



The changing habitats of the Greensand Country: a historical perspective over 80 years

Author:

Dr Jim Rouquette

Reviewed by:

Dr Alison Holt, Natural Capital Solutions

Contact details:

Dr J.R. Rouquette

Natural Capital Solutions Ltd

www.naturalcapitalsolutions.co.uk

jim.rouquette@naturalcapitalsolutions.co.uk

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Introduction

Land-use and habitats in the UK have changed drastically since the Second World War. During this time period the countryside underwent a period of major intensification and industrialisation, with a rapid rise in the use of artificial fertilizers, pesticides, and machinery, as well as increases in field sizes, drainage of wetlands, reduction in rotations, simplification and homogenization of farm types, and altered cropping patterns from spring sown to autumn sown crops. At the same time there has been a rapid expansion of urban areas and an increase in plantation forestry. These factors taken together have led to the loss of many of the semi-natural habitats of lowland UK, and the fragmentation of remaining patches, resulting in major declines in biodiversity. It has also resulted in changes to the ecosystem services delivered by the land, with a primary focus on agricultural and timber production, but a decline in other ecosystem services.

Here, the land-use and habitats of the Greensand Country have been mapped using data from the 1930s and compared to the current situation (2020). The primary aims have been to establish how land-use has changed, and the magnitude of change across different habitats.

Location

This assessment focusses on the Greensand Country; a distinctive area of sand and sandstone that forms a ridge between the clay vales of lowland Bedfordshire, to the south of Bedford. Greensand Country stretches for 45 km, the vast majority in Bedfordshire, but reaching onto Cambridgeshire at the eastern end and Buckinghamshire and Milton Keynes at the western end. This study area is similar to the Greensand Ridge National Character Area (NCA 90), which was also the basis for the Greensand Nature Improvement Area (NIA). However, as the Greensand Country has a slightly different boundary and occupies some areas just outside of the Greensand Ridge NCA, we have produced maps and analyses for the Greensand Ridge plus a 1 km buffer.

Approach

Although historic maps are available dating back several centuries and with newer editions appearing at regular intervals in more recent times, these do not provide any information on habitats, apart from identifying woodlands. Indeed, only one source of habitat information is available prior to the 1980s and that is The Land Utilisation Survey of Great Britain, 1933-49. These resulting maps are known as the “Dudley Stamp Maps” after the organiser and instigator of the survey. A scanned and digitised version of the survey was obtained, to represent habitats from the 1930s.

To create a map of present day (2020) habitats, a natural capital basemap was created as part of a parallel project to carry out a natural capital assessment for Bedfordshire. This was based on the OS Mastermap Topography GIS layer (the most detailed mapping available across GB), but then used a series of additional data sets to classify each polygon within OS Mastermap to an appropriate habitat type. Full details of the method and data used can be found in the Bedfordshire Natural Capital Assessment report (forthcoming). The Bedfordshire basemap was merged with similar maps

produced using the same methodology for Cambridgeshire, Buckinghamshire and Milton Keynes and then clipped to the Greensand Country boundary.

The digital version of the Land Utilisation Survey classifies habitats into eight different categories, and the modern basemap uses a large number of different habitat types. A key challenge when comparing maps from very different sources is the difficulty of matching land cover types between the different surveys. The original definitions of the Dudley Stamp categories were used and compared to the habitat types produced in the modern basemap, and matched as closely as possible. Nine final categories were chosen, and Table 1 describes how the habitats from both time-periods fit into these categories.

Table 1: Final habitat categories chosen, and the corresponding categories from the Dudley Stamp maps (1930s) and the natural capital basemap (2020)

Final categories	Dudley Stamp categories	Basemap habitats
Woodland	Forest and woodland	Broadleaved woodland Coniferous woodland Mixed woodland Scrub Parkland
Arable	Arable land	Cultivated / disturbed land (excluding allotments)
Semi-natural grassland	Meadowland and permanent grass	Semi-natural grassland (includes neutral, acid, calcareous and rough grasslands), Floodplain grazing marsh
Improved grassland	-	Improved grassland (excluding floodplain grazing marsh), Amenity grassland > 1 ha
Heath and marsh	Heaths and moorlands	Marshy grassland, Heathland, Mire Swamp
Built-up areas and gardens	Land agriculturally unproductive (includes buildings, roads, industry) Gardens (includes allotments)	Built-up areas Infrastructure Gardens & brownfield Allotments Amenity grassland < 1 ha Railway and road verges
Orchards	Orchards	Orchards
Water	Water	Water
Other / unclassified	-	Other Uncertain Unclassified (currently under development)

