differences of opinion: *There will, no doubt, continue to be those tensions but we're working them out, certainly, within the partnership [Interview 27].* A number of different strategies for harmonizing the thinking and work of partners were identified during the interviews. Steering Group meetings and workshops were often useful to share ideas and to guide collective decisions, but several interviewees stressed the importance of one-to-one interaction to fully understand where each stakeholder is coming from and to develop strategic documents. A combination of different methods often worked best. It was important to have the time to work through differences:

We did more one-to-one meetings, more iterations… and the final workshop… was a very much calmer workshop [Interview 6].

Because we've not had a deadline to have to have agreement by, you sometimes have to say, 'well sorry, we just have to accept that we don't agree with each other.'… if the disagreement is going against what the vision is about then that gives us a clear reason so say, 'this isn't appropriate' [Interview 9].

In some cases, a clear upfront vision for an initiative provided an important reference point to guide decision-making:

Having a very strong vision, and people signed up to that vision – a very simple but very strong vision that you can keep referring back to… maintaining that, and sticking to that…spending time getting the right vision. You could argue that we spent there to four years before we actually got to the point that we had our vision [Interview 9].

There is a Master Plan, which was funded by the landowners and produced in 2007. It is a massive document, which sets out the ideals of what the partnership, as a whole, would like to do [Interview 11].

However, not all initiatives had a closely defined vision or plan. Quite a few interviewees described a less structured and more opportunistic approach. This allowed decision-makers to make ad-hoc trade-offs:

I've got no, if you like, 'structure' to kind of make that [strategic] assessment… I think it will probably be a subjective one in the end, and one that is driven by cost… In terms of what we've decided to do, that's largely been determined by our own experience and opportunities [Interview 1].

We tend to be fairly ad hoc… we probably see ourselves as the sort of champions of an overall vision for the area, but the collaborative working tends to be… more site-specific [Interview 7].

Because there are various teams working on this project, we meet up occasionally and say, 'right, who's working on what now? Are we linking it in?' [Interview 11].

I think they will just see where this project goes, and then make decisions from there [Interview 3].

We had a lot of reservations initially about writing anything down and [with] the idea of developing a management plan… how do you have a management plan for something that you're not in control of… [when] you're allowing natural processes to develop for you? There might be things that trigger us to think, 'right, we need to put something in writing for this.'" [Interview 9].

Milestones such as funding applications or the end of a funding period are important opportunities to re-assess strategic direction:

We are at the point of reviewing where we are going next because the Biffa [award] money has now run out." [Interview 1].

So 20 years [at the end of the HLF contract] is a good opportunity to look at it again… it will be a time of reckoning and change, or not [Interview 10].

We're reviewing the plan currently after five years. This is somewhat more difficult in some respects because we've got an existing plan… we've got that kind of structure… and we're trying to decide now – is that the right structure going forward? [Interview 9].

Initiatives may update plans and strategies based on current experience, or may commission a study to guide a particular strategic decision. One interviewee explained that they commissioned a study because they '*wanted something that would give [them] a clue as to what to do next*!' [Interview 6]. Another pointed out that their priorities '*based on the underpinning science*,' had not changed [Interview 2].

10 Land tenure and management

LSC initiatives not only involve different numbers and kinds of partners, they include land held under a variety of different forms of tenure: owned or occupied by private, public and non-governmental actors.

In conservation initiatives with a single or a small number of landowners, relatively complete management control can potentially be established over the entire area (Hodge and Adams 2013). This makes it possible for managers to pursue objectives such as 'rewilding', minimizing human impact and allow natural processes to take place. However, patterns of land tenure in large-scale initiatives can be highly complex, and use-rights (e.g. grazing

rights or access) can be separated from land ownership: areas of commons are particularly complex.

Negotiations about grazing are complex; one in-depth survey respondent commented: "*Yes, it is delicate, yes and, you know, in an area many... of the farmers have grazed here for generations*" [Interview 23]. Initiatives owned by one or a small number of owners are not exempt from government regulation (e.g. on planting or felling trees, or feral livestock management). One interviewee observed that 'privately owned' initiatives tend to have markedly fewer staff employed than initiatives with more complicated ownership arrangements (and perhaps more public money).

Land acquisition is often a mechanism used by initiatives to gain management control over an expanded or particularly valuable area by enlarging or linking reserves. For example, "*in the first 10 years, the project partnership [of one initiative] managed to gain ownership of more than 50% of the project area*." [Interview 8]. Acquisition of this scale was made possible through an extremely large Heritage Lottery Fund grant, but even in this case the acquired land included areas with different farm tenancies. When short-term tenancies expire management of the land returns to the landlord, but long-term tenancies under the Agricultural Holdings Act (AHA) can last up to three generations, so the initiative must engage with the tenants to influence management:

Our aspiration [is] to increase the woodland area and increase connectivity. Effectively, the only thing that constrains us there is availability of land tenure and funding within the constraints of our own policies [Interview 11].

Ownership is not the be all and end all of it, it's management control that's really essential [Interview 8].

In another initiative, where only a fifth of the land area was under conservation management by partners, strategic land purchase of former peat extraction sites had enabled the initiative to defend the hydrology of the landscape. One of these sites was of particular importance because the extraction of peat was not completed. One of the challenges identified from this initiative was that:

'a lot of the planning permissions for peat extraction pre-date designation, so this [site] is [now] about as designated as you can get in this country. It's an SSSI… European SPA, it's also a Ramsar site… and yet… with planning permission [to extract peat]' [Interview 6].

Many LSC initiatives focused primarily on existing reserves or protected areas, and involve either direct expansion or physical linking of these areas, or engagement with the nearby or surrounding landholders. Some initiatives were carrying out much of their active habitat management or restoration within the existing reserves (where they had management control), aiming to influence land management outside the reserve(s) through an advisory role. Most often advice related to informing and assisting landholders to apply for payments for improved management (through agri-environment or Woodland Grant Schemes).

For some initiatives the 'core' reserves made up only a small fraction of the total area, but included key habitats: '*It's a very small percentage of the whole thing that is actually owned by [partner organizations]… however we probably own the majority of woodland within the project area*', [Interview 11]. .

Sometimes, lead organizations did not own any land within the initiative area. This could be an opportunity to focus on the areas within the initiative that were in most need of attention: '*That's probably where it's very different from [other LSC initiatives] – where they start with their ownership and then work outwards. We didn't have that, so we started with the best bits, or the bits that need help the most*', [Interview 2]. It could on the other hand be a challenge: '*Within the project area, we only manage other people's land…. It is very difficult because the mechanisms for delivering land use change are fairly weak … It's difficult to convince anybody in this area to… do anything drastic*', [Interview 5].

Land tenure in many initiatives is a complicated mixture of private and public ownership, lease and management agreements. Public land such as that owned by Local Authorities, City Councils, Highway Agencies and Country Parks may provide important areas of green space or connecting land. Some initiatives involve utility companies that own land within the initiative area (Browning and Yanik 2004). Commonly, initiatives are working with large numbers of farm owners and tenants to increase awareness and improve management of agricultural landscapes – either to support the wildlife on farmland, or to improve the connectivity across the arable land that lies between patches of semi-natural habitat:

Quite a lot of the work is to do with supporting farmers getting into agri-environment schemes and then helping them to… optimize their work within agri-environment

agreements, and… quite a lot of work with the minerals industry and mineral planning [Interview 7].

Two interviewees discussed initiatives working across administrative boundaries; a national border in one case, and a county border in the other. Cross-boundary initiatives have added complexity concerning policy, partnerships and funding, but they face these challenges to benefit ecologically:

Although we got a lot of our funding from the Heritage Lottery Fund, and like most funders they are based on a regional basis, but they gave us permission to spend the money across the whole area – because we made the argument that the wildlife doesn't respect the county boundaries! [Interview 2].

11. Communication and engagement

Communication and engagement with a variety of audiences was of great importance to many LSC initiatives. In some cases entire teams of staff were devoted to communicating the importance of the existing wildlife, and the purpose and long-term aims of different management practices, especially when proposed management might appear radical and obtrusive. Communication was often a two-way exchange involving listening to what people had to say, and gauging their responses.

It may be straightforward to engage with people who are already interested in nature or the outdoors, but it could be a challenge to reach new audiences:

It's fair to say that we did very well at engaging with existing audiences, people who already had some interest in wildlife, but in this project we probably did less well with getting new people from the city out into the woods… we found it very hard to get into those audiences, partly because we're trying to do so much else [Interview 2].

It's quite easy to get to people that are interested… it's the farmers that… have slightly less interest… how do you engage with them? [Interview 12].

Most initiatives highlighted the importance of communicating with local communities who may be affected by the work they are doing, and/or who may like to get involved. One interviewee described their general strategy to involve people and keep them informed through informal meetings, a newsletter and by always being available to meet or respond to emails. They also highlighted the importance of 'drip-feeding' successes so that the positive messages always outweigh the negative [Interview 4]. Many initiatives spent a great deal of effort on community consultation: *'You have the business plan …. and that was on the back of a huge amount of community consultation that'd been done, which identified four key themes we wanted to go forward on',* [Interview 28]

However, simply 'consulting' the community did not guarantee a unified view of what an initiative should seek to achieve. Communities are often diverse, and hold diverse opinions. Some people might support bold plans for an initiative in the hope that new jobs might be created, others might prefer a more conservative future, preserving the status quo: '*a lot of people moved into the area because it was the way they liked it and therefore there's always that slight tension that they don't want other things to happen, necessarily, that might change the elements that they're there to enjoy' [Interview 28].* Indeed, initiatives that have been successful in communicating widely and have become 'high profile', risk coming under critical scrutiny (locally and in the media). Some interviewees described their reluctance to "*blow the trumpet*" while getting established for fear that local communities might feel exploited. One interviewer commented:

'So, some of them I think, genuinely do feel threatened by what we're doing and quite upset by it. But, in terms of the actual landowners, our neighbours, our tenants, I don't think they do feel so threatened' [Interview 18].

Public engagement is seen to be of critical importance for the sustainability of many initiatives. For one of the initiatives interviewed, the only existing work to date focused solely

on community engagement and awareness, with the hope of bringing in more habitat management down the line. Interviewees expressed their belief that community engagement was needed to, "*achieve sustainable land use change*" [Interview 7], and that it was, "*important to keep the focus on maintaining the relationship with local people*" [Interview 1].

Initiatives used many different methods for communicating. Print media, such as articles in magazines and newspapers, banners, displays and leaflets, were widely used:

In the last four years we've had a regular newsletter … we produce about seventeen thousand copies three times a year. . . [Interview 18].

We used to meet once a year with those other landowners so the newsletter was, initially, a replacement for that but with modern technology and the fact that you can email newsletters to people . . . [it] serves a wider purpose now so it means we can, sort of, get the message out further [Interview 23].

The Internet was an increasingly important means of communication. Initiative websites were used to publish reports, photos and other resources, and to advertise volunteer opportunities and upcoming events. Activities including talks, guided walks, education programmes and other events were also commonly used as an opportunity for communication.

The use of appropriate and effective language was critical to the success of communication. One initiative hoped to find funding to hire a consultant, "*to do a sort of idiot's guide that explains in language that people might stand a chance of understanding and use that with the Local Authority, with the Environment Agency*." [Interview 6] The respondent commented '*We're very much talking a landowner language and trying to get them interested in the project*' [Interview 6].

Public engagement activities included: training events for volunteers; guided walks; landscape and management workshops; and forging links with existing associations and groups. Many interviewees highlighted individual one-to-one contact as an important means of engagement. The majority of initiatives aimed to support landowners and farmers to get into agri-environment schemes. Some initiatives had among their staff an advisor to engage with farmers and assisting with payment applications. When engaging with people it is important to approach conservation from a perspective that is familiar to them, and engagement by word-of-mouth and demonstration to neighbours can be invaluable. As one interviewee commented: '*if you can get one person on board, they can influence their neighbours*' [Interview 1]. Other observations on engagement were:

Whoever the landowner is, you need to understand what their objectives for the site are, and then see if you can fit in [your] objectives alongside that… You are trying to give free ecological knowledge that adds value to what they are already doing. They are the experts in the management [Interview 2].

A lot of the initial approaches were made by [the Farming and Wildlife Advisory Group – FWAG] because landowners see FWAG as part of the farming community a lot more than

they see [a conservation organisation] or if they were approached directly by one of these major landowners… we wouldn't have made contact with nearly as many landowners as we have done if they hadn't done the initial contacting for us [Interview 11].

We want to build a really strong link with the [National Farmers Union] in the region… it's about finding the influential farmers , and talking to them and getting them on our side, or at least willing to talk about it and using that as a network [Interview 12].

As described by one interviewee, engagement involved identifying the appropriate *driver* for each actor, where a *driver* can be described as, '*anything that will incentivise someone to do something that they a) don't know about, b) don't want to do, or c) aren't doing… but could be interested in*' [Interview 12]. For example drivers that motivate companies (like CSR responsibilities and profits) will differ from those of farmers. It is important to target appropriately to a specific audience.

Interviewees noted the importance of having a Project Officer '*who can get to know the area and get to know the individuals*' [Interview 2], and can act as an impartial advisor who '*has some distance between… the landowner and the government grant'* [Interview 2]. Volunteers are also important advocates for an initiative, helping to get others engaged.

One initiative had established a Community and Education Team funded by the Heritage Lottery grant who were '*using heritage and education to make different sorts of links with the local community as well and we've found it's a very good way to get people interested in the initiative*' [Interview 8] The same initiative also set up a Community Forum to provide a platform for discussion about the '*legitimate concerns from the various stakeholders and from the communities in and around the project area*' [Interview 8]. One initiative had set up a Liaison Group that met every two to three years to discuss the development of the initiative.

The most coordinated example of an engagement strategy described during an interview was as follows:

We had a four-tiered strategy for the project of engaging with different audiences… the first tier was the general public… that was public talks, guided walks in the woods… advertise on church notice boards… The next level up was volunteer training. So that was giving existing and new volunteers better skills and actually helping them to get actively involved in conservation… everything from monitoring and identification through to chainsaw licenses and individual skills. The next level up was trying to engage with all the people who own these woods through landowner workshops. So very often the volunteers from level 2 would go out and meet someone or survey a wood and would then invite the landowner to come to a workshop… so we were helping them learn how to give advice or how to pass on information… The fourth level was actually going out one-on-one on their sites, so again our project officer would go out and give tailored advice… recommend what could be done, help them get a Forestry Commission grant for example… What we wanted was for the project to have a progression through those levels [Interview 2].

12. Funding of large-scale conservation

12.1 The hunt for funds

Funding is a key concern in almost all LSC initiatives. One in-depth interviewee commented "*the big stumbling block is funding*" [Interview 26]; another that "*A lot of the reason that it dried up was just because the funding dried up*" [Interview 28]. Nearly all in-depth interviewees saw their ability to find and secure funding as a major challenge for their initiative. Indeed, the future of respondents' jobs often depended on it:

I mean, if we get this Heritage Lottery Fund my post continues for a period of time as well but if it doesn't. . . funding will always be a threat because … if we don't get that funding then we're almost. . . 'yes, it's a great project and we've achieved a lot but there's so much more we want to do'. . [Interview 25].

Searching for and preparing successful funding bids is time consuming:

We put this project together and we started fundraising for it in 2004, and it started in 2007 – and between those two dates the [species] went extinct in [the area]. So by the time it started, the [species] that we were going to hang it on wasn't there anymore. So we did the management, and then we reintroduced it [Interview 2].

One interviewee commented that they needed to be able to translate conservation management "*into the terms that people like Regional Development Agencies understand*". This meant, for example:

every pound of agri-environment [funding] that you spend in this landscape, what's the multiplier effect on it? How many jobs does it support? What kind of jobs? That sort of economic analysis so that we don't have to rely on making environmental arguments all the time [Interview 6].

Many interviewees explained that they, or other (in some cases shared) staff, spend a large proportion of their time in search of appropriate funding or reporting to existing funders:

We are being encouraged to engage with people who are managing our sites to manage them for biodiversity, for carbon, for water, but still within a fairly, not 'ad hoc', but disjointed funding framework which only looks at short-term funding [Interview 1].

As an example of a relatively simple funding arrangement, one long-term initiative described the funding sources it would receive over the current three year period: £50,000 of agency funding, £10,000 of Government funding for a specific management activity, and approximately £90,000 from the lead organisation (who in this case was the landowner) made up the match funding for a grant worth £180,000 from Biffa award. Following this three year period, the initiative planned to apply for further Biffa award funding, and would possibly join a large bid for EU LIFE funding or apply for HLF funding [Interview 1].

