The Greensand Ridge Nature Improvement Area: The Ecological Evidence Base

Cooper's Hill Lowland Heathland
Photography by Gwen Hitchcock

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Bedfordshire
Cambridgeshire
Northamptonshire

Contents

1. Introduction

1.1 What is a Nature Improvement Area?

Over recent decades 60% of the species found in the UK have declined. Even those which were once common, like brown hares, common lizards and small copper butterflies are vanishing (*State of Nature Report, 2013*). A step-change is required to halt this loss and reverse the prospects for nature in the UK. In June 2011 the Government published The Natural Environment White Paper: *The Natural Choice – Securing the Value of Nature*. This was informed by England's Biodiversity Strategy (*Biodiversity 2020: A strategy for England's wildlife and ecosystem services*, August 2011) and the Lawton Report: *Making Space for Nature*. All three documents focus on the need to create bigger, better and more joined up spaces for wildlife whilst reconnecting people with nature. They also contain plans to achieve this; reversing the loss of biodiversity and creating the step-change which is needed. One of these plans, announced in The Natural Environment White Paper, is the creation of Nature Improvement Areas (NIAs). These are large (10,000-50,000 hectares/100-500km^2) discrete areas, which are set up where the opportunities and benefits for biodiversity are greatest and operated by local partnerships with a shared vision for the natural environment. In 2006, Bedslife (the local biodiversity partnership) produced *Rebuilding Biodiversity* which identified biodiversity hotspots and opportunity areas across Bedfordshire. The Greensand Ridge is instantly recognisable on maps within this report because of the concentration of wildlife rich habitats and designated sites that it contains. It covers 19% of Bedfordshire but contains 41%, by area, of the county's County Wildlife Sites (CWS). Through the sustainable use of natural resources, restoring and creating wildlife habitats, connecting local sites and joining up local action on a landscape-scale, NIAs (such as the Greensand Ridge) will bring about multiple benefits for wildlife and people. Each NIA will have its own character and specific issues to address, but they are all areas where:

- There are good opportunities to deliver an ecological network at the landscape-scale.
- There is a shared vision from a partnership of local people, including statutory and voluntary sectors.
- Significant improvements can be made to the ecological network in terms of enlarging and enhancing existing wildlife sites and improving ecological connectivity between them.
- Opportunities exist to better integrate the surrounding land uses with the ecological network.
- People living in urban areas and communities can access the network.
- Multiple benefits can be derived from the establishment of the NIA, for example, contributing to a low-carbon economy or Water Framework Directive objectives.
- People can be inspired through a better experience of the natural world (Defra 2012).

To provide inspiration and begin to build up an evidence base the Government allocated £7.5 million to fund the establishment of 12 initial NIAs. These would guide the creation of more NIAs across the Country which would be identified locally by Local Authorities. After designation they can be included in Local Plans alongside other measures for sustainable development (Natural Environment White Paper, 2011). The protection and creation of ecological networks is also promoted in the National Planning Policy Framework (Department for Communities & Local Government, March 2012).

1.2 Scope of this Report

This report summarises the ecological significance of the Greensand Ridge in the context of becoming a NIA. It identifies the existing ecological resource through the presentation of a series of maps illustrating various aspects of the Ridge's biodiversity, before moving on to explore the potential to enhance and create ecological networks across the NIA; expanding, buffering and connecting the existing core areas. This will be put into practice through a range of projects outlined in the final section. Some of the diverse benefits from creating a more robust ecological network will be explored; however, the benefits for local people and improvements to allow better access to the

ecological network will be covered in a separate document (Access and Engagement Framework). This is an integral part of the NIA and so will be focussed on elsewhere.

1.3 Introducing the Greensand Ridge

Bedfordshire's Greensand Ridge is a narrow, elongated, elevated area which runs in a north-east/south-west direction covering a significant part of Central Bedfordshire, along with small sections of Buckinghamshire and Cambridgeshire. It is the marked contrast of this 'island' of Greensand rising above the encircling Bedfordshire and Cambridgeshire claylands which makes the area both attractive and distinctive within the wider regional setting. It covers just over 27,300ha and forms Natural England's National Character Area 90.

The Greensand Ridge is composed of sands and sandstones from the Lower Greensand which were laid down in shallow tropical seas during the Cretaceous period, around 124-112 million years ago. Some deposits are rich in marine fossils, whilst others contain deposits of Fuller's Earth, which was produced when volcanic ash from erupting volcanoes settled in the shallow Cretaceous seas. Tilting of these rock layers during the formation of the Alps, followed by millions of years of erosion, particularly during the last Ice Age, has produced the landform which exists today. The Greensand is a more resistant rock and so was not eroded as much as the softer clays which surround it. This has left the Ridge as a prominent feature in the landscape. It has a steep north-facing scarp slope, whereas the south-facing dip slope is generally gentler. In places on the Ridge there are patches of bounder clay over the Greensand. These were deposited as the ice sheets retreated and produce the Ridge's neutral grasslands and bounder clay ancient woodlands. For some of its length the River Flit runs along the base of this slope. Along the Flit are a string of wetlands which are heavily influenced by the water which percolates through the Greensand Ridge and the peat deposits in this area. The Ridge is bisected by two larger rivers at either end. At the south-western end the Ridge is divided by the Ouzel Valley and at its north-eastern end by the River Ivel.

The geology of the Greensand Ridge gives rise to acidic, nutrient poor and free draining soils which have a low fertility compared to the surrounding claylands. They provided the right conditions for heathlands to become established and favoured the establishment of heath and woodland hunting estates over other agricultural uses. The north-west facing scarp slope has a number of woodlands (both ancient and plantations) on patches of clay soil, producing a distinct wooded skyline. King's and Baker's Woods Site of Special Scientific Interest (SSSI) at the western end of the Ridge, is the largest continuous area of ancient woodland in Bedfordshire. The acidic waters from the Greensand aquifer support wetter woodlands along the base of the dip slope, along with acid mires and floodplain grazing marshes along the rivers. The historic parklands which are characteristic of the Ridge still contain many veteran trees along with expanses of semi-improved neutral and acidic grasslands. In addition to these habitats, historically, the Greensand Ridge would have had extensive areas of heathland and acid grassland. Only fragments of these now remain at sites such as Cooper's Hill SSSI and Rushmere Country Park. In recent years the creation of new heathlands has begun, the largest of which is at Sandy Heath Quarry.

The wildlife rich habitats that remain along the Greensand Ridge support a variety of species, many of which are locally or nationally rare. On the heathland and acid grasslands proliferous pink (*Petrorhagia prolifera),* fragrant agrimony (*Agrimonia procera*) and heath dog violet (*Viola canina*) can be found. Woodlark (*Lullula arborea*) have bred on some of the heathland sites and a range of uncommon invertebrates can be found. Amongst the woodlands there are populations of lily-of-the-valley (*Convallaria majalis*), scaly male ferns (*Dryopteris affinis*) and wild service trees (*Sorbus torminalis*). Maulden Wood is a dormouse (*Muscardinus avellanarius*) introduction site which is regularly monitored and purple emperor (*Apatura iris*) and silver-washed fritillary (*Argynnis paphia*) butterflies can be found in some of the Ridge's woodlands. In addition the wetland sites contain marsh fern (*Thelypteris palustris*), marsh violet (*Viola palustris*) and star sedge (*Carex echinata*). Along the Flit Valley species of *Sphagnum* moss can be found along with important populations of lower plants and fungi. The rivers have many beautiful native black poplar trees (*Populus nigra spp.*

betulifolia) and are regularly used by otters (*Lutra lutra*) with some populations of water vole (*Arvicola amphibius*). Water shrew (*Neomys fodiens*) are very occasionally recorded from some of the wetter areas. The rich habitats and woodlands along the Greensand Ridge are also important for bats. There are a number of important hibernation sites for a variety of bat species along the Ridge, as well as abundant foraging landscapes in some areas. A range of reptiles and amphibians can be found including the County's largest population of adder (*Vipera berus*) and the reintroduced natterjack toad (*Bufo calamita*).

1.4 The Need for Ecological Networks

The light soils have created a distinctive pattern of land uses and habitats along the Greensand Ridge. The character of the Ridge, however, and the extent of its habitats have been eroded over time by changes in agricultural practices and the impact of people. Although core biodiversity hotspots still exist, they have become increasingly smaller and more isolated. This has had a dramatic impact on the ability of the Ridge to maintain sustainable populations of many of the species which contribute to its diverse habitats and landscape qualities. Small isolated populations are more vulnerable to local extinction than larger, well-connected ones. If, for example, bad weather conditions caused a species to be unable to breed successfully over a few seasons, there is a good chance of the population on a small isolated site becoming too small to remain viable. Males and females might not meet to breed or the population could randomly become skewed towards one sex. If the site was larger or connected to other sites in the vicinity, species extinctions are less likely to occur. Larger sites tend to have bigger populations which are more robust and small but more connected sites can be recolonized. The findings from the Lawton Report: *Making Space for Nature*, amongst others, have recognised that the step-change for nature that is required is only possible if wildlife is connected at the landscape scale. Whilst nature reserves and other core areas for biodiversity are still vital they are not, and cannot, conserve wildlife into the future. As the climate changes the need to consider nature on a larger scale becomes more important. Individual sites may alter dramatically as the climate changes. There is a need to allow species to move across the landscape so that they can find new places where there are the correct conditions for them to flourish. Identifying The Greensand Ridge as an NIA aims to enhance the landscape to enable this to happen. It is an ideal area because it still has rich wildlife sites with many opportunities to expand, buffer and connect them across a distinctive landscape.

Quarrying of the Greensand sands and digging of peat and Fuller's Earth in some areas, both historically and more recently, has dramatically changed the landscape but also provided many opportunities for restoration. Sandy Heath Quarry, where a large area of heathland is being created, is just one example of this. Other sites, however, have not been restored with nature conservation in mind and so, at present, are less useful in the creation of an ecological network. In addition to quarrying there are a range of other threats which have reduced the ecological network on the Greensand Ridge. Lack of, or inappropriate management of, sites with wildlife interest has led to a decline in the quality of some and others have been lost all together. Even sites which are managed for biodiversity have come under pressure as they are required to provide a diverse range of functions. In particular, informal recreation of some of the sites has resulted in conflicts of interest developing. In the past, many of the Ridge's characteristic woodlands and heathlands have been replanted with conifers or other non-native species for commercial forestry. Some woodlands are still commercially managed for conifers, although there are others which are being restored. Many of the wetlands and watercourses are fed by the Greensand aquifer. Over-abstraction of this is one of the greatest threats to these areas as it would result in lower base flows in the rivers and drier wetland sites. In addition to this, many of the watercourses also have high nutrient levels which can cause significant damage to some of the sensitive wetland sites during and after flood events. Finally, due to the desirable towns and villages along the ridge some areas have faced pressure from insensitive housing and commercial developments. Although these pressures are not as great as in other parts of the county, badly sited or designed developments still have the potential to cause greater fragmentation to the ecological network or reduce the quality of core areas.

Creating a functional ecological network and tackling these threats has benefits beyond those for wildlife. Biodiversity and the ecosystems that it makes up are often undervalued by conventional economic analysis and decision making, although they are critically important to our well-being and economic prosperity. Ecosystems provide a vast range of services which enable us to survive, from producing food, controlling water supplies and regulating the climate, to providing opportunities for recreation and contact with nature which research has shown promotes long term health and happiness (Natural England 2012). The UK National Ecosystem Assessment (2011) found that about 30% of the services that ecosystems provide are in decline and many others are operating in a reduced state. These services include declines in pollinators, which are estimated to be worth hundreds of millions of pounds annually, and the condition of soils. Soils are vital for food production and biodiversity but have suffered from atmospheric deposition and inappropriate management. The provision of a better environment also has direct benefits to the local economy. It creates an image which is attractive to employers and employees who are already in the area and also helps to attract more investment. Tourism can be particularly important. Other aspects which are not always considered are the ethical, spiritual and aesthetic qualities of biodiversity which are more difficult to quantify. There are also community benefits to having a healthy, functioning natural environment. It promotes a sense of well-being about an area, particularly when the local community is involved in its management. This can range from commenting on a site's management plan to recording the wildlife that is found in an area or being involved in the practical management of sites alongside others from the local community. There is an increasing body of evidence which identifies how a healthy natural environment is able to promote the health and wellbeing of local residents. Experiencing nature can help to prevent disease and accelerate recovery from illness, as well as helping to tackle obesity, coronary heart disease and mental health problems (Natural England 2012). The wide range of benefits derived from a healthy natural environment is recognised in England's Biodiversity Strategy: Biodiversity 2020, which places people at the heart of biodiversity policy (Defra 2011).

2. Updating and Presenting Ecological Data

The following section summarises the ecological character and important features of the Greensand Ridge through a series of maps. Each map illustrates a different aspect of the Ridge to build up the ecological information and highlight the wealth of biodiversity which is already present within the NIA.

2.1 Landform

The landform and geology of the Greensand Ridge dictates many of its ecological features. Its distinctive steep north-west facing scarp slopes are easily identified by the closely spaced contour lines on Figure 1. The Ridge's dip slope is gentler and runs into the valley of the River Flit in its central section. This is illustrated on Figure 1 by the Indicative Flood Map. The Ridge is bisected by the River Ouzel at its western end and by the River Ivel at its eastern end.