All “meadowland and permanent grass” identified in the Dudley Stamp map was classified as “semi-natural grassland” and no areas were classified in the “improved grassland” category. This is based on the assumption that no agricultural grasslands were improved at that time as they were not receiving inorganic fertilizers. This has been shown to be true in areas with detailed botanical data from the 1930s.

Urban areas presented a particular difficulty as these areas were not mapped in any detail in the Dudley Stamp survey. In the Dudley Stamp maps, dense urban areas were classified as “land agriculturally unproductive”, with suburban areas classified as “gardens”, and only large greenspaces within urban areas were marked separately. As there was no obvious way to match this with the categories on the modern map, a new category was created of “built-up areas and gardens” containing both the Dudley Stamp categories. For the present-day map, all urban and garden categories were combined, along with amenity grassland (e.g. road verges) that were less than 1 ha in size. Note that ditches between fields were not recorded on the Dudley Stamp maps and the width of larger rivers and drainage channels was not recorded accurately, hence any change in the amount of water between the two time periods should be interpreted with caution.

Using the new categories, two maps were created representing the 1930s and 2020 and clipped to the study area boundary. Data were then extracted on the cover of each habitat in each time period and the change in habitat area was calculated.

Results

A map of habitats in the 1930s is shown as Figure 1, with the corresponding map from 2020 as Figure 2.

Semi-natural grassland was the dominant habitat type in the 1930s, occupying 46.3% of the area of Greensand Country (17,734 ha), with arable occupying 30.6% (Figure 3). There appeared to be a gradient of habitats in the 1930s, with semi-natural grassland very dominant in the west and arable more common in the east. Woodlands occupied 10.4%, spread throughout Greensand Country, and built-up areas and gardens occupied 9.6%. There were no improved grasslands.

In contrast, by 2020, arable has increased to 46.7% of the land area and is now the dominant land cover type, with improved grasslands occupying a further 15.8%, especially in the western half of the area. Semi-natural grassland has declined to just 4.8% (1,821 ha), whilst built-up areas and gardens have increased to 14.4% and woodland has increased to 14.7% of the area.

The overall change in cover between the two time periods is shown in Figure 4. This shows that there has been a loss of 15,900 ha of semi-natural grasslands (a 90% decline) and almost 700 ha of heath and marsh (wetland) habitats (a 91% decline) across Greensand Country. On the other hand, arable has increased by 6,200 ha (an increase of 53%), built-up areas and gardens by 1,800 ha (50% increase) and woodland by 1,600 ha (41% increase). Improved grassland has increased from zero to 6,000 ha. The amount of water has remained almost identical, although the exact change recorded here is unreliable, as smaller drainage ditches were not recorded in the 1930s map. Orchards increased from 3 to 95 ha (an increase of 2,710%).