A few initiatives were starting to consider payment for ecosystem services (PES) and biodiversity offsetting as future long-term funding strategies, however this was still very much

in the development stage and interviewees acknowledged the potential challenges inherent in these mechanisms.

[XXXX] County Council are part of a pilot scheme for the Government on biodiversity offsetting… It's about trying that out and seeing if that does work to fund people managing land for conservation… that's very much in the early stages of development, but something we're looking at [Interview 12].

Securing ecosystems services from. . . from that landscape to foster a vibrant, stable growing population through creating opportunities for local enterprise and well-being, linked to the sustainable use of the land [Interview 27].

12.2 The influence of funding on LSC initiatives

Patterns of funding have profound effects on LSC initiatives. This takes two main forms. First, funding is short-term nature of funding cycles restricts long-term conservation visions. Second, the shape and priorities of initiatives are shaped by the priorities of funding organisations. Funders may stipulate a particular area within an existing initiative where the funds must be spent, or may require strict targets that may not necessarily be appropriate. The requirements of funders can constrain or direct conservation goals. One in-depth interviewee commented "*we tend to go where the funding is and where things work*" [Interview 26].

Funding sources used by LSC initiatives were diverse. They included the Heritage Lottery Fund, Landfill Funding (Biffa Award, SITA Trust, Waste Recycling Environmental[WREN]), European Union Funding (EU LIFE, INTERREG, WAVE), Charitable Trusts (e.g. Tubney Charitable Trust), Government schemes for Agri-environment (*Scottish Rural Development Programme, Glastir, Entry Level Stewardship, Higher Level Stewardship, Organic Entry Level Stewardship*), or woodlands (e.g. English Woodland Grant Scheme)

Conservation management over large areas and long time periods requires long-term financial commitment to provide adequate staffing, equipment and running costs. Yet interviewees noted that funding was mostly short term. As a result, resources had constantly to be refocused, preventing the consistency required to work at the landscape scale: '*So, you then spend another few months working, somehow, to meet the conditions before they give you the letter of permission to start and allow you to go ahead and that is quite interesting in itself, because there is no HLF funding provided for the six month gap that we had*', [Interview 21]. Funding applications (e.g. to the EU LIFE Programme) are a big commitment of staff resources with no guarantee of success – moreover, the applicant does not find out for 9-12 months whether or not they have been successful.

Higher Level Stewardship funding had been central to many initiatives. A brake on central HLS funds because of the Comprehensive Spending Review in 2010 meant that new HLS applications were put on hold. These grant schemes are the lifeblood of many LSC

initiatives, but widely problematic: as one Scottish project manager commented '*Well, SRDP* [Scotland Rural Development Programme] *is a real minefield* ...' [Interview 26].

To make conservation effective over a large-scale, many initiatives find themselves piecing together a number of different funding sources with their own restrictions and requirements – a balancing act to cover all the necessary elements of the initiative:

A lot of other projects, at least the other projects that I'm involved with… tend to literally be 'projects' – they are clearly defined, they've got a short period, maybe 3-4 years of funding … Everything comes together around a funding bid. But if we're talking about large landscape-scale management, the ecosystems, then that's actually not helpful [Interview 9].

The diversity of funding sources (and partners receiving funds) means that many initiatives experience, "*very complex financial administration*" [Interview 8] and organisations often employ a Grants Officers, or an entire team of people to work on grant applications, especially if the organisation runs a large-scale conservation programme or numerous LSC initiatives. Fundraising expertise was identified as a valuable asset, thus one person was said to be *'very good at writing bids in a language that funders like'* [Interview 3]. Specialised staff are important:

We have a Grants Officer whose job it is to find those funding streams and in discussions with the Chief Exec., the various Managers, puts together bids for particular projects which fit in with those funding streams… Since we've had the grants officer [three years ago], we've brought in obviously a lot more funding and been able to do a lot more projects [Interview 3].

Some funders may fund communication and engagement activities, while others will only fund habitat management or equipment costs. Rarely will one source be large enough or applicable to each element of an LSC initiative. Additionally, most major grant applications require matched funding, in some cases up to the same value as the grant applied for; meaning that initiatives must secure funds from partner organizations and/or other sources to qualify for a grant. In some cases matched funding can be raised by an initiative over the duration of the grant once it has been awarded.

Large organisations involved in multiple initiatives may seek to balance funds between them, or to concentrate resources on selected projects. In this way initiatives may effectively be competing for resources within one organisation.

Exit strategies after funding finishes are important. One interviewee noted that this was explicit in their funding applications '*the aim was to generate little armies of volunteers to carry on work after the project officer went*' [Interview 2]. One re-wilding initiative noted that such initiatives did not generally require large 'chunks' of funding, which may help sustainability:

'*It's simply about re-channeling the money that's already coming into the [area] through the forestry or through the farmers in different ways… yes, we have got some external funding in but we haven't had to go to the Lottery, or whatever… that's helped us keep our focus within*

the partnership as well… we're not meeting external organizations' deadlines or criteria', [Interview 2].

The dependence of many LSC initiatives on particular sources of funding means that project goals are often shaped by the interests or requirements of funders. One interviewee observed "*I mean, it does help with funding, you know, having some of these buzzwords in your application*" [Interview 26]. Several observed that it was important to resist the temptation to blindly adapt long-term conservation aims to match funding requirements:

You need to keep a scientific basis for why you're trying to do what you're doing and what your objectives are, and not just follow the funding [Interview 2].

If funders tie us to targets [that] we've got to do immediately, we ended up on a treadmill… if you want the outcomes, you need a relationship both with individual landowners and with the landowning community, and that happens over decades [Interview 6].

Funders' goals are not always a good fit for the work of a project: '*The [Project Officer] tended to use the project boundary as a bit blurry. But in terms of what we report to our funders, it's a hard line… we only report what we did inside*', [Interview 2]. Interviewees noted the need for care in seeking funding if its requirements did not align with the initiative's vision or objectives (e.g. requirements for strict ecological targets in a re-wildling initiative). One interviewee believed that initiatives need to be willing to decline funding:

Funding is really secondary to advocacy and people, because without those people the organisation's support isn't there and without support it doesn't matter how much money you've got – you can't do some things [Interview 9].

Often funders demand novelty, and will refuse to fund the same activity twice, even if it has been successful. This requires initiatives to either find new sources of funding to support on-going activities, or to adapt activities that are already working to get more funding from the same source:

With [landscape scale projects], people fund them, and then they say, 'fantastic, it's a great success – we can never fund it again. You've shown what works, now we can't pay for that, you have to do something different.' [Interview 2].

The proper solution is that funders realise that landowner engagement is the only way to do landscape scale conservation, and just bloody well fund it! [Interview 6].

A final challenge is that funding sources are dynamic and future or long-term funding is rarely guaranteed.

While we secured funding for… the visitor survey work… the Government pulled the plug on the growth area funding and also the whole green infrastructure agenda… with the result that there's not going to be the money to what we originally hoped there would be [Interview 5].

The priorities of funding also change as an initiative develops:

What we try to do now is build much more money up front from things like Landfill Communities Fund so that when a project starts, we have money already to chop trees down, to manage grassland, or whatever [Interview 2].

The SITA fund definitely kick-started the project… not only by getting contractors in to do the real heavy stuff to start off with... but also… paid for some of the equipment like chainsaws and… petrol [Interview 4].

You have to have a dollop to start with which helped towards the sort of capital costs of the purchase of the estate and that came from a group of funders ranging from big charitable trusts to private individuals [Interview 8].

13. Conclusions

Interviews with the managers of large-scale conservation initiatives in England, Scotland and Wales demonstrate the complexity of implementing conservation at a large-scale. This complexity arises partly because of the need to take action over a large area, and partly because this usually requires working with a large number of stakeholders and without any dedicated funding source over the long periods of time typically required. Many LSC initiatives are very ambitious, and have been started with no specific plan for reaching their stated goals. Large project areas are difficult and expensive to manage, especially where parcels of land are scattered. Control of a large area can be achieved through land acquisition, management agreements, or engagement with landowners. All have their own challenges. A long-term responsibility comes with large land acquisitions. There is an added complexity to working across administrative boundaries, where policy, funding sources and stakeholders may all differ.

13.1 Science and conservation planning

Large or ‘landscape scale’ conservation areas or zones have become an important feature of conservation in the UK. Several non-governmental organisations have taken a lead in developing innovative projects of considerable scale and ambition. Moreover, large-scale conservation is becoming increasingly central to policy thinking in the UK. The Lawton report, *Making Space for Nature* (Lawton and others 2010), recommended a landscape-scale approach to conservation. The UK National Ecosystem Assessment outlines the importance of ecosystem services in the UK context (UK National Ecosystem Assessment 2011). The 2011 English *Natural Environment White Paper* calls for the establishment of new Nature Improvement Areas to enhance and reconnect habitats, and the encouragement of Local Nature Partnerships.

There are important scientific questions about how effectively enlarged or connected conservation sites will conserve biodiversity, and meet other objectives such as the provision of ecosystem services, in the face of economic and climatic change, disease and invasive

species. These are all challenges that compound other pressures in unpredictable ways, particularly over long timescales.

The scale and ambition of LSC initiatives is leading to experimental and open-ended approaches to management that challenge conventional ways of doing conservation, and conventional or mechanistic conservation thinkers. Unpredictable future climate conditions make such approaches essential, but they are sometimes resisted by conservationists still intent on preserving a static 'nature'. Established approaches such as UK BAP tend to direct attention towards species and habitats in danger of being lost due to past and current pressures, rather than to encourage innovative thinking about the future.

Lindenmayer and others (2008) comment that "*"Research for over two decades has resulted in a large literature, yet there is little consensus on the applicability or even the existence of general principles or broad considerations that could guide landscape conservation".* They present a checklist of 13 issues under three themes important in landscape conservation (Table 4.1). Several of these are relevant to the data collected under this study.

Table 4.1 A checklist of important issues to foster the development of practical goals for landscape conservation (after Lindenmayer and others 2008)

Theme	Important Issues for landscape conservation
Setting goals	1. Develop long-term shared visions and quantifiable objectives
Spatial issues	2. Manage the entire mosaic, not just the pieces
	3. Consider both the amount and configuration of habitat and particular land cover types
	4. Identify disproportionately important species, processes and landscape elements
	5. Integrate aquatic and terrestrial environments
	6. Use a landscape classification and conceptual models appropriate to objectives
Temporal issues	7. Maintain the capability of landscapes to recover from disturbances
	8. Manage for change
	9. Accept inevitable time lags between events and consequences
Management approaches	10. Manage in an experimental framework
	11. Manage both species and ecosystems

12. Manage multiple scales

13. Allow for contingency

Develop long-term shared visions and quantifiable objectives: Interviews suggest that the recent growth in LCA projects in the UK reflects and long-term intentions on the part of conservation organisations. Whether large-scale conservation represents a *shared* vision amongst partners is a separate question. The discussion in this report shows the many ways partners are working together to deliver individual projects. However it is evident that lead organisations are still keen to promote independent and highly branded programmes of their own, as an important means of fund raising for lead organisations, most of which are charities. Many projects suggest a blend of science-based considerations and local and sometimes social visions at project sites.

Manage the entire mosaic, not just the pieces – Many projects involve action to 'improve the wider environment' which may be interpreted as management of *matrix* as opposed to *pieces*. There seems to be increasing attention on broader conservation aims in large projects.

Identify disproportionately important species, processes and landscape elements – many projects have been specifically designed (at least initially) to address conservation of important species (especially birds and butterflies or moths) though these might have been on selected on the basis of rarity/conservation priority rather than importance to the ecosystem. Some processes (particularly associated with water (flood depth and duration, water quality, stream erosion and deposition) are important, especially in initiatives seeking to 're-wild' landscapes, or adopt an open-ended approach.

Where project managers are open to such dynamic approach, there is generally an explicit concern to: *maintain the capability of landscapes to recovery from disturbances.* Nationally, an example of this is the Wild Ennerdale partnership project led by the National Trust. Its vision is to allow the evolution of Ennerdale as a wild valley for the benefit of people, relying more on natural processes to shape its landscape and ecology', which includes the key principle that, "the valleys landscape and habitats will be given greater freedom to develop under natural processes, allowing robust and functioning ecosystems to develop on a landscape scale" (Wild Ennerdale 2011).

Most interviewees were aware of considerations relating to future climate change, although this general awareness had surprisingly limited impact on management decisions in most cases. The intent to be of long duration of many UK large conservation initiatives is relevant to Lindenmeyer and others' (2008) concern to have regard for the inevitability of *time lags between events and consequences*. Many LSC initiatives appeared to be managed *in an experimental framework*. A number undertook adaptive management, whether formally or *de facto* as project circumstances changed. Most initiatives had regard for the need to *manage both species and ecosystems,* although some were more specifically focused.

Environmental monitoring appears often to be a 'Cinderella activity' in large conservation areas, developed late, undertaken with a low intensity and focused on short periods with

rarely long term commitments past the life of the conservation initiative and infrequent evaluation. Often this was the result of funding being more focused on delivery on the ground than research and monitoring (e.g. ELS/HLS schemes, where conservation objectives do not include monitoring activities).

13.2 Partnerships

Coordination of partners is everywhere recognized as a key issue, to ensure that efforts are not duplicated and that messages are consistent. There is a particular need to ensure that all partners understand and support the approach being taken, especially where this involves experimental and open-ended approaches to conservation that might interfere with access or appear very different from the way that some individual partners might manage their own reserves and other sites. The approach must be flexible and must make sense to partners, otherwise the project cannot survive.

The conservation objectives or approaches of different organizations can conflict, and it can be difficult to reach compromise. There can be trade-offs between the formalization of partnerships (securing investment and commitment, minimizing risk of staff turnover) and fostering informal relationships between organizations (flexibility to get around policy restrictions and other challenges and to respond to other opportunities).

Key conclusions:

The building of genuine partnerships and relationships takes time.

A well coordinated partnership working can allow funds to be effectively spent and can make use of partners different expertise and perspectives.

Key relationships between the individuals from partner organizations can be more important to an initiative than the actual organizations involved.

One-on-one contact is important for negotiation and to reach agreements

Formalised agreements (MoUs, management agreements) are often not required when partnerships and relationships are well established, and when advocacy is used to foster commitment – but initiatives can be vulnerable to staff turnover, changes of grants regimes or land ownership

A strong and clear vision for an initiative can allow partners, funders and other stakeholders to negotiate and guide strategic decisions. However, it is important to make time and space for flexibility so that you can capitalize on opportunities, adapt to challenges that arise and incorporate lessons into the initiative as you go along

Allowing initiative staff to balance their work among partner organizations, or hosting office space with a partner facilitates networking and allows them to make use of their expertise and contacts

13.3 Communication with stakeholders

Equally important is effective and clear communication with stakeholders, particularly the general public or local landowners and communities. Inconsistent and unclear terms to describe LSC initiatives limit public (and professional) understanding: a clear terminology for large conservation projects is urgently needed.

There is real potential for public dissatisfaction with or misconception about the aims and objectives of LSC initiatives, especially where management is novel or affects the appearance of or access to the countryside. Communication barriers (both within partnerships and outwards to communities and other stakeholders) are often cultural and personal, and are exacerbated by not having enough time to develop and legitimate goals for conservation that are genuinely shared. It is logistically and conceptually challenging to communicate and engage with 'new' audiences, especially in urban areas. There can be a trade-off between publicizing conservation achievements widely (e.g. media coverage, website, etc.) and fostering local ownership and support.

Key conclusions:

Time is needed to build relationships with landowners and local communities and to understand the involvement and perception of different stakeholders in the area

Conservation objectives need to be presented to landowners in a way that makes sense to them, and in a way that will make it in their interest to be involved

It is important early on to foster local understanding about an initiative and encourage engagement in order to develop shared understandings that prevent misunderstandings and complaints

Word-of-mouth, demonstration, leadership (champion farmers) and site visits are useful approaches to encourage the participation of landowners

There needs to be frequent and relevant feedback to stakeholders to maintain their support and interest

There is a need for money at the start of a initiative/initiative to kick-start activities, to implement on the ground, and possibly to acquire land

Different approaches are needed to engage and communicate with different audiences because people respond differently

Project officers help to link partners and can act as impartial advisors between landowners and grant-giving agencies

13.4 Supporting large-scale conservation in Great Britain

There are many large-scale conservation initiatives in England, Scotland and Wales, and they are highly diverse. It would aid communication within the field if definitions were clarified, and the relations between different 'schemes' were well communicated to the public and the media. It is important to recognise the huge diversity of approaches, and project partners, rather than assuming that 'one-size-fits-all'. Conservation objectives and approaches need to be based on the particular landscapes, ecosystems and wildlife involved; the stakeholders involved; the individuals (their experience and expertise) involved and local social and political conditions.