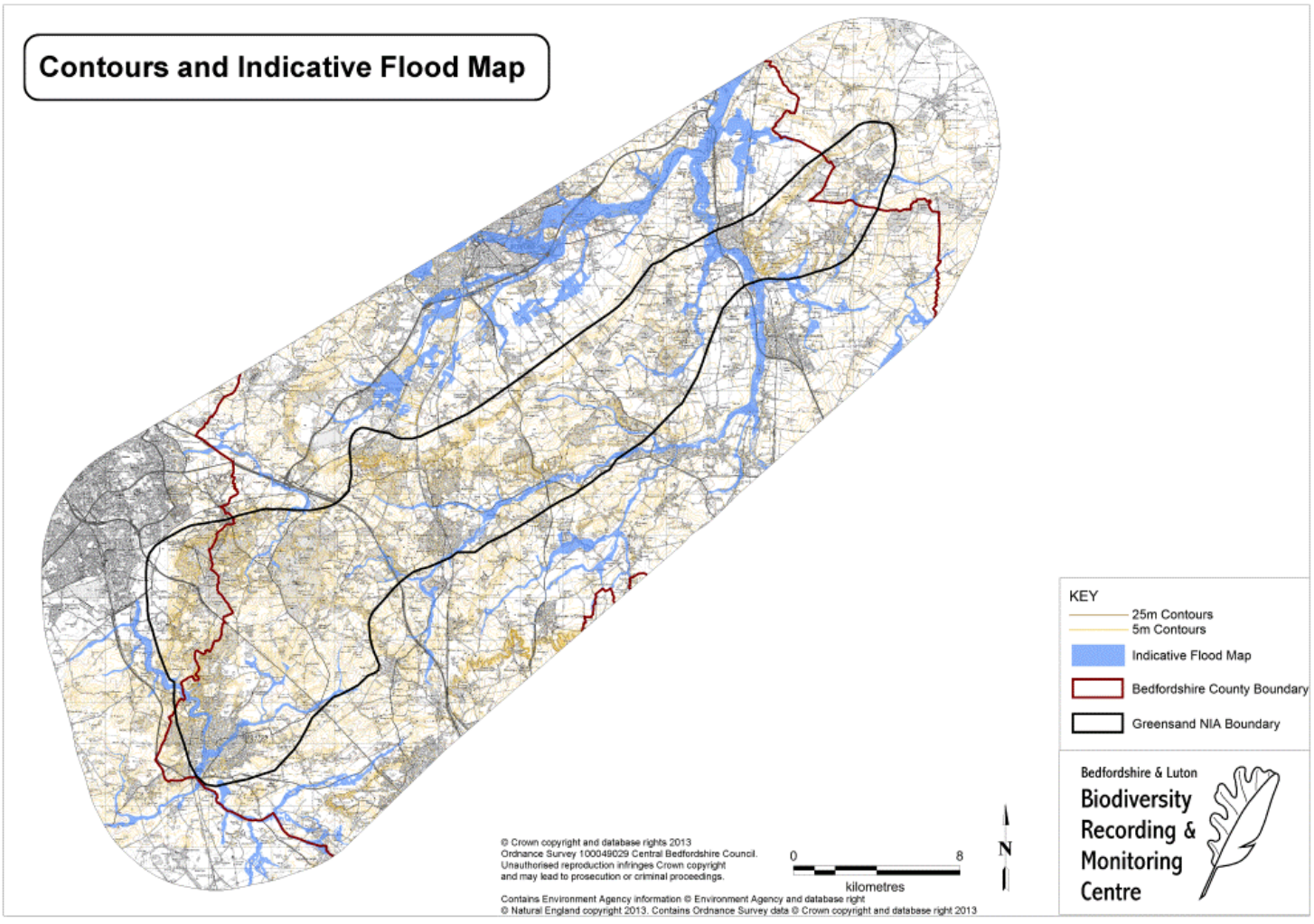

Figure 1: Contours illustrate the distinctive landform of the Greensand Ridge whilst the Indicative Flood Map shows the river valleys.

2.2 Habitats Overview

The habitat overview which is shown in Figure 2 demonstrates the cluster of woodlands (ancient and more recent) which are found along the Greensand Ridge. There are also more grasslands (of various qualities) than on the surrounding clay vales which have more productive arable land. The map also shows the fragments of heathland and acid grassland that remain. Currently many of these sites are small and relatively isolated making them vulnerable to further decline. In the river valleys there are strings of wetland sites which include floodplain grazing marsh, lowland fens and wet woodlands.

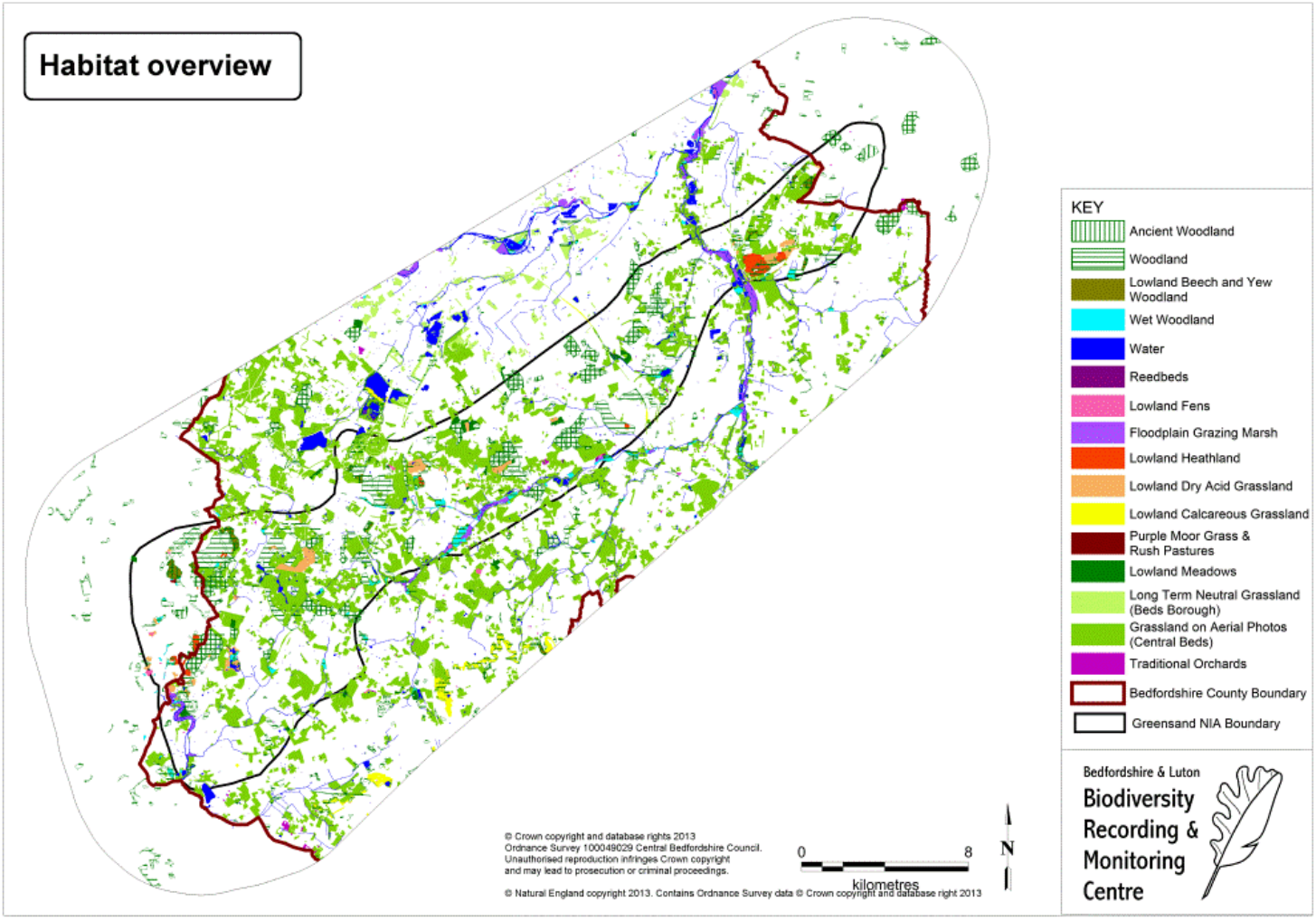

Figure 2: There are a diverse range of habitats included in the NIA from ancient woodlands to heathlands and acid grasslands. In Cambridgeshire and Buckinghamshire habitat data is only included for areas within the NIA boundary not the wider hinterland.

2.3 Habitats of Principal Importance

In 2006 the Natural Environment and Rural Communities Act (NERC) came into effect, which for the first time placed a statutory duty on public bodies to have regard to the purpose of conserving biodiversity across all their functions. This is often referred to as the 'Biodiversity Duty' (Section 40). The aim of the Act is to embed nature conservation within all the relevant policies and decisions that public bodies make. To help with this, the Act also contains Section 41 which is a list of habitats and species which are "*of principal importance for the purpose of conserving biodiversity*". Section 41 lists all the Biodiversity Action Plan (BAP) habitats and species which were previously assembled in response to the Convention on Biological Diversity in 2002. The BAP summarised the status of the most threatened habitats and species in the UK and then set out a series of actions to halt their decline and then reverse it. There are National Action Plans for 1150 species and 65 habitats. Although the Aichi Targets from the most recent Convention on Biological Diversity in 2010 have replaced the BAP, it is still a very valuable reference and is represented in recent Acts of Parliament. Some of the habitats of *"principal importance"* included in Section 41 of the NERC Act are found along the Greensand Ridge. The locations of these are shown in Figure 3. It is encouraging to note that many of the habitats marked on the overview in Figure 2 are still present in Figure 3 which shows those which are of particular note. It illustrates the ecological richness of the area and potential to create a functioning network. It also, however, better represents the spaces between core areas which currently represent barriers for many species of wildlife.

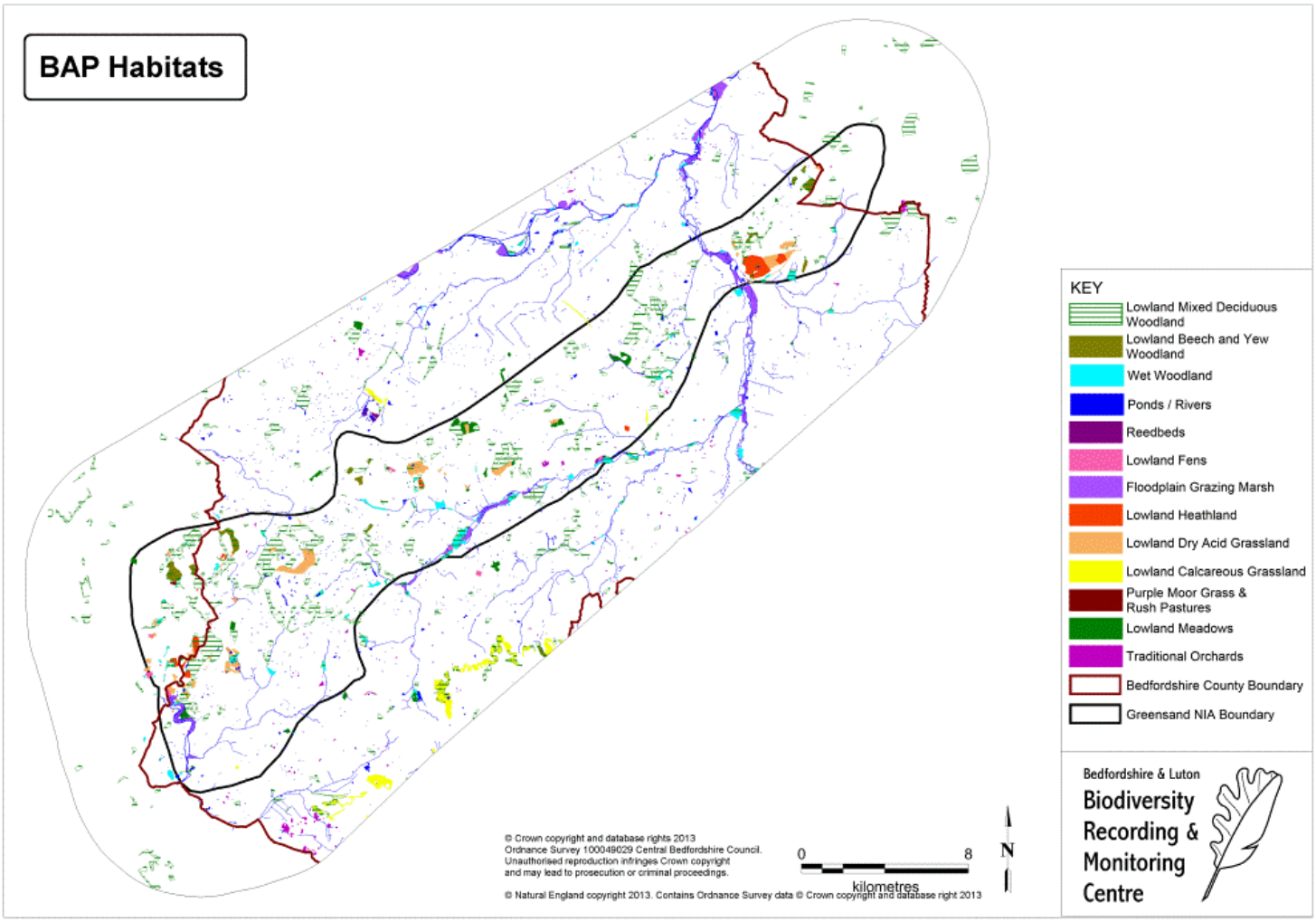

Figure 3: Many of the habitats found along the Greensand Ridge are recognised as BAP habitats or habitats of "*principal importance"* under the NERC Act 2006. In Cambridgeshire and Buckinghamshire habitat data is only included for areas within the NIA boundary not the wider hinterland.

The historic parkland sites (taken from the Historic Environment Record) shown on Figure 4 illustrate the Greensand Ridge's link to estate management as opposed to the agricultural uses which surround the Ridge. Wood pasture and parkland is also shown on this figure. The combination of veteran trees and old permanent grasslands, which are found in these landscapes, often makes them rich in wildlife. It is because of this that wood pasture and parkland is recognised as a habitat of *"principal importance"*. The figure shows the extent of the parkland landscape which would have existed along the Ridge in the past (historic parklands) compared to the wood pasture and parkland which exists today. Although many areas have been lost there are exceptions, most notably the Woburn estate.