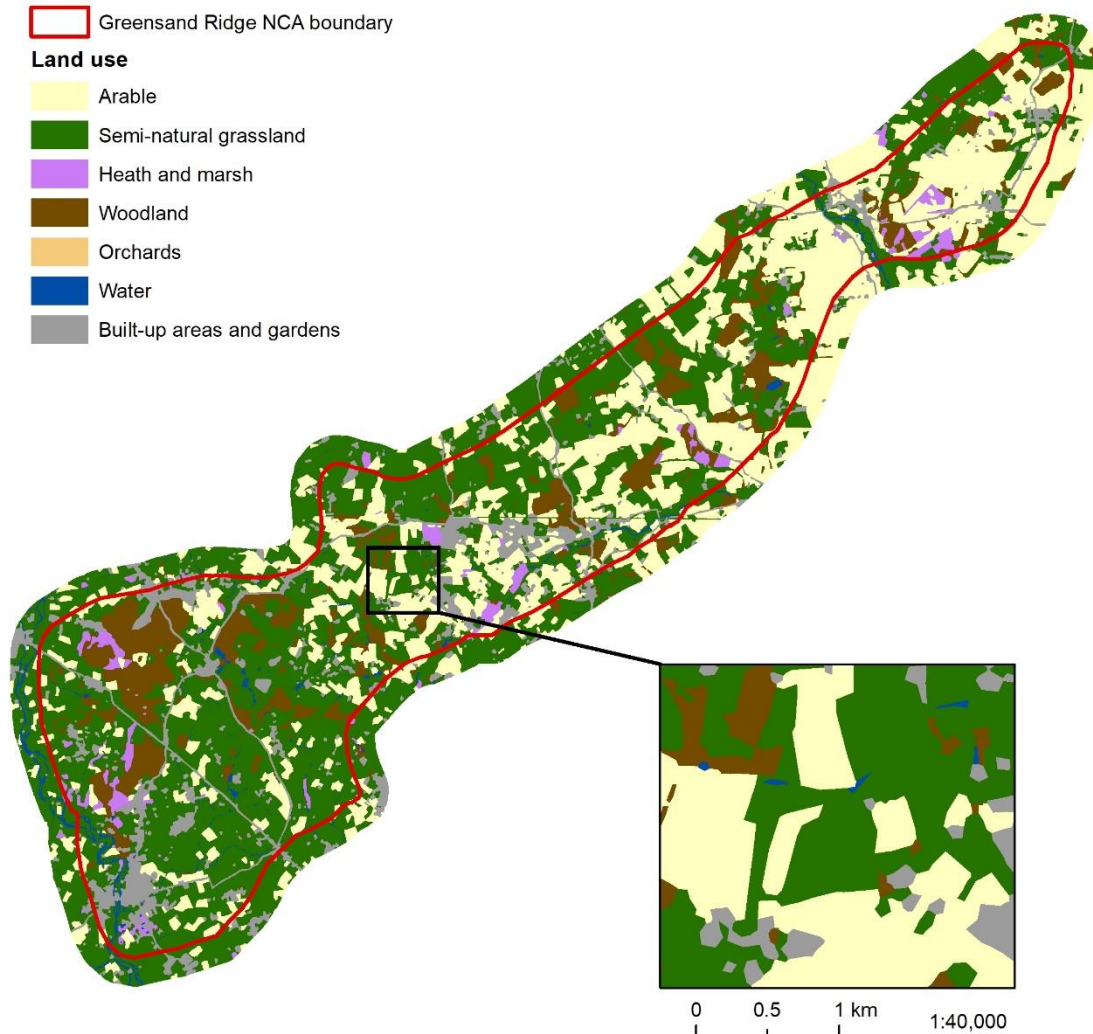
Land use and habitats in the 1930s

Legend

 Greensand Ridge NCA boundary

Land use

 Arable
 Semi-natural grassland
 Heath and marsh
 Woodland
 Orchards
 Water
 Built-up areas and gardens



Data are derived from the Land Utilisation Survey of Britain, 1933-1949, (c) Audrey N. Clark.
 Contains Environment Agency information (c) Environment Agency and/or database rights.

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0 4.75 9.5 km 1:200,000
 (at A4 paper size)



Figure 1: Land-use and habitats in the 1930s, derived from the “Dudley Stamp” maps.