The nature of funding is central to the future of large-scale conservation in the UK. Most initiatives are dependent on external funding, especially grants for land purchase (particularly from the Heritage Lottery Fund) and agri- environment schemes. It is a major ongoing challenge for many initiatives to find and secure funding, and to find the time and staff to do so. Moreover some grant schemes are highly prescriptive, and unpredictability about the future shape of grant schemes make it difficult for initiatives to plan ahead and can impact on the sustainability of an initiative. Unrealistic deadlines for funding restrict effective partnership building, and lead to disorganized application processes. Competitive grant schemes do not necessarily drive up quality, but can waste scarce staff time and destabilise strategy within organizations that try to assemble consortia or modify objectives simply to become eligible to apply. Many organizations lack capacity to implement grant schemes effectively.

Key conclusions:

There is potential to foster opportunities to improve key relationships with funders, for example working to increases flexibility, to develop longer-term funding sources and to make application processes less bureaucratic and time consuming, and working to reduce unproductive funding targets and requirements.

LSC managers must be prepared to turn down funding if the requirements and targets do not match the initiative's vision and objectives, or if they are too bureaucratic

Flexible funding sources are rare but are extremely valuable

It is beneficial to have a suite of different funders to fund the different aspects of a LSC initiative – but beware overstretch in terms of reporting requirements

It is valuable to have a dedicated and experienced fundraising member of staff, a grants officer or an entire team to assist with multiple LSC initiatives or an entire LSC programme to prepare grant applications and to find and secure additional funding sources

Public grant schemes provide an incentive for landowners to implement conservation management but also help them to plan, become more organised, and develop relationships with other landowners and experts

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Chapter 5. The environmental outcomes of large-scale conservation in England, Scotland and Wales

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This chapter reports on a series of spatial analyses to investigate how LSC activity is distributed across Britain in relation to patterns of biodiversity and landscape character and existing protected areas, and whether there is a relationship between high levels of LSC and greater environmental improvements than would be expected by chance The approaches taken were:

- **a comparison of changes in human-perceived landscape 'character';**
- **a comparison of the differences in the relationships between key conservation indicators and LSC initiatives and the other English conservation strategies;**
- **an analysis of the relationships between LSC activity and climate vulnerability in England**
- **a comparison of *levels* of biodiversity and the extent of coverage of LSC initiatives across Great Britain**
- **a comparison of the relationship between *changes* in measures of biodiversity and the extent of coverage of LSC initiatives across Great Britain.**
- **a comparison of the relationship between *changes* in measures of biodiversity in ecologically similar areas with differing levels of LSC.**

1. Introduction

As outlined in Chapter 1, a major goal of the study was to analyse the environmental outcomes of large-scale conservation (LSC) in Britain and to determine whether areas with greater levels of LSC activity have achieved better outcomes for biodiversity and ecosystem services. Our main rationale for this work is that it remains unclear how effective this approach to conservation has so far been in contributing to the establishment and maintenance of coherent ecological networks in the UK in the ways suggested by Lawton *and others* (2010). This could reflect how difficult it is to conduct comparative studies on the effectiveness of large-scale conservation. There are three main reasons for this. First, it is very difficult to effectively match sites to reduce confounding variables and inherent selection bias in protected area designation (Andam *and others*, 2008) – that is, to compare 'like with like'. Second, the lack of availability of long-term data and resolution of data at an appropriate scale (Gaston *and others*, 2006) makes assessing the performance of any conservation strategies in meeting biodiversity targets notoriously difficult. Finally, analysing the effectiveness of creating the habitat networks advocated by Lawton adds an extra level of difficulty, as the configuration of the network tends to be correlated with the amount of habitat present (Fahrig 2003). As a result, despite their intuitive appeal based on strong

ecological principles, there is surprisingly little evidence for the effectiveness of conservation networks or corridors (see Tewksbury and others 2002 for a good example of where it does matter), or that there is any sort of strong effect of configuration of the landscape on biodiversity overall (Fahrig 2003; Yacobi and others 2007). To understand whether 'joined-up' conservation is more effective therefore, ideally requires data on species abundance both before and after management started, plus a method for controlling for the area managed when looking for habitat network effects, and also information on what the management would have been like had the conservation strategy not been put in place (Gaston *and others*, 2008).

Keeping the above caveats in mind, this part of the project aimed to address the following broad questions:

6) To what extent is LSC activity concentrated in the most environmentally distinctive and important parts of Britain?
7) To what extent does LSC activity complement or overlap with existing conservation networks (National Parks (NP), Areas of Outstanding Natural Beauty (AONB), Sites of Special Scientific Interest (SSSI), agri-environment schemes)?
8) What are the observed biodiversity benefits of LSC?
9) What are the ecosystem service benefits of LSC?

2. Methods

2.1 Approaches to investigating conservation outputs and environmental outcomes

We initially considered using monitoring data from individual LSC initiatives to investigate the land management that had been carried out and the environmental outcomes that had been achieved. However, as such data are both rare and variable in terms of both quality and the type collected, and because collecting new empirical data was beyond the scope of this project, it quickly became apparent that the only way of doing such an analysis at the scale of Britain was to take advantage of Britain's existing nationally consistent environmental datasets.

Several different approaches to answer the above questions emerged, with the aim of maximizing the number of ecological datasets already available in Britain that could be used for these analyses. The finest scale of analysis was at the 10 x 10 km grid resolution due to the limitations in our knowledge of the spatial extent of LSC and the resolution of the existing appropriate ecological datasets. However, in some instances, data limitations meant we were able to run analyses at the resolution of the 159 National Character Areas (NCAs)[23] in England only. The approaches taken here were:

[23] National Character Areas divide England into 159 distinct natural areas. Each is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries. https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making

7) A comparison of changes in human-perceived landscape 'character' – a cultural ecosystem service - and the distribution of LSC initiatives at the NCA resolution
8) A comparison of the differences in the relationships between key conservation indicators and LSC initiatives and the other English conservation strategies (SSSIs, NPs, AONBs) at the NCA resolution.
9) An analysis of the relationships between LSC activity and climate vulnerability in England at the NCA resolution.
10) A comparison of *current distributions* of biodiversity and the extent of coverage of LSC initiatives across Britain at the 10 x 10 km resolution. These analyses included statistical controls for environmental conditions.
11) A comparison of the relationship between *changes* in measures of biodiversity and the extent of coverage of LSC initiatives across Britain at the 10 x 10 km resolution. These analyses are only possible where time series data are available.
12) A comparison of the relationship between *changes* in measures of biodiversity in ecologically similar areas with differing levels of LSC. This analysis required an initial step of identifying the degree of ecological similarity of all 10 x 10 km grid cells in Britain. A side product of this step was producing a 'geographical distinctiveness' map of Britain that we hope will in itself be useful for policy makers and managers.

2.2. Quantifying the extent of LSC activity

Of the 777 LSC initiatives for which we had spatial data when the analysis was carried out, only 486 had polygon (shape) data associated with them. Polygon data for the other 291 LSC initiatives were created by buffering the point data (which was generated through the XY location data collected by a radius so that the corresponding circle had the same area as the conservation area. A similar approach has been used by the IUCN in its World Database on Protected Areas (WDPA), as discussed by Chape and others (2013). This simple approach makes the fewest assumptions about the true configuration of the LSC initiatives and therefore is the best choice in the absence of spatial data. A simple sensitivity analysis showed that this approach was a good approximation of using actual polygon data at the 10 x 10 km resolution.

As the majority of our analyses were at the 10 x 10 km resolution, a measure of the degree of LSC activity in each 10 x 10 km square was required. We used two different measures to capture different components of LSC activity (Figure 5.1):

1) **Cumulative LSC percentage cover**: We calculated the cumulative percentage cover (analogous to the well-established approach used for plants (e.g. Kershaw 1957) of LSC initiatives for each 10 x 10 km grid square to quantify the intensity of LSC activity in any given grid cell. For example, if LSC initiative A covers 50% of square, LSC initiative B 30%, and LSC initiative C 80% the percentage cover of the square will be 160% (Figure 5.2). We also calculated this measure at the NCA resolution.
2) **Cumulative LSC area**: While the cumulative percentage approach captures the amount of activity within a particular 10 x 10 km grid cell, it does not quantify the potential impact of the total size of LSC initiatives that are present within the grid cell. For example, LSC initiative A might cover 50% of a square, and be entirely contained

by the square (and therefore relatively small – 50 km^2), while LSC initiative B might only be 30% within the grid square, but have a total area of 200 km^2 and thereby potentially a greater impact on biodiversity within the grid square than LSC initiative A, even though B covers less area within the square itself. We therefore also calculated the cumulative LSC area represented in each grid square. For example, if LSC initiatives A, B and C all fall partially within a grid square, and have areas of 50, 200, and 10 km^2, respectively, then the total conservation area of the square is 260 km^2 (Figure 5.3). Again, overlapping LSC areas are double-counted in this approach.

The Pearson correlation between the two measures was $R = 0.68$ ($t = 48.4499$, $df = 2733$, $P < 0.001$), indicating the two measures, while related, are capturing different elements of the distributions of LSC initiatives.

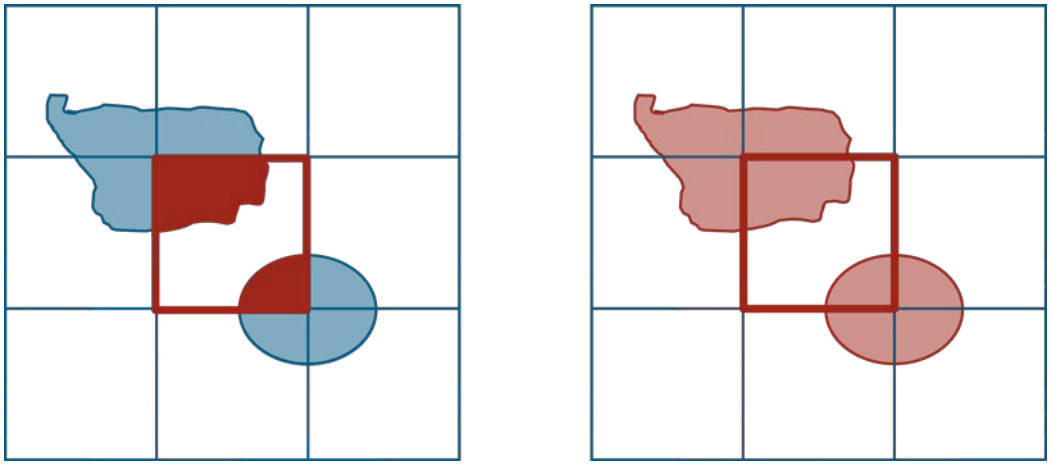

Figure 5.1 The extent of LSC activity in a 10 x 10 km grid square (outlined in bold) as measured by cumulative LSC percentage cover (left) and cumulative LSC area (right). In the former, only the area of the two LSC initiatives in this example that fall within the square are recorded, while in the latter the entire area of both LSC initiatives is recorded as both fall partially within the square of interest.

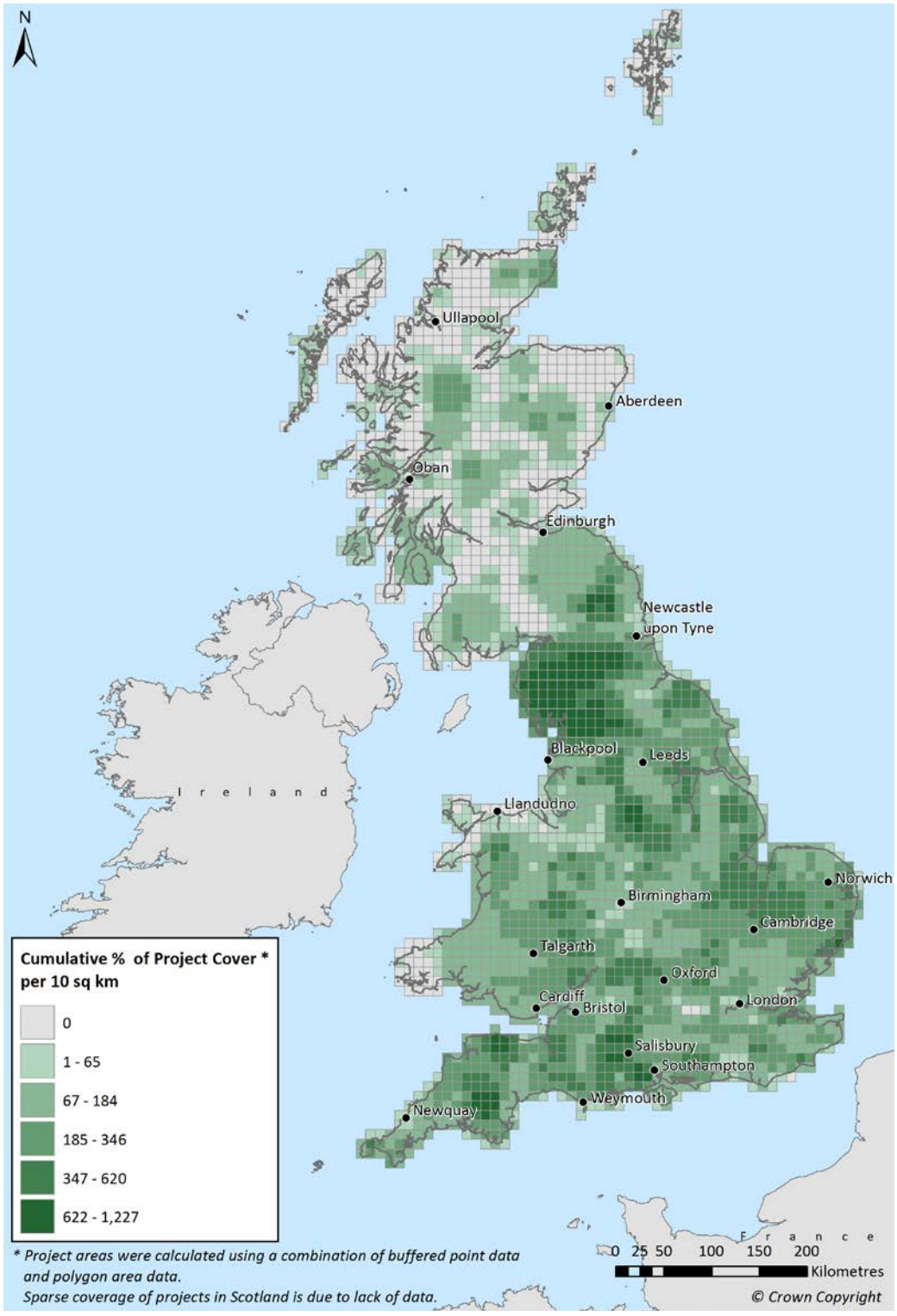

Figure 5.2 **Cumulative LSC percentage cover per 10 x 10 km^2 of area covered by LSC initiatives[24]**