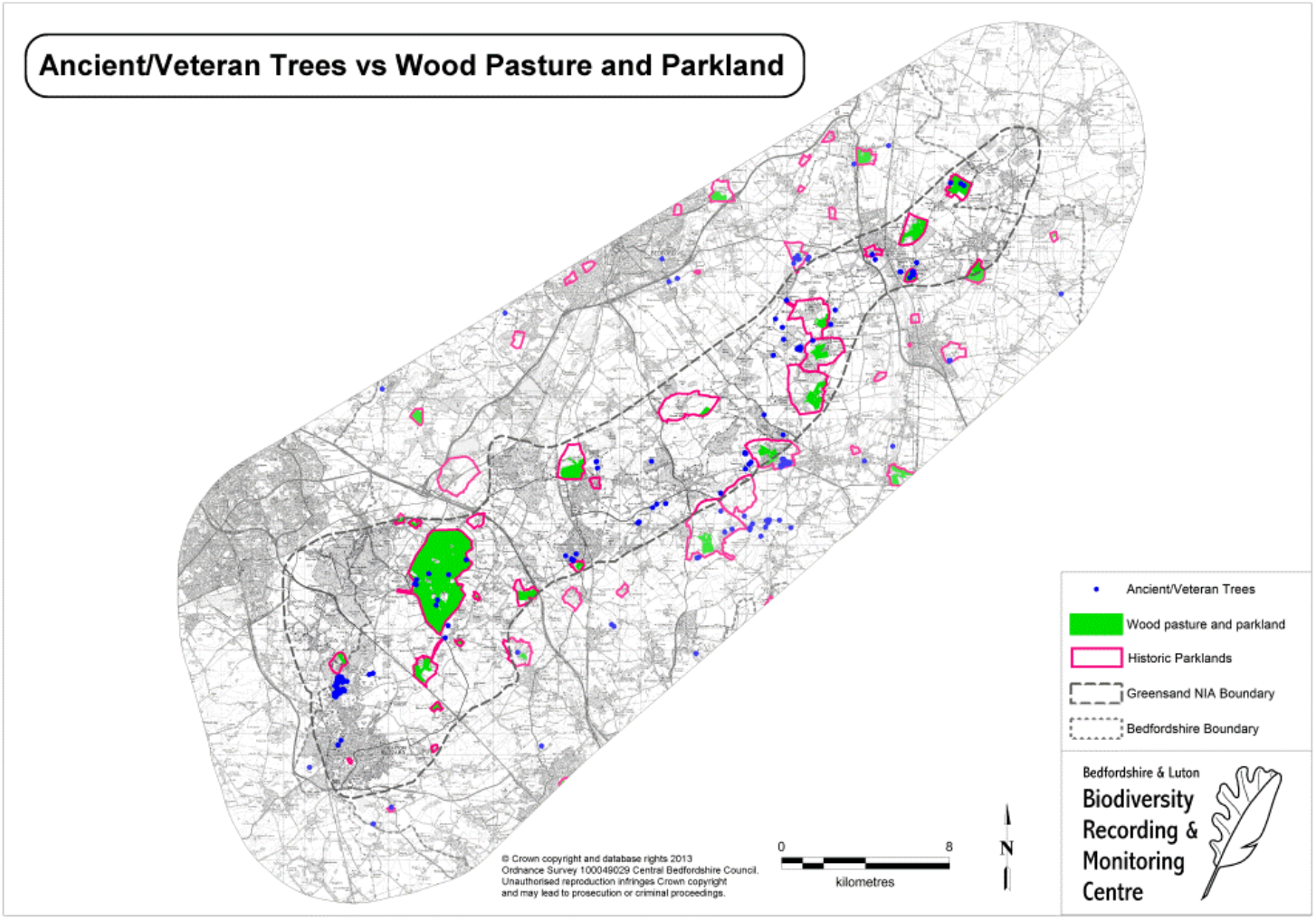

Figure 4: The importance of the Greensand Ridge for parkland landscapes is clearly demonstrated. The area historically covered by parkland was much greater than the wood pasture and parkland habitats which remain today, although there are some notable exceptions.

2.4 Species of Principal Importance

In addition to listing habitats, Section 41 of the NERC Act 2006 also contains a list of species which are considered to be "*of principal importance for the purpose of conserving biodiversity*". From this list 141 species have been recorded from within the Greensand Ridge NIA. A further 22 additional species have been found within 5km of the NIA. Figure 5 represents the distribution of these species across the Ridge. It shows that there are several hotspots, most notably around:

- King's and Baker's Woods
- Aspley Wood
- Ampthill, Flitwick, Maulden and Clophill and their surrounding countryside
- RSPB The Lodge at Sandy
- Potton town and the surrounding countryside
- Gamlingay village and the surrounding countryside

Most of these are close to towns and villages allowing easy access for people to connect with nature on their doorsteps. Some of the areas which have particularly low numbers of species recorded from them may reflect the existence of large private estates where public access, and therefore biological recording, is limited. In these areas there could be additional hotspots which are not reflected on Figure 5. Nearly 55% of the species of *"principal importance"* which have been recorded in the NIA are insects, reflecting the abundance of this group within the natural world. The list also contains 34 birds, 11 mammals, ten plants, four reptiles, three amphibians, one mollusc and one fish.

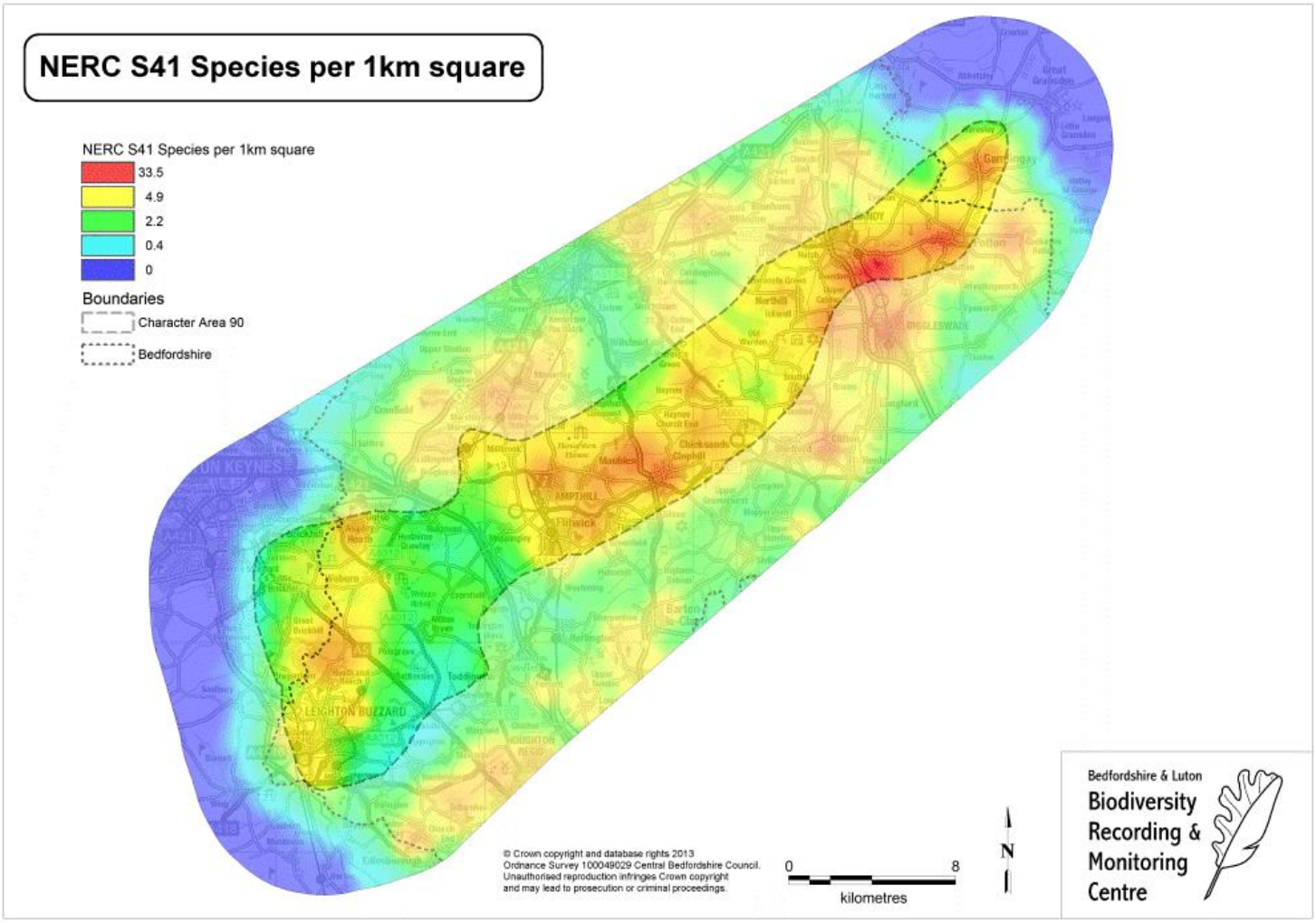

Figure 5: There are several hotspots for species listed in Section 41 of the NERC Act 2006 along the Greensand Ridge. In Buckinghamshire and Cambridgeshire species records were only obtained for areas inside the NIA and not within the 5km around it.

2.5 Statutory and Non-Statutory Sites

Reflecting of the quality and quantity of wildlife rich habitats found on the Greensand Ridge, it has numerous sites which are designated for nature conservation at various levels. The Ridge has one National Nature Reserves at King's Wood near Heath and Reach, 14 SSSI, six Local Nature Reserves, 131 County Wildlife Sites (CWS) and 11 Roadside Nature Reserves. The designated sites reflect the range of habitats which are found within the NIA. They include wetland sites like Flitwick Moor SSSI and CWS, heathland and acid grasslands, such as those found at Rushmere Country Park CWS and Cooper's Hill SSSI and CWS, and numerous woodlands; including the ancient woodland at King's Wood, Houghton Conquest CWS and the plantation woodland at Warren Wood CWS, which now hosts a Centre Parcs. To reflect the geological interest of the area it has two additional SSSI and 13 Local Geological Sites. The distribution of these sites is shown on Figure 6.

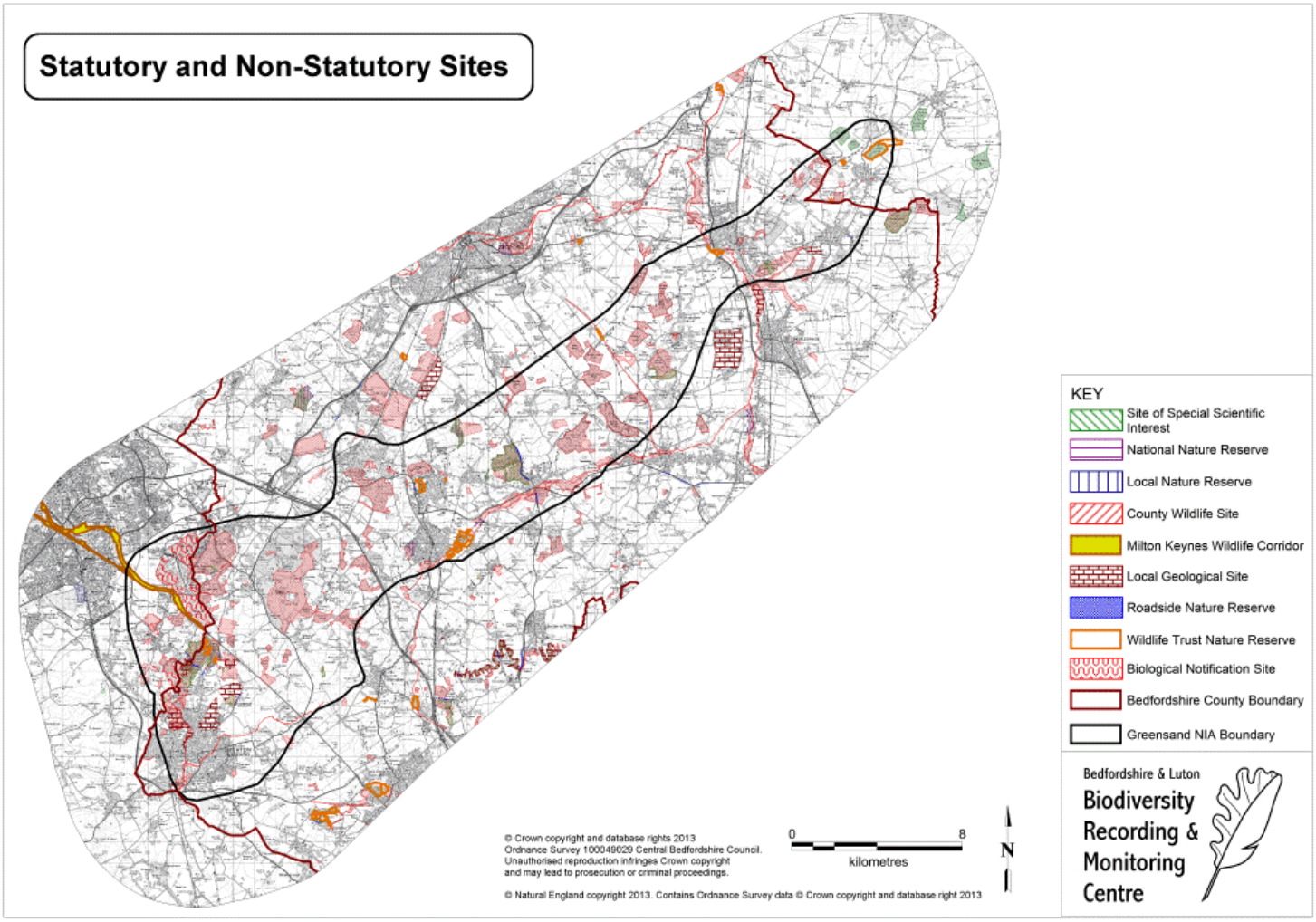

Figure 6: The distribution of statutory and non-statutory designated sites across the Greensand Ridge NIA. In Buckinghamshire and Cambridgeshire only sites within the NIA are shown. These counties will have different selection guidelines for non-statutory sites.

SSSI cover 2% (5.6km^2) of the area of the NIA. This is higher than the rest of Bedfordshire where only 1% of land is designated as an SSSI. Compared to the national average of 8%, however, both are still very low despite 40% of Bedfordshire's SSSI being within the NIA. When last assessed by Natural England most of the NIA's SSSI were in a favourable (65% by area) or unfavourable recovering (30% by area) condition. The area of SSSI which is in a favourable condition is much higher than the national average which is only 37% (Natural England, 2013). Only two of the Greensand Ridge NIA's SSSI (Maulden Church Meadow and Nine Acres Pit) are in an unfavourable condition which shows little change, and one section of King's and Baker's Wood and Heaths is classified as unfavourable declining. The condition of each SSSI is shown in Figure 7.