Land use and habitats in 2020

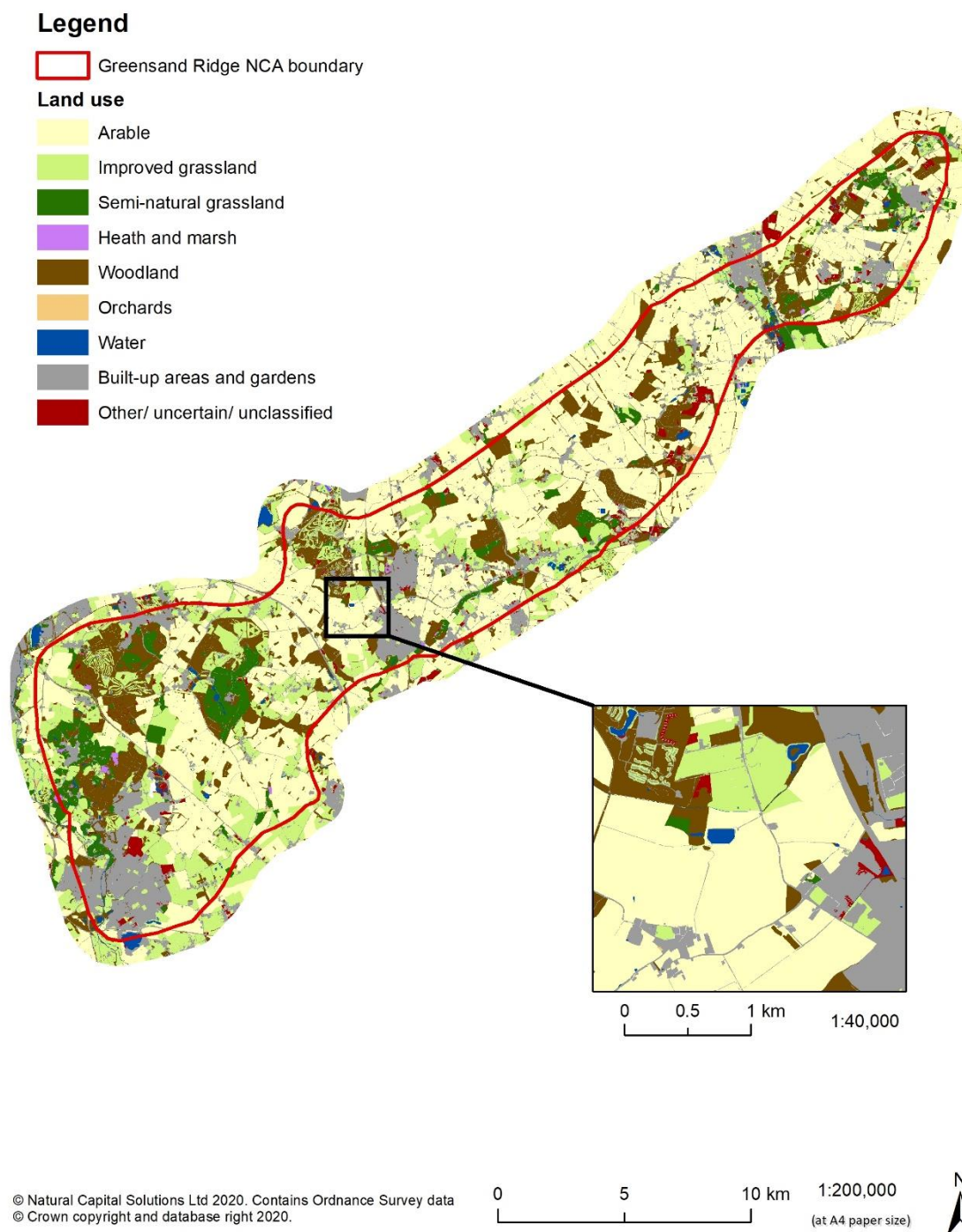


Figure 2: Land-use and habitats in 2020, derived from natural capital basemaps for each county, but with categories matched as closely as possible to the “Dudley Stamp” maps.