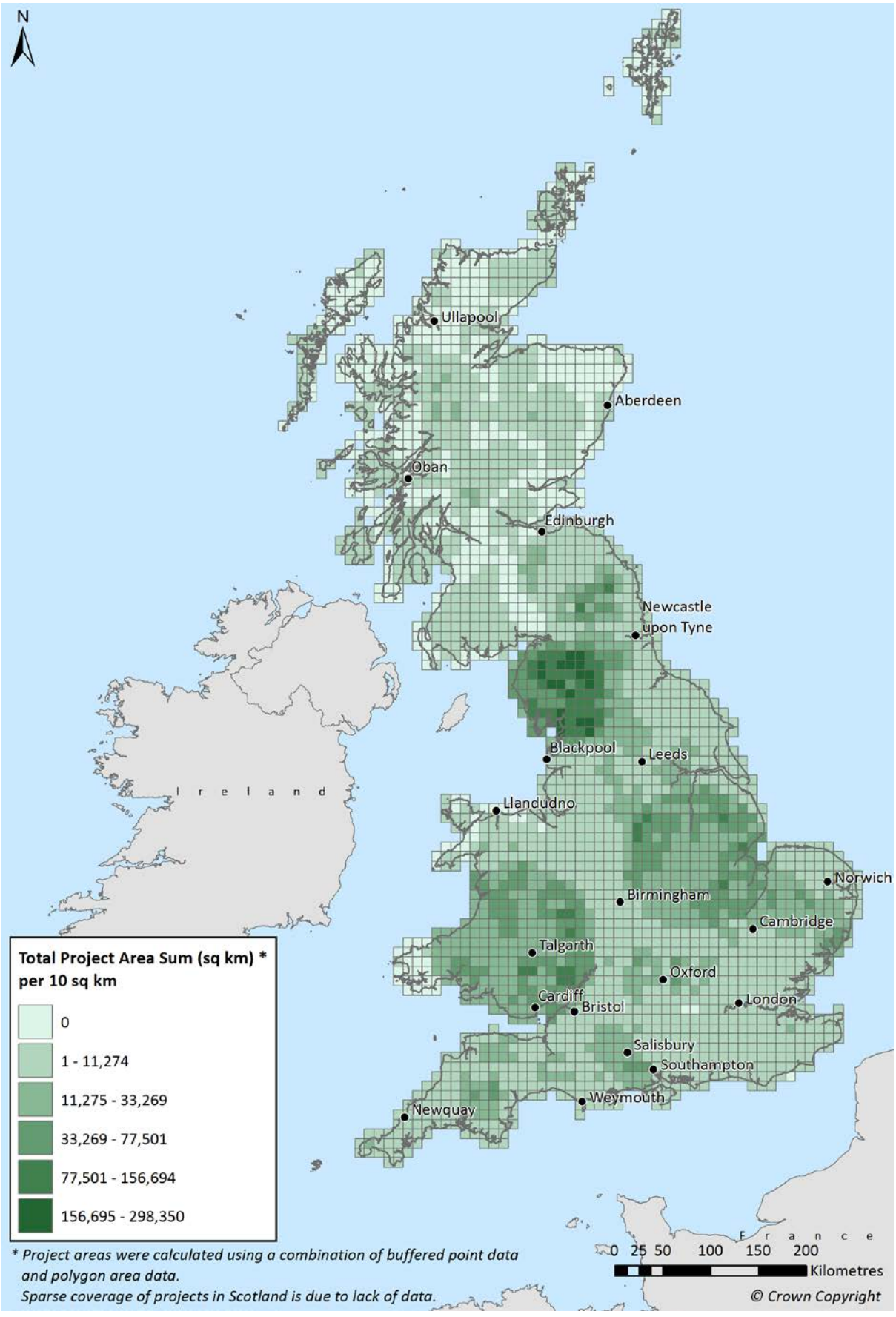

Figure 5.3 Cumulative LSC area of LSC initiatives per 10 x 10 km^2

2.3 A comparison of changes in human-perceived landscape character

The first temporal analysis we conducted was to quantify the extent to which changes human-perceived character of the landscapes (based on changes in the Countryside Quality Counts (CQCs) between 1999 and 2003; Haines-Young 2007) correlated with LSC activity. This analysis gives an indication of the relationship between LSC activity and landscape aesthetics – a cultural ecosystem service. As these data were gathered at the NCA resolution, we calculated the area of LSC (calculated as the total area of all LSC initiatives within that NCA) per NCA of a) all LSC initiatives and b) just LSC initiatives that were initiated in 2000 or earlier. We then ran one-way ANOVAs to see if there were significant differences in coverage between NCAs whose status remains consistent with their initial character ('maintained'), where there have been positive changes to the character('enhancing'), weakening or erosion of the character of the NCA ('neglected'), or fundamental, generally negative shifts in the character of the NCA ('diverging'). See Haines-Young 2007 for more details on the different components of the CQC: http://www.naturalengland.org.uk/ourwork/landscape/englands/character/cqc/default.aspx.

2.4 A comparison of the differences in the relationships between key conservation indicators and LSC initiatives and the other English conservation strategies (SSSIs, NPs, AONBs) at the NCA resolution

Two simple but important questions are 1) to what extent LSC activity occurs within the existing conservation infrastructure of Britain, and 2) to what extent LSC activity complements or duplicates the representation of biodiversity of these conservation strategies. We used two measures of LSC activity for all 641 LSC initiatives in England within each NCA: 1) the number of LSC initiatives in each NCA, based on assigning each LSC to a primary NCA; and 2) the cumulative percentage cover of LSC initiatives that fall in an NCA calculated the same way as 'cumulative LSC percent cover' at the 10 x 10 km resolution (Section 2.2). We then calculated the non-parametric Spearman correlation between our two measures of LSC activity per NCA described above and the distribution of National Parks, AONBs, SSSIs, NNRs, and local nature reserves ('local sites') at the NCA resolution in England. We also calculated the Spearman correlations between LSC activity, NPs, AONBs, SSSIs, and the degree of coverage by key habitat and BAP species. These analyses were conducted for England alone due to data limitations.

2.5 An analysis of the relationships between LSC activity and climate vulnerability in England at the NCA resolution

One aim of the study was to investigate the degree to which LSC activity is likely to support the adaptation of the British landscape to climate change. We used the GIS outputs of Natural England's climate change vulnerability models for England (Taylor and Knight, 2012), which provides an assessment of the relative vulnerability of Biodiversity Action Plan (BAP) habitats to climate change, to examine the relationship between our two measures of LSC activity and the climate change vulnerability variables at the NCA resolution. We used the same two measures of LSC activity at the NCA resolution as in Section 2.4: 1) the

primary NCA each LSC initiative was assigned to; and 2) the percentage cover of all LSC initiatives per NCA. These variables considered using the outputs of the climate change vulnerability model were:

- The percentage of all BAP habitat types covered by each NCA;

- The degree of habitat fragmentation, which includes calculations for landscape permeability and aggregation of similar habitat in surrounding squares;

- Sensitivity: The overall sensitivity to climate change, which is based on the England Biodiversity Strategies Classification of risk of direct impact of climate change; and

- Vulnerability, which is an overall assessment of relative vulnerability to climate change based on the conservation value, habitat sensitivity and adaptive capacity, which includes habitat fragmentation (structural complexity), topographical heterogeneity and habitat condition (Taylor and Knight, 2012).

As the original climate change data were at 200 x 200 m grid cell resolution, we needed to upscale the data to the NCA resolution. For percentage of BAP habitat, we summed the area of all BAP habitats by NCA and then divided by NCA area. For fragmentation, sensitivity and vulnerability we simply calculated the median value across all 200 x 200 m grid cells in each NCA. This means that 200 x 200 m grid cells that are split between one or more NCA (i.e. 20% of square in one, 80% in other) count the same in both/all NCAs they are in as 200 x 200 m squares that fall entirely within one NCA. This however, should not be a serious issue as a) the areas involved are small (that is, the vast majority of 200 x 200 m squares will fall within a single and b) we are using indices, which can easily apply to 2 or more places, and not finite values (e.g. grams of carbon). Medians were used rather than means for these values, to account for the wide variability within the data.

The relationship between the two measures of LSC activity and the climate change vulnerability variables was investigated using a non-parametric Spearman Rank correlation.

2.6 A comparison of *current distributions* of biodiversity and the extent of coverage of LSC initiatives across Britain

We obtained the best available nationally-consistent datasets on the distributions of species from the British Trust for Ornithology (BTO) – the 10 x 10 km resolution 1988-91 bird atlas data and 10 x 10 km data on the distributions of non-bird Biodiversity Action Plan (BAP) species from the Biological Records Centre (BRC) for these analyses. Unfortunately, the majority of the data within both datasets was collected before most LSC projects were put in place, so none of these datasets can be used to determine whether LSC increases protection of biodiversity; they can simply tell us whether LSC activity correlates with the distributions of biodiversity in Britain. We focused on analysing BAP species as a) datasets are likely to be most complete for these species and b) it is these species for which we would expect to see the greatest effects of conservation, as there is a legislative imperative to do so.

We reasoned that LSC activity might be to increase the likelihood of occurrence of BAP species over and above that predicted by physical environmental factors alone, brought about by the advantages of coherent management. For birds, we focused analyses on 16 Biodiversity Action Plan species from the list in Franco *and others* (2009) where we thought an effect might be found. We summed the occurrences of these species to produce an index of BAP species abundance ranging from 0 to 16 for each 10 km square. On closer examination, we found that despite being BAP species, several (e.g. Song thrush) were nevertheless widespread in Britain, precluding useful analysis of presence/absence data. We therefore selected the seven species in Table 4.8 (Section 4.3.3) for further analysis.

For the non-bird BAP species, we did not run models on individual species due to the lower reliability of the BRC data due to variations in sampling effort, but rather looked at the richness of BAP species for a suite of taxa.

As our aim was to test for an effect of LSC over and above physical environmental effects, we derived measures of bioclimate, human population pressure, geology and land cover for each 10 x 10 km square. Pearson correlations were then calculated between these variables to identify clusters of collinearity and Spearman correlations to identify additional curvilinear relationships. Following recent work by Dormann *and others* (2012), we removed the minimum number of variables possible to reduce the maximum correlation to below 0.7, an approach which is just as effective at minimising effects of collinearity as more sophisticated approaches (Dormann *and others* (2012). This left six physical environment variables (- three bioclimatic variables downloaded from WorldClim (http://www.worldclim.org/bioclim; Bio5 , Bio6, Bio12)human population density from the UK 2009 census(Pop09), dominant bedrock geology class from the British Geological Survey (6 classes; 'broadgeol') and the dominant land cover type from CEH's Land Cover Map 2000, to which we added the cumulative LSC percentage cover or cumulative abundance layers, respectively, as our index of LSC intensity. All the data were then masked to exclude 10 km squares outside England where the LSC data were weakest, and to remove cases where environmental data were missing, leaving 1,302 squares for analysis.

The number of BAP species was modelled using a Generalised Linear Model (GLM) with either Poisson errors and a log link function or negative binomial link function where overdispersion (conditional variance > conditional mean) was present in the count data. Presence-absence data for the seven selected bird species were modelled using a GLM with binomial error structure and a logit link.

2.7 A comparison of the relationship between *changes* in measures of biodiversity and the extent of coverage of LSC initiatives

The Countryside Survey (CS)(http://www.countrysidesurvey.org.uk/home) is the only large-scale dataset in Britain that allows reliable examination in changes of the countryside over time. The CS has been carried out at regular intervals since 1978 (1984, 1990, 1998 and 2007) and, where possible, plots are re-sampled over time. The countryside is sampled and studied using rigorous and consistent scientific methods. This allows the users of the data to compare new results with those from previous surveys, enabling the detection of gradual and subtle changes that occur in the UK's countryside over time.

Given that the LSC initiatives we consider here are relatively recent, we were particularly interested in changes that occurred between 1998 and 2007. The following components of the CS were sampled in these years:

- Freshwater invertebrate species;
- Freshwater chemistry;
- Freshwater river habitat;
- Landscape broad habitat;
- Soil invertebrates;
- Soil pH; and
- Vegetation species.

The CS is based on a stratified random sample of Britain, and is carried out at the 1 x 1km resolution. The squares are selected to represent all major habitat types in the UK. As the locations of the 1km squares are kept confidential to avoid any deliberate influences that could affect them or the features within them, we were able only to assign these squares to a particular 10 x 10 km grid dataset. We have no way of knowing whether the changes observed in the 1 x 1 km are representative of the 10 x 10 km as a whole, but the CS squares are intended to represent the surrounding landscape and so this is a reasonable assumption given the lack of evidence.

We examined relationships between 1) changes in soil pH; 2) changes in freshwater invertebrate community composition; 3) changes in soil invertebrate community composition; and 4) changes in plant / algae / bryophyte community composition and LSC coverage in England at the 10 x 10 km resolution. We have not run analyses for Britain (or for Scotland and Wales individually) as LSC spatial coverage of Wales and Scotland appears to be very incomplete.

For the preliminary analyses of soil pH, freshwater pH and conductivity, we simply calculated the non-parametric (Spearman's) correlations between changes in each of these indicators and LSC coverage.

We used multivariate ordination techniques to quantify the extent to which LSC coverage could predict changes in the community composition of vegetation and freshwater and soil invertebrates. More specifically, we used redundancy analysis (RDA) (Van den Wollenberg, 1977) to quantify changes in community structure. RDA is a type of constrained ordination in which the multivariate response is forced ("constrained") to be ordered on axes that are linear combinations of predefined predictors. In layman's terms, these RDA analyses can be thought of as being conceptually quite similar to a simple regression analyses in that – like in a standard linear regression – our goal was to see how well a single variable (LSC coverage) could predict a change in something of interest (the response variable – here a change in community structure). A constrained ordination such as RDA is suitable when the goal of the analysis is to investigate the effect of specific environmental variables (here coverage of LSC initiatives) on a multivariate response (i.e., the change in the percentage coverage of plant species). The statistical significance of the relationships between the community responses and these environmental variables was evaluated using Monte Carlo randomizations.

The ordinations were run in the same way for all three community-level analyses (vegetation, soil invertebrates and freshwater invertebrates). Only plots sampled in 1998

and then resampled in 2007 were selected for analysis. The mean cover of vegetation/abundance of invertebrates in each 10 by 10 km grid was calculated for 1998 and 2007 separately. The difference between cover in the two time periods was then calculated and used as our (multivariate) community response variable.

We also ran unconstrained ordinations (PCA) to identify overall extent of changes in community structure (irrespective of the driver of such changes).

Before each analysis, we transformed our species data (the multivariate response) so that the RDA or PCA ordination was calculated using chord distance as a measure of similarity between plots rather than the default Euclidean distance:

$$Y^1_{ij} = \frac{Y_{ij}}{\sqrt{\sum_{j=1}^{p} Y_{ij}^2}}$$

where Y_{ij} is the original data for species *j* in plot *i*, Y^1_{ij} the transformed data, and *p* the number of species. This transformation is used to compensate for problems that arise in RDA when large numbers of zeros are present in the dataset as is often the case in ecological studies, including this one (Legendre & Gallagher, 2001).

We did not use the more common canonical correspondence analysis (CCA) (Ter Braak, 1986) as this constrained ordination technique can give artificially high weightings to rare species due to the Chi-square distance measure on which it is based (Legendre & Gallagher, 2001). CCA ordination is also not possible when negative values are present, as was the case for the between-year changes in species. All analyses were run in R 2.15 (www.r-project.org).

We also extracted from the Countryside Survey changes in broad habitat types between 1998 and 2007 at the 10 x10 km resolution to see to what extent these correlate with LSC coverage; however, preliminary analyses showed that the data were not suitable for such analyses (results not shown).

2.8 A comparison of the relationship between *changes* in measures of biodiversity in ecologically similar areas with differing levels of LSC

Site matching and creation of a 'distinctiveness' map

Answering questions about the effectiveness of LSC ideally requires a comparison between areas that are similar in their socio-ecological characteristics but differ in the degree of LSC activity that is occurring (a counterfactual; e.g. Andam and others 2008, Nelson & Chomitz 2011). Counterfactuals are important as they provide a mechanism for overcoming the selection bias that is prevalent in conservation activities – nature conservation in Britain tends to occur in upland areas that have poor soils where there are fewer conflicts with other types of land use (Jackson & Gaston 2008). To address this, sites need to be matched to control for confounding variables / biases relating to the site itself such as topography, climate and habitat type. We did such 'site matching' using Maxent, a program developed to

predict species distributions using maximum entropy, and detailed environmental data (Phillips *and others*, 2006). Spatial maps were generated to create a 'distinctiveness map' based on topography, climate and habitat type across Britain, so we can compare 10km x 10km squares that are similar in most ways except management type.
Five variables were used for the matched square comparisons: broad bedrock geology class (6 classes –'broadgeol'); dominant land cover type based on Land Cover 2000 data; and three uncorrelated variables created using Principal Components Analysis (PCA). These PCA axes were created from a suite of environnmental variables commonly used in climate envelope models for birds and butterflies and include temperature and rainfall, growing degree days (all from Bioclim, as described earlier), and human population. The three axes used (which correspond to 94% of the variation in the original data) are as follows:

1) PCA1: Rainfall (based on annual precipitation, precipitation of the wettest month and precipitation of the driest month; all data obtained from Bioclim http://www.worldclim.org/bioclim);
2) PCA2: Temperature (based on annual mean temperature, maximum temperature of the warmest month, the minimum temperature of the coldest month and growing degree days; all data obtained from Bioclim http://www.worldclim.org/bioclim); and
3) PCA3: Human population from the 2009 UK census.