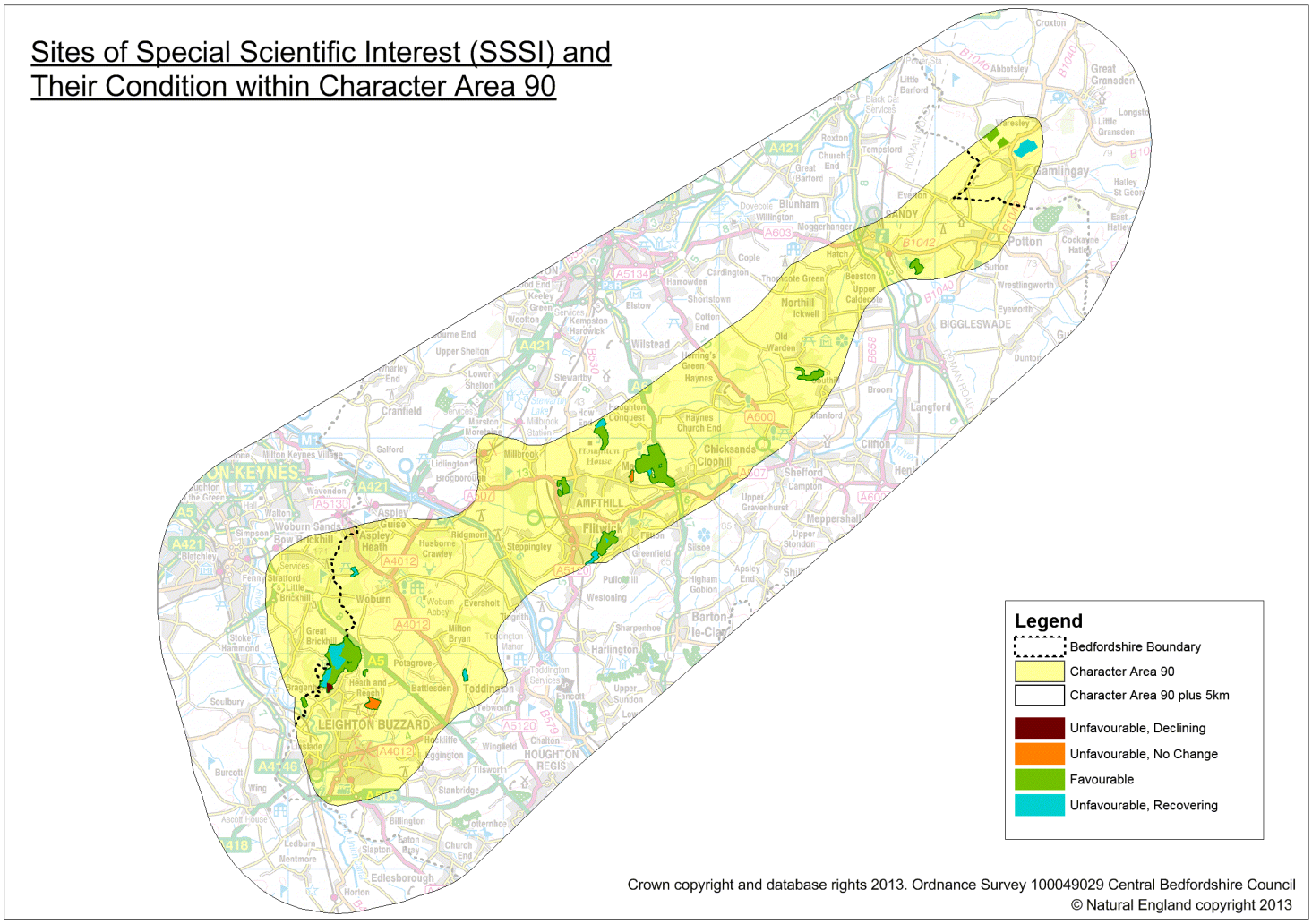

Figure 7: Natural England condition assessments of SSSI within the Greensand Ridge NIA.

CWS are assessed differently to SSSI. Sites which are being managed to preserve or enhance their wildlife interest are judged to be in positive conservation management (Figure 8). This could include the site being registered in a suitable Environmental Stewardship Scheme land management option or English Woodland Grant Scheme; having an active management plan; or efforts by individual land owners or managers. Of the CWS which are on the Greensand Ridge within Bedfordshire and Cambridgeshire 72% (73% by area) are in positive conservation management. Across England only 45% of CWS are in positive conservation management (DEFRA, 2012), showing the quality of sites on the Greensand Ridge. When the habitats within these CWS are considered there is a lot of variation in the proportion of each which is in positive conservation management. This is shown in the table on the following page. Most woodlands and wetlands are appropriately managed, whereas only about half of the area covered by heathland and lowland meadow CWS is judged to be in positive conservation management.

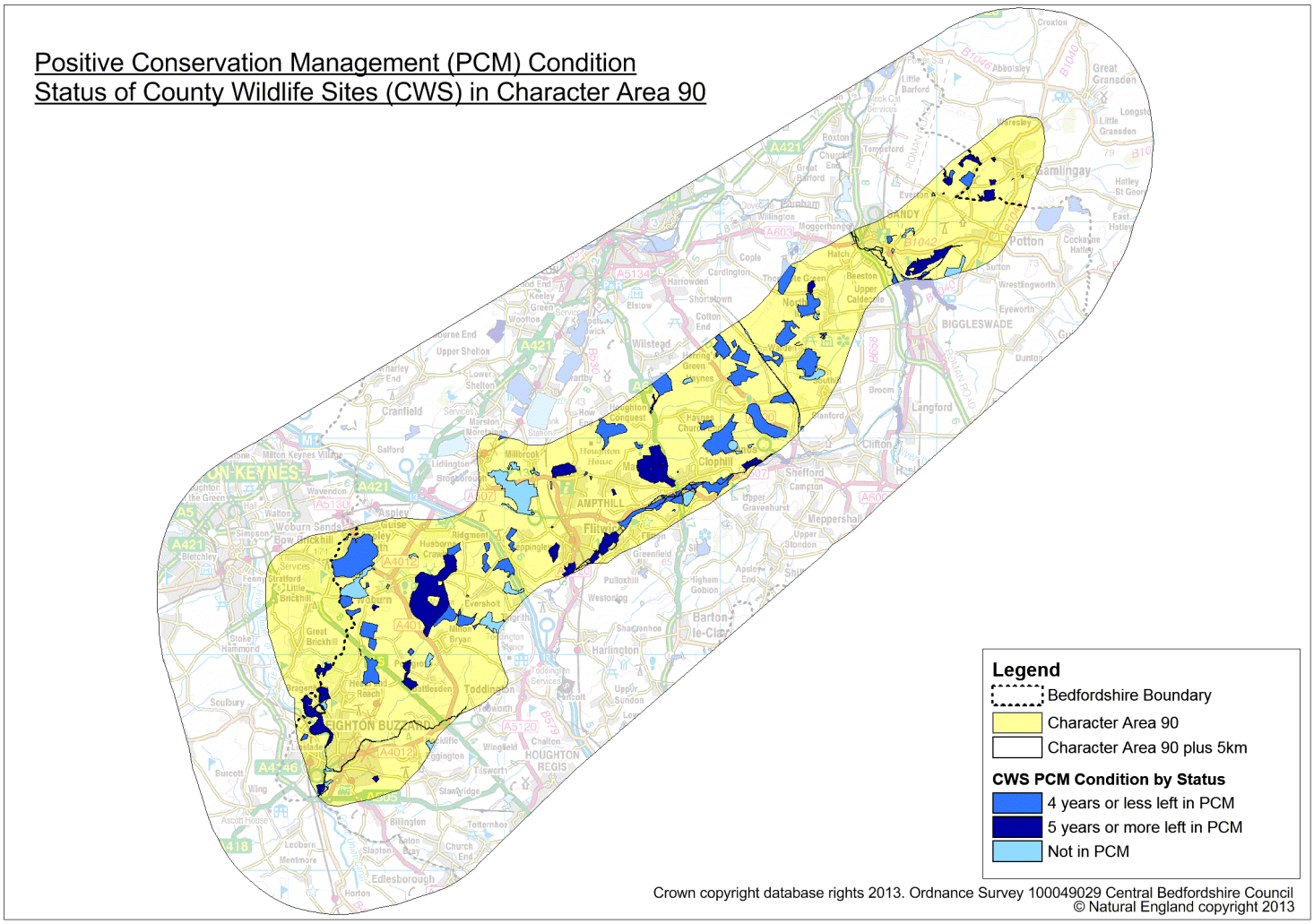

Figure 8: CWS which are in positive conservation management across the Greensand Ridge NIA. At present no information is available for Buckinghamshire.

	Total Area (ha)	Total Number of Sites	% of Total CWS Area	Area in Positive Conservation Management (ha)	Number of Sites in Positive Conservation Management	% of Area in Positive Conservation Management
Lowland Calcareous Grassland	28.1	1	1%	0	0	0%
Lowland Meadow/Neutral Grassland	430.4	18	22%	224.5	12	52%
Lowland Heathland	13.7	2	1%	7.5	1	55%
Wet Woodland	55.7	3	3%	32.3	2	58%
Lowland Dry Acid Grassland	143.1	10	7%	89.8	7	63%
Standing Open Water & Canals	98	7	5%	73.5	5	75%
Rivers	96.3	4	5%	76.4	3	79%
Woodland	809.4	44	42%	647.3	34	80%
Ponds	4.4	2	0%	3.9	1	89%
Wetlands (fen, marsh, swamp, reedbeds)	127.9	6	7%	124.9	5	98%
Wood-pasture & Parkland	54.4	3	3%	53.6	2	99%
Open Mosaic Habitats on Previously Developed Land	62.8	1	3%	62.8	1	100%
Unknown	20.6	4	1%	16.9	3	82%
TOTAL	1944.8	105		1413.4	76	73%

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2.6 The Wider Landscape including Agri-Environment Schemes

Even though the Greensand Ridge has an abundance of designated sites the majority of the NIA is not within one of these areas. Biodiversity is not constrained to these sites and although they continue to be vital refuges for many species the wider landscape is of great significance. One group of species which is not catered for within designated sites are the arable plants. These are species which require frequently disturbed soil and thrive at the borders of agricultural fields. Figure 9 shows how they are distributed across the NIA. The figure uses Plantlife's arable scoring system which allocates a weighting to every arable plant species found in each area, in this case each 1km square, to produce a score. The most important areas are shown as red squares. In some squares further work has been completed to better define the area in which the arable plants are found. These are shown in blue and there are three within the NIA.

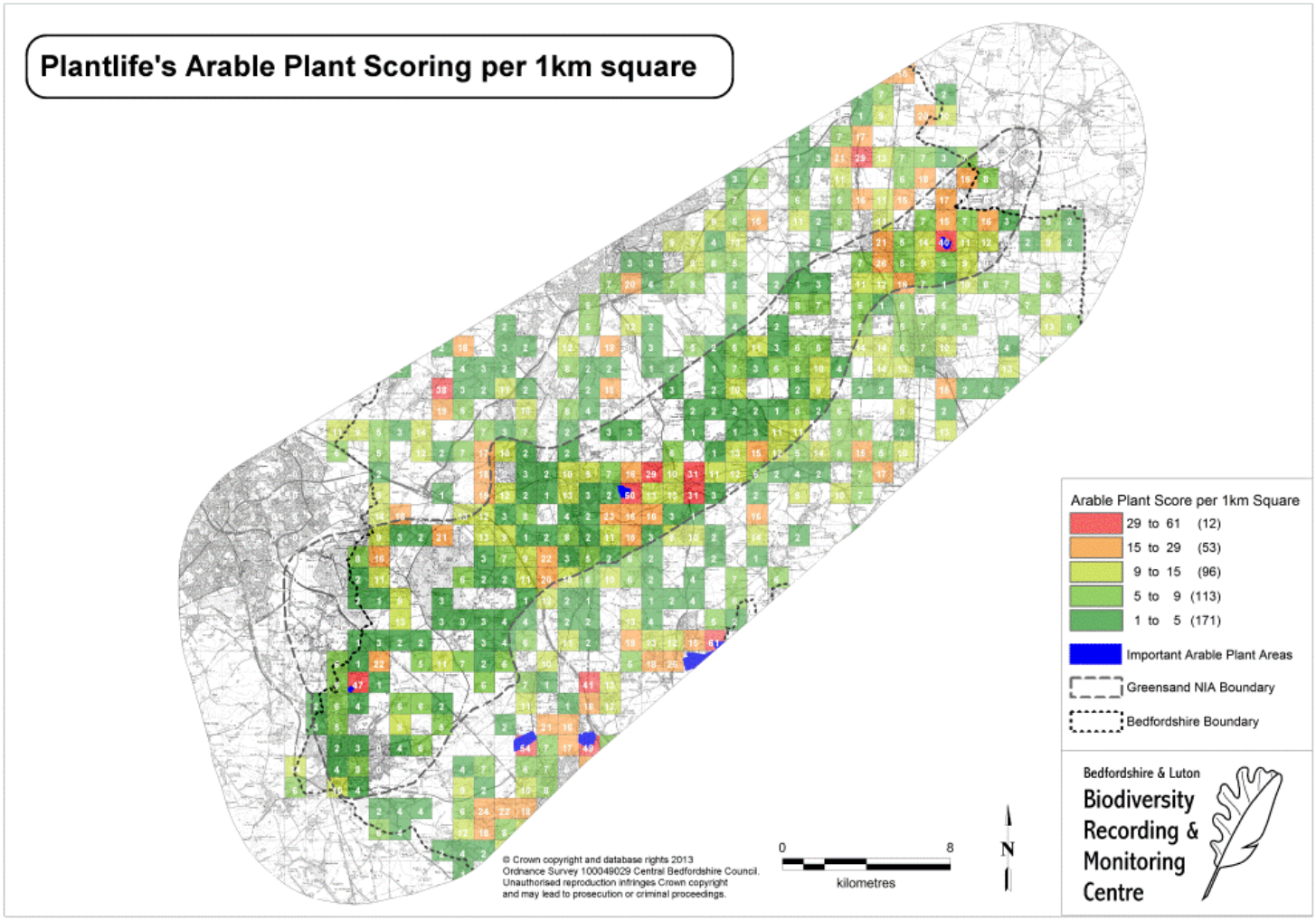

Figure 9: The arable plant scores for each 1km square within the Greensand Ridge NIA using Plantlife's scoring system. Particularly important arable plant areas which have been better defined are shown in blue.

Arable plants only represent a small proportion of the flora found within the NIA. Figure 10 represents the hotspots for all vascular plants which have been recorded across the Ridge. It shows the importance of the Ridge as a hotspot for floral diversity in comparison to the surrounding claylands and particularly highlights the diversity of many of the designated sites. It is interesting to note that a few areas of the Ridge have noticeably fewer plant species recorded from them. The area to the west of Upper Caldecote is one example. Further work is required to better understand why this is.