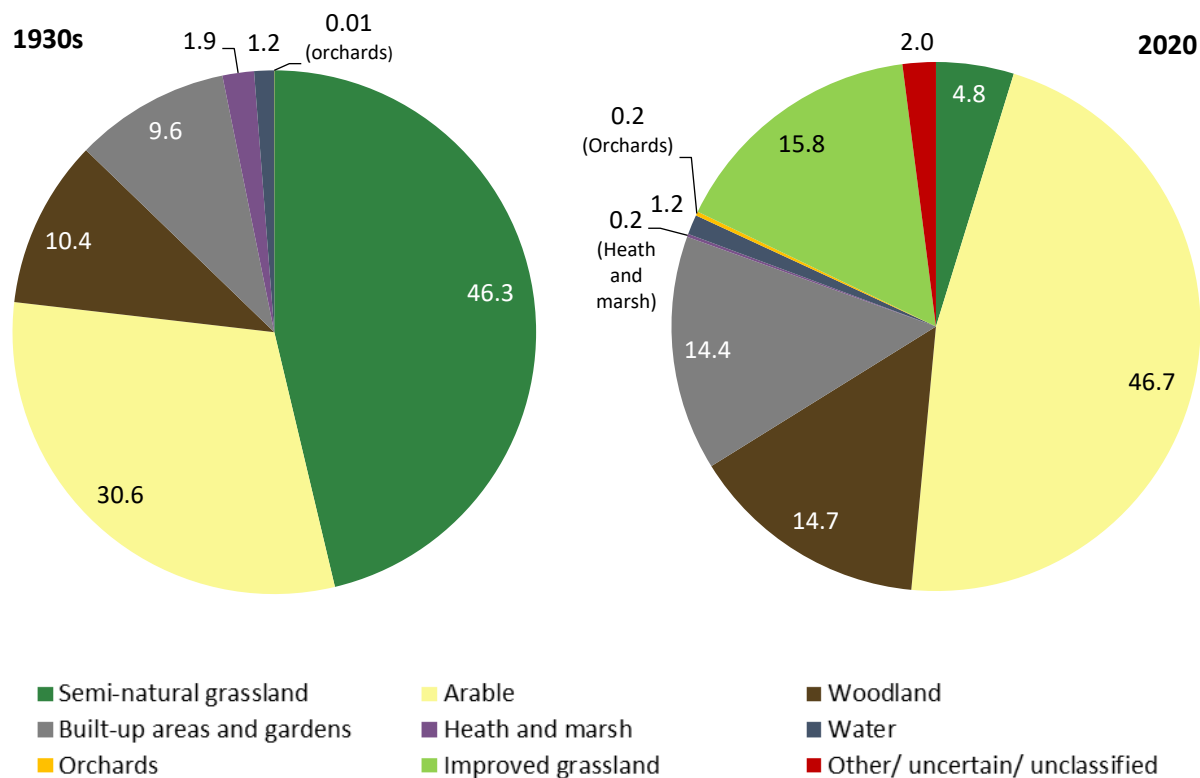


Figure 3: Percentage cover of habitat types in the 1930s (left) and 2020 (right).