Datasets and analyses using the 'distinctiveness' map

Our initial goal was to compare matched pairs from the uniqueness map with a) no and b) extensive LSC activity. However, as there is some degree of LSC coverage for nearly all of England at the 10 x 10 km resolution, we instead selected matched pairs where one square had LSC coverage that was below the first quartile of the total distribution of LSC coverage in England, and where one square was in the top quartile of LSC distributions for England. We identified the subset of these 'matched pairs' in which both squares contained data from the Countryside Survey (the only biodiversity dataset collected during the time period that corresponded to the establishment of the majority of the LSC projects). This left us with 16 matched pairs for the vegetation data, but no matched pair for the soil or freshwater invertebrates. We then ran a set of paired t-test analyses for these 16 pairs based on changes in the abundance of 10 species of trees which showed the largest changes in the ordination analyses described earlier.

3. Results

3.1 A comparison of changes in human-perceived landscape character

There is considerable evidence that LSC activity is highest in NCAs where the Countryside Quality Counts (Haines-Young 2007) indicate that the quality of the countryside in terms of boundary features, agriculture and woodlands, and semi-natural features has an enhancing status, as opposed to a 'neglected' status, based on changes between 1998 and 2003. However, when we only looked at LSC initiatives that were established before 2000 (7% of all projects), there was a significant effect only for 'boundary features' - areas with

'enhancing' status had four times much LSC activity as areas with 'neglected' status (Table 5.1).

Table 5.1 **Significant associations with countryside 'character' and LSC coverage (cumulative percentage, hence values > 100%) in English NCAs. Means are only shown if there is an overall significant difference (one-way ANOVA); otherwise this comparison is labelled as 'NS'. Groups with non-significant (P < 0.05) differences between categories of changes based on Tukey's HSD test have the same letter associated with them.**

Character type and direction of change	Mean percent cover: Pre-2000 LSCIs	Mean percent cover: All LSCIs
Agriculture	NS	
-Enhancing		420a
-Maintained		283ab
-Neglected		238b
-Diverging		207b
-Unclassified		153b
Boundary		
-Enhancing	71a	481a
-Maintained	39a	343ab
-Neglected	16a	233bc
-Diverging		No data
-Unclassified		142c
Trees/woodland	NS	NS
Semi-natural		
-Enhancing		398a
-Maintained		258b
-Neglected		233b
-Diverging		No data
-Unclassified		144b
River and coastal	NS	NS
Overall change in CQQ	NS	
-Enhancing		
-Maintained		402a
-Neglected		308ab
-Diverging		223ab
-Unclassified		219ab
		142b

3.2 A comparison of the differences in the relationships between key conservation indicators and LSC initiatives and the other English conservation strategies (SSSIs, NPs, AONBs) at the NCA resolution

In short, LSC initiatives are broadly correlated with SSSIs and NNRs at the NCA resolution, but less so with NPs and AONBs. Moreover, LSC initiatives correlate well the NCAs most important to BAP biodiversity in England (Table 5.2), particularly the mammals. There was also a strong association between the percentage cover of broadleaved woodlands (based on the NIWT (National Inventory of Woodlands and Trees), which only includes woodlands greater than 1 ha in size) and the primary NCAs LSC initiatives were located in.

Table 5.2 **Spearman Rank correlations between two measures of LSC activity per NCA – the number of LSC initiatives in each NCA, based on assigning each LSC initiative to a primary NCA ('LSCI – primary'), and percentage coverage of the NCA by LSC initiatives ('% LSCI') – and various indicators of environmental condition ('Indicators') and percentage coverage of other conservation designations - local nature reserves ('% local'), % SSSI, % NNR, % NP,% AONB. All analyses are carried out for England only at the NCA resolution. The ranked importance of each NCA for the different BAP groups was carried out by Natural England. All correlations with *Rho* >~ 0.20 are significant at the 95% confidence level. Results of particular interest are highlighted in bold.**

Indicator	% Local	% SSSI	% NNR	% NP	% AONB	LSCI-primary	% LSCI
% broadleaf woodland	0.45	0.14	0.11	0.02	0.28	0.21	0.11
%woodland	0.44	0.26	0.16	0.15	0.24	0.26	0.28
% access land	0.43	0.51	0.29	0.27	0.17	0.22	0.49
%Farm Area	-0.28	-0.11	-0.08	0.07	0.21	-0.06	0.13
RiverDensity (m/ha)	-0.15	0.03	-0.08	0.34	-0.05	0.07	0.06
% RiversGoodStatus	0.04	0.23	0.03	0.37	0.27	0.12	0.48
% Lakes	0.13	0.25	0.11	0.2	-0.08	0.29	0.05
Mean elevation	0.15	0.07	-0.17	0.3	0.08	0.04	0.34
SD elevation	0.21	0.18	-0.12	0.36	0.17	0.11	0.4
%Urban	0.07	-0.13	0	-0.27	-0.15	0	-0.46
%SSSI	**0.14**	**1**	**0.7**	**0.27**	**0.29**	**0.64**	**0.52**
%NNR	0.03	0.7	1	0.11	0.19	0.53	0.31
%SAC	0.02	0.78	0.6	0.38	0.3	0.52	0.48
%SPA	-0.04	0.51	0.34	0.25	0.11	0.3	0.2
%Natura200	0.03	0.84	0.61	0.35	0.29	0.52	0.47
%Ramsar	-0.16	0.36	0.41	0	0.01	0.18	-0.05
SSSI % Favourable	-0.11	-0.08	0.04	-0.1	0.16	0.03	-0.19
SSSI % Recovering	0.16	0.16	0.03	0.12	-0.09	0.03	0.2
SSSI % No change	0	-0.09	-0.07	-0.07	-0.06	0.03	0.08
SSSI % Declining	-0.02	0.07	0.14	0.04	0.02	0.11	-0.02
% NP	**-0.18**	**0.27**	**0.11**	**1**	**-0.1**	**0.19**	**0.4**
% AONB	**0.18**	**0.29**	**0.19**	**-0.1**	**1**	**0.19**	**0.2**
BAP Blanket Bog %	0.05	0.34	-0.01	0.56	0	0.19	0.46
BAP Coastal Flood Plain %	-0.13	0.36	0.39	0.02	0.11	0.37	0.02
BAP Lowland Calc Grass %	0.01	0.21	0.17	-0.13	0.32	0.11	0.14
BAP Lowland Dry Acid Grass %	0.16	0.37	0.3	0.2	0.08	0.26	0.22
BAP Lowland Meadows %	0.03	0.38	0.37	0.01	0.13	0.41	0.23
BAP Purple Moor Grass %	-0.01	0.31	0.29	0.26	0.03	0.28	0.33
BAP Undetermined Grass %	0.07	0.2	0.25	-0.02	-0.01	0.28	-0.12
BAP Upland Calc Grass %	**0**	**0.32**	**0.05**	**0.61**	**0**	**0.16**	**0.44**

BAP Upland Hay Meadows %	-0.05	0.19	0.02	0.29	0.02	0.06	0.28
BAP Coastal Sand Dunes %	-0.1	0.18	0.31	-0.03	0.12	0.08	-0.04
BAP Coastal Vegetated Shingle %	0.01	0.29	0.29	-0.06	0.22	0.14	0.07
BAP Fens %	0.06	0.54	0.47	0.2	0.18	0.5	0.33
BAP Lowland Heath %	0.33	0.35	0.33	0.07	0.15	0.32	0.11
BAP Lowland Raised Bog %	-0.05	0.23	0.1	0.22	-0.11	0.17	0.21
BAP Mudflats %	0	0.34	0.38	-0.03	0.14	0.28	-0.03
BAP Reedbeds %	-0.11	0.38	0.42	-0.06	0.06	0.33	-0.03
BAP Upland Heath %	0	0.26	-0.02	0.56	-0.02	0.13	0.39
BAP Saline Lagoons %	-0.09	0.3	0.35	-0.03	0.12	0.17	0.01
BAP NIWT Broadleaved %	**0.22**	**0.4**	**0.32**	**0.11**	**0.28**	**0.53**	**0.11**
Importance for BAP Herps	-0.03	0.12	0.21	-0.13	-0.08	0.08	-0.01
Importance for BAP Birds	-0.03	0.07	0.14	-0.04	-0.02	0.01	-0.08
Importance for BAP Plants	0.12	0.59	0.55	0.08	0.32	0.5	0.22
Importance for BAP Mammals	**0.12**	**0.34**	**0.27**	**0.16**	**0.18**	**0.43**	**0.25**
Total Importance for BAP Species	**0.07**	**0.5**	**0.49**	**0.06**	**0.23**	**0.4**	**0.14**

3.3. Analyses of the relationships between LSC activity and climate vulnerability in England at the NCA resolution

There was a strong positive relationship between LSC percentage cover and the percentage of BAP habitat (Spearman's *Rho* = 0.58, *P*<0.01) in each NCA. In addition, there was a significant negative relationship between LSC percentage cover and fragmentation and overall climate change vulnerability (Spearman's *Rho* = -0.54, *P*<0.01 and Spearman's *Rho* = -0.36, *P* < 0.01), and between the number of LSC initiatives in each NCA (based on assigning each LSC to a primary NCA) and fragmentation (Spearman's *Rho*= -0.28, P<0.01). There was no relationship between sensitivity to climate change and LSC activity (Table 5.3).

Table 5.3 **Spearman Rank correlations between two measures of LSC activity per NCA – the number of LSC initiatives in each NCA, based on assigning each LSC to a primary NCA ('LSCI - primary), and percentage coverage of the NCA by LSC initiatives ('% LSCI') – and four indices of climate change vulnerability. Bold indicates significant at the 0.05 level**

Index of climate change vulnerability	% LSC	LSC - Primary
Percent BAP habitat	**0.58**	0.25
Median Fragmentation	**-0.54**	**-0.28**
Median Vulnerability	**-0.36**	-0.09
Median Sensitivity	-0.01	0.01

3.4 A comparison of *levels* of biodiversity and the extent of coverage of LSC initiatives across Britain

Results of the analyses of all BAP species

Generalised linear modelling of the number of BAP species against physical environment variables and cumulative LSC area and percentage showed a very weak positive relationship (P = 0.01, N = 1141, odds ratio = 1), and no effect of LSC activity after controlling for the environmental variables described above.

Birds

There was a statistically significant but very small (odds ratio is 1.000049) positive relationship between LSC coverage on total bird richness in Britain. However, there was no statistically significant effect of LSC coverage on the distribution of the 7 BAP species we considered individually.

The results for individual species in England are shown in Table 5.4 (cumulative percentage) and Table 5.5 (cumulative LSC area). The variable for LSC cumulative percentage was significant in five models but the effect was positive only for the Nightjar and the Woodlark, while for cumulative LSC area there was only a significant (negative) relationship for corn bunting, and very weak positive relationship for the reed bunting.

In all cases, the odds ratios indicate that the magnitude of the relationship between LSC and bird biodiversity is extremely small, even where significant. For example the odds ratio of 1.001 for Woodlark suggests that this species is only 0.1% more likely to occur when the cumulative percentage of LSC is high. In logistic regression the odds ratio is used to indicate the change in odds of the response occurring resulting from a one unit change in the covariate.

Table 5.4 Results of the GLMs for seven BAP species in England – cumulative percentage

Predictor variable	Nightjar	Corn bunting	Grey partridge	Reed bunting	Turtle dove	Tree sparrow	Woodlark
Absent	935	540	178	119	416	323	1044
Present	177	572	934	993	696	789	68
Bio5	***	.	NS	***	***	NS	***
Bio6	NS	NS	***	***	NS	***	NS
Bio12	NS	***	***	**	***	***	***
Pop09	NS	NS	NS	NS	***	NS	NS
Broadgeol	***	***	***	**	*	*	NS
LCM	NS	NS	NS	NS	NS	NS	NS
Cumulative percentage	***	***	*	NS	NS	**	***
Odds Ratio for Project % cover	1.0008	0.9991	0.9996			0.9995	1.001
Sign of effect	+	-	-			_	+

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

Table 5.5 Results of the GLMs for seven BAP species in England – cumulative LSC area

Predictor variable	Nightjar	Corn bunting	Grey bartridge	Reed bunting	Turtle dove	Tree sparrow	Woodlark
Absent	935	540	178	119	416	323	1044
Present	177	572	934	993	696	789	68
Bio5	***	NS	NS	***	***	NS	***
Bio6	NS	NS	***	***	NS	***	NS
Bio12	.	***	***	**	***	***	***
Pop09	.	NS	NS	NS	***	NS	NS
Broadgeol	***	***	***	**	*	*	NS
LCM	NS	NS	NS	NS	NS	NS	NS
Proj. Area	NS	***	NS	.	NS	NS	NS
Odds Ratio for Project Area		1.00		1.00			
Sign of effect		-		+			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

Scotland – BAP birds

We ran the same analyses for the BAP birds in Scotland based on the BTO's 1988-91 dataset. These results were even less conclusive than the results for England due to a) the small number of 'presences' of some species and b) the relatively small number of LSC initiatives in Scotland. In some cases (i.e. nightjar), there was insufficient variance in the data for the analyses to be run. In short, there is no evidence of a significant relationship between LSC and BAP birds for Scotland (Tables 5.6 & 5.7).

Table 5.6 **Results of the GLMs for seven BAP species in Scotland – cumulative LSC area**

Predictor variable	Nightjar	Corn bunting	Grey partridge	Reed bunting	Turtle dove	Tree sparrow	Woodlark
Absent	716	634	441	225	720	559	
Present	9	91	284	500	5	155	
Bio5		*	***	**		***	
Bio6		***	***	***		NS	
Bio12		***	***	NS		***	
Pop09		NS	*	***		*	
Broadgeol		NS	NS	NS		NS	
LCM		NS	*	.		NS	
Proj. Area		**	NS	.		NS	
Odds ratio for project area		1.000000	1.000001	1.000001			
Sign of effect		-	+	+			
Nagelkerke R^2		0.417	0.617	0.357		0.486	

Significance. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 5.7 **Results of the GLMs for seven BAP species in Scotland – cumulative percentage**

Predictor variable	Nightjar	Corn bunting	Grey partridge	Reed bunting	Turtle dove	Tree sparrow	Woodlark
Absent	716	634	441	225	720	559	
Present	9	91	284	500	5	155	
Bio5		.	***	**		***	
Bio6		***	***	***		NS	
Bio12		***	***	NS		***	
Pop09		NS	.	***		*	
Broadgeol		NS	NS	NS		NS	
LCM		NS	*	*		NS	
Proj. %cover		*	*	*		NS	
Odds Ratio for Project % cover		0.9936	0.9965	1.0026			
Sign of effect		-	-	+			
Nagelkerke R^2		0.404	0.622	0.359		0.492	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

England – non-bird BAP species

There were a number of statistically significant associations between several BAP groups (including mammals and herptiles) (Table 5.8); however, the odds ratio was 1.00 in all cases, indicating that the explanatory power of these relationships was very low.

Table 5.8 Summary of results of the GLMs for groups of BAP species

Cumulative LSC area			Cumulative Percentage		
Taxa	Sign of significant relationship	Odds ratio	Taxa	Sign of significant relationship	Odds ratio
Bryophytes	+	1.00	Bryophytes		
Cantharidae			Cantharidae	+	1.00
Carabids			Carabids	+	1.00
Cerambycidae			Cerambycidae	+	1.00
Chrysomelids	+	1.00	Chrysomelids	+	1.00
Coccinellidae			Coccinellidae	+	1.00
Fish			Fish		
Herptiles	+	1.00	Herptiles	+	1.00
Heteroptera			Heteroptera	+	1.00
Mammals	+	1.00	Mammals	+	1.00
Millipedes			Millipedes		
Molluscs	-	1.00	Molluscs		
Neuroptera			Neuroptera	+	1.00
Odonata	-	1.00	Odonata		
Opiliones			Opiliones	+	1.00
Orthoptera			Orthoptera		
Plants			Plants	+	1.00
Woodlice	+	1.00	Woodlice	+	1.00

3.5 A comparison of the relationship between *changes* in measures of biodiversity and the extent of coverage of LSC initiatives

All these analyses were conducted using Countryside Survey (CS) data, as described in the Methods.