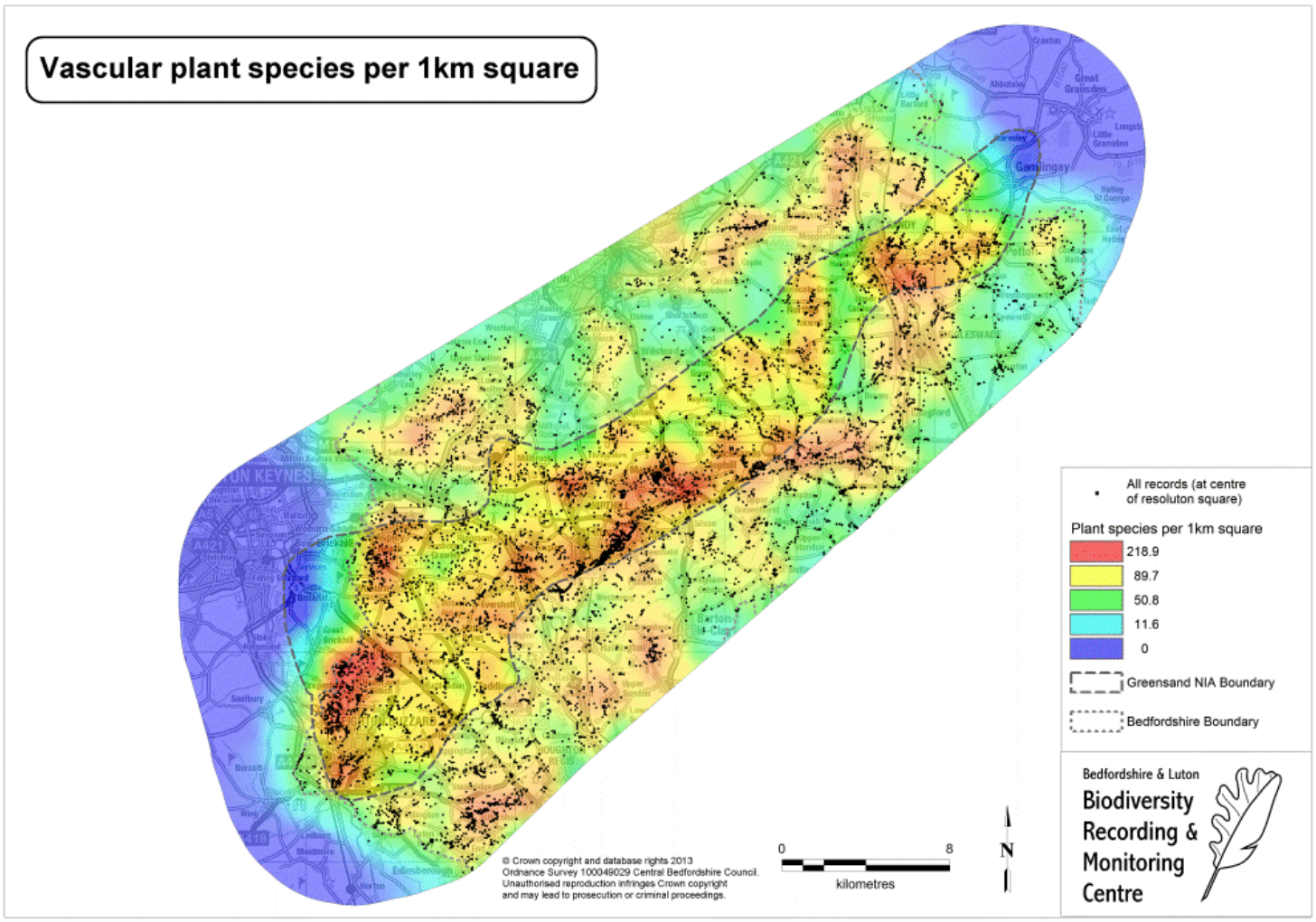

Figure 10: Density of vascular plants that have been recorded across the Greensand Ridge within Bedfordshire. Data from Cambridgeshire and Northamptonshire was not available.

The distribution of plant species across the NIA is just one aspect of its biodiversity. It is a useful one to illustrate as it forms the base of most food chains, supporting a wealth of other species across the habitats found on the Ridge. It is also a group which is fairly well recorded in the County. There are many other groups of species for which the wider countryside beyond designated sites is of particular importance. This could be because they move over large areas, require a variety of habitats or are dependent on agricultural activities. Species groups which would fall into this category include many species of bats and some birds. Enhancing the Ridge for them will also benefit a wider range of wildlife species who are, at present, only found within designated sites, by creating links between other habitats. This is important as it allows wildlife to move between sites; creating more robust interconnected populations. For example, butterflies like the Sliver-washed Fritillary (*Argynnis paphia*) and Wood White (*Leptidea sinapis*) have life cycles which depend on woodland plants. Although they may spend the majority of their time within one particular woodland, where it is possible

to move across the landscape (via wooded corridors or stepping stones of copses) they have the opportunity to colonise new woodlands and connect distant populations.

One way of enhancing agricultural habitats and connecting other wildlife rich areas is through agri-environment schemes. Figure 11 shows the locations of active agri-environment schemes (Agricultural Stewardship Schemes and English Woodland Grant Schemes) across the NIA. Within these schemes there is a range of options some of which are more beneficial for biodiversity than others. The colour pattern on the map divides the options into different habitats and whether they are beneficial for biodiversity or neutral. Examples of neutral options would be creating footpaths and open access areas or those which are designed to enhance archaeological features. The map indicates that there has been an average uptake of agri-environment schemes across the NIA in comparison to the rest of Bedfordshire. Across Bedfordshire 33% of land is in an agri-environment scheme compared to 34% in the Bedfordshire section of the NIA. Most of the options taken on the Greensand Ridge are beneficial for biodiversity and will enhance the ecological network.

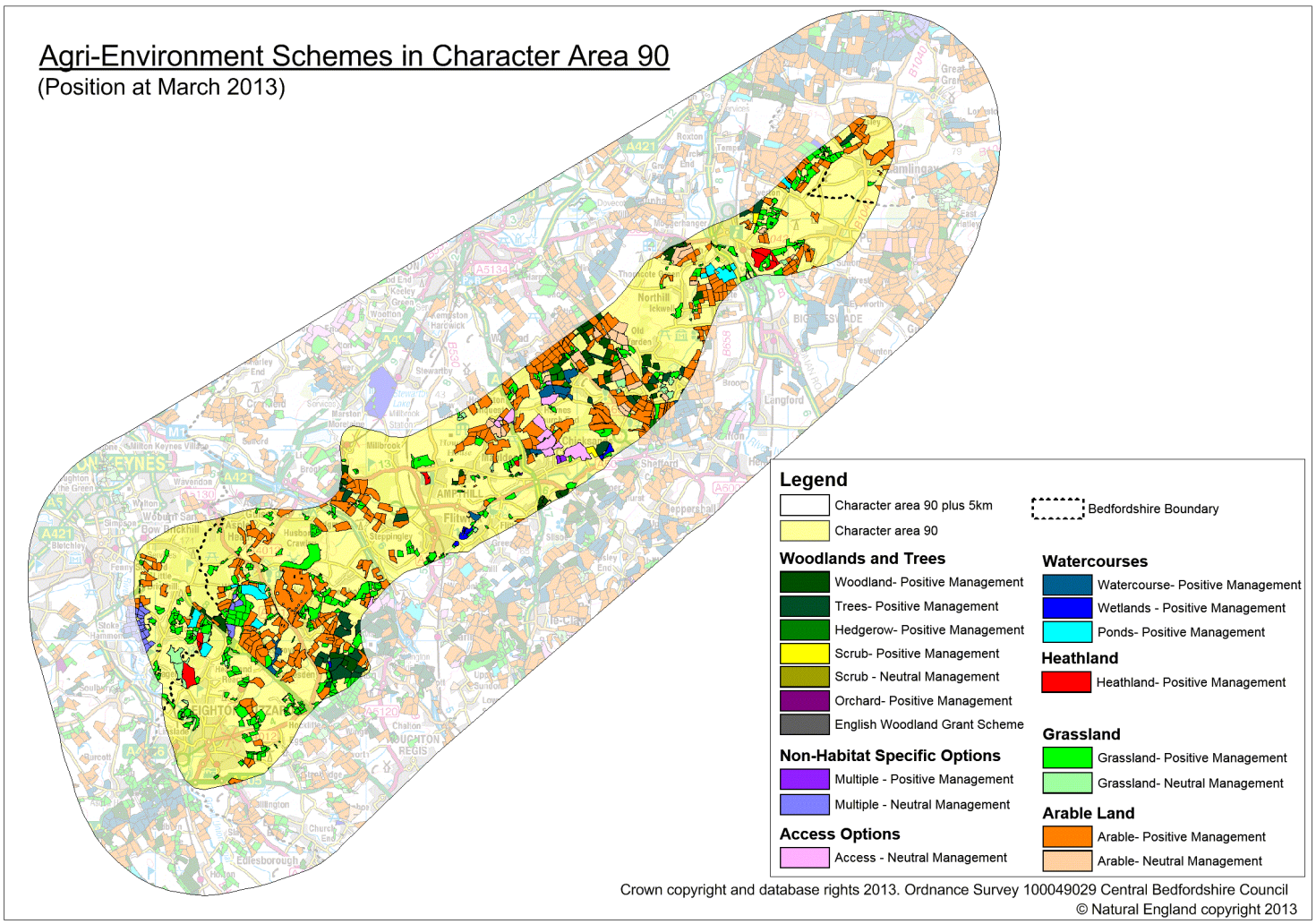

Figure 11: Agri-environment scheme options and their benefit for a range of habitats across the Greensand Ridge NIA.

Although the influence of agri-environment schemes is very important, there are also other ways of maintaining and enhancing the ecological network on the Greensand Ridge. These include making better use of the network of road verges and river corridors, as well as promoting links through new housing developments and the restoration of former industrial sites. These are discussed further in the fourth section of this report.

3. Identifying the Potential

3.1 Rebuilding Biodiversity

In September 2008 the former Mid Bedfordshire District Council published their Green Infrastructure Plan. The Plan brought together information on the biodiversity, historic environment, landscape, access routes and open spaces to form a co-ordinated network across the district. To inform the biodiversity section of the Green Infrastructure plan a range of partners came together to produce the Rebuilding Biodiversity map (Figure 12). The existing habitats (to the extent that they had been mapped at the time) were buffered and connected, using information on the District's landform, soils and hotspots for particular species, to highlight where the creation of links for biodiversity would be most useful. The network was colour coded on the map to show the types of habitats which would be connected through each link. Some of the most relevant links to the Greensand Ridge NIA are:

- B: **Sandy to Potton Ridge** where sandy soils give major opportunities for heathland and acid grassland creation and woods on the Ridge sloping down to important spring lines at the junction with clay soils. The ecology of this area is varied and complex and part of the area is listed as of national importance for fungi. The major initiative by the RSPB and Lafarge to create heathland in the core of this zone at Sandy Heath Quarry has scope to expand to link together a whole series of isolated sites.
- E: The **dip slope of the Greensand Ridge** from Shefford through Maulden to Ampthill and Flitwick where undulating countryside, with major opportunities for grasslands, heaths and woodlands, slopes down to a rich and unique collection of wetland sites in the Flit valley. Flitwick Moor itself is of national importance for many species groups including fungi, bryophytes and invertebrates. Within the valley sensitive management of water quantity and quality combined with improved management regimes on some sites, restoration of relict habitat and the creation of new could rebuild a large habitat network. Above the valley there are major opportunities for new heathlands, acid grasslands and lowland meadows, as well as the restoration of hedgerows and creation of arable field margins to expand and link together relatively large and important sites such as Maulden and Chicksands woods.
- F: The **woods and parklands of the Woburn area** with the links through to the sand quarries of the Leighton Buzzard area and to the valuable habitats on the Buckinghamshire portion of the Greensand Ridge are an important biodiversity hotspot. A large collection of ancient woods and the rare wood pasture habitat of Woburn Park support many species of importance. The biodiversity of this hotspot is rich and emphasis here is more on the conservation and enhancement of the existing resource, although the broad principles of conserving, expanding, buffering and linking habitats are as relevant here as elsewhere.
- H: The **Southill/Shuttleworth/Ickwell/Northill area** of woodlands, hedgerows, parkland and spacious villages is the second biodiversity hotspot. The varied topography and mix of soil types supports many species of importance and the emphasis here is very similar to that described for Area F.
- I: The **steep northwest facing slope of the Greensand Ridge** supports a string of important woods and grasslands. Along the slope the soils are varied and considerable opportunity exists to expand and link woods via both new woodland and networks of hedgerows, lowland meadows and sensitively managed arable field margins.

Summaries of the other links shown on the map are included in Appendix 1.

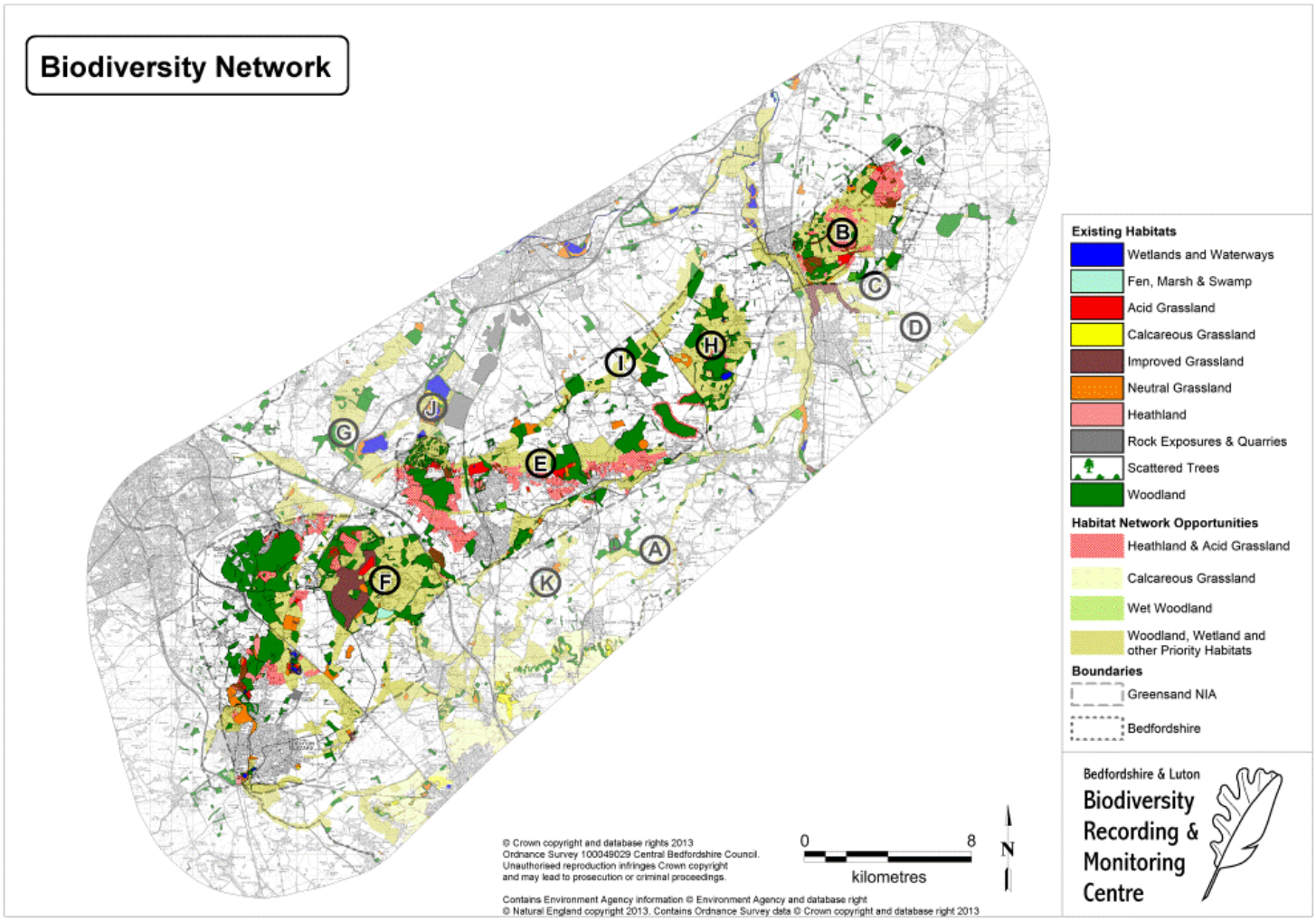

Figure 12: Rebuilding Biodiversity network map taken from the Mid Bedfordshire Green Infrastructure Plan (September 2008). The habitat information shown on the map reflects the data available at the time of its production. Many of the layers have been updated since.