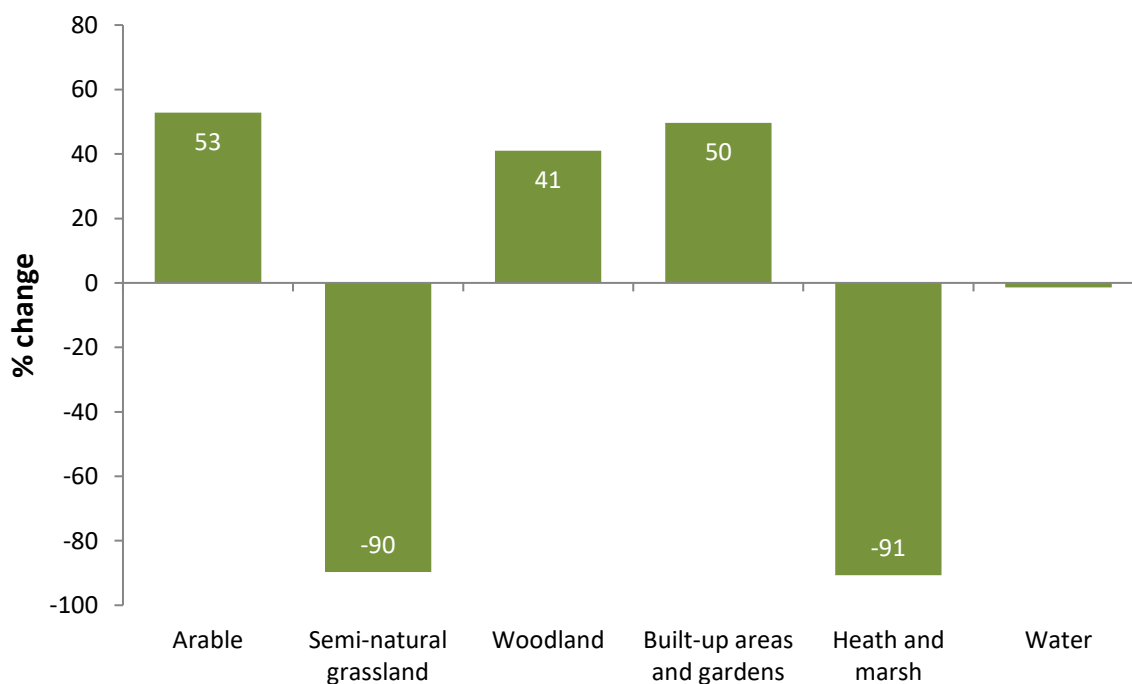


Figure 4: Percentage change in habitat types between the 1930s and 2020. Note that orchards increased by 2,710% (from 3.4 to 95 ha) in the same time period and is not shown.

Discussion

The maps and data paint a picture of profound habitat change over the last 80 years. The vast majority of semi-natural habitats have been lost, replaced predominantly by arable and improved grassland. There has also been an expansion of woodland, particularly of plantation forestry in the 1950-60s. Similar changes have been seen throughout the UK. Nationally, it has been estimated that 97% of enclosed semi-natural grasslands in England and Wales were lost between 1930 and 1984, whereas woodland in the UK increased by almost 100% over similar periods¹, figures that are not dissimilar to the 90% decline and 41% increase seen here. The figures from Greensand Country are similar to Northamptonshire, where a 95% decline in semi-natural grasslands and an 88% decline in heath and marsh were recorded, with a similar shift to arable, improved grassland and woodland. Cambridgeshire was already dominated by arable in the 1930s, but still recorded an increase in arable and a loss of 84% of semi-natural grasslands and 88% of heath and marsh.

Such significant losses of semi-natural habitats are almost certain to have had an impact on biodiversity in Greensand Country. As well as direct loss of habitat, remaining habitat patches are smaller and more fragmented with reduced connectivity between wildlife populations. This reduces dispersal between populations, and small and isolated populations are more prone to local extinction.

Efforts were made to match the habitats recorded in the 1930s to those from the present day, but there will inevitably be some discrepancies. Habitats were recorded at a much higher resolution in the present study, capturing very small habitat patches. This was not the case in the 1930s, particularly in urban areas, and water was also mapped with less accuracy. In addition, the digitization process led to some further loss of detail for small habitat patches. It is likely that both the built-up / garden and water categories will have been slightly over-simplified in the 1930s map compared to the present day, and some smaller habitats such as orchards will have been underrepresented. The exact habitat areas and percentage change reported here are therefore prone to some error. Nevertheless, the overall picture of change is accurate.

There are likely to have been major changes in the ecosystem services delivered by the natural environment over the last 80 years. Clearly agricultural production will have increased, along with timber production. However, a number of regulatory services are likely to have declined. The ability of the land to retain water will have decreased, and the positive impact of habitats filtering pollutants and enhancing water quality will also have declined. The impact on carbon storage and sequestration is more difficult to predict without a detailed assessment, as gains in carbon through increasing woodland cover will have been offset by losses due to conversion of semi-natural grasslands to arable and improved grassland, which store less carbon and give rise to emissions from agricultural activities. The supply of pollination services is likely to have declined with the loss of semi-natural habitats, but the demand for pollination will have increased considerably as oilseed rape has become a major component of the farming landscape but was not planted at all in the 1930s. Cultural services will also have been impacted although it is impossible to assess these due to cultural and other changes over the period.

Mapping and comparing land use and habitats over 80 years is a powerful way of demonstrating the changing landscape of Greensand Country and the loss of semi-natural habitats. Additional uses of the maps could be to assess changes in the degree of fragmentation and connectivity of habitat

¹ UK NEA (2011) The UK National Ecosystem Assessment. UNEP WCMC, Cambridge.

patches, and to identify previous land-use configurations to aid with the identification of the most suitable locations for habitat restoration. This could work particularly well in combination with the habitat opportunity mapping currently being undertaken in the area.