Water and soil chemistry

There was a significant positive relationship between LSC intensity and changes in freshwater pH (Spearman's *Rho* = 0.232; *N* = 131; *P* = 0.008 for cumulative percentage and Spearman's *Rho* = 0.246; *N* = 131; *P* = 0.005 for cumulative LSC area); freshwater conductivity (Spearman's *Rho* = 0.242; *N* = 131; *P* = 0.005 for cumulative percentage and Spearman's *Rho* = 0.216; *N* = 131; *P* = 0.013 for cumulative LSC area) and soil pH, though only based on cumulative LSC area and not cumulative LSC percentages for the latter (Spearman's *Rho* = 0.041; *N* = 107; *P* = 0.676 for cumulative percentage and Spearman's *Rho* = 0.190; *N* = 107; *P* = 0.05 for cumulative LSC area) at the 10 x 10 km resolution for England (the only country in Britain for which coverage of LSC initiatives is sufficiently high to run these analyses). All analyses were run on changes in these indices between 1998 and 2007

Changes in community composition

Overall, we found very little evidence that changes in community composition between 1998 and 2007 relate to the coverage of LSC at the 10 x 10 km resolution for England (the only country in Britain for which coverage of LSC is sufficiently high to run these analyses). For the freshwater and soil invertebrates, we found no significant relationship between LSC and changes in community composition. This may be partly because the sample size was small (n = 51), but also probably reflects the fact that LSC coverage never explained more than 1.2% of the community-level changes between 1998 and 2001. Running these analyses for the whole of Britain showed qualitatively similar patterns.

We did however find a statistically significant ($P < 0.05$) relationship between LSC coverage and changes in vegetation (n = 286 for England), though LSC coverage explained only ~0.5% of the community-level changes between 1998 and 2001; again, these results hold for Britain (the signal is qualitatively very similar, but slightly weaker; not shown). The species that do appear to be associated with LSC coverage are mosses and trees, particularly an increase English oak seedlings (*Quercus robur*) but decrease in mature oaks (Figure 5.4), and indeed changes in oak seedling abundance between 1998 and 2007 are statistically significantly ($P < 0.05$) positively correlated with LSC coverage (Pearson's $r = 0.15$), while mature oak abundance is negative correlated with LSC coverage (Pearson's $r = -0.17$), as is mature elm (Ulmus) abundance (Pearson's $r = -0.18$). Qualitatively similar results were found when we re-ran the analysis using cumulative LSC area, rather than percentage cover (not shown).

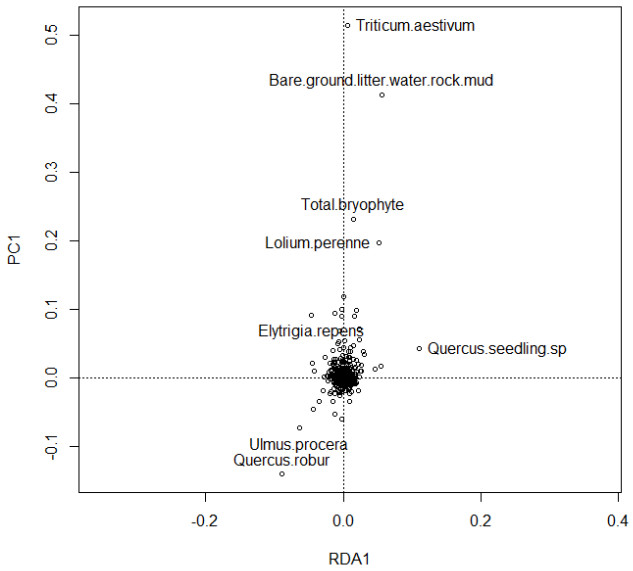

Figure 5.4 Ordination biplot showing the relationship between LSC cumulative coverage (RDA1) and changes in vegetation community cover between 1998 and 2007. Changes in the Y axis (PC1) are not indicative of any relationship with LSC coverage

3.6 A comparison of the relationship between *changes* in measures of biodiversity in ecologically similar areas with differing levels of LSC

Distinctiveness Map

A distinctiveness map (Figure 5.5) was generated using the methods described in section 2.8.

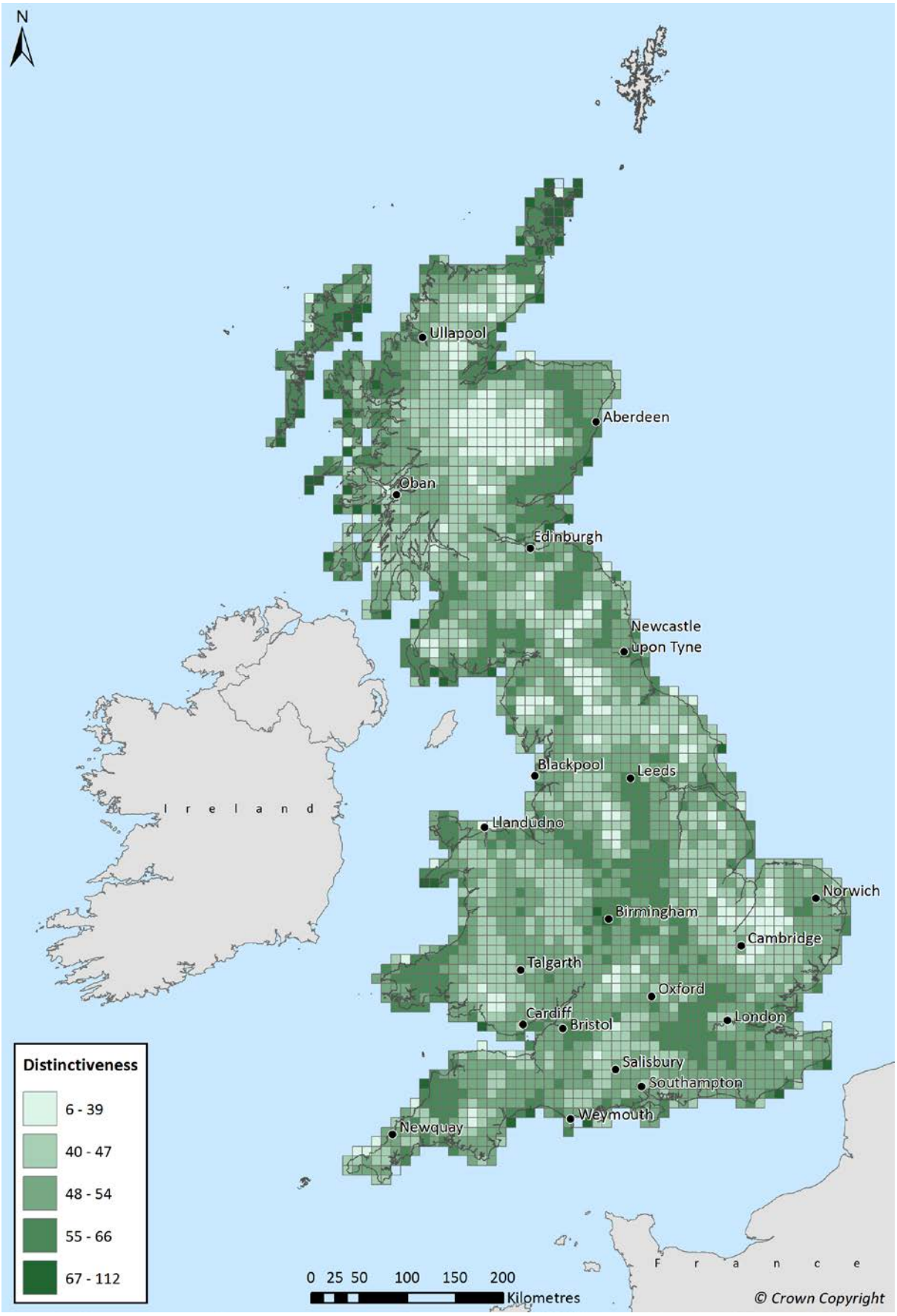

Figure 5.5 **Distinctiveness map. High values indicate high distinctiveness (few matches with other squares) for a particular 10 x 10 km square**

Preliminary analyses show that temperature, rainfall and human population density, rather than land cover or geology, are the best predictors of distinctiveness (Figure 5.6). There is a moderate and statistically signficant negative correlations between LSC activity and distinctiveness (Spearman's *rho* = -0.239 for cumulative percentage and -0.217 for cumulative LSC), indicating that LSC initiatives generally are in the more commonly distributed landscapes in Britain.

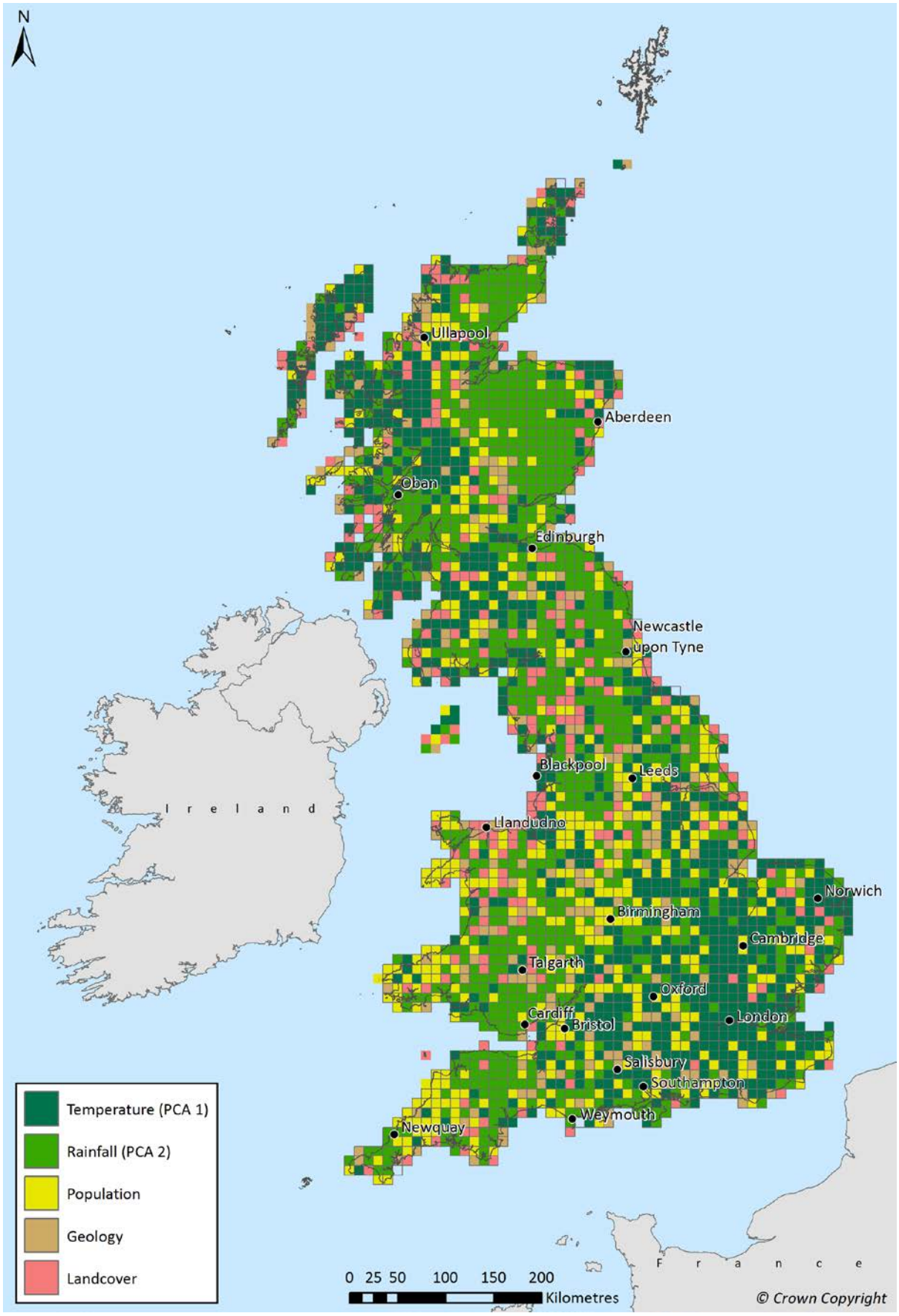

Figure 5.6 Variables which have the highest contribution to the models underlying the distinctiveness map

3.6.2 'Matched pair' analyses based on the distinctiveness map

Of the 10 paired t-tests conducted, only one (Sycamore; *Acer pseudoplatanus*) showed a statistically significant relationship at P < 0.05, indicating that there was larger increase in the abundance of this species in 10 x 10 squares with low LSC coverage than with high LSC coverage (Table 5.9). However, given the small sample size (n = 16), it is worth pointing out that there are some indications (P < 0.10) of an increase in seedling numbers in the matched squares with high LSC coverage.

Table 5.9 Results of paired t-test for matched pairs

Species	T statistic	p-value	|---95% conf. interval---|		mean of differences
Acer pseudoplatanus (Sycamore)	2.614	0.02	9.607	94.518	52.0625
Alnus glutinosa (Common alder)	1.049	0.31	-23.885	70.135	23.125
Fraxinus excelsior (European ash)	-0.431	0.673	-52.396	34.771	-8.813
Hedera helix (Common ivy)	-1.02	0.324	-102.573	36.198	-33.188
Pinus sylvestris (Scots pine)	0.425	0.677	-20.807	31.182	5.188
Quercus robur (English oak)	1.309	0.21	-28.738	120.238	45.75
Quercus Seedlings	-1.827	0.088	-21.126	1.626	-9.75
Salix caprea (Goat willow)	-1.464	0.164	-6.14	1.14	-2.5
Salix cinerea (Grey Willow)	-1.464	0.164	-23.026	4.276	-9.375
Salix seedlings	-2.046	0.059	-49.256	1.006	-24.125

4. Discussion

Protected areas cover 12.2% of the global land surface (Chape and others, 2005), but they often have a skewed distribution with a disproportionate representation of some ecosystems and land cover types and an underrepresentation of others (e.g. Oldfield and others 2004). For these and other reasons the concern still exists that the current reserves are inadequate to protect biodiversity (Araújo and others, 2004; Barber and others, 2012; Lawton and others, 2010; Rodrigues and others, 2004; Rodriguez-Rodriguez and Martinez-Vega, 2012). Further concerns have arisen that the effectiveness of conservation areas have not been assessed fully (Gaston and others, 2006) and that in their current condition and fragmented configuration may not allow species to adapt to a changing climate (Lawton and others, 2010). Making Space for Nature (Lawton and others, 2010) stated that although targeted conservation efforts have been successful in helping to conserve many species, there is a need for our wildlife and conservation networks to focus on the landscape scale and be "bigger, better and more joined-up" if they are to be coherent and resilient, especially in the context of climate change. To do this, we need landscape-scale habitat restoration and recreation, which supports ecosystem processes and ecosystem services. The principles set out by Making Space for Nature (Lawton and others, 2010) are principles, which have been embraced by the Government's White Paper on Biodiversity (2011).

The current project aimed to assess the environmental outcomes of LSC in Britain and to determine whether areas with bigger and/or more "joined up" conservation have achieved positive outcomes for biodiversity and ecosystem services, as well as to ascertain how LSC activity fits into the wider conservation landscape of Britain.

4.1. Key findings – biodiversity

Our strongest findings came not for individual species, but rather of early indications of positive changes in the quality of woodlands. There is some evidence – based on Countryside Survey data – that LSC activity is associated with an increase in young oaks, and possibly willows (borderline significant result) – at the expense of older oaks and elms, suggesting woodland regeneration activity is occurring. More generally, the correlation with nightjar and woodlark occurrence – in addition to the changes in tree abundances discussed above – indicate that LSC activity preferentially occurs in forested areas.

The most likely explanation for the woodland results is probably habitat specialisation and the extent that LSC initiatives cover different British habitats. Whereas the habitat favoured by Nightjars and Woodlarks appears to be well-represented within LSC initiatives and not elsewhere – ancient woodlands are the second-best represented habitat type in LSC initiatives after lowland heaths (Chapter 2) – the other BAP species for which LSC percentage cover was significant occur across a broader range of habitat types which are under-represented in LSC initiatives. This finding illustrates the complexity of trying to demonstrate landscape-scale benefits, especially without biodiversity time series data. Lawton and others (2010) did, however, highlight that many of the species currently being lost from England are specialist species, suggesting a reduction in habitat quality and variety is to blame. Globally, it is not uncommon for conservation areas to be focussed or concentrated on specific habitat types, or ecosystems, meaning other areas are left under-

represented within protected areas (Rodrigues and others, 2004). Jackson and others (2004) discussed methods for selecting conservation areas and suggested that more species can be conserved by focussing on complementary features between conservation sites, rather than using individual site-selection criteria.