The biodiversity/ecological network contains a number of key features. The first of these are the *core areas* which already contain rich habitats and support a range of species, often within designated sites. The concept of the biodiversity network is to expand and enhance these areas, along with smaller wildlife rich fragments, to encourage larger, more robust wildlife populations. Although the Greensand Ridge already contains some core areas the creation of *restoration areas*, where new habitats would be created which will, given time, become core areas in the future, will make the network more robust. These core areas and restoration areas will be connected together across the NIA using *corridors and stepping stone*s which will allow wildlife to move between them. *Buffer zones* are another key feature of the biodiversity network. These surround the core areas reducing the pressure on them and diluting the impact of negative influences. Finally, the network considers the land which surrounds the NIA promoting its sustainable management in a wildlife friendly way.

3.2 Core Areas

3.2.1 Heathland and Acid Grassland

Heathland and Acid Grassland are two of the most characteristic habitats found along the Greensand Ridge. Although they are now reduced to small fragments they would have been much more widespread and connected in the past. Existing sites include areas of King's and Baker's Woods, Rushmere Country Park, Cooper's Hill, Ampthill Park, Maulden Heath and The Lodge at Sandy. Within some of the conifer plantations, such as those at Wavendon Heath and Rowney Warren, there are also small areas of heathland vegetation along rides and clearings. Gorse, along with other scrub and trees are associated with most of these heathlands and acid grasslands. Although they provide additional features and can add more structure to the heath, they require management to prevent them becoming too dominant and threatening the heathland and acid grassland vegetation. The existing heathlands support a range of different species from natterjack toads (*Bufo calamita*) and adders (*Vipera berus*) to woodlarks (*Lullula arborea*). Some of the locally rare plants which are found on the Ridge include spring vetch (*Vicia lathyroides*), weasel's snout (*Misopates orontium*) and bilberry (*Vaccinium myrtillus*). On the bilberry in the Aspley Heath and Aspley Guise areas the beautiful snout (*Hypena crassalis*) moth, which is rare in this area, has been found. Across the Greensand Ridge in the bare sand and heathland environments there are a range of invertebrates which are uncommon. These include the beetles *Amara fulva* and *Ocypus opthalmicus* from Sandy Heath Quarry and *Bembidian pallidipenne* from Fox Corner, a Roadside Nature Reserve.

3.2.2 Wood Pasture and Parkland including Veteran Trees

Wood pastures and parklands bring together a number of potentially wildlife rich features, such as veteran trees and grasslands which have been established for a long time. Many also have some historic significance. The Greensand Ridge has a number of historic parklands some of which still have features which qualify them as a habitat of "*principal importance*". The largest remaining parkland is on the Woburn estate. It is the only example in the County of a working wood pasture with large herbivores grazing the acid/neutral grassland amongst trees with a mixed age structure, some of which are veterans. Other examples of this habitat include Ampthill Park and parts of The Lodge at Sandy.

3.2.3 Woodland

Woodland is the other habitat which is characteristic of the Greensand Ridge. Seven per cent of the NIA is covered with broadleaved woodland (which accounts for 38% of the area of CWS) and there are also many conifer plantations. Some of these were planted on ancient woodland sites, Chicksands Wood and Wilstead Wood had conifers planted on some parts, whilst others are on former heathlands, for example Wavendon Heath, Rowney Warren and Sandy Warren. Within the broadleaved woodlands there are extensive stands of semi-natural ancient woodland, including King's and Baker's Woods (the largest area of ancient woodland in Bedfordshire), Maulden Wood and King's Wood, Houghton Conquest. The woodlands range from acidic oak-birch woodlands on the sandy soils to damp oak-ash woodlands on areas of clay. Wet woodlands are also present along spring lines, such as those at Stockgrove Country Park, and particularly along the River Flit. The Flit Valley contains the majority of the wet woodland within Bedfordshire, with key sites at Flitwick Moor and Lower Alders. The Ridge also contains numerous secondary woodlands. The mature beech woodland at Jackdaw Hill near Lidlington and the young woodland which has been planted around Linslade Wood are just two examples. Locally uncommon plants which are found in woodlands on the Greensand Ridge include wood vetch (*Vicia sylvatica*), bitter vetchling (*Lathyrus montanus*) and soft shield fern (*Polystichum setiferum*). Dormice (*Muscardinus avellanarius*) have been introduced into Maulden Wood and are spreading through it to colonise new areas. Lesser spotted woodpeckers (*Dendrocopus minor*), nightingales (*Luscinia megarhynchos*), spotted flycatchers (*Muscicapa striata*) and woodcock (*Scolopax rusticola*) are all found in the Ridge's woodlands and purple emperor (*Apatura iris*) and silver-washed fritillary (*Argynnis paphia*) butterflies can also be seen. At present

these species are found in small numbers and some are in decline, but their continued presence offers a good base for the NIA.

3.2.4 Grasslands

The acid grassland which is found in association with heathland and the grassland element of wood pastures and parklands have already been discussed. There are, however, additional wildlife rich grasslands along the Greensand Ridge. Unimproved neutral grasslands are very occasional but can be found on areas of boulder clay, for example at Maulden Church Meadow. There are also areas where cuttings have been made through the boulder clay and here calcareous grasslands develop. The grassland at Old Warden Tunnel on the edge of the NIA is one example. Within the disused quarries a range of grassland communities have become established from acid grassland and lichen heaths to calcareous and neutral grasslands. Although these grassland habitats do not make up a significant proportion of the NIA they do support some species of interest, such as sulphur clover (*Trifolium ochroleucon*) which is found on the Roadside Nature Reserve at Deadman's Hill.

3.2.5 Wetlands

The Greensand Ridge NIA includes a variety of different wetlands. In the Flit Valley the acidic waters which come from the Greensand aquifer create acid mires, floodplain grazing marshes and wet woodlands. These support a unique assemblage of species particularly sedges, lower plants such as *Sphagnum* mosses and liverworts, and invertebrates. In the wet woodlands many specialist fungi and liverworts can be found among the alder, birch and willow trees. Some of the sites are of national importance. Flitwick Moor SSSI is a key site in the Flit Valley. It contains a mixture of valley mire, swamp, wet woodland and pond habitats alongside marshy, acidic and neutral grasslands which support an abundance of rare plants, lower plants, fungi and invertebrates. Flitwick Moor is one of the most important sites for fungi in the south-east of England and has been recognised as an Important Fungus Area by Plantlife and the British Mycological Society (Plantlife, undated). It is the only site in the county where water rail (*Rallus aquaticus*) breed regularly. Either side of Flitwick Moor along the Flit Valley there are a string of designated wetland sites. These include the majority of the wet woodland found in Bedfordshire. Other acid wetlands are rare within Bedfordshire. They are confined to small flushes at Wavendon Heath and at Cooper's Hill, where marsh violet (*Viola palustris*) grows. These wetland habitats and those within the valleys have strong links to the higher ground on the Ridge. They form part of the same hydrological system, with the water which falls on the Ridge and feeds the aquifer within it defining the quality and quantity of the water sustaining the wetlands. Considering the management of the land across the Ridge will have a greater impact on its wetland habitats than it may first appear.

Along the Flit and Ouzel rivers there are many native black poplars (*Populus nigra spp. betulifolia*), a tree which is rare in this area, along with mature willow pollards. Away from the acidic springs there are some areas where marsh and fen have formed on more calcareous soils. In these areas there are species like greater tussock sedge (*Carex stricta*) and jointed rush (*Juncus articulatus).* In the Ouzel Valley, which cuts across the Ridge at its south-western end, semi-improved neutral floodplain grasslands are a dominant feature. On a slightly smaller scale, across the Greensand Ridge there is a scattering of pond and some larger lakes have been created as part of the restoration plans in disused quarries. These are frequented by overwintering wetland birds including tufted duck (*Athya fuligula*), teal (*Anas crecca*) and pochard (*Aythya ferina*). Smaller wildlife ponds for conservation purposes have been created at Duck End Nature Reserve and Flitton Moor, both of which have become rich in wildlife. Bog pimpernel (*Anagallis tenella*) has been recorded from Duck End, whilst other locally rare plants including common cotton-grass (*Eriophorum angustifolium*) and greater dodder (*Cuscuta europaea*) are found on some of the other wetland sites.

3.3 Restoration Areas

The partnership of conservation organisations who work along the Greensand Ridge have, for many years, aimed to restore areas creating more wildlife rich habitats. This is particularly true for the Ridge's heathlands which at present are especially depleted and isolated. Areas of heathland and acid grassland are being restored at Rushmere Country Park, Rammamere Heath, Shire Oak Heath, Maulden Heath and Sandy Warren. The quarrying activity on the Ridge has also created opportunities to create new habitats. At Sandy Heath Quarry the RSPB and Lafarge Aggregates are creating a large area of heathland and acid grassland. This will significantly increase the amount of this habitat in the area and should provide an additional core area in the future. Figure 13 shows the locations of other quarry sites along the Greensand Ridge. If suitable restoration plans can be secured, these could also become core areas in the future.

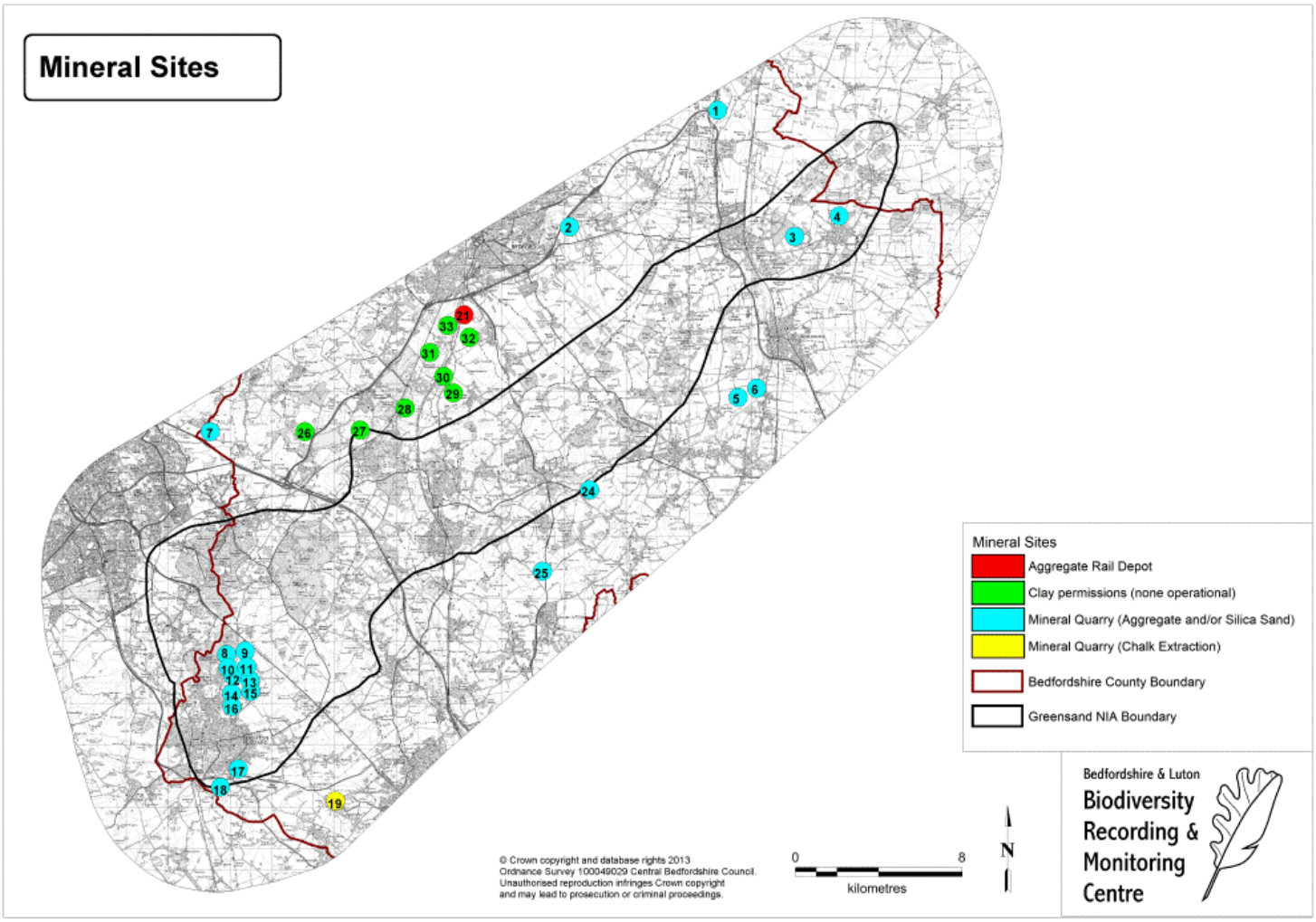

Figure 13: The locations of quarries within the Greensand Ridge area. With suitable restoration plans these could become core areas in the future. The numbers identify each quarry. The key can be found in Appendix 2.

There have also been long-term aspirations to provide better connections between the wetland sites along the Flit Valley enhancing it as a core area. The purchase of Sandy Smith Nature Reserve by the Greensand Trust has added another hub for wildlife in the river valley and enhanced connections along it.

Eight per cent (2,178ha) of the NIA is also part of the Forest of Marston Vale. This Community Forest was established in 1991 to demonstrate the contribution which environmental improvement can have

to social and economic regeneration. It aims to plant over 5 million trees by 2031 to cover 30% of its area in woodland. Already it has achieved 10% woodland cover by planting over 1 million trees as well as working with surrounding landowners to promote woodland cover within the landscape formerly dominated by the brick industry. As they mature, these new woodlands and connections between them will provide more woodland core areas in the future as they mature.

3.4 Corridors and Stepping Stones

Connecting the core areas and restoration areas is a key feature of the NIA. The historic landuses and geology of the Ridge means that the key sites are not too distant from each other and many features already exist which could become wildlife corridors or stepping stones. The river valleys along the Flit, as well as the Ivel and Ouzel where they cross the Ridge, provide ideal opportunities to link sites together along the watercourse corridor. Figure 14 shows where the watercourses within the NIA are and their ecological status according to the Water Framework Directive. This considers factors including the chemical health of the water along with biological factors and the structure of the river. Key features of corridors along these watercourses would be establishing suitable edge habitats, for example managing the mature willows and black poplar trees, improving the channel morphology and enhancing the quality of the water within the rivers.

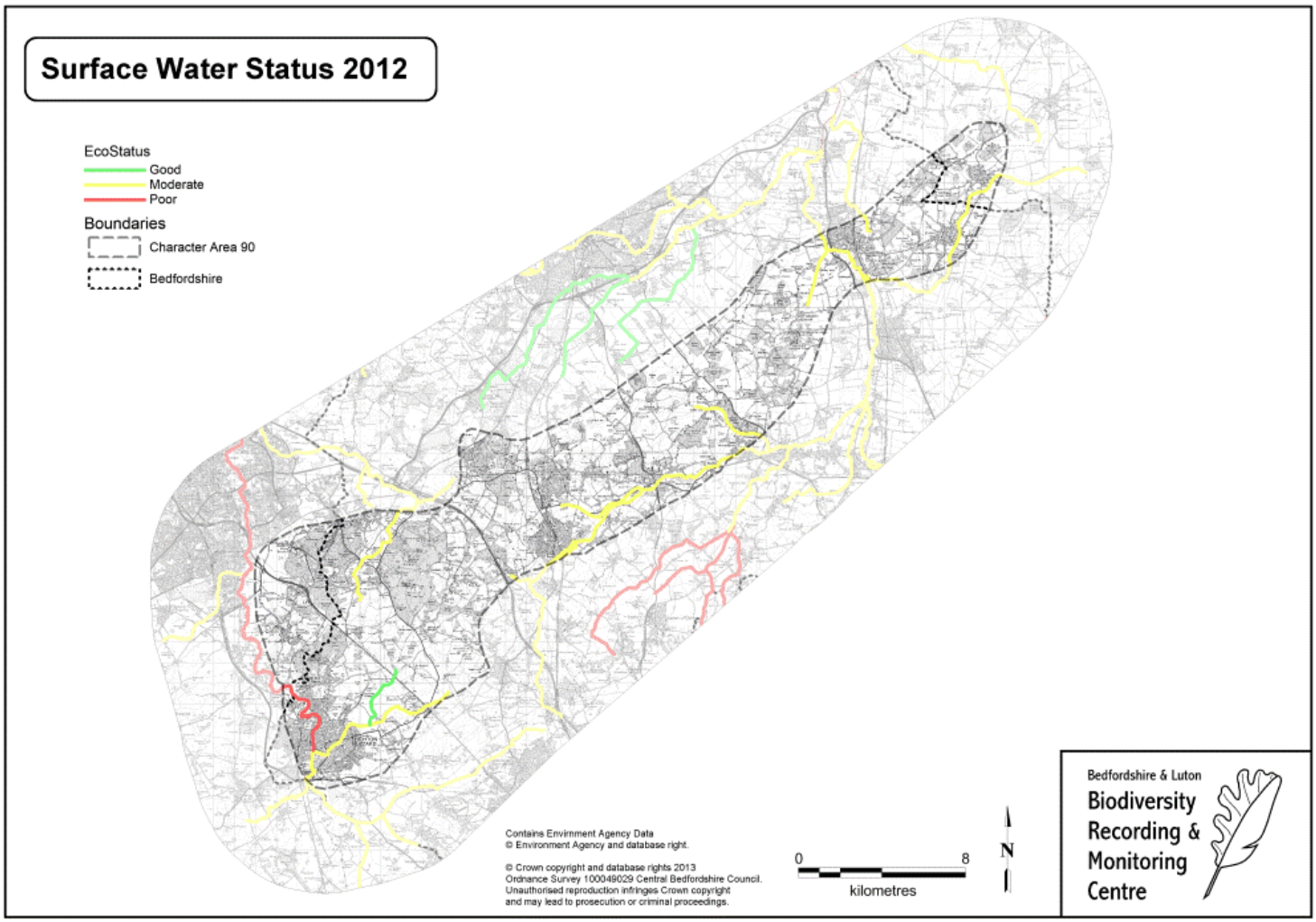

Figure 14: The main watercourses within the Greensand Ridge NIA are the River Flit, where it runs along the base of the dipslope, and the Ivel and Ouzel Rivers as they cut across the Ridge. The colours show the Water Framework Directive status of each river.

Along with the river corridors there are other opportunities to provide an ecological network across the Greensand Ridge. The area's road network has many roadside verges, some of which have been designated as Roadside Nature Reserves, which could be enhanced to provide wildlife corridors between core areas. Figure 15 shows the transport corridors within the NIA. Enhancements which could be made include ensuring that the Roadside Nature Reserves are managed correctly and considering the management regimes of the wider verges to create floral or woodland corridors for wildlife.

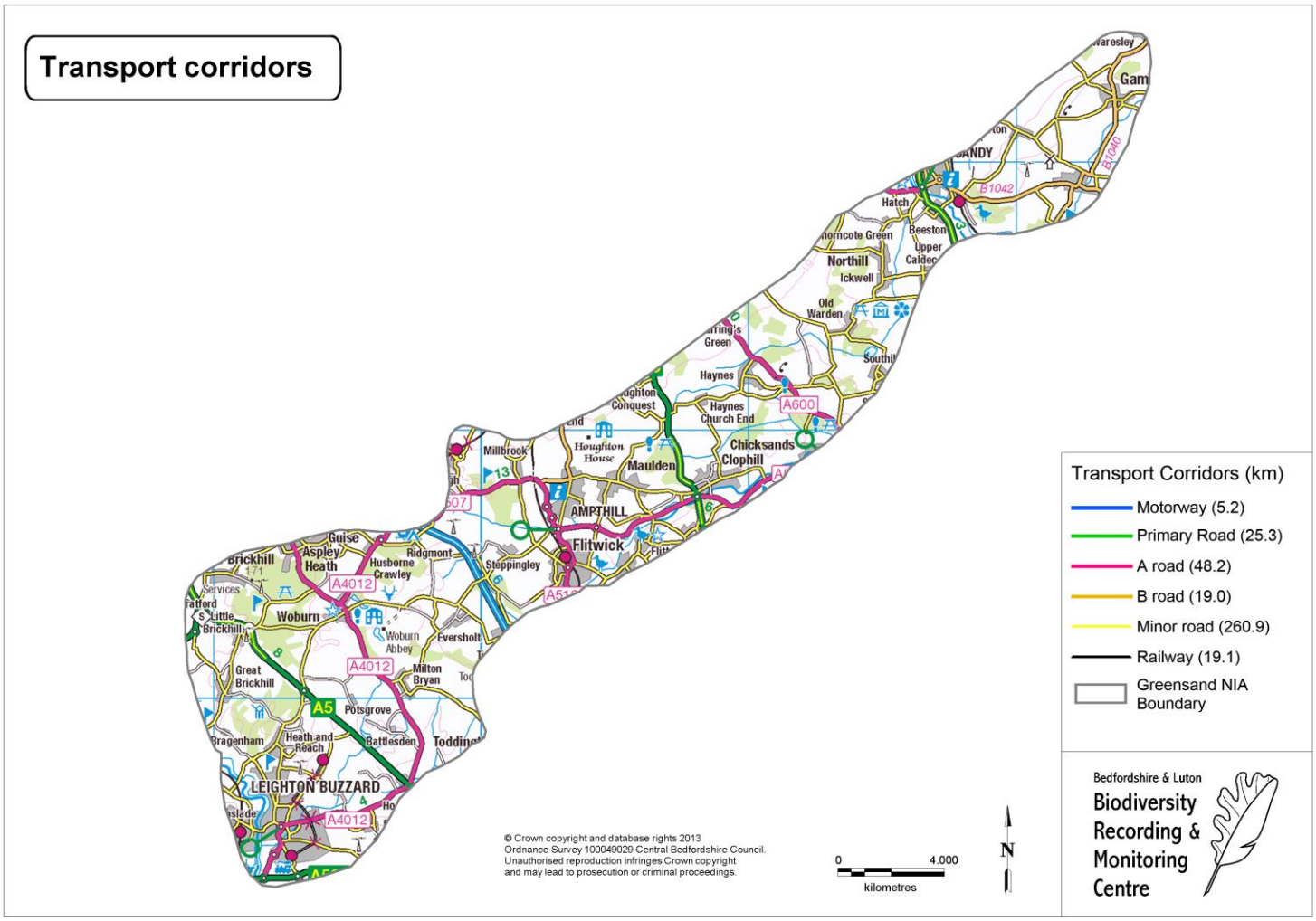

Figure 15: The transport corridors across the Greensand Ridge provide opportunities to create corridors for wildlife connecting core areas.

There are a range of other opportunities which could be pursued to create and enhance biodiversity corridors and stepping stones in other areas of the Greensand Ridge. These include making the best use of agri-environment schemes, promoting wildlife gardening in the towns and villages along the Ridge and enhancing public open spaces for wildlife. A lot of good work has already been carried out on former quarry sites to ensure that their restoration plans include linkages to the wider area. For example, once industrial uses at Cainhoe Quarry have ceased the site's restoration will include the creation of new hedgerows. This will strengthen the ecological network within the area where gaps had been identified. There is, however, more to do and it should be recognised that some restoration plans will not be put into practice for many years to come. Within the NIA there are many useful schemes being progressed which will enhance the ecological network. They are, however, often disparate and so the focus that the NIA designation brings will strengthen joint working to bring together network enhancements across the Greensand Ridge.

3.5 Buffer Zones and the Surrounding Land

Agri-environment schemes are a key way of encouraging land management across the Greensand Ridge to accommodate ecological networks. They can provide better managed woodlands to provide stepping stones between core woodland sites; enhance corridors through hedgerow management and the creation of field margins; and buffer existing sites by managing their surroundings in a less intensive way. All these agri-environment schemes are agreed for a period of five years, or ten years if it is a Higher Level Stewardship Scheme. This results in the uptake of schemes across the NIA changing over time. Figure 16 highlights the period over which each scheme is operational and therefore, shows areas where schemes are going to run out in the near future. It shows that large areas in the Toddington, Woburn and Eversholt areas have schemes which will end in 2016. Schemes which end can provide a new opportunity to co-ordinate their designs, improving their impact and enhancing the ecological network further.

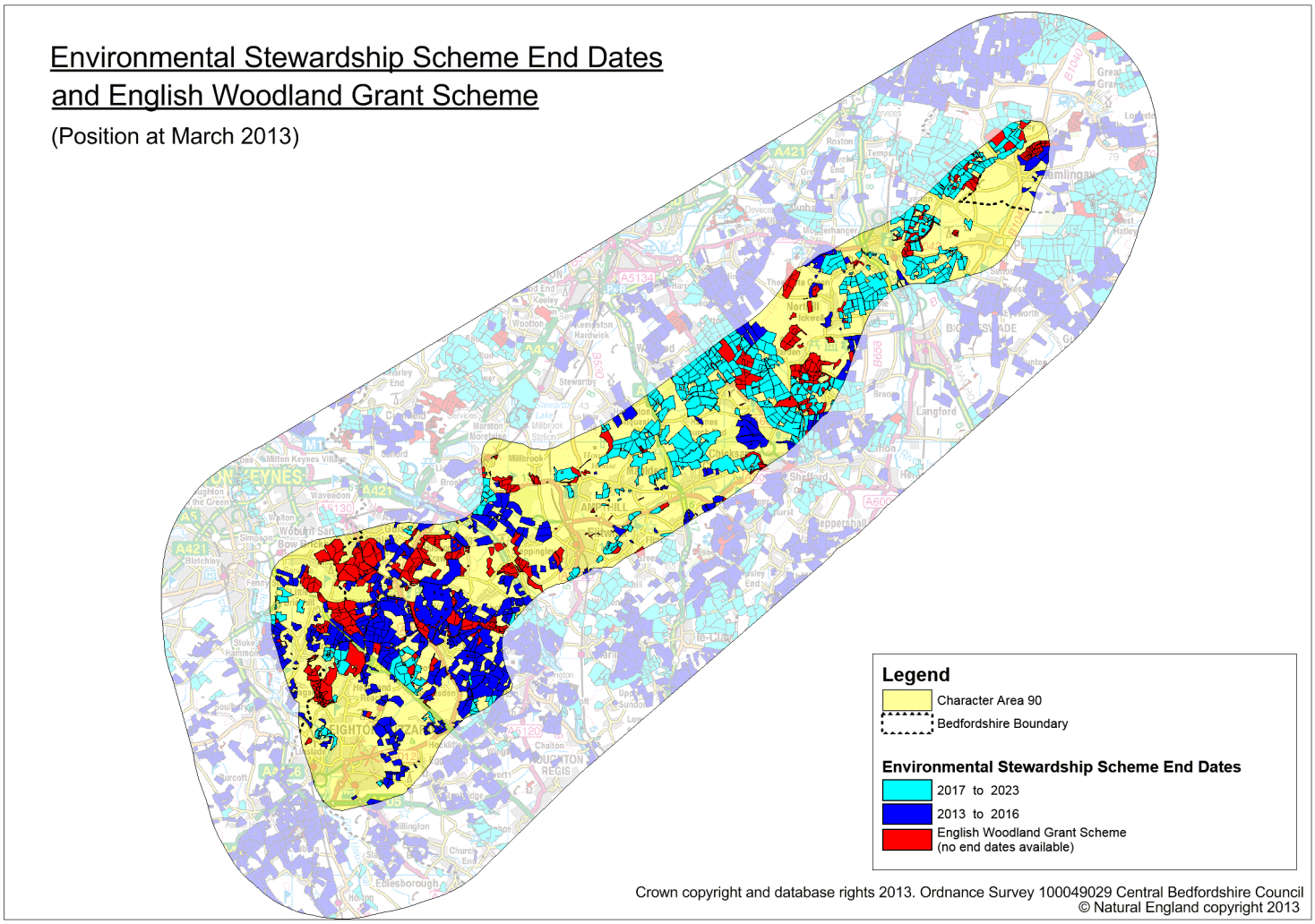

Figure 16: When each agri-environment scheme agreement on the Greensand Ridge will end.

Buffering existing key sites and maintaining links between them can sometimes be threatened by development pressures. Influencing the selection of new development sites through the Local Plan is an important way of preserving the ecological network. New developments can also play a part in the creation of the network if they are designed sensitively. Being aware of the surrounding ecological assets is a good start from which networks across the development can be built up. Preserving existing corridor features like hedgerows and creating wildlife stepping stones are also important. A vital component to the future usefulness of these networks is space. Although many multi-functional areas work well, where space is limited corridors can easily lose their ecological function and never

achieve the aim for which they were created. Green infrastructure, including ecological networks, has been embedded in the Local Plan, supported by the National Planning Policy Framework, to emphasise the need for developments to adequately consider these issues.

4. From Theory to Action

This final chapter gives a brief outline of a range of projects which would all enhance the ecological network on the Greensand Ridge NIA in line with the broad principles which have already been discussed. Most projects bring together activities which are already being pursued by various organisations. Designating the Greensand Ridge as a NIA will provide a platform to bring these activities and organisations together, producing the step change for nature that the NIA process seeks.