The relatively strong association between NCA-level LSC coverage and those NCAs that are most important for BAP species – particularly mammals – is also of interest, and could reflect the number of LSC initiatives associated with the species-focused conservation NGOs, particularly (for mammals) the Wildlife Trust's Living Landscape programme (Chapter 2). An important caveat though is that these associations are simply that – without time series data, there is no way of telling whether LSC management activity has increased BAP diversity, or whether LSC initiatives are simply located in areas judged most important for BAP species as such areas are deemed to be priorities for conservation.

The relatively strong association between LSC activity and changes in water and soil chemistry we found was surprising, but likely not a reflection of LSC activity. The increase in soil pH is likely simply indicative of a general increase in pH across woodlands found in the 2007 Countryside Survey, which has been attributed to a general decrease in sulphur emissions (http://www.countrysidesurvey.org.uk/sites/default/files/pdfs/reports2007/CS_UK_2007_TR9-revised.pdf). As water pH and conductivity were measured in the Countryside Survey to support biotic indicators of water quality (http://www.countrysidesurvey.org.uk/sites/default/files/pdfs/reports2007/CS_UK_2007_TR8.pdf) – biotic indicators showed no change in our analyses – the ecological meaning of the increases in these two measures of water quality remains unclear.

Overall, these results raise more questions than they answer in that they highlight the lack of data available to quantify the effectiveness of LSC in protecting biodiversity. For example, while the Countryside Survey data suggests that LSC activity preferentially affects deciduous woodlands species the NCA level association between LSC activity and deciduous woodland cover is not particularly strong, though there is a strong association with broadleaved woodland greater than 1 ha in size that is also classified as BAP habitat and LSC activity at the NCA level. Barber and others (2012) discussed the inconsistency between fine-scale and coarse scale data in assessing the effectiveness of protective areas, highlighting that coarse-scale assessments often indicate that protected areas are conserving biodiversity, while at the fine-scale the answer is different. They stressed the need for frequent monitoring and evaluation for the development of effective management strategies.

This issue of a lack in the availability of consistent datasets at an appropriate spatial scale is not a new one and has been raised by others investigating the effectiveness of protected areas (e.g. Ellis and others, 2012; Gaston and others, 2006). For example, Dale and Kline (2013) discussed the discrepancies between the desired and actual data used in landscape-scale research. They suggest the need for redefining questions around what can realistically be assessed, given the spatial resolution and temporal characteristics of available datasets. Our difficulties in quantifying the effectiveness of LSC in improving biodiversity arises due to a number of issues, many of which were also discussed by Dale and Kline (2013) as common issues surrounding landscape scale research. These are as follows:

1) Despite high levels of monitoring of biodiversity outcomes by some projects, the general lack of consistent monitoring of biodiversity outcomes by many LSC initiatives (Chapter 2) meant that using data from individual projects was unrealistic. It is important to note that increasing monitoring in itself is not sufficient; a nationally consistent protocol on how to monitor biodiversity by LSC projects needs to be implemented for such data to be truly useful to inform policy.

2) The majority of the excellent national datasets in Britain (i.e. on birds, butterflies) are not sufficiently spatially or temporarily resolved to be of utility for evaluating what are effectively quite small conservation actions. The only nationally consistent datasets that are suitable for this purpose (the Countryside Survey and Environmental Change Network sites) do not have sufficient spatial overlap with projects to allow assessments of effectiveness to have much statistical power.

3) A lack of data on how well the area covered by a LSC initiative actually translates into on the ground management – that is, an initiative may state it covers 1500 ha, but only actively manage 50 ha of this – further increases the difficulties in assessing effectiveness. This issue was compounded by the fact that we don't have good spatial (vector) coverage of the areas covered by a large number of LSC initiatives.

In addition to the above data issues, a major difficulty we encountered is that we were able to look only at how the area covered by LSC relates to biodiversity outcomes (albeit to a limited extent); assessing the relative importance of the different elements of ecological networks set out by Lawton an others (2010) (for example whether 'joined up' conservation areas are more effective than areas with large patches that are separated from each other) proved impossible, as such an analysis would require disentangling the effects of increasing management area from the effects of the configuration of the management. Such analyses are difficult even where high-resolution spatial data exists as habitat amount and fragmentation variables tend to be highly correlated (Fahrig 2003), and are unrealistic with the LSC dataset we have, given the issues we encountered in delineating exactly where LSC management is occurring, and exactly where biodiversity is occurring. Indeed, it is likely that analysis of the effectiveness of 'joined-up' initiatives and, more broadly, the relative importance of different structural landscape elements, requires a long-term experimental approach – see Tewksbury and others 2002 for a good example of this. The difficulty in this type of analysis is highlighted by Chape and others (2005), who analysed data on protected areas within the World Database on Protected Areas (WPDA), containing records of 104,791 protected areas, covering over 20 million km^2. Even with those data, they were unable to say clearly whether conservation objectives are being met as individual and national areas or as a global network, due to data issues similar to those encountered in our project.

Finally, it is important to note that our attempt to find a broad biodiversity signal across all initiatives will have resulted in high levels of error, given the very different objectives and starting dates of the projects considered here. The reasons we did not run further analysis on subsets of the LSC initiatives are two-fold 1) The diversity of objectives of many projects meant that sub-division would have been problematic, mainly due to issues of sample size (for example, the majority of initiatives date from 2000 onwards; analysing older initiatives separately would reduce the available sample considerably); and 2) the main goal of this project was to get an idea of the overall impact of LSC activity on environmental outcomes in Britain, and not to focus on a particular project type or taxa. Indeed, a number of such

specific analyses (e.g. for agri-environmental schemes on farmland birds) (i.e. Baker and others (2012) – have been carried out to date, showing that such programmes have the potential to have national population-level effects, but also that some components of AES have little effect on bird populations. By the same token, it is important to note that the lack of evidence for the overall effectiveness we have found here does not necessarily contradict site/project-level evidence of success in increasing species numbers or restoring habitat in some places through large-scale coordinated action (e.g. Ellis and others 2012), just that small-scale successes are not (from the data available) reflected in broad gains in biodiversity across the country. Pfund (2010) emphasized that the effectiveness of landscape-scale approaches are at present, unknown, because progress in assessing and using landscape scale methods has been hindered by, among other factors, a lack of long-term funding, appropriate, standardised monitoring, and a lack of suitable approaches for complex landscapes. The need for more theoretical and applied research into "complex socio-ecological systems" was highlighted.

4.2. Key findings – ecosystem services

Our results show that LSC initiatives tend to be concentrated in NCAs whose natural character is classified as 'enhancing' rather than 'neglected', suggesting that LSC activity is highest in the parts of England whose landscape aesthetic character – a cultural ecosystem service – is improving.. This is supported by Maes and others (2012), who found that areas in a favourable condition had higher levels of biodiversity and a better potential to provide regulating and cultural ecosystem services than those habitats in an unfavourable condition. The high pre-2000 LSC activity in NCAs with enhancing boundary features may indicate an effect of LSC management. However, the small sample size of pre-2000 LSC activity means that we are not in a position to make any strong inferences from these findings.

Our results also show that LSC activity is most common in the less 'distinct' portions of the country (as identified by our distinctiveness map). This suggests that LSC initiatives tend to be more concentrated in relatively large-scale landscapes such as the uplands of the Lake District, rather than in the most environmentally distinct areas of the countries (i.e. some of the Western Isles of Scotland). However, this result may also partly be a reflection that certain urbanized landscapes (i.e. central London) are quite distinctive and therefore relatively 'unique', but which are not 'hotspots' of LSC activity.

Unfortunately, we were unable able to assess the effectiveness of LSC for conserving other ecosystem services. This is because in addition to the data needs outlined above, quantifying ecosystem services usually requires additional links to the beneficiaries of such services that are generally not available at the resolution required. Moreover, discussions with Stuart Clarke and Ruth Waters (the leads on the flagship Natural England Ecosystem Service Pilot Areas) suggested that a) the very recent implementation of ecosystem service projects combined with b) the long lead-in times required for such initiatives (Sayer, 2009) to yield their policy objectives means that actually measuring outcomes at this point in time is not realistic for most services. For example, the benefits of removing drainage ditches on moorland will probably not become apparent for 10-15 years. Dale and Kline (2013) additionally highlighted some issues associated with trying to assess changes in ecosystem services using indicators such as biodiversity, carbon and nutrient cycling. These include the high number of factors impacting on land use and variation in management across landscapes, both spatially and temporally, making analysis highly dependent on which time

and space ranges are used in the analysis; the complexity of landscapes, auto-correlation between variables and the large number of variables, make it hard to determine clear cause and effect; and the general lack of empirical data means assessments are based on models which often have high levels of error (Eigenbrod and others 2010a).

There are a number of ways that could be used in the future to quantify the ecosystem service benefits of LSC. For one, Stuart Clarke and Ruth Waters (Natural England) suggest that data from the NE Ecosystem Service Pilot Areas could be used to model the future carbon sequestration benefits of current management actions. We did not undertake such work here due to resource constraints. In addition, the recently developed proxies for quantifying the state of ecosystem services based on the Countryside Survey (Smart and others 2010) offer an additional promising way forward for monitoring the effectiveness of LSC for conserving ecosystem services. We did not use these proxies here given the already very weak signal we observed based on primary biodiversity data in our analysis, but suggest that these proxies would be very useful for a finer-resolution analysis done at within the 1 x 1 km squares where the Countryside Survey is carried out. Thirdly, econometric methods could possibly be used to assess the value of ecosystem services in LSC initiatives. A recent study (Christie and Rayment 2012) used choice experiments and a weighting matrix approach to value all SSSIs in England and Wales, and showed that the ecosystem service benefits (£956 million) of SSSIs significantly exceed management costs (£111 million). However, the diversity of LSC activity (in terms of management objectives and actual on-the-ground management) highlighted in Chapter 2 would make such an analysis for LSC initiative considerably more challenging than for SSSIs. Moreover, the lack of consistent monitoring data for LSC initiatives (as opposed to SSSIs, where information on the status and trend is generally available) would further complicate such an analysis. Finally, the degree of spatial congruence of LSCs and stored vegetation carbon could be quantified. Given the upland bias of both LSC activity and stored carbon in Britain, it is likely that LSCs are over-represented in terms of their representation of British carbon stores, as is the case both SSSIs and National Parks in England (Eigenbrod and others 2009). We did not carry out such analyses here as a) the importance of carbon conservation in upland LSCs is well-understood; b) such analyses tell you nothing about the effectiveness of conservation measures within LSCs, which was our primary goal; and c) there was a lack of publicly available carbon data.

4.3. Key findings – complementarity of large-scale conservation with existing conservation strategies

The designation of conservation areas is not random, i.e. they will contain areas of concern such as a species group or habitat (Andam and others, 2008; & Gaston and others, 2006). Therefore, spatial overlaps of conservation infrastructure and initiatives, or tiering (Eigenbrod and others, 2010b), should be expected, given similar objectives. Therefore, we might expect an overlap between LSC projects and other conservation sites and activities; Eigenbrod and others (2010b) found this to be the case for SSSIs, NPs and AONBs in England. Our NCA-level analyses suggest that while there is a degree of overlap of LSC initiatives with other conservation strategies – particularly SSSIs and NNRs – LSC initiatives do in fact also cover parts of the country less well represented by these national-scale conservation networks. For example, NCA-level associations between SSSIs and NPs and

AONBS we observed here are considerably lower than between LSC initiatives and SSSIs and NNRs. The NCA level associations with particular BAP habitat types also broadly reflect both the variety of these reported in the database (Chapter 2), and the strong representation of lowland heath, ancient woodlands, and lowland meadows.

Is large-scale conservation in the right place? As shown in Chapter 2, there are clear areas of higher or lower LSC activity across Great Britain, particularly in England (where there is more activity and information is more complete). Our findings that high levels of LSC activity appear to be correlated with existing protected areas, some threatened species and improved landscape character suggest that conservation organisations are preferentially focusing on areas that are inherently 'better' from the point of view of both biodiversity and landscape. This could be seen as a waste of resources (the 'neglected' areas might need more work). On the other hand, these are likely to be the most ecologically intact areas, containing some of the country's most valued landscapes, important areas for species and other environmental features of conservation concern. Therefore, given limited conservation resources, it could be argued that they are the right areas to be focusing on.

4.4. Key findings – the potential for large-scale conservation initiatives to support adaptation to climate change

Given the additive effect of climate change and habitat fragmentation via land use change, Opdam and Wascher (2004) stressed the need for conservation efforts to switch to a landscape-scale approach and to move from strategies involving protected areas to those focussed on landscape networks, which incorporate protected areas and on an "offensive landscape development strategy".

Our NCA level analyses suggest that LSC initiatives tend to be located in areas of BAP habitat that have been assessed as likely to be relatively resilient to climate change; there are fewer initiatives than would be expected by chance in landscapes that are highly fragmented or identified by the Natural England model as having a high overall vulnerability to climate change. This might mean that more effort should be given in future, when selecting sites for conservation, to address highly vulnerable areas. On the other hand, it could be argued that current efforts are correctly focusing on the 'best' and most resilient areas, which could be essential as the backbone of future ecological networks under climate change.

4.5. Ways forward

Lawton (2010) stated the need for 'more, bigger, better and joined' conservation areas. There is evidence from Butterfly Conservation that this principle works well for highly targeted management actions for species with specific habitat requirements (Ellis and others, 2012). Our findings here suggest a combination of very diverse management goals combined with major data limitations mean that, despite some evidence of increased recruitment of deciduous trees, we still lack compelling evidence of the effectiveness of LSC overall in meeting its biodiversity goals across the wider countryside. Sayer (2009) stressed the need for "clear and measureable goals" when undertaking conservation at the landscape

scale. We therefore strongly suggest that future funding for LSC includes requirements to monitor the effectiveness of such measures using consistent and quantitative measures of success that are linked to specific conservation goals, and that adequate funding is provided to enable this. Such monitoring could be linked to the national-scale datasets we use here (and others being developed on ecosystem services) as well as our distinctiveness map, and the information collected used to assess the degree to which changes in projects are indeed occurring at a more rapid rate than at other areas within Britain with similar socio-ecological characteristics. Linking monitoring in LSCs to areas with similar socio-ecological characteristics would give the counterfactuals required that are currently lacking. Coordination across conservation initiatives at NCA level, for example, could help to facilitate consistent monitoring. Consistent monitoring has been called for by others assessing landscape-scale conservation (e.g. Chape and others, 2005; Dale and Kline, 2013; Pfund, 2010; Pressey and Bottrill, 2009; Rodriguez-Rodriguez and Martinez-Vega, 2012). Pfund (2010), for example, stated the need for a landscape-scale framework to be developed specifically for monitoring and as a mechanism to allow comparison across landscape-scale studies. The need for more consistency in data collection methods at the landscape-scale, was also suggested by Pressey and Bottrill (2009) and Dale and Kline (2013), as a way to develop baselines to improve monitoring. Development of such a standardized monitoring and evaluation framework has been attempted for the NIAs (Collingwood Environmental Planning 2015), suggesting that the lessons learnt in this project have already been taken on board by the Defra group. We hope that a more complete assessment of the full environmental benefits of landscape-scale conservation will soon be possible.

5. Acknowledgements

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Annex I. List of abbreviations and acronyms

AES Agri-environment Scheme(s)

AHA Agricultural Holdings Act

AONB Area of Outstanding Natural Beauty

BA Broads Authority

BAP Biodiversity Action Plan

BC Butterfly Conservation

BOA Biodiversity Opportunity Areas

BTO British Trust for Ornithology

BTVC British Trust for Conservation Volunteers

BW British Waterways

CC County Councils

CCF Catchment Sensitive Farming

CCW Countryside Council for Wales

CEH Centre for Ecology and Hydrology

CSF Catchment Sensitive Farming

CSM Common Standards Monitoring

CT Charitable Trusts

DC District Councils

Defra Department for Environment, Food and Rural Affairs

DWPA Diffuse Pollution from Agriculture

EA Environment Agency

EH English Heritage

ELS Entry-level Scheme (part of the Environmental Stewardship agri-environment scheme)

ES Environmental Stewardship

EU European Union

FC Forestry Commission

FCS Forestry Commission Scotland

FE Forest Enterprise

FR Forest Research

FWAG Farming & Wildlife Advisory Group

GLA Greater London Authority

HLF Heritage Lottery Fund

HLS Higher Level Stewardship (part of the Environmental Stewardship agri-environment scheme)

IDB Internal Drainage Boards

JMT John Muir Trust

JNCC Joint Nature Conservation Committee

LA Local Authorities

LBAP Local Biodiversity Action Plan

LSC Large Scale Conservation (This is equivalent to the term ‘landscape-scale conservation’, used commonly in other conservation literature. In this report, the term ‘LSC initiative’ is used to describe individual conservation areas. This is synonymous with the term ‘Large Conservation Area’ used in other reports and papers published by some of the authors.)