The list of projects was collected at a meeting on 5th June 2013 attended by all the conservation organisations who work in the Greensand Ridge area. This was then used at a workshop on 17th July 2013 to consider where the priorities for action should be. The workshop asked participants to contemplate what their individual priorities were, as well as the priorities for the organisations which they represented. When both the individual and organisation priorities were combined the top five projects are:

4.1 The Working Woodlands Centre

The Greensand Trust's Working Woodlands Centre, located at Maulden Wood SSSI, will provide an integrated approach to enhancing the Ridge's under-managed and under-utilised woodlands. The project will provide opportunities for woodland owners, managers, businesses, local communities and individuals whilst protecting and enhancing the woodlands to benefit biodiversity. The first phase of the project is up and running. This includes a new building to offer training and education facilities along with accompanying toilets, offices and a small car park. Associated with this and located a short distance away is a series of 'incubator' workshop units for wood and woodland-related businesses. The units enable new businesses to get started and develop their markets as well as providing a base for and enhancing volunteering opportunities. In the future it is hoped that the Working Woodlands Centre will provide more visitor facilities, with planning permission secured for future phases. The role of the Working Woodland Centre in promoting the management of woodlands and so enhancing their biodiversity was ranked very highly as an important objective for the NIA. It provides a mechanism to fund the management of woodlands as well as providing a focus for training and education for all ages.

4.2 Recovering Heathland Habitats

Heathland and acid grassland is one of the most characteristic habitats on the Greensand Ridge. Its decline, however, means that the heathland sites which remain are mostly small and fragmented. Promoting the recovery of existing sites, as well as connecting them through creating new sites, corridors and stepping stones is another strong priority within the NIA. This project involves the continuation of joint working between different organisations to enhance and link up the existing sites as well as providing up-to-date information and monitoring on the project's progress. The Greensand Trust have organised annual Heathland Forum events to promote joint working and best practice in heathland and acid grassland management and restoration. They have also used heathland creation proposals at Rushmere Country Park to pilot the national ECOLAP study. Natural England commissioned this study to investigate effective ways to integrate the public's perception of landscape change and value with the creation of ecological networks. It is hoped that by considering cultural factors in the creation of new habitats it will make the enhance network more sustainable. Within the NIA promoting a better ecological network for heathlands is a priority.

4.3 Road Verge Connections

The road network across the NIA provides an ideal opportunity to create wildlife corridors and stepping stones between core biodiversity areas. There are already 11 Roadside Nature Reserves across the Ridge which have been designated as buffers for existing wildlife rich areas or because of the habitats and species that they contain. The management of these sites has not always been consistent and one of the priorities for the NIA partnership, particularly Central Bedfordshire Council, is to improve this. As part of the NIA there may also be opportunities to enhance other key verges

along the road network for biodiversity. Projects could include considering the mowing regime of existing verges, the seeds used to repair damaged verges after works or the management of scrub corridors to enhance their wildlife value.

4.4 Supporting County Wildlife Site Owners

The Greensand Ridge has 131 CWS covering the whole range of habitats that exist within the NIA. Most CWS are privately owned and/or managed by individuals and businesses. Providing advice and support to these owners was agreed at the workshop to be amongst the highest priorities for action. This is because the CWS system covers the vast majority of the core habitats which already exist. It includes a variety of sites from churchyards to restored former quarries. Losing these would significantly impair the ecological network across the NIA. Advice can take a variety of forms from conducting ecological surveys and arranging access for specialist ecologists to providing advice on how to best manage particular habitats and organising enhancement works. There are a number of organisations which are currently involved in this work including The Wildlife Trust, Greensand Trust, Bedfordshire Rural Communities Charity and Central Bedfordshire Council.

4.5 Opportunities on Minerals Extraction Sites

The geology of the Greensand Ridge continues to provide opportunities for the quarrying industries. As the quarries become exhausted and are restored these former industrial sites can greatly benefit the Ridge's ecological network. They can be used to create new core areas for the future or to provide buffers, corridors and stepping stones between existing core sites. The RSPB have a dedicated Nature after Minerals team which works with planners and the minerals industry to promote the restoration of former quarry sites for biodiversity. The Greensand Trust along with partners has been working with the sand quarries in the Leighton Buzzard and Heath and Reach area through The Sandpit Strategy (updated 2012). This Strategy aims to promote a positive, joined up approach to restoration, delivering landscape and access enhancements, linking existing and creating new habitats.

There are a range of other projects which the organisations at the workshop agreed would enhance the ecological network across the Greensand Ridge but had a lesser priority. These were:

4.6 Building Up the Data – Bio-blitz

There is a requirement for monitoring when designating areas as NIAs to measure their success over time. This is not easy to do and requires many factors to be considered. One of these factors is the number and diversity of species which are present. Bio-blitz have become a popular way of looking in detail at a particular site to discover more about the species which live there or to re-survey an area which has been previously studied to monitor change. Many organisations working on the Greensand Ridge have already been involved in Bio-blitz. Of particular note is the Bedfordshire Natural History Society whose local expertise is vital in these events. The Society arranges a number of events cross the county each year, some of which will cover sites within the NIA.

4.7 Recognising Veteran Trees and Restoring Parkland

The Greensand Ridge contains many areas of historic parkland, many of which retain features which are rich in wildlife. Although a couple of these parks still survive intact others only contain relics of their former expanses. For example, veteran trees may survive within agricultural fields or small areas of grassland could still be found along verges or tracks. Preserving these features for the future as an important component of the Greensand Ridge is another project that the workshops identified. Along with retaining the parkland habitats which remain, restoration possibilities should be explored in the areas of historic parkland. This would not only increase the core areas for parkland habitat but could also provide buffers for surrounding core areas and include corridors or stepping stones of other habitats to enhance the ecological network further.

4.8 Non-Native Invasive Species Local Action Group

Non-native invasive species are one of the largest threats faced by our native wildlife. They can degrade habitats at an alarming rate as well as causing wider problems, for example, increasing flood risk or disturbing commercial activities. In the Flit Valley the non-native plant Himalayan balsam (*Impatiens glandulifera*) had led to a decline in the quality of some areas of Flitwick Moor SSSI. This annual plant can grow to over two metres in just one season, out-competing other vegetation in wetland areas before it dies off completely in the autumn. This leaves river banks in areas where the balsam grows bare in the winter increasing the erosion risk. A project to tackle Himalayan balsam, led by the Wildlife Trust with other members of the Flit Valley Local Action Group, is in its fifth year. It has been very successful in dramatically reducing the area of this invasive species from Flitwick Moor and where it occurs upstream along the River Flit. Tackling balsam upstream of Flitwick Moor will stop seeds re-entering this nationally important site, making its control more sustainable in the future. Himalayan balsam, however, is only one non-native species which is found within the NIA. Others include American mink (*Neovison vison*), signal crayfish (*Pacifastacus leniusculus*) and many species of aquatic plant. The Local Action Group is expanding its activities to cover these as well.

4.9 Supporting Farming for Wildlife in the NIA

This section of the projects list covers two areas of work which were highlighted during the workshop. These are making improvements for wildlife on the farm estate held by Central Bedfordshire Council and promoting agri-environment schemes more widely across the Greensand Ridge. As agricultural land accounts for a high proportion of the area not dedicated to nature conservation, urban environments or quarrying activities, it provides many opportunities which would enhance the ecological network. Environmental Stewardship Schemes contain a range of options which could be used to create new wildlife rich areas or to provide stepping stones and corridors between rich areas. Providing advice to farmers who are entering new schemes would ensure that the options taken provide the best benefit for biodiversity and allow a wider view to be taken across the whole of the NIA. Advice is also offered to woodland owners who would like to apply for the Woodland Grant Scheme. This provides funding to manage woodlands which can enhance their value for wildlife. Again having a wider view of the ecological network across the Greensand Ridge can help make the most of this scheme. Many of the organisations who work on the Greensand Ridge are able to offer agri-environment scheme advice. For example, the RSPB provide a web-based toolkit which provides information to arable farms. Figure 16 in the previous section highlighted the areas where Environmental Stewardship Schemes will end in the next few years and also show areas which have not been entered into a scheme. Working with landowners in these areas will be a priority for the NIA.

4.10 Focus on the Brickhills

The Brickhills are a collection of villages surrounded by a range of rich wildlife habitats at the south-western end of the Greensand Ridge in Buckinghamshire. Their character is slightly different from the rest of the Ridge and so a specific project to improve the biodiversity network in this area would be useful. The area is mostly on the scarp slope of the Ridge as it drops into the Ouzel Valley. It is an intimate landscape dominated by pastures divided by deep-cut lanes and high hedges. Scattered among the pastures are small woodlands, valley mires, acid grasslands and marshy grasslands containing species like the southern marsh orchid (*Dactylorhiza praetermissa*). In recognition of these rich habitat patches there are many small designated sites clustered around this section of the Ridge.

4.11 In-channel River Improvements

According to the Water Framework Directive's assessment, the majority of the rivers within the NIA are of a Moderate condition and are classed as heavily modified channels. The exceptions to this are the River Ouzel from the centre of Leighton Buzzard towards Milton Keynes which is classified as Poor and the brook which runs from Battlesden Lake into the Clipstone Brook which is classified as Good. It was agreed at the workshop that a project which sought and acted on opportunities to improve the in-channel environment of the watercourse would be very beneficial. It would not only

improve the rivers as habitat in their own right but would also improve their function as a corridor along which a range of wildlife could travel, linking together core areas of the ecological network. The Environment Agency have a River Basin Management Plan for the area which identifies and delivers (subject to funding) watercourse enhancements. On the Ivel in-channel improvements have already been made by removing weirs and setting back embankments. Investigations on the Ouzel are about to begin.

4.12 Horse Pasture Management for Wildlife

In some areas of the Greensand Ridge there are an abundance of horse pastures, some of which have been designated as CWS. Many horse owners enjoy the countryside and landscape within the NIA and are keen to improve the pastures that their horses use for wildlife, especially when it can also benefit the health of their animals. It has been identified that an event publicising how horse pastures can become wildlife friendly and promote the health of the horses grazing them would be useful. A similar event has been held in the past in the south of the County and proved to be very popular. The event included tips on how to create a diverse, flower rich sward in the field and the veterinary reasons for doing so. Boundary features, such as hedges and walls, can also be useful wildlife corridors if managed appropriately and provide valuable shelter within the field.

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Appendix 1: Rebuilding Biodiversity Summaries

Figure 12 (Section 3.1) shows a section of the Biodiversity Network which was produced for Rebuilding Biodiversity (Bedslife) and included in the Mid Bedfordshire District Council Green Infrastructure Plan. Linkages B,E,F,H and I are most relevant to the Greensand Ridge and therefore are described in the main body of the text. Summaries of the other linkages are included below.

A: **Shallow river /stream valleys** running north from the calcareous grasslands and woods of the Chilterns and linking this important area to those to the north. Here habitats could be conserved or expanded to complement the streams. Flower rich lowland meadows and hedges with perhaps arable field margins managed as grassland would link together along the valley and be enhanced by occasional field ponds, copses and re-profiled watercourses.

C: **Shallow river valley from Biggleswade to Potton** and the network of lowland meadows, marshy grasslands, streams, wet woodland, willow pollards and restored mineral workings along the Ivel Valley. Careful management of water quantities and quality could make some areas wetter whilst others need secure sensitive management regimes to conserve, restore and expand small grasslands. Otter and water vole populations are important here and large networks of sensitively managed habitat are important for their survival.

D: In the **rolling arable farmland east of Biggleswade** and into Cambridgeshire species of open arable farmland are important. This area forms a western extension of an area of farmland stretching northeast through Cambridgeshire which is of national significance for farmland bird populations. Emphasis here should be on the networks of habitats within an arable farmland landscape which can support strong populations of open farmland species.

G: Amongst the **grasslands and woodlands on the steep slopes overlooking the Marston Vale** there are opportunities for further woodland and grassland creation. An isolated series of key habitats are complemented by a range of key species in the wider countryside. Substantial new habitat initiatives are already beginning to link more mature habitat and there are opportunities for woodland, lowland meadow, hedgerow and arable margin habitats to build a strengthened network linking together the Greensand Ridge with important habitat areas in northwest Bedfordshire.

J: The **wetlands at the core of the Marston Vale,** ranging in size from small field ponds and marshy areas to huge lakes that have resulted from clay extraction, support important breeding and wintering birdlife. The ponds and lakes are noted in a national study as important stonewort areas and amphibian populations are strong. The maturing post-industrial habitats have a rich invertebrate fauna including the last local outposts for some national priority butterflies. Care is needed to prevent habitat fragmentation and destruction of key post-industrial sites and considerable opportunities exist for buffering, linking and improving the quality of wetland habitat.

K: A **ridge of land** with scattered fragments of rich habitat stretching from grasslands and wetlands around Toddington, in South Bedfordshire, to Silsoe. Sandy soils outcrop in places. The topography and complexity of soils offer opportunities to rebuild a network of species rich hedgerows and grasslands, including arable field margins, to support strong populations of farmland species and to buffer and link those important existing fragments.

Appendix 2: Mineral Extraction Sites

Number	SITENAME	SITETYPE	STATUS
1	Black Cat	Mineral Quarry (Aggregate and/or Silica Sand)	Permitted site not yet implemented (2012)
2	Willington Pit (including Octagon Farm)	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
3	Sandy Heath	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
4	Myer's Farm	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
5	Broom South	Mineral Quarry (Aggregate and/or Silica Sand)	Permission implemented. Extraction yet to commence
6	Broom Quarry	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
7	Whitsundoles	Mineral Quarry (Aggregate and/or Silica Sand)	
8	Fox Corner	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
9	Churchways (including Checkly Wood and Riddy's Pit)	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
10	Bryant's Lane	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
11	Double Arches	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
12	Reach Lane	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
13	Munday's Hill	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
14	New Trees	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
15	Nine Acres	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
16	Chamberlain's Barn	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
17	Pratt's Quarry	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
18	Grovebury Road	Mineral Quarry (Aggregate and/or Silica Sand)	Active quarry extracting in 2012
19	Totternhoe Quarry	Mineral Quarry (Chalk Extraction)	Active quarry extracting in 2012
20	Kensworth Quarry	Mineral Quarry (Chalk Extraction)	Active quarry extracting in 2012
21	Elstow Aggregate Rail depot	Aggregate Rail Depot	
22	Crescent Road Aggregate Rail	Aggregate Rail Depot	

	Depot		
23	Limbury Sidings, Leagrave Road,Aggregate Rail Depot	Aggregate Rail Depot	
24	Cainhoe	Mineral Quarry (Aggregate and/or Silica Sand)	
25	Simpsonhill Plantation	Mineral Quarry (Aggregate and/or Silica Sand)	
26		Clay permissions (none operational)	
27		Clay permissions (none operational)	
28		Clay permissions (none operational)	
29		Clay permissions (none operational)	
30		Clay permissions (none operational)	
31		Clay permissions (none operational)	
32		Clay permissions (none operational)	
33		Clay permissions (none operational)	