MoD Ministry of Defence

NCA National Character Area

NE Natural England

NIA Nature Improvement Area

NNR National Nature Reserve

NRA Nature Reserve Agreement

NT National Trust

NTS National Trust Scotland

RSFS Royal Scottish Forestry Society

RSPB Royal Society for the Protection of Birds

SCaMP Sustainable Catchment Management Programme (United Utilities & RSPB)

SFA Scottish Forest Alliance (BP, FCS, RSPB, WoT)

SNH Scottish Natural Heritage

SRDP Scotland Rural Development Programme

TFL Trees for Life

WAG Welsh Assemble Government

WAVE Water Adaptation is Valuable for Everybody

WGS Woodland Grant Scheme

WN Wildland Network

WoT Woodland Trust

WT Wildlife Trusts

WWT Wildfowl and Wetlands Trust

Annex II: Questions in the online survey

Section 1 General information about your project:

1. Name of Project:
   ……

2. What was the project start date (yr):
   ……

3. What is the planned duration of the project (*in yrs*):

<5 years	5-10 years	>10-20 years	>20-50 years	>50 years
☐	☐	☐	☐	☐

4. What is the lead organisation for the project?:
   ……..

5. What is the extent of the project?
   - Current area (hectares)
     ……
   - Future / planned area (hectares)
     ……..

6. Which of the following land cover/habitat types are present within the conservation area?

Rivers and Streams	☐
Arable and Horticultural	☐
Broadleaved, Mixed and Yew Woodland	☐
Coniferous Woodland	☐
Improved Grassland	☐
Neutral Grassland	☐
Calcareous Grassland	☐
Acid Grassland	☐
Bogs	☐
Fen, Marsh and Swamp	☐
Dwarf Shrub Heath	☐
Montane Habitats	☐

Standing Open Waters and Canals	☐
Boundary and Linear Features	☐
Inland Rock	☐
Littoral sediment *(includes saltmarsh / mudflats)*	☐
Supra-littoral sediment	☐
Supra-littoral Rock	☐
Littoral Rock	

Section 2 Application of Scientific Principles

We are interested in what has led to the selection of the area of the project activity and the approaches used in identifying the interventions and activities that are proposed or have been implemented. Please provide answers to the following questions.

7. What sources of scientific information were used to **select the project area**, and to **determine management actions**?

	To select site	**To determine management actions**
• Specific ecological assessment for the project	☐	☐
• Published regional assessments (e.g. Biodiversity Opportunity Areas)	☐	☐
• Published national assessments (e.g. national connectivity maps)	☐	☐
• Expert knowledge from within your organisation	☐	☐
• Expert knowledge from external experts (e.g. scientific researchers)	☐	☐
• Other (please specify below)	☐	☐

Details/comments (e.g. it would be very helpful to state what specific information has been considered – e.g. species distributions, ecological networks, climate change vulnerability, potential for ecosystem service delivery, etc.):

8. Please indicate which subjects this scientific information covered *(please tick all that apply)*

- Data on animal distributions/abundance ☐
- Data on animal distributions/abundance ☐
- Data on current/potential ecosystem services ☐
- Landscape character assessment ☐
- Water quality ☐
- Other ☐

Please describe in more detail if possible *(e.g. number of sites monitored, frequency)*

9. In what ways does this particular large-scale project offer opportunities that managing existing smaller conservation sites in the area would not? Please select any of the following that are a particular aim of your project, or add any reasons not on this list if relevant

To create habitat over a bigger area than covered by existing small reserves ☐

To manage species populations outside formal reserves; ☐

To buffer and extend existing reserves; ☐

To establish large scale networks for species movement; ☐

To be able to coordinate management across multiple existing conservation sites; ☐

To have an increased influence over large-scale ecosystem processes such as hydrology; ☐

To better integrate conservation and human communities and enhance ecosystem services; ☐

Other (please add details below)... ☐

Details/comments

10. Has your project been designed against explicit assumptions about ecological networks? If so, are objectives set or management actions planned with respect to: areas *(This list of terms is provided from the Lawton Review 'Making Space for Nature')*

- Core areas ☐
- Stepping stones ☐
- Buffers ☐
- Linear corridors ☐
- Landscape corridors ☐
- Habitat mosaics ☐
- Sustainable use areas ☐
- Restoration areas ☐

11. If you ticked any of the above, did you have a particular species or group of species in mind when designing these landscape elements?

YES ☐ NO ☐

If yes, please give details

12. Were any specific tools or methods used to determine the appropriate size and shape of, and distance between, the different landscape elements?

YES ☐ NO ☐

If yes, please give details

13. Are any of the following being monitored as part of your project? *(please tick all that apply)*

- Species (flora) ☐
- Species (fauna) ☐
- Habitats ☐
- Physical parameters ☐
- Water quality ☐
- Recreational use ☐
- Community engagement ☐
- Other (please specify) ☐

Please describe in more detail if possible *(e.g. number of sites monitored, frequency)*

14. Are any of your management actions being undertaken in an explicitly experimental way, with the results analysed and used to modify future management? (For example, are you testing different management approaches to determine which works best for your conservation goals?)

YES ☐ NO ☐

If yes, please give details

Section 3 Adaptation to Climate Change

A particular area of interest is whether and how projects have been responding to the issues of climate change and adaptation to climate change.

15. Has your planning and management of the project taken into account climate change?

YES ☐ NO ☐ if *No* please go to **Section 4**

You can continue through the questions on adaptation to climate change by clicking here.

16. Has a specific assessment of the vulnerability of the natural environment to climate change been carried out by this project, or by others within the project area?

☐ No, vulnerability to climate change has not been assessed in any detail

☐ Yes, we have done a simple vulnerability assessment based on general ecological knowledge and published information, or using results of studies in other areas with similar landscape/ecosystem types

☐ Yes, a detailed vulnerability assessment has been done for this specific area.

Details/comments

17. Which of the following impacts of climate change are of greatest concern/interest for conservation of nature and wildlife in the area of this project? (*please select all that apply*)

☐ Effects of changing species distributions as a result of changing temperature and rainfall patterns (e.g. valued species no longer being able to survive in their current ranges; new species becoming established; changing ecological communities)

☐ Effects of changing seasonal events and longer growing seasons (e.g. changing plant growth, phenological mismatch)

☐ Effects of drought + high temperatures (including fire)

☐ Effects of river flooding

☐ Effects of extreme precipitation and storms

☐ Effects of sea level rise and coastal flooding

☐ Effects of changes to human behaviour as a result of climate change (e.g. changed farming practices, water use, visitor numbers

☐ Effects on water quality of changing rainfall patterns and rising temperatures

☐ Effects on aquatic ecosystems of changes in stream flow

☐ Other impacts (please give details below)

Details/comments

18. Which habitats and vegetation types in the area do you think will be most seriously affected by the impacts above? (tick all that apply)

Rivers and Streams	☐
Arable and Horticultural	☐
Broadleaved, Mixed and Yew Woodland	☐
Coniferous Woodland	☐
Improved Grassland	☐
Neutral Grassland	☐
Calcareous Grassland	☐
Acid Grassland	☐
Bogs	☐
Fen, Marsh and Swamp	☐
Dwarf Shrub Heath	☐
Montane Habitats	☐
Standing Open Waters and Canals	☐
Boundary and Linear Features	☐
Inland Rock	☐
Littoral sediment (includes saltmarsh / mudflats)	☐
Supra-littoral sediment	☐
Supra-littoral Rock	☐
Littoral Rock	☐

19. Are there any particular species in your area you think are likely to be greatly affected (either positively or negatively) by the impacts of climate change you noted above? Please give details.

20. In broad terms, which of the statements below best describe your main **goals** in relation to adaptation? *(please select all that apply)*

- ☐ Maintaining existing populations of particular species or groups of species in spite of climate pressures
- ☐ Increasing ecological connectivity to enable species to move within/ through/ in and out of the area
- ☐ Enabling new species to become established in the conservation area
- ☐ Reducing non-climate threats to/pressures on individual species
- ☐ Reducing non-climate pressures on the overall ecosystem
- ☐ Maintaining the overall ecosystem in its current structure/state
- ☐ Letting the ecosystem change, or actively helping it to do so (e.g. letting a freshwater system shift to brackish/saline)
- ☐ Actively protecting the area against direct effects of climate change and extreme events (e.g. flooding, fire)
- ☐ Other_____

Details/comments. For example, please note the particular species/ecosystems that your answers above refer to

21. How has climate change, and any resulting changes to your conservation goals, influenced your management actions? Please tick the single phrase that best describes how management has considered climate change

- Existing management was deemed adequate and appropriate to respond to climate change ☐
- Existing management was deemed appropriate but with some small changes (e.g. to timing or extent of management actions taken ☐
- Management actions have been significantly changed to address adaptation ☐
- The whole project itself was set up with adaptation as a central objective so management actions explicitly addressed climate change from the start ☐
- other - please specify: ☐

Details/comments

22. Which are the most important specific management actions that you are taking to help the natural environment adapt to climate change? (Please tick any of the following actions that you are carrying out with climate change specifically in mind (but including things that would be done even in the absence of climate change); please add any actions not listed below)

- Species-level management (e.g. controlling invasive species, supplementary feeding; re-introduction) ☐
- Enlarging, buffering and linking habitat patches or creating new patches ☐
- Maintaining or altering the structure of vegetation (e.g. increasing heterogeneity of vegetation; changing vegetation height; planting trees for shade) ☐
- Managing water levels/water supply ☐
- Directly intervening in response to extreme events (e.g. fire fighting, pumping water after flooding, pumping water in during drought) ☐
- Measures to protect against or safely accommodate flooding ☐
- Management to reduce other pressures (e.g. water pollution) ☐
- Other ☐

Details/comments

23. To what extent has scientific information from each of the following sources been useful in doing vulnerability assessments, setting goals and/or determining appropriate management **in relation to climate change adaptation**?

Please tick any source that has been either important (I) or very important (VI)

Source	**I**	**VI**	**Please give details/specify which publications etc.**
Personal education and ecological knowledge of the project staff	☐	☐	
Personal experience of working in the area (e.g. experience of past extreme weather events)	☐	☐	
Scientists in your own organisation	☐	☐	
Other colleagues within your own organisation (please specify)	☐	☐	
Other conservation site managers in the region (please specify)	☐	☐	
Scientific researchers outside your organisation	☐	☐	
Reports or information notes published by government or NGO organisations (please specify)	☐	☐	
Scientific journals (please specify which)	☐	☐	
Other journals or magazines (e.g. *British Wildlife*, *Ecos*, *New Scientist*) (please specify which)	☐	☐	
Books (please specify which)	☐	☐	
Radio, TV or newspapers (please specify which)	☐	☐	
Other (please specify)	☐	☐	

Section 4 Social and Institutional Factors

24. Does this project involve a partnership (i.e. working with a range of individuals or organisations)?

YES ☐ NO ☐

If YES, which of these best describes the partnership? *(please tick one)*

- Pre-existing partnership (working on other conservation initiatives) ☐
- Newly established partnership (formed for the purposes of this project) ☐

25. If YES to the last question, which other individuals or organisations are involved and what role does each play? (*Please tick all that apply)*

Organisations	**Role**					
	Funding	**Scientific Advice**	**Provider / owner of land**	**Providing equipment**	**Direct conservation management**	**Monitoring**
Government Department:	☐	☐	☐	☐	☐	☐
Agency / NDPB	☐	☐	☐	☐	☐	☐
NGO	☐	☐	☐	☐	☐	☐
Private landowner	☐	☐	☐	☐	☐	☐
Utility:	☐	☐	☐	☐	☐	☐
Research institute	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐

Details/comments

26. Which types of agreements between partners are involved in this project? *(tick all that apply)*?

Informal agreement	☐
Memorandum of Understanding	☐
Covenants	☐
Contracts / Lease agreements	☐
Licences (e.g. grazing licence):	☐
Tenancies	☐
Other (*please specify)*	☐

27. Is this project related to other projects? *(For example, is it part of a wider programme in the area, does it follow an earlier project in the same area, is it running in parallel with other initiatives?)*

YES ☐ NO ☐

If YES, please explain:

28. Within the area actively managed, who are the main occupiers of the land involved? *(Please estimate the % of land under each category*):

	% of area
Private organisation (e.g. farms, estate, corporation, cooperative):	
Public organisation: (e.g. Forestry Commission, Countryside Council for Wales, Local Authority etc.):	
Utility (e.g. water company)	
Non-government Organisation/Trust (e.g. Wildlife Trusts, Butterfly Conservation, etc):	

Other (please specify)

29. Approximately how many individual land owners (from any organisation) are involved in total?

1-5 ☐
2-5 ☐
6-10 ☐
11-20 ☐
21-40 ☐
Over 40 ☐

30. Approximately how much capital funding has the project received to date?

£1k - 10k	>£10k-£50k	>£50-£100k	>£100-£250k	>250k-500k	>500-£1M	>£1M
☐	☐	☐	☐	☐	☐	☐

31. Please estimate the proportions (high, medium or low) of each funding source contributing to the project.

Source	**H**	**M**	**L**
lead organisation	☐	☐	☐
partner organisations *(please specify which)*	☐	☐	☐
lottery funds *(please specify which)*	☐	☐	☐
agri-environment schemes/woodland grant schemes (please specify which)	☐	☐	☐
landfill tax (landfill community fund)	☐	☐	☐
charity (*please specify which)*	☐	☐	☐
Local Authority (please specify which):	☐	☐	☐
public body *(please specify which)*	☐	☐	☐
legacy *(please specify which)*	☐	☐	☐
corporate *(please specify which):*	☐	☐	☐

private donations	☐	☐	☐
Project generated funds (e.g. sales)	☐	☐	☐
Other (please specify which	☐	☐	☐

32. Which of these sentences best describes the management of the project and decision-making process? (*select only one*)

- Lead organisation makes all the project decisions ☐
- Lead organisation does all day to day management, strategic decisions made by partnership ☐
- Steering committee makes the major decisions: ☐
- Decisions are all made collaboratively: ☐
- Other (please specify): ☐

Details/comments

33. With whom does the project communicate? (please select all that apply, and if possible specify the primary means of communication/reporting).

Organisations	**Tick**	**Format of communication**
Local community	☐	
General public	☐	
Members of partner organisations	☐	
Non-partner organisation membership	☐	
Local government	☐	
Regional or national government (including non-departmental public bodies)	☐	
Businesses	☐	
Educational Institutions	☐	
Other	☐	

34. Does the project have a volunteering programme? If you have used volunteers within the project please indicate what they are doing and please provide an approximate number of volunteers

	Approximate number of volunteer days per year					
Volunteer activities	**1-10**	**>10-25**	**>25-100**	**>100**	**101-250**	**>250**
Direct conservation action	☐	☐	☐	☐	☐	☐
Surveys and monitoring	☐	☐	☐	☐	☐	☐
Communications / events	☐	☐	☐	☐	☐	☐
Fund-raising	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐

35. Has the project increased public access to the conservation sites within the project area?

YES ☐ NO ☐ Not known ☐

Please describe in more detail if possible, including any other social benefits that have been observed

Please provide any other comments that you feel are relevant but were not covered in the questions above:

Annex III. Topics covered in interviews

The text below was sent to participants in advance and formed the basis for the semi-structured interview

Interview Topics:

The interview will be entirely informal (conversational) and is designed to last about an hour. This sheet provides a general introduction to the topics that will be discussed to allow you to familiarize yourself in advance with information that might be useful. Topics will not necessarily be discussed in the same order or with the exact wording as shown below, but all of the topics will be discussed during the course of the interview.

The topics that we will discuss are:

Project basics – This will cover information about your project's area (both currently and in the future), the habitats within this area and the conservation goals of the project.

How the project works – Here we will discuss details about project partners, negotiation and decision-making processes, and communication strategies. Additionally we will cover considerations of land tenure.

Science – This will explore the scientific evidence and concepts that have been used to inform the project. We will also discuss project targets and monitoring strategies.

Climate change – We will specifically discuss considerations of the impacts of climate change and whether the project incorporates objectives or actions related to climate change adaptation.

Funding – This will cover project costs for the lead organisation, for partners, and for others. We will also discuss funding sources.

Summary – The interview will finish with a discussion about barriers and opportunities and any recommendations you would like to share.